ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR OFFSHORE EXPLORATION DRILLING CAMPAIGN FOR Block M12, M13 & M14




Submitted to:

PC Myanmar (Hong Kong) Limited
Myanmar Centre Business Suites
10th, 11th, 12th Connecting Floor, Myanmar Centre Tower 2,
192, Kaba Aye Pagoda Road, Bahan 11201, Yangon, Myanmar
T: +(951) 515011/526411, 9345065/66/67/68
F: +(951) 525698/525684

Prepared by:

International Environmental Management Co. Ltd.
Bangkok (Head Office)
8th Floor, Sitthivorakit Building
5 Soi Pipat, Silom Road, Bangrak, Bangkok 10500, Thailand
Tel: (66-2) 636.6390-9, 636.6683-4 Fax: (66-2) 236-6276
E-mail: ron@iem-thai.com

In association with:

Environmental Quality Management Co. Ltd.
No. 233, Block 23, Sayee Pin Lane, Thuwunna,
Thingungyun, Yangon, Myanmar
Ph: (951) 560291, (951) 561417 Fax: (951) 563994
E-mail: ohnmarmay@eqmmyanmar.com

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၁။ စီမံကိန်း အကျဉ်းချုပ်

၁.၁။ နိဒါန်း နှင့် ရည်ရွယ်ချက်များ

မြန်မာ့ရေနံနှင့်သဘာဝဓာတ်ငွေ့လုပ်ငန်း၊ နိပွန်၊ PTTEP တို့နှင့် ၁၉၉၀ခုနှစ် မေလ ၃ရက်တွင် ချုပ်ဆိုထားသော ထုတ်လုပ်မှုခွဲဝေခြင်းစာချုပ်အရ ရေနံလုပ်ကွက်အမှတ် M12, M13, M14 တို့တွင် စမ်းသပ်တွင်း တူးဖော်ရေးလုပ်ငန်းစဉ်များ ဆောင်ရွက်ရန် PETRONAS Carigali Myanmar Limited (PCML) အော်ပရေတာ အနေဖြင့် ဤစာရွက်စာတမ်းကို အဆိုပြုတင်သွင်းခြင်း ဖြစ်ပါသည်။

ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ငန်းများကို ဆောင်ရွက်ရန် နိုင်ငံတကာ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုကုမ္ပဏီလိမိတက်ဒ် (IEM) နှင့် ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေးစီမံခန့်ခွဲမှုကုမ္ပဏီလိမိတက်ဒ် (EQM) တို့ကို ငှားရမ်းပြီးဖြစ်ပါသည်။

နိုင်ငံတကာပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုကုမ္ပဏီ(IEM)သည် PCMLအတွက် နယ်ပယ်တိုင်းတာသတ်မှတ်ခြင်းနှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာပြင်ဆင်ခြင်းများကို ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း လုပ်ထုံးလုပ်နည်း အပိုဒ် ၄၈ အရ နှင့်အညီ ပံ့ပိုးလုပ်ဆောင်ပေးသွားမည် ဖြစ်ပါသည်။

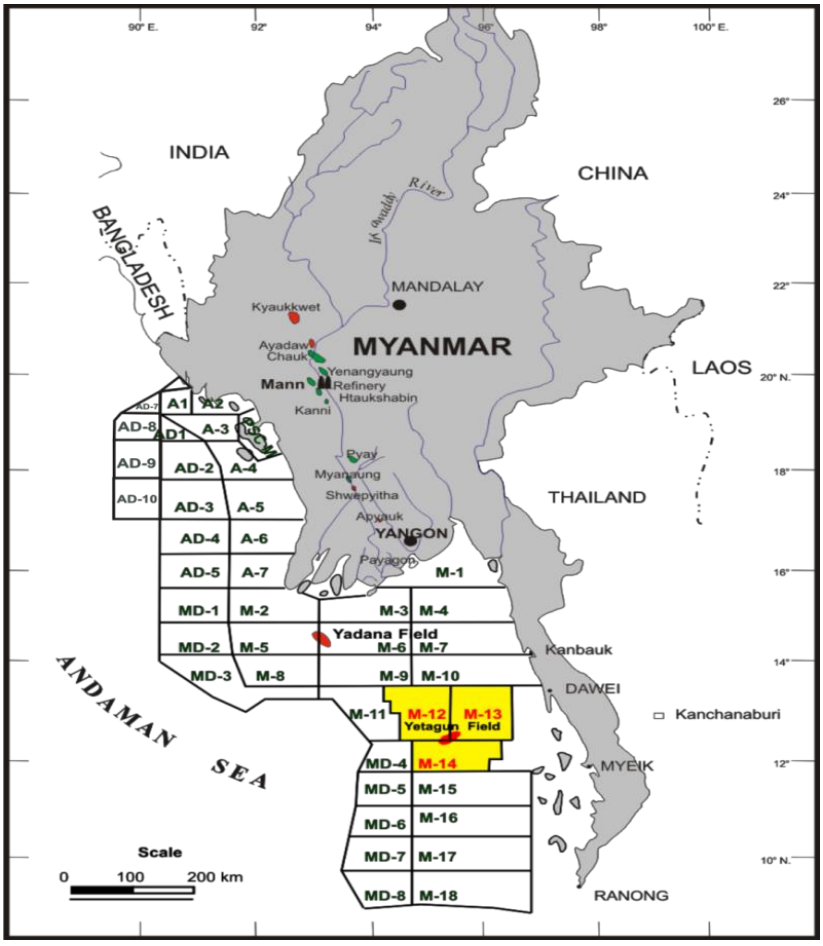
၁.၂။ စီမံကိန်းအစီအစဉ်

ရဲတံခွန်လုပ်ကွက် (ရဲတံခွန်ပင်မနှင့် ရဲတံခွန်မြောက် အပါအဝင်) သည် အက်ဒမန်ပင်လယ်ထဲတွင် တည်ရှိပြီး မြန်မာနိုင်ငံ ကမ်းလွန်လုပ်ကွက် M12၊ M13 နှင့် M14 တို့ ဖြစ်ပါသည်။ PC မြန်မာ (ဟောင်ကောင်) (PCML)သည် ၂၀၁၃ ခုနှစ် စက်တင်ဘာလ ၁၂ ရက်တွင် လုပ်ကွက်များ၏ အော်ပရေတာအဖြစ် ဆောင်ရွက်ခဲ့ပါသည်။ အကျိုးစီးပွားပါဝင်မှုမှာ PCML (၁၀.၉၁%)၊ PC Myanmar Inc (၃၀%)၊ မြန်မာ့ရေနံနှင့် သဘာဝဓါတ်ငွေ့လုပ်ငန်း (၂၀.၄၅%)၊ JX Nippon ရေနံနှင့် သဘာဝဓါတ်ငွေ့လုပ်ငန်း ကော်ပိုရေးရှင်း (၁၉.၃၂%) နှင့် PTTEP (၁၉.၃၂%) တို့ ဖြစ်ပါသည်။

ယခုလက်ရှိတွင် ထိုလုပ်ကွက်သည် မြန်မာနိုင်ငံမှ ထိုင်းနိုင်ငံသို့ တင်ပို့ရန်အတွက် တနေ့လျှင် ပျမ်းမျှ 180 MMSCAF ထုတ်လုပ်ပေးလျက်ရှိပါသည်။ အရန်ဓာတ်ငွေ့များနည်းပါးလာမှုကြောင့် ဓာတ်ငွေ့များ ပိုမိုထုတ်လုပ်လာနိုင်ရန်အတွက် PCML မှအလားအလာရှိသော သဘာဝဓာတ်ငွေ့သိုက်များ တွေ့ရှိရန်အလို့ငှာ စမ်းသပ်တူးဖော်ခြင်းလုပ်ငန်များ ဆောင်ရွက်လိုခြင်းဖြစ်ပါသည်။

သုံးဖက်မြင်ဆိုက်စမစ်တိုင်းတာခြင်းကို ၂၀၁၆ ဒီဇင်ဘာလ မတိုင်ခင်တွင် လုပ်ဆောင်ပြီးစီးခဲ့ပြီး ဖြစ်ပါသည်။ ယခုစီမံကိန်းသည် သတ်မှတ်ထားပြီးလုပ်ကွက်အတွင်းရှိ စမ်းသပ်တူးဖော်ခြင်း စီမံကိန်းတစ်ခု ဖြစ်ပါသည်။ လုပ်ကွက်အမှတ် M12, M13, M14 အတွင်းရှိ တူးဖော်မည့်နေရာများမှာ တနင်္သာရီတိုင်း၏မြို့တော်ထားဝယ်မြို့မှ ရေမိုင် ၉၀အကွာ နှင့် ဘိတ်မြို့မှ ရေမိုင် ၁၀၅ မိုင်အကွာတွင် တည်ရှိပါသည်။

လုပ်ကွက်များ၏တည်နေရာများမှာ အောက်ပါအတိုင်း ဖြစ်ပါသည်။ (ပုံ ၁-၁)



ပုံ (၁-၁) ရေနံလုပ်ကွက်အမှတ် M12၊ M13 နှင့် M14

၁.၃။ စီမံကိန်းအဆိုပြုသူ

၁၉၄၇ ခုနှစ်တွင် တည်ထောင်ခဲ့သော Petroliam Nasional Berhad (PETRONAS) သည် FORTUNE Global 500 ®ရှိ အကြီးမားဆုံး ပူပေါင်းဆောင်ရွက်မှုများအနက်မှ မလေးရှားနိုင်ငံ၏ နိုင်ငံသားပေါင်းစုံ ပါဝင်သည့် ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်းစုကြီးတစ်ခု ဖြစ်ပါသည်။ PETRONAS၏ လုပ်ငန်းခွဲ ကုမ္ပဏီဖြစ်သော PC Myanmar (Hong Kong) Limited (PCML) သည် ရေနံလုပ်ကွက်အမှတ် M12, M13, M14 တို့၏ ထုတ်လုပ်မှုခွဲဝေခြင်းသဘောတူစာချုပ်၏ အော်ပရေတာ ဖြစ်ပါသည်။ PCML သည် လူ့အဖွဲ့အစည်း၏ ကြီးမားလာသောလိုအပ်ချက်များကို ဖြည့်ဆည်းရန် စွမ်းအင်ရှာဖွေခြင်း၊ ထုတ်လုပ်ခြင်း နှင့် ဖြန့်ဝေခြင်းများ လုပ်ဆောင်လျက်ရှိပါသည်။

PCML သည် ကမ္ဘာတစ်ဝှမ်းရှိ နိုင်ငံပေါင်း ၅၀ ကျော်မှ ဝေးလံပြီးခက်ခဲကြမ်းတမ်းသည့်နေရာဒေသများမှာပင် စွမ်းအင်အရင်းအမြစ်များကို ကူညီထုတ်လုပ်ပေးနိုင်သည့် ဆန်းသစ်သောနည်းပညာများကို အသုံးပြုကြ ပါသည်။

ရန်ကုန်မြို့ရှိ PCML ရုံး -

Myanmar Centre Business Suites
, 11th, 12th Connecting Floor, Myanmar Centre Tower 2
၁၉၂၊ ကမ္ဘာအေးဘုရားလမ်း၊ ဗဟန်းမြို့နယ်၊ ၁၁၂၀၁၊ ရန်ကုန်၊ မြန်မာ။
ဖုန်း - +(၉၅၁) ၅၁၅၀၁၁/၅၂၆၄၁၁, ၉၃၄၅၀၆၆၅/၆၆/၆၇/၆၈
ဖက်စ်: +(၉၅၁) ၅၂၅၆၉၈/၅၂၅၆၈၄

၁.၄။ မူဝါဒ၊ တရားဥပဒေနှင့် ဖွဲ့စည်းပုံမူဘောင် အကျဉ်းချုပ်

၁.၄.၁။ မူဝါဒ၊ တဂ်းဥပဒေမူဘောင်

၁.၄.၁.၁။ ပတ်ဝန်းကျင်ဆိုင်ရာ မူဝါဒများ

မြန်မာနိုင်ငံတွင် ပတ်ဝန်းကျင်ထိန်းသိမ်းကာကွယ်ရေးအတွက် ပတ်ဝန်းကျင်ဆိုင်ရာနည်းဥပဒေမူဘောင်များနှင့် အစီအစဉ်များမှာ လျင်မြန်စွာ တိုးတက်လာနေပါသည်။ ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်၏ ပြုပြင်ပြောင်းလဲရေးအစီအစဉ် တစ်စိတ်တစ်ပိုင်းအဖြစ် ပတ်ဝန်းကျင်ဆိုင်ရာနည်းဥပဒေမူဘောင်များကို ထပ်မံပြင်ဆင်ခြင်းနှင့် အကောင်အထည်ဖော်ခြင်းများ ပါဝင်ပါသည်။ စီးပွားရေးနှင့်လူမှုရေး ပြုပြင်ပြောင်းလဲရေးမူဘောင်(FESR 2013) နှင့် အမျိုးသားအဆင့် ဘက်ပေါင်းစုံဖွံ့ဖြိုးရေး အစီအစဉ် (NCDP 2011-2030) သည်လည်း မြန်မာနိုင်ငံ၏ ပတ်ဝန်းကျင်ထိန်းသိမ်းကာကွယ်ရေးပန်းတိုင်ကို ဆက်လက် အကောင်အထည်ဖော်ဆဲ ဖြစ်ပါသည်။

လက်ရှိအချိန်တွင် ပတ်ဝန်းကျင်ဆိုင်ရာ နည်းဥပဒေများကို သက်ဆိုင်ရာဝန်ကြီးဌာနများနှင့် အစိုးရဌာနများမှ အကောင်အထည်ဖော်ဆောင်ရွက်နေဆဲ ဖြစ်ပါသည်။ စီမံကိန်းနှင့် သက်ဆိုင်သော ပတ်ဝန်းကျင်ဆိုင်ရာ နည်းဥပဒေများကို အောက်ဖော်ပြပါ အပိုင်းတွင် ဖော်ပြထားပါသည်။

၁.၄.၁.၂။ နိုင်ငံတော်ရှိ ပတ်ဝန်းကျင်ဆိုင်ရာ နည်းဥပဒေများ

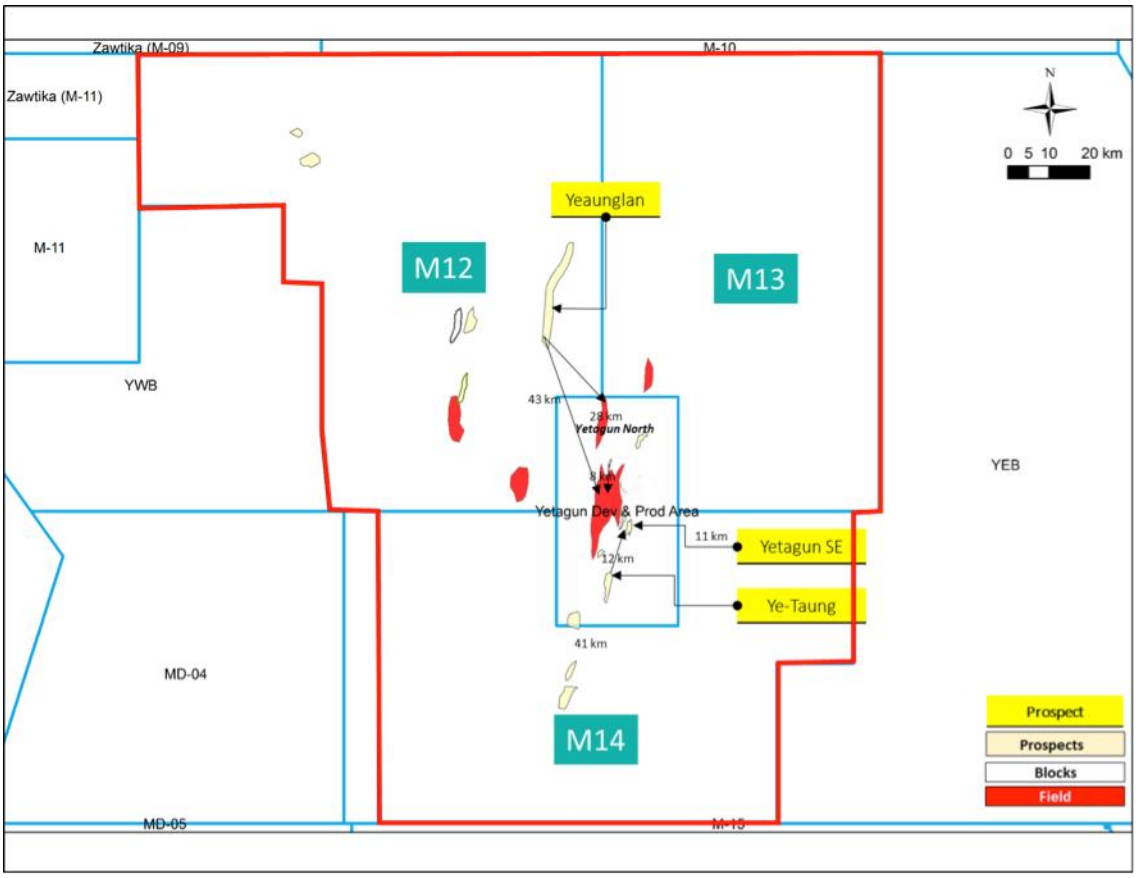
မြန်မာနိုင်ငံတော်၏ ဖွဲ့စည်းပုံအခြေခံဥပဒေနှင့်အခြားဥပဒေများအရ ကဏ္ဍအလိုက် စာရင်းပြုစုထားသည့် အောက်ဖော်ပြပါ ဥပဒေများ၊စံချိန်စံညွှန်းများနှင့်အညီ စီမံကိန်းအား အကောင်အထည်ဖော်သွားမည် ဖြစ်ပါသည်။

- ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်၏ ဖွဲ့စည်းပုံအခြေခံဥပဒေ (၂၀၀၈)
- မြန်မာ့ရင်းနှီးမြှုပ်နှံမှုဥပဒေ (၂၀၁၆)
- မြန်မာနိုင်ငံရှိ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂)
- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနည်းဥပဒေ (၂၀၁၄)
- ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း လုပ်ထုံးလုပ်နည်း (၂၀၁၅)
- အမျိုးသားအဆင့် ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် (၂၀၁၅)

၁.၅။ စီမံကိန်းလုပ်ငန်းများ

၁.၅.၁။ စီမံကိန်းတည်နေရာ

ရေတံခွန်လုပ်ကွက်များကို နယ်ပယ်သုံးခု ခွဲခြားသတ်မှတ်ထားပါသည်။ ၄င်းတို့မှာ ရေတံခွန်အရှေ့တောင်ပိုင်း၊ ရေအောင်လန်နှင့် ရေတောင် တို့ဖြစ်ပါသည်။ (ပုံ ၁-၂)



ပုံ (၁-၂) ခန့်မှန်းတည်နေရာများ

၁.၅.၂။ ရေနံတူးစင်နှင့် ကျောက်ဆူးသုံးဆွဲသဘော်များ သယ်ယူရွှေ့ပြောင်းခြင်း

တူးဖော်ခြင်းလုပ်ငန်းကို ရေပြင်ကျယ်တွင် လုပ်ဆောင်မည် ဖြစ်ပါသည်။ မြန်မာ့ရေပိုင်နက်ရှိ PCML ၏ ပညာအတွေ့အကြုံများအရ ရေပေါ်တွင်တစ်ဝက်ပေါ်၍ ရေအောက်တွင်တစ်ဝက်မြုပ်သော ရေနံတူးယာဉ်သည် ပိုမိုကောင်းမွန်သော ရေနံတူးစင် အမျိုးအစား ဖြစ်ပါသည်။

ဒီဇယ်နှင့်ကုန်ကျစရိတ်များကို လျော့ချရန် ထောက်ပံ့ဂေးယာဉ်များဖြစ်သည့် ကျောက်ဆူးသုံးဆွဲသဘော်များသည် နိုင်ငံအနီးအနားမှ ရွှေ့ပြောင်းမောင်းနှင်လာမည် ဖြစ်ပါသည်။ ၄င်းရေယာဉ်များသည် သာမန်အားဖြင့် အလျား ၇၀ မီတာ ခန့်ရှိပြီး မြင်းကောင်ရေအား တစ်သောင်းခန့်ရှိပါသည်။ ပျှမ်းမျှအားဖြင့် ရေနံတူးစင်အတွက် ထောက်ပံ့ဂေးယာဉ် (၃) စင်း ရှိမည် ဖြစ်ပါသည်။

၁.၅.၃။ တွင်းတူးခြင်းနှင့် တွင်းတူးရှုံ့ရည်

တွင်းတူးမည့်နေရာ၌ တွင်းတူးစင်အားနေရာ ချထားပြီးနောက် ရေကိုအခြေခံသောရှုံ့ရည် နှင့် သဘာဝပတ်ဝန်းကျင်အတွက်ကောင်းမွန်စေရန် ပေါင်းစပ်ဖွဲ့စည်းထားသည့် ရှုံ့ရည်များကို အသုံးပြုလျက် စမ်းသပ်တွင်းများကို ဒေါင်လိုက်အတိုင်း တူးဖော်သွားပါမည်။ တွင်းတူးရှုံ့ရည် အမျိုးအစား(၃) မျိုးကို အောက်ပါအတိုင်း အသုံးပြုသွားမည်ဖြစ်ပါသည်။

- Bentoniteနှင့်အတူ ပင်လယ်ရေကို မျက်နှာပြင်ပိုင်းတွင် အသုံးပြုသွားပါမည်။ တွင်းတူးရည်တွင် ပင်လယ်ရေသာမက အခြားအဓိကပါဝင်သည့်အရာများမှာ barite၊ drill-gel နှင့် guar gum တို့ဖြစ်ပါသည်။
- ရေကိုအခြေခံသောရှုံ့ရည် (WBM) ကို မျက်နှာပြင်ပိုင်း၊ အလယ်ပိုင်း နှင့် ရေနုံနှင့်သဘာဝဓာတ်ငွေ့သိုက်တို့တွင် အသုံးပြုသွားပါမည် (ရွေးချယ်ရန် ၁)။ ၎င်း၏အဓိကပါဝင်သည့်အရာများမှာ barite, shale inhibitor additive နှင့် ပင်လယ်ရေတို့ ဖြစ်ပါသည်။ PCMLသည် ရေနုံတွင်းတူးဖော်ရာတွင် ရေကိုအခြေခံသောရှုံ့ရည်(WBM)ကို အဓိက အသုံးပြုသွားမည် ဖြစ်ပါသည်။

၁.၅.၄။ တွင်းစမ်းသပ်ခြင်းအဆင့်

တွင်းတည်ဆောက်ပြီး၍ ဘိလပ်မြေပလပ်ချပြီးသည့်အခါတွင် logging မှတဆင့် ရေနုံသိုက်တည်ရှိမှုကို လေ့လာပါမည်။ ဂ လက်မ လိုင်နာတောင့်ကို သုံး၍ ထိုးဖောက်ပြီး တွင်းကို စမ်းသပ်သွားပါမည်။ တွင်းစမ်းသပ်ခြင်းကို တဖြည်းဖြည်း အောက်တွင်းထဲသို့ နှိမ့်ချသွားပါမည်။ ပေါ့သောအရည် (နိုက်ဒရိုက်ကျင်၊ ဆီ)ကို ကြိုးဖြင့် လောင်းထည့်ပါမည်။ အရည်သည် စီးဆင်းနိုင်ပါက မည်မျှမှုအခြေအနေတစ်ခုကို ဖန်တီးနိုင်ပါသည်။ မျက်နှာပြင်စမ်းသပ်ခွဲခြားသည့်စက်ကို အသုံးပြု၍ အရည်များကို ရေ၊ ခါတ်ငွေ့နှင့် အပျစ်အခဲများအဖြစ် ခွဲခြားပါမည်။ ခွဲခြားသည့်စက်ဖြင့်လည်း ဟိုက်ဒရိုကာဗွန်စီးဆင်းမှုကို တိုင်းတာသွားပါမည်။ ထွက်ရှိလာသည့်အရည်သည် ပတ်ဝန်းကျင်သို့ ဟိုက်ဒရိုကာဗွန်ယိုစိမ့်မှုကို ကာကွယ်ရန် မီးရှို့ပစ်ပါမည်။ အောက်တွင် တွင်းစမ်းသပ်ခြင်းကိရိယာပုံကို ပြထားပါသည်။

၁.၅.၅။ တွင်းကို ပလပ်ချ၍ ပိတ်သိမ်းခြင်း

တွင်းစမ်းသပ်ခြင်းလုပ်ငန်းများ ပြီးသွားသည့်အခါတွင် ရေနုံအစမ်းတွင်းကို ယာယီပိတ်သိမ်းပါမည်။ (သို့မဟုတ်) အပြီးသတ်ပိတ်သိမ်းပါမည်။ တွင်းတူး၍ တွက်ချက်ပြီးနောက်တွင် အဆိုပါတွင်းအတွက် ယာယီပိတ်သိမ်းခြင်း (သို့မဟုတ်) အပြီးသတ်ပိတ်သိမ်းခြင်းလုပ်ထုံးလုပ်နည်းများကို ရေးဆွဲပါမည်။ တွင်းပိတ်သိမ်းခြင်းလုပ်ထုံးလုပ်နည်းကို ပတ်ဝန်းကျင်ကာကွယ်ရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးကို စဉ်းစား၍ ကျယ်ပြန့်သောအလေ့အကျင့်များနှင့် လုပ်ထုံးလုပ်နည်းများပေါ်တွင် အခြေခံကာ ရေးဆွဲထား ပါသည်။ တွင်းစမ်းသပ်ခြင်းအဖြေမှ စီးပွားဖြစ်ရေနုံသိုက်မတွေ့ရှိက တွင်းကို ပလပ်ချ၍ အပြီးသတ်ပိတ်သိမ်း သွားပါမည်။

၁.၅.၆။ ညစ်ညမ်းမှုထိန်းချုပ်သည့်ကိရိယာများ

တွင်းတူးစက်တွင် အောက်ပါအတိုင်း ညစ်ညမ်းမှုထိန်းချုပ်သည့်ကိရိယာများ ပါရှိသည်။

- မိလ္လာရေ သန့်စင်သည့် စနစ်များ
- အမှိုက် သိပ်သည်းစေသည့် စနစ်
- အမှိုက်ကြိတ်စက်များ
- ၂၅ bbls ရှိသော ရေပေါ်ဆီအညစ်အကြေးဖယ်ရှားပေးသော ကိရိယာ
- ၅ m^3/h ရှိသော ဆီနှင့်ရေ ခွဲခြားသည့်စက်

အထက်တွင်ဖော်ပြထားသည့် ကိရိယာတို့သာမက အရေးပေါ်အခြေအနေအတွက် (ဥပမာ- ဆီယိုဖိတ်ခြင်း၊ ပေါက်ကွဲခြင်း အစရှိသည့်) တွင်းတူးစက်နှင့်ထောက်ပံ့ရေးယာဉ်များပေါ်တွင် များစွာသော ကိရိယာများကိုလည်း ထားရှိပါလိမ့်မည်။ ကြိုတင်ပြင်ဆင်ထားသည်များမှာ -

- မီးသတ်ဆေးဘူးနှင့် ရေပိုက်များ
- IMO/SOPEP ဆီယိုဖိတ်မှုကို ပြန်လည်ကုစားနိုင်သည့် ပစ္စည်းများ ထောက်ပံ့ပေးထားခြင်း
- ရေနှင့် အမှိုက်များ ယိုစိမ့်ပါက ပြင်ပသို့ ပျံ့နှံ့သွားခြင်းမရှိစေရန် တားဆီးပေးနိုင်သော ရေပေါ်ပေါ်သည့် ဖောက်နန် (Containment floating boom) နှင့် ရေနှင့် အမှိုက်အား တားဆီးပေးနိုင်သော ဖောက်နန်အား တွန်းနိုင်၊ ဆွဲနိုင်သော ပစ္စည်း (trawling floating boom)
- အငွေ့အရည်များကိုဖျန်းပေးနိုင်သော မောင်းတံရှည် (Sprayer boom) နှင့်အတူ ရှံ့ရည်အရောအနှော နှင့် ရေနံအရောအနှောကို ဓာတ်ပြယ်စေနိုင်သော အခဲ၊ အမှုန့် (dispersant agent)
- ပင်လယ်ရေမျက်နှာပြင်မှ ရေနံများအား စုပ်ယူဖယ်ရှားပေးသည့် စက်ပစ္စည်း (Oleophilic skimming or mechanical skimming)

ပေါက်ကွဲမှုကိုတုန့်ပြန်နိုင်သည့် အရေးပေါ်အစီအစဉ်၊ ဆီယိုဖိတ်မှုကိုတုန့်ပြန်နိုင်သည့် အစီအစဉ်နှင့် အခြားအရေးပေါ်တုန့်ပြန်နိုင်မည့် အစီအစဉ်များကို ရေနံအစမ်းတွင်းတူးဖော်ခြင်း လုပ်ငန်းစဉ်အတွင်း စီမံဆောင်ရွက် သွားမည်ဖြစ်ပါသည်။

၁.၅.၇။ စီမံကိန်းအချိန်ဇယား

PCML ရေနံအစမ်းတွင်းတူးဖော်ခြင်းကို ၂၀၁၈ ခုနှစ် Q4 နောက်ပိုင်းမှ စတင်၍ ၂၀၁၉ ခုနှစ် Q2 ထိ ဆောင်ရွက်သွားပါမည်။ ရေနံတွင်းများကို ရေပေါ်တွင် တဝက်ပေါ်၍ ရေအောက်တွင် တဝက်မြုပ်သော ရေနံတူးယာဉ်ဖြင့် တူးဖော်သွားပါမည်။ တွင်းတစ်တွင်းစီသည် ၇၅ ရက်ခန့် ကြာမြင့်မည်ဖြစ်ပါသည်။ ရေနံတွင်း (၃) တွင်းကို တူးဖော်ရန်စီစဉ်ထားပြီး ထပ်မံ၍ ရှာဖွေတွေ့ရှိပါက နောက်ထပ်တွင်း (၂) တွင်းကို စမ်းသပ်တူးဖော်သွားပါမည်။

၁.၆။ ပတ်ဝန်းကျင်အခြေအနေ

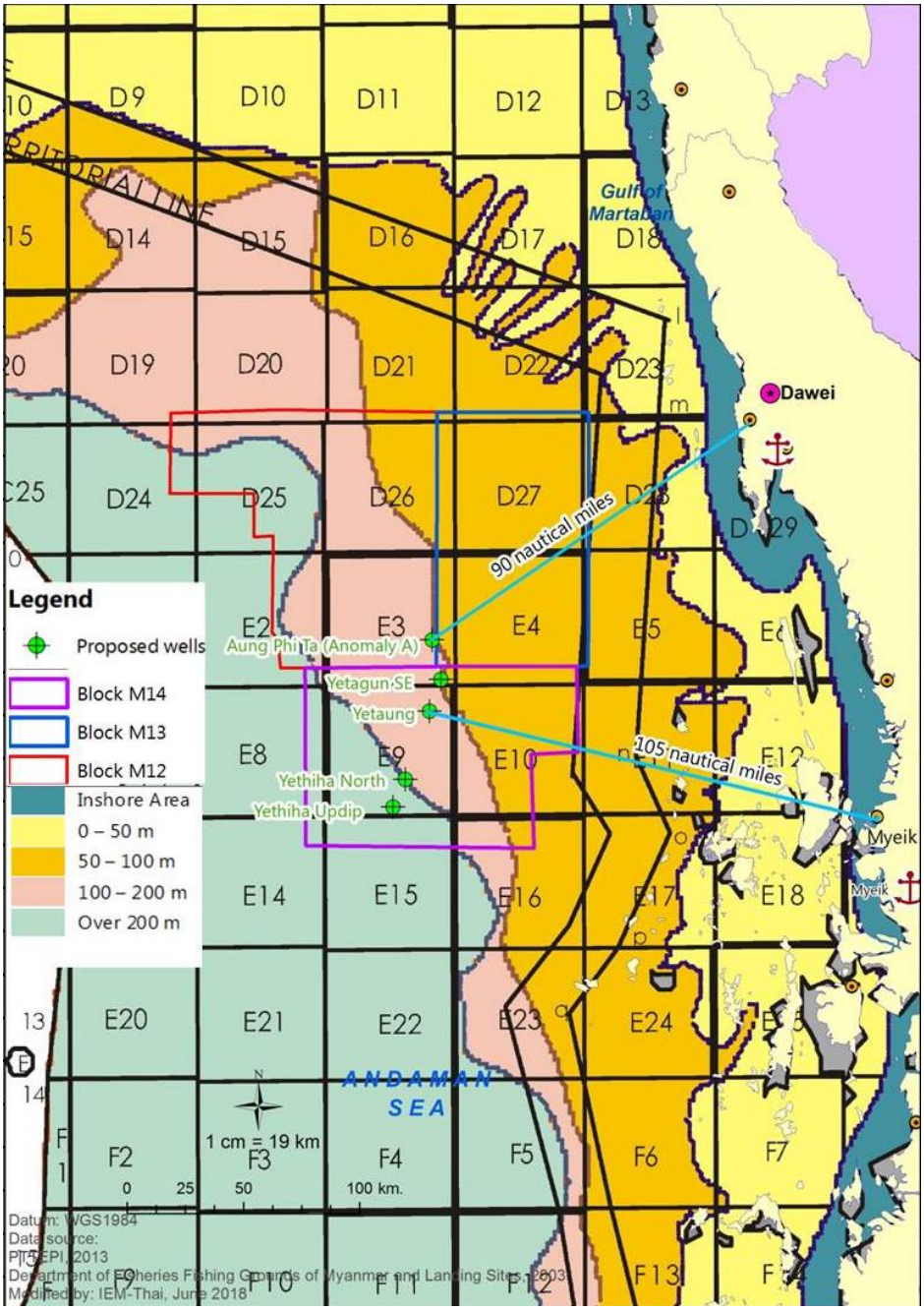
စီမံကိန်းသည် မြန်မာ့ကမ်းလွန် မုတ္တမ ပင်လယ်ကွေ့၏ အနောက်တောင်ဘက်ရှိ ရေနံလုပ်ကွက်အမှတ် M12, M13 & M14 တို့တွင် တည်ရှိပါသည်။ ရေနံလုပ်ကွက်အမှတ် M12, M13 & M14 အတွင်း တွင်းတူးမည့်နေရာသည် ရေအနက် မီတာ ၁၂၀ မှ ၁၈၀ ကြားရှိပါသည်။ ရေနံလုပ်ကွက်အမှတ် M12, M13 & M14 အတွင်းရှိ အဆိုပြုတွင်းများမှာ (ပုံ ၁-၃) တွင် ဖော်ပြထားသည့်အတိုင်း ထားဝယ်မြို့အနီး ကမ်းခြေမှ ရေမိုင် ၉၀ အကွာ နှင့် ဘိတ်မြို့မှ ရေမိုင် ၁၀၅ မိုင် အကွာတွင် တည်ရှိပါသည်။

၁.၆.၁။ ထိခိုက်လွယ်သော ဂေဟဗေဒအဖွဲ့အစည်း

မြန်မာနိုင်ငံ၏ သွန်ကာကျောက်တန်းအများစုကို တနင်္သာရီ ကမ်းရိုးတန်းဒေသရှိ သစ်တော ဖုံးလွှမ်းလျက်ရှိသော ကျွန်းများနှင့် Mergui Archipelago တွင် တွေ့ရပါသည်။ ရေနံလုပ်ကွက်အမှတ် M12၊ M13၊ M14 အစွန်းမှ ၃၄ ကီလိုမီတာ၊ ၆၁ ကီလိုမီတာနှင့် ၁၇၈ ကီလိုမီတာ အသီးသီးတွင် တည်ရှိသော Moscos ကျွန်းတောရိုင်းတိရိစ္ဆာန်ဘေးမဲ့တော၊ တနင်္သာရီ ကမ်းရိုးတန်းနှင့် Narcondam ကျွန်းများတွင် သွန်ကာကျောက်တန်းများ ရှိပါသည်။ (Pe, 2004) အဆိုပါကျွန်းများတွင်ရှိသော သွန်ကာကျောက်တန်းများကို စစ်တမ်း ကောက်ယူ ထားပြီး ဖြစ်ပါသည်။ (WRI, 2002)

၁.၆.၂။ ကာကွယ်ထားသောနေရာများ

မြန်မာနိုင်ငံတွင် စုစုပေါင်းကာကွယ်ထားသည့်နေရာ (၄၅) နေရာရှိပါသည်။ အဏ္ဏဝါနှင့် ကမ်းရိုးတန်းဒေသများ ကြွယ်ဝမှုရှိသော်လည်း မြန်မာနိုင်ငံတွင် အဏ္ဏဝါ အမျိုးသားဥယျာဉ် (၁) ခုနှင့် တောရိုင်းတိရိစ္ဆာန်ဘေးမဲ့တော (၃) ခု အပါအဝင် အဏ္ဏဝါ ထိန်းသိမ်းရေးနယ်မြေ (MPA) (၄) ခုသာ ရှိပါသည်။ စီမံကိန်းအနီးအနားတွင် ရှိသော ကာကွယ်ထိန်းသိမ်ထားသော နေရာများမှာ Mosထ ကျွန်းတောရိုင်းတိရိစ္ဆာန်ဘေးမဲ့တောတို့ ဖြစ်ပါသည်။ ၎င်းကာကွယ်ထိန်းသိမ်းထားသောနေရာများသည် ရေနံအစမ်းတွင်းများမှ ၈၀ ကီလိုမီတာကျော်တွင် တည်ရှိပြီး စီမံကိန်းလုပ်ငန်းများကြောင့် မည်သည့် သက်ရောက်မှုမှ ရှိမည်မဟုတ်ပါ။



ပုံ (၁-၃) ရေနံလုပ်ကွက်အမှတ် M12၊ M13၊ M14

၁.၇။ ပတ်ဝန်းကျင်ဆိုင်ရာသက်ရောက်မှုများ

ကမ်းလွန်ရေနံအစမ်းတွင်းတူးဖော်ခြင်းလုပ်ငန်းစဉ်များကြောင့် ဖြစ်နိုင်ချေရှိသော ပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှုများကို ထည့်သွင်းစဉ်းစားပြီး ဖြစ်ပါသည်။ စီစစ်ခြင်းအဆင့်၌ သတ်မှတ်ထားသည့်အတိုင်း စီမံကိန်းလုပ်ငန်းတစ်ခုချင်းစီနှင့် သက်ဆိုင်သောကဏ္ဍများကိုလည်း အနှစ်ချုပ် ဖော်ပြထားပါသည်။ ယခုကနဦးအဆင့်၌ သတ်မှတ်ထားသည့် ကဏ္ဍအကျဉ်းချုပ်ကို အောက်တွင်ဖော်ပြထားပါသည်။

၁.၇.၁။ ပတ်ဝန်းကျင်၊ လူမှုရေး နှင့် ကျန်းမာရေးဆိုင်ရာ ကဏ္ဍများ

ဇယား (၁-၁) ပတ်ဝန်းကျင်ဆိုင်ရာကဏ္ဍများ

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှု	ကြွင်းကျန်အန္တရာယ်များ
လေအရည်အသွေး/ရာသီဥတု	အင်ဂျင်စက်မောင်းခြင်း (တပ်ဆင်ခြင်း၊ တွင်းတူးခြင်းနှင့် တွင်းပိတ်သိမ်းခြင်း)	လောင်စာဆီ လောင်ကျွမ်းခြင်းကြောင့် လေအရည်အသွေးကျဆင်းခြင်း	လျစ်လျူရှုနိုင်
	တွင်းစမ်းသပ်ခြင်း	ပေါက်ကွဲခြင်းများကြောင့် လေအရည်အသွေးကျဆင်းခြင်း	လျစ်လျူရှုနိုင်
	တွင်းတူးစက် သယ်ယူပို့ဆောင်ခြင်း (တပ်ဆင်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	လေမောင်းနှင်ခြင်းမှ ဓာတ်ငွေ့ထွက်ခြင်းကြောင့် လေအရည်အသွေးကျဆင်းခြင်း	လျစ်လျူရှုနိုင်
ပင်လယ်ရေ အရည်အသွေး	ရေဆိုး (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	ပင်လယ်ထဲသို့ ရေဆိုးစွန့်ပစ်မှုကြောင့် ဖြစ်နိုင်ချေရှိသော ညစ်ညမ်းမှု	နိမ့်သော
	စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းစမ်းသပ်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	စွန့်ပစ်ပစ္စည်းများ ယိုစိမ့်ခြင်းကြောင့် ဖြစ်နိုင်ချေရှိသော ညစ်ညမ်းမှု	နိမ့်သော
	လောင်စာဆီသိုလှောင်ခြင်းနှင့် ကိုင်တွယ်အသုံးပြုခြင်း (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	ယိုစိမ့်မှုများကြောင့် ဖြစ်နိုင်ချေရှိသော ညစ်ညမ်းမှု	နိမ့်သော
	ဘေးအန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများ (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	ယိုစိမ့်မှုများကြောင့် ဖြစ်နိုင်ချေရှိသော ညစ်ညမ်းမှု	နိမ့်သော
	ရှုံနှင့် ဖြတ်စများ စွန့်ပစ်ခြင်း	ဖြစ်နိုင်ချေရှိသော ညစ်ညမ်းမှု (အစိုင်အခဲများ၊ သတ္တုများ၊ အဆိပ်အတောက်များ တိုးပွားလာမှု) နှင့် အောက်ဆီဂျင် လျော့နည်းခြင်း (အော်ဂဲနစ်ပစ္စည်း)	နိမ့်သော

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှု	ကြိုင်းကျန် အန္တရာယ်များ
အနည်အနှစ်များ	လောင်စာဆီသို လှောင်ခြင်းနှင့် ကိုင်တွယ်အသုံးပြုခြင်း (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	ယိုစိမ့်မှုများကြောင့် ဖြစ်နိုင်ချေရှိသော ညစ်ညမ်းမှု	လျစ်လျူရှုနိုင်
	ဘေးအန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများ (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	ယိုစိမ့်မှုများကြောင့် ဖြစ်နိုင်ချေရှိသော ညစ်ညမ်းမှု	လျစ်လျူရှုနိုင်
	ရှုံ့နှင့် ဖြတ်စများ စွန့်ပစ်ခြင်း	ရှုံ့နှင့် ဖြတ်စများ အနည်ထိုင်ခြင်းကြောင့် အမှုန်အမွှား များ၏ အရွယ်အစားနှင့် ဓါတ်သဘော ပြောင်းလဲခြင်း	နိမ့်သော
အနည်အနှစ်အရည်အသွေး	ရေဆိုး (တပ်ဆင်ခြင်း၊ တွင်းတူးခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	သမုဒ္ဒရာအတွင်း ရေဆိုးစွန့်ပစ်မှုကြောင့် ဖြစ်နိုင် ချေရှိသော ညစ်ညမ်းမှု	လျစ်လျူရှုနိုင်
	လောင်စာဆီ သိုလှောင်ခြင်းနှင့် ကိုင်တွယ်အသုံးပြုခြင်း (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	လောင်စာဆီသိုလှောင်ခြင်းနှင့် ကိုင်တွယ်အသုံးပြုခြင်း (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	လျစ်လျူရှုနိုင်
	ဘေးအန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများ (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	ယိုစိမ့်မှုများကြောင့် ဖြစ်နိုင်ချေရှိသော ညစ်ညမ်းမှု	လျစ်လျူရှုနိုင်
	စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	စွန့်ပစ်ပစ္စည်းများ ယိုစိမ့်ခြင်းကြောင့် ဖြစ်နိုင်ချေရှိသော ညစ်ညမ်းမှု	လျစ်လျူရှုနိုင်
	ရှုံ့နှင့် ဖြတ်စများ စွန့်ပစ်ခြင်း	ရှုံ့နှင့် ဖြတ်စများ အနည်ထိုင်ခြင်းကြောင့် အနည်အနှစ်ဓါတ်သဘော ပြောင်းလဲလာမှု (အော်ဂဲနစ်ပါဝင်မှု တိုးမြင့်လာခြင်း၊ အောက်ဆီဂျင်ပါဝင်မှု လျော့သွားခြင်း၊ ဓါတ်သတ္တုနှင့် အဆိပ်အတောက်ပါဝင်မှု တိုးမြင့်လာခြင်း)	နိမ့်သော
ဆူညံသံ	အင်ဂျင်စက် လည်ပတ်ခြင်း (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	စက်ပစ္စည်းများ၊ ယန္တရားများကြောင့် ဆူညံသံ တိုးမြင့်လာမှု	လျစ်လျူရှုနိုင်

အပိုင်းကဏ္ဍ	လုပ်ငန်း	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှု	ကြိုးကျန် အန္တရာယ်များ
	တွင်းတူးစက်တပ်ဆင်ခြင်း (တပ်ဆင်ခြင်း)		
	တွင်းစမ်းသပ်ခြင်း		
	တွင်းတူးစက် သယ်ယူပို့ဆောင်ခြင်း (တပ်ဆင်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)		
ဇီဝဗေဒ အရင်းအမြစ်များ	ရေဆိုး (တပ်ဆင်ခြင်း၊ တွင်းတူးခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	ရေဆိုး စွန့်ပစ်ခြင်းကြောင့် ပင်လယ်ရေ အရည်အသွေး ကျဆင်းခြင်းသည် အဏ္ဏဝါဂေဟဗေဒအပေါ် သက်ရောက်နိုင်ပါသည်။	လျစ်လျူရှုနိုင်
	စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	ယိုစိမ့်မှုဖြစ်ခြင်းကြောင့် ပင်လယ်ရေ အရည်အသွေး ကျဆင်းခြင်းသည် အဏ္ဏဝါဂေဟဗေဒအပေါ် သက်ရောက်နိုင်ပါသည်။	လျစ်လျူရှုနိုင်
	တွင်းတူးစက် တပ်ဆင်ခြင်း	ဆူညံသံများကြောင့် အဏ္ဏဝါ သတ္တဝါများကို အနှောင့်အယှက်ဖြစ်စေနိုင်ပါသည်။	လျစ်လျူရှုနိုင်
	ရှုံ့နှင့် ဖြတ်စများ စွန့်ပစ်ခြင်း	ရှုံ့နှင့် ဖြတ်စများ စွန့်ပစ်ခြင်းသည် နှုံးအနည်အနှစ်ကို တိုးပွားစေပြီး အဏ္ဏဝါ သတ္တဝါများကို အဆိပ်အတောက်ဖြစ်စေပါသည်။ ရှုံ့နှင့် ဖြတ်စများ စုပုံခြင်းသည် နှုံးအနည်အနှစ်ကို ဖြစ်စေပြီး benthos များပေါ် သက်ရောက်စေနိုင်ပါသည်	လျစ်လျူရှုနိုင်
	တွင်းတူးစက်ကို ပြန်လည်သယ်ယူပို့ဆောင်ခြင်း (တွင်းပိတ်သိမ်းခြင်း)	ရေကြောင်းသယ်ယူပို့ဆောင်ခြင်းများသည် အဏ္ဏဝါ နှံ့တိုက်သတ္တဝါများနှင့် တိုက်မိခြင်းကို ဖြစ်စေပါသည်။	လျစ်လျူရှုနိုင်

ဇယား (၁-၂) လူမှုရေးဆိုင်ရာ ကဏ္ဍ

အပိုင်းကဏ္ဍ	လုပ်ငန်းစဉ်	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှု	ကြိုးကျန် အန္တရာယ်များ
ငါးများ	ကွင်းဆင်းလေ့လာခြင်း (တပ်ဆင်ခြင်း)	တွင်းတူးနေရာမှ ငါးဖမ်းကိရိယာများနှင့် တခြားအဟားအဆီးများကို ဖယ်ရှားခြင်းသည် ငါးဖမ်းကိရိယာများကို ပျက်ဆီးနိုင်ပါသည်။ ငါးဖမ်းလုပ်ကွက် ဆုံးရှုံးခြင်းသည် ငါးဖမ်းသမားများ၏ ဝင်ငွေကို တိုက်ရိုက်နည်းအားဖြင့် ထိခိုက်နိုင်ပါသည်။ စီမံကိန်းလုပ်ငန်းများလည်ပတ်နေစဉ်အတွင်း မတော်တဆ တိုက်မိခြင်းတို့သည်	နိမ့်သော
	ရေဆိုး (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)		
	စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)		
	တွင်းတူးစက် တပ်ဆင်ခြင်း		

	ရှုံ့နှင့် ဖြတ်စများ စွန့်ပစ်ခြင်း လောင်စာဆီသိုလှောင်ခြင်းနှင့် ကိုင်တွယ်အသုံးပြုခြင်း (တွင်းတူးခြင်း) ဘေးအန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်း (တွင်းတူးခြင်း) တွင်းတူးစက်ကို ပြန်လည်သယ်ယူပို့ဆောင်ခြင်း (တွင်းပိတ်သိမ်းခြင်း)	ငါးဖမ်းသမားများနှင့် စီမံကိန်း ကိရိယာများအပေါ် သက်ရောက်နိုင်ပါလိမ့်မည်။ စီမံကိန်းလုပ်ငန်းများကြောင့် ရောင်းချရန်/စားသုံးရန်အတွက် ငါးရရှိမှု ပမာဏ လျော့နည်းလာခြင်းနှင့်အတူ သက်ရှိသတ္တဝါပမာဏနှင့် အရည်အသွေးကိုလည်း ကျဆင်းစေနိုင်ပါသည်။ တွင်းတူးစက်ကို ပြန်လည်သယ်ယူပို့ဆောင်ပြီးနောက် ကန့်သတ်နယ်မြေတွင် ငါးဖမ်းသမားများ ပြန်လည်ငါးဖမ်းနိုင်ပါသည်။ (ကောင်းသော သက်ရောက်မှု)	
သယ်ယူပို့ဆောင်ခြင်း	တွင်းတူးစက် တပ်ဆင်ခြင်း (တပ်ဆင်ခြင်း) စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း) တွင်းတူးစက် သယ်ယူပို့ဆောင်ခြင်း (တပ်ဆင်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း) တွင်းတူးခြင်း လုပ်ငန်းစဉ်များ (တွင်းတူးခြင်း) တွင်းစမ်းသပ်ခြင်း (စမ်းသပ်ခြင်း)	ရေယာဉ်လမ်းကြောင်း တိုးလာခြင်းနှင့် မတော်တဆဖြစ်ရပ်များကြောင့် ရေယာဉ်လမ်းကြောင်း ဖြတ်တောက်ခြင်း	နိမ့်သော
ပိုက်လိုင်း၊ ကေဘယ်လ်၊ ရေအောက်ဖွဲ့စည်းပုံများ	တွင်းတူးစက် တပ်ဆင်ခြင်း (တပ်ဆင်ခြင်း)	တွင်းတူးစက် တပ်ဆင်စဉ် ရေအောက်ကေဘယ်လ်ကြိုးများနှင့် ရေနံပိုက်လိုင်းများ ပျက်ဆီးလာနိုင်မှု	နိမ့်သော
လူမှု-စီပွားရေး	လည်ပတ်ရေး အဆင့်အားလုံး	ပတ်ဝန်းကျင်နေရာများ၌ နေထိုင်သူများ၊ စီးပွားရေး လုပ်ငန်းများနှင့် ဝန်ဆောင်မှုလုပ်ငန်းများအတွက် အလုပ်အကိုင်၊ ဝင်ငွေနှင့် ထိန်းသိမ်းစောင့်ရှောက်ရေး အခွင့်အလမ်းများ တိုးလာမှု။	ကောင်းသော
ယဉ်ကျေးမှု အမွေအနှစ်နယ်မြေများ	တွင်းတူးစက် တပ်ဆင်ခြင်း (တပ်ဆင်ခြင်း)	ပျက်ဆီးသွားသောယာဉ်များကဲ့သို့သော ရေအောက်ရှေးဟောင်းနယ်မြေများ ပျက်ဆီးလာနိုင်မှု	လျစ်လျူရှုနိုင်
ခရီးသွားလာရေးနှင့် အပန်းဖြေနေရာများ	စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း)	ထုတ်လွှတ်ခြင်း၊ မတော်တဆယိုဖိတ်ခြင်း (သို့) မသင့်တော်သော စွန့်ပစ်ခြင်းမှ အမြင်အလှတရားကွယ်ပျောက်သွားပြီး စွဲဆောင်နိုင်မှုနေရာများ လျော့နည်းလာခြင်း။	လျစ်လျူရှုနိုင်

ဇယား (၁-၃) ကျန်းမာရေးကဏ္ဍ

အဝိုင်းကဏ္ဍ	လုပ်ငန်းစဉ်	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှု	ကြွင်းကျန်အန္တရယ်များ
လူထုကျန်းမာရေး	စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု	ဘေးအန္တရာယ်ရှိ ဓါတုပစ္စည်းများ၊ ဓါတ်ငွေ့များ ထုတ်လွှတ်ခြင်းနှင့် စွန့်ပစ်ပစ္စည်းများ စွန့်ပစ်ခြင်း တို့ကြောင့် လူထုအပေါ် ကျန်းမာရေး သက်ရောက်နိုင်မှု	နိမ့်သော
လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်	ရေဆိုး (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း) စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု (တပ်ဆင်ခြင်း၊ တွင်းတူးဖော်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း) တွင်းတူးစက် သယ်ယူပို့ဆောင်ခြင်း (တပ်ဆင်ခြင်း၊ တွင်းပိတ်သိမ်းခြင်း) တွင်းတူးစက် တပ်ဆင်ခြင်း (တပ်ဆင်ခြင်း) ရှုံ့နှင့် ဖြတ်စများ စွန့်ပစ်ခြင်း တွင်းစမ်းသပ်ခြင်း (စမ်းသပ်ခြင်း) တွင်းတူးစက်ကို ပြန်လည်သယ်ယူပို့ဆောင်ခြင်း (တွင်းပိတ်သိမ်းခြင်း)	ဓါတ်ငွေ့များ ထုတ်လွှတ်ခြင်းကြောင့် အလုပ်သမား များ၏ ကျန်းမာရေးကို ထိခိုက်နိုင်ခြင်း shale shakers ကဲ့သို့သော တချို့စနစ်များတွင် H2S များ အလွန်အကျွံ စုပုံခြင်းသည် အလုပ်သမားများ၏ ကျန်းမာရေးကို ထိခိုက်နိုင်ခြင်း ဆူညံသံ - တွင်းတူးစင်ပေါ် ရှိ ဆူညံသံမြင့်မားမှုသည် အလုပ်သမားများ၏ အကြားအာရုံကို ထိခိုက်စေနိုင်ပါသည်။ ဓါတုပစ္စည်းအန္တရာယ် - အလုပ်သမားများသည် ဘေးအန္တရာယ်ရှိသော ဓါတုပစ္စည်းများကို ထိတွေ့စေနိုင်ပါသည်။ ရေဆိုး - အလုပ်နေရာတွင် မသန့်ရှင်းသော အလေ့အကျင့်များကြောင့် အလုပ်သမားများကြား ကူးစက်ရောဂါများ ပျံ့နှံ့နိုင်ပါသည်။ ဘေးအန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းများ - ရုပ်ပိုင်းဆိုင်ရာ ကျန်းမာရေး၊ စိတ်ပိုင်းဆိုင်ရာ ကျန်းမာရေးနှင့် ဘဝအရည်အသွေးပေါ်တွင် သက်ရောက်နိုင်ပါသည်။	နိမ့်သော

ဇယား (၁-၄) မစီစဉ်ထားသော ဖြစ်ပျက်မှုကဏ္ဍ

လုပ်ငန်းစဉ်	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှု	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှု	ကြွင်းကျန် အန္တရယ်များ
ပေါက်ကွဲခြင်း	တူးဖော်ခြင်း	ဟိုက်ဒရိုကာဗွန်များ ထိန်းချုပ်မှု မရှိဘဲ ပန်းထွက်ခြင်း၊ မီးလောင်ခြင်း၊ ပေါက်ကွဲခြင်းတို့သည် ပတ်ဝန်းကျင်နှင့် လူသားတို့ ထိခိုက်ဒဏ်ရာရခြင်းနှင့် အသက်ဆုံးရှုံးခြင်းကို ဖြစ်စေပါသည်။	အလယ်အလတ်
မီးလောင်ခြင်း သို့မဟုတ် ပေါက်ကွဲခြင်း (ပေါက်ထွက်ခြင်းနှင့် မသက်ဆိုင်)	လောင်စာ သိုလှောင်ခြင်း မီးရှို့စမ်းသပ်ခြင်း	တွင်းတူးစက် သို့မဟုတ် စက်သုံးဆီသိုလှောင်သည့် နေရာတွင် ပေါက်ကွဲနိုင်ခြင်း သို့မဟုတ် မီးလောင်နိုင်ခြင်း	အလယ်အလတ်
ဓါတုပစ္စည်း၊ လောင်စာဆီ၊ ရေနံ (သို့မဟုတ်) ဘေးအန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းများ ယိုဖိတ်ခြင်း	ဓာတုပစ္စည်းများ၊ အန္တရာယ် ဖြစ်သော ပစ္စည်းများ သို့မဟုတ် စွန့်ပစ်ပစ္စည်းများ သိုလှောင်ခြင်း	မတော်တဆဆီယိုစိမ့်ခြင်း ကြောင့် လေအရည်အသွေး၊ ပင်လယ်ရေ အရည်အသွေးနှင့် အဏ္ဏဝါ သတ္တဝါများအပေါ် သက်ရောက်နိုင်ပြီး သဘာဝပတ်ဝန်းကျင်ကို ညစ်ညမ်းမှု ဖြစ်စေခြင်း	အလယ်အလတ်
သယ်ယူပို့ဆောင်စဉ် မတော်တဆဖြစ်ခြင်း များ / သဘော်များ တိုက်မိခြင်း	လောင်စာဆီ၊ တွင်းတူးပစ္စည်းများ၊ လူများ၊ ရှုံ့နှင့် ဖြတ်စများနှင့် စွန့်ပစ်ပစ္စည်းများ သယ်ယူပို့ဆောင်ခြင်း တွင်းတူးစင်သယ်ယူပို့ဆောင်ခြင်း/ ပြန်လည်သယ်ယူပို့ဆောင်ခြင်း	ဖန်ထမ်းများ ထိခိုက်ဒဏ်ရာ ရရှိခြင်း သို့မဟုတ် အသက်ဆုံးရှုံးခြင်း ဖြစ်နိုင်ခြေ၊ နေရာကွက်၌ သဘာဝပတ်ဝန်းကျင် ညစ်ညမ်းမှုဖြစ်ခြင်း	အလယ်အလတ်
အပူပိုင်းဆိုင်ကလုန်းမုန်တိုင်း	လေပြင်းမုန်တိုင်းနှင့် မိုးရွာချခြင်း	တွင်းတူးစင်ပျက်စီးခြင်း၊ ဆီယိုစိမ့်ခြင်းနှင့် သဘာဝပတ်ဝန်းကျင် ညစ်ညမ်းမှုဖြစ်ခြင်း	မြင့်သော

၁.၈။ စုပေါင်းသက်ရောက်မှုများ

ဆင့်ကဲသက်ရောက်မှုများဆန်းစစ်ရခြင်း၏ ရည်ရွယ်ချက်မှာ ၄င်းတို့သီးသန့်တစ်ခုတည်းရှိရုံဖြင့် သိသာထင်ရှားသော သက်ရောက်မှုများကို မဖြစ်စေပဲ ယင်းစီမံကိန်း နှင့်/သို့ တခြားစီမံကိန်းများ၏ အတိတ် ပစ္စုပ္ပန် (သို့) အနာဂတ်ရှိ လုပ်ငန်းဆောင်ရွက်မှုများမှ သက်ရောက်မှုအချင်းချင်းပေါင်းစပ် သွားသည့်အခါ ပိုမိုကျယ်ပြန့် ပိုမို သိသာထင်ရှားသော သက်ရောက်မှု(များ)ကို ဖြစ်စေနိုင်သည့် ပတ်ဝန်းကျင်၊လူမှုရေး (သို့မဟုတ်) ကျန်းမာရေးဆိုင်ရာရလဒ်များကို သတ်မှတ်ပေးရန် ဖြစ်ပါသည်။

ဆင့်ကဲသက်ရောက်မှုများ ဆန်းစစ်ရခြင်းသည် ဆင့်ကဲသက်ရောက်မှုများ မဖြစ်ပေါ်လာအောင် အဆုံးအဖြတ်ပေးပါသည်။ ထို့အပြင် အဆိုပါအစမ်းတွင်း(၃)တွင်း တူးဖော်ခြင်းစီမံကိန်းအတွက် လက်ရှိ သတ်မှတ်ထားသော လျော့ချရေးနှင့် စောင့်ကြည့်လေ့လာရေးနည်းလမ်းများသည် **အခန်း(၇)**တွင် အသေးစိတ် ဖော်ပြထားသော ဆင့်ကဲသက်ရောက်မှုများကို ထပ်မံ၍ ကာကွယ်တားဆီးပေးလိမ့်မည်ဟု ဆုံးဖြတ်ပေးပါသည်။

၁.၉။ လျော့ချရေးနှင့် စီမံခန့်ခွဲမှုနည်းလမ်းများ

အဆိုပါနယ်ပယ်တိုင်းတာခြင်းအဆင့်တွင် စီမံကိန်းလုပ်ငန်းများကြောင့် ဖြစ်လာနိုင်ချေရှိသော အဓိက သက်ရောက်မှုများနှင့် လျော့ချရေးနည်းလမ်းများကို သတ်မှတ်ဖော်ပြထားပါသည်။ လျော့ချရေးနှင့် စောင့်ကြည့်စစ်ဆေးရေး လုပ်ငန်းစဉ်များကိုလည်း ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း (EIA) အစီရင်ခံစာရှိ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်တွင် ဖော်ပြသွားပါမည်။

ပတ်ဝန်းကျင်ကဏ္ဍ	*ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ*	*လျော့ချရေးလုပ်ငန်းစဉ်များ*
ပတ်ဝန်းကျင်ဆိုင်ရာ အရင်းအမြစ်များ		
၁။ ပင်လယ်ရေနှင့် နှံးအနယ်အနှစ်အရည်အသွေး	၁.၁။ လောင်စာဆီယိုဖိတ်မှုကြောင့် ပျက်ဆီးယိုယွင်းမှု	၁.၁.၁။ (၄၀၀) gross tons ကြီးသော ရေယာဉ်များကို လောင်စာသိုလှောင်ခြင်း၊ စွန့်ပစ်ပစ္စည်းသန့်စင်ခြင်းနှင့် စွန့်ပစ်ပစ္စည်းများ စွန့်ပစ်ခြင်းဆိုင်ရာနည်းဥပဒေများ၊ လုပ်ထုံးလုပ်နည်းများနှင့်အတူ ဆောင်ရွက်သွားရန်။ (Petroleum Act, MARPOL 73/78, PCML နှင့် ကန်ထရိုက်တာ လုပ်ထုံးလုပ်နည်းများ) ၁.၁.၂။ မတော်တဆ တိုက်မိခြင်းမှ ရှောင်ရှားရန် ရေယာဉ်များပေါ်တွင် မီးများနှင့် အချက်ပေးမီးများ လုံလောက်စွာ ထားရှိရန်။ ၁.၁.၃။ ရေယာဉ်များ ပင်လယ်ပြင်ခရီးသွားရာတွင် လုံခြုံစိတ်ချရစေရန်အလို့ငှာ မြန်မာနိုင်ငံနှင့် နိုင်ငံတကာရေကြောင်းအဖွဲ့အစည်းများ (IMO) ဆိုင်ရာ နည်းလမ်းများနှင့် စံချိန်စံညွှန်းများကို အသုံးပြုရန် ၁.၁.၄။ PCML ၏ ဆီယိုဖိတ်ခြင်းအတွက် တုန့်ပြန်မည့်အစီအစဉ်ကို ရေးဆွဲရန်။ ၁.၁.၄။ မတော်တဆ တိုက်မိခြင်းမှ ကာကွယ်ရန်

ပတ်ဝန်းကျင်ကဏ္ဍ	*ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ*	*လျော့ချရေးလုပ်ငန်းစဉ်များ*
		ရေယာဉ်လမ်းကြောင်းနှင့် မသက်ဆိုင်သည်များကို သတိပေးရန် ထောက်ပံ့ရေးရေယာဉ်များ အသုံးပြုခြင်း။
	၁.၂။ စွန့်ပစ်ပစ္စည်းများကြောင့် ပျက်ဆီးယိုယွင်းခြင်း	၁.၂.၁။ ရေယာဉ်များ ပင်လယ်ပြင်ခရီးသွားရာတွင် လုံခြုံစိတ်ချရစေရန်အလို့ငှာ မြန်မာနိုင်ငံနှင့် နိုင်ငံတကာရေကြောင်းအဖွဲ့အစည်းများ (IMO) ဆိုင်ရာ နည်းလမ်းများနှင့် စံချိန်စံညွှန်းများကို အသုံးပြုရန် ၁.၂.၂။ ဆီနှင့် ဓါတုပစ္စည်းများ ယိုဖိတ်ခြင်းမှ ကာကွယ်ရန် တွင်းတူးစင်ကို နံရံနှင့် တပ်ဆင်ရပါမည်။ ယိုဖိတ်လာသည့် ဆီနှင့် ဓါတုပစ္စည်းများကို အလုံပိတ်ထားသော ကွန်တိန်နာတွင် သိမ်းဆည်းထားပါမည်။ ပင်လယ်ထဲသို့ မစွန့်ပစ်ခင် သဘော်ပေါ်မှ ရေဆိုးများကို သန့်စင်ရန်အတွက် ထောက်ပံ့ရေးယာဉ်တွင် တင်ဆောင်ပါမည်။ ၁.၂.၃။ ရေယာဉ်များမှ ရေဆိုးများကို MARPOL ၇၃/၇၈ နောက်ဆက်တွဲ I၊ II နည်းလမ်းများနှင့်အညီ စွန့်ပစ်သွားပါမည်။ ၁.၂.၄။ စွန့်ပစ်အရည်အသွေးကို MARPOL ၇၃/၇၈ စံချိန်စံညွှန်းနှင့် ကိုက်ညီစေရန် ကောင်းမွန်ထိရောက်သည့် ရေဆိုးသန့်စင်စနစ်ကို ထားရှိသွားရန်။ ၁.၂.၃။ မစွန့်ပစ်ခင် ရေဆိုးများကို ဆီ/ချောဆီ ဇကာထဲသို့ ထည့်ရန်။ ၁.၂.၄။ အစာအစားစွန့်ပစ်ပစ္စည်းများကို ပင်လယ်ထဲသို့ မပစ်ခင် ၂၅ မိုင်မီတာထက်သေးငယ်အောင် ပြုလုပ်ရန်။
ဇီဝဗေဒဆိုင်ရာ အရင်းအမြစ်များ		
၂။ မျိုးတုန်းပျောက်ကွယ်လုနီးဖြစ်သော ပင်လယ်နေသတ္တဝါများ	၂.၁။ ကွင်းဆင်းလေ့လာသည့်နေရာမှ ပင်လယ်နေသတ္တဝါများ ရွှေ့ပြောင်းသွားနိုင်ခြင်း	၂.၁.၁။ မျိုးတုန်းပျောက်ကွယ်လုနီးဖြစ်သော အဏ္ဏဝါသတ္တဝါများရှိသည့် နေရာအနီးတွင် သွားလာခြင်းမပြုရန်။ ၂.၁.၂။ တွင်းတူးစင် မတည်ဆောက်ခင်တွင် မျိုးတုန်းပျောက်ကွယ်တော့မည့် အဏ္ဏဝါသတ္တဝါများကို လေ့လာရန် တွင်းတူးစင်ပတ်လည်တွင် ၁-၂.၅ စတုရန်းကီလိုမီတာဇုန်ကို တည်ဆောက်ထားရန်။ ၂.၁.၃။ တွင်းတူးစင်တည်ဆောက်နေစဉ်အတွင်း ထောက်ပံ့ရေးရေယာဉ်ပေါ်မှနေ၍ တွင်းပတ်လည်တွင် မျိုးတုန်းပျောက်ကွယ်တော့မည့်အဏ္ဏဝါသတ္တဝါများကို စောင့်ကြည့်သွားရန်။ ၂.၁.၃။ တွင်းတူးစင်မတည်ဆောက်ခင်

ပတ်ဝန်းကျင်ကဏ္ဍ	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ	လျော့ချရေးလုပ်ငန်းစဉ်များ
		စီမံကိန်းဧရိယာ၌ မျိုးတုန်းတော့မည့် အကျော်ဝါသတ္တဝါများ တွေ့ရှိပါက စီမံကိန်းဧရိယာအတွင်းသို့ ၎င်းသတ္တဝါများကို ဝင်ရောက်ခြင်းမှ ကာကွယ်ရန် အသံလှိုင်းကို အသုံးပြုရန်။ ၂.၁.၄။ ပင်လယ်ကြမ်းပြင်တွင် ကျောက်ဆူးကြိုးများကို ဆွဲခွင့် မပြုရန်။ ၂.၁.၅။ စီမံကိန်းဧရိယာတွင် မျိုးတုန်းပျောက်ကွယ်တော့မည် အကျော်ဝါသတ္တဝါများ တွေ့ရှိပါက မှတ်တမ်းထားရန်နှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန (ECD)သို့ တင်ပြရန်အလို့ငှာ စောင့်ကြည့်စစ်ဆေးရေး အစီရင်စာတွင် ထည့်သွင်းဖော်ပြရန်။
လူသားတို့အသုံးပြုမှုများ		
၃။ ငါးဖမ်းခြင်း	၃.၁။ ကန့်သတ်နယ်မြေကို ၅၀၀ မီတာသတ်မှတ်လိုက်ခြင်းကြောင့် ငါးဖမ်းလုပ်ကွက်များပေါ် သက်ရောက်နိုင်ခြင်း	၃.၁.၁။ တွင်းတူးစင်မသယ်ခင် အနည်းဆုံး (၃၀) ရက် ကြိုတင်၍ မြန်မာ့ရေနံနှင့် သဘာဝဓါတ်ငွေလုပ်ငန်း (MOGE)၊ ရေတပ်၊ ရေကြောင်းပို့ဆောင်ရေးညွှန်ကြားမှုဦးစီးဌာန တို့နှင့် ပူးပေါင်း၍ စီမံကိန်းလုပ်ငန်းများအကြောင်း ရေလုပ်သားများထံသို့ အကြောင်းကြားစာပေးပို့ရန်။ ၃.၁.၂။ လုပ်ငန်းများမစတင်ခင် အနည်းဆုံး (၄၅) ရက်ကြာကြိုတင်၍ စီမံကိန်းလုပ်ငန်းများအကြောင်း သက်ဆိုင်ရာ ငါးလုပ်ငန်းအဖွဲ့အစည်းများကို အကြောင်းကြားရန်။ ၃.၁.၃။ PCML မှ လူထုအသိပညာပေးအစီအစဉ်နှင့် တိုင်းကြားမှုများကို ကိုင်တွယ်ဖြေရှင်းသည့်အစီအစဉ်ကို အကောင်အထည်ဖော်ရန်။
	၃.၂။ မတော်တဆ ထိခိုက်မှုများ	၃.၂.၁။ တွင်းတူးစင်ပတ်လည် ၅၀၀ မီတာကို ဘေးအန္တရာယ်ကင်းရှင်းရေးဇုန်အဖြစ် ထားရှိရန်။ ၃.၂.၂။ ရေလမ်းကြောင်းများကို အချက်ပေးရန် ထောက်ပံ့ရေးရေယာဉ်များကို အသုံးပြုသွားရန်။ ၃.၂.၃။ မတော်တဆ တိုက်မိမှုများကို ကာကွယ်ရန် ရေယာဉ်များပေါ်တွင် အချက်ပြမီးများ လုံလောက်စွာ ထားရှိရန်။

ပတ်ဝန်းကျင်ကဏ္ဍ	*ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ*	*လျော့ချရေးလုပ်ငန်းစဉ်များ*
	၃.၃။ ရေနံတွင်းတူးစင်မတပ်ဆင်ခင် ငါးဖမ်းပစ္စည်းများ ဖယ်ရှားပစ်ခြင်း	၃.၃.၁။ စီမံကိန်းလုပ်ငန်းမစတင်ခင် ၄၅ ရက်ကြိုတင်၍ သက်ဆိုင်ရာငါးလုပ်ငန်းအဖွဲ့အစည်းများကို စီမံကိန်းလုပ်ငန်းများအကြောင်း အသိပေးရန်။ ၃.၃.၂။ ငါးဖမ်းကိရိယာများ ပျက်စီးခြင်း (သို့မဟုတ်) ဖယ်ရှားမည်ဆိုပါက သဘောတူညီချက်အတိုင်း ငါးလုပ်ငန်းအဖွဲ့အစည်းများ၊ ငါးလုပ်ငန်းဦးစီးဌာနနှင့် မြန်မာ့ရေနံနှင့် သဘာဝဓါတ်ငွေ့လုပ်ငန်း (MOGE) တို့မှ တဆင့် လျော်ကြေးပေးဆောင်ရန်။ ၃.၃.၃။ ငါးဖမ်းကိရိယာဖယ်ရှားမှုကို မှတ်တမ်းထားရှိရန်။ ၃.၃.၄။ PCML၊ MOGE၊ ငါးလုပ်ငန်းဦးစီးဌာန၊ ငါးလုပ်ငန်းအဖွဲ့အစည်းများ၊ ငါးဖမ်းကိရိယာပိုင်ရှင်တို့နှင့် ညှိနှိုင်းကာ သင့်တော်မျှတသော လျော်ကြေးကို ပေးဆောင်ရန်။ ၃.၃.၅။ PCML ၏ လူထုဆက်သွယ်ရေးအစီအမံနှင့် တိုင်ကြားမှုကို ကိုင်တွင်ဖြေရှင်းမည့် အစီအစဉ်ကို အကောင်ထည်ဖော်ဆောင်ရွက်ရန်။
၄။ သဘော်များ	၄.၁။ သဘော်လမ်းကြောင်းများ တိုးလာနိုင်ခြင်း ၄.၂။ မတော်တဆ ထိခိုက်မှုများ	၄.၁.၁။ အနည်းဆုံး (၃၀) ရက် ကြိုတင်၍ မြန်မာ့ရေနံနှင့် သဘာဝဓါတ်ငွေ့လုပ်ငန်း (MOGE)၊ ရေတပ်၊ ရေကြောင်းပို့ဆောင်ရေးညွှန်ကြားမှုဦးစီးဌာန တို့နှင့် ပူးပေါင်း၍ စီမံကိန်းလုပ်ငန်းများအကြောင်း ရေလုပ်သားများထံသို့ အကြောင်းကြားစာပေးပို့ရန်။ ၄.၁.၂။ တွင်းတူးစင်ပတ်လည် ၅၀၀ မီတာကို ဘေးအန္တရာယ်ကင်းရှင်းရေးဇုန်အဖြစ် ထားရှိရန်။ ၄.၁.၃။ ရေလမ်းကြောင်းများကို အချက်ပေးရန် ထောက်ပံ့ရေးရေယာဉ်များကို အသုံးပြုသွားရန်။ ၄.၁.၄။ မတော်တဆ တိုက်မိမှုများကို ကာကွယ်ရန် ရေယာဉ်များပေါ်တွင် အချက်ပြမီးများ လုံလောက်စွာ ထားရှိရန်။

ပတ်ဝန်းကျင်ကဏ္ဍ	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ	လျော့ချရေးလုပ်ငန်းစဉ်များ
၅။ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု	၅.၁။ ပင်လယ်ကြမ်းပြင်ပေါ် နှံ်းအနည်အနှစ်ကျရောက်နိုင်ခြင်း၊ ပင်လယ်ရေအရည်အသွေးနှင့် ပင်လယ်နေသတ္တဝါများအပေါ် တိုက်ရိုက်သက်ရောက်နိုင်ခြင်း ၅.၂။ ရေလုပ်သားများအပေါ် သွယ်ဝိုက်သောနည်းအားဖြင့် သက်ရောက်နိုင်ခြင်း	၅.၁.၁။ ကန်ထရိုက်တာများသည် စောင့်ကြည့်စစ်ဆေးရေးလုပ်ငန်းများ၊ သက်ဆိုင်သည့် ဥပဒေများနှင့် စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု နည်းဥပဒေများနှင့်အညီ ဆောင်ရွက်သွားရပါမည်။ ၅.၁.၂။ ရှင်းလင်းမြင်သာသော အညွှန်းလေဘယ်များပါသည့် အမှိုက်ပုံးများတွင် စွန့်ပစ်ပစ္စည်းများ (ဘေးအန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းနှင့် ဘေးအန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်း)ကို ခွဲခြားချ ထားရှိရန် ။ ၅.၁.၃။ ပင်လယ်အတွင်းသို့ မည်သည့်ပလက်စတစ်အမှိုက်များ မပစ်ချရန်။ ၅.၁.၄။ ဘေးအန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများကို တာရှည်ခံပြီး သယ်ယူရွှေ့ပြောင်းရာတွင် လုံခြုံစိတ်ချရသည့် ကွန်တိန်နာများတွင် ထည့်၍ထားရှိရန်။ မီးလောင်နိုင်ချေရှိသည့် နေရာများ အဝေးတွင် ထားရှိရန်။ ၅.၁.၅။ စွန့်ပစ်ပစ္စည်းအမျိုးအစားနှင့် ပမာဏကို မှတ်တမ်းတင်လေ့လာရန်။ ၅.၁.၆။ ဥပဒေနှင့်အညီ စွန့်ပစ်ပစ္စည်းများ သိုလှောင်ခြင်း၊ သယ်ယူရွှေ့ပြောင်းခြင်း၊ ခွဲခြားခြင်းနှင့် စွန့်ပစ်ခြင်းတို့အတွက် လိုင်စင်ရှိကန်ထရိုက်တာကို အလုပ်ခန့်ထားရန်။ ၅.၁.၇။ သန့်စင်သည့်နေရာ (သို့မဟုတ်) စွန့်ပစ်သည့်နေရာသို့ ဘေးအန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းများ သယ်ယူရာတွင် ဘေးအန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်း မှတ်တမ်းစနစ် ထားရှိရန်။
ကျန်းမာရေး		

၆။ အလုပ်သမားများကျန်းမာရေးနှင့် ဘေးကင်းမှု	၆.၁။ ဘေးအန္တရာယ်ရှိသောပစ္စည်းများနှင့် ထိတွေ့မှုများကြောင့် ဖျားနာနိုင်ခြင်း (သို့မဟုတ်) မတော်တဆဖြစ်စဉ်များကြောင့် ထိခိုက်ဒဏ်ရာရမှုများ	၆.၁.၁။ PCML ၏ ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးစီမံခန့်ခွဲမှုစနစ်ကို အကောင်အထည်ဖော်ရန်။ ၆.၁.၂။ လေထုအရည်အသွေးနှင့် ဆူညံသံပေါ် သက်ရောက်မှုများကို ထိရောက်သော လျော့ချရေးလုပ်ငန်းစဉ်များ ချမှတ်ဆောင်ရွက်ရန်။ ၆.၁.၃။ အလုပ်သမားများအတွက် ကာကွယ်ရေးပစ္စည်းကိရိယာများ ထားရှိပေးရန်။ ၆.၁.၄။ ရေးဦးသူနာပြု သေတ္တာများနှင့် ရေးဦးသူနာပြုအခန်းများ ထားရှိရန်။ ၆.၁.၅။ အရေးပေါ်အခြေအနေမျိုးတွင် အရေးပေါ်ဆောင်ရွက်နိုင်ရန်အလို့ငှာ အနီးဆုံးကျန်းမာရေးဌာန၊ ဆေးရုံများနှင့် ပူးပေါင်းဆောင်ရွက်ရန်။ ၆.၁.၆။ မတော်တဆထိခိုက်မှုများကာကွယ်ရန်၊ လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းစေရန်အတွက် လုပ်ငန်းစဉ်များ ချမှတ်ရန်။ • စက်ပစ္စည်းကိရိယာများသုံး၍ လည်ပတ်ရသည့်အတွက် ဘေးအန္တရာယ်ကင်းရှင်းရေးနည်းလမ်း။ • ဘေးအန္တရာယ်ကင်းရှင်းရေးလုပ်ထုံးလုပ်နည်း။ • အလုပ်ခွင့်ပြုချက်အတွက် လုံးထုံးလုပ်နည်း။ • ဓါတုပစ္စည်းများအတွက် MSDS ထားရှိရန်။ • နိုင်ငံတကာလောင်စာသိုလှောင်မှုနှင့် စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု လမ်းညွှန်ချက်ကို လိုက်နာရန်။ • ဘေးအန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းများအတွက် စောင့်ကြည့်စစ်ဆေးရေးစနစ်နှင့် စာရင်းထားရှိရန်။ ၆.၁.၇။ အလုပ်လုပ်ရန်အတွက် ကောင်းမွန်သော ပတ်ဝန်းကျင်အနေအထားကို ထားရှိပေးရန်။ ၆.၁.၈။ အရေးပေါ်တုန့်ပြန်နိုင်ရန်အတွက် မီးဘေးကာကွယ်ရေးပစ္စည်းများ ထားရှိ၍ လျော့ချရေးလုပ်ငန်းများအတွက် ကောင်းမွန်သော လေ့ကျင့်မှုများ ပေးထားရန်။ ၆.၁.၉။ စီမံကိန်းဇရိယာတဝိုက်တွင် ဘေးအန္တရာယ်ကင်းရှင်းရေးဇုန် ထားရှိပြီး စီမံကိန်းအတွင်း ငါးဖမ်းလှေများနှင့် ရေယာဉ်များ ဝင်ရောက်လာသည့်အခါ အကြောင်းကြားရန် လေ့များထားရှိရန်။ ၆.၁.၁၀။ ဘေးအန္တရာယ်ဖြစ်စေနိုင်သော

ပတ်ဝန်းကျင်ကဏ္ဍ	*ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ*	*လျော့ချရေးလုပ်ငန်းစဉ်များ*
		ဓါတုပစ္စည်းများအတွက် ဘေးအန္တရာယ်ကင်းရှင်းရေးအစီအစဉ်များ ချမှတ်ရန်။ • ဓါတုပစ္စည်းများကို အလုံပိတ်ထားသည့် ကွန်တိန်နာထဲတွင် သိုလှောင်ရန်နှင့် ဓါတုပစ္စည်းသိုလှောင်ရုံကို လေဝင်လေထွက်ကောင်းသည့်နေရာတွင် ထားရှိရန်။ • ဓါတုပစ္စည်းများကို ကိုင်တွင်ရသည့်အလုပ်သမားများအတွက် ဓါတုပစ္စည်းကာကွယ်ရေးကိရိယာများ ထားရှိပေးရန်နှင့် အလုပ်သမားများအား ကာကွယ်ရေးကိရိယာများ အသုံးပြုမှုကို စစ်ဆေးရန် (ဆိုလိုသည်မှာ အသက်ရှူကာကွယ်ရေးကိရိယာ၊ လက်အိတ်များ၊ အမှုန်ကာကွယ်သည့် မျက်မှန်များနှင့် လုံခြုံသော ဝတ်စုံများ) • သိုလှောင်ရုံ၊ တွင်းတူးစင်နေရာနှင့် အစိုင်အခဲထိန်းချုပ်သည့်နေရာများတွင် ရေပန်းများ တပ်ဆင်ထားရန်။

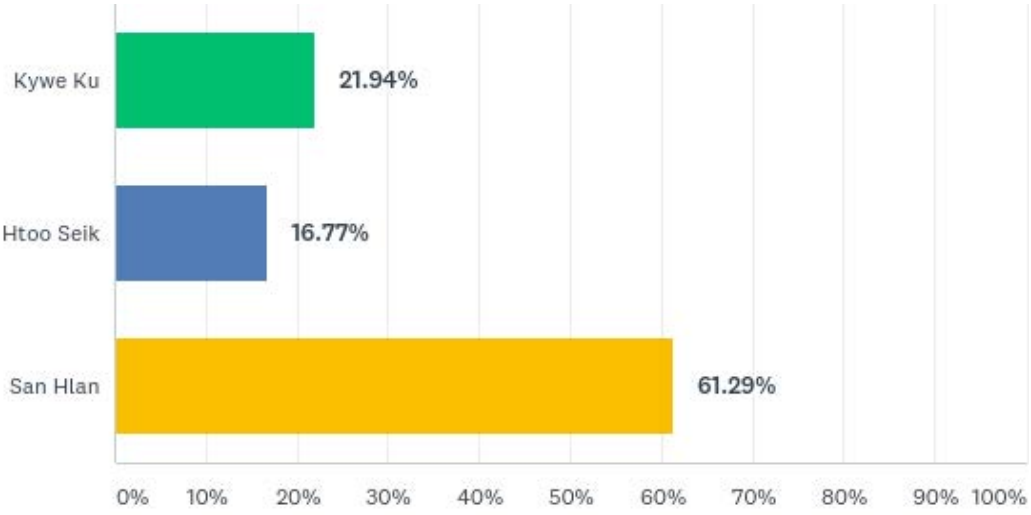
၁.၁၀။ လူထုတွေ့ဆုံဆွေးနွေးခြင်း

နယ်ပယ်တိုင်းတာသတ်မှတ်ခြင်းအဆင့်၌ သက်ဆိုင်ရာ အဖွဲ့အစည်းများ၊ တနင်္သာရီတိုင်းမှ စီမံကိန်းဇရိယာတွင် ငါးဖမ်းလျက်ရှိသော ရေလုပ်သားများ၊ အစိုးရအဖွဲ့အစည်းများ၊ သတင်းမီဒီယာများ၊ အစိုးရမဟုတ်သော အဖွဲ့အစည်းများ၊ လူထုအခြေပြုအဖွဲ့အစည်းများနှင့် ကမ်းလွန်အစမ်းတွင်းတူးဖော်ခြင်း ဆောင်ရွက်နေသည့် ဒေသအဖွဲ့အစည်းများနှင့်အတူ လူထုတွေ့ဆုံ ဆွေးနွေးပွဲကို ဆောင်ရွက်ခဲ့ပါသည်။

၁.၁၀.၁။ လူထုအမြင်စစ်တမ်းကောက်ယူမှုရလဒ်များ

စစ်တမ်းကောက်ယူခဲ့သည့် ရွာများမှာ ကျွဲကူးရွာ (မြိတ်) ၂၂%၊ ထူးဆိပ် (မြိတ်) ၇% နှင့် စမ်းလှန်း (ထားဝယ်) ၆၁% တို့ဖြစ်ပါသည်။

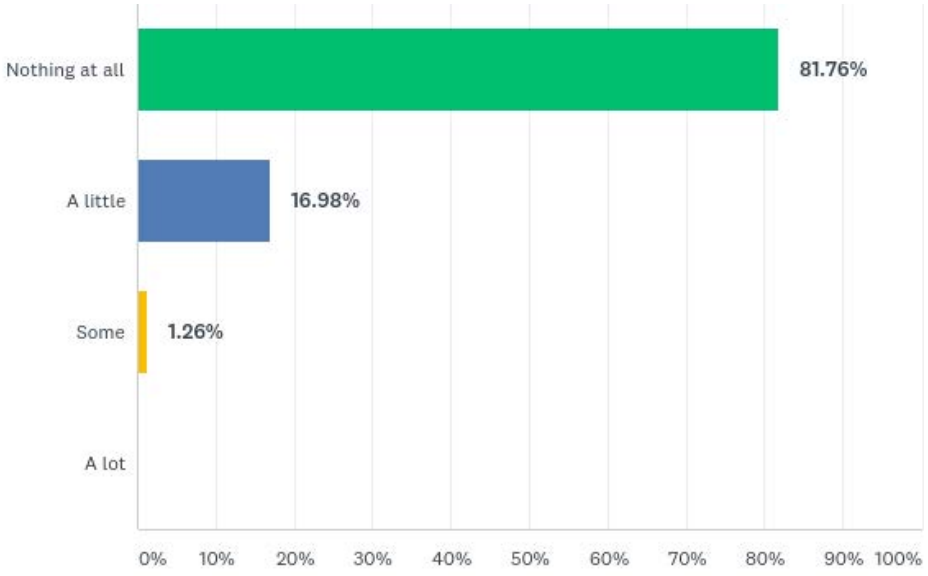
ဇယား (၁-၁) စစ်တမ်းကောက်ယူခဲ့သည့် ရွာများ



လူထုအမြင်စစ်တမ်းကောက်ယူမှုရလဒ်အရ ၅၈% သည် ယောကျ်ားလေးများဖြစ်ကြ၍ ၄၂% သည် မိန်းကလေးများဖြစ်ကြပါသည်။ ၉၉% မှာ ဗုဒ္ဓဘာသာကိုးကွယ်သူများဖြစ်ကြပြီး ၃၅% ၇၅% မှာ ရေလုပ်သားများဖြစ်ကြပါသည်။ ၄၈% မှာ အလယ်တန်းပညာရေး ပြီးဆုံးသူများဖြစ်ကြပါသည်။

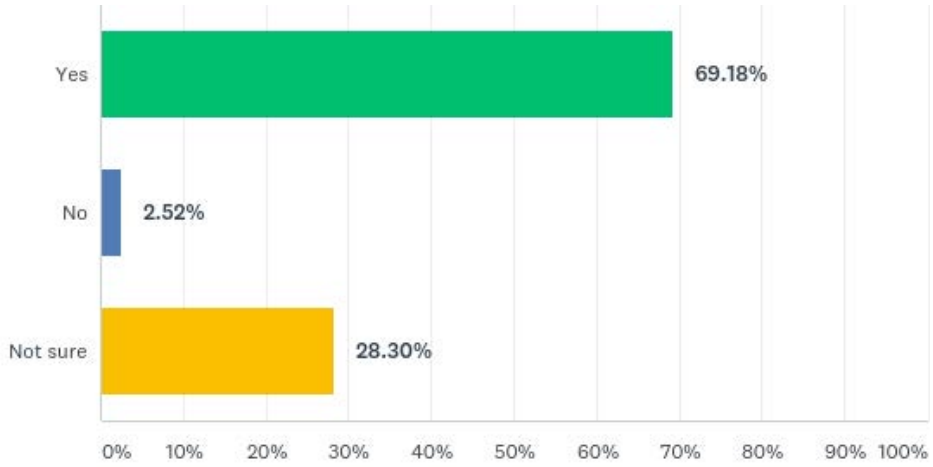
စစ်တမ်းဖြေဆိုသူများအနက် ၁၈%သော ဖြေဆိုသူများမှာ စီမံကိန်းနှင့် ပတ်သက်၍ သိရှိခဲ့ပြီးဖြစ်ပါသည်။ (ဇယား ၁-၂)

ဇယား (၁-၂) စီမံကိန်းအကြောင်း နားလည်သဘောပေါက်မှု



ထို့အတူ တုန့်ပြန်ဖြေဆိုသူများအနက် ၆၉% သည် စီမံကိန်းဖော်ဆောင်မှုနှင့် ပတ်သက်၍ သဘောတူကြ၍ ၃% မှာ သဘောမတူကြပါ။ ၂၈% သော ဖြေဆိုသူများသည် စီမံကိန်းအပေါ် သဘောတူခြင်း၊ မတူခြင်းနှင့် ပတ်သက်၍ သေချာမသိပါ။ (ဇယား ၁.၃)

ဇယား (၁-၃) အဆိုပြုစီမံကိန်းကို သဘောတူပါသလား။



၁.၁၀.၂။ နယ်ပယ်တိုင်းတာသတ်မှတ်ခြင်းအဆင့် လူထုတွေ့ဆုံဆွေးနွေးပွဲ ရလဒ်များ

မြိတ်နှင့် ထားဝယ်မြို့များတွင် မြို့နယ်အဆင့် လူထုတွေ့ဆုံပွဲများကို ကျင်းပခဲ့ကြပါသည်။ ရွာအဆင့် လူထုတွေ့ဆုံပွဲကို ကျွဲကူးကျေးရွာ (မြိတ်) နှင့် စမ်းလှန်းကျေးရွာ (ထားဝယ်) တွင် ကျင်းပခဲ့ပါသည်။ လူထုတွေ့ဆုံဆွေးနွေးပွဲမှ ရရှိလာသည့် အကြံပြုချက်များ၊ စိုးရိမ်ပူပန်မှုများကို အောက်တွင်အကျဉ်းချုပ်ဖော်ပြထားပါသည်။

မြိတ်ခရိုင်ငါးလုပ်ငန်းအဖွဲ့ချုပ်၊ အထွေထွေအုပ်ချုပ်ရေးဦးစီးဌာန (မြိတ်နှင့်ထားဝယ်)၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန (မြိတ်နှင့် ထားဝယ်)၊ စည်ပင်သာယာရေးကော်မတီ (မြိတ်နှင့်ထားဝယ်)၊ ငါးလုပ်ငန်းဦးစီးဌာန (မြိတ်) တို့နှင့် တွေ့ဆုံဆွေးနွေးပွဲများကိုလည်းကျင်းပခဲ့ပါသည်။ (မှတ်ချက်- ထားဝယ် ငါးလုပ်ငန်းဦးစီးဌာနမှတာဝန်ရှိသူများ တက်ရောက်ခြင်းမရှိပါ။) မြိတ်နှင့်ထားဝယ်မြို့များ၏ မြို့နယ်အဆင့် လူထုတွေ့ဆုံပွဲများတွင် သတင်းမီဒီယာများလည်း ပါဝင်ခဲ့ကြပါသည်။ MCN TV News Channel နှင့် ၎င်း၏ Facebook page မှတဆင့် လူထုတွေ့ဆုံပွဲသတင်းကြေညာခြင်း နှင့် DVB media မှ လူထုတွေ့ဆုံပွဲနှင့် ပတ်သက်သည့် သတင်းများကို ၎င်း၏ Facebook page မှတဆင့် ထုတ်ပြန်ကြေညာခဲ့ပါသည်။

လူထုတွေ့ဆုံပွဲတိုင်း၏ အစီအစဉ်တွင် အောက်ဖော်ပြပါအစီအစဉ်များ ပါဝင်ခဲ့ပါသည်။

၁။ သက်ဆိုင်ရာမြို့နယ်အဆင့်တာဝန်ရှိသူမှ အဖွင့်အမှာစကားပြောကြားခြင်း

၂။ PCML ရေနံကုမ္ပဏီမှတာဝန်ရှိသူများနှင့်မိတ်ဆက်ပေးခြင်း

၃။ မြန်မာ့ရေနံနှင့်သဘာဝဓာတ်ငွေ့လုပ်ငန်းကိုယ်စားလှယ်မှ မိတ်ဆက်စကားပြောကြားခြင်း

၄။ PCML ရေနံကုမ္ပဏီ၏ စီမံကိန်းအကြောင်းအရာများ ရှင်းလင်းတင်ပြခြင်း

၅။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ငန်းစဉ်အကြောင်း ရှင်းလင်းတင်ပြခြင်း

၆။ တက်ရောက်သူများမှမေးခွန်းများမေးမြန်းခြင်းနှင့်ပြန်လည်ဖြေကြားခြင်း

လူထုတွေ့ဆုံပွဲ တက်ရောက်လာသူအားလုံးအနက် ၆၉% သည် စီမံကိန်းနှင့်ပတ်သက်၍ ထောက်ခံကြပြီး ၂၈ % သည် စီမံကိန်းနှင့်ပတ်သက်၍ တိကျစွာဖြေကြားခြင်းမရှိပါ။ ၂.၅% နှင့်အောက်သောတက်ရောက်လာသူများသည် စီမံကိန်းနှင့်ပတ်သက်၍ ထောက်ခံမှုမရှိကြောင်းတွေ့ရှိရပါသည်။

၆၈% သောဒေသခံပြည်သူလူထုသည် စွမ်းအင်လိုအပ်ချက်ကို ဒေသခံပြည်သူလူထု၏ အဓိကဖွံ့ဖြိုးတိုးတက်မှု ဦးစားပေးကဏ္ဍ အဖြစ် သတ်မှတ်ထားပါသည်။ မြိတ်နှင့်ထားဝယ်ဒေသများတွင် စွမ်းအင်ကွန်ယက် ပိုမိုဖွံ့ဖြိုးတိုးတက်ရန် လိုအပ်သောကြောင့် ဤကဏ္ဍနှင့်ပတ်သက်သည့် များစွာသော မေးခွန်းများမြင့်တက်လာကြောင်းတွေ့ရှိရပါသည်။ အထူးသဖြင့် ဒေသခံလူထုသည် စီမံကိန်းမှ မည်သို့သော အကျိုးအမြတ်များယူဆောင်လာမည်ကို သိရှိလိုကြပါသည်။ လက်ရှိတည်ရှိနေသော ဖွံ့ဖြိုးမှုများ အောင်မြင်ပြီးဖြစ်နေသောကြောင့် ၎င်းတို့နှင့်ပတ်သက်သည့် မေးခွန်းများလည်း ပိုမိုမြင့်တက်လာပါသည်။

အခြားသော တွေ့ရှိရပါများသည့် မေးခွန်းများတွင် PCML ရေနံကုမ္ပဏီမှ ဆောင်ရွက်ထားရှိပြီးသည့် အစီအစဉ်များအပြင် မည်သို့သော ဒေသဖွံ့ဖြိုးမှုအစီအစဉ်များ (CSR programs) အကောင်အထည်ဖော်ရန်စီစဉ်ထားရှိသနည်း စသည်တို့ ပါဝင်ပါသည်။ မြိတ်ဒေသတွင် ဒေသဖွံ့ဖြိုးမှုအစီအစဉ်များ (CSR programs) မရှိကြောင်းသိရှိရပါသည်။ ပင်လယ်ရေလုပ်သားများသည် ၎င်းတို့လုပ်ငန်းနှင့်

မြန်မာ့ကမ်းရိုးတန်း တစ်လျှောက် ငါးသယံဇာတထွက်ကုန်များ သိသိသာသာ လျော့ကျမှုနှင့် ပတ်သက်ပြီး စိုးရိမ်ပူပန်မှုများရှိနေပါသည်။ ပင်လယ်ရေလုပ်သားများသည် ရေနံနှင့် သဘာဝဓာတ်ငွေ့လုပ်ငန်းကြောင့် ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများအပေါ် စိုးရိမ်ပူပန်မှုများ လည်း ရှိနေပါသည်။ တွင်းတူးနေရာ ပတ်လည် (၅၀၀ မီတာ) ဘေးအန္တရာယ်ကင်းရှင်းရေးဇုန်အတွက် မည်သို့သော နစ်နာကြေးများ ထောက်ပံ့မည်နည်း၊ ၎င်းတို့၏ အသက်မွေးဝမ်းကျောင်းကဏ္ဍ အပေါ် ပြင်းထန်သည့် သက်ရောက်မှုများအတွက် မည်သို့ သော နစ်နာကြေးများ ထောက်ပံ့မည်နည်း၊ အစရှိသည့် အမျိုးအမျိုးသော မေးခွန်းများကို ပင်လယ်ရေ လုပ်သားများမှ မေးမြန်းမှုများ ရှိနေပါသည်။ မြိတ်ဒေသခံငါးလုပ်ငန်းရှင်များ၊ ပင်လယ်လုပ်သားများသည် တွင်းတူးစင်အနီး ပတ်လည် (၅၀၀ မီတာ) ဘေးအန္တရာယ် ကင်းရှင်းရေးဇုန် ၊ လက်ရှိတည်ရှိနေသော ကမ်းလွန်ရေနံတွင်းတူးစင်ပလက်ဖောင်းများ နှင့် ပိုက်လိုင်းများ ပတ်လည်တွင်ရှိနေသော ကန့်သတ်ဇုန်များသည် ၎င်းတို့၏ ငါးဖမ်းမှုကဏ္ဍအပေါ် ထိခိုက် သက်ရောက် နေသည် ဟု ခံစားနေရသည်။ စီမံကိန်းကြောင့် အခြားထိခိုက်မှု ပြင်းထန်သည့်နေရာများ ရှိလာပါက မည်သို့ဆောင်ရွက် မည်နည်း စသည့် အခြားမေးခွန်းများလည်း တွေ့ရှိရပါသည်။ အဆိုပြုထားသည့် တွင်းတူနေရာများနှင့် အနီးဆုံးထိခိုက်မှု သက်ရောက်နိုင်သည့် ဇရိယာသည် ကီလိုမီတာ ၅၀ အကျော်တွင် တည်ရှိနေပါသည်။ အခြားမေးခွန်းများ ဖြစ်သည့် အဆိုပြုဖွံ့ဖြိုးတိုးတက်မှုလုပ်ငန်း များမှ ငါးမျိုးစိတ်များ၊ ပင်လယ်သန္ဓာ ကျောက်တန်းများ၊ ပင်လယ်မြက်များနှင့် အနီးအနား ကျွန်းများအပေါ် ထိခိုက်နိုင်ခြေရှိသည့် သက်ရောက်မှုများနှင့် ပတ်သက်သည့် မေးခွန်းများလည်း မြင့်တက်လာပါသည်။ မြေပုံပေါ်တွင် ဖော်ပြထားသည့် ထိခိုက်မှု သက်ရောက်နိုင်သည့် ဇရိယာများအပေါ် ရေနံစမ်းသပ် တွင်းတူးခြင်း စီမံကိန်းကြောင့် သက်ရောက်မှုတစ်ခုမျှ ရှိလာနိုင်လိမ့်မည်မဟုတ်ကြောင်း ရှင်းလင်းစွာလုပ်ဆောင်ထားပါသည်။ စီမံကိန်းကြောင့် ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုအားလုံးကို မပျံနှံအောင်ကန့်သတ်ထိန်းချုပ်ထားမည်ဖြစ်ပြီး နိုင်ငံတကာ အဆင့်မှီလုပ်ထုံး လုပ်နည်းများနှင့် လျော့ချသွားနိုင်မည်ဖြစ်ပါသည်။

၁.၁၀.၃။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း လူထုတွေ့ဆုံပွဲရလဒ်

မြို့နယ်အဆင့် တွေ့ဆုံဆွေးနွေးပွဲများ ကျင်းပခဲ့သော မြို့နယ်များမှာ သရက်ချောင်း၊ လောင်းလုံ၊ မြိတ်နှင့် ထားဝယ်မြို့တို့ဖြစ်ပါသည်။ မြိတ်နှင့် ထားဝယ်မြို့တွင် ကျင်းပသော လူထုတွေ့ဆုံပွဲများတွင် မီဒီယာများ တက်ရောက်ခဲ့ပါသည်။ မြဝတီသတင်းစာ၊ Dawei Watch၊ MRTV၊ MWD၊ ဟင်္သာမီဒီယာ၊ Elevn Media၊ မြဝတီ၊ DVB၊ မြန်မာ့အလင်း၊ ကြေးမုံ၊ တနင်္သာရီဂျာနယ်၊ မြိတ်ဒေသသတင်းစာတို့မှတဆင့် လူထုအား စီမံကိန်းအကြောင်း ထုတ်ဖော်ပြောကြားခဲ့ပါသည်။

ဤလူထုတွေ့ဆုံပွဲကို ၂၀၁၈ ခုနှစ်၊ ဇူလိုင်လ ၂၃ ရက်မှ ၂၆ ရက်အတွင်း ဆောင်ရွက်ခဲ့ပါသည်။ ဒုတိယအကြိမ် လူထုတွေ့ဆုံပွဲသို့ တက်ရောက်သူများ၏ စိုးရိမ်ပူပန်မှုများသည် ပထမအကြိမ် လူထုတွေ့ဆုံပွဲမှ မှတ်သားထားသော စိုးရိမ်ပူပန်မှုများနှင့် အလားတူပင် ဖြစ်ပါသည်။ အစမ်းတွင်းတူးခြင်းးနှင့် ပတ်သက်၍ အဓိက စိုးရိမ်ပူပန်မှုများနှင့် အကြံပြုချက်များမှာ အောက်ပါအတိုင်း ဖြစ်ပါသည်။ စိုးရိမ်ပူပန်မှုအများစုမှာ မြိတ်မြို့နယ် ငါးလုပ်ငန်းအဖွဲ့အစည်းမှ ဖြစ်ပါသည်။ ၎င်းတို့ စိုးရိမ်ပူပန်မှုများကို အစိုးရသို့ တင်ပြမည့်ကိစ္စနှင့် ပတ်သက်၍ ယုံကြည်မှုမရှိဘဲ ဖြစ်နေပါသည်။ ရေလုပ်ငန်းဆောင်ရွက်နေသူများသည် ၎င်းတို့၏ အသက်မွေးဝမ်းကျောင်းလုပ်ငန်း ဖြစ်သော ငါးဖမ်းလုပ်ငန်းအပေါ် ရေရှည် ထိခိုက်မှုရှိမည်ကို စိုးရိမ်ပူပန်ကြပါသည်။ ငါးဖမ်းလုပ်ငန်းအပေါ် အစမ်းတွင်းတူးဖော်ခြင်းကြောင့် ရေရှည် သက်ရောက်နိုင်မှုများကိုလည်း မေးမြန်းခဲ့ကြပါသည်။

ရေလုပ်ငန်းဆောင်ရွက်နေသူများသည် ငါးဖမ်းခြင်းကို တားမြစ်ထားသည့် သတ်မှတ်ဇရိယာသည် ကျယ်လွန်းသည်ဟုလည်း ခံစားနေကြပါသည်။ အဓိကအချက်မှာ ၎င်းတို့သည် ဒေသဖွံ့ဖြိုးရေး အစီအစဉ်များ (CSR) ကို မည်သည့်စီမံကိန်းကမှ မရရှိခဲ့သောကြောင့် ဖြစ်ပါသည်။ ထို့အပြင် ၎င်းတို့၏ ဒေသတွင် စွမ်းအင်ထုတ်လုပ်မှုများ ဆောင်ရွက်နေပြီး ၎င်းတို့ဒေသရှိ လျှပ်စစ်မီတာခမှာ ၄ဆမှ ၈ ဆအထိ ပိုပေး၍ အသုံးပြုနေရသောကြောင့် ဖြစ်ပါသည်။

မြိတ်မြို့ရှိ ရေလုပ်ငန်း ဆောင်ရွက်နေသူများသည် ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း အဖြေများကို သိရှိလိုကြပြီး နမူနာကောက်ယူမှု ရလဒ်များ (ဥပမာ- ပြဒါးကြောင့် ထိခိုက်မှု) ကို သိရှိလိုကြပါသည်။ ငါးလုပ်ငန်းရှင်များအသင်းနှင့် ထပ်မံ၍ တွေ့ဆုံဆွေးနွေးရန် လိုအပ်နေကြောင်း တွေ့ရှိရပါသည်။ လူထုတွေ့ဆုံပွဲမှ ရရှိလာသော အချက်များကို ဖြေရှင်းရန် လျော့ချရေးနည်းလမ်းများကို ဆောင်ရွက်ပေးရပါမည်။ ရရှိလာသော စိုးရိမ်ပူပန်မှုများနှင့် ပြန်လည်ဖြေကြားချက်များအား အသေးစိတ်ဖော်ပြထားပါသည်။

၁.၁၀.၄။ လူထုအား အသိပေးကြေညာခြင်း

လူထုတွေ့ဆုံဆွေးနွေးခြင်းနှင့် စီမံကိန်းအကြောင်းအရာ အသိပေးကြေညာခြင်းကို ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း ဆိုင်ရာ လုပ်ထုံး လုပ်နည်း အပိုဒ် ၆၁ အရ လိုက်နာအကောင်အထည်ဖော် ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။ PCML ရေနံ ကုမ္ပဏီသည် အဆိုပြုစီမံကိန်းဆိုင်ရာ အချက်အလက်များကို PCML ရေနံကုမ္ပဏီ၏ ဝဘ်ဆိုဒ် နှင့် PCML ရေနံကုမ္ပဏီ ရန်ကုန်ရုံးတွင် အသိပေးကြေညာသွားပါမည်။ စီမံကိန်းအကြောင်းအရာ အသိပေးကြေညာခြင်းကို မြန်မာနိုင်ငံ ငါးလုပ်ငန်းအဖွဲ့ချုပ်နှင့် တွေ့ဆုံဆွေးနွေးပွဲများ၊ ထားဝယ်မြို့၊ မြိတ်မြို့နယ်အဆင့် လူထုတွေ့ဆုံပွဲများတွင် တက်ရောက်ခဲ့သော သတင်းမီဒီယာများမှတဆင့် အသိပေးကြေညာပြီး ဖြစ်ပါသည်။

MCN TV News Channel နှင့် ၎င်း၏ Facebook page မှတဆင့် လူထုတွေ့ဆုံပွဲသတင်းကြေညာခြင်း နှင့် DVB media မှလည်း လူထုတွေ့ဆုံပွဲနှင့် ပတ်သက်သည့် သတင်းအချက်အလက်များကို ၎င်း၏ Facebook page မှတဆင့် ထုတ်ပြန်ကြေညာခဲ့ပါသည်။

၁.၁၁။ နိဂုံး

ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာသက်ရောက်မှုများအားလုံးကို လျစ်လျူရှုနိုင်လောက်သော (သို့မဟုတ်) နိမ့်သောအဆင့်အဖြစ် သတ်မှတ်ထားပြီး ဖြစ်နိုင်ခြေရှိသောသက်ရောက်မှုများကို လျော့ချရန် စီမံခန့်ခွဲနိုင်ပါသည်။ တွင်းနေရာများသည် ကမ်းရိုးတန်းဒေသမှ ဝေးကွာပြီး ကမ်းလွန်အပိုင်းတွင် တည်ရှိသောကြောင့် ကမ်းလွန်ရေလုပ်သားများ၏ ငါးဖမ်းလုပ်ငန်းအပေါ် ကန့်သတ်မှု အနည်းငယ် ဖြစ်စေပါလိမ့်မည်။ ဘေးအန္တရာယ်ကင်းရှင်းရေဇုန်အဖြစ် ကန့်သတ်ထားမြစ်ထားသော ငါးဖမ်းဇရိယာသည် အက်မဒမန်ပင်လယ် ဇရိယာ၏ သေးငယ်သောပမာဏသာ ဖြစ်ပါသည်။ သို့သော်လည်း ရေလုပ်သားများက ၎င်းတို့၏ ငါးဖမ်းဇရိယာအမြောက်အများကို တိုးပွားလာသော ရေနံနှင့် သဘာဝဓာတ်ငွေ့လုပ်ငန်းများက ပိတ်ဆို့ကန့်သတ်ထားသည်ဟု ယူဆလျက် ရှိပါသည်။ ဤကိစ္စရပ်သည် PCML၏ ဒေသဖွံ့ဖြိုးရေးအစီအစဉ်များကို ရေးဆွဲအကောင်အထည်ဖော်ရာတွင် ငါးဖမ်းလုပ်ငန်းများ အပါအဝင် တန်ဘာရီတိုင်းဒေသကြီးတစ်ခုလုံးကို လွှမ်းခြုံမိစေရန် ထည်းသွင်းစဉ်းစားရမည့် ကိစ္စရပ်တစ်ခု ဖြစ်ပါသည်။ ယခုအချိန်အခါ၌ ဒေသဖွံ့ဖြိုးရေးအစီအစဉ်များကို ရဲတံခွန်ရေနံမြေလုပ်ငန်းနှင့်

ကုန်းတွင်းပိုက်လိုင်းများတည်ရှိရာ ထားဝယ်ခရိုင်တွင် ဦးစားပေး လုပ်ဆောင်လျက်ရှိပါသည်။ ယင်းကိစ္စရပ်သည် ဘိတ်ခရိုင်ရှိဒေသခံပြည်သူများ၏ စီမံကိန်းအပေါ် မကျေနပ်သော သဘောထားအမြင်များကိုဖြစ်ပေါ် စေပါသည်။ ရဲတံခွန်ရေနံမြေဖွံ့ဖြိုးတက်ရေးအစီအစဉ်များထဲမှ တစိတ်တပိုင်းအဖြစ် အနာဂတ်တွင်ဆွေးနွေးညှိနှိုင်းခြင်း ဖြင့်သော်လည်းကောင်း၊ ဒေသဖွံ့ဖြိုးရေး အစီအစဉ်များ လုပ်ဆောင်ခြင်းဖြင့်သော်လည်းကောင်း ဖော်ပြပါကိစ္စရပ်များကို ဖြေရှင်းဆောင်ရွက်ရန် အရေးကြီးလှပါသည်။

အလုပ်သမားများနှင့်လူထုကျန်းမာရေးအပါ သက်ရောက်မှုအဆင့်အားလုံးကို နိမ့်သောအဆင့်ဟူ၍ သတ်မှတ်ထားပါသည်။ စွန့်ပစ်ပစ္စည်းများအားလုံးကို အပြည်ပြည်ဆိုင်ရာစံနှုန်းများ နှင့်ကိုက်ညီစေရန် သီးခြားစွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအစီအစဉ်ကို ဆောင်ရွက်ရပါမည်။ ဟိုက်ဒရိုကျဉ်ဆာလ်ဖိုဒ်သည် ဘေးအန္တရာယ် ဖြစ်ပေါ် စေနိုင်သောကြောင့် ၎င်းအတွက် စောင့်ကြည့်စစ်ဆေးသည့်ကိရိယာများကို တပ်ဆင်ခြင်းနှင့် စမ်းသပ်ခြင်းများ ပြုလုပ်ရန် လိုအပ်ပါသည်။ အရေးပေါ် တုန့်ပြန်မှုကိရိယာများ အသုံးပြုရာတွင် လေ့ကျင့်သင်ကြားထားသူများဖြင့် ဆောင်ရွက်ရန် လိုအပ်ပါသည်။

ကြိုတင်စီစဉ်မထားသောအဖြစ်အပျက်များတွင် ကြွင်းကျန်သက်ရောက်မှု အလယ်အလတ်ရှိနိုင်ပြီး ကပ္ပလီပင်လယ်ကွေ့တွင် ဖြစ်ပေါ် လေ့ရှိသည့် တိုင်ဖွန်းမုန်တိုင်းဖြစ်ပေါ် ပါက ကြွင်းကျန်သက်ရောက်မှုမှာ မြင့်သောအဆင့်တွင် ရှိနိုင်ပါသည်။ စီစဉ်မထားသော အဖြစ်အပျက်များ မဖြစ်ပေါ် စေရန် ဆောင်ရွက်နိုင်ခြင်းသည် လက်ရှိသင်တန်းအစီအစဉ်များနှင့် ကမ်းလွန်အရေးပေါ် တုန့်ပြန်မှုအစီအစဉ်၊ ဆီယိုဖိတ်မှုအရေးပေါ် တုန့်ပြန်ရေးအစီအစဉ်များနှင့် ဆက်စပ်နေပါသည်။

ပေါက်ကွဲထွက်ခြင်းကိုလျော့ချရန် ရေအောက်ပေါက်ကွဲမှုကာကွယ်ရေးကိရိယာ(BOP)ကို တပ်ဆင်ပြီး စမ်းသပ်ရန် လိုအပ်ပါသည်။ တွင်းတူးခြင်းလုပ်ငန်းစဉ်ကို ဂရုတစိုက်အကောင်အထည်ဖော်ဆောင်ရွက်ရန် လိုအပ်ပါသည်။ မီးဘေးအန္တရယ်နှင့်ဆက်စပ်နေသော ပေါက်ကွဲမှုဘေးအန္တရာယ်များအတွက် ကမ်းလွန်ရေနံတူးစင်တွင် မီးငြိမ်းသတ်မှုစနစ်များထားရှိပြီး ပုံမှန်စောင့်ကြည့်စစ်ဆေးခြင်းများကို ဆောင်ရွက်ရန် လိုအပ်ပါသည်။

အကြံပြုချက်များကို အောက်ပါအတိုင်း ဖော်ပြထားပါသည်။

- စီမံကိန်းနေရာပြင်ဆင်တည်ဆောက်ခြင်းအဆင့်မတိုင်ခင်တွင် ကမ်းလွန်ရေလုပ်သားများကို စီမံကိန်း၏ရှေ့ဆက်ဆောင်ရွက်မည့် လုပ်ငန်းစဉ်များကို အသိပေးပြောကြားရန် အကြံပြုထားသော လူထုတွေ့ဆုံဆွေးနွေးပွဲများကို အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း
- လုပ်ငန်းခွင်စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအစီအစဉ်ကို ဆောင်ရွက်ခြင်း။
- PCML၏အရေးပေါ် တုန့်ပြန်မှုအစီအစဉ်ကို အသုံးချခြင်း။
- PCML၏ ဆီယိုဖိတ်မှုအရေးပေါ် တုန့်ပြန်ရေးအစီအစဉ်ကို အသုံးချခြင်း။
- စီမံကိန်းမစတင်မီအကြံပြုထားသောသင်တန်းအစီအစဉ်များကို ဆောင်ရွက်ရန်။

  PCMLနှင့်ကမ်းလွန်ရေလုပ်သားများကြား ဆက်ဆံရေးပိုမိုကောင်းမွန်လာစေရန် ငါးဖမ်းလုပ်ငန်း ဖွံ့ဖြိုးတိုးတက်ရေးနှင့် သက်ဆိုင်သော ဒေသဖွံ့ဖြိုးရေး အစီအစဉ်များကို လုပ်ဆောင်ခြင်း။

  အခန်း(၈) တွင် ဖော်ပြထားသော ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် အတိုင်းလိုက်နာဆောင်ရွက်ရန်။

Contents

TABLES

Figures

Charts

1. EXECUTIVE SUMMARY

1.1 Introduction and Objectives

This document is submitted in support of the intent of PC Myanmar (Hong Kong) Limited (PCML) (Operator) to undertake an exploration drilling campaign in Blocks M12, M13, & M14, under a Production Sharing Contract (PSC) with Myanma Oil & Gas Enterprise (MOGE), NIPPON and PTTEPI on 3rd May 1990.

International Environmental Management (IEM) Co. Ltd. and Environmental Quality Management Co. (EQM) has been commissioned by PCML to undertake this EIA Process.

IEM will support PCML to ensure the Scoping and the preparation of the EIA Report in accordance with Section 48 of the EIA Procedure.

1.2 The Planned Project

The Yetagun Field (consisting of Yetagun Main and Yetagun North) is located in Andaman Sea, offshore of Myanmar in Blocks M12, M13 and M14. PC Myanmar (Hong Kong) Limited (PCML) assumed operatorship of the blocks on 12th September 2003. The participating interest in the blocks is PCML (10.91%), PC Myanmar Inc (30%), Myanma Oil & Gas Enterprise (20.45%), JX Nippon Oil & Gas Exploration Corporation (19.32%) and PTTEP (19.32%).

The block is currently producing approximately 180 MMSCAF of Gas a day for export from Myanmar to Thailand. Due to the depletion of gas reserves, PCML would like to conduct exploration drilling to identify potential reservoirs to increase gas production.

A 3D Seismic survey had been carried out and completed by December 2016. This project is classified as an exploration drilling project in an established development block. The drill locations in Blocks M12,M13, & M14 are located 90 NM away from Dawei, the capital of Tanintharyi Region, and 105 NM from Myeik.

The blocks location as per below (**Figure 1-1**)

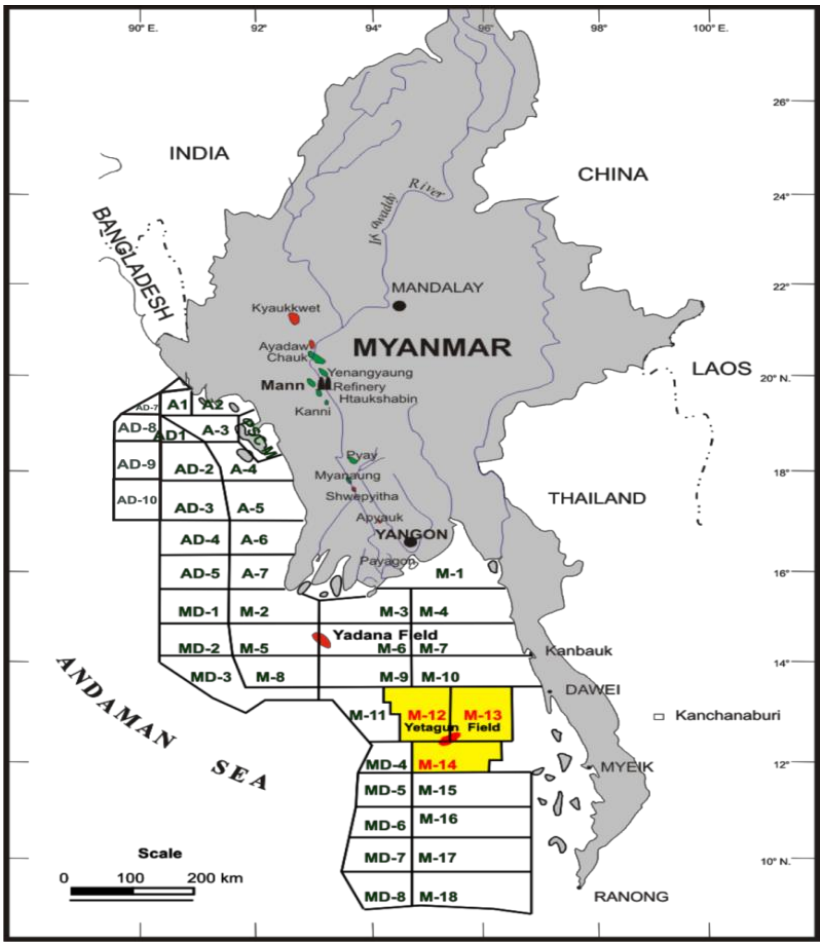


Figure 1-1: Blocks M12, M13, & M14

1.3 Project Proponent

Petroliam Nasional Berhad (PETRONAS) established in 1974, is Malaysia's fully integrated oil and gas multinational ranked among the largest corporations on FORTUNE Global 500®. PC Myanmar (Hong Kong) Limited (PCML), a subsidiary of PETRONAS, is the operator of the Production Sharing Contract (PSC) of Blocks M12, M13 and M14. PCML explores, produces and delivers energy to meet society's growing needs.

PCML applies innovative approaches to technology, which help unlock and maximise energy sources from even the most remote and difficult environments with operations in over 50 countries around the world.

The PCML office in Yangon is:

Myanmar Centre Business Suites
10th, 11th, 12th Connecting Floor, Myanmar Centre Tower 2,
192, Kaba Aye Pagoda Road, Bahan 11201, Yangon, Myanmar
T: +(951) 515011/526411, 9345065/66/67/68
F: +(951) 525698/525684

1.4 Overview of the Policy, Legal and Institutional Framework

1.4.1 Policy and Legal Framework

1.4.1.1 *Environmental Policy Framework*

Environmental legislation and arrangements for environmental conservation in Myanmar are developing rapidly. As part of Myanmar's reform process that involves the updating and enforcing environmental policy and legislation. The Framework for Economic and Social Reform (FESR 2013) and the National Comprehensive Development Plan (NCDP 2011-2030) continue Myanmar's goal of environmental conservation.

At present, all laws relating to the environment are being formulated and administered by the sectoral ministries and departments concerned. The following section provides a list of environmental legislation relevant to the Project activities

1.4.1.2 *National Environmental Legislation*

The national legislation applicable to the Project comprises the following sources of law, listed hierarchically in accordance with the Constitution and other laws of Myanmar:

- The Constitution of the Republic of the Union of Myanmar (2008);
- The Myanmar Investment Law (2016);
- Myanmar Environmental Conservation Laws (2012);
- Environmental Conservation Rules (2014);
- Environmental Impact Assessment Procedure (2015);
- National Environmental Quality (Emission) Guideline (2015).

1.5 Project Activities

1.5.1 Project Location

The three (3) field prospects have been identified in the Yetagun blocks. They are Yetagun South East, Yeaunglan & Ye-Taung. (**Figure 1-2**)

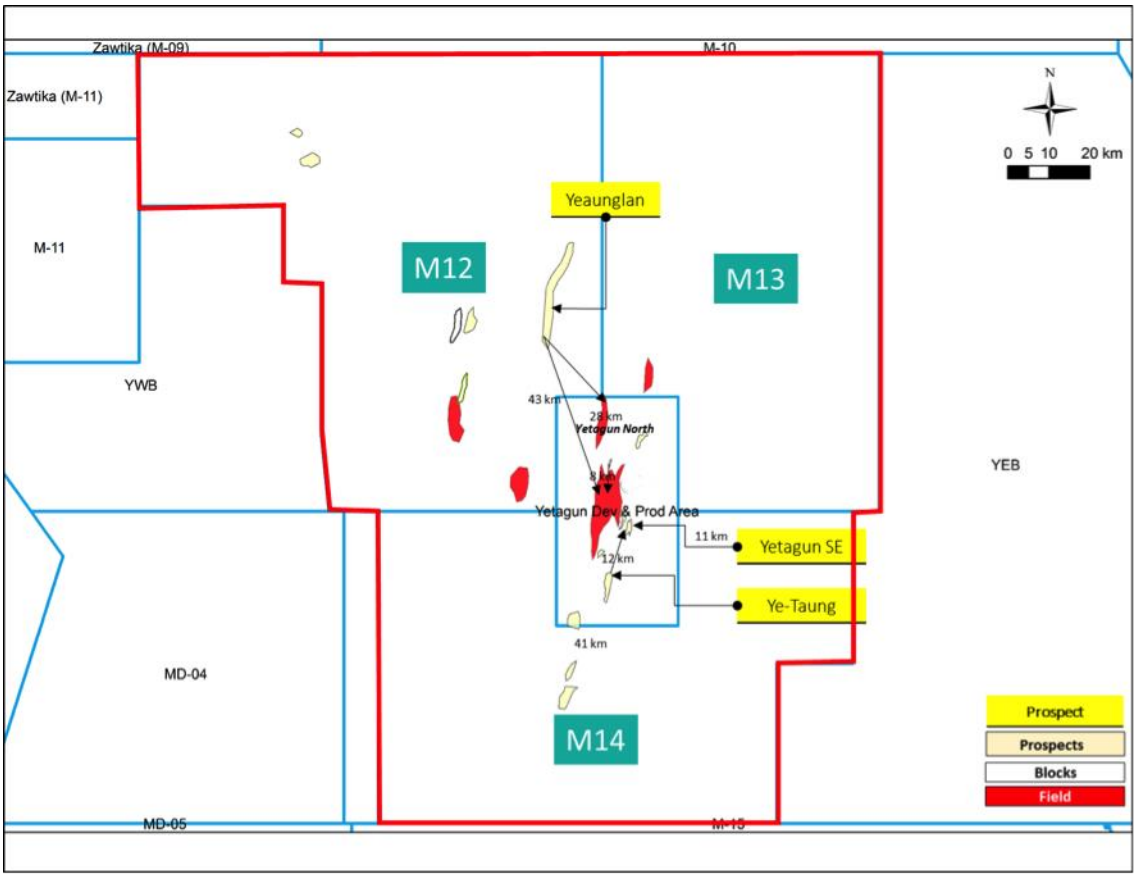


Figure 1-2: Prospective Field locations

1.5.2 Mobilization of Drilling Rig and AHTS Vessel

The drilling would take place in open water. Due to PCML experience in Myanmar waters, a semi-submersible/drill-ship is the preferred drilling rig type.

The supporting vessels, Anchor Handling Tug Vessel (AHTS) would also be mobilized from a nearby country to reduce diesel consumption and cost. These ships would normally be around 70 meters in length and about 10,000bhp. There would be approximately 3 supporting vessel for the drilling rig in the campaign.

1.5.3 Drilling and Drilling Mud

After the rig had been positioned in its location at the drilling site, the drilling stage would commence.

The exploration wells to be drilled would be vertical wells. These wells would be drilled with water based and synthetic based mud systems. Three types of drilling mud will be used as follows:

- **Seawater with bentonite** will be used for the surface section. The main components of the drilling fluid other than seawater are barite, drill-gel, and guar gum.
- **Water-based mud (WBM)** will be used for surface section, intermediate section and the reservoir (option 1). The main components are biodegradable and include: barite, shale inhibitor additive and seawater. PCML will use WBM as main drilling fluid for all well sections.

1.5.4 Well testing phase

Once the well had been constructed, cemented and logged, the target reservoir would be identified through logging activities. The 7" liner would then be perforated and well tested. A well test assembly would be lowered into the hole and a lighter fluid (Nitrogen/base oil) would be injected into the string. An underbalanced situation would be created where the formation fluids would be able to flow. There would be a surface test separator which would separate the fluids into water, gas and condensate. This separator would allow the measurement of the hydrocarbon flow. The produced fluid would then be flared to avoid any hydrocarbon spilled into the environment. The figure below shows a typical surface layout for the well testing equipment.

1.5.5 Well Plug and Abandonment Program

The exploration well will be either suspended or abandoned after the completion of operations at the well site. The temporary or permanent abandonment procedures for any well will be designed for that particular well after the well has been drilled and evaluated. The abandonment procedures will be based upon industry wide practice and procedures, taking into consideration both environmental protection and safety issues. If the well test results indicate that there no commercial viable reservoir is found; the well will be permanently plugged and abandoned.

1.5.6 Pollution prevention equipment

A typical drilling unit comprises the following pollution prevention equipment:

- Sewage treatment systems;
- One air operated garbage compaction system;
- Garbage grinders;
- One skimmer tank typically of 25 bbls;
- One oily water separator typically of 5 m^3/h.

Apart from the above equipment, several devices will be available on the rig or on its support vessels for emergency interventions (e.g. oil spill, blowout, etc.). The following means of intervention are anticipated:

- Fire hydrant and water cannon;
- IMO/SOPEP spill kits;
- Containment floating boom and trawling floating boom;
- Sprayer boom associated with a stock of dispersant agent;

- Oleophilic skimming or mechanical skimming.

A Blowout Contingency Plan, an Oil Spill Response Plan and an Emergency Response Plan will be applied during the appraisal/exploration drilling campaign.

1.5.7 Project Schedule

The PCML exploration drilling program is planned to start in late Q4 2018 and finish by Q2 2019. The exploration wells would have to be drilled with a semi-sub/drill ship. The project duration is based on 75 days for each well. Three wells are planned and if there is a discovery 2 additional exploration/appraisal wells will be drilled.

1.6 Environmental Setting

The Project is located in Blocks M12,M13, & M14 in the southwestern portion of the Gulf of Martaban (also known as the Gulf of Moattama), offshore of Myanmar. Bathymetry in the planned drilling area within Blocks M12, M13, & M14 is between water depths of 120m to 180 m. The proposed wells in Blocks M12,M13, & M14 are located approximately 90 NM from the shoreline near Dawei and 105 NM from Myeik, as shown in **Figure 1-3**.

1.6.1 Sensitive Ecosystems

The majority of Myanmar's coral reefs are found in the Mergui Archipelago, a complex of forested offshore islands in the Tanintharyi coastal area. There are coral reef formations on the Moscos Island Wildlife Sanctuary, Thanintharyi coastal area, and Narcondam islands, which are located 34, 61, and 178 km from the edge of Blocks M12, M13, & M14, respectively (Pe, 2004,). The coral reefs on these islands have only been minimally surveyed (WRI, 2002).

1.6.2 Protected Areas

A total of 45 protected areas have been established in Myanmar. Despite rich marine and coastal habitat, there are only 4 marine protected areas (MPA) in Myanmar, including 1 marine national park and 3 wildlife sanctuaries. The protected areas nearest the project area are Moscos Island Wildlife Sanctuary. This area is over 80 km from the exploration wells, and are not expected to experience any impact or influence from the project operations.

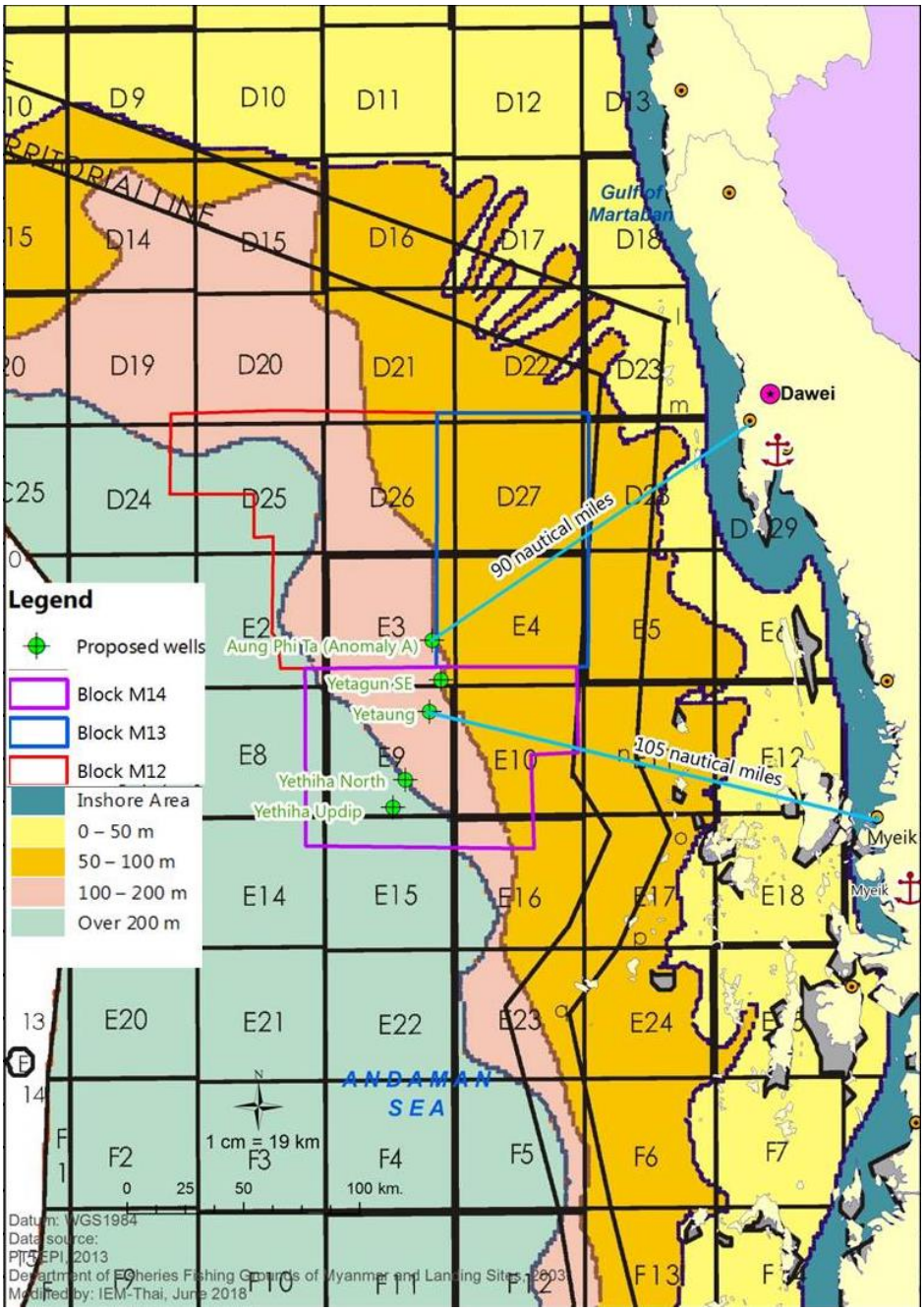


Figure 1-3: Blocks M12, M13, & M14 Area

1.7 Environmental Impacts

Potential impacts from activities during all phases of the offshore appraisal/exploration drilling program have been considered and aspects relevant to each development phase, as determined from screening, have been summarized. A summary of aspects identified at this initial phase are provided below:

1.7.1 Environmental, Social and Health Aspects

Table 1-1: Environmental Aspects

Aspect	Activity	Potential Impact	Residual Risk
Air Quality/Climate	Engine Combustion (installation, drilling, abandonment)	Deterioration from fuel combustion	Negligible
	Well Testing (testing)	Deterioration from flaring emissions	Negligible
	Transportation of Drilling Rig (installation, abandonment)	Deterioration of air quality from boat emissions	Negligible
Seawater Quality	Wastewater (installation, drilling, abandonment)	Potential contamination from wastewater discharge to the sea	Low
	Waste Management (installation, drilling, testing, abandonment)	Potential contamination from spills or leakages of waste	Low
	Fuel Storage and Handling (installation, drilling, abandonment)	Potential contamination from spills	Low
	Hazardous Waste (installation, drilling, abandonment)	Potential contamination from spills	Low
	Discharge of Mud and Cuttings (drilling)	Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
Sediment Characteristics	Fuel Storage and Handling (installation, drilling, abandonment)	Potential contamination from spills	Negligible
	Hazardous Waste (installation, drilling, abandonment)	Potential contamination from spills	Negligible
	Discharge of Mud and Cuttings (drilling)	Change in sediment particle size and chemistry from mud and cuttings deposition	Low
Sediment Quality	Wastewater (installation, drilling, abandonment)	Potential contamination from wastewater discharge to ocean	Negligible
	Fuel Storage and Handling (installation, drilling, abandonment)	Potential contamination from spills	Negligible

Aspect	Activity	Potential Impact	Residual Risk
	Hazardous Waste (installation, drilling, abandonment)	Potential contamination from spills	Negligible
	Waste Management (installation, drilling, abandonment)	Potential contamination from spills or leakages of waste	Negligible
	Discharge of Mud and Cuttings (drilling)	Potential change in sediment chemistry from mud and cuttings deposition (potential increase in organic content, reducing oxygen concentrations; increase in heavy metal concentration and toxicity)	Low
Noise	Engine Combustion (installation drilling, abandonment)	Increased noise from machines and equipment	Negligibl
	Drilling Rig Installation (installation)		
	Well Testing (testing)		
	Transportation of Drilling Rig (installation, abandonment)		
Biological Resources	Wastewater (installation, drilling, abandonment)	Potential deterioration of seawater quality from wastewater discharge could affect the marine ecosystem	Negligible
	Waste Management (installation drilling, abandonment)	Potential deterioration of seawater quality from spills or leakages could affect the marine ecosystem	Negligible
	Drilling Rig Installation (installation)	Increased noise may disturb marine biota	Negligible
	Discharge of Mud and Cuttings (drilling)	Mud and cuttings discharge can increase turbidity, and may be toxic to marine organisms. Mud and cuttings deposition can result in sediment contamination and sediment accumulation affecting benthos	Negligible
	Drilling Rig Demobilization (abandonment)	Increased marine transportation may increase risk of collision with marine mammals	Negligible

Table 1-2: Social Aspects

Aspect	Activity	Potential Impact	Residual Risk
Fisheries	Site Survey (installation)	Removal of fishing equipment and other obstacles from the drilling area may cause damage to fishing equipment	Low
	Wastewater (installation, drilling, abandonment)		

	Waste Management (installation, drilling, abandonment) Drilling Rig Installation (installation) Discharge of Mud and Cuttings (drilling) Fuel Storage and Handling (drilling) Hazardous Waste (drilling) Drilling Rig Demobilization (abandonment)	Loss of fishing area could directly affect the income of fishermen Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption Fishermen can return to fish in the exclusion zone after rig demobilization (positive impact)	
Transportation	Drilling Rig Installation (installation) Waste Management (installation, drilling, abandonment) Transportation of Drilling Rig (installation, abandonment) Overall drilling operations (drilling) Well Testing (testing)	Increased traffic Potential disruption to traffic in case of accident	Low
Pipeline/Cable/Underwater Structures	Drilling Rig Installation (installation)	Possible damage to underwater cable lines and petroleum pipelines during rig installation resulting in interruption of service	Low
Socio-Economy	All operational phases	Increased employment/income and procurement opportunities for people, business and services in surrounding area	Positive
Historical/ Archaeological Sites	Drilling Rig Installation (installation)	Possible disruption or damage of underwater archaeological sites, such as shipwrecks	Negligible
Tourist and Recreational Areas	Waste Management (installation, drilling, abandonment)	Reduced attractiveness of area due to reduced visual aesthetics from releases, accidental spills or improper disposal	Negligible

Table 1-3: Health Aspects

Aspect	Activity	Potential Impact	Residual Risk
Public Health	Waste Management	Potential health impacts on communities from exposure to hazardous chemicals, emissions or waste	Low
Occupational Health and Safety	Wastewater (installation, drilling, abandonment) Waste Management	Emissions of air pollutants may be hazardous to worker health Potential accumulation of extremely toxic H2S in certain systems (such as shale shakers could be	Low

Aspect	Activity	Potential Impact	Residual Risk
	(installation, drilling, abandonment)	hazardous to worker health Noise – High noise levels on the drilling rig could affect the hearing of workers Chemical threat - Workers may be exposed to hazardous chemicals Wastewater - Unhygienic practices in the work place can promote the spread of vector-borne diseases amongst project workers Non-Hazardous Wastes - may have an impact on physical health, mental health, and quality of life	
	Transportation of Drilling Rig (installation, abandonment)		
	Drilling Rig Installation (installation)		
	Discharge of Mud and Cuttings (drilling)		
	Well Testing (testing)		
	Drilling Rig Demobilization (abandonment)		

Table 1-4: Unplanned Event Aspects

Aspect	Activity	Potential Impact	Residual Risk
Blowout	Drilling	Release of uncontrolled volumes of hydrocarbons, Fire, Explosion causing impact to the environment and possible injury or death to personnel	Medium
Fire or Explosion (not associated with Blowout)	Fuel Storage Flare Testing	Possible explosion or fire on drilling rig or fuel storage area	Medium
Chemical, Fuel / Oil or Hazardous Waste/Materials Spill	Storage of chemicals, hazardous materials or waste	Potential risk of spills to the environment affecting air quality, seawater quality, and impact to marine biota	Medium
Transportation Accidents / Ship Collisions	Transportation of fuel, equipment, personnel, mud and cuttings, and waste Rid mobilization / demobilization	Possible injury or death to personnel; and localized contamination of environment	Medium
Tropical Cyclone	Heavy winds and rain	Possible damage to drill rig, spills and contamination of the environment	High

1.8 Cumulative Impacts

The objective of the cumulative impact assessment is to identify those environmental, social or health aspects that may not on their own constitute a significant impact but when combined with impacts from past, present or reasonably foreseeable future activities associated with this and/or other projects, result in a larger and more significant impact(s).

Our cumulative impact assessment has determined that no cumulative impacts will occur. In addition it is determined that existing defined mitigation and monitoring measures for the planned three (3) well exploration drilling project will further prevent cumulative impacts from occurring as detailed in **Chapter 7**.

1.9 Key Mitigation and Management Measures

At this scoping phase we have identified a number of key potential impacts and typical mitigation measures that could possibly be implemented for this project. Mitigation and monitoring measures will be defined in the Management Plan within the final EIA to be submitted for this project.

Environmental Factors /Events	Potential Impact	Mitigation Measures
Environmental Resources		
1. Seawater & Sediment Quality	1.1 Deterioration due to spill of fuel	1.1.1 Each vessel greater than 400 gross tons will comply with all fuel storage, waste treatment and disposal regulations/procedures (the Petroleum Act, MARPOL73/78, PCML and contractor procedures). 1.1.2 Provide appropriate lights and warning signals on all vessels to prevent accidental collision. 1.1.3 Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety. 1.1.4 Implement PCML's Oil Spill Response Plan. 1.1.5 Use support vessels to warn off non-related vessel traffic to prevent accidental collision.
	1.2 Degradation from other discharges	1.2.1 Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety. 1.2.2 The drilling rig shall be equipped with bund wall to prevent oil and chemical spills. Any spilled oil and chemical will be collected into a sealed container. Support vessel, will divert contaminated water from different parts of ship to treatment before drainage to the sea. 1.2.3 Wastewater discharge from project's vessels will at least comply with the regulation of MARPOL 73/78 Annex I and II. 1.2.4 Provide effective wastewater treatment system to ensure that the quality of the discharge meets the criteria of MARPOL 73/78. 1.2.5 Divert wastewater to oil/grease traps prior to discharge. 1.2.6 Food waste must be shredded to smaller than 25 mm before discharge to sea.
Biological Resources		
2. Endangered marine animals	2.1 Endangered marine animals migrate from the survey area	2.1.1 Avoid transportation near areas with endangered marine animals. 2.1.2 Before drilling rig installation, establish 1 to 2.5 km^2 zone around the rig area to observe endangered marine animals. 2.1.3 During rig installation, look for endangered marine animals around rig area from the support vessels. 2.1.4 If any endangered marine animal is found in the project area before rig installation, use sonar wave to prevent endangered marine animals entering the area. 2.1.5 Do not let anchors drag on the seabed.

Environmental Factors /Events	Potential Impact	Mitigation Measures
		2.1.6 Record endangered marine animals found in project area and include in monitoring report to ECD.
Human Use Values		
3. Fishing	3.1 Limited fishing area due to 500m safety zone	3.1.1 At least 30 days prior to rig mobilization, coordinate with MOGE, Navy, Department of Marine Administration, to issue "Notice to Mariner" regarding project activities. 3.1.2 Inform relevant fisheries associations regarding project activities at least 45 days prior to commencement. 3.1.3 Implement PCML's Community Awareness Plan and complaint handling process.
	3.2 Accidental collision	3.2.1 Establish 500 m safety zone around the drilling rig. 3.2.2 Use support vessels to warn off traffic. 3.2.3 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.
	3.3 Removal of fishing equipment before Drilling Rig installation	3.3.1 Inform relevant fisheries associations regarding project activities at least 45 days prior to commencement. 3.3.2 If fishing equipment becomes damaged or must be removed, compensation will be made according to agreements via Fisheries Associations Department of Fisheries, and MOGE. 3.3.3 Record the fishing equipment removed. 3.3.4 Provide fair compensation, at rate agreed upon between PCML, MOGE, Regional Department of Fisheries, Fisheries associations, and equipment owners. 3.3.5 Implement PCML's Public Relations Plan and complaint handling process.
4. Shipping	4.1 Increased shipping traffic 4.2 Accidental collision	4.1.1 At least 30 days prior to rig mobilization, coordinate with MOGE, Navy, Department of Marine Administration, to issue "Notice to Mariner" regarding project activities. 4.1.2 Establish 500 m safety zone around the drilling rig. 4.1.3 Use support vessels to warn off traffic. 4.1.4 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.
5. Waste Management	5.1 Direct impact on seawater quality, seabed sediment, and marine organism 5.2 Indirect impact on fisherman	5.1.1 All contractors must comply with the waste management regulations, and relevant laws, as well as monitor operations. 5.1.2 Separate and store each type of waste (separate non-hazardous waste and hazardous waste) into appropriate containers having clear labels. 5.1.3 Do not drop any plastic waste into the sea. 5.1.4 Store hazardous waste in containers that are durable and safe for transport/transfer. Also, store them in areas away from fire sources. 5.1.5 Record and examine the type and quantity of waste. 5.1.6 Employ a licensed contractor for storing, transferring, separating, and disposing of waste in compliance with the law. 5.1.7 Hazardous Waste Manifest System for transporting hazardous waste to treatment or disposal location.
Health		
6. Worker Health & Safety	6.1 Injuries or illness due to exposure to harmful substances or accident	6.1.1 Implement PCML's HSE Management System. 6.1.2 Implement strict mitigation measures for impacts on air, noise 6.1.3 Provide personal protective equipment (PPE) for all workers. 6.1.4 Provide first-aid kits and first-aid rooms in the project area.

Environmental Factors /Events	Potential Impact	Mitigation Measures
6. Worker Health & Safety (cont.)	6.1 Injuries or illness due to exposure to harmful substances or accident	6.1.5 Cooperate with the nearest health center/hospital in order to immediately support response to emergency events. 6.1.6 Implement steps of operation for occupational, health, and safety; and the protection and controlling of accidents: ▪ Safety method for working with machines/equipment ▪ Procedure for safety operation ▪ Procedure for work permission ▪ Provide MSDS for all chemicals ▪ Follow international fuel storage and waste management guidelines ▪ Compliance monitoring system and manifest system for hazardous wastes 6.1.7 Provide a suitable work environment. 6.1.8 Provide fire protection equipment and manual for emergency management at project site, and provide the appropriate practice complying with mitigation measures. 6.1.9 Set a suitable safety zone around the project area and provide boats to notify fishing boats and commercial vessels to avoid entering the operation area 6.1.10 Provide safety measures relating to chemical hazards: ▪ Store chemicals in closed containers and place in a chemical storage area with good ventilation. ▪ Provide chemical protection equipment for workers handling chemicals and check the equipment usage of workers, such as respiratory protection devices, chemical protection gloves, dust protection glasses, and safety suite. ▪ Provide shower in chemical storage area, drilling rig area, and solid control system area.

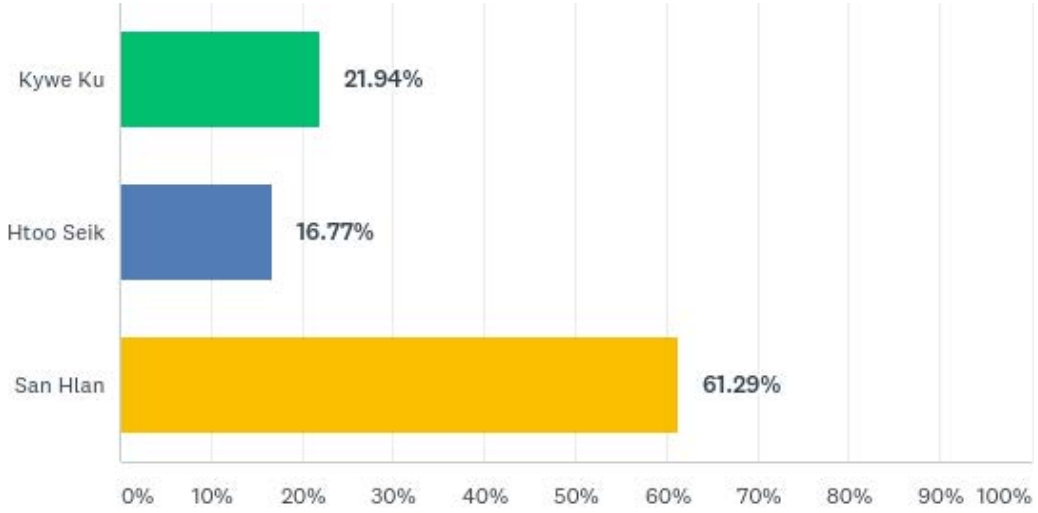
1.10 Public Consultation

At the Scoping Phase Public Consultation was initially conducted with relevant stakeholders including, but not limited to, coastal communities who fish in the project area from the Tanintharyl areas, government authorities, media, NGOs, CSOs, and regional centers that serve as a logistical base for manpower and supply of the offshore appraisal and exploration drilling program.

1.10.1 Results of the Opinion Survey

The villages surveyed included Kywe Ku (Myeik) 22%, Htoo Seik (Myeik) 7%, and San Hlan (Dawei) 61%. (Chart 1-1)

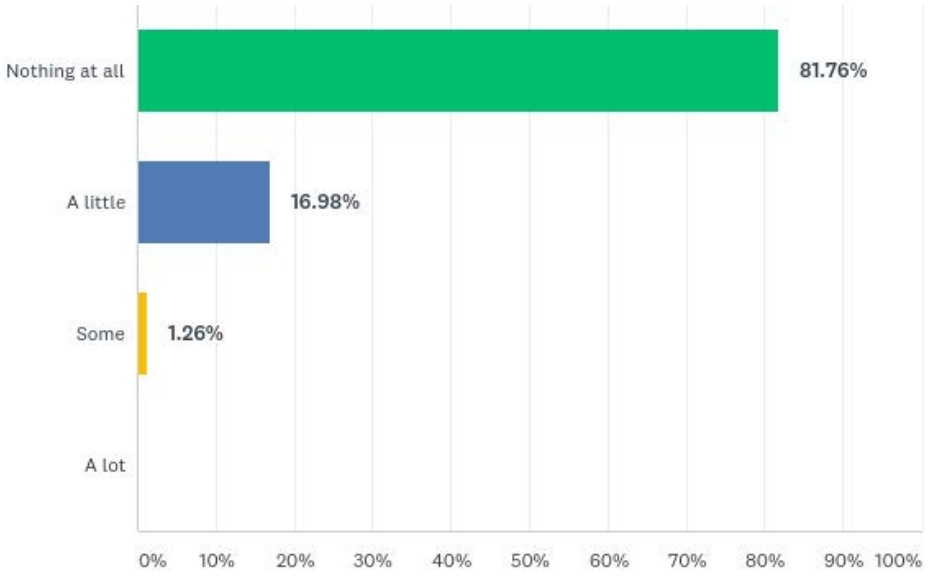
Chart 1-1: Villages Interviewed



Of those that attended the meetings and completed the project opinion survey: 58% were male and 42% were female; 99% were Buddhist; 35% 75% were fisherman; and 48% had completed secondary school education.

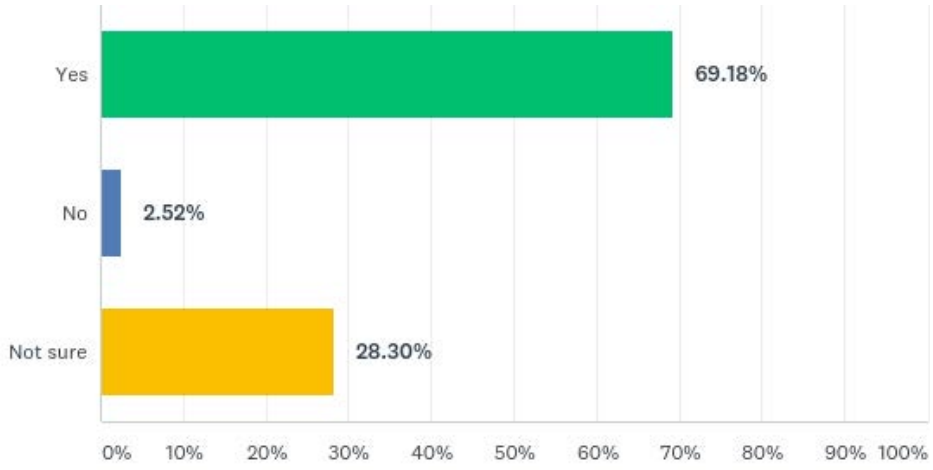
The Participants indicated that 18% had some information about the project. (**Chart 1-2**)

Chart 1-2: Project Awareness



Participants indicated that 69% supported the project, while 28% were unsure, and 3% did not support the project. (**Chart 1-3**)

Chart 1-3: Do you agree with the proposed project?



1.10.2 Result of Scoping Public Consultation Meetings

The regional centers where township meetings were held included Myeik and Dawei. Village level town hall meetings were also held at Kywe Ku (Myeik), and San Hlan (Dawei) The following summary of the public consultation meetings is provided below:

Meeting were also held with the Myeik District Fisheries Federation, GAD (Myeik & Dawei), ECD (Myeik & Dawei), CDC (Myeik & Dawei), Myeik Department of Fisheries. Note Dawei Department of Fisheries personnel were not available. Media were present for town hall meetings in Myeik and Dawei. Public disclosure occurred via MCN TV News Channel and Facebook page, and DVB media issued information on the news and on their Facebook page.

The meeting format of each meeting included:

1. Introduction speech by each meeting host (i.e. Dawei/Myeik Township Administrator)
2. Introduction to PCML personnel
3. Introductory speech by MOGE representative
4. PCML Project Presentation
5. Presentation about Environmental Impact Assessment
6. Question and Answer Session

Overall 69% of the people attending the public meetings were supportive of the project and 28% were still unsure. Less than 2.5% did not support the project.

The public in this area recognizes the need for energy as 68% identified this as a main development priority for their community. Many questions were raised as to when the energy grid will be more developed in the Myeik/Dawei area. In particular the public wants to know what benefit the project will bring. Questions were also raised as to what profits has the existing developments already achieved.

Other common themes included what type of CSR programs will be implemented in addition to the programs already in place by PCML. In Myeik the lack of CSR programs was noted. Fishermen are concerned about their industry and the drastic reduction of available fish stocks off the coast of Myanmar. The fishermen are concerned about further possible impact by the oil and gas industry.

Various questions were raised by fisherman as to what compensation would be provided for the 500 m exclusion zone around the drill sites and what compensation would be provided in the event of a serious impact to their livelihood. The Myeik fisherman feel that the restriction zone around the drilling rig and existing offshore platforms and pipelines is impacting their ability to harvest fish. Other questions were raised that asked if sensitive areas would be affected by the project. The closest sensitive area to the planned drill sites is over 50 km away. Further questions were raised concerning possible impacts from the planned development on fish species, coral, seagrass and nearby islands. It was made clear that none of the sensitive areas shown on the map would be affected by the exploration drilling project. All potential impacts from this project will be very localized and can be mitigated with standard international practice.

1.10.3 Result of EIA Public Consultation Meetings

The regional centers where township meetings were held included Thayet Chaung, Lang Lone, Myeik and Dawei. Media were present for the town hall meetings in Myeik and Dawei. Public disclosure was conducted via reporters from MyaWaDi Newspaper, Dawei Watch, MRTV.MWD, Hinthar Media, Elevn Media Myawaddy, DVB, Myanma Alin/ Kyay Mone, Thanintharyi Journal, Myeik Local Newspaper.

This consultation occurred during the week of 23th to 26th July 2018, 2018. The stakeholders at the 2nd public consultation at the township meeting and at the villages raised similar concerns as the 1st public consultation. They key issues, concerns and recommendations regarding the exploration drilling are as follows. Many concerns were raised by the Meik Fisheries Association. They do not believe that there concerns are being expressed to the government agencies. The fisherman are concerned about potential impacts to their livelihood, particularly fishing and crabbing. They have asked questions about the potential impacts of exploration drilling on their fishing operations. Also they feel that the exclusion zones are too large and there fishing activities are restricted. Of key importance is that they do not receive any project benefits and do not receive any CSR programs. At the same time even while they are producing energy in their region, the price they pay for electricity is four to eight times higher.

The fisherman in Meik would also like to receive more information on the results of the EIA and particularly the sampling results as they are concerned about impacts from mercury as an example. It is clear that further consultation is needed with the Meik Fisherman's association. Mitigation measures have been developed to address the issues raised during consultation meetings. The following meeting notes provide a more detailed presentation of the issues raised and response provided.

1.10.4 Public Disclosure

The project disclosure was conducted in compliance with Paragraph 61, EIA Procedure. PCML has disclosed the planned project information via PCML website and at PCML Yangon Office. Disclosure of the planned project has been achieved via the media who attended meetings with the Myanmar Fisheries Federation and Public Meetings in Dawei and Myeik. Public disclosure was conducted via MCN TV News Channel and Facebook page, and also DVB media issued information on the news and on their Facebook page.

1.11 Conclusion

All environmental and social issues are ranked as negligible or low and can be managed to minimize potential impacts. As the well locations are offshore and far from the coastal area, experience shows that fishing will be limited to a very small number of deep offshore fisherman. Although the actual restricted fishing area of the exclusion zone is small compared to the Andaman Sea, the perception of the fisherman is that a large portion of their fishing areas are being blocked by the increased activity in offshore oil & gas industry. This is a regional issue that should be considered in the CSR development plans of PCML to ensure the entire Thanintharyi Region including the fisheries industry are included and represented. Currently, CSR activities have been concentrated in the Dawei District focused around the on-shore pipeline locations and other facilities of the Yetagun field. This has resulted in stakeholder from Myeik District having a negative perception towards the project. It is important for these issues to be addressed with future consultation and CSR activities as part of the overall Yetagun Field development plans.

Occupational and Public Health issues are also all ranked as low. A specific waste management plan will be prepared to ensure that all wastes are managed to international standards. Hydrogen Sulphide is a potentially serious issue that requires monitoring equipment to be installed and tested, as well as having personnel trained on use of emergency response equipment.

Unplanned Events have all been ranked as having a medium residual risk, with the exception of typhoons which are ranked as high due to the high possibility of occurrence in the Gulf of Martaban. The key to ensuring that unplanned events do not happen is linked to ongoing training programs and the implementation specific offshore emergency response plan and oil spill contingency plans.

To mitigate the potential for a blowout, a subsea BOP needs to be installed and tested. Drilling procedures need to be carefully implemented. The risk of fire and related explosions requires that regular monitoring and inspection measures are in place, with all fire extinguishing facilities maintained and managed on the offshore drill rig.

Recommendations:

The following recommendations are provided:

- Implement recommended stakeholder engagement program before site installation phase to inform offshore fisherman of the upcoming activities.
- Prepare a site specific waste management plan.
- Apply PCML's Emergency Response Plan.
- Apply PCML's Oil Spill Contingency Plan.
- Conduct recommended training program prior to project initiation.
- Identify & implement CSR programs related to fishery resource development to increase the relations between PCML and the deep offshore fisherman.
- Adopt and implement the EMP provided in **Chapter 8**.

2. INTRODUCTION

2.1 Background

PC Myanmar (Hong Kong) Limited (PCML) (Operator) to undertake an exploration drilling campaign in Blocks M12, M13, & M14, under a Production Sharing Contract (PSC) with Myanma Oil & Gas Enterprise (MOGE), NIPPON and PTTEPI on 3rd May 1990. The blocks location as **Figure 2-1**.

The Yetagun Field (consisting of Yetagun Main and Yetagun North) is located in Andaman Sea, offshore of Myanmar in Blocks M12, M13 and M14. PC Myanmar (Hong Kong) Limited (PCML) assumed operatorship of the blocks on 12th September 2003. The participating interest in the blocks is PCML (10.91%), PC Myanmar Inc (30%), Myanma Oil & Gas Enterprise (20.45%), JX Nippon Oil & Gas Exploration Corporation (19.32%) and PTTEP (19.32%). The block is currently producing approximately 180 MMSCAF of Gas a day for export from Myanmar to Thailand. Due to the limited gas reserves, PCML would like to conduct exploration drilling to identify potential reservoirs to increase gas production.

A 3D Seismic survey had been carried out and completed by December 2016. The prospects had been identified to image the deep lower Miocene section. The seismic coverage is approximately 1104 sq. km. The Seismic results have been processed and new target reservoirs have been identified for exploration drilling purpose. PCML plans to conduct exploration drilling on these identified potential reservoirs. The exploration drilling campaign would include drilling three (3) exploration wells within the project area.

International Environmental Management Co. Ltd. (IEM) and local partner Environmental Quality Management Co. Ltd. (EQM) have been contracted by PCML to prepare an environmental impact assessment report (EIA) for the proposed exploration drilling project ("the Project").

2.2 Project Proponent

Petroliam Nasional Berhad (PETRONAS) established in 1974, is Malaysia's fully integrated oil and gas multinational ranked among the largest corporations on FORTUNE Global 500®. PC Myanmar (Hong Kong) Limited (PCML), a subsidiary of PERTONAS, is the operator of the Production Sharing Contract (PSC) of Blocks M12, M13 and M14. PCML explores, produces and delivers energy to meet society's growing needs.

PCML applies innovative approaches to technology, which help unlock and maximise energy sources from even the most remote and difficult environments with operations in over 50 countries around the world.

The PCML office in Yangon is:

Myanmar Centre Business Suites
10th, 11th, 12th Connecting Floor, Myanmar Centre Tower 2,
192, Kaba Aye Pagoda Road, Bahan 11201, Yangon, Myanmar
T: +(951) 515011/526411, 9345065/66/67/68
F: +(951) 525698/525684

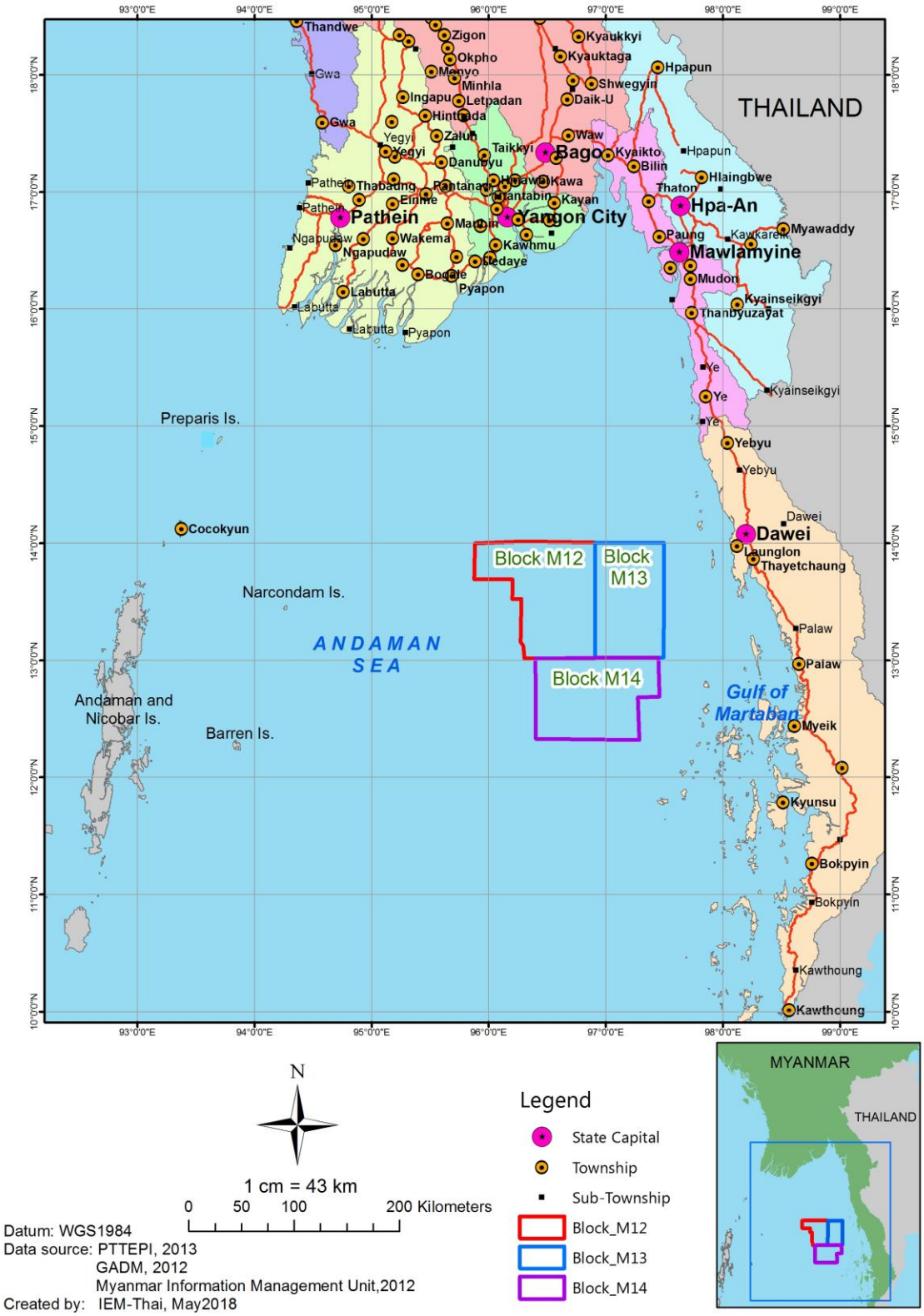


Figure 2-1: Blocks M12, M13 & M14 and Townships Map

2.3 EIA Objectives

The purpose of this EIA Report is to identify and, to the extent possible, quantify the potential impacts and positive benefits of the project with respect to the environment, human use values, quality of life and health. Once these impacts have been identified, prevention, mitigation, and monitoring measures will be proposed to minimize impacts.

The specific objectives of this report are to:

- Identify all planned activities and potential unplanned events;
- Establish an environmental, social and health baseline of the project area;
- Identify and assess potentially significant impacts based on existing conditions to:
    - Physical Resources;
    - Ecological Resources;
    - Human-Use Values;
    - Quality-of-Life Values;
    - Health.
- Identify and recommend mitigation measures to minimise potential impacts;
- Recommend a monitoring plan that can track changes in the environment, social issues and health over time and to ensure compliance with Myanmar legislation.

2.4 EIA Scope

The environmental, social and health impact assessment report for the Project includes:

- a review of applicable legislation;
- a detailed project description of the proposed exploration drilling program;
- an evaluation of the existing environmental, social and health conditions;
- an environmental, social and health impact assessment, including both the positive and negative impacts during the construction, the operation and the abandonment period;
- proposed mitigation measures to reduce the potential harmful impacts to the nearby environment, social issues, and health; and
- proposed monitoring program to monitor the environmental, social and health quality that may be affected by the Project.

2.5 Study Area

The overall study area of the project will cover a 5-km area of the proposed exploration well site area in Blocks M12, 13 & 14. The environmental and social baseline data was focused within the coastal areas next to the blocks covering the Thanintharyi Region. The drill locations in Blocks M12, M13, & M14 are located 90 NM away from Dawei, the capital of Tanintharyi Region, and 105 NM from Myeik. The region is divided into three districts, 10 townships, 83 wards, 264 village tracts and 1,250 villages.

The study area will be used to identify sensitive receptors in the assessment of impacts on physical resources, biological resources, human use values, and quality of life values. Examples of sensitive receptors are schools, temples, water resources, residential areas, etc.

2.6 EIA Methodology

The EIA was prepared following the scope outlined in **Section 2.3**. and the methodology provided in **Chapter 6: Impact Assessment**.

2.6.1 Data Collection

2.6.1.1 Primary Data Sources

Data collected for this EIA include details of the proposed project, environmental baseline, socio-economic setting and health conditions of the potentially affected areas. Data were obtained from primary and secondary sources.

Primary data sources include:

- Environmental quality baseline survey for seawater, sediment, plankton and benthos conducted by Environmental Resource Management Co. Ltd. (ERM (HK)) on 19 – 22 April 2018;
- Traditional Ecological Knowledge (TEK) biodiversity surveys with fisherman which focused on a number of ecological indicators regarding biodiversity and ecological status was conducted on 11-15 June 2018;
- Attitude & Opinion surveys & Focus Group Meetings with fisherman / villagers conducted on 11-15 June 2018.
- Fishermen Socio-economic surveys and interviews on 23 – 25 July, 2018.

2.6.1.2 Secondary Data Sources

Secondary data sources came from literature, relevant authorities in the project area. The secondary data sources are cited throughout this report, and listed in the references section.

2.6.2 Policy, Legal and Institutional Framework

A review of all legislation relevant to the undertaking of industrial projects in Myanmar was undertaken during the EIA process. The details are presented in **Chapter 3**.

2.6.3 Project Description

The Project was reviewed in order to gain a full understanding of the project and to compile information on project activities. The Project is described in **Chapter 4**.

2.6.4 Description of the Environment

Environmental, social and health information was collected and evaluated in the following areas:

- **Physical Environment**: geography, climate, air quality, noise, geology, soil, surface water hydrology, surface water quality, groundwater;
- **Biological Environment**: flora, fauna, aquatic biota, threatened/endangered species, protected areas;
- **Human Use Values:** land use, agriculture and industry, fishery and aquaculture, irrigation and agricultural water sources, water supply, wastewater management, solid waste management, transportation, power supply, electricity and communications;
- **Quality-of-Life Values**: local administration, demographics, socio-economy, archaeological resources, tourism;

- **Health**: health services and public health statistics.

The Environmental Setting is described in **Chapter 5.**

2.6.5 Impact Assessment

An initial screening assessment of project activities consisted of developing a summary matrix of project activities against environmental, social and health parameters to determine if potential impacts were considered significant or not. If any issues were considered significant, then these were assessed in more detail. Qualitative and quantitative analyses were conducted to assess potential impacts on environmental, social or health receptors that may be caused by the proposed project activities. The impact analysis criteria are summarized in **Chapter 6**.

The impact assessment also included an assessment of unplanned events. The assessment examines the potential of the project to result in major hazardous events (such as a fire or oil spill from a blow-out) or environmental hazards to impact the project and the environment (such as earthquakes). The risk assessment includes a qualitative and a quantitative evaluation of risks to help further define the probability and potential consequences of these major hazardous events, and to evaluate the significance and the areas that might be impacted by these events. Specific systems for the further management of the significant risks are then proposed. Residual risk was determined after management measures were defined.

2.6.6 Cumulative Impact Assessment

A cumulative impact assessment was completed to identify those environmental, social or health aspects that may not on their own constitute a significant impact but when combined with impacts from past, present or reasonably foreseeable future activities associated with this and/or other projects, result in a larger and more significant impact(s). The cumulative impact is described in **Chapter 7**.

2.6.7 Mitigation and Monitoring

In the impact assessment, a number of potentially significant impacts were identified. For each of these project activities, mitigation measures were defined to prevent and/or reduce the likelihood or magnitude of impacts and/or to limit the extent of an impact if one does occur. The proposed mitigation measures take into account applicable guidelines, industry practices, expert judgement, design techniques, and operational control.

In addition, environmental monitoring measures were designed to monitor the environment and project activities. The purpose of these monitoring measures is: to evaluate the effectiveness of the mitigation measures that will be put in place; to assess compliance with Myanmar legislation, guidelines and standards; and to compare environmental conditions after implementation of the project to environmental baseline conditions to document possible change and/or impact. The mitigation and monitoring measures are described in **Chapter 8**.

2.6.8 Public Consultation & Disclosure

International Environmental Management Co., Ltd. (IEM) and Environmental Quality Management Co., Ltd (EQM) completed two rounds of public consultation meetings to ensure that key stakeholders are aware of the planned project activities. Any comments and concerns that have been raised by stakeholders have been considered as part of the EIA and SIA, and Environmental Management Plan. Prior to initiating the public consultation for the Scoping Phase, a meeting was held with the Chief Minister of Thanintharyi Region to obtain support and approval for meetings with stakeholders in Dawei and Myeik on 1 -2 June 2018.

The public involvement for this EIA consisted of two parts: scoping phase and EIA phase public consultations. The scoping phase public consultation program was completed on 11-15 June 2018. At

the Scoping Phase Public Consultation was initially conducted with relevant stakeholders including, but not limited to, coastal communities who fish in the project area from the Tanintharyi areas, government authorities, media, NGOs, CSOs, and regional centers that serve as a logistical base for manpower and supply of the offshore appraisal and exploration drilling program. Stakeholder engagement meetings were conducted with Thanintharyi Regional Authorities (Head of District General Administration Department), Regional and District Department of Fisheries, and the Environmental Conservation Department (ECD). In addition public meetings were held at the Township level in Dawei and Myeik. The following provides a summary of public consultation and disclosure activities:

- Meetings with the Myanmar Fisheries Federation
- Stakeholders Meeting/Focus Group Discussions with communities, non-governmental organizations (NGOs), fisherman, and government officials in Dawei and Myeik (stakeholder invitees included; General Administration Department (District, Township, local village leader), Environmental Conservation Department (ECD), Department of Fishery, Department of Forestry, Local Port Authority/ Ministry of Transport (MOT), Parliament Member (House of Representatives), Parliament Member (House of nationalities), NGO/CSOs.)
- Attitude and Opinion Survey of fisherman
- Collection of traditional ecological information.
- Public disclosure via MCN TV News Channel and Facebook page, and DVB media issued information on the news and on their Facebook page (link at: https://www.youtube.com/watch?v=cLdC4qN8CWk&feature=youtu.be and http://burmese.dvb.no/archives/275177 .

The second public consultation meetings were completed on 23 – 25 July 2018. These meetings presented the draft preliminary EIA report at the Township level in Dawei and Myeik.

MOGE assisted IEM/ PCML by contacting local officials in each village and making arrangements for our team to meet with them. MOGE too, participated in each focus group meeting and addressed those questions appropriate for the government to answer. All suggestions and concerns from stakeholders were considered in the development of the Environmental Management Plan. The public involvement & disclosure activities are described in **Chapter 9**.

2.7 Organization of EIA Implementation

The impact assessment was completed by the Myanmar registered consultant companies; International Environmental Management Co. Ltd. (IEM) and Environmental Quality Management Co. Ltd. (EQM). The IEM & EQM consultant registrations are included in **Appendix 1**.

International Environmental Management Co. Ltd
No. 148/B, Dhamma Zedi Road, Bahan Township Yangon

Environmental Quality Management Co. Ltd
No. (233), Block 23, Sayeepin Lane
Thuwunna, Thingungyun Township, Yangon, Myanmar

2.7.1 EIA team

The impact assessment was conducted by Myanmar registered consultant companies International Environmental Management Co. Ltd. (IEM) and Environmental Quality Management Co. Ltd. (EQM) The EIA assessment team consisted of the individuals described in **Table 2-1.**

Table 2-1: EIA Assessment Team

No.	Name	Background / Expertise	Responsibility
IEM			
1	Ron Livingston	1979, Master's Degree in Natural Resources Management, University of Manitoba, Winnipeg, Manitoba, Canada. 1976, B.Sc., University of Manitoba, Winnipeg, Manitoba, Canada.	Senior Environmental & Social Expert
2	Dylan Jenkins	2008, B.Sc. (Biosystems Engineering), University of Manitoba, Canada	Environmental Analyst / Biodiversity
3	Komgrit Prawatlertudom	2009, B. Sc. (Marine Sciences), Chulalongkorn University, Thailand	Environmental Modelling / Marine Biology
4	Ubonwan Sintopan	2007, MS. (Natural Resources Management), Asian Institute of Technology, Thailand 2004, B.S. (GEOGRAPHY), Chiang Mai University, Thailand	Environmental Analyst / GIS
EQM			
1	Dr. Ohnmar May Tin Hlaing	2004 -2006, M.Sc in Environmental Engineering and Management, Asian Institute of Technology, Thailand 1986-1996, Bachelor of Medicine and Bachelor of Surgery, Institute of Medicine, Myanmar	Senior Environmental & Health Expert / Local Coordinator
2	Daw Soe Moe Nwe	2013, B.Sc. (Forestry)	Socio-economic Team Leader
3	U Khun Set Thar	2014, University of Forestry, Forestry	Socio-economic Team Leader / Biodiversity Survey
4	U Thiha Htut	2012, Dagon University, Microbiology	Social surveyor
5	Daw Noe Noe Lwin	2014, Myanmar Maritime University, B.E (Naval Architecture)	Social surveyor
6	Daw Thwe Thwe Htun	B.Sc. (Chemistry)	Social surveyor
7	Daw Yoon Mi Mi Thaw	B.Sc. (Chemistry)	Social surveyor

3. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

This section lists all legislation relevant to the undertaking of industrial projects in Myanmar. The legislation can be divided into two categories as follows:

- PETRONAS HSE Policy (summarized in **Section 3.1**)
- PCML Health, Safety and Environment Management System (**Section 3.2**)
- Policy & Legal Framework (**Section 3.3**)
- Contractual and other Commitments (**Section 3.4**)
- Institutional Framework (**Section 3.5**)
- Project's Environmental, Social & Health Standards (**Section 3.6**)

3.1 PETRONAS HSE Policy

PC Myanmar (Hong Kong) Limited (PCML) is committed to Health, Safety and Environment (HSE) and shall take reasonable and practicable steps to prevent and eliminate the risk of personal injury, occupational illnesses and damage to properties. PCML shall take proactive steps and measures in the protection and the conservation of the environment.

In line with PETRONAS' Group Policy Statement on Health, Safety and Environment, PCML shall therefore:

Comply with HSE legal requirements wherever we operate;

Implement effective risk control measures in all our activities; including operations covering acquisition, exploration, development, production and abandonment, which will eliminate, prevent or reduce risks to a level as low as reasonably practicable (ALARP);

Build an effective and resilient HSE Management System as an integral part of our business philosophy and cultivate a desired HSE Culture;

Provide competent workforce, adequate resources and organisation in all our activities in ensuring a safe environment at the workplace;

Promote HSE engagement between joint venture partners, regulatory authorities, Contractors and key stakeholders;

Drive and promote continuous improvement in HSE performance;

Establish effective crisis management and emergency response capabilities in all our operations.

PETRONAS requires all its employees, contractors and others to strictly adhere to this policy at all times. Joint venture partners of PETRONAS are expected to implement an effective HSE Management System which is in line with industry best practices.

3.2 PCML Health, Safety and Environment Management System

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

PCML will ensure the contractor will have an Emergency Response Procedures Manual that includes response procedures for blowout, fire, earthquake, medical emergency, release of hazardous/toxic substances, etc. PCML has an Emergency Response Plan (ERP) that will be updated specifically for each well site operations and site-specific location.

This ERP is considered a standard E&P Emergency Management System and is based on Industry accepted standards and practices (e.g. ISO, BCI, EMI, BS etc.). Topics of the ERP are outlined in **Table 3-1**.

Table 3-1: Emergency Response Plan

Main Sections	Topics
Procedure & Responsibilities	a) Drilling Superintendent b) On-Scene Commander c) PIC (Person-In-Charge)
Emergency Organisation	d) Introduction e) Emergency Response Philosophy f) Overview of the Response Organisation
Emergency Arrangements And Facilities	g) Major gas release / H2S h) Explosion / fire i) Accommodation fire j) Blow-out k) Oil spill l) Hazmat spill m) Helicopter incident n) Man missing o) Loss or damage of radioactive source p) Vessel accident q) Medevac r) Bomb threat / terrorist act s) Fatality t) On-scene Commander Field Arrangements and facilities
Risk Management	u) Major Hazards v) Emergency Plans

3.3 Policy and Legal Framework

3.3.1 Environmental Policy & Framework

Environmental legislation and arrangements for environmental conservation in Myanmar are developing rapidly. As part of Myanmar's reform process that involves the updating and enforcing environmental policy and legislation. The Framework for Economic and Social Reform (FESR 2013) and the National Comprehensive Development Plan (NCDP 2011-2030) continue Myanmar's goal of environmental conservation.

At present, all laws relating to the environment are being formulated and administered by the sectoral ministries and departments concerned. **Section 3.3.2** provides a list of environmental legislation relevant to the Project activities

3.3.2 National Environmental Legislation

The national legislation applicable to the Project comprises the following sources of law, listed hierarchically in accordance with the Constitution and other laws of Myanmar:

- The Constitution of the Republic of the Union of Myanmar (2008)
- The Myanmar Investment Law (2016)
- The Environmental Conservation Law (2012);
- The Environmental Conservation Rules (2014);
- Environmental Impact Assessment Procedure (2015);
- National Environmental Quality (Emission) Guideline (2015).

The EIA Procedure for Myanmar was promulgated on 29th December 2015. The Ministry of Natural Recourses and Environmental Conservation (MONREC) implements the procedure. The EIA Procedure sets out the requirements for development, assessment and subsequent monitoring of an EIA. The requirements to conduct an EIA are outlined in the Environment Conservation Law (2012) and Environment Conservation Rules (2014). In addition; the EIA Procedures are supported by the draft Administrative Instruction which sets out a proposed format and content for reports.

Under Myanmar's EIA Procedure, there is a requirement for the undertaking of an IEE or an EIA in order to obtain an ECC for certain development projects.

3.3.2.1 The Constitution of the Republic of the Union of Myanmar (2008)

The latest enacted Constitution of the Republic of the Union of Myanmar (May 2008) provides the most up to date information on governing laws and regulations in Myanmar. The Constitution prevails over any other national legislation or international agreements. The key sections are 21 (a, d), 37 (a, b), 45, Section 347, Section 390.

Section 21.

(a) Every citizen shall enjoy the right of equality, the right of liberty and the right of justice, as prescribed in this Constitution.

(d) Necessary law shall be enacted to make citizens' freedoms, rights, benefits, responsibilities and restrictions effective, steadfast and complete.

Section 37 states that the Union (a) is the ultimate owner of all lands and all natural resources above and below the ground, above and beneath the water and in the atmosphere in the Union; (b) shall

enact necessary law to supervise extraction and utilization of State-owned natural resources by economic forces;

Section 45 states that The Union shall protect and conserve natural environment.

Section 347. The Union shall guarantee any person to enjoy equal rights before the law and shall equally provide legal protection.

Section 390. States that every citizen has the duty to assist the Union in carrying out the following matters:

- preservation and safeguarding of cultural heritage;
- environmental conservation;
- striving for development of human resources;
- protection and preservation of public property.

3.3.2.2 The Myanmar Investment Law (2016)

The Myanmar Investment Law, enacted in 2016, vastly simplified the process for investment applications and offers a number of tax breaks, incentives, guarantees, rights and protections for business ventures. The Myanmar Investment Commission (MIC) is a government-appointed body formed under the Myanmar Investment Law.

The law includes provisions to restrict or prohibit investment activities which affect public health, the environment and ecosystems, which produce toxic waste or which engage with toxic chemicals; duties of investors to conduct business in such a way as to avoid environmental damage, air and water pollution, in accordance with existing laws as per the following sections. The key sections are 50 (a, d) 51 (c, d, e and f), 65 (e, g, i, j, k, l m, n o, p, q), and 71.

Chapter (12) Rights to Use Land, Section 50.

(a) An Investor who obtains a Permit or an Endorsement under this Law has the right to obtain a long-term lease of land or building from the private owned or from the relevant government departments, governmental organizations managed by the Government, or owned by the State in accordance with the stipulations in order to do investment. Citizen investors may invest in their own land or building in accordance with relevant laws.

(d) The investor shall register the land lease contract at the Office of Registry of Deeds in accordance with the Registration Act.

Chapter (13), Section 51

(c) shall appoint only citizens for works which does not require skill;

(d) shall appoint skilled citizen and foreign workers, technicians, and staff by signing an employment contract between employer and employee in accordance with the labor laws and rules;

(e) shall ensure to obtain the entitlements and rights in the labor laws and rules, including minimum wages and salaries, leave, holidays, overtime fees, damages, compensation of the workman, social welfare, and other insurance related to workers in stipulating the rights and duties of employers and employees and occupational terms and conditions in the employment contract;

(f) shall settle disputes arising among employers, among workers, between employers and workers, and technicians or staff in the investment in accordance with the applicable laws.

Chapter (16) Responsibilities of Investors, Section 65. The Investor -

(e) shall immediately inform the Commission if it is found that natural mineral resources or antique objects and treasure trove not related to the investment permitted above and under the land on which the investor is entitled to lease or use and not included in the original contracts. If the Commission

allows, the investor shall continue to carry out the investment in such land, and if not allowed, the investor shall transfer and carry out, by obtaining the permission, at the substituted place which is selected and submitted by him;

(g) shall abide by the applicable laws, rules, procedures and best standards practiced internationally for this investment so as not to cause damage, pollution, and loss to the natural and social environment and not to cause damage to cultural heritage;

(i) shall close and discontinue the investment only after payment of compensation to employees in accordance with applicable laws for any breach of employment contracts, closure of investment, sale and transfer of investment, discontinuation of investment, or reduction of workforce;

(j) shall pay wages and salaries to employees in accordance with applicable laws, rules, procedures, directives and so forth during the period of suspension of investment for a credible reason;

(k) shall pay compensation and indemnification in accordance with applicable laws to the relevant employee or his successor for injury, disability, disease and death due to the work;

(l) shall supervise foreign experts, supervisors and their families, who employ in its investment, to abide by the applicable laws, rules, orders and directives, and the culture and traditions of Myanmar;

(m) shall respect and comply with the labor laws;

(n) shall have the right to sue and to be sued in accordance with the laws;

(o) shall pay effective compensation for loss incurred to the victim, if there is damage to the natural environment and socioeconomic losses caused by logging or extraction of natural resources which are not related to the scope of the permissible investment, except from carrying out the activities required to conduct investment in a Permit or an Endorsement.

(p) shall allow the Commission to inspect in any places, when the Commission informs the prior notice to inspect the investment;

(q) shall take in advance a Permit or an Endorsement of the Commission for the investments which need to obtain prior approval under the Environmental Conservation Law and the procedures of environmental impact assessment, before undertaking the assessment. Such investments shall be submitted the situation of environmental and social impact assessment to the Commission during the permitted investment period.

Section 71. In conducting their investment activities, the investor shall carry out health assessments, cultural heritage impact assessments, environmental impact assessments and social impact assessments according to the type of investment activities in accordance with the relevant laws, rules, regulations and procedures.

3.3.2.3 The Environment Conservation Law (2012)

The Environmental Conservation Law (Pyidaungsu Hluttaw Law No. 9 / 2012) has the following objectives:

a) to enable to implement the Myanmar National Environmental Policy;
b) to enable to lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process;
c) to enable to emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefit of present and future generations;
d) to reclaim ecosystems as may be possible which are starting to degenerate and disappear;
e) to enable to manage and implement for decrease and loss of natural resources and for enabling the sustainable use beneficially;

f) to enable to implement for promoting public awareness and cooperation in educational programmes for dissemination of environmental perception;

g) to enable to promote international, regional and bilateral cooperation in the matters of environmental conservation;

h) to enable to cooperate with Government departments, Government organizations, international organizations, non-government organizations and individuals in matters of environmental conservation.

The Key sections of importance are 7 (o), 14, 15, 24, 25 and 29 related to pollution control and penalties:

Section 7 of the law, The rights of the Committee are as follows:

(o) managing to cause the polluter to compensate for environmental impact, cause to contribute fund by the organizations which obtain benefit from the natural environmental service system, cause to contribute a part of the benefit from the businesses which explore, trade and use the natural resources in environmental conservation works;

Section 14. A person causing a point source of pollution shall treat, emit, discharge and deposit the substances which cause pollution in the environment in accord with stipulated environmental quality standards.

Section 15. The owner or occupier of any business, material or place which causes a point source of pollution shall install or use an on-site facility or controlling equipment in order to monitor, control, manage, reduce or eliminate environmental pollution. If it is impracticable, it shall be arranged to dispose the wastes in accord with environmentally sound methods.

Section 24. The Ministry may, in issuing the prior permission, stipulate terms and conditions relating to environmental conservation. It may conduct inspection whether or not it is performed in conformity with such terms and conditions or inform the relevant Government departments, Government organizations to carry out inspections.

Section 25. The Ministry may, if it is found that a holder of the prior permission fails to comply with any of the terms and conditions relating to environmental conservation contained in the prior permission, pass any of the following administrative penalties:

(a) causing to comply with in accord with the terms and conditions after warning, causing to sign the bond;

(b) causing to comply with in accord with the terms and conditions after paying a fine.

Section 29. No one shall violate any prohibition contained in the rules, notifications, orders, directives and procedures issued under this Law.

3.3.2.4 The Environmental Conservation Rules (June 2014)

The Environmental Conservation Rules relating to the Environmental Conservation Law, were enacted on 5 June 2014, contain specific items relating to IEE, EIA and pollution prevention which fall under the powers of the Ministry Natural Resources and Environmental Conservation. The key sections of importance are 51 – 56, 58, 61 and 69 (a and b).

Section 51. The Ministry shall assign duty to the Department for enabling to adopt and carry out the environmental impact assessment system.

Section 52. The Ministry shall determine the categories of plan, business or activity which shall carry out environmental impact assessment.

Section 53. The Ministry may, so as to scrutinize whether or not it is necessary to conduct environmental impact assessment, determine the proposed plans, businesses or activities which do not

include in stipulation under rule 52 as the categories which are required to conduct initial environmental examination.

Section 54. The business, department, organization or person who would carry out categories of plan, business or activity stipulated under rule 52:

(a) shall carry out environmental impact assessment for his plan, business or activity;

(b) submit to the Ministry in advance by which organization or person, the environmental impact assessment is intended to be carried out;

(c) submit the environmental impact assessment report to the Ministry.

Section 55. The plan, business or activity which is established before the issue of these rules and responsible to carry out the environmental impact assessment or initial environmental examination shall prepare the environmental management plan in accord with the environmental impact assessment procedure to be issued under the Law and submit to the Ministry. The Ministry shall scrutinize the environmental management plan for approving it. The person who carries out the project, business or activity shall implement the environmental management plan approved by the Ministry and matters stipulated by the Ministry within the time stipulated by the Ministry.

Section 56. The person who carries out any project, business or activity shall arrange and carry out for conducting the environmental impact assessment for any project, business or activity by a qualified third person or organization accepted by the Ministry.

Section 58. The Ministry shall form the Environmental Impact Assessment Report Review Body with the experts from the relevant Government departments, Government organizations.

Section 61. The Ministry may approve and reply on the environmental impact assessment report or environmental management plan with the approval of the Committee.

Section 69.

(a) Any person shall not emit, cause to emit, dispose, cause to dispose, pile and cause to pile, by any means, the pollutants and the hazardous waste or hazardous material stipulated by notification under the Law and any of these rules at any place which may affect the public directly or indirectly.

(b) Any person shall not carry out to damage the ecosystem and the natural environment which is changing due to such system, except for carrying out with the permission of the Ministry for the interest of the people.

3.3.2.5 Environmental Impact Assessment Procedure (2015)

Environmental Impact Assessment Procedures have been prepared by MONREC under the Environmental Conservation Law, 2012. It requires that the Project proponent shall include in its evaluation environmental, social and health aspects of the environment, and shall identify and assess all adverse impacts and risks for environment, social issues and, if relevant, health that potentially could arise from the Project. Therefore this law shall be effectively considered an EIA procedure framework. The key sections are paragraphs 87, 102 – 110, 113, 115, and 117.

CHAPTER VIII. Environmental Compliance Certificate, Conditions and Revisions to Conditions

Section 87. Upon receipt of the written approval from the relevant authority, the Project Proponent shall commence implementation of the Project strictly in accordance with the conditions attached to the ECC and including the EMP, within such time as may be prescribed by the Ministry.

Responsibility for all Adverse Impacts

Section 102. The Project Proponent shall bear full legal and financial responsibility for:

a) all of the Project Proponent's actions and omissions and those of its contractors, subcontractors, officers, employees, agents, representatives, and consultants employed, hired, or authorized by the Project acting for or on behalf of the Project, in carrying out work on the Project; and

b) PAPs until they have achieved socio-economic stability at a level not lower than that in effect prior to the commencement of the Project, and shall support programs for livelihood restoration and resettlement in consultation with the PAPs, related government agencies, and organizations and other concerned persons for all Adverse Impacts.

Section 103. The Project Proponent shall fully implement the EMP, all Project commitments, and conditions, and is liable to ensure that all contractors and subcontractors of the Project comply fully with all applicable Laws, the Rules, this Procedure, the EMP, Project commitments and conditions when providing services to the Project.

Section 104. The Project Proponent shall be responsible for, and shall fully and effectively implement, all requirements set forth in the ECC, applicable Laws, the Rules, this Procedure and standards.

Section 105. The Project Proponent shall timely notify and identify in writing to the Ministry, providing detailed information as to the proposed Project's potential Adverse Impacts.

Section 106. The Project Proponent shall, during all phases of the Project (pre-construction, construction, operation, decommissioning, closure and post-closure), engage in continuous, proactive and comprehensive self-monitoring of the Project and activities related thereto, all Adverse Impacts, and compliance with applicable laws, the Rules, this Procedure, standards, the ECC, and the EMP.

Section 107. The Project Proponent shall notify and identify in writing to the Ministry any breaches of its obligations or other performance failures or violations of the ECC and the EMP as soon as reasonably possible and in any event, in respect of any breach which would have a serious impact or where the urgent attention of the Ministry is or may be required, within not later than twenty-four (24) hours, and in all other cases within seven (7) days of the Project Proponent becoming aware of such incident.

Section 108. The Project Proponent shall submit monitoring reports to the Ministry not less frequently than every six (6) months, as provided in a schedule in the EMP, or periodically as prescribed by the Ministry.

Section 109. The monitoring reports shall include:

a) documentation of compliance with all conditions;
b) progress made to date on implementation of the EMP against the submitted implementation schedule;
c) difficulties encountered in implementing the EMP and recommendations for remedying those difficulties and steps proposed to prevent or avoid similar future difficulties;
d) number and type of non-compliance with the EMP and proposed remedial measures and timelines for completion of remediation;
e) accidents or incidents relating to the occupational and community health and safety, and the environment; and
f) monitoring data of environmental parameters and conditions as committed in the EMP or otherwise required.

Section 110. Within ten (10) days of completing a monitoring report as contemplated in Article 108 and Article 109 in accordance with the EMP schedule, the Project Proponent shall make such report (except as may relate to National Security concerns) publicly available on the Project's website, at public meeting places (e.g. libraries, community halls) and at the Project offices. Any organization or person may request a digital copy of a monitoring report and the Project shall, within ten (10) days of receiving such request, submit a digital copy via email or as may otherwise be agreed upon with the requestor.

Section 113. For purposes of monitoring and inspection, the Project Proponent:

a) shall grant to the Ministry and/or its representatives, at any time during normal working hours, access to the Project's offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed; and

b) from time to time as and when the Ministry may reasonably require, shall grant the Ministry access to the Project's offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed.

Section 115. In the event of an emergency, or where, in the opinion of the Ministry, there is or may exist a violation or risk of violation of the compliance by the Project with all applicable environmental and social requirements, the Project shall grant full and immediate access to the Ministry at any time as may be required by the Ministry.

Section 117. The Project Proponent shall further ensure that the Ministry's rights of access hereunder shall extend to access by the Ministry to the Project's contractors and subcontractors.

3.3.2.6 National Environmental Quality (Emission) Guideline (2015)

MONREC has established environmental quality standards, the National Environmental Quality Standard [Legal Reference: ECL 2012 (Article 2c) and EQS 2016]. These Guidelines are noted to be the same as that recommended by the IFC General EHS Guidelines (2007) (World Bank Group, 2007) and the IFC sector specific guidelines (World Bank Group, 2015). The key relevant sections are 1, 4, 5, 6, 7, 9, 12 and 13.

Section 1

These national Environmental Quality (Emission) Guidelines (hereafter referred to as Guidelines) provide the basis for regulation and control of noise and vibration, air emissions, and liquid discharges from various sources in order to prevent pollution for purposes of protection of human and ecosystem health.

Section 4

Unless otherwise indicated, these Guidelines refer to emission sources, and are intended to prevent or minimize adverse impacts to environmental quality or human health by ensuring that pollutant concentrations do not reach or exceed ambient guidelines and standards. The Guidelines apply to projects that generate noise or air emissions, and / or that have either direct or indirect discharge of process water, wastewater from utility operations or storm water to the environment.

Section 5

General and industry-specific Guidelines as set out in Annex 1 – Emissions Guidelines shall apply to any project subject to EIA Procedure, as adopted by the Ministry, in order to protect the environment and to control pollution in the Republic of the Union of Myanmar. These Guidelines specifically apply to all project types listed in the EIA Procedure under 'Categorization of Economic Activities for Assessment Purposes', which sets out projects that are subject to EIA or initial environmental examination.

Section 6

Provisions of the general and applicable industry-specific Guidelines shall be reflected in project environmental management plan (EMP) and environmental compliance certificate (ECC) and together constitute a project's commitment to take necessary measures to avoid, minimize and control adverse impacts to human health and safety, and the environment through reducing the total amount of emissions generation; to adopting process modifications, including waste minimization to lower the load of pollutants requiring treatment; and as necessary, to apply treatment techniques to further reduce the load of contaminants prior to release or discharge.

Section 7

Recognizing that these Guidelines are intended to prevent pollution through reducing the mass of pollutants emitted to the environment, dilution of air emissions and effluents to achieve maximum permitted values is not acceptable. Specified guideline values should be achieved, without dilution, at least 95 percent of the time that a project is operating, to be calculated as a proportion of annual operating hours.

Section 9

As specified in the EIA Procedure, all projects are obliged to use, comply with and refer to applicable national guidelines or standards or international standards adopted by the Ministry. These Guidelines will henceforth be applied by the Ministry in satisfying this requirement until otherwise modified or succeeded by other guidelines or standards.

Section 10

As specified in the EIA Procedure, following project approval a project shall commence implementation strictly in accordance with the project EMP and any additional requirements set out in the project ECC, which will encompass conditions relating to emissions. In this regard, the Ministry will require that projects adhere to general and applicable industry guidelines as set out in Annex 1 of this law.

Section 12.

As specified in the EIA Procedure, projects shall engage in continuous, proactive and comprehensive self monitoring of the project and comply with applicable guidelines and standards. For purposes of these Guidelines, projects shall be responsible for the monitoring of their compliance with general and applicable industry-specific Guidelines as specified in the project EMP and ECC.

Section 13

Air emissions, noise, odor, and liquid / effluent discharges will be sampled and measured at points of compliance as specified in the project EMP and ECC.

3.3.3 Project-Relevant Laws

The Myanmar Environmental Conservation Law, Environmental Conservation Rules, Environmental Quality (Emission) Standards are the first step to address all the complex environmental and social management issues faced by Myanmar. A number of other laws exists which, either directly or indirectly, relate to environmental and social management of the project. The other relevant Myanmar government agencies/ requirements applicable to the Project are summarized below:

- The Petroleum and Petroleum Products Law, 2017, Section 8 (m), Section 9 (a, c, d), Section 19(a,b,e), Section 10 (a,c,d,f)
- Public Health Law, 1972
- The Prevention and Control of Communicable Disease Law, 1995
- The Control of Smoking and Consumption of Tobacco Product Law, 2006 (Section 9)
- The Myanmar Fire Force Law, 2015 (Section 25)
- The Protection and Prevention of Antique Objective Law, 2015 (Section 12)
- The Protection and Prevention of Ancient Monument Law, 2015 (Section 12, 20(f) (c), 15(c))
- Employment and Skill Development Law, 2013 (Section 5, 14, 30)
- The Factories Act, 1951 (Before notification that this project is oilfield issued by MOEE)
- The Oilfields Act, 1918

- The Welfare of Labors of Oilfield Act, 1951(After notification)
- The Workmen Compensation Act, 1951
- Labor Organization Law, 2012
- Settlement of Labor Dispute Law, 2012
- Minimums Wages Law, 2013
- Payment of Wages Law, 2016- (3,4,8,7(ii),9,10(a) to e
- Social Security Law, 2012 - 11, 16(a), 48(a), 51(a) (b), 54
- Leaves and Holidays Act, 1951
- The Explosive Act (1887)
- The Explosive Substances Act (1908)
- Fresh Water Fisheries Law, 1991 (Section 40)
- The Motor Vehicles Law, 2015 and Rules, 1987
- Myanmar Insurance Law, 1993 (Section 16)
- Forest Law, 1992 (Section 12)
- Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law 1994
- The Underground Water Act, 1930
- The Farmland Law, 2012 (Section 30)
- The Protection and Prevention of Cultural Heritage Area, 2015 (Section 20, 23, 29(b))
- The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013 (Section 16,17,23,27)
- Import and Export Law, 2012 (Section 7)
- Conservation of Rivers, Creeks and Water Resources Law, 2006 (Section 24 (b), 21(a)(b), 19, 11(a) (b))
- The Private Industrial Enterprise Law, 1990
- The Law On Standardization (2014)
- The Science and Technology Development Law (1994)
- Myanmar Engineering Council Law (2013)
- State-Owned Economic Enterprises Law, 1989
- The Protection of rights of National Race Law, 2015
- Ethnic Rights Protection Law (2015)
- Myanmar Port Authority Law 2015
- Law Amending the Territorial Sea and Maritime Zone Law (2008)
- Union of Myanmar Marine Fisheries law (25 April1990, amended 1993)
- The Law Relating to Aquaculture, 1989
- The Law Relating to the Fishing Rights of Foreign Fishing Vessels, 1989
- Territorial Sea and Maritime Zones law (1977)

The project relevant laws are detailed in **Table 3-2**.

Table 3-2: Project Relevant Law

Laws and Regulations	Description
Petroleum and Petroleum Products Law, 2017	
The Petroleum and Petroleum Products Law (the "PPPL") 2017 was enacted by Pyaydaungsu Htuttaw as Pyaydaungsu Htuttaw Law No. 20/2017 on 1st August 2017 to repeal the Petroleum Act 1934. The PPPL contains the provisions on import and export, transportation, storage, refinery, distribution, inspection and testing of petroleum and petroleum products and issuance of relevant licenses. Licenses for exportation, importation, transportation, transit, storage, refinery, distribution, testing of petroleum and any petroleum products must be obtained from the MOEE, other relevant Ministries and any business related with the petroleum products cannot be operated without a relevant license. The Relevant sections are 7 a and c, 8 a, c, e, f, j, m, 19a and d, 10 a, b and d, 11 b, 13, 32, 33.	
Public Health Law, 1972	
Section 3	The Public Health Law empowers the Government of the Union of Myanmar to carry out measures relating to environmental health, such as garbage disposal, use of water for drinking and other purposes, radioactivity, protection of air from pollution, sanitation works and food and drug safety. Provisions to promote and safeguard public health including measures and prohibitions regarding environmental health.
Section 5	The project owner will accept any inspection, anytime, anywhere if it is needed.
Section 9	This law empowers the Government to carry out measures relating to environmental health, such as garbage disposal, use of water for drinking and other purposes, radioactivity, protection of air from pollution, sanitation works and food and drug safety. However, detailed provisions do not exist to ensure more effective and comprehensive regulation of these areas.
The Prevention and Control of Communicable Disease Law, 1995 and Amendment of Prevention and Control of Communicable Diseases Law (2011)	
Section 8	Under the supervision and guidance of the Health Officer of the relevant area, undertake the responsibility of carrying out the following environmental sanitation measures:- (a) in-door, out-door sanitation or inside the fence outside the fence sanitation; (b) well, ponds and drainage sanitation; (c) proper disposal of refuse and destruction thereof by fire; (d) construction and use of sanitary latrines; and (e) other necessary environmental sanitation measures.
The Control of Smoking and Consumption of Tobacco Product Law, 2006 (Section 9)	
The Control of Smoking and Consumption of Tobacco Product Law (No. 05/2006)	
Chapter IV - Non-Smoking Areas	
Section 6	The following compounds, buildings, rooms and places are non-smoking areas: (a) hospital buildings, offices, compounds and other buildings in the compound except staff houses and apartments in the hospital compound; (b) medical treatment centres and clinics; (c) stadium and indoor playing fields; (d) children drill sheds and playgrounds; (e) teaching buildings, classrooms, offices, compounds and other buildings in the compound except staff houses and apartments in the school compound; (f) teaching buildings of universities, degree colleges, colleges and institutes, classrooms and offices; (g) opera houses, cinema halls, video halls and other buildings of entertainment; (h) marts, department stores, stores and market sheds; (i) museums, archives, public libraries and reading rooms; (j) elevators and escalators;

	(k) motor vehicles and aircrafts for passenger transport; (l) air-conditioned public rooms; (m) public auditoriums; (n) teaching buildings and classrooms of private tuition classes and training schools; (o) other public compounds, buildings and places prescribed through notification by the Ministry of Health.
Section 7	Places to which the public have access in the following buildings, vehicles and crafts are non-smoking areas except the private offices and rooms. However, specific places where smoking is allowed, shall be arranged in such areas: (a) buildings of offices and departments; (b) buildings of factories and workshops; (c) buildings of hotels, motels, guest houses and lodging houses; (d) buildings of railway stations, airports, ports and highway bus terminals; (e) restaurants; (f) trains and vessels for passenger transport: (g) other public buildings, rooms and places prescribed through notification by the Ministry of Health.
Section	The person-in-charge shall: (a) keep the caption and mark referring that it is a non-smoking area at the place mentioned in section 6 in accordance with the stipulations. (b) arrange the specific place where smoking is allowed as mentioned in section 7, and keep the caption and mark also referring that it is a specific place where smoking is allowed, in accordance with the stipulations. (c) supervise and carry out measures so that no one shall smoke at the non-smoking area. (d) accept the inspection when the supervisory body comes to the place for which he is responsible.
The Myanmar Fire Force Law, 2015 (Section 25)	
The Myanmar fire force law, 2015 covers requirements for fire fighting and fire protection. The objectives of Myanmar Fire Force Law are: a) To take precautionary and preventive measure and loss of state own property, private property, cultural heritage and the lives and property of public due to fire and other natural disasters b) To organize fire brigade systemically and to train the fire brigade c) To prevent from fire and to conduct release work when fire disaster, natural disaster, epidemic disease or any kind of certain danger occurs d) To educate, organize an inside extensively so as to achieve public corporation e) To participate if in need for national security, peace for the citizens and law and order	
Chapter 2	
Section 3-a,b,c,d	It covers all the issue of man-made disaster to the nations.
Chapter 8	
Section 15-a,b,c,d Section 17-a,b,c,d,e,f	It covers all the steps how to protect the fire issues
Chapter 11	
Section 24 Section 25-a,b Section 26, 27, 28, 29, 30, 31, 32, 33	Issue of Prohibitions and plan how to manage firefighting
Chapter 12	
Section 34, 35, 36, 37, 38, 39	Penalties

Chapter 13	
Section 40, 41, 42, 43, 44, 45, 46, 47	General Information to protect laws regulations and penalties
The Protection and Prevention of Antique Objective Law, 2015 (Section 12)	
The Protection and Preservation of Antique Objects Law (No. 43/2015) covers requirements for the finding of antique objects.	
Section 12	The person who finds any object which has no owner or custodian, shall promptly inform the relevant Ward or Village-Tract Administrator if he knows or if it seems reasonable to assume that the said object is an antique object.
Section 13.	(a) If the information is received under section 12, the Ward or Village-Tract Administrator shall keep the said object as may be necessary and shall forward the information to the relevant Township Administrative Office within 14 days. The Township Administrator shall promptly carry out the necessities and inform the Department within 7 days from the date on which the information is received; (b) The Department shall inspect whether it is a real antique object or not and keep or cause to keep as may be necessary in accord with the stipulations when the information is received under sub-section (a).
The Protection and Prevention of Ancient Monument Law, 2015 (Section 12, 20(f) (c), 15(c))	
The Protection and Preservation of Ancient Monuments Law (No. 51/2015)	
Section 12	If a person who finds an ancient monument of over one hundred years old and above or under the ground or above or under the water which has no owner or custodian knows or it seems reasonable to assume that the said monument is an ancient monument, he shall promptly inform the relevant Ward or Village-Tract Administrative Office.
Section 13	(a) If the information is received under Section 12, the Ward or Village- Tract Administrator shall keep the said monument as may be necessary and shall forward the information to the relevant Township Administrative Office within 14 days. The Township Administrator shall promptly carry out the necessities and inform the Department within 7 days from the date on which the information is received. (b) The Department shall inspect whether it is a real ancient monument or not and keep or cause to protect as may be necessary in accord with the stipulations when the information is received under sub-section (a).
Chapter VII. Applying for prior Permission, Scrutiny and Issue	
Section 14	Any Department, any organization or any person desirous of any of the followings shall abide by the provisions of other existing laws and apply for the prior permission under this Law to the Department in accord with the stipulations: (a) repairing and maintaining the whole or a part of an ancient monument without altering its original form or its original workmanship or altering the boundary of its enclosure; (e) surveying, digging and researching places where an ancient monument is situated;
Section 15	A person aiming at realizing any of the following within the specified area of an ancient monument shall apply to get prior permission to the Department: (b) constructing or extending or repairing new buildings including hotels, factories and residential buildings or fencing or extending a fence; (c) digging to search petroleum, natural gas, gem or mineral, piping petroleum and natural gas, constructing factories, connecting national grid, constructing communication tower, constructing or extending infrastructures such as road, bridge, airfield, irrigation and embankment; (d) connecting underground electric cable, communication cable and other underground works; (f) gold sieving, digging, burning bricks, digging well, lake, creek, ditch, gully, pit digging, refilling, levelling, mining, quarry, gravel digging and unearth sand, removing the mounds and hills which can damage the physical feature of the land;
Chapter VIII Prohibitions	
Section 19	No one shall carry out any of the following acts within the specified campus of an ancient monument without the written permission of the Department: (a) destroying or damaging an ancient monument; (b) carrying out to alter the original form or the original workmanship of an ancient monument; (c) digging to search for remains; (d) looting and removing original elements and artefacts from an ancient monument.
Section 20	No one shall carry out any of the following acts which are assumed to cause damage to an ancient monument within the specified area of an ancient monument or of a listed ancient monument without a written prior permission:

	(b) using machines which causes vibration within the specified place of an ancient monument and running various types of vehicles; (c) cultivating, gardening, breeding, fencing by blocking nearby an ancient monument or doing any other act which can affect an ancient monument; (d) emission of gas such as hot-air balloon which can affect an ancient monument; (e) landing and taking off and, flying aeroplane and helicopter which can directly or indirectly affect an ancient monument; (f) discarding chemical substance and rubbish which can affect an ancient monument and the environment.
The Private Industrial Enterprise Law, 1990	
The State Law and Order Restoration Council enacted this law by Law No.22/90 on 26th November, 1990.According to this law; all private industrial enterprises shall avoid or reduce the use of polluting technology. Section 3. Private Industrial Enterprises shall be conducted in accordance with the following basic principles: - (a) to enhance the higher proportion of the manufacturing value added in the gross national product and value of services, and to increase the production of the respective economic enterprises which are related to the industrial enterprise; (b) to acquire modem technical know-how for raising the efficiency of industrial enterprises and to establish the sale of finished goods produced by the industrial enterprise not only in the local market, but also in the foreign market; (c) to cause utilization by relying mainly as local natural resources; (d) to cause narrowing down of the gap between rural development and urban development by causing the development and improvement of industrial enterprises; (e) to cause opening up of more employment opportunities; (f) to cause avoidance of or reduction of the use of technical know-how which cause environmental pollution;	
State-Owned Economic Enterprises Law, 1989 (amended 97)	
This law sets out economic enterprises to be carried out soley by the government, as well as the rights of carrying out other economic enterprises, and the right to form organizations. Section 4. The Government may, by notification, permit in the interest of the Union of Myanmar any economic enterprise which is prescribed under Section 3 to be operated solely by the Government to be carried out by joint-venture between the Government and any other person or any other economic organization or under conditions by any person or any economic organization subject to conditions.	
The Development of Employees and Expertise (Skill), 2013 (Section 5, 14, 30)	
Employment and Skill Development Law (No 29/2013). The key sections are 5, 14, and 30 (a and b).	
Section 5	(a) (1) If the employer has appointed the employee to work for an employment, the employment agreement shall be made within 30 days. But it shall not be related with government department and organization for a permanent employment. (2) If pre training period and probation period are stipulated before the appointment the said trainee shall not be related with the stipulation of sub-section (1). (b) The following particulars shall be included in the employment agreement: (1) the type of employment; (2) the probation period; (3) wage, salary; (4) location of the employment; (5) the term of the agreement; (6) working hour; (5) day off, holiday and leave; (8) overtime; (6) meal arrangement during the work hour; (7) accommodation; (8) medical treatment; (9) ferry arrangement to worksite and travelling; (10) regulations to be followed by the employees; (11) if the employee is sent to attend the training, the limited time agreed by the employee to continue to work after attending the training; (12) resigning and termination of service; (13) termination of agreement; (14) the obligations in accord with the stipulation of the agreement;

	(15) the cancellation of employment agreement mutually made between employer and employee; (16) other matters; (17) specifying the regulation of the agreement, amending and supplementing; (18) miscellaneous (19) The worksite regulations contained in the employment agreement shall be in compliance with any existing law and the benefits of the employee shall not be less than those of the any existing law. (20) According to the employment agreement, the Ministry shall issue the notification for paying the stipulated compensation to the employee by the employer, if the work is completed earlier than the stipulated period or the whole work or any part of it have to be terminated due to unexpected condition or the work has to be terminated due to various conditions. (21) The employment agreement made under subsection (a) shall be related with daily wage workers, piece rate workers who are appointed temporarily in the government department and organization. (22) The worksite regulations and benefits contained in the employment agreement mutually made between the employer and employee or among the employees shall be amended as necessary, in accord with the existing law. (23) The employer shall send a copy of the employment agreement made between the employer and employee, to the relevant employment and labour exchange office within the stipulated period and shall get the approval of it. (24) The employment agreement made before the enforcement of this law shall be confirmed up to the end of the term of the original agreement.
Section 14	The employer shall carry out the training program in accord with the work requirement in line with the policy of the skill development team to develop the skill relating to the employment for the workers who are proposed to appoint and working at present.
Section 30	(a) The employer of the industry and service business shall put in to the fund monthly as put in fees without fail for the total wages of the subordinates and the supervisors' salary for not less than 0.5%; (b) Put in money paid under subsection (a) shall not be deducted from the wage and salary of the employees.
The Factories Act, 1951 (Before notification that this project is oilfield issued by MOEE)	
The Factories Act, 1951 and Law Amending the 1951 Factories Act -Pyidaungsu Hluttaw Law No. 12/2016 contains provisions for the proper disposal of waste and effluents in factories; treatment of waste water; regulations for health and cleanliness in factories, and the prevention of hazards	
Section 23	Fencing of Machinery (1) In every factory the following shall be securely fenced by safe-guards of substantial construction which shall be constantly maintained and kept in position while the machinery is in operation:-
Section 30	Hoists and Lifts (1) Every hoist or lift shall be of good mechanical construction, sound material and strength and shall be properly maintained. (2) Every hoist or lift shall be thoroughly examined by an authorised examiner at least once in every period of six months and a register shall be kept containing the prescribed particulars for every such examination. (3) Every hoistway or liftway shall be sufficiently protected by an enclosure fitted with gates. The hoist or lift and every such enclosure shall be so constructed as to prevent any person or thing from being trapped between any part of the hoist or lift and any fixed structure or moving part. (4) The maximum safe working load shall be clearly marked on every hoist or lift and no load greater than that shall be carried thereon. (5) The cage of every hoist and lift used for carrying persons shall be fitted with a gate on each side which provides access to a landing.
Section 32	Revolving Machinery (1) In every factory in which the process of grinding and abrading is carried on there shall be permanently affixed to or placed near each machine in use a notice indicating the maximum safe working peripheral speed of every grinding of abrading wheel. The speed of the shaft or spindle upon which the wheel is mounted, and the diameter of the pulley necessary to secure such safe working peripheral speed. (2) The speeds indicated in notice under sub section (1) shall not be exceeded. (3) Effective measures shall be taken in the factory to ensure that the safe working peripheral speed of every revolving vessel, cage, basket fly wheel, pulley, discs or similar appliance driven by power is not exceeded.
Section 33 (1)	Pressure Plant (1) If in any factory, any part of the machinery or plant used in a manufacturing process is operated at a pressure above atmospheric pressure, effective

	measures shall be taken to ensure that safe working pressure of such parts is not exceeded. (2) The President may make rules providing for the examination and testing of any plant or machinery refer to in sub section (1) and prescribing such other safety measures in relation thereto as may in his opinion be necessary in any factory or class of factories.
Section 35	Heavy Lifting (1) No woman adolescent or child shall be employed in any factory to lift or carry or move any load so heavy as to be likely to cause injury. (2) The President may make rules prescribing the maximum weights that may be lifted, carried or moved ordinarily by persons employed in factories or in any class or description of factories or in carrying on specified process.
Section 37	Protection of Eyes In respect of any such manufacturing process carried on in any factory as may be prescribed, being a process which involves- (a) risks of injury to the eyes from particles or fragments thrown off in the course (b) of the process; or (c) risk to the eyes of exposure to excessive light, the President may make rules that require that effective screens or suitable goggles shall provide for the protection of persons employed on, or in the immediate vicinity of the process.
Section 37	Protection from Fumes (1) In any factory no person shall enter or be permitted to enter any chamber, tank, vat, pit, pipe, flue or other confined space in which dangerous fumes are liable to be present to such an extent as to asphyxiate persons, unless it is provided with a man-hole of adequate size, or other effective means of egress. (2) No portable electric light of voltage exceeding 24 volts shall be permitted in any factory for use inside any confined space referred to in sub-section (1), and where the dangerous fumes present are likely to be inflammable, no lamp or light other than that of flame-proof construction shall be permitted to be used in such confined space. (3) No person in any factory shall enter or be permitted to enter any such confined space referred to in sub-section (1) unless all possible measures have been taken to remove any fumes which may be present and to prevent any ingress of fumes and unless either, (a) a certificate in writing has been given by an authorised examiner, based on a test carried out by himself, that the space is free from dangerous fumes and fit for persons to enter; or (b) the person entering is wearing a suitable breathing apparatus and a belt securely attached to a rope the free end of which is held by a person standing outside the confined space. (4) In every factory suitable breathing apparatus, reviving apparatus and belts and ropes shall be kept ready for immediate use in the vicinity of any such confined space which any person has entered. All such apparatus shall be examined at regular intervals and certified by an authorised examiner to be fit for use; and a sufficient number of the persons from amongst the employed in every factory shall be trained in the use of all such apparatus and in artificial respiration. (5) In any factory no person shall be permitted to enter any boiler, boiler furnace, boiler flue, chamber, tank, vat, pipe, or other confined space for the purpose of working or making any of examination therein until it has been sufficiently cooled by ventilation or otherwise so as to be safe for persons to enter. (6) The President may make rules prescribing the minimum dimensions of the manholes referred to in sub-section (1), and may by order in writing exempt or subject to such conditions as he may think fit, any factory or class or description of factories from compliance with any of the provisions of this section.
Section 39	Explosive or Inflammable Dust, Fume, Etc. (1) Where in any factory any manufacturing process produces dust, fume or vapour of such nature and to such an extent as to be liable to explode on ignition. All possible measures shall be taken to prevent any such explosion by – (a) effective enclosure of the plant or machinery used in the manufacturing process; (b) removal or prevention of accumulation of dust, fume or vapour; (c) isolation or effective enclosure of all possible sources of ignition (2) Where in any factory the plant or machinery used in a process referred to in sub-section (1) is not so constructed as to withstand the force of such an explosion, all possible measures shall be taken to prevent the spread of the explosion and to minimize the damage caused thereby, by providing chokes, baffles, vents or other effective appliances in the plant or machine. (3) Where in any factory any part of a plant or machinery that contains any explosive or inflammable fumes and vapour under pressure greater than atmospheric pressure, such part shall not be opened except in accordance with the following provisions, namely:- (a) before the fastening of any joint of any pipe connected with such part is loosened, any flow of gas or vapour into the part or into any such pipe shall be

	effectively stopped by a stop-valve or other means; (b) before any such fastening of any joint or any pipe or the firmly fastened cover is removed, all measures shall be taken to reduce the pressure of the fume or vapour in the part or pipe to atmospheric pressure; (c) where any such fastening has been loosened or removed effective measures shall be taken to prevent any explosive or inflammable fume or vapour from escaping from the pipe plant or parts of machinery until such cover or joint has been firmly re-fastened or firmly refixed. (4) No plant, tank or vessel which contains, or has contained any explosive or inflammable substance, shall be subjected in any factory to any welding, brazing, soldering or cutting operation involving the application of heat, unless adequate measures have been taken to remove such substance and fumes arising therefrom, or to render such substance and fumes non- explosive or non-flammable, and unless a certificate in writing has been given by a competent examiner after a test carried out by himself that the plant, tank, or vessel is free from explosive or flammable vapour. No such substance shall be allowed to enter such plant, tank or vessel after any such operation, until the metal has cooled sufficiently to prevent any risk of igniting the substance.
Section 40	Arrangements to be Made in Case of Fire (1) Every factory shall be provided with such means of escape in case of fire as may be prescribed, and if it appears to the Inspector that any factory is not so provided, he may serve on the manager of the factory an order in writing specifying the arrangements which, in his opinion, should be carried out to bring the factory into conformity with the provisions of this section and any rules made thereunder, and requiring them to be carried out before a date specified in the order. (2) In every factory the doors affording egress from any room shall not be locked or fastened so that they cannot be easily and immediately opened from the inside while any person is within the room, and all such doors, unless they are of the sliding type, shall be constructed to open outwards. (3) In every factory, every window, door or other exit affording a means of escape in case of fire, other than the means of exit in ordinary use, shall be distinctively marked in a language understood by the majority of workers and in red letters or by some other effective and clearly understood sign. (4) In every factory there shall be installed apparatus to give warning in case of fire clearly audible to every person employed in the factory. (5) A passage - way giving access to such means of escape in case of fire shall be kept clear for the use of all workers in every room of the factory. (6) Effective measures shall be taken to ensure that in every factory- (a) where more than twenty workers are ordinarily employed in any place on the lowest floor, or (b) where explosive or highly flammable materials are stored or used, all the workers are familiar with the means of escape in case of fire and have been adequately trained in the procedure to be followed in such case
The Oilfields Act, 1918	
The Oilfields Act, 1918 and The Law Amending Oilfields Act (34/2010), provides clarification on activities within the oil and gas industry, and provides the Government with the power to define and alter limits of any notified oilfield. In addition, the Government may make rules for regulating all matters connected with many operations related to the extraction of oil and/or gas. The Act also provides guidance on issues such as preventing oil and gas wastes, reporting of fires, accidents and other occurrences and regulating the collection and disposal of both oil and gas.	
Section 4	(1) The Minister for the Ministry of Electric and Energy may, by notification, define the jurisdiction of the Managing Director of the Myanmar Oil and Gas Enterprise." (2) It shall be the duty of a Managing Director of the Myanmar Oil and Gas Enterprise to regulate within his jurisdiction all operations for the winning of oil and gas with a view to preventing waste of oil and gas and damage to accumulations of oil and gas by the infiltration of water or other causes. (3) The Minister for the Ministry of Electric and Energy may, by notification, appoint General Manager assigned for the relevant notified oilfield to assist the Managing Director of the Myanmar Oil and Gas Enterprise in performing his duties and exercising his power within his jurisdiction.
Section 13	(1) The President of the Union may make rules for regulating all matters connected with or subsidiary to any operations for the winning of oil or gas or both. (2) In particular, and without prejudice to the generality of the foregoing power, such rules may- (a) define the powers and duties of a Managing Director of the Myanma Oil and Gas Enterprise; (b) direct that any of the powers or duties assigned by this Act or any rule thereunder to the President of the Union shall be exercised or performed, subject to such conditions as may be imposed, by the Minister, the Ministry of Electric and Energy or the Managing Director of the Myanma Oil and Gas Enterprise; (c) provide for the appointment by operators of responsible local representatives and officers and for the duties to be carried out by such representatives and officers ; (d) provide for the maintenance by operators of records of all matters relating to the drilling, re-drilling, deepening, shutting down, plugging or abandoning of all wells and for the inspection of such records, and for the supply of copies or abstracts of such records to the Managing Director of the Myanma Oil and Gas Enterprise; (e) prescribe the maintenance by operators of records relating to the production of oil, gas or water from all wells and for the inspection of such records or the supply

	of copies or abstracts of such records to the Managing Director of the Myanma Oil and Gas Enterprise; (f) prescribe the submission by operators of records, reports and statistics relating to any other technical matter connected with or subsidiary to any operations for the winning of oil or gas or both, or the provision of facilities for the inspection of such records by the Managing Director of the Myanma Oil and Gas Enterprise or his representative at the offices of operators; (g) provide for the prevention of waste of oil or gas and also the prevention of environmental pollution by petroleum operations;" (h) provide for the detection of the presence of water in wells and for the prevention of the influx of water into oil and gas sands; (i) for the purpose of preventing waste of oil or gas or damage to oil or gas sands by water or other causes, provide for the regulation of the drilling, re-drilling, deepening, shutting down, plugging and abandoning of wells and for the limitation or prohibition of such operations and for the taking of remedial measures; (j) for the purposes of preventing waste of oil or gas or damage to oil and gas sands by water or other causes, provide for the regulation of the methods of producing oil or gas and for the limitation or prohibition of such methods and for the taking of remedial measures; (k) provide for measurement of oil and gas for the assessment of royalty or of any tax: (l) provide for the conveyance of oil and gas to the place of measurement: (m) provide for the prevention of the removal of oil or gas without measurement; (n) provide for the recovery of any royalty or tax ; (o) regulate the rights of ingress or egress to and from any well- sites, and the right to transport materials, tools or machinery or to lay pipes or wires above or below ground across any well-sites ; (p) regulate or prohibit all access to any area in which operations for the winning or subsidiary to the winning of oil or gas or both , are carried on ; (q) provide that no article or no specified class of article shall be removed from any area in which operations for the winning of oil or gas or both or subsidiary thereto are carried on without a pass in the prescribed form; (r) provide for the issue, production and surrender of such passes ; (s) prescribe the manner in which the operator operating the contract area shall demarcate such area and provide for the preservation of the demarcation marks prescribed;" (t) prescribe the manner in which hand-dug wells shall be protected; (u) provide for the reporting of fires, accidents and other occurrences ; (v) prescribe the precautions which operators and their employees shall take so as not to interfere with neighboring operators or their employees or with lines of communication ; (w) regulate or prohibit the use of naked lights and of lamps other than those of a prescribed description or pattern; (x) regulate or prohibit smoking and the use or possession of matches; (y) regulate or prohibit the use of forges and open fires; (z) regulate or prohibit all or any kind of work by night; (aa) regulate or prohibit the use of steam-boilers; (bb) provide for the institution and regulation of fire-brigades, voluntary or otherwise; (cc) prescribe and regulate the use of lightning conductors; (dd) prescribe the use of fire-extinguishing apparatus (ee) prescribe the procedure to be adopted when a fire breaks out; (ff) provide for the compulsory cessation or limitation of operations of any kind in order to prevent or limit the spread of fires; (gg) provide for the construction of gate-valves or stop-cocks on flowing wells and their closure on an alarm of fire being given; (hh) provide for the maintenance of fire-lines ; (ii) regulate the collection and disposal of oil and gas ; (jj) regulate or prohibit the use of oil-tanks; (kk) regulate the position of pipes for the conveyance of oil and provide for the laying of such pipes underground where necessary; (ll) prescribe the method of dealing with flowing wells; (mm) provide for the prohibition within or removal from any area of any construction which might in the opinion of the Managing Director of the Myanma Oil and Gas Enterprise cause danger or inconvenience; (nn) regulate the construction of any rig, derrick, engine- house or similar construction;

	(oo) regulate the use of engines and machinery; (pp) prescribe the use of guards on machinery; (qq) prescribe the provision and use of safety belts or appliances; (rr) prescribe the provision and use of safety appliances in connection with the descent of persons in hand-dug wells; (ss) prescribe the cases in which, the authorities to whom, and the limitations as to time and other conditions subject to which, an appeal shall lie from an order passed by the Managing Director of the Myanma Oil and Gas Enterprise or by an General Manager assigned for the relevant notified oilfield under this Act
The Welfare of Labors of Oilfield Act, 1951 (After notification)	
The 1951 Oilfields (Labour & Welfare) Act prescribes a wide range of protection measures for O&G workers, covering health, safety and worker welfare issues. It also covers working hours, holidays and extensive prescriptions on employing children as well as setting up an inspection service, complemented by a range of penalties but it is unclear whether there has been inspection and enforcement of these basic provisions.	
The Workmen Compensation Act, 1923 (amended 2005)	
Workman's Compensation Act (1923) Amended by Law No 4/2005	
Section 10 (A)	Power to Require From Employers, Statements Regarding Fatal Accidents (1) Where a commissioner receives information from any source that a workman has died as a result of an accident arising out of, and in the course of, his employment, he may send by registered post a notice to the workman's employer requiring him to submit, within thirty days of the service of the notice, a statement, in the prescribed form, giving the circumstances of the death. (2) If the employer is of opinion that he is liable to deposit compensation, he shall make the deposit within thirty days of the service of the notice. (3) If the employer is of the opinion that he is not liable to deposit compensation, he shall in his statement indicate the grounds on which he disclaims liability. (4) Where the employer has so disclaimed liability, the Commissioner after such inquiry as he may think fit, may inform any of the dependents of the deceased workman that it is open to the dependents to prefer a claim for compensation, and may give them such other further information as he may think fit.
Section 10 (B)	Reports of Fatal Accidents (1) Where, by any law for the time being in force, notice is required to be given to any authority, by or on behalf of an employer of any accident occurring on his premises which results in death, the person required to give the notice shall, within seven days of the death, send a report to the Commissioner, giving the circumstances attending the death; (2) Provided that, where the President of the Union has so prescribed, the person required to give the notice may, instead of sending such report to the Commissioner. Send it to the authority to whom he is required to give the notice. (3) The President of the Union, may by notification in the Gazette, extend the provisions of sub-section (1) to any class of premises other than those coming within the scope of that sub-section, and may by such notification, specify the persons who shall send the report to the Commissioner.
Section 11	Medical Examination (a) Where a workman has given notice of an accident, he shall, if the employer, before the expiry of three days from the time at which service of the notice has been effected, offers to have him examined free of charge by a qualified medical practitioner, submit himself for such examination; and any workman who is in receipt of a half-monthly payment under this Act shall, if so required, submit himself for such examination from time to time: (b) If the commissioner considers it necessary for the settlement of any question arising in any proceedings under this Act, he may require a workman who has given notice of an accident to submit himself for examination by a medical practitioner, and the cost of such medical examination, if any, shall be payable by the employer; Provided that a workman shall not be required to submit himself for examination by a medical practitioner otherwise than in accordance with rules made under this Act or at more frequent intervals than may be prescribed. (1) If a workman, on being required to do so by the employer under sub-section (I) or by the Commissioner at any time refuses to submit himself for examination by a qualified medical practitioner or in any way obstructs the same, his right to compensation shall be suspended during the continuance of such refusal or obstruction unless, in the case of refusal he was prevented by sufficient cause from so submitting himself. (2) If a workman, before the expiry of the period within which he is liable under subsection (3) to be required to submit himself for medical examination voluntarily leaves without having been so examined, his right to compensation shall be suspended until he

	returns and offers himself for such examination. (4) Where a workman, whose right to compensation has been suspended under sub-section (2) or sub-section (3), dies without having submitted himself for medical examination as required by either of those sub-sections, the Commissioner may, if he thinks fit direct the payment of compensation to the dependants of the deceased workman. (5) Where under sub-section (2) or sub-section (3) a right to compensation is suspended, no compensation shall be payable in respect of the period of suspension. (6) Where an injured workman has refused to be attended by a qualified medical practitioner whose services have been offered to him by the employer free of charge, or having accepted such offer has deliberately disregarded the instructions of such medical practitioner then if it is thereafter proved that the workman has not been regularly attended by a qualified medical practitioner and that such refusal, failure or disregard was unreasonable in the circumstances of the case, and that the injury has been aggravated thereby, the injury and resulting disablement shall be deemed to be of the same nature and duration as they might reasonably have been expected to be if the workman had been regularly attended by a qualified medical practitioner, and compensation, if any, shall be payable accordingly.
Labor Organization Law, 2012	
The Labour Organization Law, (No. 07/2011) and The Labour Organization Rules, 2012 were enacted to protect the rights of the workers, to have good relations among the workers or between the employer and the worker, and to enable to form and carry out the labour organizations systematically and independently.	
Section 3	Every worker, who has attained the age prescribed in respective existing law to work in any trade or activity shall have the right to: (a) join as a member in a labour organization and to resign from a labour organization according to their own desire; (b) join as a member only in a labour organization formed according to the category of trade or activity relating to them.
Section 29	The employer shall recognize the labour organizations of his trade as the organizations representing the workers.
Section 30	The employer shall allow the worker who is assigned any duty on the recommendation of the relevant executive committee to perform such duty not exceeding two days per month unless they have agreed otherwise. Such period shall be deemed as if he is performing the original duty of his work.
Section 31	The employer shall assist as much as possible if the labour organizations request for help for the interest of his workers. However, the employer shall not exercise any acts designed to promote the establishment or functioning of labour organizations under his domination or control by financial or other means.
Section 49	No person shall coerce, threaten, use undue influence or seduce by illegal means any worker to participate or not to participate in a labour organization.
Section 50	No person shall: (a) interfere or obstruct the executive committees in performing duties and powers contained in this Law; (b) in respect of labour affairs, carry out demonstrations within 500 yards from hospitals, schools, religious buildings, airports, railways, bus terminals, ports or diplomatic missions and military or police installations.
Settlement of Labor Dispute Law, 2012	
Settlement of Labour Dispute Law (No. 05/2012) Amended by Law No. 40/2014 was enacted for the settlement of labour disputes:	
Section 23	A party, employer or worker, may complain individual dispute relating to his grievance to the Conciliation Body and if he is not satisfied with the conciliation of such body in accord with stipulated manners, may apply to the competent court in person or by the legal representative.
Section 38	No employer shall fail to negotiate and coordinate in respect of the complaint within the prescribed period without sufficient cause.
Section 39	No employer shall alter the conditions of service relating to workers concerned in such dispute at the consecutive period before commencing the dispute within the period under investigation of the dispute before the Arbitration Body or Tribunal, to affect the interest of such workers immediately.
Section 40	No party shall proceed to lock-out or strike without accepting negotiation, conciliation and arbitration by Arbitration Body in accord with this law in respect of a dispute.
Section 41	No person shall carry out lock-out or strike to amend such decision or agreement within the effective period of the decision of the Arbitration Body or the Arbitration Council or any collective agreement.
Section 42	No person shall prohibit the right to work independently of the workers who are not desirous to participate in the strike nor impede the right of a worker to strike.
Section 43	No person shall fail to abide by or carry out any condition contained in agreement concluded before the Conciliation Body in respect of individual dispute or collective dispute.
Section 44	No person, after having informed in advance by the Arbitration Body or Tribunal for settling the dispute, shall fail to arrange to enable to examine the trade under dispute or to produce the documents which is considered by the Arbitration Body or Tribunal that it concerns with the dispute or to appear as a witness when he is so summoned.

Section 45	No person, if he is sent notice for examination before the Arbitration Body or Tribunal, shall fail without sufficient cause to appear in person or to send legal representative within the stipulated period.
Section 51	If any employer, in the course of settlement of dispute, commits any act or omission, without sufficient cause, which by causing a reduction in production resulting so as to reduce the workers' benefits shall be liable to pay full compensation in the amount determined by the Arbitration Body or Tribunal. Such money shall be recovered as the arrear of land revenue.
Minimums Wages Law, 2013	
The Minimum Wages Law, No. 07/2013 was enacted on 22nd March 2013 (The Minimum Wages Rules, 2013). Section 12 (d) of the law provides that the employer shall pay the minimum wage to the workers working in the commercial, production business and service in cash.	
Section 12	The employer: (a) shall not pay wage to the worker less than the minimum wage stipulated under this Law; (b) may pay more than the minimum wage stipulated under this Law; (c) shall not have the right to deduct any other wage except the wage for which it has the right to deduct as stipulated in the notification issued under this Law; (d) shall pay the minimum wage to the workers working in the commercial, production and service business in cash. Moreover, if the specific benefits, interests or opportunities are to be paid, it may be paid in cash or partly in cash and partly in property, with prevailing regional price, jointly according to the desire of the worker; (e) in paying minimum wage to the workers working in the agricultural and livestock business, some cash and some property at prevailing regional price may be paid jointly according to local custom or desire of the majority of workers or collective agreement. Such payment shall be for any personal use and benefit of the worker and his family and the value shall also be considerable and fair.
Section 13	The employer: (a) shall inform the workers the rates of minimum wage relating to the business among the rates of minimum wage stipulated under this Law and advertise it at the workplace to enable to be seen by the relevant workers; (b) shall prepare and maintain the lists, schedules, documents and wages of the workers correctly; (c) shall report the lists, schedules and documents prepared and maintained under sub- section(b) to the relevant department in accord with the stipulations; (d) shall accept the inspection when summoned by the inspection officer. Moreover, he shall produce the said lists and documents upon asking to submit; (e) shall allow the entry and inspection of the inspection officer to the commercial, production and service businesses, agricultural and livestock breeding workplaces and give necessary assistances; (f) if the workers cannot work due to sickness, shall give them holiday for medical treatment in accord with the stipulations; (g) if the funeral matter of the member of the family of worker or his parent occurs, shall give holiday without deducting from the minimum wage, in accord with the stipulations.
Section 22	Any employer: (a) shall not fail to pay the workers the minimum wage stipulated under this Law; (b) shall not pay to the workers less than the minimum wages and other benefits which is entitled by the worker under section 14; (c) relating to the accounts, schedules, documents and lists of wage of the workers: i. shall not make false entry, deceitful recording or false and deceitful reporting; ii. shall not fail to report to the relevant department in accord with the stipulations; iii. shall not fail to produce when required by the inspection officer; (d) shall not fail to go and accept inspection when summoned by the inspection officer; (e) shall not obstruct or interfere with the inspection officer who comes and inspects on duty.
Section 24	Any employer: (a) shall not violate any term and condition contained in the minimum wage notification; (b) shall not fail to inform the workers relating to the rates of minimum wage concerning to his workers among the rates of minimum wage stipulated under this Law and announce at the place where the workers are able to see it in the work centre and workplace;

The Minimum Wages Rules, 2013 include: Chapter 9 - The power and obligations of the employers	
Section 43	The employer: (a) shall increase the remuneration depending on the skill, to promote the productivity and the employment skill of the employees; (b) shall perform in accord with the factory act 1951, leave and holiday act 1951 under section 13 (b) at the law for the list, schedule and document, remunerations; (c) when the employees are not able to work due to ill health, injury at work site: i. if they are under premium paid insurance to the health and social care fund, the insurance under health and social security care 2012, or ii. if they are not entitled to enjoy social security law 2012, they must be arranged to enjoy the leave and holiday act 1951. (d) in the event of family or parents funeral affairs, his entitled remuneration should not be deducted and shall be arranged to enjoy according to leave and holiday act 1951; (e) before fixing of the minimum wage by the National Committee under this rule, if his remuneration is less than the prescribed amount, he should be paid up to the full amount; (f) part time, hourly job employees shall be paid the prescribed minimum wage for the working hours; (g) for the salary employees one day day-off shall be allowed in a week. If he has to work on the off day, overtime wage shall be paid in accord with the existing law; (h) if the employee has to work less than the prescribed working hour and if it is not due to his will or he has to stop the work due to the shortage of work from the employer, he shall be entitled to enjoy the remuneration as if he has to work full time; (i) the prescribed minimum wage shall be paid without discrimination of the male or female; (j) although he has the obligation to pay the minimum wage in cash, separate entitlement, benefit in accord with the stipulation shall be given due to the employee's will, majority of the employees' will, collective consent, in cash or partial in cash or prevailing regional rate or regional tradition; (k) overtime work shall be allowed according to the law after negotiation with the employees; (l) the employee who is not capable to fulfill the standard norm or production norm prescribed in accord with the factory, workshop, department, shall be trained to be skillful in the probation period. If necessary, the relevant factory, workshop, departments under this law shall be paid for not less than 50% of the remuneration within three months. In the probation period 75% of the remuneration shall be paid.
Payment of Wages Law, 2016-- (3,4,8,7(ii), 9,10(a) to e	
Payment of Wages Law (No 17/2016) covers the following requirements:	
Chapter 2	
Section 3-a, Section 4-a, b, Cc-i ,c-ii,d, e, f, g Section 5, 6	It covers all the issue of strategies for payment and timeline between. Section 3 The employer (a) will pay for salary either Myanmar Kyats or Foreign Cash permitted by National Bank of Myanmar. When delivery the salary (b) If the employer needs to pay the other opportunities or advantages, he can pay cash together with other materials according employee's attitude. Section 4 When the contract finish, employer need to pay the salary (not more than one month) to employees. For the permanent worker, need to pay per monthly. If more than 100 employees, need to pay within the 5 days from the end of month. If fire the employees, need to pay salary within two days after fire. When employee dies due to the accident, need to pay money as an insurance to employee's family within two days.
Chapter 3	
Section 7-a,b,c,d, Section 8, Section 9, Section 10- a,b,c,d,e,f,g,h,i,j, Section 11-a,b, Section 12-a,b, Section 13	It covers all the issue of deducted salary based on different categories. Section 9 When cut the salary due to the employees' absence, total cut salary not more than 50 % of his salary. Section 10 Employer need to approval form the department as a penalty and cannot more than actual ravage rate when cut salary. No cut salary from the employees under 16 age.
Chapter 4	
Section 14	Wages issue related with Overtime

Chapter 6	
Section 19-a,b,c, Section 20-a,b,c, Section 21-a,b,c	Prosecutions policy issue based on salary and wages
Chapter 7	
Section 22, Section 23	Prohibitions
Chapter 8	
Section 24, 25,26, 27, 28, 29, 30	General Information to protect laws regulations and penalties
Social Security Law, 2012, 48(a), 51(a) (b), 54	
The objectives of the Social Welfare Law (2012) and accompanying Social Welfare Rules (2014) include providing workers with the right to draw back some of the contributions paid by employers and workers as savings in accordance with the stipulations, and to obtain the right to continue medical treatment, family assistance benefit, superannuation benefit, survivors' benefit, unemployment benefit, the right to residency and ownership of housing after retirement in addition to health care and pecuniary benefit for sickness, maternity, death, employment injury of the workers.	
Section 11	The Social Welfare Law (2012) requires the following establishments to comply with the provisions for compulsory registration with the social security system and benefits (indicated in the Social Welfare Law) if they employ a minimum number of workers as determined by the Ministry of Labour in co-ordination with the Social Security Board: Industries which carry out business whether or not they utilize mechanical power or a certain kind of power; businesses of manufacturing, repairing and servicing; or engineering businesses, factories, warehouses and establishments.
Section 16	(a) The following employers shall effect insurance for the workers working at their establishments by compulsorily registering at the relevant township social security office and contribute to the social security fund contained in clauses (1),(3),(4), and (5) of sub-section (a) of section 15 in accord with the stipulations to enable to enjoy social security benefits: (i) employers of establishments; (ii) employers of establishments employing the number of workers, including the relatives of the employers except at least one worker and their wife, husband, children and parents depending upon them, under sub-section(a) of section 11; (iii) employers of unpaid apprentices and trainees.
Section 48	(a) The employer shall effect insurance by registering for employment injury benefit insurance system contained in section 45 at the relevant township social security office and pay contribution to employment injury benefit fund in accord with stipulations in order that workers applied to provisions of compulsory registration may obtain the employment injury benefits
Section 51	The employer: (a) shall pay contribution monthly to Employment Injury Benefit Fund at the rates stipulated under section 50. Moreover, he shall also bear the expenses for paying as such; (b) shall pay defaulting fee stipulated under section 88, in addition to the contribution if fails to contribute after effecting insurance for employment injury benefit.
Section 54	(a) The employer shall report to the relevant township social security office immediately if a serious employment accident occurs to his insured worker. There shall not be any delay without sufficient cause to report as such. (b) A team of officers and other staff who inspect the establishments, if it is found out the employment injury, death, and contracting disease, shall report to the relevant township social security office in accord with the stipulations.
Section 75	The employers of establishments applied by this Law: (a) shall prepare and keep the following records and lists correctly and submit to the relevant township social security office in accord with the stipulations: (i) records and lists of workers' daily attendance; (ii) records on appointment of new workers, employing worker by changing of work, termination, dismissal and resignation; (iii) records on promotion and paying remuneration ; (iv) records and lists of employer, manager, and administrator and records on change of them; (b) shall inform the relevant township social security office if the following matters arise: (i) changes in number of workers and address of establishment;

	(ii) change of employer, change of business, suspension of work, and close-down of work; (iii) employment injury, decease and contracting diseases; (c) shall submit records of work and lists if requested by inspectorate or official assigned by the Social Security Head Office and various levels of Regional Social Security Office under this Law.
Leaves and Holidays Act, 1951	
The Leave and Public Holiday Act, 1951 Amended by Law No. 06/2006 and No. 30/2014 include:	
Section 3	(1) Every employee shall be granted by his employer the following public holidays with full wages or pay (as the case may be); namely: • Independence day – one day • Full Moon of Tabuang – one day • Thingyan – three days • Burmese New Year – one day • May Day – one day • Full Moon of Kason – one day • Resistance Day – one day • Beginning of Buddhist lent – one day • Full Moon of Tansaungnom – one day • National Day – one day
Section 4	(1) Every employee who has completed a period of twelve months continuous service shall be granted earned leave with average wages or average pay for a period of ten consecutive days by his employer during the subsequent period of twelve months.

The Protection of rights of National Race Law, 2015		
Consists of four bills, as submitted to the legislature; Buddhist Women's Special Marriage Bill, Religious Conversion Bill, Monogamy Bill and Population Control Bill.		
Chapter (3)	Section (4-a,c,d, g, h, i, j)	Rights of Ethnic community and to maintain the cultural heritage, literature, language and culture
Chapter (6)	Section (14), (15), (16), (17), (18), (19), (20), (21)	Issue to manage how to protect above the different categories
Chapter (7)	Section (22), (23), (24)	Prohibitions
Chapter (8)	Section (25), (26), (27)	Issue related with Penalties
Chapter (9)	Section (28), (29), (30), (31), (32), (33)	General Information to protect laws regulations and penalties

Ethnic Rights Protection Law (2015)	
This law has provisions for equal treatment and considerations for various ethnicities and races within Myanmar. Particular articles of importance are Article 5.	
The Explosive Act (1887)	
Section 5 (1)	The President of the Union may make rules consistent with this Act to regulate or prohibit, except under and in accordance with the conditions of a licence granted as provided by those rules, the manufacture, possession, use, sale, transport and importation of explosives, or any specified class of explosives.
Section 6	(1) Notwithstanding anything in the rules under the last foregoing section the President of the Union may, from time to time, by notification in the Gazette, prohibit, either absolutely or subject to conditions, the manufacture, possession or importation of any explosive which is of so dangerous a character that, in the opinion of the President of the Union, it is expedient for the public safety to issue the notification. (2) The officers of sea customs at every port shall have the same power in respect of any explosive with regard to the importation of which a notification has been issued

	under this section and the vessel containing the explosive as they have for the time being in respect of any article the importation of which is prohibited or regulated by the law relating to sea customs* and the vessel containing the same; and the enactments for the time being in force relating to sea customs or any such article or vessel shall apply accordingly. (3) Any person manufacturing, possessing or importing an explosive in contravention of a notification issued under this section shall be punished with fine which may extend to three thousand rupees, and, in the case of importation by water, the owner and master of the vessel in which the explosive is imported shall, in the absence of reasonable excuse, each be punished with fine which may extend to three thousand rupees-
Section 8	Whenever there occurs in or about, or in connection with, any place Notice of in which an explosive is manufactured, possessed or used, or any carriage or accidents. vessel either conveying an explosive or on or from which an explosive is being loaded or unloaded, any accident by explosion or by fire attended with loss of human life or serious injury to person or property, or of a description usually attended with such loss or injury, the occupier of the place, or the master of the vessel or the person in charge of the carriage, as the case may be, shall forthwith give notice thereof to the officer in charge of the nearest police-station.
Section 10	When a person is convicted of an offence punishable under this Act or the rules made under this Act, the Court before which he is convicted may direct that the explosive, or ingredient of the explosive, or the substance (if any) in respect of which the offence has been committed, or any part of that explosive, ingredient or substance, shall, with the receptacles containing the same, be forfeited.11
Section 13	Whoever is found committing any act for which he is punishable under this Act or the rules under this Act. and which tends to cause explosion or fire in or about any place where an explosive is manufactured or stored, or any railway or port, or any carriage, ship or boat, may be apprehended without a warrant by a police officer, or by the occupier of. or the agent or offences. servant of. or other person authorized by the occupier of. that place, or by any agent or servant of, or other person authorized by, the railway administration or conservator of the port, and be removed from the place where he is arrested and conveyed a soon s conveniently may be before a Magistrate.
The Explosive Substances Act (1908)	
Section 2	In this Act, the expression "explosive substance" shall be deemed to include any materials for making any explosive substance; also any apparatus, machine, implement or material used, on intended to be used, or adapted for causing, or aiding in causing, any explosion in or with any explosive substance; also any part of any such apparatus, machine or implement.
Section 3	Any person who unlawfully and maliciously causes by any explosive substance an explosion of a nature likely to endanger life or to cause serious injury to property shall, whether any injury to person or property has been actually caused or not, be punished with transportation for life or any shorter term, to which fine may be added, or with imprisonment for a term which may extend to ten years, to which fine may be added
Fresh Water Fisheries Law, 1991 (Section 40)	
Section 3	Freshwater fishery shall be carried out in accordance with the following objectives: a. to further develop the fisheries; b. to prevent the extinction of fish; c. to safeguard and prevent the destruction of freshwater fisheries waters; d. to obtain duties and fees payable to the State; e. to manage the fisheries and to take action in accordance with the Law
Section 40	No one shall cause harassment of fish and other aquatic organisms or pollution of the water in a freshwater fisheries water.
The Motor Vehicles Law, 2015 and Rule, 1987 and Rule 1987	
The Motor Vehicle Law No. 55/15. The Union Parliament has enacted this law.	
Section 49	No one shall do the following in public places: (a) Driving above the speed limit or below the minimum speed. (b) Driving a dangerous motor vehicle. (c) Driving a motor vehicle under the influence of drugs and intoxicants or alcohol.
Section 54	No one shall do the following: (c) Driving a motor vehicle loaded above the loading capacity. (d) Driving a motor vehicle in violation of any provisions of the by-laws related to the pedestrian crossing. (e) Changing, without legal permission or reasons backed up by evidence, a vehicle to lose its original type and physical appearance, altering parts of machinery

	equipment, or changing the conditions stated in the motor vehicle inspection certificate.
Section 65	If anyone is found guilty of breaching any provisions stated in the by-laws issued in accordance with this law, he/she shall bare a punishment of a fine worth not more than thirty thousand kyats.
Section 75	The ministry shall include one or all of the following in releasing the by-laws. (c) Issues relating to the building of a motor vehicle, building of a carriage, installation of parts and equipment, and maintenance. (d) Specifying the type of motor vehicle, the weight and the maximum load. (f) Private industry of motor vehicle inspection (h) Matters to be carried out by the responsible person for the driver and motor vehicle in the event of an accident caused by the motor vehicle. (j) Matters related to the reduction of the environmental impact caused by the motor vehicle.
Myanmar Insurance Law, 1993 (Section 16)	
Requires any business which may pollute the environment to effect compulsory general liability insurance.	
Section 16	An entrepreneur or an organization operating an enterprise which may cause loss to State-owned property or which may cause damage to the life and property of the public or which may cause pollution to the environment shall effect compulsory general liability insurance with Myanmar government.
Forest Law, 1992	
The Burma Forest Act 1902, with amendment made from time to time, had been in use up till the new forest legislation, Forest law 1992, was promulgated by the State Law and Order Restoration Council in November 1992. The new forest law, in line with the Myanmar Forest Policy, focuses on the balanced approach towards conservation and development issues implicit in the concept of sustainable forestry. It decentralizes the management and opens up opportunities for increased private sector involvement in timber trade. Highlighting environmental and biodiversity conservation, the law encourages community forestry and people's participation in forest management to meet the basic needs of the rural people, but prescribes severe punishments for forest offences. In addition, the MOF has promulgated the Forest Rules in 1995. Provisions to conserve water, soil, biological diversity and the environment; sustain forest produce yields; protect forest cover; establish forest and village firewood plantations; sustainably extract and transport forest products	
Section 3	This Law shall be implemented in accordance with the following basic principles: - (a) to implement the forestry policy of the Government; (b) to implement the environmental conservation policy of the Government; (c) to promote the sector of public co-operation in implementing the forestry policy and the environmental conservation policy of the Government; (d) to develop the economy of the State, to contribute towards the food, clothing and shelter needs of the public and for perpetual enjoyment of benefits by conservation and protection of forests; (e) to carry out in accordance with international agreements relating to conservation of forests and conservation of environment; (f) to prevent the dangers of destruction of forest and bio-diversity, outbreak of fires, infestation of insects and occurrence of plant disease; (g) to carry out simultaneously conservation of natural forests and establishment of forest plantations; (h) to contribute towards the fuel requirement of the country.
Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law 1994	
Under the Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law, 1994, hunting without licence, breeding protected animals without permission, causing water and air pollution, poisoning water, possessing, selling, transporting or transferring wildlife or any part thereof without permission are treated as actionable crimes. The punishments are more severe for those offences committed against protected wildlife. The Law exempts the possessing of any part of a normally protected or seasonally protected wildlife as a souvenir or wearing as a traditional custom, the possessing or wearing of any part of a completely protected animal with a certificate or registration, possessing, use, sale, transport or transfer of a drug prepared from a part of a protected wildlife species. A total of 45 protected areas have been established in Myanmar. The natural areas for protection are categorized as follows: • Scientific Nature Reserve; • National Park; • Marine National Park; • Nature Reserve;	

• Wildlife Sanctuary; • Geo-physically Significant Reserve; and • Other Nature Reserve as determined by the Minister. The Protection of Wild Life and Wild Plants and Conservation of Natural Areas Law, No. 6/1994 and Rules on Protection of Wildlife and Protected Area Conservation Law (2002) Provisions on the protection of fauna and flora and their habitat (including living and non-living organisms, migratory and endangered species); the conservation of natural areas; guidelines for scientific research; and the establishment of zoological and botanical gardens	
Section 3	The objectives of this Law are as follows: • To implement the policy of the Government of protecting wild life and wild plants; • To implement the policy of the Government of conserving natural areas; • To carry out, in accordance with International Conventions adopted by the State, in respect of the preservation of wild life and wild plants, living and non-living organisms and migratory birds; • To protect wild life and wild plants in danger of extinction and the habitats thereof; • To contribute towards works of natural scientific research; and • To protect wild life and wild plants by the establishment of Zoological gardens and botanical gardens. The Protection of Wildlife and Protected Areas Rule 2002 provide the sustainability of ecosystems, habitats and biodiversity
Section 31	A Forest Officer may pass an administrative order causing a fine that may extend to Kyat 10,000 to be paid, on a person who kills, hunts, wounds or raises a seasonally protected wild animal without permission during the closed season.
Section 36	Whoever commits any of the following acts shall, on conviction be punished with imprisonment for a term which may extend to 5 years or with fine which may extend to kyats 30,000 or with both:- (a) killing, hunting or wounding a normally protected wild animal or seasonally protected wild animal without permission, possessing, selling, transporting or transferring such wild animal or any part thereof without permission; (b) extracting, collecting or destroying in any manner any kind of protected wild plants within the prescribed area without permission; (c) destroying ecosystem or any natural state in the natural area; (d) altering, removing, destroying or obliterating without permission. any boundary mark of a natural area or any boundary mark of a zoological garden or botanical garden administered by the Government or in which the Government has subscribed share capital.
Section 37	Whoever commits any of the following acts shall, on conviction be punished with imprisonment for a term which may extend to 7 years or with fine which may extend to kyats 50,000 or with both:- (a) killing, hunting or wounding a completely protected wild animal without permission, possessing, selling, transporting or transferring such wild animal or any part thereof without permission;
The Underground Water Act, 1930	
The Underground Water Act, 1930 provides measures for systematic and sustainable use of underground water and prohibitions on accessing and using underground water without a license Whereas it is expedient to conserve and protect underground sources of water supply in the Union of Burma; it is hereby enacted as follows:	
Section 1	This Act extends to such areas as the President of the Union may, by notification,1 direct and shall apply only to tubes exceeding a depth to be prescribed by the President of the Union: Provided that the President of the Union may prescribe different depths for different local areas.
Section 3	No person shall sink a tube for the purpose of obtaining underground water except under and in accordance with the terms of a licence granted by the water officer. Every person owning a tube which was in existence before the extension of this Act to the local area concerned shall apply to the water officer for a licence for the said tube, and such licence shall be granted free of charge.
Section 4	(1) Any Magistrate taking cognizance of an offence under section 3 may at any time order the tube in respect of which the offence has been or is alleged to have been committed to be forthwith closed until such time as a licence for the same has been taken out in accordance with the provisions of the said section. (2) If the order for the closure of a tube under sub-section (1) is not complied with, the Deputy Commissioner, Subdivisional Officer or Township Officer exercising jurisdiction over the local area concerned may cause the said tube to be closed, and the expense of such closure shall be recoverable from the owner of the tube as if it were an arrear of land-revenue.
Section 5	Every person obtaining or attempting to obtain underground water shall supply the water officer with such information as the President of the Union may by rule prescribe.

The Farmland Law, 2012 (Section 30)	
Section 9	The following rights shall be enjoyed in connection with the right for farming: (a) right to have such land in hand, right for farming and gain benefit of such farm; (b) right to sell, pawn, lease, exchange, or donate, in whole or in part of the right for farming in accord with prescribed disciplines; (c) disputes arising out of inheritance of farmland shall be decided upon by the law respective court in accord with existing law; (d) the duration of the right for farming shall continue so long as the stipulated conditions are not breached; (e) land development operation are to be carried out by doing joint-venture with the investment of rural cooperative association or private investors; (f) in accordance with Myanmar Investment Law, foreigner or organization containing foreigner are to be carried out by doing joint-venture;
Section 14	A person who has the permission of right for farming should not be sold, pawned, leased, exchanged or donated to any foreigner or organization containing foreigner without the permission of State Government.
Section 30	In respect of the application to utilize the farmland for other purposes in the interest of the public: (a) The Central Farmland Management Body shall give permission to utilize the paddy land for other purposes, with the recommendation of the Region or State Farmland Management Body; (b) The respective Region or State Government shall give permission to utilize the farmland for other purposes except paddy land, with the recommendation of the Region or State Farmland Management Body
The Protection and Prevention of Cultural Heritage Area, 1998 (Amended 2009) (Section 20, 23, 29(b))	
The Protection and Preservation of Cultural Heritage Region Law, 1998 Amended by Law. No.1/2009 Provisions to protect ancient sites and regions and cultural heritage areas from any adverse impacts due to industrialization, tourism and urbanization.	
Section 20	No person shall carry out any of the following in the cultural heritage region: (a) destroying an ancient monument; (b) willfully altering the original ancient form and structure or original ancient workmanship of an ancient monument; (c) excavating to search for antiquities; (d) exploring for petroleum, natural gas, precious stones or minerals.
Section 23	No person shall plough and cultivate or carry out any activity which may cause damage to the cultural heritage within the boundary notified by the Department in the cultural heritage region.
Section 29	(a) The provision of sub-section (d) of section 20 shall not apply to the drilling of petroleum or natural gas and mining of precious stones or minerals for the benefit of the State in the cultural heritage region. (b) If any circumstance arises for the drilling of petroleum or natural gas and mining of precious stones or minerals in the cultural heritage region for the benefit of the State, it shall be submitted to the Government and permission shall be requested.
The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013 (Section 16,17,23,27)	
The Prevention of Hazard from Chemicals and Related Substances Law was enacted on 26th August 2013. The objectives of this Law include: protecting natural resources from decrease and loss, and safeguarding living things from endangerment caused by chemical and chemical related substances; and systematically controlling safety in carrying out approved chemical and associated materials businesses. The Law requires continuous development of worksite safety, health and environmental conservation. The Prevention of Hazard from Chemicals and Related Substances Law (2013) defines Chemical as: imposing danger to the health or life of man or animal or chemical element, chemical compound and chemical mixture which cause bad consequences to the environment naturally or appearing after created by man. This definition includes the vapour, liquid, waste materials of oily and solid which act chemically and technically.	
Section 16	A person who has obtained a licence:- (a) shall abide the licence regulations; (b) shall perform to abide strictly the instructions for being safety in using the chemical and related substances by himself and also the persons who serve the work; (c) shall keep the required safety equipment enough in the chemical and related substances businesses, furthermore shall grant the personal protection equipment and dresses free of charge to the working persons; (d) shall make the course of training and study and instruction if necessary to the working persons for using the occupational safety equipment, the personal protection

	equipment and the dresses systematically in the chemical and related substances business; (e) shall be inspected by the respective Supervisory Board and Boards of Inspection in respect of whether or not the hazard may impact on the Human Being and Animals' health and the environment; (f) shall make medical check up the working persons who will work in the chemical and related substances business and shall permit to serve in that work after obtaining the recommendation that his health is suitable for that work. This medical check up records shall be kept systematically; (g) shall send the copy of informative letter of the permission to the respective Department of Township Administration, if the hazardous chemical or related substances are permitted to store; (h) shall acquire in advance the guidance and agreement of the respective Department of Fire Brigade, if the business that is worried to fire hazard is operated by using the fire hazard substances or the explosive substances; (i) shall transport only the permitted amount of the chemical and related substances in accordance with the prescriptive stipulations, if they are transported in local; (j) shall take the permission from the Central Supervisory Board if the chemical and related substance is altered and transferred from one place to any other place which contained in the license; (k) shall abide and perform in accordance with the related environmental laws not to impact and damage to the environment in operating the chemical and related substances business.	
Section 17	A person who has obtained a licence, shall put the insurance in accordance with the prescriptive stipulations to be able to pay the compensation, if the impact and damage is occurred on the Human Being and Animals or the environment in respect of the chemical and related substances businesses.	
Section 23	A person who has obtained the registration certificate:- (a) shall apply to register again, to the Central Supervisory Board if the chemical and related substances, which are not contained in the registered list, are used; (b) shall inform and submit the unused chemical and related substances list to the Central Supervisory Board, although which are contained in the registered list.	
Section 27	A person who has obtained the licence to be complied the following matters to control and decrease the hazard of the chemical and related substances:- (a) classifying the hazard level to protect in advance the hazard according to the properties of the chemical and related substances; (b) expressing the Material Safety Data Sheet and Pictogram; (c) providing the safety equipments, the personal protection equipments to protect and decrease the accident and attending to the training to be used systematically; (d) performing in accordance with the stipulations in respect of transporting, possessing, storing, using, discharging the chemical and related substances; (e) not being imported or exported the chemical and related substances banned by the Central Supervisory Board and the machinery and equipments which are used them.	
Import and Export Law, 2012 (Section 7)		
Chapter IV Prohibitions		
Section 5	No person shall export or import restricted, prohibited and banned goods.	
Section 6	Without obtaining license, no person shall export or import the specified goods which is to obtain permission.	
Section 7	A person who obtained any license shall not violate the conditions contained in the license.	
The Law On Standardization (2014)		
Chapter (2)	Section (3-d,e,g)	It is covered in the issue of Environmental Conservations, natural resources and law to protect not standardized products and technology improvement issue in Country
Chapter (5)	Section (9), (10), (11), (12), (14a, 14b), (16a, 16b)	It is step of how to apply to get the standardized certificate to authorized from the Government Department
Chapter (6)	Section (17) (18),	Applying the issue of Quality/Standardized assurance
Chapter (7)	Section (19- a, b, c), Section (20-a,b,c)	Authorized issue by the committee
Chapter (8)	Section (21), (22), (23)	How to do the Appeal issue
Chapter (9)	Section (24), (25), (26)	Crime, Penalties and Punishment
Chapter (11)	Section (29), (30-a,b), (31), (32-a,b,c)	General Information to protect laws regulations and penalties
The Science and Technology Development Law (1994)		
Section 3. The objectives of this Law are as follows:		

a) to carry out development of Science and Technology for promotion of industrial production contributory towards the National Economic Development Plans;
b) to carry out Research and Development for the increased extraction and utilization of domestic raw materials and the promotion of industrial production enterprises based on modern Science and Technology;
c) to effect Technology Transfer for the promotion of production processes and the improvement of the quality of goods;
d) to nurture luminaries required for the development of Science and Technology and for Research and Development and to improve their qualifications;
e) to communicate and co-operate with domestic and foreign research institutes and organizations for the development of Science and Technology and Research and Development;
f) to honor and grant appropriate benefits to outstanding luminaries and inventors in the field of Science and Technology.

Myanmar Engineering Council Law (2013)

he objectives of this Law are as follows:

(a) to uphold and upgrade the dignity, ethics and quality of the Myanmar citizen engineers, graduate technicians and technicians who are practising engineering works;
(b) to explore using engineering technology and information technology combined the good methods, research and development activities by which the natural resources and human resources of the State may be beneficially applied with least impact on environment;
(c) to carry out guidance and supervision, and to take necessary actions for fulfillment of the requirements of stipulated technical standard, proper method, free from danger, keeping ethic and being dutiful in the fields of engineering and technology education, researches and services;
(d) to service engineering and technology ielated functions and duties beneficial for the State assigned by the relevant Ministry and relevant organizations

Section 20. If the holder of a technlogical degree or technological diploma, conferred by any engineering university, any technological university, any technological college or any technological institute within the country or abroad, wishes to obtain a registered graduate technologist certificate or a registered technician certificate, he shall apply to the council in accordance with the stipulations.
Section 34. If, whoever has received a registration certificate, is found to have breached any rules contained in the registration certificate or violated any prohibition contained in a rule, order or directive enacted under this law or in any stipulation of this law, the executive committee may take the following administrative actions-
(a) giving a warning;
(b) assessing a suitable fine;
(c) suspending the registration certificate;
(d) cancelling the registration certificate.
Section 37. No one shall perform any engineering work and technological work which are specified as being dangerous to the public by a rule enacted under this law without having received a registration certificate issued by the council, except for engineers appointed in a government department or an organization in the performance of their duties.
Section 38. No engineer, graduate technologist and technician shall use, together with his name, a title which is not compatible with his status.
Section 39. No registered engineer, graduate technologist and technician-
(a) shall transfer his registration certificate to anyone or allow it to be used by anyone;
(b) shall fail to return his registration certificate to the council within 30 days from the day on which a decision is passed, or an administrative action is taken, under this law to cancel the registration certificate.

Conservation of Rivers, Creeks and Water Resources Law, 2006 (Section 24 (b), 21(a)(b), 19, 11(a) (b))

The Conservation of Water Resources and Rivers Law (2006) was promulgated on 2nd October 2006. The aims of this Law are as follows:

- To conserve and protect the water resources and rivers system for beneficial utilisation by the public;
- To ensure smooth and safe waterways navigation along rivers and creeks;
- To contribute to State economic development through improving water resources and river systems; and
- To protect environmental impact.

The key sections are 11 (a, b), 19, 21 and 24.

Section 11	No person shall: (a) dispose of engine oil, chemical, poisonous material and other materials which may cause environmental damage, or dispose of explosives from the bank or from a vessel which is plying, vessel which has berthed, anchored, stranded or sunk. (b) catch aquatic creatures within river-creek boundary, bank boundary or waterfront boundary with poisonous materials or explosives.
Section 19	No one shall dispose of any substance into the river-creek that may cause damage to waterway or change of watercourse from the bank or vessel which is plying, vessel which has berthed, anchored, stranded or sunk.
Section 21	No one shall: (a) build lavatories unsuitable to the urban and rural community lifestyle in the bank area and watercourse area. (b) drill well or pond or dig earth without the permission of the Directorate.

Section 24	No one shall: (a) violate the conditions relating to navigation of vessels in rivers and creeks prescribed by the Directorate for conservation of water resources, rivers and creeks. (b) violate the conditions prescribed by the Directorate so as not to cause water pollution and change of watercourse in rivers and creeks.
Myanmar Port Authority Law 2015	
	"Any person who by himself or another so casts or throws any ballast or rubbish or any such other thing or so discharges any oil or water mixed with oil, or the master of any vessel from which the same is so cast, thrown or discharged, shall be punishable with fine not exceeding fifty thousand kyats, and shall pay any reasonable expenses which may be incurred in removing the same". Relevant articles include 23 a, b and c, 19, 80 a, b and d, and 83.
Law Amending the Territorial Sea and Maritime Zone Law (2008)	
	After clause 3 of the annex to the Territorial Sea and Maritime Zone Law, clause 4 and clause 5 have been inserted with new coordinates which have no impact on the Project.
Union of Myanmar Marine Fisheries law (25 April1990, amended 1993)	
	There are several restrictions relating to marine fisheries contained within the Fisheries Law. Person(s) found guilty of violating any of the prohibitions shall be liable to heavy fines and/or imprisonment. The relevance of this law to the offshore component of the project is that it places restriction on pollution: "No person shall dispose of living aquatic creatures or any polluting material into the Union of Myanmar Marine Fisheries". Relevant articles include 39 and 40.
The Law Relating to Aquaculture, 1989	
	To avoid impacts to the environment from aquaculture.
The Law Relating to the Fishing Rights of Foreign Fishing Vessels, 1989	
	To govern foreign fisheries in Myanmar waters.
Territorial Sea and Maritime Zones law (1977)	
	The Union of Myanmar has exclusive jurisdiction for the construction, maintenance or operation of offshore terminals and exclusive jurisdiction to preserve and protect the marine environment, and to prevent and control marine pollution. Relevant articles include 18, 30, 31, and 18d

3.3.4 International Environmental Conventions, Protocols and Agreements

Myanmar has ratified several international and regional conventions. Those relevant to the project are provided in **Table 3-3**.

Table 3-3: International and Regional Agreements and Conventions

No.	Conventions	Year (Ratified/ Acceded/Accepted)
Environment		
1	MARPOL: International Convention for the Prevention of Pollution from Ships 1973 and MARPOL Protocol of 1978	1988 (Accession)
2	United Nations Convention on the Law of the Sea (UNCLOS), Montego Bay, 1982	1996 (Ratified)
3	Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, New York, 1994	1996 (Accession)
4	Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, Rome, 1973	1994 (Acceptance)
5	ICAO: ANNEX 16 to the Convention on International Civil Aviation Environmental Protection Vol. I and II, Aircraft Noise and Aircraft Engine Emission	Accession
6	Agreement on the Networks of Aquaculture Centres in Asia and the Pacific, Bangkok 1988	1990 (Accession)
7	Vienna Convention for the Protection of the Ozone Layer, Vienna 1985	Accession 16th Sep 1998 (Vienna) & Accession 24th Nov 1993 (Montreal)
8	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	Entered into force 6th April 2015
9	Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal 1987	1993 (Ratification)
10	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London 1990	1993 (Ratification)
11	United Nations Framework Convention on Climate Change (UNFCCC), New York 1992	1994 (Ratification)
12	Convention on Biological Diversity, Rio de Janeiro 1992	1994 (Ratification)
13	The Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris 1972	1994 (Acceptance)
14	International Tropical Timber Agreement (ITTA), Geneva 1994	1996 (Ratification)
15	United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought, Paris 1994	1997 (Accession)
16	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington DC 1973; and as amended in Bonn, Germany 1979	1997 (Accession)
17	ASEAN Agreement on Conservation of Nature and Nature Resources, Kuala Lumpur, 1985	1997 (Signatory)
18	Kyoto Protocol to the Convention on Climate Change, Kyoto 1997	2003 (Accession)
19	ASEAN Agreement on Trans-boundary Haze Pollution	2003 (Ratification)
20	Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	2004 (Accession)
21	Ramsar Convention on Wetlands of International Importance	2005 (Accession)
22	Establishment of ASEAN Regional Centre for Biodiversity	2005 (Signatory)
23	Declaration on ASEAN Heritage Parks	2003 (Signatory)
24	International Treaty on Plant Genetic Resources for Food and Agriculture, 2001	2004 (Ratification)
25	Catagena Protocol on Biosafety, Cartagena, 2000	2001 (Signatory)

No.	Conventions	Year (Ratified/ Acceded/Accepted)
Social, Labour and Health		
23	Universal Declaration of Human Rights (UNDHR)	signed
23	Convention on the Rights of the Child	1991 (acceded)
24	Convention on Elimination of All Forms of Discrimination against Women (CEDAW)	1997 (acceded)
25	Relevant ILO Conventions in force in Myanmar: • C1 Hours of Work (Industry) • C14 Weekly Rest (Industry) • C2 Unemployment Convention, 1919 (No. 2) • C6 Night Work of Young Persons (Industry) Convention, 1919 (No. 6) • C11 Right of Association (Agriculture) Convention, 1921 (No. 11) • C14 - Weekly Rest (Industry) Convention, 1921 (No. 14) • C17 Workmen's Compensation (Accidents) • C18 - Workmen's Compensation (Occupational Diseases) Convention, 1925 (No. 18) • C19 Equality of Treatment (Accident Compensation) • C21 - Inspection of Emigrants Convention, 1926 (No. 21) • C26 - Minimum Wage-Fixing Machinery Convention, 1928 (No. 26) • C29 Forced Labour Convention • C42 Workmen's Compensation (Occupational Diseases) Revised 1934 • C52 Holidays with Pay • C63 Convention concerning Statistics of Wages and Hours of Work, 1938 (No. 63)Excluding Parts III and IV • C87 Freedom of Association and Protection of the Right to Organize • C182 - Worst Forms of Child Labour	

3.3.5 International Standards & Guidelines

The Project will also follow International Environmental guidelines and standards including World Bank /IFC (International Finance Corporation) Guidelines & Industry Standards as detailed in **Table 3-4**.

Table 3-4: International Guidelines

Applicable International Standards & Guidelines	
1	Equator Principles (2013)
2	International Financial Cooperation/ World Bank General Environmental Health and Safety (EHS) Guidelines (April 30, 2007)
3	International Financial Cooperation/World Bank Environmental, Health and Safety Guidelines for Offshore Oil and Gas Development, 2015
4	International Convention for the Safety of Life at Sea (SOLAS), 1974.

3.4 Contractual and other Commitments

The Project will comply with the Myanmar Environmental Conservation Law, Environmental Conservation Rules, Environmental Quality (Emission) Standards and all necessary international standards. PCML makes the following commitments:

- The project will comply with commitments, mitigation measures and management plans stated in the EIA report.
- The company is responsible for its actions and omissions and those of its contractors, subcontractors, officers, employees, agents, representatives, and consultants employed, hired, or authorized by the company acting for or on behalf of the Project.
- Support programs for livelihood restoration and resettlement in consultation with the PAPs, related government agencies, and organizations and other concerned persons for all Adverse Impacts.
- Fully implement the EMP, all Project commitments, and conditions, and is liable to ensure that all contractors and subcontractors of the Project comply fully with all applicable Laws, the Rules, this Procedure, the EMP, Project commitments and conditions when providing services to the Project.
- Be responsible for, and shall fully and effectively implement, all requirements set forth in the ECC, applicable Laws, the Rules, this Procedure and standards.
- Timely notify and identify in writing to the Ministry, providing detailed information as to the proposed Project's potential Adverse Impacts.
- Respect and comply with the customs, traditions and traditional culture of the ethnic groups in the Union;
- Abide by the terms and conditions, stipulations of special licenses, permits, and business operation certificates issued to them, including the rules, notifications, orders, and directives and procedures issued by the MIC and the applicable laws, terms and conditions of contract and tax obligations;
- Carry out in accordance with the stipulations of the relevant department if it is, by the nature of business or by other need, required to obtain any license or permit from the relevant Union Ministries government departments and governmental organizations, or to carry out registration;
- Immediately inform the Commission if it is found that natural mineral resources or antique objects and treasure trove not related to the investment permitted above and under the land on which the investor is entitled to lease or use and not included in the original contracts.
- To inform the village administrative office and the Department of Historical Research if any historical thing is found during the project operations.
- Abide by the applicable laws, rules, procedures and best standards practiced internationally for this investment so as not to cause damage, pollution, and loss to the natural and social environment and not to cause damage to cultural heritage;
- Close and discontinue the investment only after payment of compensation to employees in accordance with applicable laws for any breach of employment contracts, closure of investment, sale and transfer of investment, discontinuation of investment, or reduction of workforce;
- Pay wages and salaries to employees in accordance with applicable laws, rules, procedures, directives and so forth during the period of suspension of investment for a credible reason;

- Pay compensation and indemnification in accordance with applicable laws to the relevant employee or his successor for injury, disability, disease and death due to the work;
- Supervise foreign experts, supervisors and their families, who employ in its investment, to abide by the applicable laws, rules, orders and directives, and the culture and traditions of Myanmar;
- Respect and comply with the labor laws;
- Have the right to sue and to be sued in accordance with the laws;
- Pay effective compensation for loss incurred to the victim, if there is damage to the natural environment and socioeconomic losses caused by logging or extraction of natural resources which are not related to the scope of the permissible investment, except from carrying out the activities required to conduct investment in a Permit or an Endorsement.
- Ensure equal rights for local workers and avoid salary bias, i.e. ensure that local and foreign workers have the same salary at the same level.
- Ensure that all foreign employees apply for the proper work permit and visa through the Myanmar Investment Commission (MIC).
- Provide rights and benefits including but not limited to, leave, holidays, overtime pay, compensation and social security. Most of the relevant particulars are in the Myanmar Companies Act.
- Settle disputes, within the law, between workers, employers, consulting experts or any other personnel involved in the business operation.

3.5 Institutional Framework

The aim of this Chapter is to describe the Administrative and political divisions of Myanmar.

3.5.1 Administrative Divisions

Myanmar is a multi-ethnic country composed of over 130 ethnic groups, and viewing macroscopically, in the central part of the country from north to south along Ayeyarwady River resides the largest group covering 70% of the total population, Bamar, and in mountainous area in east and west reside most of the minorities.

Myanmar has a three levels administrative structure, as described below.

The first level subdivision includes:

- Seven states;
- Seven regions (regions were previously referred to as “divisions”, prior to August 2010);
- Five self-administered zones;
- One self-administered division;
- One union territory.

States and regions are divided into districts. Districts consist of townships, which are composed of towns, wards and village-tracts, that are groups of adjacent villages. The administrative structure of the states, regions and self-administering bodies is defined in the Constitution.

Each region and state has a Regional/State Government, consisting of a Chief Minister, Ministers and an Advocate General. Legislative authority resides with the State/Regional “Hluttaw” (a parliament or legislative body), which are made up of elected civilian members and representatives of the military.

The Constitution states that Naypyidaw is a Union Territory under the direct administration of the President. The Naypyidaw Council, led by a Chairperson, carries out general functions on behalf of the President. The Chairpersons of the Naypyidaw Council are appointed by the President, and include civilians and representatives of the military.

Self-Administered Zones and Self-Administered Divisions are administered by a Leading Body, which is headed by a Chairperson, and has executive and legislative powers. The Leading Body consists of elected State/Regional Hlutttaw members and military personnel.

The project is located in the Myanmar Offshore area. The nearest Regional area is the Thanthintharyi Region. The region is divided into three districts, 10 townships, 83 wards, 264 village tracts and 1,250 villages. The Districts include:

- Mon District
- Dawei District
- Myeik District

3.6 Project's Environmental, Social & Health Standards

MONREC has established environmental quality standards, the National Environmental Quality Standard [Legal Reference: ECL 2012 (Article 2c) and NEQG 2015]. ECD / MONREC have indicated that the discharge standards shown in **Table 3-5** are applicable for Offshore Oil and Gas activities. These are in accordance with international standards.

Table 3-5: Myanmar Discharge Standards Applicable to Offshore Oil and Gas activities

Parameter	Guideline
Drilling fluids and cuttings (non-aqueous drilling fluid)	Non-aqueous drilling fluid, re-inject or ship-to-shore; no discharge to sea Drilled cuttings, re-inject or ship-to-shore; no discharge except: Oil concentration lower than 1% by weight on dry cuttings* Mercury maximum 1 mg/kg dry weight in stock barite Cadmium maximum 3 mg/kg dry weight in stock barite Discharge via a caisson at least 15 meters below sea surface**
Drilling fluids and cuttings (water-based drilling fluid)	Water-based drilling fluid, re-inject or ship-to shore; no discharge to sea Water-based drilled cuttings, re-inject or ship-to-shore; no discharge except: Mercury 1 mg/kg dry weight in stock barite Cadmium 3 mg/kg dry weight in stock barite Maximum chloride concentration must be less than four time's ambient concentration of fresh or brackish receiving water Discharge via a caisson at least 15 meters below sea surface**
Produced water	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/le
Completion and well work-over fluids	Ship-to-shore or re-inject, no discharge to sea except: Maximum one day oil and grease discharge should not exceed 42 mg/l; 30 day average should not exceed 29 mg/l Neutralize to attain a pH of 5a or more
Produced sand	Ship-to-shore or re-inject, no discharge to sea except when oil concentration lower than 1% by weight on dry sand
Hydrotest water	Send to shore for treatment and disposal Discharge offshore following environmental risk analysis, careful selection of chemicals Reduce use of chemicals
Cooling water	The effluent should result in a temperature increase of no more than 3°C at edge of the zone where initial mixing and dilution take place; where the zone is not defined, use 100 meters from point of discharge
Desalination brine	Mix with other discharge waste streams if feasible
Sewage	Compliance with MARPOL 73/78b
Food waste	Compliance with MARPOL 73/78b
Storage displacement	Compliance with MARPOL 73/78b
Bilge water	Compliance with MARPOL 73/78b
Deck drainage	Compliance with MARPOL 73/78b

Note:
a Standard unit
b In nearshore waters, carefully select discharge location based on environmental sensitivities and assimilative capacity of receiving waters
** It is noted that, in the 2015 IFC EHS Guidelines for Offshore Oil and Gas Development, Table 1: Effluent Levels from Offshore Oil and Gas Development, the guideline is less specific, as follows: "Discharge via a caisson (at least 15 m below surface is recommended whenever applicable; in any case, a good dispersion of the solids on the seabed should be demonstrated)"

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). The 2015 IFC EHS Guidelines for Offshore Oil and Gas Development guidelines are the most up todate guidelines available.

ECD has advised that operators need to follow both the 2015 IFC EHS Guidelines for Offshore Oil and Gas Development guidelines and the NEQG 2015 discharge emission requirements for offshore exploration drilling campaigns.

4. PROJECT DESCRIPTION

4.1 Background

A 3D Seismic survey had been carried out and completed by December 2016. The prospects had been identified to image the deep lower Miocene section. The seismic coverage is approximately 1104 sq. km. The Seismic results have been processed and new target reservoirs have been identified for exploration drilling purpose. PCML plans to conduct exploration drilling on these identified potential reservoirs. The exploration drilling campaign would include drilling three (3) exploration wells within the project area.

PCML aspires to have an exploration campaign by Q4 2018. The exploration drilling campaign would be carried out in open waters. The exploration wells would have to be drilled with a semi-sub/drill ship. The project duration would be about 75 days for each well. The exploration drilling campaign would start after the completion of the monsoon season of 2018.

Three (3) exploration/appraisal wells are planned to be drilled from Q4 2018 to Q2 2019. The expected depth of these wells is 4500 m TVDDF. If there is a discovery, 2 additional exploration/appraisal wells will be drilled in this area. There would be one HPHT prospect in Yeaunglan and the rest of the prospects are normal exploration wells.

4.2 Purpose and Objectives

PCML plans to drill three (3) exploration wells in the block M-12,13,14. The primary objective of drilling the exploration well is to test and prove the hydrocarbon potential for hydrocarbon charge in the deep Miocene layer. If reservoirs are discovered, further studies on chemical and physical properties of petroleum, age of reservoirs, rock characteristics, porosity, permeability in the formation and others will be conducted.

Gas is the main type of petroleum product anticipated from this exploration drilling. If a sustained commercial flow rate of the potential reservoirs is established, PCML will prepare and submit a separate EIA report for the production drilling campaign to MONREC for their consensus under the requirements of the Myanmar Environmental Conservation Law.

4.3 History and Petroleum Activity

The completed exploration drilling activity for Blocks M12, M13 & M14 are included in **Table 4-1**.

Table 4-1: Exploration Drilling Activity for Yetagun Field

Wells Drilled	Years	No. of wells/ Activity
Infill	2003-2018	20 infill wells
Exploration	2003-2018	8 exploration wells

4.4 Project Need and Justification

Myanmar has proven natural gas reserves of 7.8 trillion cubic feet.[1] Gas production in 2014 was over 2 billion cubic feet per day and oil production onshore reached 8,300 barrels per day in 2014, in addition to offshore gas fields that produced 8,000 barrels per day of condensate. As of 2014, the country operated three refineries with a combined capacity of 55,000 barrels per day of petroleum products, the vast majority of natural gas production, about 95 percent, came from the two offshore fields at Yadana and Yetagun in the Andaman Sea. There is some domestic offtake, but the majority of this gas is exported via pipeline to Thailand.[2] Since then, the Shwe field in the Bay of Bengal and the Zawtika field in the Andaman Sea have been commissioned and put into production (2013 and 2014 respectively). The majority of the gas from the Shwe field is exported to China via a newly built pipeline and the Zawtika gas is mainly exported to Thailand also via pipeline.

As of 1 December 2014[3] oil and gas production in Myanmar was as follows:

Production	Onshore	Offshore
Gas mmcfd	70	2,000
Oil and condensate bpd	8,300	8,000

Gas sales were as follows:

Sales	Thailand	China	Domestic
Gas mmcfd	1,400	400	300

Myanmar faces energy access and security challenges. The International Energy Agency has calculated that Myanmar has the poorest level of energy access in all of the Asia-Pacific, and Myanmar is the least developed economy in Southeast Asia. Only 13 percent of the country's population have access to the national electricity grid, approx. 26 per cent have access to electricity, and almost 95 percent of its people depend on solid fuels such as wood and rice husks for cooking and heating.[4]

Secure energy supplies will be important to Myanmar's future development. The Ministry of Electricity and Energy (MoEE) has set the basis of Myanmar's energy policy framework as:

(i) fulfilling domestic energy requirement
(ii) implementing sustainable energy development;
(iii) promoting the wider use of new and renewable sources of energy;
(iv) promoting energy efficiency and conservation;
(v) promoting use of alternative fuels;
(vi) implementing effective utilization of discovered crude oil and natural gas resources in the interest of the entire nation; and (vii) promoting more private participation.[5]

PCML, as the operator of the Myanmar onshore petroleum PSC, is striving to develop and produce gas reserves from potential reservoirs located within Blocks M12, M13 & M14.

[1] BP, "BP Statistical Review of World Energy" (June 2011).
[2] Asian Development Bank, Interim Country Partnership Strategy: Myanmar, 2012–2014 (Manila: October, 2012).
[3] MOGE 1 December 2014
[4] UNDP, "Accelerating Energy Access for All in Myanmar" (2013), Executive Summary.
[5] Myanmar Ministry of Energy, "Regional Energy Cooperation" (accessed 15 July 2014).

4.5 Project Alternatives

4.5.1 "No Project" Option

The 'No Project' alternative in Blocks M12, M13, & M14 would result in no exploration for oil and gas and would result in PCML not meeting its Blocks M12, M13, & M14 Concession commitments.

Potential gas reserves identified from the seismic studies would not be tested to determine whether they are economic for development. Gas demand in Myanmar is expected to continue increasing. The no-project alternative would result in losing a number of unrealized benefits:

- No gas reserves would be extracted from this field in the future. This would require potential future production from other energy sources such as hydropower, oil and coal.
- No royalties would be obtained from future production and sale of the hydrocarbons produced from the field to benefit Myanmar.
- Gas resources are needed to support the development of the Myanmar economy.

The "No Project Option" for this project is not being considered.

4.5.2 "Project" Option

Project exploration drilling can confirm the presence of petroleum reservoirs in Blocks M12, M13 & M14. If sufficient oil or gas reserves at the well sites are found, PCML would proceed with production. During production, PCML as a producer will contribute part of its revenue to the government via royalties and taxes, which will benefit local people.

4.5.3 Technical Considerations

Many technical aspects were taken into consideration for this exploration drilling program. The technical considerations include:

Geology

The well locations are clustered around prospects which were delineated using pre-existing 2D and 3D seismic data. The well location has been chosen based on the geological prognosis to explore petroleum potential and petroleum system of the deep lower Miocene section build up.

Well Design

The well design is directly affected by geological conditions. In some cases, the prime criterion for selecting casing seats is to cover exposed zones, with severe loss of circulation. In others, the seat selection may be based on differential sticking problems, perhaps resulting from pressure reduction in the field. In deep wells, however, the primary consideration is usually based on controlling abnormal formation pressures and preventing the exposure to weaker shallow zones. Selecting casing seat depths for pressure control purposes starts with knowing geological conditions such as formation pressure and fracture gradients. After these have been established, the engineer designs a casing program based his understanding of the well's anticipated behaviour.

The size of the well (slim-hole or conventional) is determined by both economics and equipment availability. To keep the cost down, it is beneficial to drill the smallest hole possible. However, other factors, such as availability of slim-hole drilling equipment, play a role. Similarly, contingency must be built into the well design; if problems occur, the solution often requires for the hole size to be reduced. The exploration wells will be 'conventional' wells.

Drilling Fluids

Top-hole sections are subject to weak surface formations and therefore require inexpensive and non-toxic mud systems (typically water-based and bentonite). Non-toxicity is required because the immediate environment is exposed and also underwater aquifers must not be contaminated. Inexpensive mud systems are needed because the mud can be lost to the weak upper formations.

Intermediate sections require more technical control to deal with either reactive shale sections or mobile evaporate sections and thus avoid getting well pipe sections stuck. Water-based mud (WBM) systems have proven to be the most economical with regards to drilling efficiency.

PCML will plan to use the following drilling fluids for this project

- **Seawater with bentonite** will be used for the surface section. The main components of the drilling fluid other than seawater are barite, drill-gel, and guar gum.
- **Water-based mud (WBM)** will be used for surface section, intermediate section and the reservoir. The main components are biodegradable and include: barite, shale inhibitor additive and seawater. PCML will use WBM as main drilling fluid for all well sections.

Mud Disposal

Disposal options for the drill cuttings include (1) onshore disposal, (2) offshore re-injection, and (3) offshore discharge. These options are discussed below.

- Onshore Disposal - Onshore disposal of cuttings in a landfill is an option for this project. This option requires the shipping of drill cuttings for onshore processing and disposal in a landfill.
- Offshore Re-Injection - Injection of cuttings into an abandoned well in or near the field is an option for the proposed project.
- Offshore Discharge - Offshore discharge of cuttings and fluids from the drilling rig is an option, as the discharge of Water Based Drilling Fluids (WBDF) and Non-Aqueous Drilling Fluid (NADF) for the Project will be in line with good international industry practice, latest IFC Guidelines and Myanmar Guidelines.

Rig Selection

Rig selection is based upon availability and the particular environment. A drillship rig or semi-submersible rig are the most suitable for PCML because of their ability to drill in deep water depths and save time sailing between oilfields worldwide.

4.5.4 Environmental Considerations

Exploration activities related to the proposed Blocks M12, 13 & M14 project will have potential impacts on the surrounding environment, including seawater and seabed quality, and marine organisms due to physical disturbances of sediment during rig installation, oil or hazardous waste spill, and blowout. However, these impacts will occur in limited areas around the drilling rig and for a short time period (75 days drilling). In addition, PCML has specified suitable environmental mitigation measures as well as a Health Safety and Environment (HSE) Plan, and will strictly implement and follow these plans. Therefore, it is expected that negative impacts can be eliminated or minimized.

To mitigate and/avoid potential impacts on environment, PCML has carefully planned the drilling program with respect to several aspects, such as project schedule, well design, waste generated, well

locations etc. PCML plans to finish the program in the shortest time possible (i.e. 75 days). The time that the environment is likely to be disturbed will be limited to a maximum of 75 days per well.

The exploration wells will be 'conventional' wells. Moreover, PCML will use drilling muds with low toxicity for the drilling program to minimize environmental impacts. Besides technical, social, and economic considerations, the location of sensitive/protected areas was also considered before the locations the appraisal well was finalized. All project locations are located far away from shores and sensitive/protected areas such habitats of seagrass, coral reefs, dugong etc.

4.5.5 Social Considerations

The social considerations for offshore drilling relate mainly to the fishing areas used by local people. The well sites will limit the access of fishermen to the area due to the 500 m safety zone around the exploration well. PCML will ensure that the project schedule is properly communicated so that local fishermen can make alternative plans while the well is being drilled.

4.6 Project Location and Components

The (3) potential field prospects have been identified in the Yetagun blocks. They are Yetagun South East, Yeaunglan, & Ye-Taung .. (**Figure 4-1**).

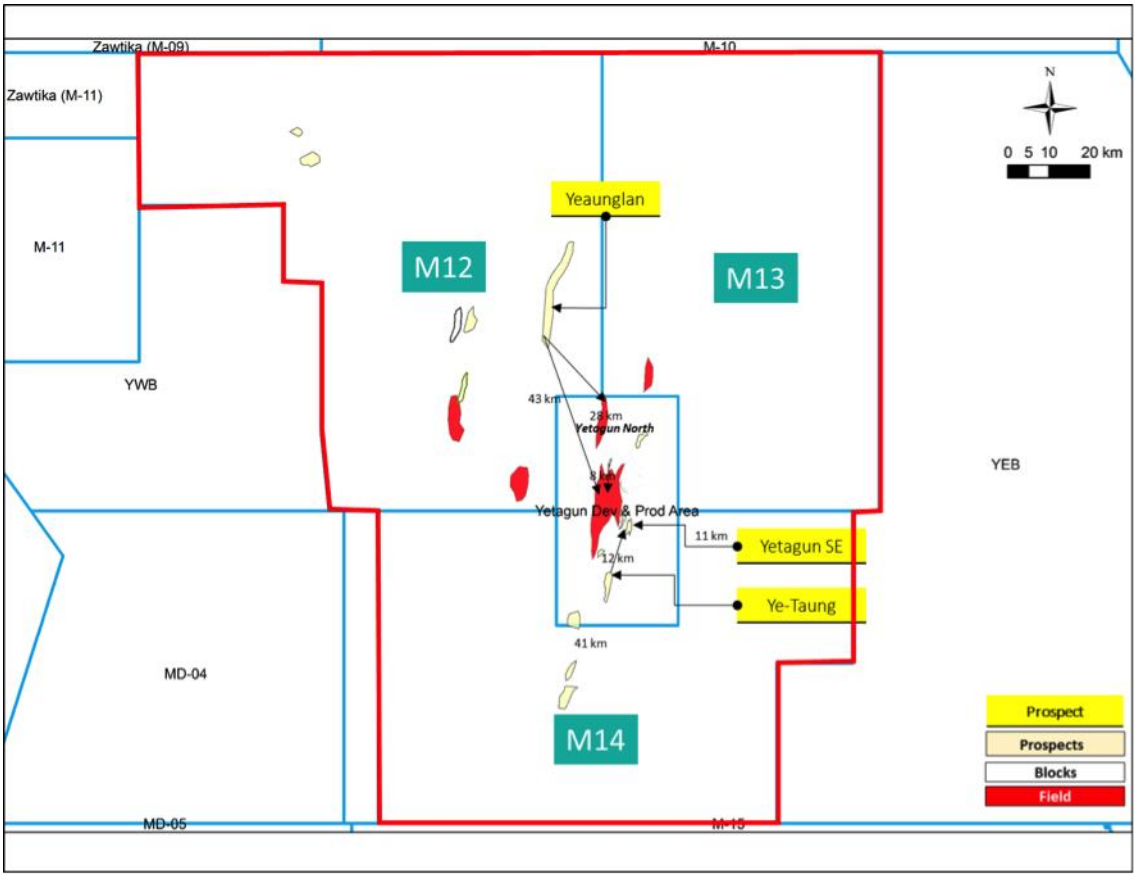


Figure 4-1: Prospective Field locations

4.7 Project Schedule

The PCML exploration drilling program is planned to start in late Q4 2018 and finish by Q2 2019. It is expected that rig move and mobilization and appraisal drilling will take up to approximately 50 days, while well testing and abandonment/demobilization will take up to approximately 10 days and 15 days, respectively; therefore it will take a maximum of approximately 75 days to drill and test the well. Three wells are planned and if there is a discovery 2 additional exploration/appraisal wells will be drilled.

Detailed schedules of the exploration drilling program are presented in **Table 4-2**.

Table 4-2: Drilling Schedule for each Appraisal Well

Activities	Days
1. Rig move and mobilization	15
2. Well drilling and casing installation (including well logging)	35
3. Well Testing	10
4. Well Abandonment and demobilization	15
Grand Total	75

After the rig had been positioned in its location at the drilling site, the drilling stage would commence. The example 75 drilling days per well is illustrated below. (**Figure 4-2**)

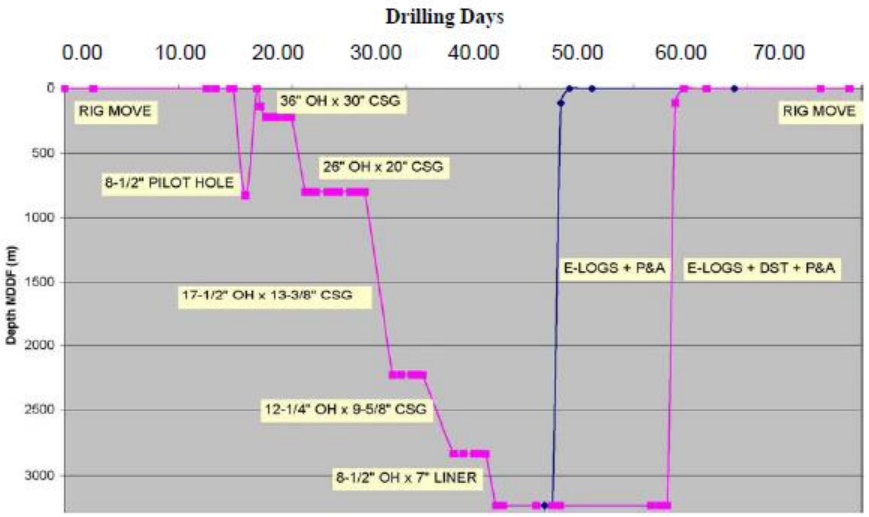


Figure 4-2: Drilling days

4.8 Offshore Exploration Drilling

4.8.1 Drilling Overview

For exploration drilling purpose, a general criteria for these wells condition are expected as below.

- Drilling water depth : 120 m-180 m
- Drilling Depth: 3000-4500 m TVDDF
- Well type: Exploration Vertical well
- Rig type: Semi Submersible / Drill ship
- Casing scheme: 5 casing string (30" conductor, 20" surface casing, 13 5/8" / 13 3/8" intermediate casing, 9 5/8" casing, 7" liner)
- Mud type: Water Based Mud (KCL/PHPA/Amine)
- CO_2 :5-15%
- H2S :N/A
- Temperature: 265 Fahrenheit for normal exploration well and 428 Fahrenheit for HPHT well.

4.9 Drilling Project Phases

The overall project activities can be summarized into below five (5) main stages

- Mobilization of Drilling Rig and AHTS vessel
- Drilling Stage
- Testing stage
- Plug and abandonment stage
- Demobilization.

4.9.1 Mobilization of Drilling Rig and AHTS Vessel Phase

The drilling would take place in open water. Due to PCML experience in Myanmar waters, a semi-submersible/drill-ship is the preferred drilling rig type. (**Figure 4-3**, Semi-Submersible and **Figure 4-4**, Drill-ship)

Figure 4-3: Semi-Submersible

Figure 4-4: Drill ship

The supporting vessels, Anchor Handling Tug Vessel (AHTS) would also be mobilized from a nearby country to reduce diesel consumption and cost. These ships would normally be around 70 meters in length and about 10,000bhp. There would be approximately 3 supporting vessel for the drilling rig in the campaign. (Figure 4-5, AHTS vessel)

Figure 4-5: 10,000 bhp AHTS Vessel

The drilling rig and AHTS vessel would be mobilized from Singapore, or any country of origin. For our operation purpose, the rig would be mobilized from a nearby country (South East Asia) to reduce the cost of mobilization. During the mobilization stage, Project Team would conduct technical inspection on rig and vessel specification and pre-mobilization briefing covering on operation and HSE requirements including the berthing, bunkering and lifting activities, waste management, emergency, etc. The drilling rig and AHTS would be MARPOL certified to ensure that all waste are handled properly.

Normally a semi-sub rig move would require 2 AHTS to guide and pull it towards the final destination. The AHTS would be utilized and another backup vessel in case of an emergency. The AHTS selected would have high bollard pull capability 120-200 tons. (**Figure 4-6**)

Figure 4-6: Rig move

After in positioning the drillship rig a 500-m radius visual observation safety zone around the rig will be established. The area will be patrolled by three support vessels during the entire installation, drilling, testing and demobilization period.

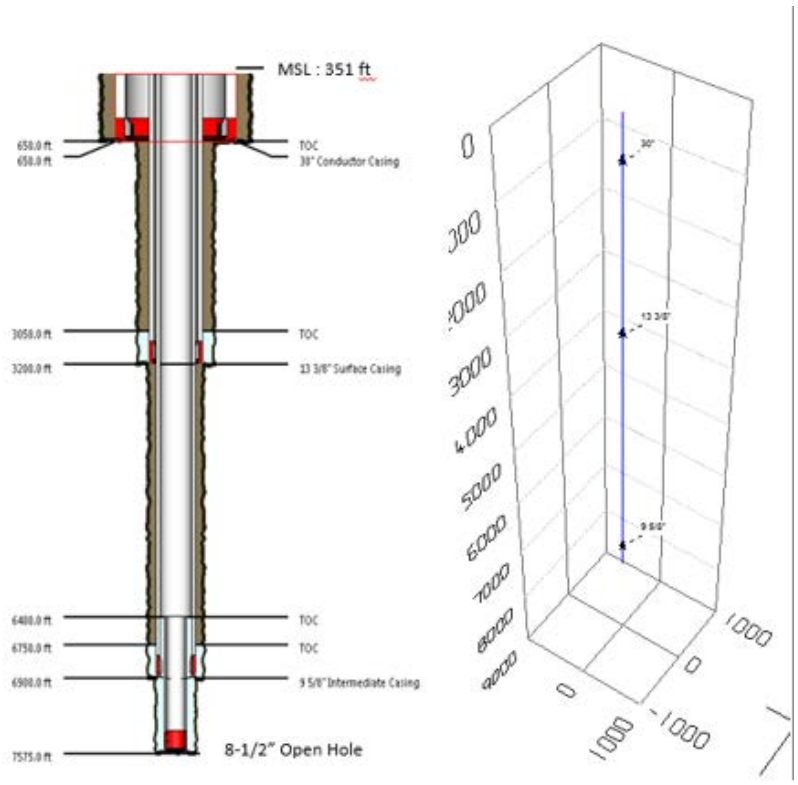
4.9.2 Drilling Phase

4.9.2.1 Well and Casing Design

The exploration wells to be drilled are vertical wells. These wells would be drilled with water based and synthetic based mud systems. The planned exploration well consists of five sections with a target depth between 3000-4500 m TVDDF. The example well design is provided below in **Figure 4-7**.

Table 4-3: Size and Depth of a Typical Appraisal Well

Well Section	Well Diameter (inch)	Casing Diameter (inch)	True Vertical Depth (m)
Jet Conductor	30	30	200
Surface section	26	20	930
Upper section	17 ½	16	2060
Middle Section	12 ¼	$9^{5/8}$	2305
Reservoir section	8 ½	7	3,000 - 4500



Source: PCML, 2018

Figure 4-7: Well design

4.9.2.2 Drilling Procedures

Drilling and Casing

Wells will be drilled after the rig is stable, following rig installation. The seabed depth will be 120 m-180 m below the rig bottom. Drilling procedures for each section are detailed as follows:

- **Jet 30" Conductor** This section will be drilled to a depth of 200 m. The section is drilled using 30-inch casing and drilling shoe is directly connected to the casing. Then, the casing will be run and cemented to the surface.
- **26-inch Hole (Surface Section)**: This section will be drilled to a depth of 930 m. The section is drilled using 20-inch casing and drilling shoe is directly connected to the casing. Then, the casing will be run and cemented to the surface. Casing helps prevent collapse of the well sidewall, inflow of drill cuttings, and loss of drilling mud, and also separates the seabed from the well space. Seawater with bentonite kill mud will be used as drilling fluid in this section. Drill cuttings will be dumped onto the sea bed near the wellhead.
- **17 1/2-inch Hole (Upper Section)**: This section will be drilled to a depth of about 2,060 m. A 13 3/8 inch casing will be run and cemented to the designated depth. This section will be drilled with a Water-Based Mud (WBM). Mud and cuttings from this section will be brought up to the rig for mud-cutting separation. After separation, the mud will be re-used for drilling while cuttings will be discharged.
- **12 1/4-inch Hole (Middle Section):** This section will be drilled to a depth of about 2,305 m. A 9 5/8 -inch casing will be run and cemented to the designated depth. This section will be drilled with a Water-Based Mud (WBM). Mud and cuttings from this section will be brought up to the rig for mud-cutting separation. After separation, the mud will be re-used for drilling while cuttings will be discharged.
- **8 1/2-inch Hole (Reservoir Section)**: This section will be drilled using an 8 ½-inch drill bit to the designated depth of 3,000 - 4000 m. After wireline logging is complete, a 7 inch-liner may be installed in this reservoir section as a contingency. Water-Based Mud (WBM) will be used as drilling fluid in this section. Mud and cuttings from this section will be brought up to the rig for mud-cutting separation. After separation, the mud will be re-used for drilling while cuttings will be discharged.

Drilled wells will be evaluated by wireline logging. When all planned activities are completed, the wells will be covered and abandoned.

Cementing

The wells would then be cemented and plug as below in **Table 4-4**.

Table 4-4: Cementing Scheme

Casing Size	Cement Type	Cement Density	Top of cement
30" casing	Single Slurry system	15.6- 15.8ppg	To surface
20" Casing	Dual Slurry system	12.6-15.8ppg	To surface
13 3/8" casing	Dual Slurry system	12.6-15.8ppg	150 feet into casing shoe
9 5/8" casing	Dual Slurry system	12.6-15.8ppg	300 feet above hydrocarbon zone
7" liner	Single Slurry	15.8 ppg	All the way into liner hanger
P&A program	Single Slurry	15.8 ppg	To surface after casing had been cut and retrieved. The program would ensure that the cement would cover the final conductor to surface.

Cemented casing will protect or isolate formations adjacent to the wellbore. Typical reasons for running casing in a well are:

- Prevent contamination;
- Strengthen the wellbore to support wellhead equipment installation, including BOPs (Blowout Preventers);
- Provide pressure integrity in case wellhead equipment (including BOPs) is closed;
- Seal off leaking or fractured formations in which drilling fluids are lost;
- Seal off weaker formations (so that higher strength formations can be penetrated safely);
- Seal off high-pressure formations because lower pressure formations may be drilled with lower-density drilling fluid; and
- Seal off troublesome formations, such as flowing salt.

The cementing chemicals to be used are shown below:

- Spacer B250
- ANTIFOAM AGENT D47
- Silica Flour D66
- Silicate Additive D75
- SALTBOND* II Additive D80A
- Liquid Retarder D81
- LITEFIL* D124 EXTENDER
- Low-Temperature Liquid Dispersant D145A
- Retarder D150A
- Fluid Loss Control Additive D193
- ScavengerPlus D208
- Mid-Range liquid FLAC D256
- Mid-Temp Retarder-L D801
- Cement Class G D907
- EZEFLO* F110 Surfactant
- Surfactant F112
- Mutual Solvent U66

4.9.2.3 Drilling Fluids (Mud)

Drilling mud performs a number of functions. Apart from carrying cuttings to the surface, it:

- Transmits power and lubrication to the drill bit;
- Exerts a hydrostatic head to help prevent caving or sloughing of the formation;
- Prevents flow of formation fluids into the borehole (which could lead to a blowout); and
- Maintains dense materials such as cuttings and barite in suspension in the borehole to maintain downward pressure in the well, when circulation is interrupted (as when adding a drill pipe).

In a closed-loop system, the drilling mud is pumped from tanks on the drilling unit down the inside of the drill string and through the drill bit. The mud carries the drill cuttings from the bit up the annulus

between the drill string and the well bore to the surface and into the drilling fluid handling system on the drilling unit. The drill cuttings are removed from the drilling mud by a solids control system. The mud is then reconditioned before returning to the drilling mud circulation system.

Two types of drilling fluid will be used as follows:

- ***Seawater with bentonite mud*** will be used for the 36" hole and 26" sections. The main components of the drilling fluid other than seawater are barite, drill-gel, and guar gum.
- ***Water Based Mud (KCL/PHPA/Glycol)*** will be used for the 17 ½" section, 12 ¼" section, as well as when drilling through the reservoir section, 8 ½" hole. The main components are barite salt, and fresh water.

Details on components in each kind of mud are provided in **Table 4-5**.

Toxicological information on the chemicals used in drilling mud is provided in **Table 4-6**. Safety Data Sheets (SDS) for all chemicals will be available on site. PCML will return unused chemicals to service providers at completion of the project.

As the drilling system is a closed-loop system, mud loss would be limited to only two factors (not including accidental spills): 1) loss into formation and 2) loss on cuttings. The amount of mud lost into formation cannot be determined until it actually occurs, because it is an operational uncertainty. As soon as mud loss into formation occurs, engineers will pump the pre-mixed Material Control Lost (MCL) into the well to seal the cracks and continue the drilling operation. Response to loss into formation is usually very quick, within 2 hours maximum. Mud that is lost into formation will not cause harm to the environment, and will not be retrieved. The amount of mud lost on cuttings can be determined by sampling of the cuttings. PCML will drill in accordance to industrial best practices and aim to limit the mud on cuttings to a maximum of 12.5%.

Table 4-5: Mud Components

Hole size (inches)	Section (inches)	Drilling Fluids System	Mud Density (PPG)
36" and 26"	30" and 20"	Seawater/Bentonite	8.6-9.5 ppg
17 ½"	13 3/8"	KCL/PHPA/Glycol	9.5-10.0ppg
12 ¼"	9 5/8"	KCL/PHPA/Glycol	10.0-11.0ppg
8 ½"	7" liner	KCL/PHPA/Glycol	11.0-13.0ppg

Table 4-6: Health and Safety Information on Mud Chemicals

Chemical	Material	Function	Hazard Information
BARITE (All Grades)	Barite	Weighting agent	NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS. ACCORDING TO THE CRITERIA OF NOHSC, AND THE ADG CODE. Inhaled quartz or crystobalite causes cancer in humans; Nuisance dust; Not regarded as dangerous for the environment.
Bentonite Spud System	Bentonite	Water based system and viscosifier	HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code Inhalation of silica crystals may cause lung disease; not classified as a dangerous risk.
CALCIUM CARBONATE (All Grades)	Crystalline silica	Lost circulation material. Weighting agent. Bridging material.	NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS. ACCORDING TO THE CRITERIA OF NOHSC, AND THE ADG CODE
Caustic Soda	Sodium Hydroxide	pH control	CONSIDERED A DANGEROUS SUBSTANCE ACCORDING TO DIRECTIVE 1999/45/EC AND ITS AMENDMENTS The material can produce severe chemical burns to the eye following direct contact; Vapours or mists may be extremely irritating; Accidental ingestion of the material may be damaging to the health of the individual; The material can produce severe chemical burns within the oral cavity and gastrointestinal tract following ingestion; The material can produce severe chemical burns following direct contact with the skin; The material may produce respiratory tract irritation; The material is considered to be harmful by all exposure routes.
CITRIC ACID	Citric acid, monohydrate	pH modifier	CONSIDERED A DANGEROUS SUBSTANCE ACCORDING to Regulation (EC) No. 1272/2008 [CLP] Serious eye damage/eye irritation
DUO-TEC*	Xanthan Gum	Viscosifier	Not considered a dangerous substance according to Regulation (EC) No. 1272/2008 [CLP] Not considered harmful or hazardous under normal operating conditions.
KLA-HIB*	High-boiling aliphatic amines	Shale inhibitor	CONSIDERED A DANGEROUS SUBSTANCE ACCORDING to Regulation (EC) No. 1272/2008 [CLP] Harmful if swallowed, Harmful in contact with skin, Causes serious eye damage, May cause respiratory irritation, Harmful to aquatic life with long lasting effects
M-I PAC* (All Grades)	Polyanionic cellulose	Fluid loss reducer & Viscosifier.	Not considered a dangerous substance according Classification according to Regulation (EC) No. 1272/2008 [CLP] Classified as Non-Hazardous according to the criteria of NOHSC. NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.
POLY-PLUS* DRY	N/A	Shale stabilizer	Not considered a dangerous substance according Classification according to Regulation (EC) No. 1272/2008 [CLP]
Soda Ash	Sodium Carbonate	pH modifier	CONSIDERED A DANGEROUS SUBSTANCE ACCORDING to Regulation (EC) No. 1272/2008 [CLP] May irritate respiratory system; May irritate and cause stomach pain; Irritiate and may cause redness and pain by skin contact; Irritating to eyes.
POLY-SAL* T	Starch	Fluid loss reducer.	Not considered a dangerous substance according Classification according to Regulation (EC) No. 1272/2008 [CLP]

4.9.2.4 Mud and Cuttings Quantities

4.9.2.4.1 Cuttings

Drill cuttings are formation particles generated by the drill bit during the drilling process and vary in size from small slivers (less than 10 mm in length) to dispersed clays and ultra fine particulates (less than 0.002 mm). The exact nature of the cuttings will depend on the geological formations drilled through.

The amount of drill cuttings discharged can be estimated by calculating the volume of each section (i.e. from hole interval height and hole diameter). Measured depth is used for the calculation.

It is estimated that approximately 502 m^3 of cuttings are generated per well. Estimated quantities of cuttings for each well are presented in **Table 4-7.**

Table 4-7: Cuttings Volumes for Well

Section (Inch)	Section (m)	Casing Size (Inch)	Casing Size (m)	Casing Depth (m)	Theoretical Cuttings Vol. (m^3)	Wash out (%)	Wash out Vol. (m^3)	Total cutting Vol. (m^3)
30	0.7620	30	0.762	200	32.83	15%	4.92	37.75
26	0.6604	20	0.508	930	228.47	15%	34.27	262.97
$17^{1/2}$	0.4445	$13^{3/8}$	0.339725	2060	124.14	15%	18.62	142.76
$12^{1/4}$	0.31115	$9^{5/8}$	0.244475	2305	33.74	15%	5.06	38.8
$8^{1/2}$	0.2159	7 liner	0.1778	3,000 - 4500	16.84	15%	2.53	19.37
Total Cuttings								**501.65**

Source: PCML, 2018

4.9.2.4.2 Drilling Mud

The mud theoretical requirements based on previous drilling campaigns are show in **Table 4-8**.

Mud will be removed from the cuttings to the extent possible. PCML will discharge cuttings with a maximum of 12.5% Cuttings Base Fluid Retention (CBFR). Therefore, it is estimated that a total of 62.71 m^3 of drilling mud will be discharged into the sea. The recovered mud will be re-conditioned and returned to the mud circulation system. The mud in casings will come out and be treated through the shaker system, and reused. Quantities of mud wastes on cuttings are shown in **Table 4-9**

Table 4-8: Mud Volumes Required for Well

Type of Drilling Mud	Well Section (inch)	Volume Requirements
Seawater with Bentonite	30	**80 m^3**
		39 m^3
Seawater with Bentonite	26	**200 m^3**
		636 m^3
		2,829 m^3
		661 m^3
		520 m^3
		3,200 m^3
KCL/PHPA/Glycol	$17^{1/2}$	**150 m^3**

Type of Drilling Mud	Well Section (inch)	Volume Requirements
		92 m³
		825 m³
		825 m³
		590 m³
KCL/PHPA/Glycol	$12^{1/4}$	**470 m³**
		35 m³
		71 m³
		590 m³
		118 m³
		482 m³
KCL/PHPA/Glycol	$8^{1/2}$	**385 m³**
		75 m³
		466 m³
		980 m³
		594 m³
		438 m³

Table 4-9: Calculated Quantity of Mud Waste from the Well

Type of Drilling Mud	Well Section (inch)	Well Section (m)	Casing Size (inch)	Casing Size (m)	Casing Depth (m)	Total Estimated Cuttings (m^3)	Mud attached to Cuttings (12.5% CBFR)
Seawater with Bentonite	30	0.7620	30	0.762	200	37.75	4.72
Seawater with Bentonite	26	0.6604	20"	0.508	930	262.97	32.87
KCL/PHPA/Glycol	$17^{1/2}$	0.4445	13-3/8"	0.339725	2060	142.76	17.85
KCL/PHPA/Glycol	$12^{1/4}$	0.31115	9-5/8"	0.244475	2305	38.8	4.85
KCL/PHPA/Glycol	$8^{1/2}$	0.2159	7 liner	0.1778	3,000 - 4500	19.37	2.42

Remark: 1. All wells have the same design; therefore the estimated amount of mud discharged is the same.
2. The amount of mud discharged is estimated based on a maximum 12.5% Cuttings Base Fluid Retention (CBFR).

4.9.2.5 Mud and Cuttings Treatment

The drilling fluids and drilled waste cuttings disposal will be completed according to the regulations and field testing for the properties will be carried out before dumping. Barite will be tested for presence of heavy metal and QA/QC test will be done to ensure no heavy metals are present.

Mud System

Mud will be formulated in a mix tank prior to entering the drilling system. In a closed-loop system, the mud is pumped from mud holding tanks on the drilling unit down the inside of the drill string and through the drill bit. The mud carries the drill cuttings from the bit up the annulus between the drill string and the well bore to the surface and into the drilling fluid handling system on the drilling unit. The drill cuttings are removed from the drilling mud by a solids control system. The mud is then reconditioned before returning to the drilling mud circulation system.

The mud circulation system includes several pieces of equipment to remove progressively smaller rock particles. General mud circulating equipment includes shale shakers, desanders, mud cleaner/silt separator, trip tankers and degasser. Each of these pieces of equipment is described in the following sections:

Shale Shakers

Shale shakers are a set of vibrating mesh screens that filter out large rock particles and allow the liquid mud to fall through the screens to a tank below. The screens operate on an angle so solids can move along the screen to the edge, where they fall into a chute and are discharged to the sea via a drop tube. The outlet of the drop tube is lowered approximately 3 m below the sea surface.

Smaller openings in the screen clean more solids from the whole mud, but there is a corresponding decrease in flow rate per unit area of screen. Hence, it is normal to run the screens in series with progressively finer screens (typically around 7 x 10-5 m), without discarding whole mud off the back of the shaker.

Desanders and Silt Separator

The mud skimmed off the shale shaker is then directed to the desanders and silt separators respectively. Desanders and silt separators function by means of a hydrocyclone. A hydrocyclone is a cone with a small hole at the narrow bottom end. The inlet pipe at the broad top of the cone is positioned so that the mud entering the cone swirls around the inside diameter. While the bottom of the cone is open, the main outlet pipe exits the top.

As mud enters the inside of the cone, it is forced to spiral down the cone by the following mud entering. As the cone gets narrower, the fluid speed has to increase to accommodate the flow rate, which results in very high centrifugal forces being applied. This means that the heavier solids particles are forced towards the cone walls.

As the fluid stream reaches the bottom of the cone, pressure builds up to a point where the fluid changes direction and begins spiralling back up the inside of the descending mud on the outside of the cone. Being heavier, the solids cannot change direction so readily and are ejected at the bottom of the cone, while the cleaned mud exits at the top. This process happens quickly with high flow speeds. Typically, it is around one sixth of a second between the mud entering and exiting the cone.

Trip Tank

A trip tank will be provided, which by using a rotating barrel, removes the finest particles.

Degasser

Mud will then be transferred to the degasser, which removes the gas from mud by means of vacuum. The gas is then sent to flare.

Cuttings Management

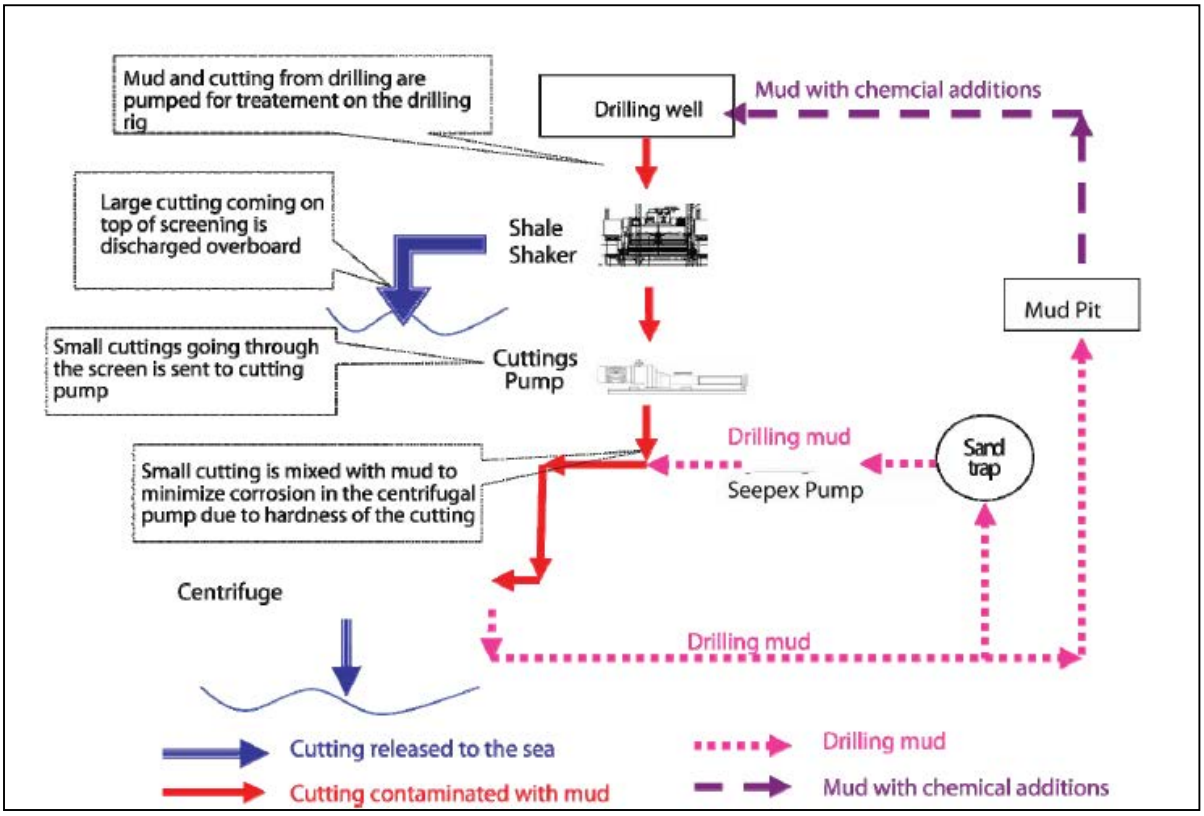
The proposed cuttings management system of the project is a cuttings wet wash system; comprised of a shaker and centrifuge. The system is designed to remove base fluid from cuttings as much as possible prior to discharge to sea. The procedures are described below.

Drill cuttings will be sent to the shaker first. The scalped cuttings coming off the top deck of the shaker are discharged overboard, while the smaller cuttings from the lower deck of the shaker are directed to a cutting pump and mixed with active mud to reduce abrasions to the centrifuge due to the hardness of cuttings. After that, the small particles mixed with mud will be sent to the centrifuge to remove cuttings.

As stated earlier, some mud is expected to be lost due to being attached to the cutting particles that are discharged. Using shakers and centrifuges to separate the mud from the cuttings, PCML expects to achieve an average of 12.5% 12.5% Cuttings Base Fluid Retention (CBFR) by weight. The actual percent CBFR would be much lower for the total cuttings discharged (around 4%).

Figure 4-8 illustrates the cuttings treatment system.

Figure 4-8: Cuttings Treatment System



Source: PCML, 2018

4.9.2.6 Wireline Logging

There are four main types of equipment used for wireline logging: the downhole instrument (which measures the data); the computerized surface data acquisition system (to store and analyze the data); the cable or wireline (which serves as both mechanical and data communication link to the downhole instrument); and the hoisting equipment (to raise and lower the instrument).

Wireline logging will be conducted after drilling of the reservoir section of the exploration well is finished. The downhole instrument will be connected to a cable and capstan and then lowered into the well to determine the physical and liquid properties of the formation at every layer surveyed during the wireline logging operation. The measured properties include: resistance, density of rock, radioactive properties, etc.

Generally, the downhole instrument includes three probes consisting of a gamma probe, a neutron probe, and a resistance probe.

- A gamma probe is used to determine the type of rock. Low values measured by a gamma probe indicate sandstone, and high values indicate shale.
- A neutron probe is used to determine the amount of reflected atoms. Some atoms will be absorbed by hydrogen which is located in the pores of the rock. High values measured by a neutron probe indicate low density and high porosity, and low values indicate high density and low porosity of the rocks.
- A resistance probe releases an electric current into the formation. Liquid in the formation will act as a resistor or conductor depending on the type of liquid. Low values measured by the resistance probe indicate that liquid in the formation is water, and high values indicate that gas or oil may be present in the formation.

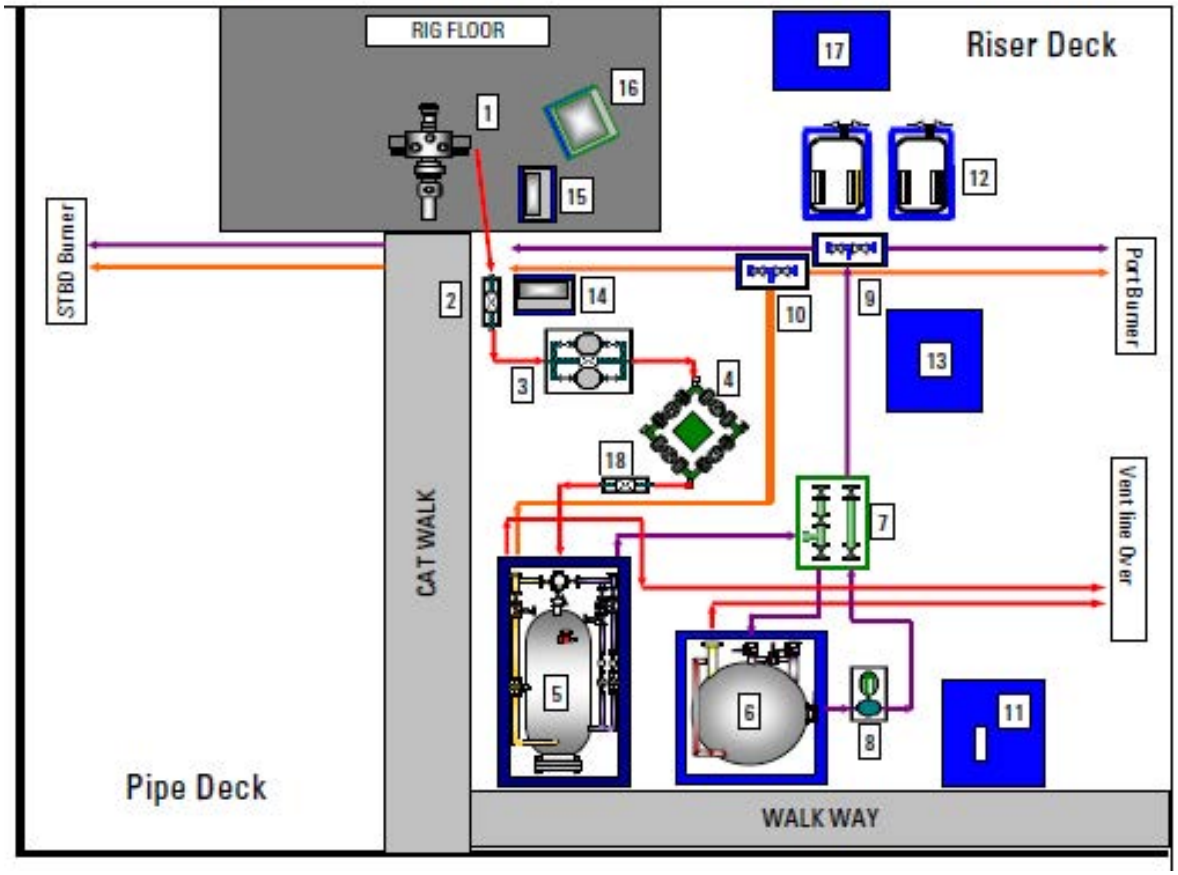
Results from the wireline logging operation will be shown in graph form. The graph will be interpreted to determine desired data (such as type of rock, type of petroleum, porosity of rock, permeability of rock, and water loading capacity of liquid). These data will be evaluated to determine whether the liquid in the formation is oil, water, or gas and plan future production development of the petroleum resources.

4.9.3 Well Testing

The purpose of a well test is to measure reservoir characteristics of an exploration or appraisal well; this information is used to determine the viability of a prospect. Information gained on a reservoir includes reservoir permeability, skin, pressure, size/extent, fluid type, depletion profiles, fault identification, drive mechanisms, connectivity (between other reservoirs) and flow potential. Well testing is normally performed after an exploration well is drilled to final depth and prior to installing completion equipment (or plug and abandonment). Methodology

Once the well had been constructed, cemented and logged, the target reservoir would be identified through logging activities. The 7" liner would then be perforated and well tested. A well test assembly would be lowered into the hole and a lighter fluid (Nitrogen/base oil) would be injected into the string. An underbalanced situation would be created where the formation fluids would be able to flow. There would be a surface test separator which would separate the fluids into water, gas and condensate. This separator would allow the measurement of the hydrocarbon flow. The produced fluid would then be flared to avoid any hydrocarbon spilled into the environment. The figure below shows a typical surface layout for the well testing equipment. (**Figure 4-9**)

Typical Surface Welltest Equipment Layout



Item	Equipment Description
1	Flowhead
2	Surface Safety Valve
3	Sand Filter
4	Choke Manifold
5	Separator
6	Surge tank twin compartment 100 bbl
7	Oil Manifold
8	Transfer Pump
9	Oil Diverter valve
10	Gas Diverter Valve
11	Acquisition Cabin
12	Air Compressor
13	Well test container
14	ESD Station
15	Sentree-3 Console
16	Sentree-3 Hose real
17	Sentree-3 container
18	iiCorr Sand Detector System

Figure 4-9: Well Testing layout

4.9.3.1 Flaring

The function of flaring system is to burn off the excess gas separated from the separator before releasing it to the atmosphere. The flare boom is constructed from a steel pipe with multi-head burners for efficient combustion. Based on experience in previous drilling campaigns, a total of less than 0.05 mmscfd of gas will be produced and flared.

4.9.3.2 Hazards

Hazards associated with surface testing are primarily surface pressure, while flowing and killing the well. A risk of hydrates also exists if the primary hydrocarbon phase is gas; however it is relatively remote. High pressure release of hydrocarbons is also a hazard. Pipework may be subject to erosion or seal failure resulting in a sudden and significant release of hydrocarbons at high pressure.

To ensure the exposure of personnel to hydrocarbon releases is kept to a minimum, the well will not be opened for the first time during hours of darkness. Once the initial integrity of the well test equipment has been established following the first well opening, subsequent openings may be done without restrictions related to hours of daylight.

4.9.3.3 Environmental Aspects

Protection of the environment is always of prime concern during any testing operations. To mitigate against any potential pollution the following actions will be implemented.

- Environmental issues will be addressed during the pre test meeting.

- The well is expected to be dry gas bearing. However in the event those hydrocarbon liquids are produced, the use of high efficiency burners with adequate air to ensure the most efficient burning will be employed.
- During the initial clean-up of this well, the produced liquid volumes should be relatively low as a cushion will be present in the string. As the presence and volume of hydrocarbons increase, flow should be managed via the separator and surge tank to enable liquids to be collected for later disposal if necessary. Good management of these fluids is critical to ensure an efficient and incident free clean-up.
- Flaring of hydrocarbons will only be carried out during daylight hours. This is due to the fact that any spillage or carry over from the flare may go unnoticed during the hours of darkness.
- Flaring operations will be continually monitored for excessive smoke. If any environmental concerns arise then the well will be shut in.
- The well test area should have waste oil drip and catchment containers available around any sampling points.
- The drains on the skids of well test vessels should be blocked off or closed where possible.

Figure 4-10: Flaring in an Exploration Drilling Campaign

Source: http://www.offshoreflying.org/

4.9.3.4 Well Control

A "blowout" may occur when a drill-string enters a reservoir. The reservoir pressure may cause an uncontrolled flow of gas, oil, or other well fluids from the well. The result is potentially serious. Although blowouts are very rare, all wells are equipped with an emergency valve known as a Blowout Preventer (BOP), which is designed to prevent blowouts.

The subsea BOP stack consists of six Cameron 18-3/4" 15,000 PSI "TL" type preventers and two Cameron "DL" type 18-3/4" 10,000 PSI annular preventers or equivalent. The minimum BOP configuration for will be as follows:

- Bling Shear (DVS) with Tandem Booster – TL with ST Locks
- Casing Super Shear Rams
- Blind Shear (DVS) with Tandem Booster – TL with ST Locks
- 7-5/8" to 3-1/2" VBRs – TL with ST Locks

- 5-7/8" to 3-1/2" VBRs – TL with ST Locks
- 7-5/8" to 3-1/2" Bi-Directional Rams – TL with ST Locks

The stack will make to the subsea wellhead using Cameron 18-3/4" 15,000 psi EVO, Vetco 27" H4 profile Hydraulic wellhead connector (both the wellhead connector and the wellhead profile are of the H4 type). Cameron "EVO" Drilling connector has a swallow of 13/24". The wellhead connector is equipped with Guide Funnel to guide and avoid any damange to the wellhead H4 profile.

The lower marine riser package (LMRP) mates to the stack with a Cameron collet 18-2/4", 10,000 psi 'HC' with studded top and secondary unlock connector.

All BOP stack valves are 15,000 psi Rated. The choke manifold is rated to 15,000 psi and will be pressure tested prior to landing the BOP.

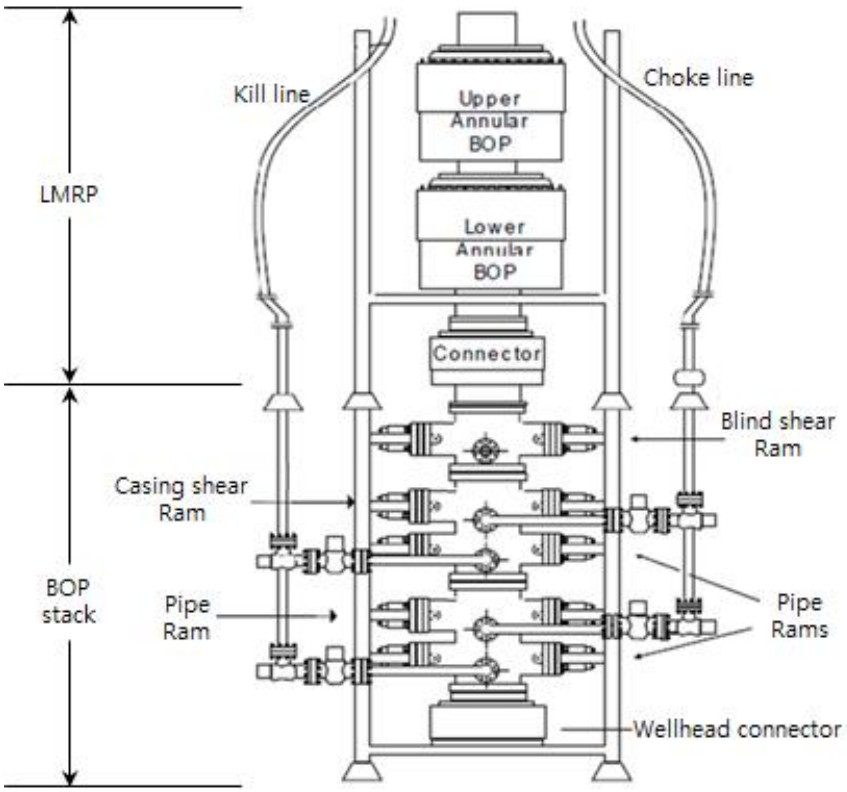


Figure 4-11: Blowout Preventer and Riser Schematic

Source: PCML, 2018

4.9.4 Well Plug and Abandonment

The exploration well will be either suspended or abandoned after the completion of operations at the well site. The temporary or permanent abandonment procedures for any well will be designed for that particular well after the well has been drilled and evaluated. The abandonment procedures will be based upon industry wide practice and procedures, taking into consideration both environmental

protection and safety issues. If the well test results indicate that there no commercial viable reservoir is found; the well will be permanently plugged and abandoned.

If the tests prove the well to be productive then it will be suspended by installing cement or mechanical plugs to isolate hydrocarbon intervals and fitting as well suspension cap to allow re-entry of the well at a later date. Once the drilling operations at the well site are complete, the rig anchors will be lifted from the seabed using an anchor handling vessel and the rig will be towed from the location, out of the field.

The following general well abandonment methodology will be followed:

- Isolate hydrocarbon-bearing zones in any open hole section by setting cement plugs such that they extend at least 30 m above and 30 m below each permeable formation.
- Isolate the open hole from cased hole by setting a cement plug from at least 30 m below the casing shoe to at least 30 m above the casing shoe. Test integrity of the plug by pressure testing to 1000 psi and by applying weight of 15klbs. An additional barrier (cement or mechanical) may be placed above the cement plug.
- Annular space between casing strings will have been isolated by achieving the Top Of Cement height at least 30 m inside the highest observed Hydrocarbon Zone. The remaining annular space will have residual mud column in it and will be isolated by the relevant seal assembly in the high pressure wellhead housing.
- Set a surface cement plug of at least 60 m within 200 m of the seabed. (No Test Required).
- The wellhead will be left in place on the seabed. The wellhead will extend above the seabed about 3 m.

4.9.5 Employment

Rig mobilization and exploration drilling in Block M12, 13 & 14 will be conducted by an expert contractor for offshore operations. The contractor has the skilled manpower and specialized equipment required for offshore work. Manpower having skills and experience with offshore exploration will be employed for the exploration drilling program. It is expected that 120 employees will be working on the rig during all phases; installation, drilling, testing, and abandonment. Accommodation on the drillship can support a workforce of 200 people. Therefore, the rig has adequate accommodation for all drilling workers. Three support vessels (8-10 workers per vessel) will be used to support the drilling activities and will patrol around the safety zone to prevent other boats entering the project area during drilling. All workers, both on the rig and vessels, will be accommodated offshore; therefore, it will not be necessary to provide onshore worker accommodation.

In addition, PCML will employ 8-10 full-time workers at the shorebases to support project activities such as boat supply, transportation of drilling equipment and materials to rig. Currently, these workers are working on the shorebases; from time to time 3-4 additional short-term workers will be hired to support shorebase activities for this project.

4.9.6 Facilities and Utilities

4.9.6.1 Support Vessels

PCML will have two primary supply vessels, as well as one additional shared vessel for this exploration drilling program. The 3 primary vessels are diesel-engine vessels, which have a fuel consumption rate of 20 mt/day. Each vessel will have approximately 8-10 crew members. The vessels will support project activities throughout the preparation, drilling, and well abandonment phases.

There will be between 6-10 trips per month for supply runs between Block M12, 13 & M14 and the Ranong shore base.

The estimated volume of dirty oil onboard the supply vessels is around 0.2-0.4 m^3 per month, which will be sent onshore for disposal.

4.9.6.2 Shore Base

There will be two shore bases for the project. The Thaketa Base, in Myanmar and Ranong shore base located in Ranong, Thailand. The drill rig will mobilize from Singapore. The Ranong shore base is currently supporting PCML's offshore operations. There will be approximately 8-10 personnel working at the shore bases.

The shore base is equipped with an office building, warehouse, material yard, temporary waste and chemical storage, etc. PCML's shore base contains:

1. Warehouse: The warehouse is operated by MM Logistic.
2. Material yard: The area will be used as temporary storage for bulk material, pipes, and other equipment delivered by vendors. Material and equipment stored here will be delivered to the project area or other areas of PCML's operations via supply vessels.
3. Chemical and waste storage area: The area will be used for temporary waste and chemical storage. Drilling chemicals will not be stored over night; they will be sent to the offshore operation on the day that the chemicals arrive at the shore base. The area will be used for temporary storage of general waste from offshore operations before being disposed of by contractors on the day that the wastes arrive at the shore base.

4.9.6.3 Accommodation

During drilling activities, accommodation for drilling workers will be provided on the main deck of the drilling rig. Workers working on support vessels will be accommodated in the allocated accommodation on the vessels.

4.9.6.4 Water Supply and Usage

All freshwater (both for consumption and for drilling) will be supplied by a local vendor in Yangon and loaded into closed containers. These containers will be delivered to the drilling site by support vessels.

Potable water: The offshore drilling rig has potable water tanks with a total capacity of 8,177 barrels (1300 m^3) used for drilling worker's consumption. All drinking water will be sourced from local retail suppliers in Yangon. Based on PCML's drilling experience, water usage for a workforce is estimated at 80 L/person/day for drinking and sanitary use. The demand for drinking will have a beneficial impact on the local sales of bottled drinking water.

Drill water: The offshore drill rig has drill water tanks with a total capacity of 18,869 barrels (3000 m^3) for dedicated tanks, used for supporting drilling activities. It is expected that 569 m^3 of fresh drill water will be used for drilling the well.

4.9.6.5 Power Supply

Power to the rig for supporting drilling activities will be supplied by five generators driven by diesel engines. Total power supply is 9500 hp. One spare generator will be used in case of an emergency situation or during service or repair of one of the main generators. Estimated fuel consumption, based on previous projects using rigs with similar power requirements, is 36,600 L/day.

4.9.7 Transportation

Road transportation for this drilling program will be minimal, consisting of small transport distances for non-hazardous solid waste, chemicals and equipment transportation from the Ranong shore base and the Thaketa shore base.

4.9.7.1 Solid Waste Transportation

After solid wastes are transported to the shore base, PCML's drilling contractor will arrange trucks to transport the wastes to appropriate disposal facilities according to waste type; two 4-m^3 skips will be loaded on each truck. No wastes will be stored on the shore base over night. The disposal facilities are located no more than 50 km from the shore base.

Only General non-hazardous ship waste is allowed to transfer for further disposal at Ranong Support Base (RSB). The remaining non-hazardous and hazardous waste will be transferred to Thaketa shore base for further disposal according to PCML's Waste Management Plan.

Based on previous similar exploration drilling campaigns studied by IEM, typically 64 m^3 solid waste are generated per well. Consequently, based on a worst case scenario, approximately and 8 truck trips (8 m^3/truck) will be required to transport the wastes to the disposal facilities

4.9.7.2 Chemical Transportation

A local contractor will be supplying chemicals for this drilling program. During the Block M12, M13 & M13 exploration drilling program, it is expected that 13 trucks trips for chemical transport will be required for the exploration well. Chemicals will be transported from the local contractor's storage to the Ranong shore base over a 50 km distance. No chemicals will be stored at the shore base; chemical will be transported to the shore base on the day of shipping out.

4.10 Exploration Drilling Emissions, Discharges and Waste Generation

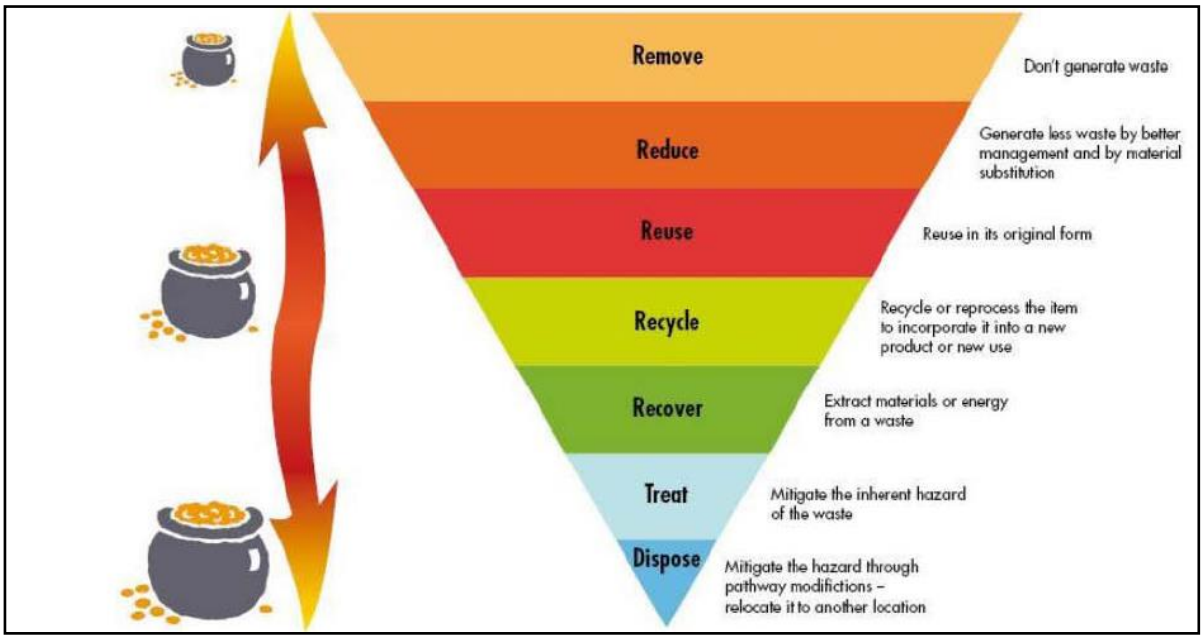
Emissions, discharges and waste generation will conform to applicable government regulations in Myanmar.

All wastes produced will be assessed and classified by type prior to treatment, transport, disposal or recycling. Wastes are classified as:

- Drilling Mud and Cuttings;
- Wastewater (effluent);
- Hazardous waste (e.g., chemical waste, waste oil etc.);
- Non-hazardous solid waste (e.g., wood, paper, steel, food waste etc
- Air emissions;
- Noise
- Fluids Produced from the Separators During Drilling and Testing.
- Waste Management Plan

4.10.1 Waste Classification

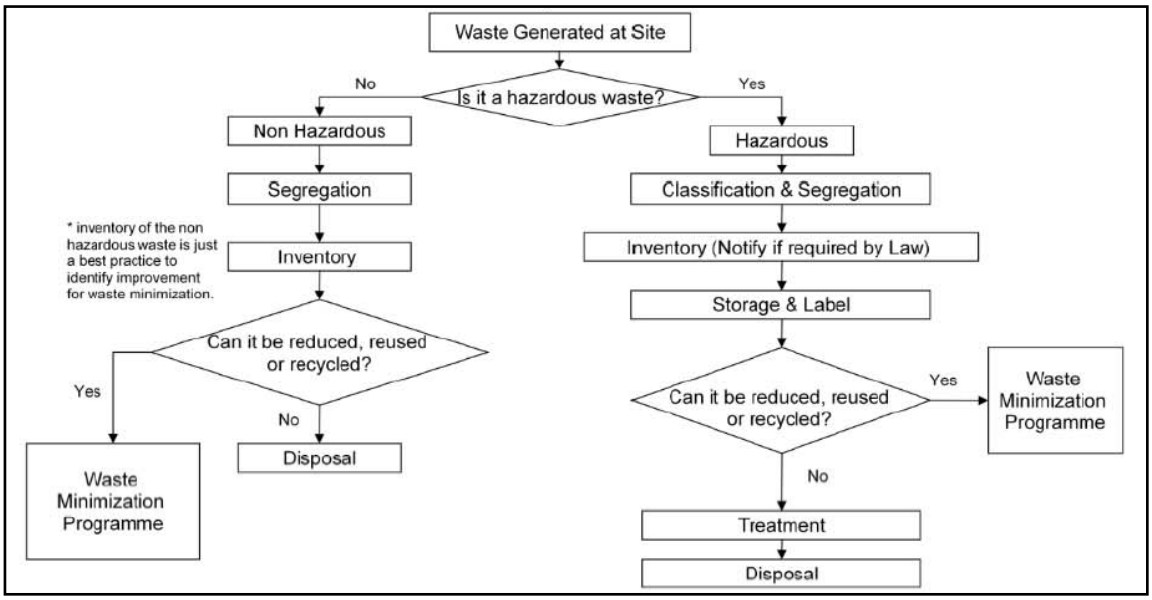
The PCML exploration program will handle waste according to PETRONAS Standards. The waste management will follow the best practices shown in **Figure 4-12**.



Source: PCML, 2018

Figure 4-12: Waste Management Best Practice

All wastes will be classified and segregated before responsible disposal. The classification and segregation process is shown in **Figure 4-13**.



Source: PCML, 2018

Figure 4-13: Waste Classification and Segregation Process

4.10.1.1 Containers

All wastes will be collected, stored, and segregated in arranged containers. All provided containers will be as follows:

- Install adequately in the working area, accommodation and office area,
- Make from durable materials compatible with the waste to be collected, leakage proof, sturdy, stable and easily handled,
- Prevent the ingress of animals, escaping odor and place under cover to avoid leachate,
- Medical or clinical waste shall be separated from other wastes because, they may contain infectious agents and potentially toxic substance for example sharp objects shall be packed in puncture-proof containers.

Containers used for medical waste shall be marked prominently with universal warning signs and/or the word "Medical waste". Used needles and syringes represent a particular threat as failure to dispose of them safely may lead to recycling and repacking. Where possible, management of medical/clinical wastes should be integrated into existing healthcare waste management system.

4.10.2 Air Emissions

4.10.2.1 Drilling Rig Emissions

Diesel generators will be used as a source of power supply for the drilling rig. The generators will operate 24 hr/day throughout all project activities on the rig during the project's duration (75 days).

Estimated fuel consumption is 36.60 m^3/day. Based on a compilation of air pollution emission factors established by the U.S. Environmental Protection Agency (EPA), air pollutant emissions from the generators on the rig during the worst case drilling and testing of the well is 103.68 tons nitrogen oxides, 6.89 tons sulphur oxides and 22.41 tons of carbon monoxide.

Air pollutant emissions from flaring of produced gas at the well will be 0.05 ton nitrogen oxides, 0.10 ton total hydrocarbons, and 0.25 ton of carbon monoxide.

Because air pollutants will be emitted during a limited period, the well site is located in an open area, and no communities or operations are located nearby, no significant environmental impacts from the drilling are expected. In addition, regular maintenance of power generators will be conducted to minimize emissions.

4.10.2.2 Greenhouse Gas (GHG) Emissions

Emissions of greenhouse gases from the Block M12, 13 & M14 Exploration Drilling Project are estimated for the different project phases:

- Preparation (electric power generation and marine transportation): a one-time release of 10,112.0 tonnes CO2 eq;
- Drilling (power generation, marine transportation, and road transportation): a one-time release of 23,594.6 tonnes CO2 eq;
- Testing (power generation, marine transportation, flaring): a one-time release of 6793.1 tonnes CO2 eq.
- Abandonment (electric power generation and marine transportation): a one-time release of 10,112.0 tonnes CO2 eq;
- This entire project is estimated to generate a worst case maximum of to 50,611.7 of CO2 equivalent for three well locations, based on 75 days per well. Air emissions and their impacts are discussed in the Impact Assessment **Chapter 6**.

4.10.2.3 Fugitive Releases

Other releases to the atmosphere will arise as a result of fugitive emissions of methane and non-methane hydrocarbons from a range of sources including, fuel bunkering, transfer operations.

Particulate emissions (dust) will also arise during bulk materials transfer operations, such as barite or cement loading, from the bulk handling system vents.

Releases of ozone depleting substances (ODS) may arise during maintenance of HVAC systems as well as from fugitive sources associated with such equipment.

Compared to the continuous emissions from the online power generation equipment on the offshore drilling unit and supply vessels, quantities of fugitive emissions are unlikely to be significant.

4.10.3 Wastewater

4.10.3.1 Sanitary Wastewater

Sanitary wastewater includes wastewater from both the sanitation facilities and the food canteen facilities on the drilling rig and support vessels. Total wastewater quantity is estimated to be 2025 m^3 for 75 operation days for 3 wells using a rate of 60 liters/person/day, maximum rig crew number of 120 persons, and support vessel crew of 24-30 (approximately 8-10 crew members/vessel). Sanitary wastewater from support vessels will be discharged directly to sea at a distance of over 12 nautical miles from the nearest shore. Sanitary wastewater from the drilling rig will be piped to the on-board wastewater treatment system prior to discharge. The discharge location will be at greater than 12 nautical miles from the nearest shore. These methods comply with MARPOL 73/78 (Annex 4) requirements.

Treated effluent must comply with MARPOL 73/78 Annex 26 requirements as specified below:

1. pH: 6-8.5
2. Biochemical Oxygen Demand (BOD) < 25 mg/L
3. Chemical Oxygen Demand (COD) < 125 mg/L
4. Total Suspended Solids (SS) < 35 mg/L
5. Total Coliform < 100 individuals/ 100 ml

4.10.3.2 Drainage

Drainage water consists of ballast water and deck drainage from both support vessels and the drilling rig, and may be contaminated with oil and grease. Drainage water will be collected and treated at the oil/water separator, installed on the rig and both support vessels. The oil/water separator will separate water from oil prior to discharging the water portion to the sea. Treated wastewater shall comply with MARPOL 73/78 Annex 4 requirements, which regulate pollution prevention of vessel and ship drainage (oil content < 100 ppm discharged at more than 12 nautical miles from the nearest shore or not over 15 ppm at less than 12 nautical miles). Separated oil and grease will be collected in an oil container for further onshore disposal.

4.10.3.3 Drilling Waste

Drill Cuttings

Amount of cuttings generated from wells are estimated in **Table 4-7**. A total of 502 m^3 of drilling cuttings are expected to be generated from the exploration drilling program, which will be eventually discharged at sea after being treated overboard.

Drilling Mud

Mud will be removed from the cuttings to the extent possible. PCML will discharge cuttings with a maximum of 12.5% Cuttings Base Fluid Retention (CBFR). It is estimated that 62.71 m^3 of drilling mud will be discharged into the sea, as shown in **Table 2-11**. The recovered mud will be re-conditioned and returned to the mud circulation system. The mud in casings will come out and be treated through the shaker system, and reused. After completion of the drilling campaign, there will be less than 200 m^3 of WBM left in their mud tanks; the drilling mud will be kept for future campaigns or returned to the drilling mud suppliers.

4.10.4 Solid Wastes

PCML has developed a Waste Management Plan to ensure correct and safe handling and disposal of non-hazardous and hazardous waste generated from the project.

This plan applies to all sites managed by PCML and to all personnel including contractors. This procedure deals with waste classification, segregation, handling, temporary sites, waste transfer, storage, and disposal facilities, record and reporting of non-hazardous waste and hazardous waste produced by PCML.

4.10.4.1 Type and Amount of Waste Generated

Solid wastes from the proposed project consist of non-hazardous waste and hazardous waste.

Non-Hazardous Waste includes paper, plastic, and other uncontaminated materials. Based on PCML's previous exploration drilling experience in The Andaman Sea and The Gulf of Thailand, the amount of non-hazardous waste is expected to be 4-5 tons per month.

Hazardous Waste includes all types of used oil, oil-contaminated water, expired cooling agents, fluorescent lights, chemical and expired chemical and solution, contaminated clothes, chemical containers, batteries, used PPE, residual material contaminated with oil or chemical, etc.

The estimated volume of dirty oil onboard the supply vessels is around 0.2-0.4 m^3 per month, which will be handled and disposed by the drilling contractor. Based on previous experience with similar projects, the total amount of hazardous waste is expected to be 0.5 ton per month.

Non-hazardous and hazardous wastes will be segregated and appropriately disposed of by the drilling contractor according to the PCML Waste Management Plan.

Container

All wastes will be collected, stored, and segregated in arranged containers, as shown in **Figure 4-14**.

All provided containers will be as follows:

- Install adequately in the working area, accommodation and office area,
- Make from durable materials compatible with the waste to be collected, leakage proof, sturdy, stable and easily handled,
- Prevent the ingress of animals, escaping odor and place under cover to avoid leachate.
- Medical or clinical waste shall be separated from other wastes because, they may contain infectious agents and potentially toxic substance for example sharp objects shall be packed in puncture-proof containers.

Containers used for medical waste shall be marked prominently with universal warning signs and/or the word “Medical waste”. Used needles and syringes represent a particular threat as failure to dispose of them safely may lead to recycling and repacking. Where possible, management of medical/clinical wastes should be integrated into existing healthcare waste management system.

Figure 4-14: Example of Hazardous Waste Containers

	
Non-Hazardous Waste Skip	**Hazardous Waste Skip**

Disposal Facilities

The waste disposal facilities available for PCML wastes are as follows:

- Yangon City Development Committee (YCDC) surface disposal yards and incinerator,
- Hazardous Waste area a DOWA Thilawa Waste Management Facility,
- Dumping at sea (e.g. biodegradable waste, treated drilling mud & cutting, blasting grit, treated produced water.)

4.11 Health, Safety and Environmental Management

PETRONAS is committed to Health, Safety and Environment (HSE) and shall take reasonable and practicable steps to prevent and eliminate the risk of personal injury, occupational illnesses and damage to properties. PETRONAS shall take proactive steps and measures in the protection and the conservation of the environment.

In line with PETRONAS' Group Policy Statement on Health, Safety and Environment, PETRONAS Carigali shall therefore:

Comply with HSE legal requirements wherever we operate;

Implement effective risk control measures in all our activities; including operations covering acquisition, exploration, development, production and abandonment, which will eliminate, prevent or reduce risks to a level as low as reasonably practicable (ALARP);

Build an effective and resilient HSE Management System as an integral part of our business philosophy and cultivate a desired HSE Culture;

Provide competent workforce, adequate resources and organisation in all our activities in ensuring a safe environment at the workplace;

Promote HSE engagement between joint venture partners, regulatory authorities, Contractors and key stakeholders;

Drive and promote continuous improvement in HSE performance;

Establish effective crisis management and emergency response capabilities in all our operations.

PETRONAS requires all its employees, Contractors and others to strictly adhere to this policy at all times. Joint venture partners of PETRONAS Carigali are expected to implement an effective HSE Management System which is in line with industry best practices.

4.11.1 Potential for Accidents, Hazards and Emergencies

PCML will ensure the contractor will have an Emergency Response Procedures Manual that includes response procedures for blowout, fire, earthquake, medical emergency, release of hazardous/toxic substances, etc. PCML has an Emergency Response Plan (ERP) that will be updated specifically for each well site operations and site specific location.

This ERP is considered a standard E&P Emergency Management System and is based on Industry accepted standards and practices (e.g. ISO, BCI, EMI, BS etc.). Topics of the ERP are outlined in **Table 4-10**.

Table 4-10: Emergency Response Plan

Main Sections	Topics
Procedure & Responsibilities	Drilling Superintendent On-Scene Commander PIC (Person-In-Charge)
Emergency Organisation	Introduction Emergency Response Philosophy Overview of the Response Organisation
Emergency Arrangements And Facilities	Major gas release / H2S

	Explosion / fire Accommodation fire Blow-out Oil spill Hazmat spill Helicopter incident Man missing Loss or damage of radioactive source Vessel accident Medevac Bomb threat / terrorist act Fatality On-scene Commander Field Arrangements and facilities
Risk Management	Major Hazards Emergency Plans

The Emergency Response Procedures are detailed in **Section 8.1, Emergency Response Plan**.

4.11.2 Pollution prevention equipment

In case of leakage or spill of hazardous wastes from a container, all workers will be evacuated from that area and the HSE team will clean up the affected area with a spill kit which has been prepared on the rig. Moreover, the rig will have a bunded area to ensure waste does not spill into the sea, an example of which is shown in **Figure 4-15**. In addition, clean-up equipment will be provided on the vessel used for waste transport. If a waste spill occurs, this equipment will be used immediately to clean-up the waste spill.

The drill ship will carry the appropriate spill response equipment as per Regulation 37 of Annex I of MARPOL which requires that oil tankers of 150 ton gross tonnage or more and all ships of 400 tons gross tonnage or more, carry an approved Shipboard Oil Pollution Plan (SOPEP) which includes the oil spill response kit (**Figure 4-16**). This regulation includes mobile offshore drilling units (MODUs), and mobile offshore unites (MOUs). A typical drilling unit comprises the following pollution prevention equipment:

- Sewage treatment systems;
- One air operated garbage compaction system;
- Garbage grinders;
- One skimmer tank typically of 25 bbls;
- One oily water separator typically of 5 m^3/h.

Apart from the above equipment, several devices will be available on the rig or on its support vessels for emergency interventions (e.g. oil spill, blowout, etc.). The following means of intervention are anticipated:

- Fire hydrant and water cannon;
- IMO/SOPEP spill kits;
- Containment floating boom and trawling floating boom;
- Sprayer boom associated with a stock of dispersant agent;
- Oleophilic skimming or mechanical skimming.

A Blowout Contingency Plan, an Oil Spill Response Plan and an Emergency Response Plan will be applied during the appraisal/exploration drilling campaign. (**Appendix 2** and **Appendix 3**)

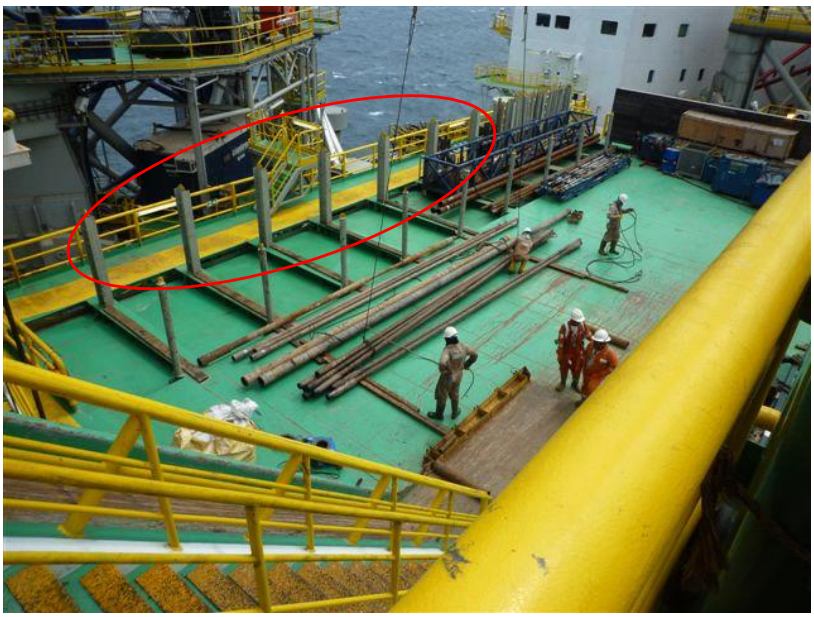


Figure 4-15: Bund

Figure 4-16: Spill Kit Example

4.11.3 Hazardous materials

Hazardous materials comprise the mud and cementing chemicals, which are typically stored in tote tanks in a dedicated closed area. Hazardous materials will not be discharged into the environment.

4.11.4 Ballast system

The drilling unit shall be equipped with fully segregated ballast tanks that will be filled and emptied with seawater as necessary to maintain trim. This system avoids hydrocarbons pollution of ballast water.

In the context of offshore oil & gas operations, ballast water is of great importance for the safety of both crew and ship. However, there are globally environmental issues related to ballast water. This is because in shipping, ballast water primarily consists of water collected from the point of take-off which contains thousands of living species (and to a lesser extent sediment). The species carried in ballast water may be invasive and are particularly responsible for a number of very destructive incidents towards marine biodiversity.

The International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) was adopted on 13 February 2004. It seeks to prevent the spread of harmful aquatic organisms from one region to another by establishing Standards and procedures for the control and management of ships' ballast water and sediments. All ships engaged on international voyages are required to manage their ballast water and sediment according to certain rules, in accordance with their own ballast water management plan. All vessels must also carry a ballast water register and an international ballast water certificate.

The provisions for each support vessel include the following:

- Vessels must have on-board and implement an approved ballast water management plan.
- Vessels must have a Ballast Water Register
- Where the ship is unable to renew the ballast water in the manner described in the convention, such ballast renewal should be carried out as far as possible from the nearest land and, in any event, at a distance of at least 50 nautical miles from the nearest land and at least 200 meters from the bottom.

5 DESCRIPTION OF THE SURROUNDING ENVIRONMENT

5.1 Setting the Study Limits

5.1.1 Introduction

This section presents the existing environmental, social, economic and health conditions of the project area, including physical and biological resources, human use values, and quality-of-life values.

The study area for this project is focused on the physical, biological, and human components of the environment in the coastal and offshore areas of the Tanintharyi Coastal Zone including the broader Andaman Sea and adjacent Indian Ocean area where Blocks M12, M13 & M14 is located. The Tanintharyi Coast. It is the longest coastal zone in Myanmar, approx. 1,200 km long. It includes the Myeik Archipelago (also called the Mergui Archipelago), comprising more than 800 islands.

The proposed wells in Blocks M12, M13, & M14 are located approximately 90 NM from the shoreline near Dawei and 105 NM from Myeik, as shown in **Figure 5-1**. This chapter describes the physical, biological and socio-economic characteristics of the project's study area.

5.1.2 Scope of Study

The environmental setting of the Project consists of physical (earth, air, water, acoustic), biological, and human components. The human component includes land use, demographics, socio-economic, cultural and quality of life aspects. The study is focused on the conditions found within the block, however, broader regional information is provided where it provides relevant context to the assessment.

This section provides an overview summary of the project environment including the physical, biological, human use, and quality of life characteristics of the project study area including:

- Physical Environment (climate and meteorology, geology, oceanography, seawater quality and sediment quality);
- Biological Environment (threatened species, plankton, phytoplankton, zooplankton, marine fish sharks, marine mammals, seabirds, sensitive ecosystems and protect areas);
- Human Use Values (fisheries, marine transportation, offshore oil and gas infrastructure, and
- Quality of Life Values

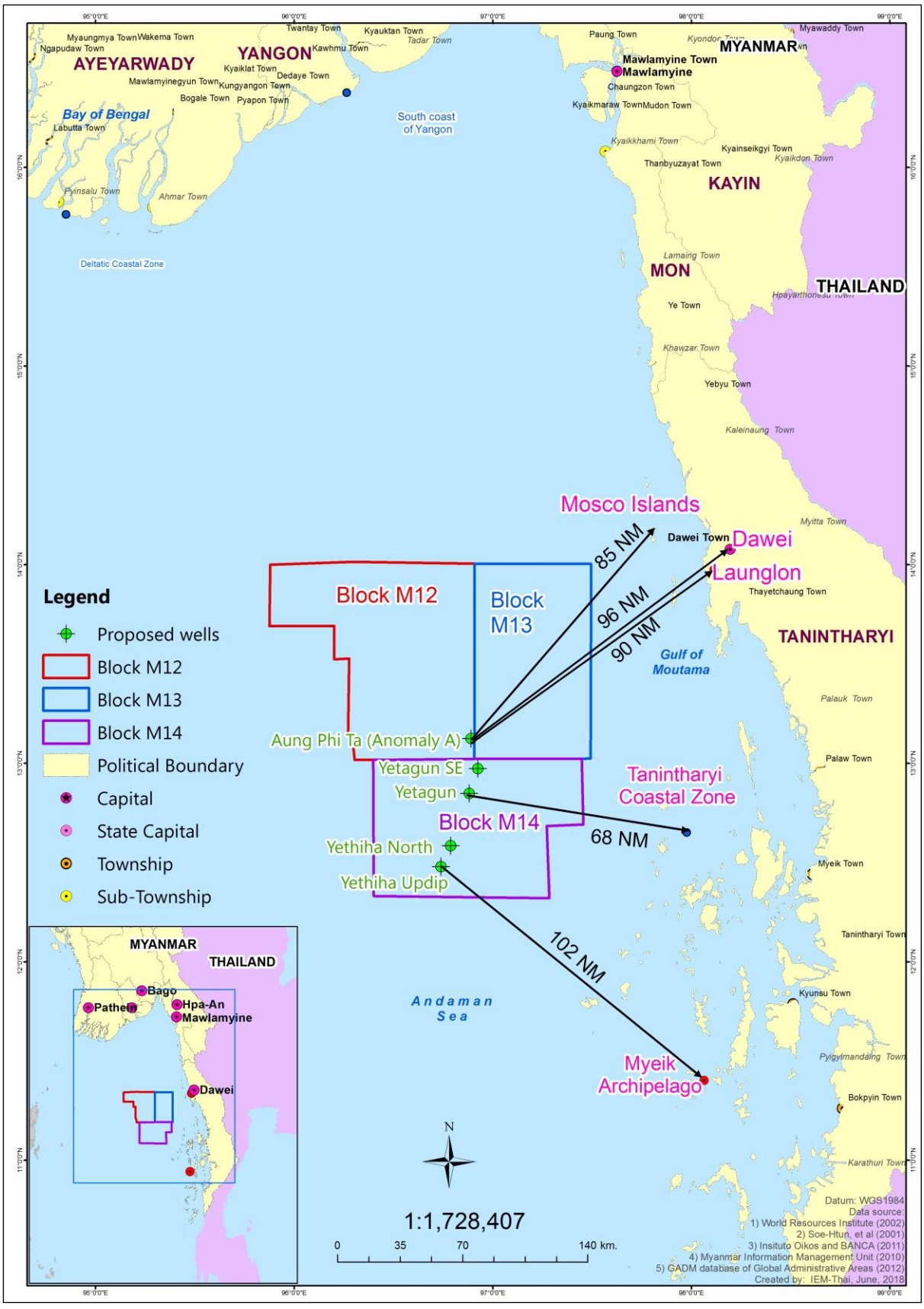


Figure 5-1: Blocks M12, M13, & M14 Area

5.2 Methodology for Data Collection and Analysis

5.2.1 Data Sources

5.2.1.1 Primary Data

PCML has completed a number of EIA/IEE Studies, and Marine Environmental Monitoring (MEM) and Marine Baseline Survey (MBS) within these blocks for related developments. These reports will be useful information for the EIA Study of this project as secondary information sources. In addition an environmental baseline study has been conducted to collect seawater samples and sediment sample near the planned drill sites.

Primary data collected during the field survey included the following:

- Sea water
- Sediment
- Benthos and Plankton
- Socio-economic data
- Local perspective, concerns and interests regarding oil and gas development

The geographical scope of the baseline survey provided an overview of site conditions believed representative of the Block M12, M13, and M14 exploration drilling program.

The specific methodologies and results from the analyses performed for Block M12, 13 and 14 were discussed in the corresponding sections in this report.

5.2.1.2 Secondary Data

Secondary data sources came from literature and relevant authorities in the project area. The secondary data sources are cited throughout this report, and listed in the references section.

5.3 Physical Environment

5.3.1 Climate and Meteorology

Myanmar has a tropical climate, and can be divided into two climatic regions, the tropical south and the temperate north. Weather is primarily influenced by the Northeast (NE) Monsoon and the Southwest (SW) Monsoon, and the short transitional periods between them (Britannica Encyclopaedia, 2009).

In the Andaman Sea, those monsoon regime generates four seasons:

- Winter - The northeast monsoon brings infrequent rainfall, mild temperatures, and lower humidity during winter (December to April).
- Spring - The spring transition period between the monsoons (April and May) is hot with very variable weather and thundery squalls.
- Summer - The southwest monsoon (June to September) is characterized by cloudiness, overcast skies, frequent light rain, interspersed with rain squalls or thunderstorms.
- Autumn - Post-monsoon transition from October and November.

The northeast monsoon initiates in November, peaks from December through February, and wanes in March. Winds out of the northeast prevail, bringing cooler, dry weather with rainfall averaging less than 20 mm/month. The southwest monsoon occurs from June through September and is characterized by high humidity and rainfall (average 600-700 mm/month). This monsoon brings daily

light rains, along with periodic squalls, thunderstorms, and heavy torrential rains. Along the Tanintaryi coast, rainfall has exceeded 1,200 mm in a month during the southwest monsoon. Transition periods occur between the dominant monsoon seasons. The annual rain is approximately 200 inches per year.

5.3.1.1 Temperature

In the coastal and offshore areas the air temperature varies little during the year but, as recorded in the coastal regions, the hottest months in the area are usually March and April. As an example monthly temperature data for Dawei and Myeik meteorological stations, during the period 1981-2010 (30 years) are shown in **Figure 5-1**. The minimum temperature was ranged between 18.2-23.7 °C at Dawei and 21.4-24.8 °C at Myeik and the maximum temperature was ranged between 28.47-34.7 °C at Dawei and 29.8-33.9 °C at Myeik throughout the year. The warmest months were March and April, while the coolest months were December and January.

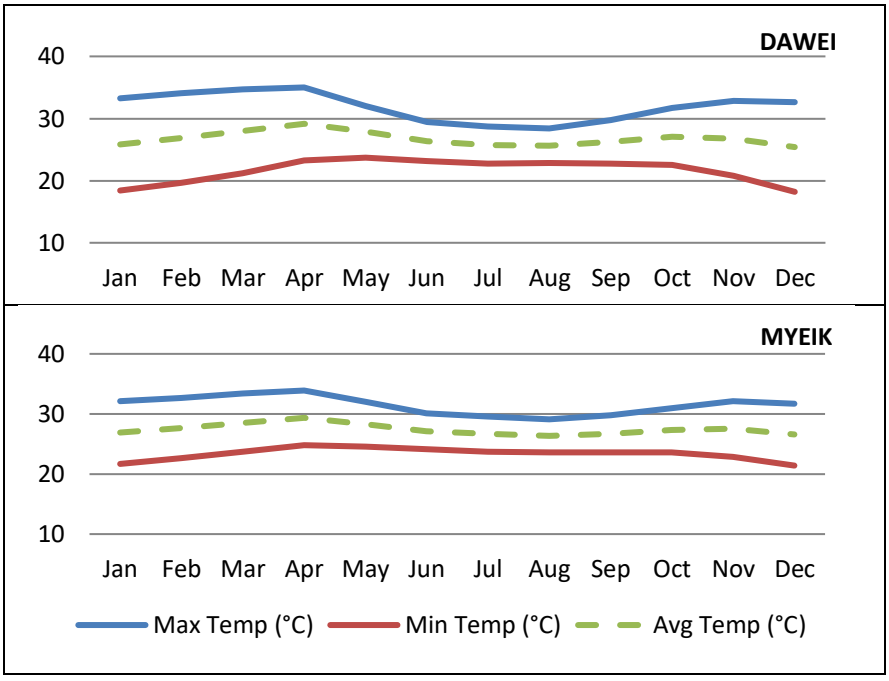


Figure 5-1: Monthly Temperature at Dawei and Myeik (1981 - 2010 Average)

5.3.1.2 Rainfall

Rainfall is highly seasonal in Myanmar. At least 75% of the precipitation occurs during the southwest monsoon (June to September). From **Figure 5-2** in the 30 year period (1981-2010), the average annual rainfall were 5,440 mm at Dawei and 3,943 mm at Myeik.

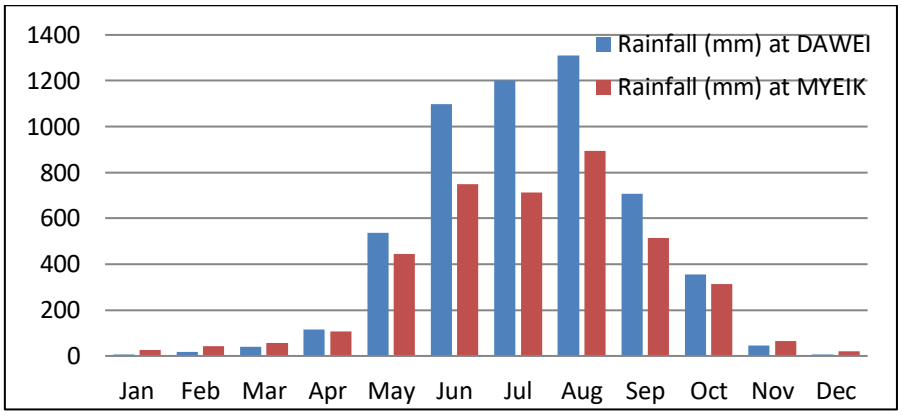
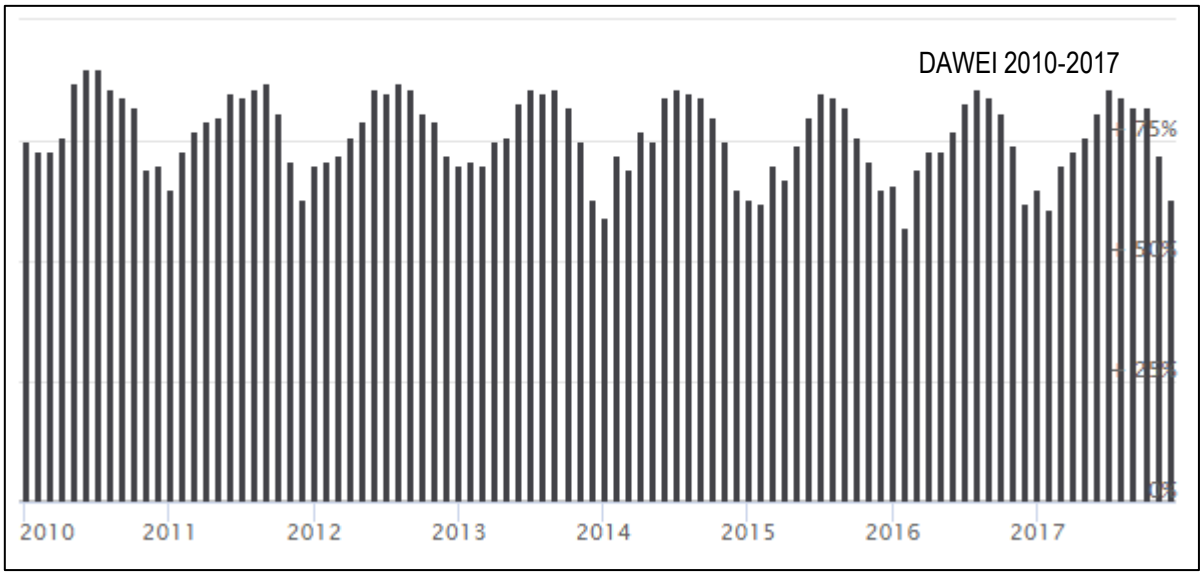


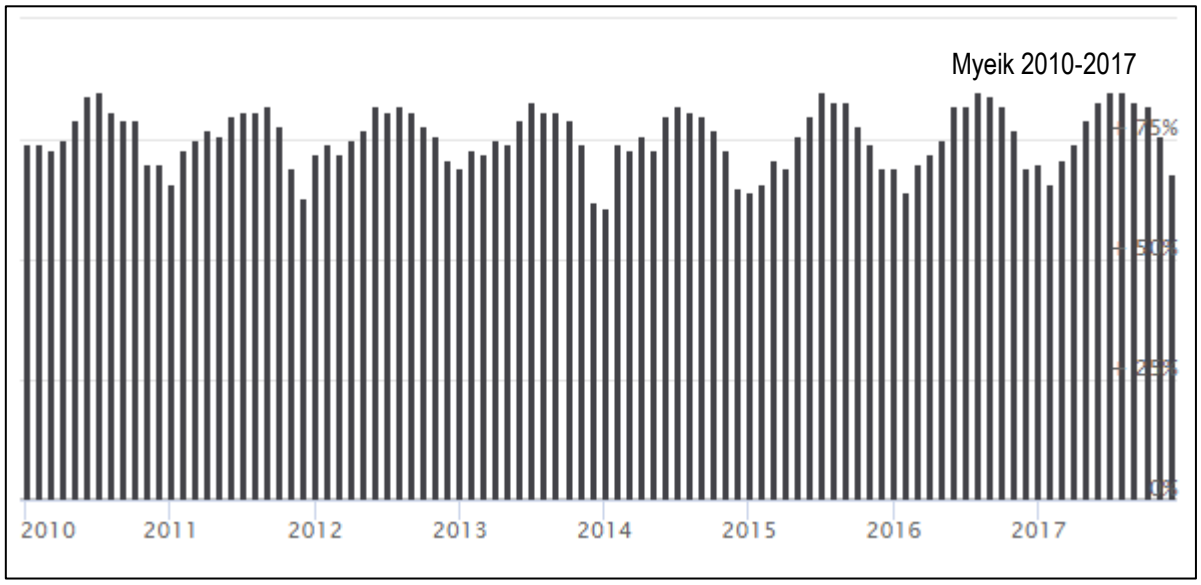
Figure 5-2: Monthly Rainfall at Dawei and Myeik (1981 - 2010 Average)

5.3.1.3 Humidity

The main differences in the humidity values occur during the seasonal changes from the moist equatorial air of the Southwest Monsoon to the dry continental winter monsoon. The Northeast Monsoon generates high moisture levels over the south and south-west.

Worldweatheronline.com reported monthly average relative humidity at Dawei and Myeik meteorological stations that Dawei station RH data were ranged from 57 - 90% over the period of 2010 – 2017. The high RH usually occurred in June – August which ranged from 75 - 90%. While Myeik station RH data were ranged from 61 – 85% in the same period. The high RH often occurred during June – August. (See **Figure 5-3**)





Source: Weatheronline.com

Figure 5-3: Humidity Data at Dawei and Myeik

5.3.1.4 Wind Speed and Direction

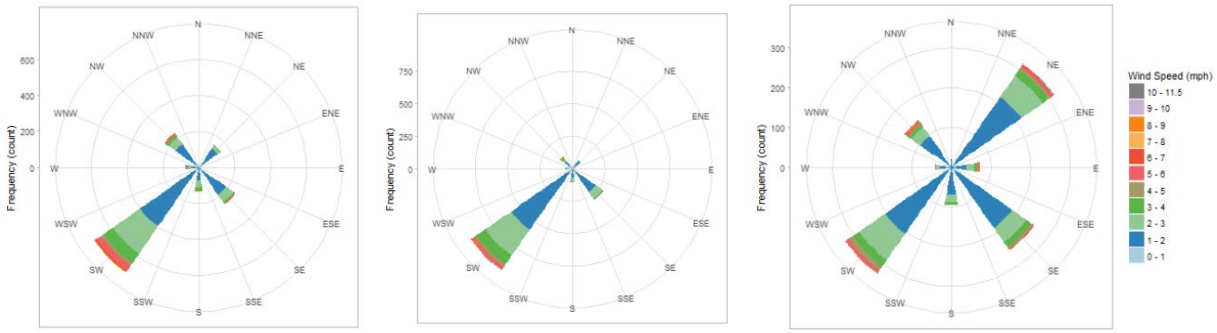
During the Northeast Monsoon, from early December through March, winds blow most frequently from between NNW and ENE although there is some variability. Winds at this time are generally light, averaging Beaufort force 2 - 3. Winds in excess of force 5 are rare, except during tropical cyclones, and sea conditions are generally benign.

During the spring inter-monsoon season from mid-March to mid-May, dry northeast winds give way to moist southwest winds. Weak and variable winds occur in April and May.

The Southwest Monsoon, which extends from mid-May through late September, brings the rainy season, along with maximum cloudiness. Winds are stronger, most frequently in the range of force 3 to force 5. During the height of the SW monsoon, between June and August the wind reaches force 8 (gale force) for about 1% of the time averaged over a number of years.

The autumn inter-monsoon season, in October and November, sees moist Southwest Monsoon air replaced by moist east winds over the coasts. These bring weak and variable winds, with land and sea breezes prevailing until the Northeast Monsoon is established (National Geospatial-Intelligence Agency, 2005).

The win rose of Dewei could represent the wind speed and direction in the study area. (See **Figure 5-4**)



(a) Pre monsoon season (b) Monsoon season (c) Post monsoon season

Figure 5-4: Wind rose of Dawei (Nearest Station to Study Area)

5.3.1.5 Tropical Cyclones

Myanmar is vulnerable to cyclones, which originate in the Bay of Bengal during pre- and post-monsoon seasons from April to May and from October to November.

Cyclone-related disasters occur in this region every 3 to 4 years (Asian Disaster Reduction Centre, 2003). The Arakan Coast is more likely to be struck by a cyclone during the autumn transitional season (National Geospatial-Intelligence Agency, 2005). In addition to the destruction caused by high winds, storm surges generated by the cyclones in the region usually flood the low-lying and densely populated Ayeyarwady river delta region, and other coastal regions along the Andaman Sea.

In early May 2008, Cyclone Nargis, generated in the Bay of Bengal, was the deadliest cyclone to ever hit the country. It made landfall across the delta of the Ayeyarwady River, then continued northeast along the coastline and devastated parts of Myanmar, with a storm surge of up to 3 m that travelled up the rivers within the delta (Theilen and Pararas-Carayannis, 2009). **Table 5-1** shows all tropical cyclones recorded in the Andaman Sea in the past ten years. **Figure 5-5** shows historical cyclone tracks in the Andaman Sea. The nearest track was Phailin in 2013 as a depression with maximum wind speed of 140 knots.

Table 5-1: Significant Tropical Cyclones affecting the Andaman Sea 2006-2016

Year	Name	Type	Max. Wind Speed (Knots)	Distance/Km (Nearest Storm-Block)	Latitude (Decimal Degree)	Longitude (Decimal Degree)
2006	MALA	CY	120	241	15.6	92.7
2007	SIDR	CY	140	517	9.6	93.1
2007	AKASH	CY	65	395	14.4	91.1
2008	NARGIS	CY	115	152	16.0	94.6
2010	GIRI	CY	135	330	16.7	92.6
2012	NILAM	DP	55	319	11.3	93.7
2013	PHAILIN	DP	140	150	12.6	95.1
2013	LEHAR	DP	75	366	10.6	94.6
2014	HUDHUD	CY	115	328	11.0	95.2
2016	KYANT	CY	40	273	15.3	92.3
2016	VARDAH	CY	85	437	11.2	92.0

Source: Novel Oceanography Portal, 2016 available at http://www.metoc.navy.mil/jtwc/jtwc.html?north-indian-ocean
Remark: DP- Depression CY- Cyclone
Note: 2009, 2011, and 2015 storms were not included as not near Blocks M12, M13, & M14
The maximum sustained wind speeds in knots are for the centre of the storm at the time of closet approach

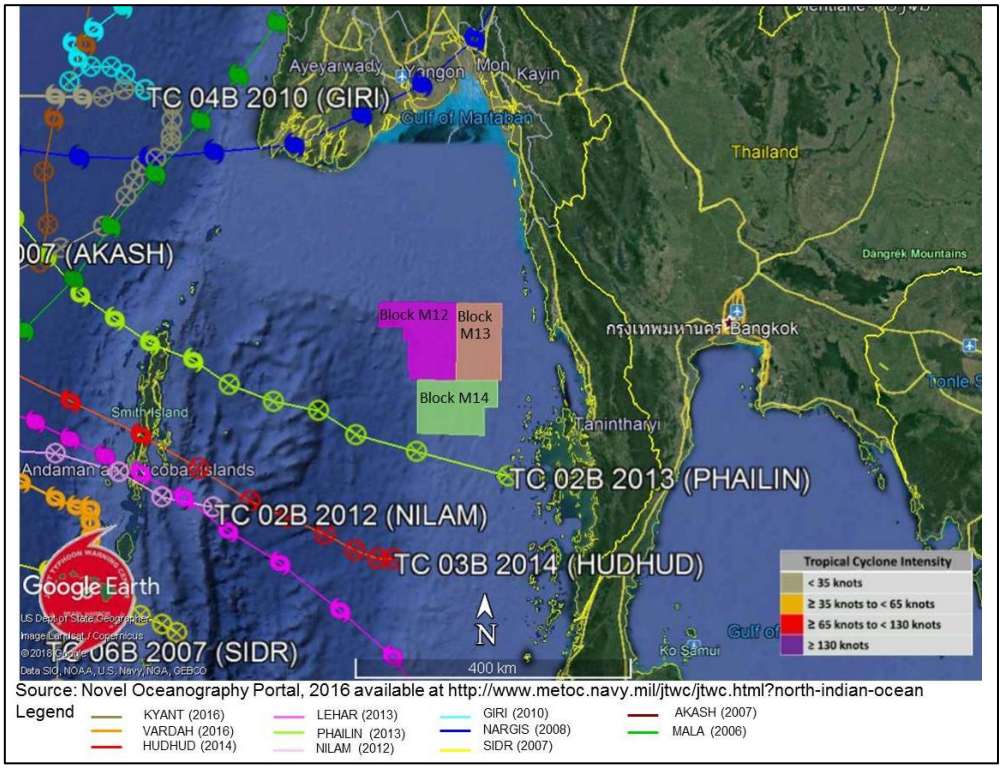


Figure 5-5: Historical Cyclone Tracks in Andaman Sea

5.3.1.6 Local weather at Yetagun Gas Field

The temperatures in the Yetagun platform vicinity range from monthly minimums of 22°C in January to monthly maximum temperatures of 32°C in April and May. A maximum temperature of 37°C has been recorded in the region.

Winds are predominately gentle to moderate in the Andaman Sea with average monthly speeds in the range of 3.5 – 7.5 m/s. Higher wind velocities in excess of 11 m/s occur less than 2% of the time and are most likely to occur during the northeast or southeast monsoon. An occasional tropical cyclone, southwest monsoon squalls, or northeast monsoon strong storm surge can create gale force winds (>17.5 m/s). The Andaman Sea/Bay of Bengal area averages 2 cyclones per year with variability from 0 to 4 cyclones. Winds blow predominately out of the SW to W during the SW monsoon, out of the NE to E during the fall transition period, out of the NW to E during the northeast monsoon, and out of the SW to NW during spring transition period. **Table 5-2** below presents the wind statistical data derived from 5 years of modelled wind data, and calibrated/verified with measured/observed data from the Yetagun exploration well drilling program (Steedman Science & Engineering 1994).

Table 5-2: Monthly, Seasonal and Annual Wind Speed and Predominant Direction

Period	Statistical Parameters			
	Min. speed (m/s)	Max speed (m/s)	Mean speed (m/s)	Predominate Direction (s) [1]
January	0.51	10.8	3.92	NW-E
February	0.51	14.4	3.93	NW-N, E
March	0.51	12.35	3.67	NW-N
April	0.51	11.83	4.16	W-NW
May	0.51	12.86	4.38	SW-NW
June	0.51	13.89	6.97	S-SW
July	1.03	12.35	6.65	SW-W
August	0.51	12.35	7.15	SW-W
September	0.51	10.29	4.81	SW-W
October	0.51	11.32	4.11	E-SE
November	0.51	16.46	5.51	NE-E
December	1.03	19.03	5.63	N-E
Annual	0.51	19.03	5.08	SW-W
Southwest Monsoon Period (Jun – Sept)	0.51	13.89	6.40	SW-W
Transition Period (Oct – Nov)	0.51	16.46	4.81	NE-E
Northeast Monsoon Period (Dec – Mar)	0.51	19.03	4.29	NW-E
Transition Period (Apr – May)	0.51	12.86	4.27	SW-NW

5.3.2 Geologic Setting Bay of Bengal and Andaman Sea

Block M12, M13 and M14 fall over the Tanintaryi offshore region. The Tanintharyi Shelf (also known as the Mergui Shelf or Mergui Terrace) forms the eastern part of the region and mainly overlies a basement of Palaeozoic–Mesozoic indurated sediments intruded by granites of the Phuket-Slate Belt terrane. Its western boundary is marked by the dextral Shan Fault (also known as the Mergui Fault in Thailand), and the shelf is located in an overall back-arc setting on continental crust. This shelf area is designated as shallow-water licence blocks M12 and M13 in the north to M18 in the south. The sediments on this shelf were sourced during much of the Early and Middle Miocene from the Thai-Myanmar Peninsula in the east, and the succession thickens westwards. During the Late

Miocene–Pleistocene, sediment input from the north became more dominant representing the distal portion of the Thanlwin/Ayeyarwady depositional system.

The Yetagun Field and associated discoveries in and around the SE corner of Block M12 (**Figure 5-6**) are close to the present-day shelf edge, which coincides approximately with the more gradational western boundary of the Tanintharyi Shelf.[1]

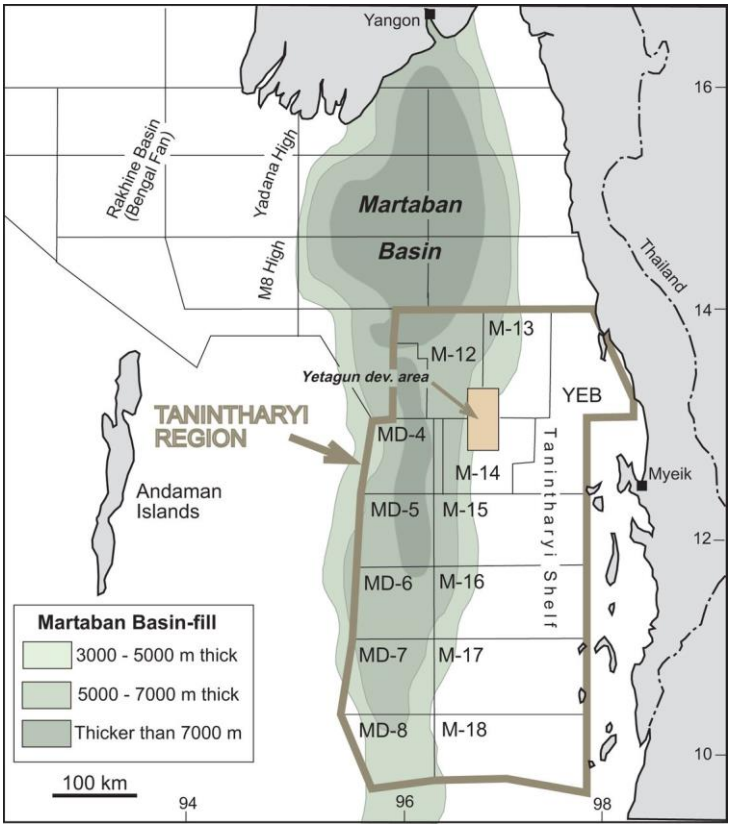


Figure 5-6: The Tanintharyi region showing MOGE block numbers, the Martaban Basin and the Yetagun gas field development area.[1]

The Yetagun structure occurs within a series of en echelon, rotated fault blocks along the Tanintharyi shelf escarpment in 100 m water depth. Metamorphic and granite igneous rocks form the pre-Miocene basement beneath the Yetagun field. Hydrocarbons of the Yetagun field are contained in the early Miocene sandstones which covered with younger deepwater shales. These shales are the source rocks for hydrocarbon accumulation, and when faulted against the sandstones, form ideal hydrocarbon traps. The top of the reservoir sandstones is buried down to 6300 – 7100 ft. from the surface in the Yetagun field.

The Andaman Sea lies along a convergent margin between the northeastern moving Australian and Indian plate and the nearly stationary Eurasian or Southeast Asian plate (Curray, 2005). It is an active back-arc basin lying behind the Sunda subduction zone where convergence between the overriding Southeast Asian plate and the subducting Australian plate is strongly oblique. Additionally there is an active spreading centre to the north east of the basin. The regional neotectonic setting of Myanmar is shown in **Figure 5-7.**

1 A. Racey, M.F. Ridd (2015) *Petroleum Geology of Myanmar*. Geological Society, London, Memoirs, Volume 45.

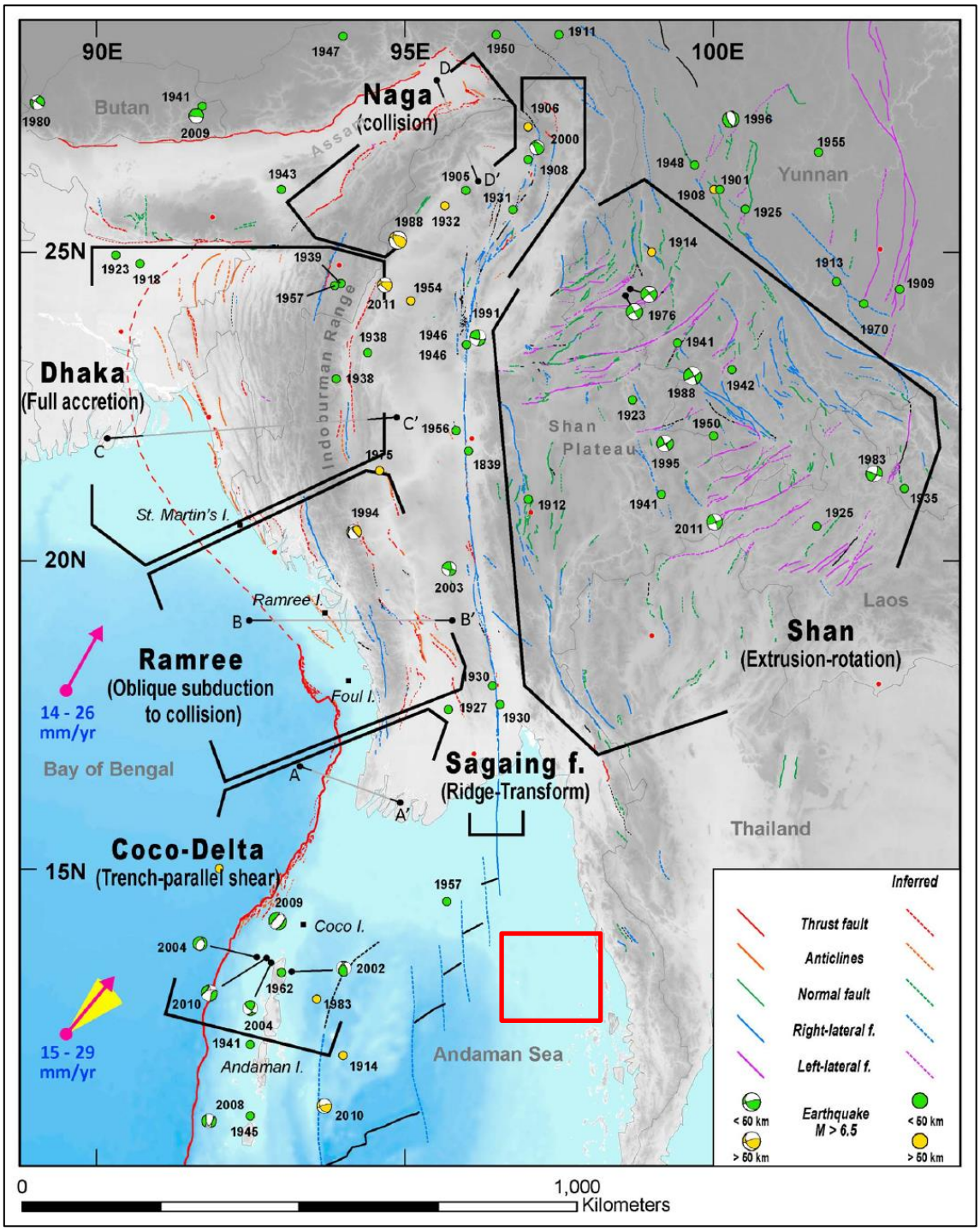


Figure 5-7: Regional Neotectonic Setting and Significant Earthquake (M>6.5)[2] (Approximated Block M12, M13 and M14 in red rectangle)

2 Wang, Yu et al (2014) Active tectonics and earthquake potential of the Myanmar region, *J. Geophys. Res. Solid Earth, 119, 3767–3822,* doi:10.1002/2013JB010762.

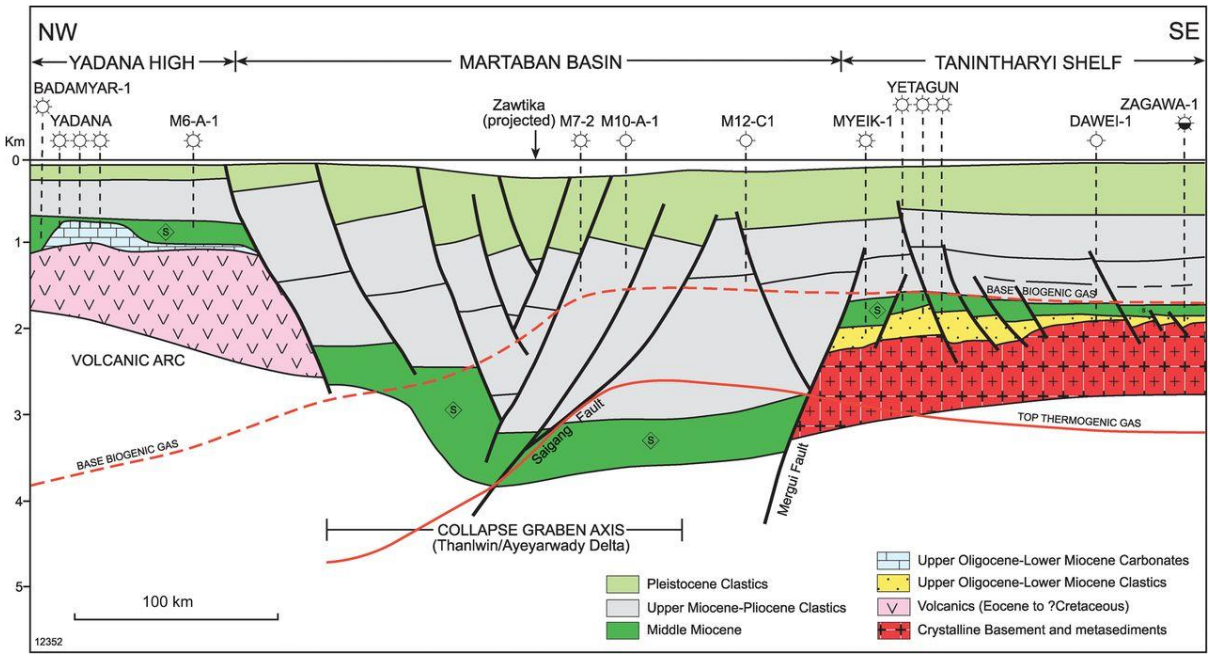


Figure 5-8: Geologic profile NW-SE across Yadana High to Tanintaryi Shelf[1]

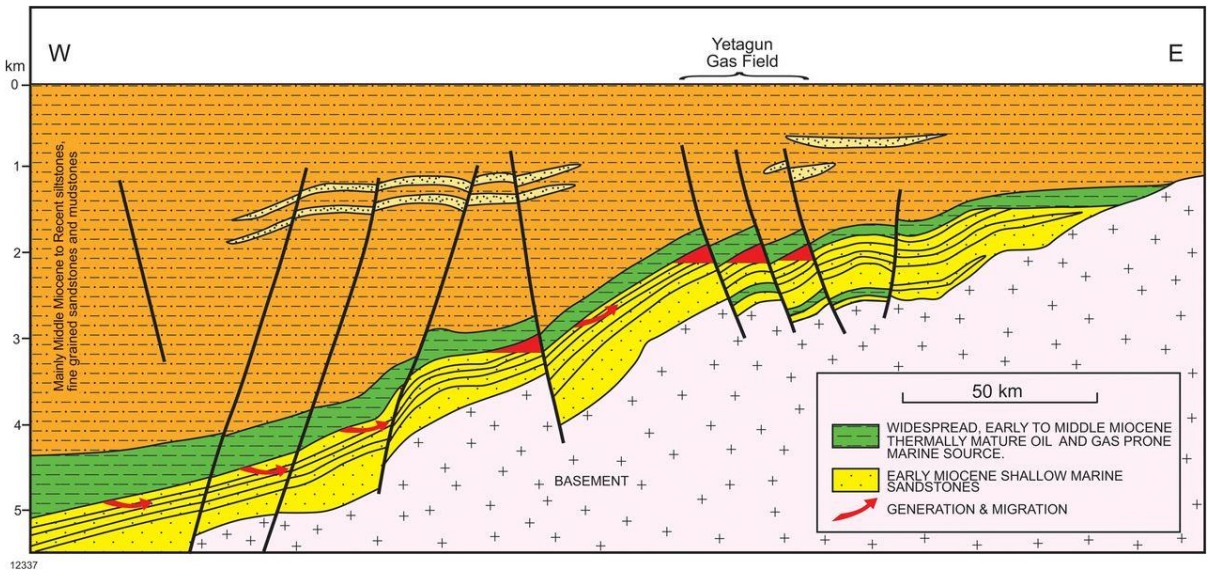


Figure 5-9: Geologic profile W-E across Yetagun Gas Field[1]

5.3.3 Earthquakes

According to Theilen and Pararas-Carayannis (2009), Myanmar is seismologically unstable and vulnerable to earthquakes due to its proximity to boundaries of major interacting tectonic plates. Specifically, the eastern Himalayan belt marks the collision boundary of the Indian tectonic plate underthrusting the Eurasian plate.

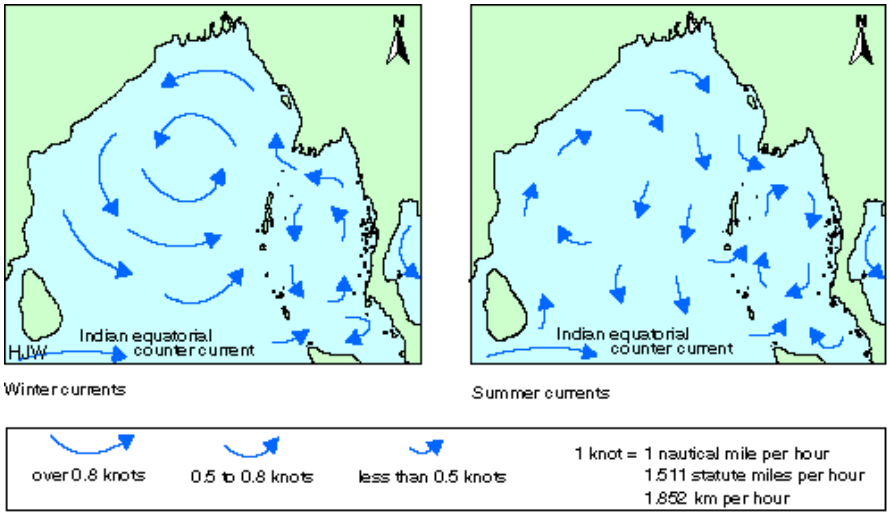
Wang, *et al* (2014) conduct the study which is to construct a view of the neotectonic architecture of the region that provides a clear framework for understanding of the recent seismic activity and the potential for future large earthquakes. The neotectonic mapping of the Myanmar region (**Figure 5-7**) shows that Geomorphologically evident active faults and folds of the Myanmar region comprise three majors systems, which accommodate the northward translation of the Indian plate into the Eurasian

plate and the extrusion of crust around the eastern syntaxis of the Himalaya. The western of these three systems comprises four distinct neotectonic domains, each distinguished by a unique geometry of the Sunda megathrust, where the Andaman Sea lies over. Distinct active hanging wall structures within each of these four domains include large strike-slip faults and both blind and surface-rupturing thrust faults. The Sagaing fault comprises the second of the three systems. Second-order structural characteristics of this ~1200 km long domain suggest division into 12 segments. Historical seismicity confirms that to a large degree these structurally defined segments constrain seismic ruptures. The third of the neotectonic systems is the Shan domain, a large region of conjugate left- and rightlateral active faults that accommodate extrusion of material around the eastern Himalayan syntaxis. Empirical global relationships between fault length and earthquake magnitude allow us to estimate maximum magnitudes for the active faults and fault segments in each of these domains. The lengths of these structures imply that most are capable of generating events greater than M_w 7.0. However, the historical and instrumental records show that smaller earthquakes are common, because of partial rupture of faults and fault segments is common. Each of the four megathrust segments is capable of producing an earthquake of M_w 8.5 or greater, but only one has done so in the period of historical record. Estimates of slip rates for the faults of the Shan domain and empirical relationships between fault length and magnitude suggest that recurrence intervals for complete rupture of these faults are typically several thousand years. Seismic moment release in this domain during the past century may have been greater than the millennially averaged rate. Empirical relationships and historical seismicity show that ruptures of segments of the Sunda megathrust and the Sagaing fault should occur every few hundred years, on average.

5.3.4 Oceanography

5.3.4.1 Currents

The oceanic flow changes direction twice during the year; it is cyclonic during the spring and early summer, and anticyclonic the rest of the year (**Figure 5-10**).

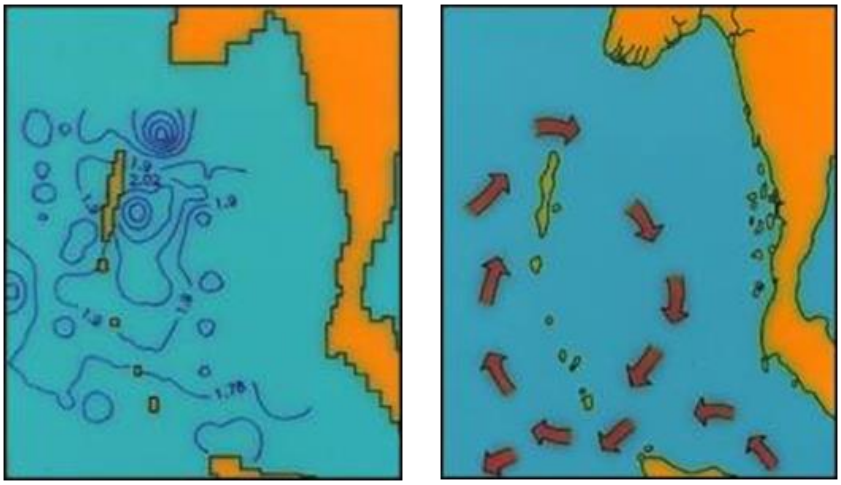


Source: India Engineering (2015)

Figure 5-10: Bay of Bengal and Andaman Sea Current Directions

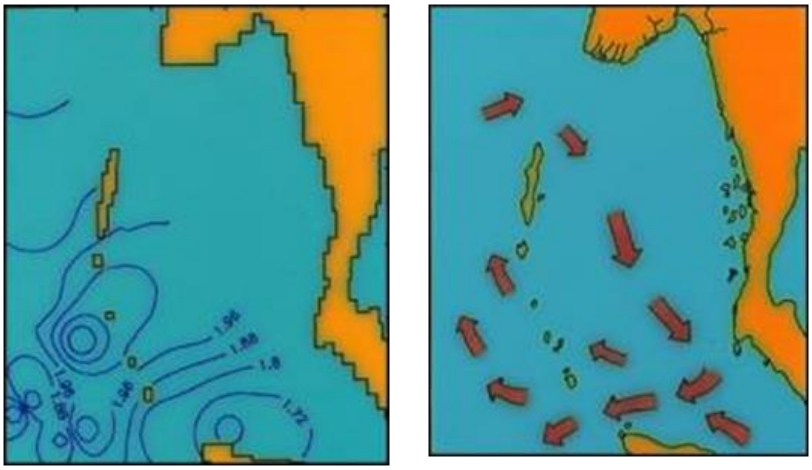
In the Andaman Sea, water circulates from the north Indian Ocean, Bay of Bengal, southwards along the coast of Myanmar and Thailand, extending southwest of Phuket Island and turning to the Indian Ocean. The southern water mass circulates from Malacca Strait northwards to the southwest coast of Phuket Island, meeting with the northern water mass and moving offshore to the Indian Ocean. Subsequently, such interaction between the two circulation leads to mixing of water mass around

southwest of Phuket Island as shown in **Figure 5-11** and **Figure 5-12** during the two monsoon seasons.



Note: Left image shows the contour line of seabed, and right image shows the water circulation which is derived from left image
Source: Khokiattiwong and Limpsaichol, 1994, as cited in Limpsaichol, Undated

Figure 5-11: Water Circulation during the Northeast Monsoon



Note: Left image shows the contour line of seabed, and right image shows the water circulation which is derived from left image
Source: Khokiattiwong and Limpsaichol, 1994, as cited in Limpsaichol, Undated

Figure 5-12: Water Circulation during the Southwest Monsoon

5.3.4.2 Tides

The tides along the Tanintharyi coast and along the west coast of Thailand are semidiurnal, with a small diurnal inequality in both time and height. The tides approach these coasts from the south-southwest and progress north. The mean spring ranges increase from about 3 m at the Myanmar-Thailand border to over 5.2 m at Myeik (National Geospatial-Intelligence Agency, 2005). The currents flow at an average rate of 0.4 knots, with a maximum of about 0.7 knots. Near the coast, the tidal currents will also exert great influence and will either augment or deter the non-tidal currents (National Geospatial-Intelligence Agency, 2005).

5.3.4.3 Bathymetry

The average depth of the Andaman Sea is about 1,000 metres (3,300 ft). The northern and eastern parts are shallower than 180 metres (600 ft) due to the silt deposited by the Irrawaddy River. This major river flows into the sea from the north through Myanmar. The western and central areas are 900–3,000 metres deep (3,000–10,000 ft). Less than 5% of the sea is deeper than 3,000 metres (10,000 ft), and in a system of submarine valleys east of the Andaman-Nicobar Ridge, the depth exceeds 4,000 metres (13,200 ft).

The bathymetry for the coast of Myanmar is shown in **Figure 5-13**. Bathymetry in the planned drilling area within Blocks M12, M13, & M14 is between water depths of 120m to 180 m.

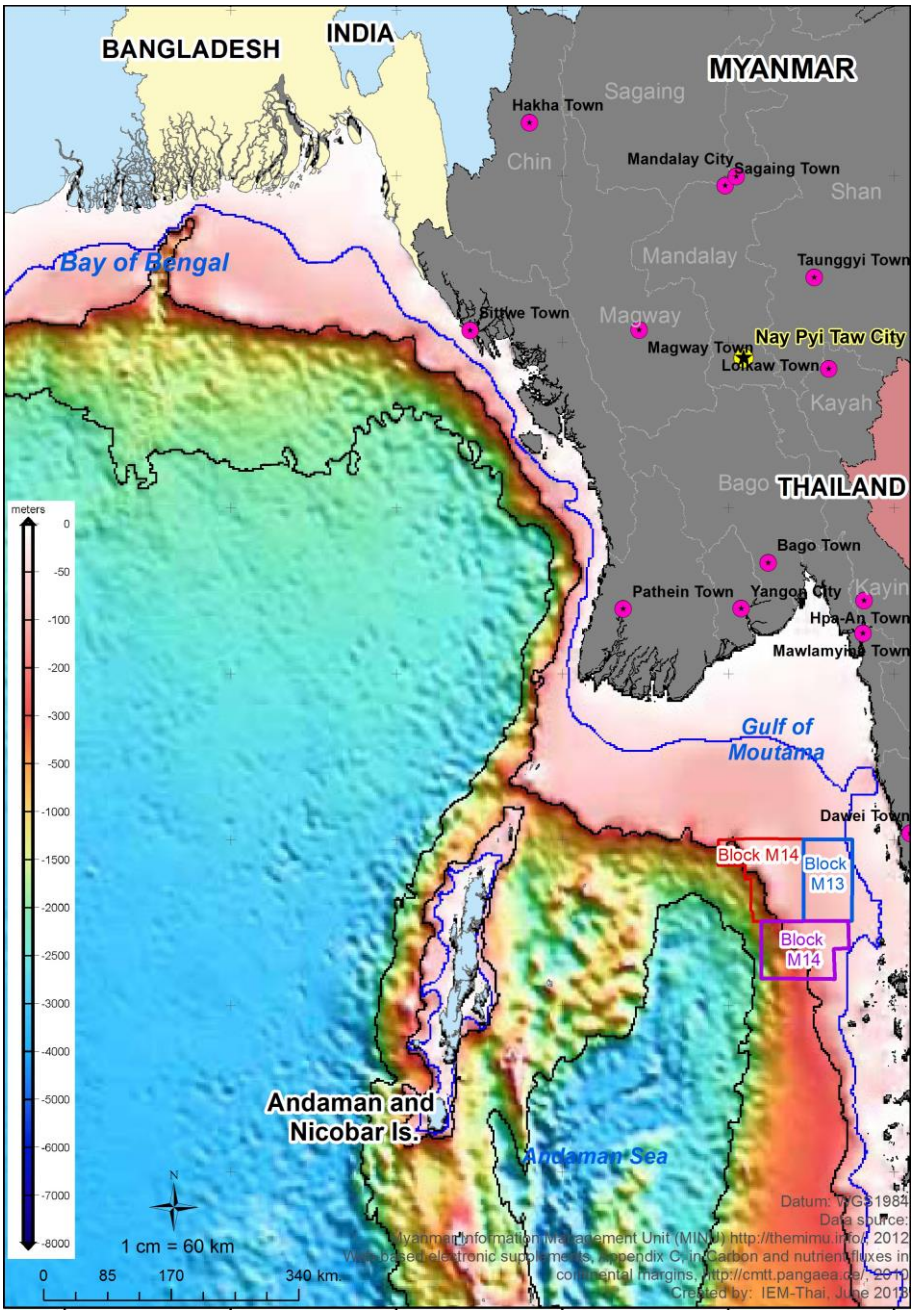


Figure 5-13: Bathymetry off Myanmar's Coast

5.3.5 Regional Seawater Quality

Information on existing seawater quality has been derived from a number of studies in the public domain. This includes data from the seawater quality sampling results from the research vessel "Dr. Fridtjof Nansen" which were sampled in 2013 with a horizontal near-surface (5 m depth) distribution of temperature, salinity, oxygen and fluorescence for the whole Myanmar coastal area, have also been reviewed. Station positions from this survey are indicated as black dots as shown in **Figure 5-14**.

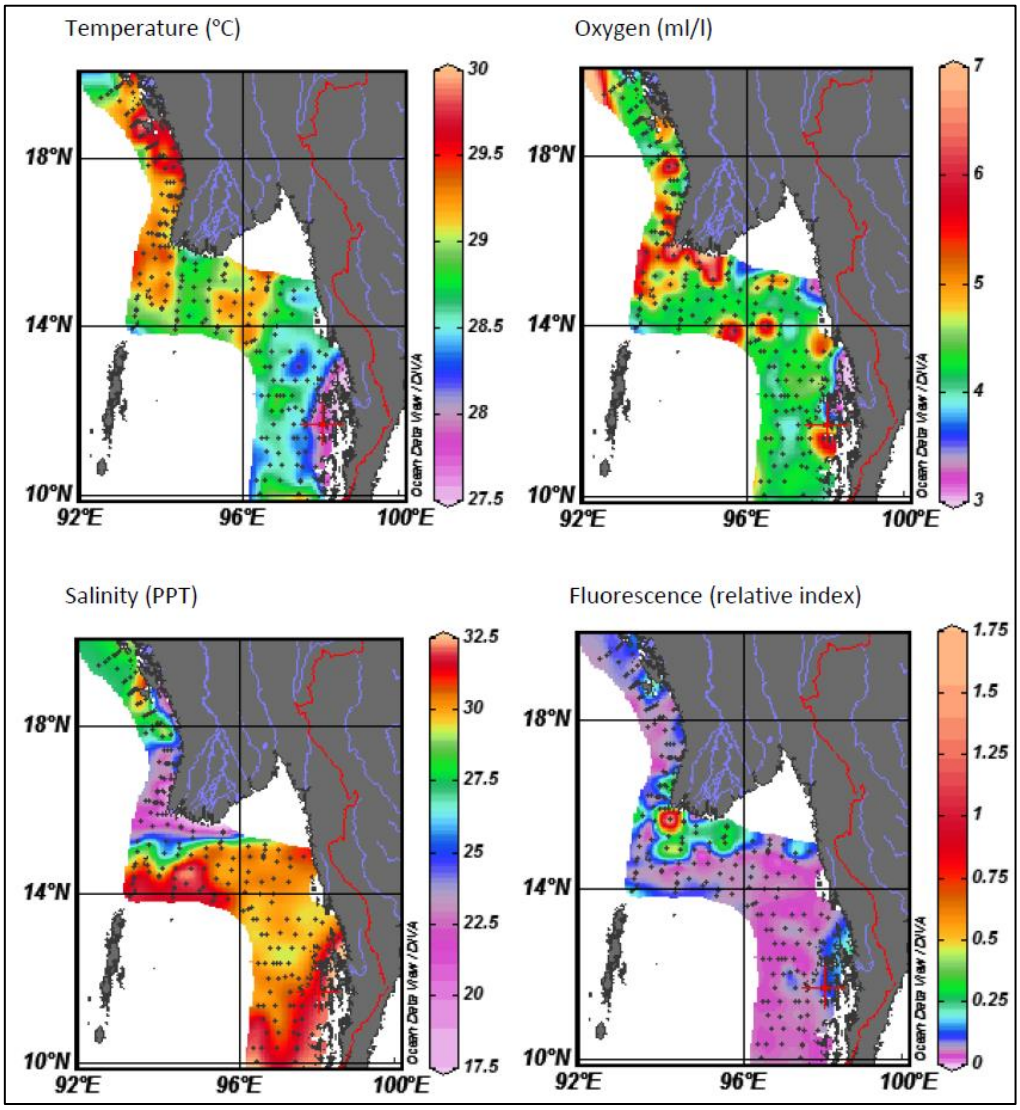


Figure 5-14: Horizontal near-surface (5m depth) distributions of temperature, salinity, oxygen and fluorescence for the whole Myanmar coastal area [3]

Particular to Tanintaryi Coastal Region **Figure 5-15** (Block M12, M13 and 14 lies between 12-14°N), Temperatures at depth of 5m in the Tanintharyi coastal region tended to be slightly cooler than in the regions further north. The temperatures were typically about 28-29 ºC at this depth, though slightly lower (~27.5-28ºC) at some north-eastern stations near the coast. Salinity at 5m was generally above

3 Jens-Otto, K. et al (2014) Cruise Report "Dr. Fridtjof Nansen" Myanmar Ecosystem Survey 13 – 17 December 2013. Retrieved from http://www.boblme.org/documentRepository/Nansen%20ecosystem%20survey%20Myanmar%2013%20November%20-%2017%20December%202013.pdf

~29.5, and increasing towards the east and south. The highest 5m levels were encountered in the most southerly area, in some cases with values between 32 and 32.5. Oxygen concentrations at 5m depth in this regions were generally between 4 -5 ml/l, with levels in the higher part of this range and at some stations also > 5 ml/l in the eastern part of the area near the coast. A few coast-near stations in the northern part of the region, however, actually showed 5m oxygen concentrations below 4 ml/l. Fluorescence levels throughout the Tanintharyi coastal region were comparatively low, only with a few stations in the north-eastern part displaying slightly higher values. We note that one particular coastal station (bottom-depth 30m) displayed very high fluorescence at depth of 6 m (no data available for 5m), which is not revealed by **Figure 5-14** and **Figure 5-15** which are based on data from 5m.

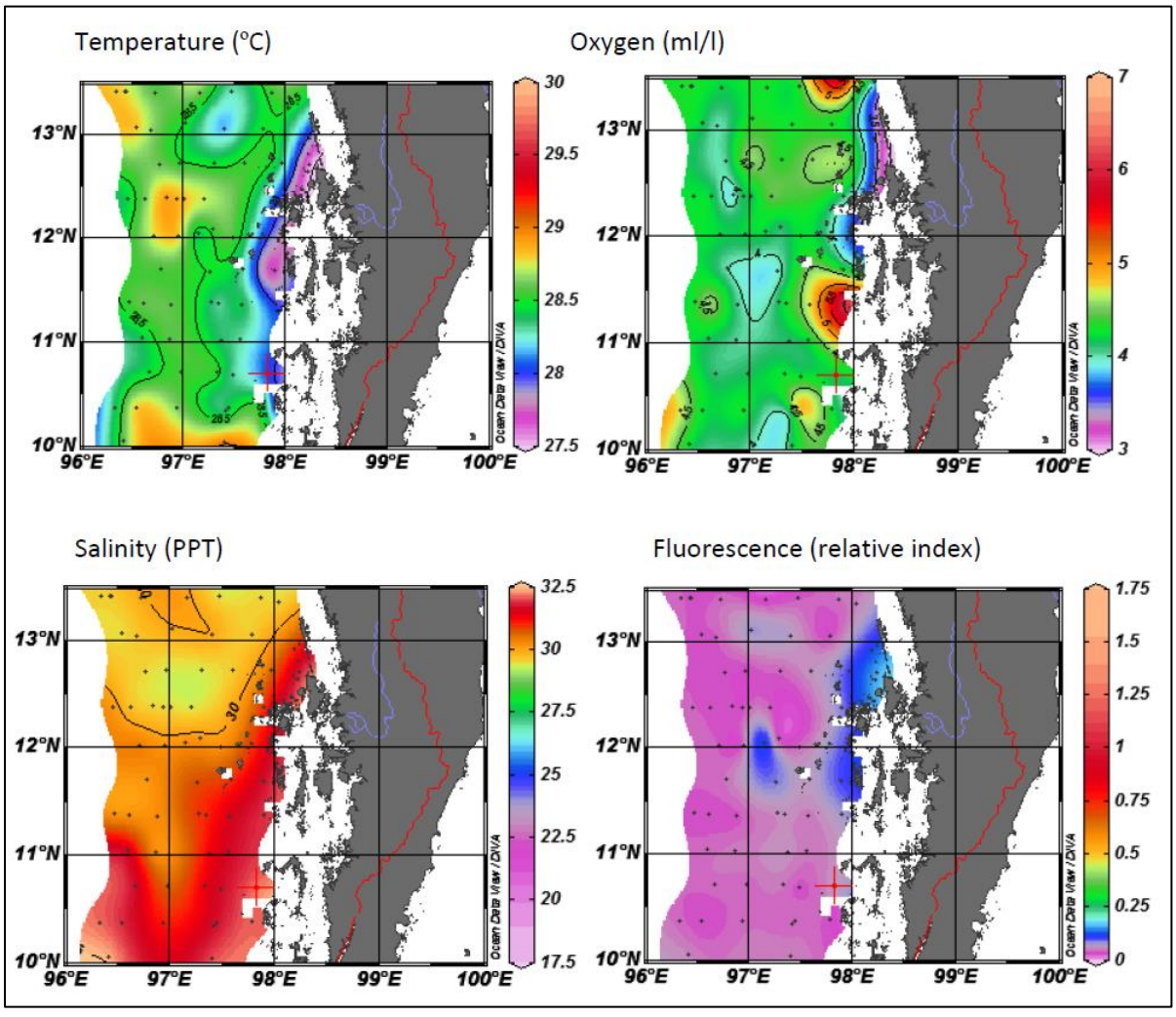


Figure 5-15: Horizontal near-surface (5m depth) distributions of temperature, salinity, oxygen and fluorescence along the Tanintharyi coastal region[3]

Regards to the hydrographic transects of each parameter, four transects were made across the shelf of the Tanintharyi coastal region; Pe Det, Tapo, Bokpyin and Kampong Lama where the nearest location to Block M12, M13 and M14 were Pe Det and Tapo as presented in respectively.

Surface temperatures along these transects were high, typically above ~27-29°C. No strong temperature variation in upper layers was observed between the coastal and offshore waters. The temperatures decreased with depth, being roughly about 21-23°C at 100 m. The temperatures at 500 m were ca. 9-10°C, ant at transects Pe Dat and Bokpyin the values at about 1000m were ~ 6-6.5°C. The

profiles showed a low salinity upper layer, with values of about 31-33 for the inner parts of the shelf areas. Down to about 100m the salinity increased rapidly, and was rather stable around 35.0 in deeper waters. Oxygen concentrations were highest in the surface layers (typically ~ 4-5 ml/l). A strong oxycline was generally found at depths of about 40-120 m. Below this, the water masses were typically hypoxic with O2 levels of ~0.5 or lower to more than 500 m depth. Oxygen concentrations increased slightly below this, reaching a little more than 1 ml/l at around 1000 m depth (transect Bokpyin). The fluorescence-maxima were generally observed inshore at rather shallow depths. The maxima were typically rather low, but elevated levels were detected along the inner part of the Bokpyin transect (relative index > 0.25 at the two innermost stations).

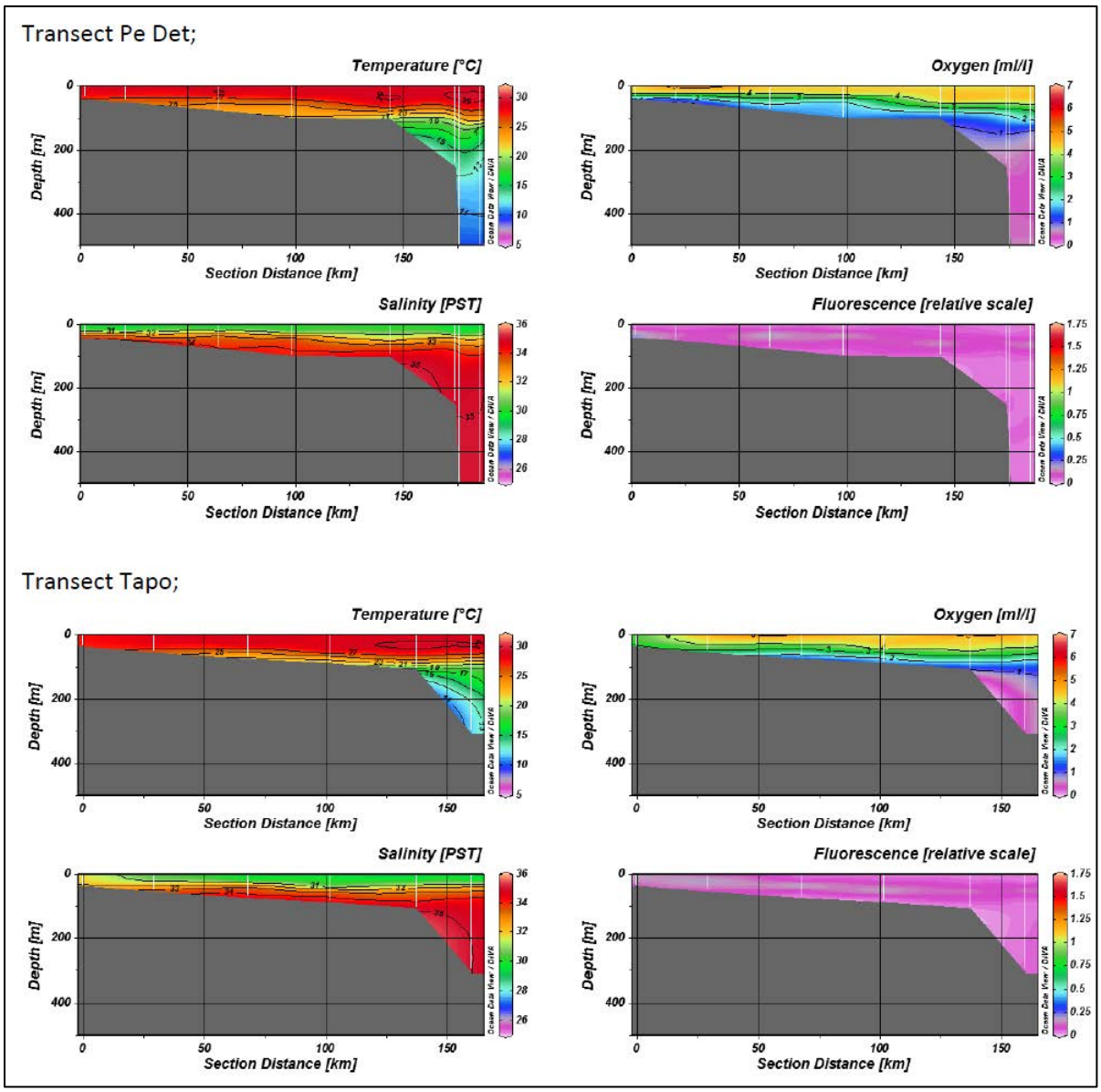


Figure 5-16 (a): Cross-shelf distributions of temperature, salinity, oxygen and fluorescence in the Tanintharyi region. Sections at Pe Det and Tapo. CTD stations indicated by white vertical lines.

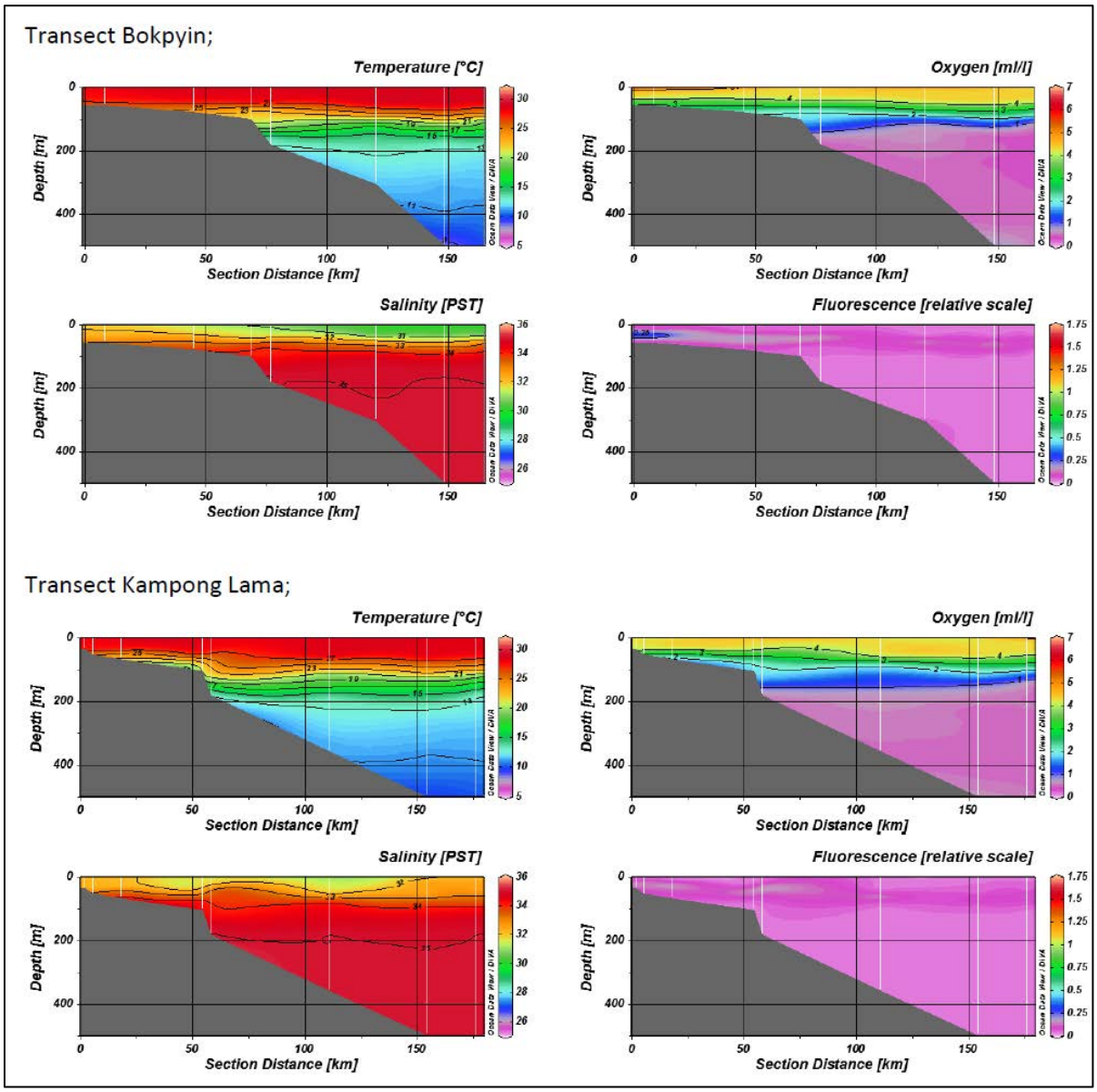


Figure 5-16 (b): Cross-shelf distributions of temperature, salinity, oxygen and fluorescence in the Tanintharyi region. Sections at Bokpyin, Kampong Lama. CTD stations indicated by white vertical lines.

From the survey program specific to this ESHIA, seawater were sampled from eight sampling stations in April 2018. The analysis results present in the tables below;

Table 5-3: In-situ Seawater quality

No.	Sample No./ Physical parameter	WL03B-B	WL03B-M	WL03B-S	WL03A-B	WL03A-M	WL03A-S
1	Date / Time	19/04/2018 14:30-14:40	19/04/2018 14:50-14:00	19/04/2018 15:10-15:20	19/04/2018 16:45-16:55	19/04/2018 17:05-17:15	19/04/2018 17:25-17:35
2	Weather	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny
3	Transparency	24m			23m		
4	Water depth						
5	Depth (of sample taken)	100m	50m	5m	100m	50m	5m
6	Tem (°C)	28.2	27.8	31.6	26.6	27.8	31.1
7	pH	7.52	7.59	7.52	7.84	7.92	7.95
8	DO (mg/l)	4.59	5.48	4.47	4.12	4.28	4.17
9	EC (µs)	49733	49651	52545	49487	50039	52002
10	TDS (ppm)	31165	30645	30394	31322	31029	30363
11	Salinity (ppt)	30.1	30.6	30.2	31.3	31.0	30.2
12	Turbidity (FNU)	0.8	0.7	0.2	0.3	0.3	0.4

No.	Sample No./ Physical parameter	WL03B-B	WL03B-M	WL03B-S	WL03A-B	WL03A-M	WL03A-S
1	Date / Time	20/04/2018 13:10-13:20	20/04/2018 13:30-13:40	20/04/2018 13:50-14:00	20/04/2018 14:45-14:55	20/04/2018 15:05-15:15	20/04/2018 15:25-15:35
2	Weather	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny
3	Transparency	26.5m			19m		
4	Water depth						
5	Depth (of sample taken)	100m	50m	5m	100m	50m	5m
6	Tem (°C)	23.4	27.4	31.6	22.9	31.1	31.1
7	pH	7.54	7.72	7.88	7.70	7.86	7.86
8	DO (mg/l)	3.53	3.62	4.33	3.74	4.97	4.97
9	EC (µs)	46903	50494	52605	46872	52121	52121
10	TDS (ppm)	31542	31374	30400	31940	30422	30422
11	Salinity (ppt)	31.7	31.4	30.2	32.2	30.2	30.2
12	Turbidity (FNU)	0.5	0.4	0.6	0.3	0.4	0.4

No.	Sample No./ Physical parameter	WL02A-B	WL02A-M	WL02A-S	WL02B-B	WL02B-M	WL02B-S
1	Date / Time	21/04/2018 7:20-7:30	21/04/2018 7:40-7:50	21/04/2018 8:00-8:10	21/04/2018 9:35-9:45	21/04/2018 9:55-10:05	21/04/2018 10:15-10:25
2	Weather	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny
3	Transparency	24m			25m		
4	Water depth						
5	Depth (of sample taken)	70m	35m	5m	80m	45m	5m
6	Tem (°C)	25.1	26.9	30.6	25.2	26.9	30.6
7	pH	7.52	7.68	7.75	7.42	7.57	7.83
8	DO (mg/l)	3.48	3.97	4.55	3.73	4.35	4.42
9	EC (µs)	48832	50046	49222	48603	49602	51019
10	TDS (ppm)	31674	31416	28912	31827	31079	30070
11	Salinity (ppt)	31.6	31.5	28.6	32.0	31.1	29.9
12	Turbidity (FNU)	0.4	0.3	0.5	0.9	0.8	0.3

No.	Sample No./ Physical parameter	WL01B-B	WL01B-M	WL01B-S	WL01A-B	WL01A-M	WL01A-S
1	Date / Time	21/04/2018 11:10-11:20	21/04/2018 11:30-11:40	21/04/2018 11:50-12:00	21/04/2018 13:25-13:35	21/04/2018 13:45-13:55	21/04/2018 14:05-14:15
2	Weather	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny
3	Transparency	23m			24m		
4	Water depth						
5	Depth (of sample taken)	100m	50m	5m	100m	50m	5m
6	Tem (°C)	26.9	30.0	31.4	27.3	29.9	31.6
7	pH	7.42	7.52	7.73	7.42	7.51	7.71
8	DO (mg/l)	3.97	4.25	4.38	4.34	4.58	5.13
9	EC (µs)	49667	50449	51904	49604	49441	51940
10	TDS (ppm)	31106	29966	30185	30969	28864	30182
11	Salinity (ppt)	31.1	29.8	30.0	30.9	29.8	30.0
12	Turbidity (FNU)	0.6	0.4	0.3	0.4	0.5	0.3

No.	Sample No./ Physical parameter	YA1-B	YA1-M	YA1-S	YA2-B	YA2-M	YA2-S
1	Date / Time	21/04/2018 17:00-17:10	21/04/2018 17:20-17:30	21/04/2018 17:40-17:50	22/04/2018 7:30-7:40	22/04/2018 7:50-8:00	22/04/2018 8:10-8:20
2	Weather	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny
3	Transparency	25m			21m		
4	Water depth						
5	Depth (of sample taken)	80m	45m	5m	80m	45m	5m
6	Tem (°C)	27.3	28.0	31.3	24.0	27.6	30.2
7	pH	7.40	7.48	7.58	7.43	7.52	7.81
8	DO (mg/l)	4.63	4.66	5.31	3.84	4.22	4.86
9	EC (µs)	49642	50268	50461	46390	50268	50756
10	TDS (ppm)	31455	31189	28954	30925	31116	30099
11	Salinity (ppt)	31.5	31.2	29.0	30.2	31.2	29.9
12	Turbidity (FNU)	0.9	0.5	0.4	0.5	0.5	0.9

No.	Sample No./ Physical parameter	YA3-B	YA3-M	YA3-S	YA4-B	YA4-M	YA4-S
1	Date / Time	22/04/2018 10:25-10:35	22/04/2018 10:45-10:55	22/04/2018 11:05-11:15	22/04/2018 13:45-13:55	22/04/2018 14:05-14:15	22/04/2018 14:25-14:35
2	Weather	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny
3	Transparency	20m			21m		
4	Water depth						
5	Depth (of sample taken)	80m	45m	5m	80m	45m	5m
6	Tem (°C)	26.6	29.8	31.2	26.5	29.6	32.1
7	pH	7.45	7.68	7.86	7.42	7.63	7.85
8	DO (mg/l)	4.22	3.86	3.67	3.30	3.58	3.79
9	EC (µs)	49868	51211	51839	49292	46644	52308
10	TDS (ppm)	31673	30656	30218	31495	27666	30144
11	Salinity (ppt)	31.8	30.5	30.0	31.8	30.9	29.9
12	Turbidity (FNU)	0.5	0.4	0.3	0.6	0.5	0.5

Source: Field program by ERM Hong Kong in April 2018

The analysis result of seawater quality present in next table;

Table 5-4 (a): Quality of Seawater sampled in vicinity of Block M12, M13 and M14

Parameter	Units	LOR	W01A -S	W01A -M	W01A -B	W01B -S	W01B -M	W01B -B	W02A -S	W02A -M	W02A -B	W02B -S	W02B -M	W02B -B
Physical and Aggregate Properties														
Suspended Solids (SS)	mg/L	2	<2	<2	<2	<2	2	3	<2	3	<2	<2	<2	<2
Inorganic Nonmetallic Parameters														
Ammonia as N	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Phosphorus as P	mg/L	0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.02	<0.01	0.02	0.03	<0.01	0.02	0.03
Nitrate as N	mg/L	0.01	<0.01	<0.01	0.1	<0.01	<0.01	0.12	<0.01	0.1	0.2	<0.01	0.11	0.24
Total Nitrogen as N	mg/L	0.1	0.2	0.1	0.2	0.1	<0.1	0.2	<0.1	0.2	0.3	<0.1	0.3	0.4
Metals and Major Cations - Filtered														
Hexavalent Chromium	µg/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Mercury	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Arsenic	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Copper	µg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Lead	µg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Zinc	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total Petroleum Hydrocarbons (TPH)														
C6 - C9 Fraction	µg/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14 Fraction	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	µg/L	100	<100	<100	<100	204	<100	<100	<100	<100	<100	<100	<100	<100
C29 - C36 Fraction	µg/L	50	<50	<50	<50	97	<50	<50	<50	<50	<50	<50	<50	<50
Polyaromatic Hydrocarbons (PAHs)														
Naphthalene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
2-Methylnaphthalene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
2-Chloronaphthalene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Acenaphthylene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Acenaphthene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Fluorene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Phenanthrene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Anthracene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2

Parameter	Units	LOR	W01A -S	W01A -M	W01A -B	W01B -S	W01B -M	W01B -B	W02A -S	W02A -M	W02A -B	W02B -S	W02B -M	W02B -B
Fluoranthene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Pyrene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
N-2-Fluorenyl Acetamide	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Benz(a)anthracene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chrysene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Benzo(b) & Benzo(k)fluoranthene	µg/L	4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
7.12-Dimethylbenz(a)anthracene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Benzo(a)pyrene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
3-Methylcholanthrene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Indeno(1.2.3.cd)pyrene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Dibenz(a.h)anthracene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Benzo(g.h.i)perylene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Acid Extractable Surrogates														
2-Fluorophenol	%	0.1	24.2	28.8	31.6	26.2	29.6	24.2	30.8	22.4	40.4	33.6	22	23.4
Phenol-d6	%	0.1	25	23	29	30	23.8	22.6	30.6	30.8	22.8	28.8	35.4	28
2.4.6-Tribromophenol	%	0.1	66.2	65.6	69.2	79.2	61.6	63	82.8	27.4	82	85.2	71.2	75.2
Base/Neutral Extractable Surrogates														
Nitrobenzene -d5	%	0.1	60.2	61.4	65	50.8	51.6	53.4	59.4	53.6	61.8	62.6	56.8	53
2-Fluorobiphenyl	%	0.1	58.8	59.6	67	61.4	52.6	51.8	61.6	55.2	60.4	65.4	50.4	51
4-Terphenyl-d14	%	0.1	73	79.8	80.4	72.4	76.8	78.6	73	67.2	79.4	78.4	79.6	79.6
TPH(Volatile)/BTEX Surrogate														
Dibromofluoromethane	%	0.1	101	98	99	101	98.5	97.6	99.1	103	100	103	104	103
Toluene-D8	%	0.1	104	103	104	105	104	104	103	103	101	104	105	102
4-Bromofluorobenzene	%	0.1	99.6	97.6	100	100	99.2	99.2	97	99.4	96.1	96.9	97.1	96.7
Aggregate Organics														
Biochemical Oxygen Demand	mg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chemical Oxygen Demand	mg/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Chlorophyll a	µg/L	0.1	<0.1	0.3	0.4	<0.1	0.1	0.3	<0.1	0.4	0.2	<0.1	0.4	0.2
Oil & Grease	mg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2

Source: Field program by ERM Hong Kong in April 2018

Table 5-4 (b): Quality of Seawater sampled in vicinity of Block M12, M13 and M14

Parameter	Units	LOR	W03A -S	W03A -M	W03A -B	W03B -S	W03B -M	W03B -B	W04A -S	W04A -M	W04A -B	W04B -S	W04B -M	W04B -B
Physical and Aggregate Properties														
Suspended Solids (SS)	mg/L	2	<2	<2	<2	6	2	<2	<2	2	5	9	<2	2
Inorganic Nonmetallic Parameters														
Ammonia as N	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Phosphorus as P	mg/L	0.01	<0.01	0.02	0.04	<0.01	0.02	0.05	<0.01	0.02	0.03	<0.01	0.02	0.02
Nitrate as N	mg/L	0.01	<0.01	0.09	0.32	<0.01	0.09	0.29	<0.01	0.06	0.16	<0.01	0.09	0.12
Total Nitrogen as N	mg/L	0.1	<0.1	0.2	0.4	0.1	0.2	0.4	<0.1	0.2	0.3	0.1	0.2	0.2
Metals and Major Cations - Filtered														
Hexavalent Chromium	µg/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Mercury	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Arsenic	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Copper	µg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Lead	µg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Zinc	µg/L	10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10
Total Petroleum Hydrocarbons (TPH)														
C6 - C9 Fraction	µg/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14 Fraction	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	µg/L	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
C29 - C36 Fraction	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Polyaromatic Hydrocarbons (PAHs)														
Naphthalene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
2-Methylnaphthalene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
2-Chloronaphthalene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Acenaphthylene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Acenaphthene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Fluorene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Phenanthrene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Anthracene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Fluoranthene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2

Parameter	Units	LOR	W03A -S	W03A -M	W03A -B	W03B -S	W03B -M	W03B -B	W04A -S	W04A -M	W04A -B	W04B -S	W04B -M	W04B -B
Pyrene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
N-2-Fluorenyl Acetamide	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Benz(a)anthracene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chrysene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Benzo(b) & Benzo(k)fluoranthene	µg/L	4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
7.12-Dimethylbenz(a)anthracene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Benzo(a)pyrene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
3-Methylcholanthrene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Indeno(1.2.3.cd)pyrene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Dibenz(a.h)anthracene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Benzo(g.h.i)perylene	µg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Acid Extractable Surrogates														
2-Fluorophenol	%	0.1	33.2	32.8	30.2	26.4	30.6	29.8	33.6	36.2	23	32.4	23.8	34.4
Phenol-d6	%	0.1	39	35	28.4	37	27.4	23.4	26.2	28.2	32.2	28	32.8	25.2
2.4.6-Tribromophenol	%	0.1	31.6	63.6	74.2	30	91.4	65.6	78	88.4	67.4	86	22.8	77.2
Base/Neutral Extractable Surrogates														
Nitrobenzene -d5	%	0.1	59.4	50.8	75.2	52.6	74.8	60.2	66.4	77.8	60.8	74	55.2	66.4
2-Fluorobiphenyl	%	0.1	57.6	51.4	75.2	60.8	75.2	54.4	54.8	64.2	58	66.2	55.8	68.4
4-Terphenyl-d14	%	0.1	73.6	79.8	81.4	64.6	80.8	76.4	78	76.2	67.2	74	68.8	77
TPH(Volatile)/BTEX Surrogate														
Dibromofluoromethane	%	0.1	102	103	102	104	106	104	106	107	107	108	109	105
Toluene-D8	%	0.1	104	104	103	104	107	103	103	106	107	103	103	105
4-Bromofluorobenzene	%	0.1	96.3	97.1	95	95.5	100	95.1	96.6	97.6	100	96.6	98	99.5
Aggregate Organics														
Biochemical Oxygen Demand	mg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chemical Oxygen Demand	mg/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Chlorophyll a	µg/L	0.1	<0.1	0.4	<0.1	<0.1	0.4	<0.1	<0.1	0.6	0.4	<0.1	0.7	0.4
Oil & Grease	mg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2

Source: Field program by ERM Hong Kong in April 2018

Table 5-4 (c): Quality of Seawater sampled in vicinity of Block M12, M13 and M14

Parameter	Units	LOR	YA1 -S	YA1 -M	YA1 -B	YA2 -S	YA2 -M	YA2 -B	YA3 -S	YA3 -M	YA3 -B	YA4 -S	YA4 -M	YA4 -B
Physical and Aggregate Properties														
Suspended Solids (SS)	mg/L	2	<2	3	<2	3	<2	<2	<2	<2	<2	2	11	<2
Inorganic Nonmetallic Parameters														
Ammonia as N	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Phosphorus as P	mg/L	0.01	<0.01	0.02	0.03	<0.01	0.02	0.04	<0.01	<0.01	0.02	<0.01	0.01	0.03
Nitrate as N	mg/L	0.01	<0.01	0.05	0.13	<0.01	0.04	0.26	<0.01	<0.01	0.15	<0.01	0.02	0.22
Total Nitrogen as N	mg/L	0.1	0.1	0.2	0.3	0.1	0.2	0.4	0.1	<0.1	0.3	0.1	0.1	0.3
Metals and Major Cations - Filtered														
Hexavalent Chromium	µg/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Mercury	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Arsenic	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Copper	µg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Lead	µg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Zinc	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total Petroleum Hydrocarbons (TPH)														
C6 - C9 Fraction	µg/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14 Fraction	µg/L	50	<50	<50	<50	<50	<50	<50	----	<50	<50	<50	<50	<50
C15 - C28 Fraction	µg/L	100	<100	<100	<100	136	<100	<100	----	<100	<100	<100	<100	<100
C29 - C36 Fraction	µg/L	50	<50	<50	<50	<50	<50	<50	----	<50	<50	<50	<50	<50
Polyaromatic Hydrocarbons (PAHs)														
Naphthalene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
2-Methylnaphthalene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
2-Chloronaphthalene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Acenaphthylene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Acenaphthene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Fluorene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Phenanthrene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Anthracene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Fluoranthene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2

Parameter	Units	LOR	YA1 -S	YA1 -M	YA1 -B	YA2 -S	YA2 -M	YA2 -B	YA3 -S	YA3 -M	YA3 -B	YA4 -S	YA4 -M	YA4 -B
Pyrene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
N-2-Fluorenyl Acetamide	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Benz(a)anthracene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Chrysene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Benzo(b) & Benzo(k)fluoranthene	µg/L	4	<4	<4	<4	<4	<4	<4	----	<4	<4	<4	<4	<4
7.12-Dimethylbenz(a)anthracene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Benzo(a)pyrene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
3-Methylcholanthrene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Indeno(1.2.3.cd)pyrene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Dibenz(a.h)anthracene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Benzo(g.h.i)perylene	µg/L	2	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2
Acid Extractable Surrogates														
2-Fluorophenol	%	0.1	23.2	24.2	32.6	35	24.4	38	----	52.2	24.4	26.2	36.8	22.6
Phenol-d6	%	0.1	24.2	32	22.4	23.4	22.4	28	----	26.2	40	30	22.8	37.8
2.4.6-Tribromophenol	%	0.1	35.2	75.4	66.2	56	27.8	55.4	----	79	29.2	78.2	62.4	27.4
Base/Neutral Extractable Surrogates														
Nitrobenzene -d5	%	0.1	50.2	55.4	64	52.6	51.8	55.4	----	61.6	76.8	51.8	56.8	63.8
2-Fluorobiphenyl	%	0.1	69.2	66	59	59	55.2	55.8	----	68.2	53	64	50.8	53.2
4-Terphenyl-d14	%	0.1	68.6	77.4	66.8	76.6	64.4	75	----	75	67.2	78	75.2	64.2
TPH(Volatile)/BTEX Surrogate														
Dibromofluoromethane	%	0.1	108	108	107	107	109	111	110	108	112	112	108	111
Toluene-D8	%	0.1	104	104	107	104	106	107	104	106	107	105	107	107
4-Bromofluorobenzene	%	0.1	96.5	96.6	101	95.7	101	100	96.2	99.2	99.3	96.6	100	99.5
Aggregate Organics														
Biochemical Oxygen Demand	mg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chemical Oxygen Demand	mg/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Chlorophyll a	µg/L	0.1	<0.1	0.4	0.3	<0.1	0.3	0.1	<0.1	0.3	0.3	<0.1	0.6	0.2
Oil & Grease	mg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2

Source: Field program by ERM Hong Kong in April 2018

5.3.6 Sediments

The Ayeyarwady continental shelf is a complex sedimentary system, discharging to Gulf of Mataban widespread to central Andaman Sea, characterized by large sediment influx (> 360 million ton/yr), a wide shelf (> 170 km), a strong tidal regime (7 m maximum tidal range), and incised by the Martaban Canyon. Grain size distribution on the Ayeyarwady shelf reveals three distinct areas in terms of sediment texture (i) a near-shore mud belt in the Gulf of Martaban and adjacent inner shelf (ii) outer shelf relict sands and (iii) mixed sediments with varying proportions of relict sand and modern mud in the Martaban Canyon. The bulk of the terrigenous sediment discharged by the Ayeyarwady River is displaced eastwards by a combination of tidal currents and clockwise flowing SW monsoon current and deposited in the Gulf of Martaban resulting in shoaling of its water depths. Part of the sediment discharge reaches the deep Andaman Sea via the Martaban Canyon and the rest is transported westward into the Bay of Bengal by the counter-clockwise flowing NE monsoon currents.

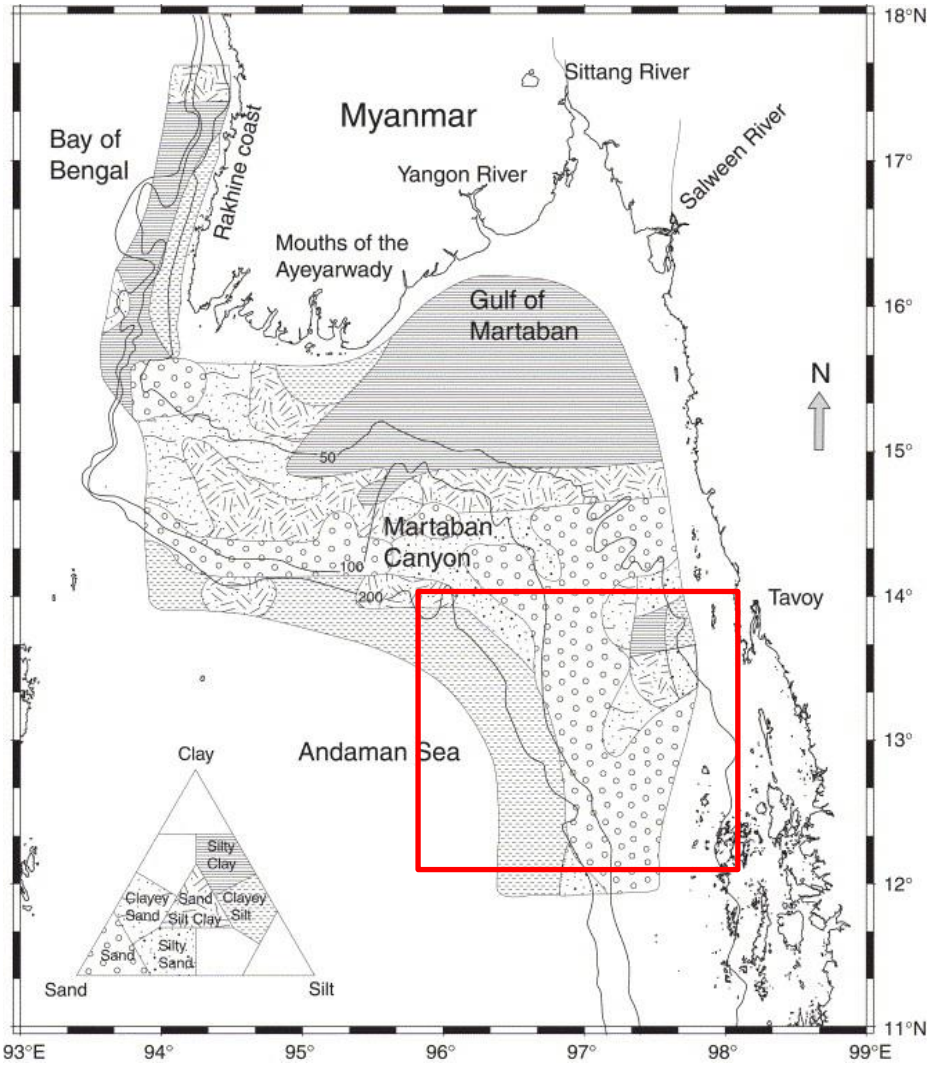


Figure 5-17: Textural variations of the surficial sediments on the Myanmar continental shelf[4] (Approximated Block M12, M13 and M14 in red rectangle)

4 Ramaswamy V. and P. S. Rao (2014) *Chapter 17 Myanmar Continental Shelf*, Geological Society, London, Memoirs, Volume 41, 231-240,

There are seven provinces of sediment in the Andaman Basin. The delta provinces are comprised of silty clays. The outer delta shelf sediments (> 60 m) are relict and enriched with feldspar, quartz and mollusc fragments and foraminifera. The Mergui Terrace is surface with muddy sands with abundant quartz (80-90%) and traces of feldspar. Homogenous silty clay dominates the central portion of the Andaman Basin. Foraminifera and radiolarian, with minor admixture of terrigenous mica, constitute the small coarse fraction of the sediments. The early Tertiary sediments are the most dominant type and cover nearly 75% of the surface area of the island. Sea highs are rich in foraminifera (Globigenrina ooze). Coarser sediment intercalations between clayey sediments indicate slumping from sea highs. Volcanic sediments are rare in the Andaman basin but volcanic ash and volcanic clay occur at sub-surface depths in the cores from the Sumatra shelf. Sediments of the Andaman-Nicobar Ridge are coarse, poorly sorted coraline detritus and reef foraminifera on the shelves and silty clay on the ridge slopes (Source: Rodolfo, 1969)

From the survey program specific to this ESHIA, sediment were samples in Apr 2018. The analysis result present below;

Table 5-5: Particle distribution of sediment samples

Sample No.	%Gravel	%Sand	%Silt	%Clay	Summary
W01A	0	97	2	1	Grey, slightly clayey, silty SAND with shall fragment
W01B	0	98	1	1	Brownish grey, slightly clayey, slightly silty SAND with shell fragment
W02A	0	93	5	2	Brownish grey, slightly clayey, silty SAND with shell fragment
W02B	0	88	9	3	Brownish grey, slightly clayey, silty SAND
W03A	2	93	3	2	Greyish brown, slightly gravelly, slightly clayey slightly gravelly SAND with shell fragment
W03B	3	93	2	2	Greyish brown, slightly gravelly, slightly clayey slightly gravelly SAND with shell fragment
W04A	3	86	5	6	Greyish brown, slightly gravelly, silty, clayey SAND with shell fragment
W04B	10	56	19	3	Brownish grey, gravelly, clayey, very silty SAND with shell fragment
YA1	0	85	12	3	Brownish grey, slightly clayey, silty SAND with shell fragment
YA2	0	87	10	3	Brownish grey, slightly clayey, silty SAND with shell fragment
YA3	0	87	10	3	Brownish grey, slightly clayey, silty SAND with shell fragment
YA4	0	84	13	3	Brownish grey, slightly clayey, silty SAND with shell fragment

The analysis result of sediment quality presented in next table;

Table 5-6: Quality of Sediment sampled in vicinity of Block M12, M13 and M14

Parameter	Units	LOR	W01A	W01B	W02A	W02B	W03A	W03B	W04A	W04B	YA1	YA2
Moisture Content (dried @ 103°C)	%	0.1	22.6	21.3	28.7	27	19.6	19.5	18.3	18.6	27.6	36.6
Metals and Major Cations												
Arsenic	mg/kg	1	19	22	17	10	8	6	12	10	8	7
Cadmium	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium	mg/kg	1	25	26	21	18	12	12	14	22	20	20
Copper	mg/kg	1	3	3	3	3	1	2	2	4	3	5
Lead	mg/kg	1	8	8	8	7	6	7	8	11	8	8
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.09
Nickel	mg/kg	1	27	31	20	17	9	9	8	15	18	18
Silver	mg/kg	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Zinc	mg/kg	1	38	40	33	31	20	21	20	30	35	36
Total Polychlorinated biphenyls	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tetrachlorometaxylene	%	0.1	79.8	101	75.6	99	85.4	78.2	100	96.6	88.4	118
Dibutylchlorendate	%	0.1	112	112	109	118	116	109	118	109	118	100
Total Petroleum Hydrocarbons (TPH)												
C6 - C9 Fraction	mg/kg	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
C10 - C14 Fraction	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	mg/kg	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
C29 - C36 Fraction	mg/kg	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Polyaromatic Hydrocarbons (PAHs)												
Naphthalene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Methylnaphthalene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Chloronaphthalene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Parameter	Units	LOR	W01A	W01B	W02A	W02B	W03A	W03B	W04A	W04B	YA1	YA2
Pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
N-2-Fluorenyl Acetamide	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b) & Benzo(k)fluoranthene	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
7.12-Dimethylbenz(a)anthracene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3-Methylcholanthrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acid Extractable Surrogates												
2-Fluorophenol	%	0.1	59.6	74.2	57	71.4	65.6	68.2	67.4	68	66.4	72.8
Phenol-d6	%	0.1	57	70.6	56	71.2	61	69.4	67	67.4	63	72
2.4.6-Tribromophenol	%	0.1	64.2	79.8	64.8	73	69.4	70.2	76.6	72.4	62	79.4
Base/Neutral Extractable Surrogates												
Nitrobenzene -d5	%	0.1	57	76.8	53	68.6	64.4	68.6	71.4	65.2	61.4	77.2
2-Fluorobiphenyl	%	0.1	62.8	76.8	58	70.2	65.2	74.8	74.4	70.8	69.4	77
4-Terphenyl-d14	%	0.1	84.4	101	76.4	92.6	88.8	94.2	100	94.2	90	75.5
TPH(Volatile)/BTEX Surrogate												
Dibromofluoromethane	%	0.1	92.4	91	90.5	90.6	93	91.4	91.4	93.1	90	92
Toluene-D8	%	0.1	101	102	100	102	98.4	99.8	98.5	99.4	99.1	101
4-Bromofluorobenzene	%	0.1	101	102	99.6	98.8	96.8	95.4	98.4	96.1	99.6	96.1
Aggregate Organics												
Oil & Grease	%	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Organic Carbon	%	0.1	<0.10	<0.10	0.24	0.29	<0.10	<0.10	<0.10	0.15	0.16	0.2

Source: Field program by ERM Hong Kong in April 2018

5.4 Biological Environment

This section describes the ecological resources in and near the proposed project area.

5.4.1 Overview

Myanmar straddles four biogeographic regions: sub-continental Asia, Palearctic central Asia, Indochina and Malesia (Sundaic), the latter two also referred to as the Southeast Asian or Oriental region. Its diverse flora and fauna is attributable to the mixing of these broadly varying regions (Davies, Sebastian and Chan, 2004).

Myanmar's coastal zone is divided into three separate sections – the Rakhine Coast, the Deltaic Coastal Zone, and the Tanintharyi Coastal Zone. The Rakhine Coastal Zone is bounded by the Bay of Bengal in the west and stretches 740 km from the Naff River to Mawdin Point. The Deltaic Coastal Zone consists of deltaic areas of three major rivers: Ayeyawady, Sittaung and Thanlwin rivers. The Tanintharyi Coastal Zone is the longest coastal zone in Myanmar, about 1,200 km long. It includes the Myeik Archipelago (also called the Mergui Archipelago), comprising more than 800 islands.

According to BANCA (2011), about 250 mammal species, more than 1,000 birds, 370 reptiles and 7,000 plants have been recorded in Myanmar. Of these, 39 species of mammals, 45 of birds, 21 of reptiles and 38 of plants are globally threatened (NCEA, 2009). 76 Key Biodiversity Areas (KBAs) have been identified, out of which 54 are recognized as Important Birds Areas (IBAs) (BLI, 2005).

The Cruise Report "Dr. Fridtjof Nansen", Ecosystem Survey Myanmar (2015) surveying during 13-17 November 2013 provides the most comprehensive and recent information on Myanmar's marine environment, and includes a summary of sea bed conditions, fish and marine fauna occurrence, plankton and nutrients (IMR-Norway and DOF-Myanmar, 2013). Data was collected from 145 fishing stations and 444 species belonging to 129 fish families were recorded. Of cartilaginous species the catches showed: 32 shark species belonging to 11 different families, 20 ray species from 5 families and 2 species of chimaeras from two different families. 235 different taxonomic entities were identified on the Rakhine Coast, while 352 entities were identified in the delta area and 329 entities on the Tanintharyi coast.

From literature analysis, 565 species of corals (24 islands of Myeik Archipelago), 10 species of seagrass, 5 species of turtle, 92 species of mangrove and 30 species of marine mammals have been recorded in coastal and offshore areas of Myanmar.

5.4.2 Threatened Species Overview

The International Union for Conservation of Nature (IUCN) Red List of Threatened Species is widely recognized as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species. A species is determined to be threatened if it is rated as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) in the IUCN Red List of Threatened Animals.

Myanmar has approx. 1,000 bird species. Of these, five are endemic to Myanmar, 45 species are classed as threatened in Myanmar. None of these are marine seabirds.

There are 7 threatened marine mammal species confirmed or potentially occurring in Myanmar's maritime territorial waters as follows:

Endangered (EN)	Blue Whale (Balaenoptera musculus) Fin Whale (Balaenoptera physalus)
Vulnerable (VU)	Indo-Pacific finless porpoise (Neophocaena phocaenoides)

	Sperm Whale (Physeter macrocephalus) Irrawaddy Dolphin (Orcaella brevirostris) Dugong (Dugong dugon).
Near Threatened (NT)	Indo-Pacific humpback dolphin (Sousa chinensis)

Five of the world's seven marine turtle species, the Hawksbill (*Eretmochelys imbricata*), Green (*Chelonia mydas*), Loggerhead (*Caretta caretta*), Olive Ridley (*Lepidochelysa olivacea*), and Leatherback (*Dermochelys coriacea*) are found in territorial waters of Myanmar. All five species are classified as threatened. The only other "threatened" marine-inhabiting reptile species is the Critically Endangered (CR) Siamese crocodile (*Crocodylus siamensis*) (IUCN, 2014). Several species of shark are classed as threatened, including the whale shark (*Rhincodon typus*), which occur in Myanmar's marine waters.

These marine species are discussed in more detail in the following sections.

5.4.3 Plankton

Plankton forms the base of the food chain supporting the marine ecosystem. It comprises a diverse range of small invertebrate plants and animals found suspended in the water column. Most species of marine fish and molluscs have a planktonic larval stage. No primary plankton survey was done for this IEE. However, plankton data is available from the M.V. SEAFDEC (2008[5] - survey year 2007) and R.V. Dr. Fridtjof Nansen (2015 - survey year 2013) study. The results from these surveys are considered representative of the Andaman Sea area.

5.4.3.1 Phytoplankton

The M.V. SEAFDEC (2008) revealed that a total of 58 genera with 135 species were identified from the samples collected in the surface layer during this survey. The identified phytoplankton consisted of 2 genera with 2 species of cyanobacteria, 36 genera with 78 species of diatoms, 19 genera with 53 species of dinoflagellates and 1genus with 1 species of silicoflagellate. In area C which covers the blocks 48 genera with 95 species were observed. (See **Table 5-7**and **Figure 5-18**)

Table 5-7: Phytoplankton in Area C from SEAFDEC survey 2007

Area Station	Total (cells/l)	Dominant species	%	Associated species	%
1	171	*Proboscia alata*	40.94	*Climacodium frauenfeldianum*	12.28
2	191	*Oscillatoria erythraea*	26.70	*Climacodium frauenfeldianum*	10.99
3	649	*Proboscia alata*	29.58	*Oscillatoria erythraea*	14.79
4	564	*Climacodium frauenfeldianum*	19.15	*Chaetoceros peruvianus*	15.25
6	1,266	*Chaetoceros lorenzianus*	14.06	*Chaetoceros socialis*	12.12
8	730	*Oscillatoria erythraea*	65.07	*Proboscia alata*	10.68
9	328	*Oscillatoria erythraea*	62.80	*Chaetoceros lorenzianus*	5.79
10	11,178	*Chaetoceros compressus*	12.41	*Detonula pumila*	10.55
12	299	*Oscillatoria erythraea*	48.83	*Proboscia alata*	8.36

The R.V. Dr. Fridtjof Nansen (2015) revealed the study that in total, 194 taxon was identified to species or to the nearest possible phylogenetic group. The average number of species per station was 44 ± 12 (SD) ranging from 22-72. The most common taxonomic groups were Fam. Chaetocerotaceae (represented with 23 different species), Fam. Ceratiaceae (represented with 22 different species) and Fam. Protoperidinaeae (represented with 15 different species). The stations with the largest species diversity were found close to shore along the Rakhine coast and on the shelf area south of 14.5°N

5 DOF of Thailand. (2008). The Ecosystem-Based Management Fishery in the Bay of Bengal. In collaboration of BIMSTEC. Retrieved from http://map.seafdec.org/downloads/BIMSTEC/BIMSTEC.pdf

(**Figure 5-19**). The most common species found were: *Oscillatoria sp* (Fam. Oscillatoriaceae), *Ceratium fura* (Fam. Ceraticeae), *Ceratium Fusus* (Fam. Ceratiaceae), *Rhizosolenia setigera* (Fam. Rhizosoleniaceae), *Thalassionema nitzschioides* (Fam. Thalassionemataceae), *Chaetoceros diversus* (Fam. Chaetocerotaceae), *Chaetoceros lorenzianus* (Fam. Chaetocerotaceae), *Hemiaulus sinensis* (Fam. Hemiaulaceae), *Ornithocercus magnificus* (Fam. Dinophysiaceae).

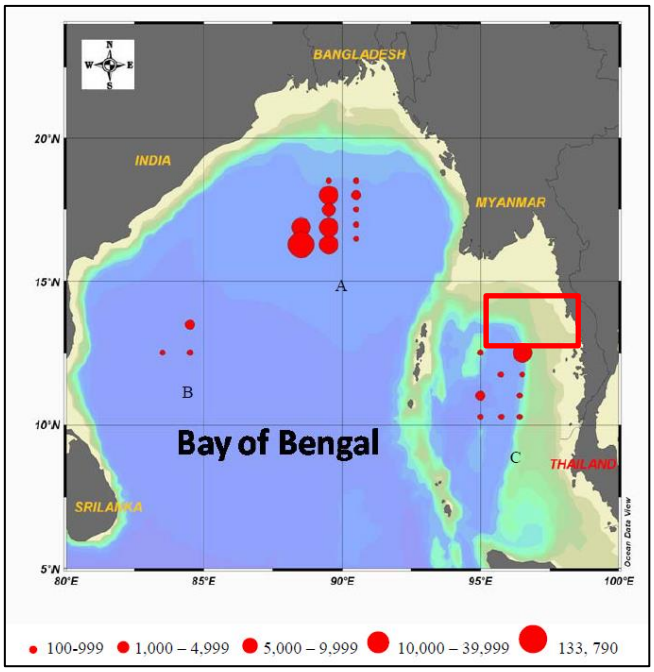


Figure 5-18: Phytoplankton density (cells/L) in the surface layer from M.V.SEAFDEC survey in 2007 (Approximated Block M12, M13 and M14 in red rectangle)

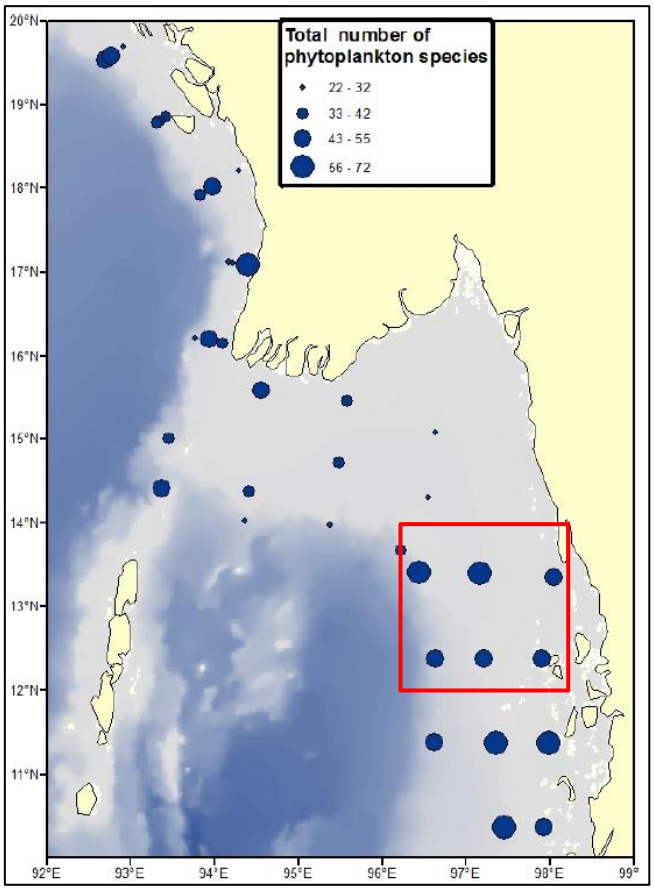


Figure 5-19: Phytoplankton species diversity from R.V. Dr. Fridtjof Nansen survey in 2013[3] (Approximated Block M12, M13 and M14 in red rectangle)

5.4.3.2 Zooplankton

The M.V. SEAFDEC study in 2007 revealed that zooplankton communities in the Bay of Bengal consisted of 205 species, 119 genera and 44 taxa. Copepods were the most diverse group containing the highest number of species (98), followed by Cnidaria (32) and Protozoa (25). The taxa that were not identified to generic or species levels included Polychaeta, mollusk larvae, Mysidacea, decapod larvae, larval stages of Copepoda, Cyphonautes larvae, Echinodermata larva and fish larvae. The diversities in area C was 147 species, 87 genera.

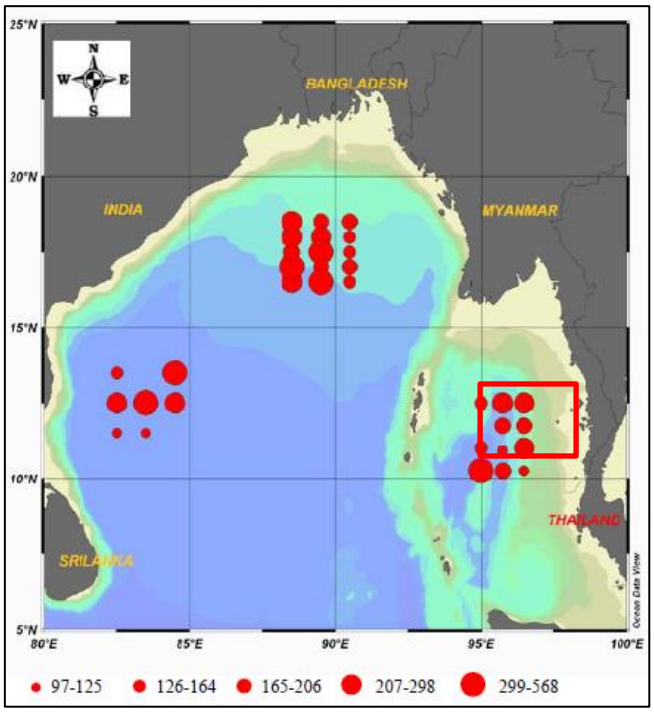


Figure 5-20: Distribution and abundance of total zooplankton (individuals/m3) from M.V.SEAFDEC survey in 2007 (Approximated Block M12, M13 and M14 in red rectangle)

From the survey of R.V. Dr. Fridtjof Nansen in 2013, 204 different zooplankton taxa determined to genus or species level. The average number of species found per station was 47±15 (SD) ranging from 23-104 species. The phylogenetic groups represented by the largest species diversity were: Fam. Sagittidae (represented with 14 different species), Class Polychaetae (represented by 12 species), Fam. Paracalidae (represented with 10 different species) and Fam. Pontillidae (represented with 9 different species). The species most commonly were: *Eucalanus subcrassus* and *Eucalanus crassus* from the Fam. Eucalanidae, but also: *Acartia erythraea* (Fam. Acartidae), *Atlanta peroni* (Fam. Atlandidae), *Undinula vulgaris* (Fam. Calanidae), *Paracalanus aculeatus* (Fam. Paracalanidae), *Oncaea venusta* (Fam. Oncaedidae), *Cresis clava* (Fam. Creseidae) and *Oikopeura cophocerca* (Fam. Oikopleuridae).

The relation between species and water depth, and latitude was also determined by regression as shown in can be analysed that high species richness could not be explained by bottom depth at sampling stations, however, there was a relation found when related to latitude. There was a modest overall increase in species richness in the northern part of the study area and the lowest diversities were related to the areas west of the large river delta complex located between 13-16°N.

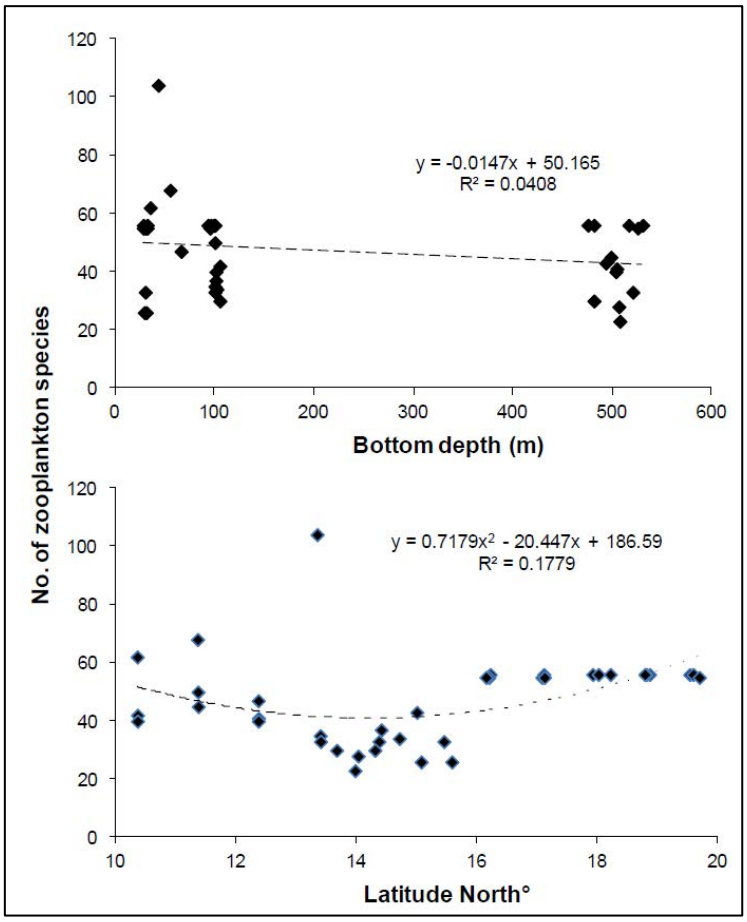


Figure 5-21: Number of zooplankton species in relation to bottom depth (linear regression line: top figure) and latitude (polynomial regression line: bottom figure) [3]

From the survey program specific to this ESHIA, zooplankton were sampled from four sampling stations. The identification result is present in the table below

Table 5-8: Zooplankton Species

Phylum	Class	Order/Family	Species	YA1	YA2	YA3	YA4
Protozoa	Sarcodina	Actinommidae	Actinomma sp.	70	84	74	0
Protozoa	Ciliata	Codonellidae	Tintinnopsis sp.	19	18	40	15
Protozoa	Ciliata	Cyttarocylindae	Favella sp.	19	264	23	25
Chaetognatha	Sagittoidea	Sagittidae	Sagitta sp.	532	738	374	640
Annelida	Polychaeta	Polychaeta (Larvae)	Polychaeta (Larvae)	63	36	17	0
Arthropoda	Crustacea	Cyclopoid Copepod	Cyclopoid Copepod	2,464	1,866	1,116	1,675
Arthropoda	Crustacea	Calanoid Copepod	Calanoid Copepod	2,552	1,638	1,111	1,940
Arthropoda	Crustacea	Harpacticoid Copepod	Harpacticoid Copepod	424	366	142	270
Arthropoda	Crustacea	Nauplius of Copepod (Larvae)	Larval stage	4,427	7,008	3,457	3,510
Arthropoda	Crustacea	Zoea (Larvae)	Larval stage	19	162	68	60
Mollusca	Gastropoda	Gastropod Larva		336	252	204	270
Bivalvia	Bivalvia Larva	Bivalvia Larva		133	72	57	57
Echinodermata	Echinoidea	Echinopluteus Larva	Echinopluteus Larva	63	78	96	90
Chordata	Larvacea	Oikpleuidae	Oikopleura	1,064	1,440	788	795

Note: ind/L of sample

5.4.4 Benthos

From the survey program specific to this ESHIA, marine benthos were sampled from eight sampling stations.

Sampling Station Name	Well name	Position	Latitude	Longitude
W01A	Aung Phi Ta (Anomaly A)	100m N	13° 7' 29.537" N	96° 53' 28.020" E
W01B		100m S	13° 7' 23.030" N	96° 53' 28.075" E
W02A	Yetagun SE	100m N	12° 58' 23.913" N	96° 55' 34.630" E
W02B		100m S	12° 58' 17.407" N	96° 55' 34.684" E
W03A	Yetaung	100m N	12° 50' 58.202" N	96° 52' 55.323" E
W03B		100m S	12° 50' 51.696" N	96° 52' 55.378" E
W04A	Yathiha North	100m N	12° 35' 12.985" N	96° 56' 14.048" E
W04B		100m S	12° 35' 6.478" N	96° 56' 14.100" E

The identification result is present in the table below;

Table 5-9: The abundance of Marine benthos from field survey

Phylum	Class	Order	Family	Species	WL01A	WL01B	WL02A	WL02B	WL03A	WL03B	WL04A	WL04B	YA1	YA2	YA3	YA4
Annelida	Polychaeta	Phyllodocida	Nephtyidae	*Aglaophamus sinensis*		1			1							
Mollusca	Bivalvia	Veneroida	Semelidae	*Abra kurodai*					1							
Annelida	Polychaeta	Terebellida	Terebellidae	*Amaeana trilobata*	1											
Echinodermata	Stelleroidea	Ophiurida	Amphiuridae	*Amphioplus* sp.					1						1	
Sipuncula	Phascolosomatidea	Phascolosomaliformes	Phascolosomatidae	*Apionsoma trichocephalus*						1						
Arthropoda	Crustacea	Amphipoda	Ampeliscidae	*Byblis* sp.	1									1		2
Arthropoda	Crustacea	Astacidea	Callianassidae	*Callianassa japonica*											1	
Nemertinea	Anopla	Heteronemertea	Cerebratulidae	*Cerebratulina* sp.											1	2
Cnidaria	Anthozoa	Ceriantharia	Cerianthidae	*Cerianthus* sp.											1	
Annelida	Polychaeta	Capitellida	Maldanidae	*Euclymene* sp.							1	1				
Annelida	Polychaeta	Phyllodocida	Glyceridae	*Glycera chirori*									1			
Annelida	Polychaeta	Phyllodocida	Glyceridae	*Glycera onomichiensis*	1											
Annelida	Polychaeta	Phyllodocida	Goniadidae	*Glycinde gurjanovae*		1										
Annelida	Polychaeta	Terebellida	Ampharetidae	*Isolda pulchella*		1		1								
Platyhelminthes	Turbellaria	Polycladida	Leptoplanidae	*Leptoplana* sp.					1							
Annelida	Polychaeta	Eunicida	Lumbrineridae	*Lumbrineris* sp.						1						
Annelida	Polychaeta	Spionida	Magelonidae	*Magelona pacifica*									1	1		1
Arthropoda	Crustacea	Decapoda	Penaeidae	*Metapenaeus ensis*										1	1	1
Annelida	Polychaeta	Capitellida	Capitellidae	*Notomastus latericeus*					1							
Annelida	Polychaeta	Eunicida	Onuphidae	*Onuphis eremita*							1					1
Annelida	Polychaeta	Phyllodocida	Lacydoniidae	*Paralacydonia paradoxa*												2
Annelida	Polychaeta	Spionida	Spionidae	*Paraprionospio pinnata*												1
Mollusca	Gastropoda	Cephalaspidae	Philinidae	*Philine japonica*										1		
Annelida	Polychaeta	Spionida	Spionidae	*Prionospio* sp.			1		1				1			1
Annelida	Polychaeta	Opeliida	Scalibregmidae	*Scalibregma inflatum*		1										
Annelida	Polychaeta	Spionida	Spionidae	*Scolelepis squamata*		1							1		1	1
Annelida	Polychaeta	Orbiniida	Orbiniidae	*Scoloplos marsupialis*									1		1	1
Annelida	Polychaeta	Spionida	Cirratulidae	*Tharyx* sp.												1
Chordata	Osteichthyes	Perciformes	Taenioididae	*Trypauchen vagina*									1			

Source: Field program by ERM Hong Kong in April 2018

5.4.5 Marine Fish

The coastal small pelagic fish inhabit the nutrient-rich inshore, continental shelf (neritic) waters to 200 m depth, while the large pelagic fish such as billfish (marlin, sailfish, swordfish) and tuna tend to inhabit the deeper offshore oceanic waters.

The data from the research vessel "Dr. Fridtjof Nansen" survey conducted in 1979-80 shows that there were over 800 marine fish species recorded. In 2013 the survey by the same vessel, 444 species were encountered. After the recent survey by R.V. Dr. Fridtjof Nansen in 2015 a comparison between the pelagic fish biomass estimate from 1979/80 and 2013/15[6] shows that the biomass was estimated at 190,000 t (10 cm mean length) compared to 1,000,000 t in 1979/80. Therefore, standing stock in 2013/2015 was possibly decreasing about 80% of the 1980 biomass with a species distribution as shown in **Figure 5-22**.

Year	Demersal fish Biomass (mt)	Pelagic fish Biomass (mt)
1979-1980	750,000	1,000,000
2013-2015	320,000	190,000
Decrease	50%	80%

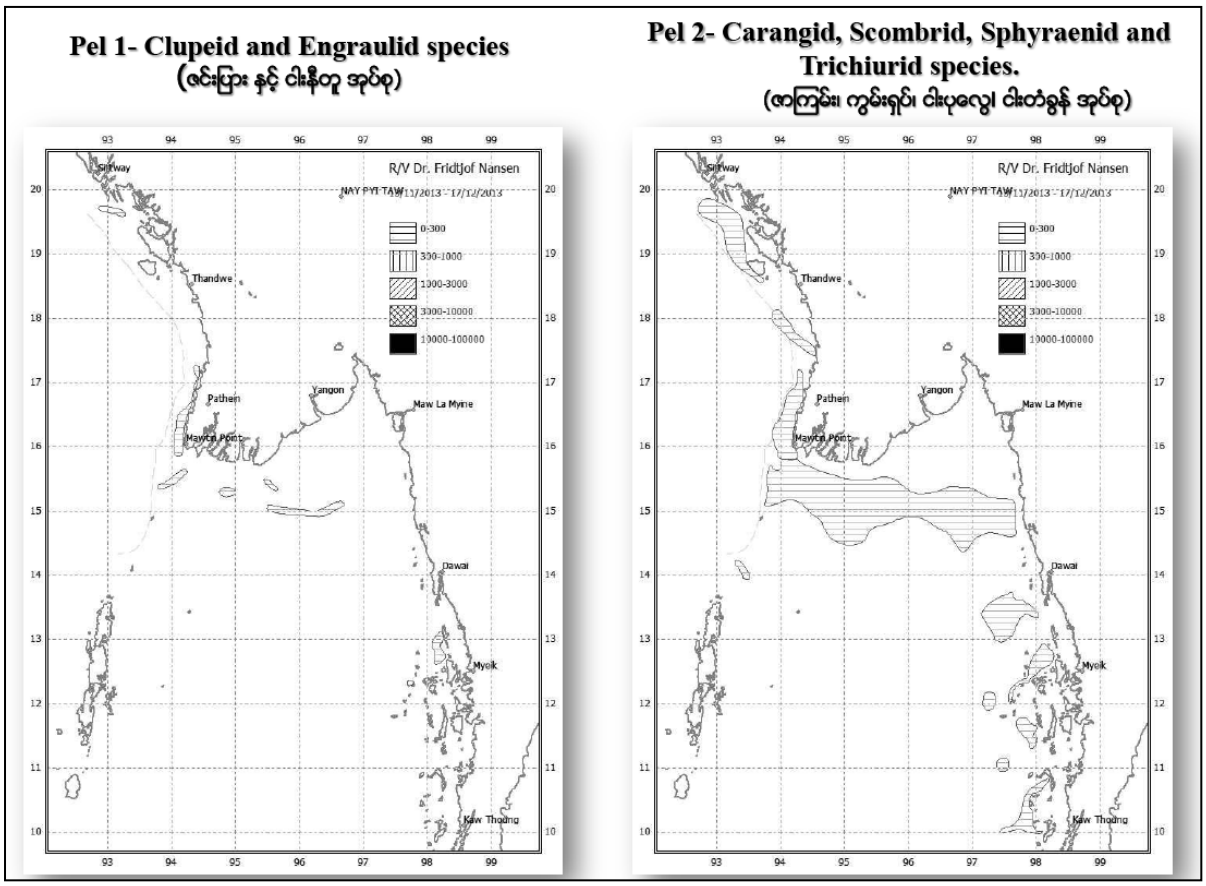


Figure 5-22: Fish Distribution results from "Dr. Fridtjof Nansen" survey conducted in 2013

6 Survey report for 2015 has not published yet

Along the Tanintharyi coastal area low densities of pelagic fish were found in this area. Most of the pelagic of the families Clupeidae and Engraulididae was found between 20 and 50 m depth. While the most common species from the families Carangidae, Scombridae, Barracuda and Hairtails found in the region was redtail scad *Decapturus kurroides*, yellow stripe scad *Selaroides leptolepis* and *Hairtail Lepturacanthus savala*. A total acoustic abundance index of 17 000 tonnes of fish was estimated based on a set (average) total length of 10 cm.

A total of 312 fishing stations with all together 444 teleost species belonging to 129 teleost fish families were recorded; for the cartilaginous species the catches showed: 32 shark species belonging to 11 different families 20 ray species from 5 families and 2 species of chimaeras from two different families. 477 entities on the Tanintharyi coast. **Table 5-10** Show the number of different entities caught per trawl in each depth region. The table illustrate that the most species rich area was the 50-100 m depth region in the Tanintharyi coast.

Table 5-10: Number of different species entities caught per trawl in each depth region.

Depth (m)	No of trawl	Species entities
20-50	2	50
50-100	18	144
100-200	11	117
200-500	13	129
>500		37
Total	44	477

SEAFDEC (2011) conducted a joint research survey on pelagic fisheries resources in 2004 & 2007 to investigate large pelagic fish in Myanmar waters, and to determine the relative abundance and size composition of the commercially important species.

The 2007 study had a total catch weighing 1,755 kg with 77 catches. There was seventeen species belonged to 16 genera and 12 families caught during the survey. The main catch, by weight and number, were swordfish 650 kg (37.0%), 21 individuals followed by bigeye thresher shark 641 kg (36.5%), 11 individuals and yellowfin tuna 75.0 kg (4.3%), 3 individuals.7

The catch was identified into 12 families, 16 genera and 17 species. The species caught were yellowfin tuna (*Thunnus albacares*), swordfish (*Xiphias gladius*), black marlin *(Makaira indica*), pelagic thresher shark *(Alopias pelagicus)*, bigeye thresher shark (*Alopias superciliosus)*, longnose houndshark (*Iago garricki)*, silky shark (*Carcharhinus falciformis)*, tiger shark (*Galeocerdo cuveri)*, pelagic stingray (*Pteroplatytrygon violacea)*, lancet fish (*Alepisaurus ferox)*, great barracuda *(Sphyreana barracuda)*, giant trevally *(Caranx ignobilis)*, dolphinfish *(Coryphaena hippurus)*,sailfish (*Istiophorus platypterus)*, roudi escolar *(Promethichthys prometheus)*, snake mackerel (*Gempylus serpens)* and escolar (*Lepidocybium flavobrunneum)*. Regarding to the catch by station, the highest catch of 16 numbers weighing 362.0 kg was obtained at the station 7 in area C where was closed to Block M13.

Regards to fisheries and commercial fish see **Maine Fisheries in Section of Human Used Value**.

7 Large Pelagic Fishery Resource Survey using Pelagic Longline in the Bay of Bengal, M.V. SEAFDEC, of the Southeast Asian Fisheries Development Center (SEAFDEC) collaborated with the BIMSTEC, during 5 November to 4 December 2007

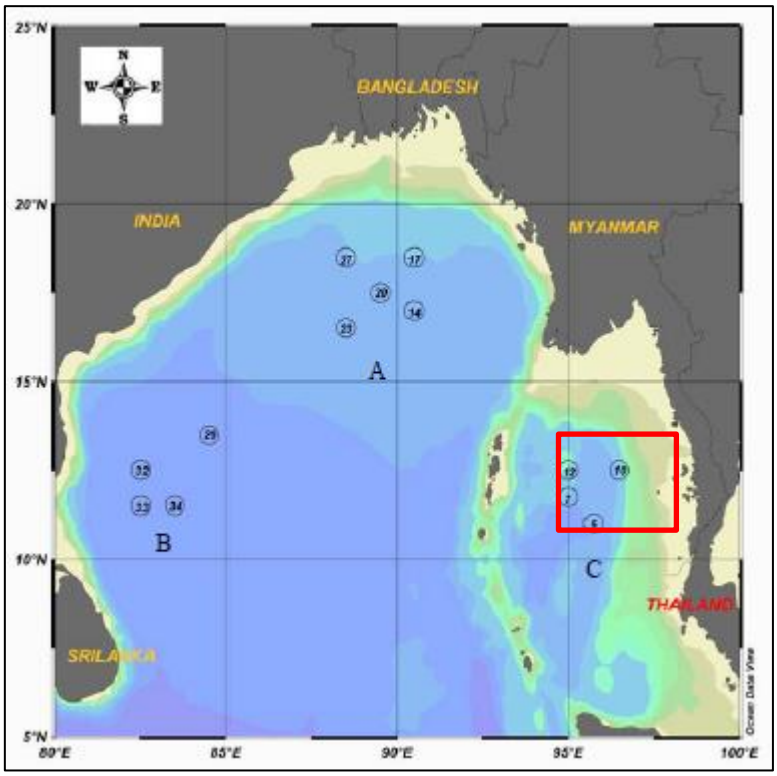


Figure 5-23: Map depicting the survey stations of pelagic longline (Approximated Block M12, M13 and M14 in red rectangle)

5.4.6 Marine Mammals

There are a total of 29 mammal species reported in Myanmar coastal waters. The habitat and conservation status of the marine mammals found in Myanmar waters are described in **Table 5-11**.

Table 5-11: Marine Mammal Species Recorded in Myanmar (LGL 2007)

Common Name		(Scientific name)	Habitat	Status		
				U.S. ESA[1]	IUCN[2]	CITES[3]
Sub-order: Mysticetes (Baleen whales)						
1.	Humpback whale	(*Megaptera novaeangliae*)	Mainly nearshore waters and banks	EN	LC	I
2	Minke whale	(*Balaenoptera acutorostrata*)	Pelagic and coastal	NL	LC	I
3	Bryde's whale	(*Balaenoptera edeni*)	Pelagic and coastal	NL	DD	I
4	Fin whale	*(Balaenoptera physalus)*	Primarily offshore, pelagic	EN	EN	I
5	Blue whale	(*Balaenoptera musculus*)	Pelagic and coastal	EN	EN	I
Sub-order: Odontocetes (Toothed Whales)						
6	Sperm whale	*(Physeter macrocephalus)*	Usually pelagic and deep seas	EN	VU	I
7	Pygmy sperm whale	(*Kogia breviceps*)	Deep waters off the shelf	NL	DD	II
8	Dwarf sperm whale	(*Kogia sima*)	Deep waters off the shelf	NL	DD	. II
9	Cuvier's beaked whale	(*Ziphius cavirostris*)	Pelagic	NL	LC	II
10	Indo-pacific Beaked Whale	(*Indopacetus pacificus*)	Pelagic	NL	DD	II
11	Blainville's Beaked Whale	(*Mesoplodon densirostris)*	Pelagic	NL	DD	II
12	Ginkgo-toothed beaked whale	(*Mesoplodon ginkgodens*)	Pelagic	NL	DD	II
13	Rough-toothed dolphin	(*Steno bredanensis*)	Deep water	NL	LC	II
14	Common Bottlenose dolphin	(*Tursiops truncatus*)	Coastal and oceanic, shelf break	NL	LC	II

	Common Name	(Scientific name)	Habitat	Status		
				U.S. ESA[1]	IUCN[2]	CITES[3]
15	Pantropical spotted dolphin	(*Stenella attenuata*)	Coastal and pelagic	Da	LC	II
16	Spinner dolphin	(*Stenella longirostris*)	Coastal and pelagic	Db	DD	II
17	Striped dolphin	(*Stenella coeruleoalba*)	Off continental shelf	NL	LC	II
18	Fraser's dolphin	(*Lagenodelphis hosei*)	Waters >1000 m	N.A.	LC	II
19	Risso's dolphin	(*Grampus griseus*)	Waters >1000 m, seamounts	NL	LC	II
20	Indo-Pacific Finless porpoise	(*Neophocoena phocaenoides*)	Coastal far from shore (up to 240 km) in waters < 200 m deep mangrove estuaries.	NL	VU	I
21	Indo Pacific hump-backed dolphin	(*Sousa chinensis*)	coastal, mangrove, estuarine	Candidate Species	NT	I
22	Indo-pacific Bottlenose Dolphin	(*Tursiops aduncus*)	coastal waters, oceanic shelf or around oceanic islands	N.A.	DD	II
23	Melon-headed whale	(*Peponocephala electra*)	Oceanic	NL	LC	II
24	Pygmy killer whale	(*Feresa attenuata*)	Deep, pantropical waters	NL	DD	II
25	False killer whale	(*Pseudorca crassidens*)	Pelagic	NL	DD	II
26	Killer whale	(*Orcinus orca*)	Widely distributed	NL	DD	II
27	Short-finned pilot whale	(*Globicephala macrorhynchus*)	Mostly pelagic, high relief topography	NL	DD	II
28	Irrawaddy Dolphin	(*Orcaella brevirostris*)	Oceanic, brackish water, coastal areas, estuaries	N.A.	VU	I
Order: Sirenia (Manatee and Dugongs)						
29	Dugong	(*Dugong dugon*)	Coastal, estuarine	EN	VU	I

Notes: N.A. - Data not available or species status was not assessed.
1 Endangered Species Act, EN = Endangered, NL = Not listed, D = Depleted
2 Codes for IUCN classifications: CE – Critically Endangered EN = Endangered; VU = Vulnerable; LC = Least Concern, NT = Near Threatened); DD = Data Deficient. Classifications are from the 2014 IUCN Red List of Threatened Species.
3 Convention on International Trade in Endangered Species of Wild Fauna and Flora (UNEP-WCMC 2006).
a Depleted status applies to the northeastern offshore and coastal stocks of spotted dolphins, which occur in the ETP.
b Depleted status applies to the eastern stock of spinner dolphins, which occurs in the ETP.

5.4.7 Conservation Status of Marine Species in Myanmar

5.4.7.1 Whales

Commercial whaling severely depleted all the large whale populations in the Indian Ocean area, and subsequently, in 1979, the International Whaling Commission declared the Indian Ocean north of 55ºS latitude a whale sanctuary. Under the IUCN Red List of Threatened Species, the blue whale and the fin whale are classified as Endangered.

Although there is limited information available on the distribution and abundance of marine mammals in Myanmar offshore waters, it is assumed for the purpose of this ESHIA, that conservation significant marine mammal species have potential to transit the waters in the vicinity of Block M12, M13 and M14 during the period of the exploration program.

5.4.7.2 Irrawaddy Dolphin

The Irrawaddy Dolphin is found in the Mekong, Ganga, Brahmaputra and Ayeyarwady rivers. The International Union for the Conservation of Nature (IUCN) states the best estimate of abundance for the Ayeyarwady population of Irrawaddy dolphins is 59 individuals, based on the December 2003 upstream survey from Mandalay to just above the Taping tributary confluence in Bhamo (IUCN, 2014), making the *Orcaella brevirostris* (Ayeyarwady River subpopulation) Critically Endangered (CR).

In 2005, the Department of Fisheries established a protected area for Irrawaddy dolphins in a 74 km (46 mile) segment of the Ayeyarwady River between Mingun and Kyaukmayaung. Protective measures in the area include mandatory release of entangled dolphins, prohibition of the catching or killing of dolphins, trade in whole or parts of them, and the prohibition of electro fishing and gillnets more than 300 feet (91 m) long, or spaced less than 600 feet (180 m) apart. Mercury discharges (leading to poisoning) and habitat loss from gold mining dredging operations in the river are also subject to tighter controls.

A vessel-based line-transect survey of nearshore waters (to a depth of 40-60m) was conducted in 2005 off the Myeik Archipelago of southern Myanmar, searching along 955 km of trackline. This survey resulted in 30 cetacean sightings, only one of which was an Irrawaddy dolphin.

The nearest area of habitat where Irrawaddy dolphins are known to occur is the shallow (< 60 m depth) coastal area of the Myeik Archipelago, which is located at SE of blocks.

5.4.7.3 Sea Turtles

Five of the world's seven marine turtle species, the Hawksbill (*Eretmochelys imbricata*), Green (*Chelonia mydas*), Loggerhead (*Caretta caretta*), Olive Ridley (*Lepidochelysa olivacea*), and Leatherback (*Dermochelys coriacea*) are found in waters of Myanmar, along the coast of Rakhine, Ayeyarwady and Tanintharyi. All five species are classified as endangered or critically endangered according to IUCN's Red List of Endangered Species. Threats from humans include capture for consumption, harvesting for the crafting of ornamental items, egg collection, accidental capture by fishing operations (by-catch), destruction of nesting sites, and pollution. The exact population of marine turtles nesting along Myanmar's coast is unknown.

The Department of Fisheries (DOF) has sighted at least 35 nesting sites in areas along the coastal regions of Myanmar (Pyi Taw, 2009). Among them, six are actively conserved through monitoring and surveillance of turtles landing sites; clutches and magnitude of hatchling enable to return to the sea. Regulations issued in 2005 by the Ministry of Fisheries prohibit the eating of turtle meat and eggs. The regulations also require that turtles caught in fishing nets be released, and trawlers must be equipped with devices to minimize the risk of turtle capture (Hamann et al, 2006).

The hawksbill and olive ridley sea turtles are primarily found in tropical coral reefs and coastal areas and unlikely to be encountered in the deep offshore areas, while green, loggerhead and leatherback turtle populations are pelagic and so are encountered in small numbers at a time in open waters.

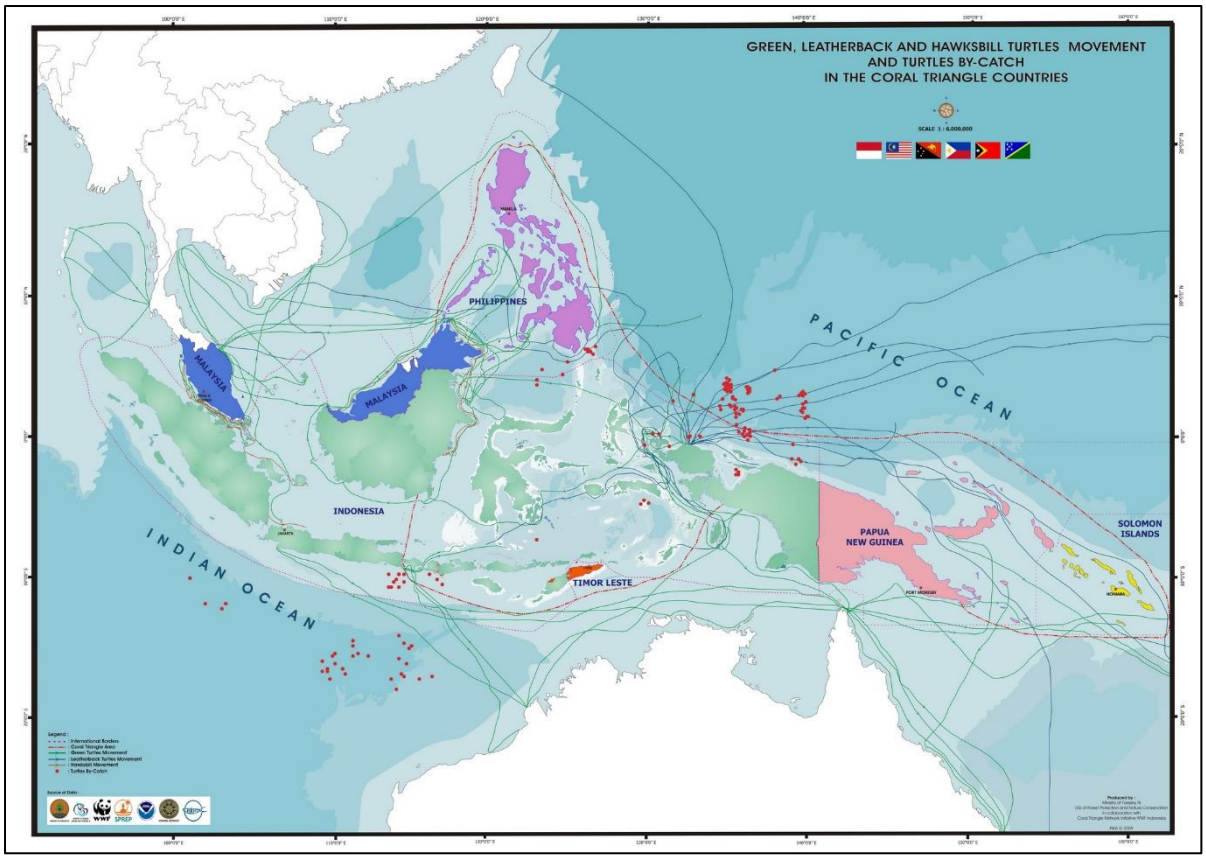
The nearest known turtle nesting areas is at the Lampi Island Marine National Park which is approx. 160 km distance from Block M14. The hawksbill and olive ridley sea turtles are primarily found in tropical coral reefs and coastal areas and unlikely to be encountered in the deep offshore areas, while green, loggerhead and leatherback turtle populations are pelagic and so are encountered in small numbers at a time in open waters.

Table 5-12: Distribution of Marine Turtles in Myanmar

Species	Locations	Status
Leatherback (*Dermochelys coriacea*)	Ayeyarwady Region, Taninthayi Region, Yangon Region	Critically Endangered
Hawksbill (*Eretmochelys imbricata*)	Ayeyarwady Region, Rakhine State, Taninthayi Region, Yangon Region (Coco Island)	Critically Endangered
Loggerhead (*Caretta caretta*)	Rakhine State	Endangered
Green (*Chelonia mydas*)	Ayeyarwady Region, Rakhine State, Mon State, Taninthayi Region, Yangon Region (Coco Island)	Endangered
Olive Ridley (*Lepidochelys olivacea*)	Ayeyarwady Region, Rakhine State, Mon State, Taninthayi Region, Yangon Region (Coco Island)	Endangered

Source: (1) MaungMaung Lwin, Fisheries Officer, Sea Turtle Conservation Unit, Research and Development Division, Department of Fisheries Ministry of Livestock and Fisheries, Yangon, Myanmar.

(2) Sea Turtle Threats, Conservation and Management in Myanmar, ASEAN/SEAFDEC Regional Technical Consultation on Management and Conservation of Sea Turtle in Southeast Asia, Kuala Lumpur, Malaysia , 2003



Source: WWF, 2009

Figure 5-24 : Green Turtle Movements across the Coral Triangle Countries

5.4.7.4 Sharks

Shark is caught worldwide for their meat, skins, fins, cartilage, jaws and livers. There is increasing concern that heavy, largely unregulated trade in shark species is contributing to a decline in global shark stocks.

The Myeik Archipelago's southernmost dive site, Western Rocky is known to have occasional whale shark sightings. February to May tend to witness the most frequent whale shark sightings in the Myeik Archipelago due to the increased feeding opportunities represented by the plankton blooms that occur at this time of year. Shark species found in Myanmar waters are shown in **Table 5-13**.

Table 5-13: Shark Species found in Myanmar Waters

Family	Scientific Name	English Name
1. HEMISCYLLIIDAE	*Chioscyillium griseum*	Graybambooshark
	Chioscyillium punctatum	Brownbanded bamboo shark
2. STEGOSTOMATIDAE	*Stegostoma fasciatum*	Zebra shark
3. HEMIGALEIDAE	*Chaenogaleus macrostoma*	Hooktooth shark
4. CARCHARHINIDAE	*Carcharhinus albimarginatus*	Silvertip shark
	C. amblyrhynchoides	Graceful shark
	C. borneensis	Borneo shark
	C. brivipinna	Spinner shark
	C. dussumieri	Whitecheek shark
	C. falciformis	Silky shark
	C. leucas	Bull shark
	C. limbatus	Blacktip shark
	C. melanopterus	Blacktip reef shark
	C. plumbeus	Sandbar shark
	C. sorrah	Spottail shark
	Galeocerdo cuvier	Tiger shark
	Glyphis gangetis	Ganges shark
	Loxodon macrorhinus	Sliteye shark
	Rhizoprionodon acutus	Milk shark
	R. oligolinx	Graysharpnose shark
	Scoliodon laticaudus	Spadenose shark
	Eusphyra blochii	Winghead shark
5. SPHYRNIDAE	*Sphyrna lewini*	Scalloped hammerhead
	S. mokarran	Great hammerhead

Source: DOF, as cited in Nay Pyi Taw, 2009

5.4.7.5 Dugong

Dugongs are completely protected in Myanmar (Chapter V, Article 15(a) of the Protection of Wildlife and Protected Area Law, Ministry of Forestry, Union of Myanmar (Notification No. 583/94, dated 26 October 1994). Despite this protection the species is opportunistically taken by fishermen and suffers additional mortality as a result of entanglement in nets. The Dugong is listed as vulnerable in the IUCN Red Data Book of Threatened Species (IUCN, 2014).

Occurrence of dugong at some islands of the Myeik Archipelago such as Sular Island, La Ngan Island, Bo Lut Island and War Kyunn Island, as well as waters in the Rakhine Coast has been reported by local communities (Ilangakoon and Tun, 2007).

The nearest area of habitat where dugongs are known to occur is in the Myeik Archipelago near Lampi, and Nyaung Wee Islands of the Myeik Archipelago which is approx. 160 km SE from Block M14.

5.4.7.6 Seabirds

Areas of importance in Myanmar for seabirds/shorebirds include the Ayeyarwady Delta, Central Tanintharyi Coast and northern Myeik Archipelago, and Moscos Islands Wildlife Sanctuary (Scott, 1989).

Terns are the most abundant group of seabirds offshore Myanmar. Other seabirds which may use these waters include gulls, storm petrels, Jaegers (also known as Skuas), tropicbirds, boobies, noddies and frigate birds. Seabird species tend be highly migratory, far ranging and widely distributed away from breeding areas. Offshore Myanmar waters are used by seabirds for foraging and loafing (resting). The seabird species of Myanmar, according to Avibase and Birdlife International, are listed in **Table 5-14**.

During the Asian Waterbird Census in 2008, a wintering Spoon-billed Sandpiper survey was conducted at 13 coastal wetland sites of the Gulf of Martaban and Rakhine Coast. A total of 63,298 shorebirds, consisting of 33 species and 7,027 waterbirds, consisting of 45 species, were recorded during the survey. Eighty-four individuals of Spoon-billed Sandpiper at five sites and one Nordmann's Greenshank, which are globally endangered species, were recorded (Wetlands International, 2008).

Table 5-14: Seabird Species in Myanmar

Family		Species	
Scientific Name	**Common Name**	**Scientific Name**	**Common Name**
Hydrobatidae	Storm-petrels	*Oceanodroma monorhis*	Swinhoe's Storm Petrel
		Oceanites oceanicus	Wilson's Storm-Petrel
		Fregetta tropica	Black-bellied Storm-Petrel
Phaethontidae	Tropicbirds	*Phaethon lepturus*	White-tailed Tropicbird
		Phaethon aethereus	Red-billed Tropicbird
Sulidae	Gannets and boobies	*Sula leucogaster*	Brown Booby
		Fregata andrewsi	Christmas Island Frigatebird
		Stercorarius pomarinus	Pomarine Jaeger
		Stercorarius parasiticus	Parasitic Jaeger
Laridae	Gulls and terns	*Anous stolidus*	Brown Noddy
		Larus vegae	East Siberian Gull
		Larus ichthyaetus	Great Black-headed Gull
		Larus ridibundus	Black-headed Gull
		Chlidonias hybrida	Whiskered Tern
		Chlidonias leucopterus	White-winged Tern
		Gelochelidon nilotica	Gull-billed Tern
		Hydroprogne caspia	Caspian Tern

Family		Species	
Scientific Name	**Common Name**	**Scientific Name**	**Common Name**
		Sterna hirundo	Common Tern
		Onychoprion anaethetus	Bridled Tern
		Sterna sumatrana	Black-naped Tern
		Sterna dougallii	Roseate Tern
		Onychoprion fuscatus	Sooty Tern
		Thalasseus bergii	Great Crested Tern
		Thalasseus bengalensis	Lesser Crested Tern
		Sternula albifrons	Little Tern
		Larus argentatus	Herring Gull
		Larus cachinnans	Yellow-legged Gull
		Larus brunnicephalus	Brown-headed Gull
		Sterna aurantia	River Tern
		Sterna acuticauda	Black-bellied Tern
Spheniscidae	Penguins	*Chlidonias leucopterus*	White-winged Tern
Gaviidae	Loons	*Anous stolidus*	Brown Noddy
Diomedeidae	Albatrosses	*Rynchops albicollis*	Indian Skimmer
Pelecanidae	Pelicans	*Pelecanus onocrotalus*	Great White Pelican
		Pelecanus philippensis	Spot-billed Pelican
Phalacrocoracidae	Cormorants	*Phalacrocorax niger*	Little Cormorant
		Phalacrocorax fuscicollis	Indian Cormorant
		Phalacrocorax carbo	Great Cormorant
Stercorariidae	Skuas and jaegers	*Stercorarius pomarinus*	Pomarine Jaeger
Procellariidae	Petrels and shearwaters		
Pelecanoididae	Diving-petrels		
Fregatidae	Frigatebirds		
Alcidae	Auks		

Source:Avibase, BirdLife International

Bird life in the mangroves is rich in migrant and resident waterbirds. Resident waterbirds include the oriental darter (*Anhinga melanogaster*), little cormorant (*Phalacrocorax nigers*), reef heron (*Egretta sacra*), dusky gray heron (*Ardea sumatrana*), ruddy shelduck (*Tadorna ferruginea*), bronze-winged jacana (*Metopidius indicus*), lesser sand plover (*Charadrius mongolus*), great stone plover (*Esacus magnirostris*), black-winged stilt (*Himantopus himantopus*), spotted greenshank (*Tringa guttifer*), lesser black-back gull (*Larus fuscus*), and common moorhen (*Gallinula chloropus*) (WWF, 2008).

5.4.8 Sensitive Ecosystems

Coastal and marine ecosystems play important roles in the productivity of coastal and marine waters, such as biogeochemical cycling, and geomorphological stability of the coastal zone (Pe, 2004). Myanmar's three coastal regions (the Rakhine coastal region, the Ayeyarwady region and the Tanintharyi coastal region) contain large numbers of estuaries and islands, some of which contain sensitive ecosystems. These are discussed further in this section. **Figure 5-25** shows a map of known coral locations and other sensitive areas in Myanmar's coastal areas.

It should be noted that none of these sensitive marine ecosystems occur in or near the planned offshore exploration operations in Block M12, M13 and M14.

5.4.8.1 Coral Reefs

Myanmar's coastal areas are favourable grounds for both hard and soft corals. Burke et al (WRI, 2002) indicates that at least 65 coral species in 31 genera have been catalogued in Myanmar's reefs. Among them 32% are regarded as least concern, 24% are Near Threatened and 18% are Vulnerable (Cherry Aung, 2009). According to UNEP (2004), coral reefs in Myanmar represent 0.66% of the world's reefs, covering an area of 1,870 km2. 56% of Myanmar's reefs are threatened (WRI, 2002). Storms, coral bleaching, diving, fishing gear, blast fishing, dredging, and land-based pollutants pose threats to coral reefs.

The majority of Myanmar's coral reefs are found in the Myeik Archipelago, a complex of forested offshore islands in the Tanintharyi coastal area (**Figure 5 17**). There are coral reef formations on the Moscos Island Wildlife Sanctuary, Thanintharyi coastal area, and Narcondam islands, which are located 34, 61, and 178 km from the edge of Blocks M12, M13, & M14, respectively (Pe, 2004,). The coral reefs on these islands have only been minimally surveyed (WRI, 2002).

5.4.8.2 Mangroves

Coastal mangrove forests play a significant role as habitats for many wildlife and fisheries. They provide nursery and rearing areas for numerous fish and crustacean species, nesting and feeding areas for birds, and actively sequester carbon from the atmosphere. They also act as an important buffer zone for inland areas against storms. Mangroves along Myanmar coasts are of immediate value to local populace, particularly as fire wood and charcoal for cooking, timber for construction and fisheries. There is a positive correlation between fish and shrimp catches in near shore waters and the extent of mangrove area (Matosobroto and Naamin 1977).

In 2007 Total mangrove coverage is estimated at 3,124 km^2, of which approx. 0.6% is protected (UP MSI et al. 2002). According to JICA (2000), there are 29 species of mangrove in Myanmar, hosting 69 species of fish, 13 species of shrimp, 4 species of crab and 9 species of other shellfish. *Rhizophora, Sonneratia, Avicennia, Bruguiera and Xylocarpus spp.* are dominant species in Myanmar. Predominant species in the Rakhine and Tanintharyi coastal mangroves are *Rhizophora mucronata and Rhizophora apiculata*. Predominant species in the Ayeyarwady delta mangroves are *Heritiera fomes* (Mangrove Service Network, 2006). There are two species of mangrove regarded as Critically Endangered. Six species are endangered, one species is Vulnerable and seven species are regarded as Near Threatened (IUCN, 2014).

The mangrove forests in Myanmar are degraded due to a number of reasons, including sedimentation from the Ayeyarwady River, which is a result of the exploitation from forestry, agriculture, aquaculture, and development projects. There are no mangroves in the vicinity of Blocks M12, M13, & M14, due to its location are far offshore from coastal mainland or islands. Mangroves will therefore not be affected by the Blocks M12, M13, & M14 Project.

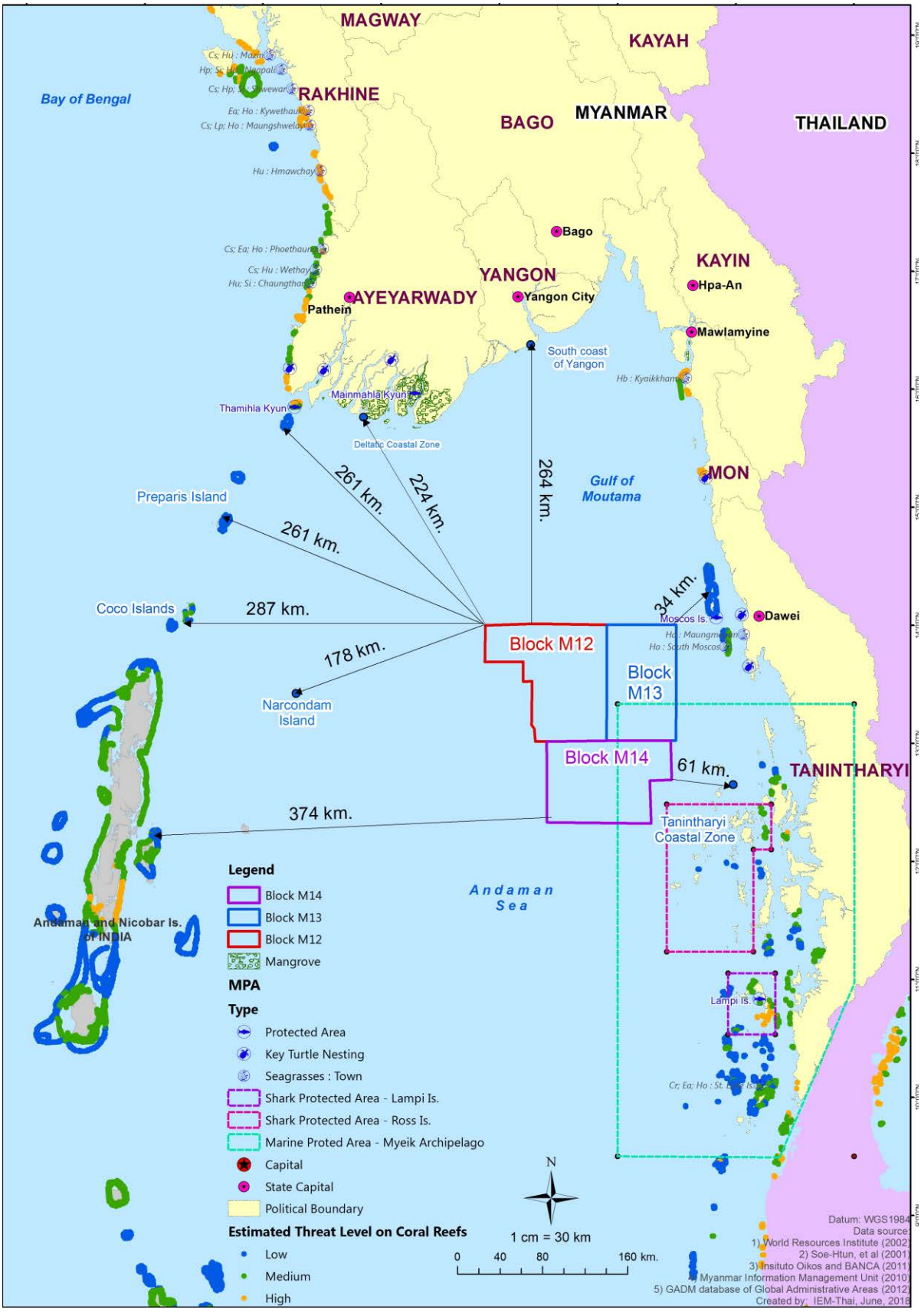


Figure 5-25: Map of Sensitive Areas near Blocks M12, M13, & M14

5.4.8.3 Seagrass

Seagrass usually grows in relatively shallow waters, and form a key feeding, breeding, and nursery ground for many species of fish, turtle, lobster, and dugong. Seagrass also improves water quality, and their root-like stems stabilize the sea bottom (World Bank, 2006).

Based on data from Soe Htun (2009), Myanmar has 10 species of seagrass belonging to 5 genera from two families. Of these, *Cymodocea rotundata, C. serrulata and Enhalus acoroides* are dominant in the seagrass beds. *Cymodocea rotundata, Enhalusacoroides, Thalassia hemprichii, Halophila beccarii, Halophila decipiens, Halophila ovalis* are the species found in the Tanintharyi Coastal Zone (Soe Htun (2009).

Threats to seagrass meadows include the use of push nets and trawls for fishing, wastewater discharges from shrimp farms, urban and industrial pollution, and salinity variations caused by irrigation and land clearing. There is no seagrass in the vicinity of Blocks M12, M13 & M14, due to its location is far offshore from coastal mainland or islands. The Blocks M12, M13 & M14 Project will therefore not affect Seagrass.

5.4.9 Protected Areas

From **Figure 5-25**, the significant MPA in Tanintharyi is Myeik Archipelago which ranges from SE corner of Block M13 through the east of Block M14. The Myeik Archipelago consisted of several MPAs near to the project area includes Ross Island Shark Protected Area (30 km SE of Block M14), Lampi Island National Park and the Shark Protected Area (160 km SE from M14). Other MPA closes to the project area i.e. Moscos Island Wildlife Sanctuary (61 km E from M13).

Myeik Archipelago[8]

The Myeik Archipelago (formerly Mergui Archipelago) lies along the western coast of the Malay Peninsula in the north-eastern waters of the Andaman Sea off Myanmar's most southern coastline within the Tanintharyi Region. The archipelago is estimated at 3,434,000ha (Novak et al., 2009) with around 800 islands which dot the seascape. The 800 islands vary from small rock outcrops to large forested islands including Lampi Marine National Park and Kyunsu (or King) Island which is the archipelago's largest Island that stretches over 45,000ha and includes the highest peak, French Bay Peak at 764m (Anon, 1975). Most of the islands are granite and limestone.

288 species of coral were observed, in 68 genera and 17 families. The status of hard coral cover varies greatly across the archipelago from 0% to 92% with an average of 48.9%. Coral communities were clearly structured by three main reef types: a) fringing reefs on relatively exposed boulder slopes of outer islands, from the surface to about 15 m depth where the boulders transitioned into sandy slopes; b) fringing reefs on relatively sheltered slopes of the inner islands with high turbidity and strong currents; and c) steeply sloping/vertical rock walls on small isolated rocks or outer island cliff faces, extending into deeper water over 20-30 m deep.

The total reef fish fauna of the Islands of the Myeik Archipelago of Myanmar consists of 495 species belonging to 62 families. The Coral Fish Diversity Index (CFDI) for the Myeik Archipelago predicts a total of 618 species. Sharks and large rays were notably absent. Larger individuals of predatory species such as groupers (Epinephelus, Plectropomus), snappers (Lutjanus) and emperors (Lethrinus) were present but only in relatively small numbers.

8 Howard, R. (Ed.). 2018. Marine Biodiversity of Myeik Archipelago: Survey Results 2013-2017 and Conservation Recommendations. Tanintharyi Conservation Programme, a joint initiative of Fauna & Flora International, the Myanmar Forest Department and Department of Fisheries. pp. 138

A total of 258 reef invertebrate fauna have been collected and of these only 127 could be identified to species level. The majority of the 258 invertebrates observed were decapods with 103 specimens and gastropods with 55. For sponges 36 unique species were collected during this expedition, with representatives from at least nine orders. Diadema were the most common of all the invertebrates recorded with 52.01 individuals per transect. Mean invertebrate numbers per transect were generally very low with all but banded coral shrimp, collector urchin and Diadema recording means under one.

Seven species of seagrasses were identified, with coverage ranging from 25.75-64.57% across ten sites surveyed. Fish life was found to be depauperate within these seagrass beds, with an average of only 1.7 fish observed across 51 baited video samples of 30 minutes each. There was a clear lack of abundance of top predatory fish from families such as Trevally, Grouper, Snapper and Sweetlips across all samples

Moscos Island Wildlife Sanctuary, further 60,000 ha extended from Myeik Achipelago, is situated in the Dawei District, Tanintharyi Region. The sanctuary comprises the south, middle and north Moscos group of islands. The islands are covered with evergreen forest, except for some rocky islands. Although it is one of the five marine protected areas, mostly the terrestrial part of the islands is protected. The most common forest type (75%) is evergreen forest. Swiftlets nest on the rocky islands of the sanctuary (BANCA, 2011). Some species of swiftlets are also known for the commercial value of their nests, which are used to make "bird's-nest soup." The increasing demand is threatening the survival of these economically important species.

Lampi Island Marine National Park encompasses a section of the Myeik Archipelago including Lampi Island itself, several smaller islands and the seas around them. The sea between Lampi and the mainland is on average 12 m deep and nowhere deeper than 24 m. Lampi Island is generally hilly and rises steeply from sea level up to 455 m. The majority of the coastline is rocky, presenting also sandy beaches, bays and inlets. Lampi Island has two major perennial rivers and many small seasonal streams. Lampi is an ASEAN heritage site, an Important Bird Area (IBA) and a designated Myanmar ecotourism site. Evergreen forest is the major forest type of the site. Mangrove and beach & dune forests are also present at the site. Coral reefs fringe the islands. Seagrass beds are present especially on the eastern side of the island (BANCA, 2011). The Lampi Island Marine National park also forms part of the Shark Protected Area.

Ross Island Shark Protected Area, established on May 5, 2004, located in Tanintharyi coastal region in part of Myeik Archipelago with the objective of protecting endangered shark species from extinction. In Myeik sharks are captures as target species of shark-longline, while as by catch of fish trawlers and shrimp trawlers. See also **5.4.7.4 Sharks**

5.5 Human Use Values

5.5.1 Marine Fisheries

5.5.1.1 Fisheries Management

Myanmar's territorial fishing zone is within 12 nautical miles offshore from the baseline, whereas the exclusive economic zone (EEZ) extends 200 nautical miles offshore. The total marine fisheries area in Myanmar including the EEZ is about 486,000 square kilometres as shown in **Figure 5-26**.

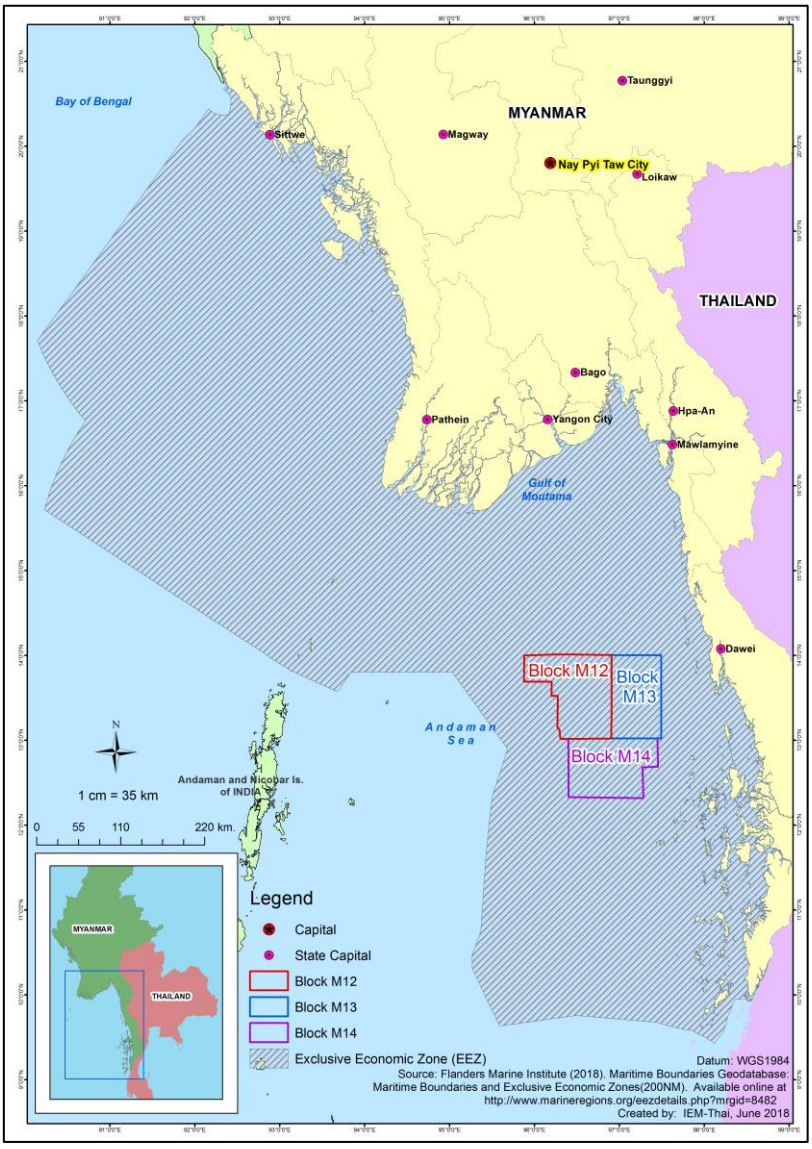


Figure 5-26: Blocks M12, M13, & M14 in Exclusive Economic (EEZ) of Myanmar

The Department of Fisheries (DoF) controls fishing activities and issues licenses within two fishing zones (inshore and offshore), and restrict fishing activities providing a degree of protection to fisheries resources as follows:

- Inshore fisheries includes fishing grounds from lowest tide level, up to about 16 m (48 feet) depth, which generally is from 12 nautical miles from the Tanintharyi coast. Small boats of less than 10 m (30 feet) and 12 horsepower (HP) engines, and some traditional style boats, are used in this fishing zone. Inshore fisheries are small scale, but supply several high value species (lobsters, shrimp, grouper, mud crab, clams, etc.),
- Offshore fisheries include the fishing grounds from the demarcation line of inshore fisheries out to the edge of the EEZ, which is 200 nautical miles from the coastline. Vessels more than thirty-feet in overall length and engine power more than 12 HP are used in offshore fisheries. Large-scale fishing such as bottom trawling, purse seining, surrounding, drift netting and long lining are common in offshore fishing. In order to properly administer and monitor fisheries activities, the DoF has divided Myanmar's offshore fisheries into 140 grid blocks of 30x30 nautical miles each. Using these grid blocks, four fishing grounds are identified as follows:
    - Rakhine Fishing Ground - Includes grounds A1 to A20, B1 to B10. Total 30 grounds.
    - Ayeyarwady Fishing Ground - Includes grounds B11 to B20, C1 to C25 and D1, D4, D5, D9, D10, D14, D15, D19, D20. Total 44 grounds.
    - Mon Fishing Area - Includes grounds D2, D3, D6, D7, D8, D11, D12, D13, D16, D17, D18, D21, D22, D23. Total 14 grounds.
    - Tanintharyi Fishing Ground - Includes grounds D24 to D29, E1 to E25, F1 to F21. Total 52 grounds.

Blocks M12, M13, & M14 are found in the Tanintharyi Coastal Fishing Ground where Block M12 covers ground D25, D26, E2, and E3, Block M13 covers ground D27 and E4, and Block M14 covers ground E9, E10, E15 and E16. (See also **Figure 5-27**)

The DoF has established a legal framework and developed and implemented various strategies for the sustainable development and management of marine fisheries. Fisheries management is pursued by proper licensing, prescribing exploitable species, designating environmental friendly fishing gears and methods, and by imposing closed area and seasons. Enforcement of fishing activities involves Myanmar Navy, Myanmar Coast Guard, Department of Fisheries, Myanmar Customs Department and Myanmar Police Force.

In 2015, DoF had issued the fishing licence for 3,089 local fishing vessels which are owned by national in offshore fisheries.

The fishing gear registration is included in the fishing licence. One fishing vessel is permitted one fishing gear only. If the fishing vessel owner wants to change the fishing gear, he shall apply to DoF for permission. The specification and limitation of fishing gears and other license conditions is stated in the fishing licence card. Currently, DoF is trying to improve the licensing system in electronic format under the e. government system.

Regarding with fishing vessel records, SEAFDEC has been assisting the South East Asian Countries in their efforts to combat IUU fishing through the implementation of the project on the Promotion of Sustainable Fisheries and Counter Measures to Reduce IUU Fishing in South East Asia. One of the activities under the this project is the Development of a Regional Fishing Vessel Record (RFVR) starting with vessel measuring 24 meters in length and over which refined fishing licencing systems could be used as tools to combat IUU fishing in the region.

The Myanmar Fishery Federation is a non-profit organization founded in 1989 that supports and promotes the fisheries sector in Myanmar. The Federation aims to improve the socioeconomic conditions and livelihoods of its members and the broader fisheries community, and provides information on relevant policies, technology, and important fisheries information to subsector stakeholders. The Federation carries out advocacy on behalf of its membership at the local, provincial and national levels, and promotes foreign investment in and export from the Myanmar fisheries

industry. As of August 2012, the total numbers of MFF members (both individuals and companies) were 28,539 (comprising 27,775 individuals and 764 companies (MFF, 2014).

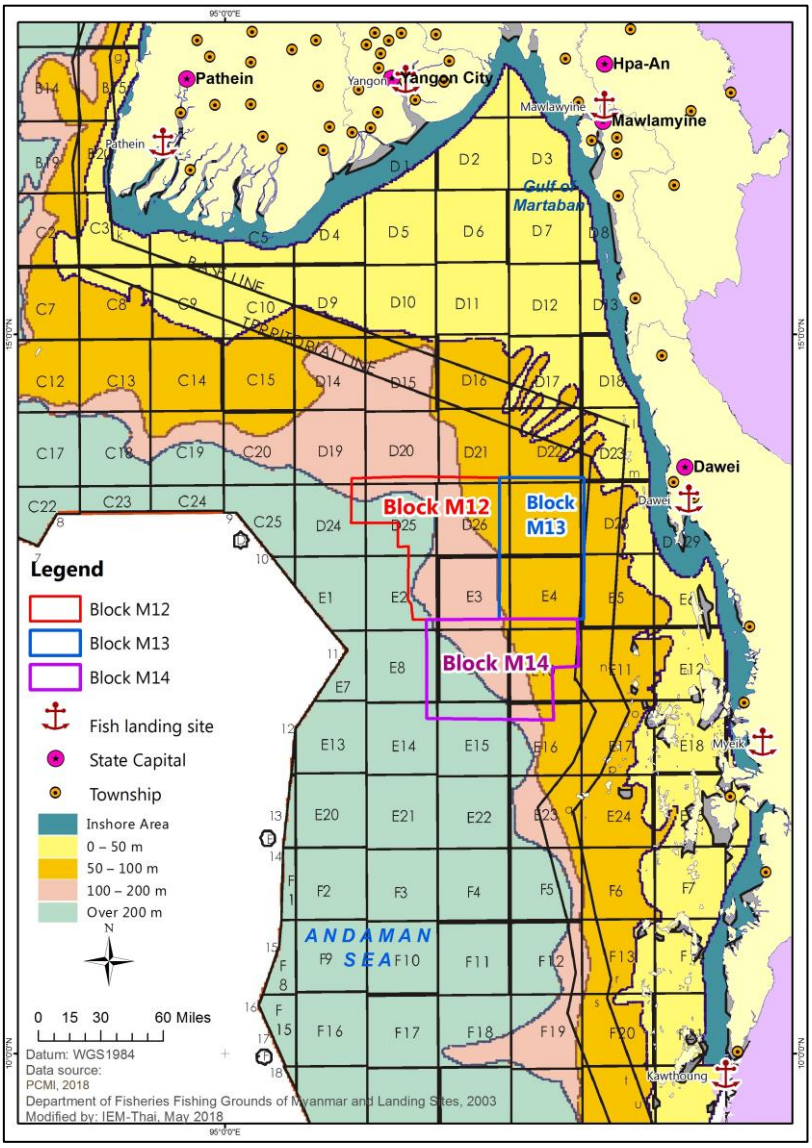


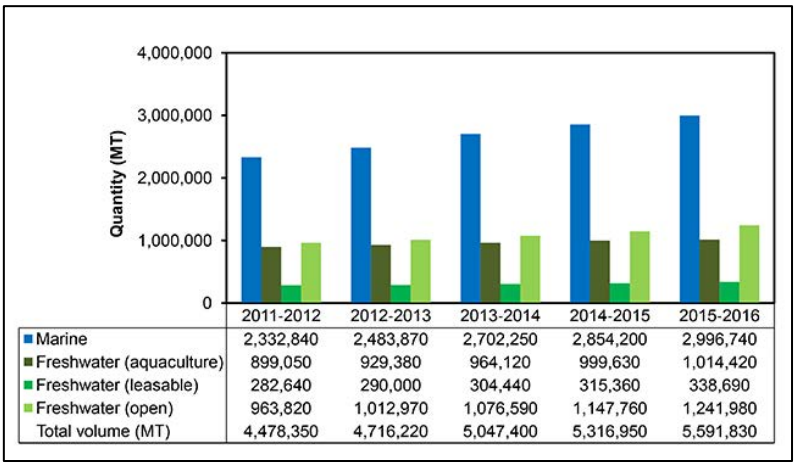
Figure 5-27: Myanmar Coastal Zone and Designation of Fishing Grounds in Myanmar Seas

5.5.1.2 Fisheries Production

Pelagic fisheries are economically important to Myanmar. During the fiscal year 2015/16, the country's total production of fish was 5.59 million MT, 54% of which was the production of marine fish at 3.00 million MT.[9] The fishery production in last 5 years presented in **Figure 5-28**.

Key marine fish species of Myanmar were listed in **Table 5-15**. The top export marine species in 2016/17 are Rohu, Mud Crab, Ribbon fish, Pink Shrimp, and Tiger Prawn, Hilsa, Big Eye Croaker (DOF, 2017).

9 DOF (2018) Myanmar fisheries statistics 2017 retrieved from http://www.dof.gov.mm/phocadownload/FS%20BOOK%202017A5.pdf



	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Marine	2,332,840	2,483,870	2,702,250	2,854,200	2,996,740
Freshwater (aquaculture)	899,050	929,380	964,120	999,630	1,014,420
Freshwater (leasable)	282,640	290,000	304,440	315,360	338,690
Freshwater (open)	963,820	1,012,970	1,076,590	1,147,760	1,241,980
Total volume (MT)	4,478,350	4,716,220	5,047,400	5,316,950	5,591,830

Source: http://www.seafdec.org/fisheries-country-profile-myanmar/ (Data from DOF, 2017)

Figure 5-28: Total fisheries production 2011-2016

Table 5-15: Commercially Important Demersal and Pelagic Fish Species in Myanmar

Scientific name	Common name	Local name
ARRIDAE	Sea Catfish	
Arius caelatus	Engraved catfish	Nga-Yaung
A.maculates	Spotted Catfish	Nga-Yaung
A.thalassinus	Giant Catfish	Nga-Yaung
A.venosus	Veined Catfish	Nga-Yaung
Osteogeneosus militaris	Soldier Catfish	Nga-Yaung
CARANGIDAE	Trevally/Scad	
A. Alectic indicus	Threadfin trevally	Byar-san-wike
Alepes djeddaba	Djeddaba trevally	Pann-zinn
Alepes melanoptera	Black fin trevally	Pann-zinn
Atropus atropus	Kuweh trevally	Nga-da-ma
Carangoides chrysophrys	Long nose cavalla	Zar-gyann
C. ciliarius	Long nose cavalla	Zar-gyann
C. ferdau	Ferdau's cavalla	Zar-gyann
C. malabaricus	Malabar's cavalla	Waing-phyu-gyi
Caranx ignobilis	Yellowfin jack	Zar-gyann
C. sexfasciatus	Dusky jack	Zar-gyann
Decapterus macrosoma	Layang scad	Pann-zinn
D. maruadsi	Round scad	Pann-zinn
Gnathanodon speciosus	Golden toothless trevally	Ka-la-ngu
Megalaspis cordyla	Hard tail scad	Pyi-daw-tha
Scomberoides commersonianus	Talang queen fish	Nga-let-war
Selaroides leptolepsis	Yellow stripe trevally	Myet-san-kje
Seriolina nigrofasciata	Black banded trevally	Nga-thaw-but
LUPEIDAE	Herring/Shad/Sardinet	
Anodontostoma chacunda	Chacunda gizzard shad	Nga-wun-pu
Dussmieria acuta	Rainbow sardine	Nga-kyaw-nyo
Tenualosa ilisha	Hilsa shad	Nga-tha-lauk
Hilsa ilisha	Elongate ilisha	Zinn-byar
Opisthopterus tardoore	Tardoore	Nga-par-shar
Sardinella gibbosa	Goldstripe sardinella	Nga-kone-nyo
LUTJANIDAE	Snapper	
B. Aprion virescens	Green job fish	Nga-ba-yin
Lutjanus argentimaculatus	Mangrove red snapper	Nag-par-ni
L.johni	John's snapper	Nag-par-ni
L.malabaricus	Malabar red snapper	Nga-ba-yin
L.russelli	Russell's snapper	Nga-ba-yin
L.sanguineus	Blood red snapper	Nga-ba-yin
L.sebae	Emperor red snapper	Nga-ba-yin
L.vitta	Brownstripe red snapper	Nga-ba-yin

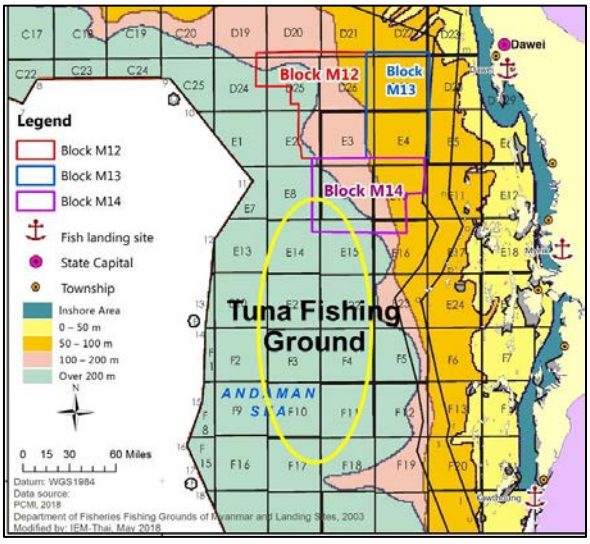
Scientific name	Common name	Local name
Pristipomoides typus	Sharp toothed snapper	Nga-ba-yin
MULLIDAE	Goat Fish	
Parapeneus heptacanthus	Spotted Golden goat fish	Kyo-war
Upeneus moluccensis	Golden band goat fish	Kyo-war
U.sulphuresu	Yellow goat fish	Kyo-war
U.vittatus	Yellow stripe goat fish	Kyo-war
MURANESOCIDAE	Sea eel / Plke Conger	
C. Congresox talabon	Yellow pike conger	Nga-shwe
Congresox talabonoides	Indian pike conger	Nga-shwe
NEMIPTERIDAE	Threadfins bream	
Nemipterus dalagoae	Dalagoa threadfin bream	Shwe-nga
N.japonicus	Japanese threadfin bream	Shwe-nga
N.nematophorus	Double whip threadfin bream	Shwe-nga
N.tolu	Notched threadfin bream	Shwe-nga
POLYNEMIDAE	Threadfins	
D. Eleutheronema tetradactylum	Four finger threadfin	Zayaw-gyi
Polynemus indicus	Indian threadfin	Ka-ku-yan
P.sextarius	Black spot threadfin	Zayaw
POMADASYIDAE	Grunt / Javelin Fish	
E. Pomadasys hasta	Lined silver grunt	Gone-gyi
Pomadasys maculatus	Blotched grunt	Gone-pyauk
SCIAENIDAE	Croaker / Drum	
Chrysochir aureus	Reeve's croaker	Thin-war
Otolithes rubber	Tiger toothed croaker	Thin-phyu
Otolithoides biauritus	Bronze croaker	Nat-ka-daw-gyi
Panna microdon	Penna croaker	Nat-ka-daw
Pennahia macrophthalmus	Big eye croaker	Gaung-pwa
P.macrocephalus	Big head pennah croaker	Gaung-pwa
Prontonebia diacanthus	Spotted croaker	Ka-tha-myin
Pterotolithus maculates	Blotched tiger toothed	Nat-ka-daw
SERRANIDAE	Grouper / Seabass	
Epinephelus bleekeri	Bleeker's grouper	Kyauk-nag
Epinephelus tauvina	Greasy grouper	Kyauk-nag
STROMATEIDAE	Pomfret	
F. Pampus argenteus	Silver pomfret	Nga-moke-phyu
SYNODONTIDAE	Lizard Fish	
G. Saurida micropectoralis	Short fin lizard fish	Nga-pa-lway
Saurida tumbil	Greater lizard fish	Nga-pa-lway
Saurida undosquamis	Brush toothed lizard fish	Nga-pa-lway
TRICHIURIDAE	Hair Tail / Ribbon Fish	
Trichieurus lepturus	Small head hair tail	Nga-da-gon

Source: ILO, 2015

Beside this record on fish key species in Table 5-15, neritic tuna also found but unrecorded. The offshore fishery for tuna and other large pelagic species in Myanmar has been initiated and developed gradually during the last decade, and is currently producing increasingly every year. In 2012/13 there was 4,418 tons of captured neritic tuna (*Scomberomorus commerson*).

There are four species of neritic tuna i.e., *Auxis thazard* (Frigate tuna), *Auxis rochei* (Bullet tuna, *Euthynnis affinis* (Kawakawa) and *Scomberomorus commerson* (Narrow-barred Spanish mackerel) are found. The neritic tunas were exploited by variety of fishing gears. The main fishing gears used for catching neritic tunas was the purse seines and king mackerel for drift gill net. As oceanic tuna, Swordfish (*Xiphias gladius*), Yellowfin Tuna (*Thunnus albacares*), Striped marlin (*Tetrapturus audax*) and Sainfish (*Istiophorus platypus*) are inhabiting in Myanmar offshore waters. Bigeye Thresher (*Alopias pelagicus*), Whit-tipped shark (*Carcharhinus longimanus*), Escolar, Pelagic stingray (*Dasyatis sp :*), Common dolphin (*Coryphaena bipinnulata*) and Snake mackerel (*Gympylus surpens*) were also found in EEZ water (Joint survey by SEAFDEC, 2004 &2007). From these two

survey results, Swordfish is the most dominant species in Myanmar Offshore waters and it can be considered as one of the commercial fishes for offshore fisheries in future.[10]



Source: modified after Julius Kyaw (2015)[11]

Figure 5-29: Tuna Fishing Ground

The tuna fishing ground are in fishing ground grid No. E8-9, E14-15, E20-22, F2-4, F10-11 and F17-18 which covers Block M14 partially. (See Figure 5-29).

According to the "Law Relating to Fishing Rights for Foreign Fishing Vessels" tuna long-ling fishing operations are permitted only outside of the territorial sea in Myanmar EEZ. As a result, high value species like tuna are almost not landed in Myanmar. But from early 2014 the deep sea fishing rights are terminated and it has been announced that the fishing rights will not be given to foreign vessels in the future. This will have considerable implications for the volume of marine fish and other seafood landed in Myanmar. Increased landings will contribute to increased domestic processing and exports of marine fishery products from Myanmar.[12]

No specific data is available for the marine capture fishery in Blocks M12, M13, & M14.

5.5.1.3 Marine Capture Fisheries

The marine capture fishery comprises coastal or inshore fisheries, and offshore or deep-sea fisheries.

In inshore fisheries, fishing boats can operate in waters 10 nautical miles from the shoreline. Inshore fishing boats are not more than 30 feet long, powered by less than 25 HP engine, and use driftnet, gillnet, and long line. On the other hand, offshore fishing vessels operate beyond the inshore fishing zone to the EEZ, are more than 30 feet long powered by more than 25 HP engine and use trawl net, purse seine, and long line. The types and number of fishing boats in Myanmar from 2011 to 2016 are shown in **Figure 5-30**.

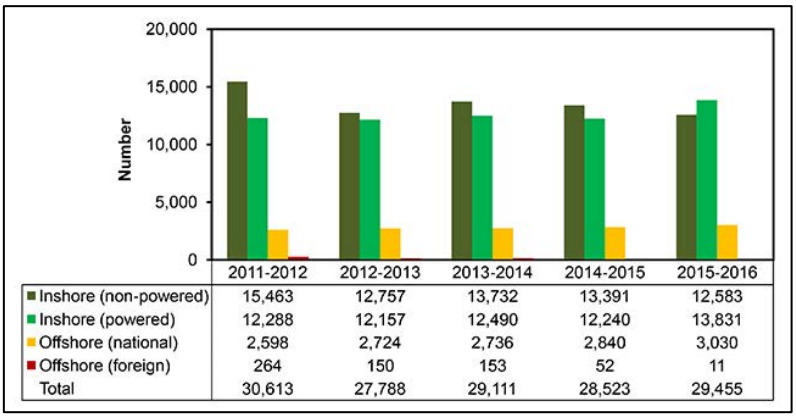
Various types of fishing gear are used to exploit the large diversity of marine species found in Myanmar waters. The fishing gear is classified into commercial, such as trawl net, purse seines, drift net and gillnet, and traditional, including hook-and-line, cast net, bag net, trammel gill net, lift net and traps. The bulk of landings derive from trawls, purse seines, drift nets and gill nets. The fishing gear registration is included in the fishing licence. One fishing vessel is permitted one fishing gear only. The types and number of fishing gears in Myanmar from 2011 to 2016 are shown in **Figure 5-31**.

Currently, most Myanmar vessels are working in water depths less than 100 m due to limitations of vessels and gears.

10 http://www.seafdec.or.th/neritic-tunas/country-profile.php

11 Julius Kyaw (2015) **Offshore tuna fisheries Myanmar** retrieved from https://www.slideshare.net/htinzawlatt/offshore-tuna-fisheries-myanmar?from_action=save

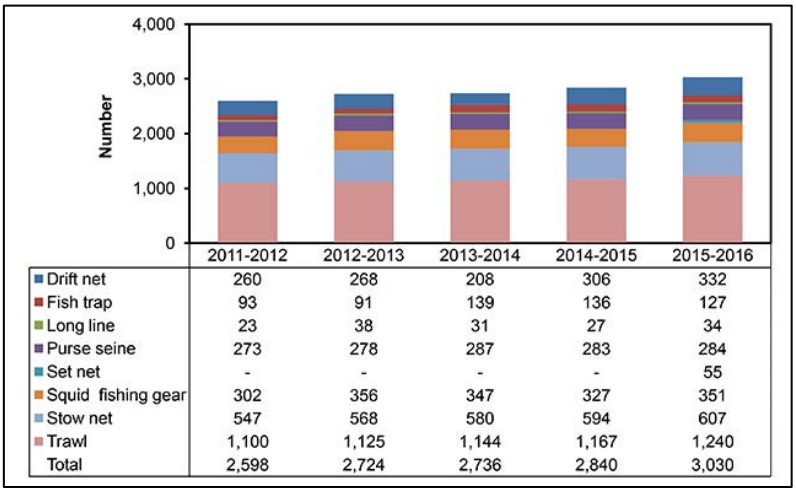
12 CBI (2013) **CBI Import Intelligence: Seafood in Myanmar** retrieved from https://www.cbi.eu/sites/default/files/market_information/researches/import-information-seafood-myanmar-europe-fish-seafood-2013.pdf



	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Inshore (non-powered)	15,463	12,757	13,732	13,391	12,583
Inshore (powered)	12,288	12,157	12,490	12,240	13,831
Offshore (national)	2,598	2,724	2,736	2,840	3,030
Offshore (foreign)	264	150	153	52	11
Total	30,613	27,788	29,111	28,523	29,455

Source: http://www.seafdec.org/fisheries-country-profile-myanmar/ (Data from DOF, 2017)

Figure 5-30: Types and number of fishing vessels in marine fisheries 2011-2016



	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Drift net	260	268	208	306	332
Fish trap	93	91	139	136	127
Long line	23	38	31	27	34
Purse seine	273	278	287	283	284
Set net	-	-	-	-	55
Squid fishing gear	302	356	347	327	351
Stow net	547	568	580	594	607
Trawl	1,100	1,125	1,144	1,167	1,240
Total	2,598	2,724	2,736	2,840	3,030

Source: http://www.seafdec.org/fisheries-country-profile-myanmar/ (Data from DOF, 2017)

Figure 5-31: Types and number of fishing gears in marine fisheries 2011-2016

DOF also reported number of fishers in marine coastal fisheries as per **Table 5-16**.

Table 5-16: Number of Fishers in Marine Coastal Fishing Fiscal Year 2010/11-2014/15

Working status	2010/11	2011/12	2012/13	2013/14	2014/15
Full-time	220,000	223,000	230,000	230,550	254,000
Part-time	251,000	254,000	251,000	252,000	252,000
Occasional	916,000	921,000	916,000	917,000	917,000

Source: DOF (2017) Fishery Statistics 2017

An inshore fishing operation usually takes 1 to 3 days but the bigger inshore vessels stay at the sea for 15 to 20 days. A typical fishing trip for an inshore fishing vessel usually involves 3 to 5 crews. The coastal populations are traditional sea-faring people with the basic skills for a working life at sea. Skills of majority of the fishers are confined to traditional fishing methods. Payment of crews may either be in the form of a monthly salary or a share in the net proceeds of the catch depending on the contractual relationship between owner and crews. Average monthly salary of a crew ranges from 80,000 to 100,000 kyats (US$ 80 to 100). Food during the fishing trip is provided by the owner of the vessels. During the recent years, many inshore fishing vessel owners find it more difficult to sustain the monthly salary for crews given the unpredictability of catch.

An offshore vessel above 80 tons employs 10 to 15 workers. Vessels that are bigger than 80 tons employ 20 to 25 workers. Monthly salary of a junior crew ranges from US$ 80 to 120. A captain earns about US$ 150 to 250 per month. Work hours on board fishing vessels can range from 6 to 12 hours depending on gears and catch opportunity. Crew members may be either contractual or permanent employees. Aside from the monthly salary, the crew also receive performance bonus if they reach the target catch. Fishing vessel crews are paid their monthly salary even when on shore. Insurance is also provided. In case of accident or death, the beneficiaries get an amount of up to approximately US$ 1,000.[13]

5.5.1.4 Illegal fishing

According to BOBLME (2015) Myanmar was relatively low on the list of surveyed countries with a risk of illegal fishing but high on the list of countries with under reporting. The estimated losses were between 0.41 and 1.22 billion US dollars. Unreported catches were estimated to be between 10 and 70% of reported landings.

Table 5-17: Estimates of Illegal and Unreported catches in Myanmar

Year	Catch	Illegal		Unreported	
		Min	Max	Min	Max
2005	1,228,710	245,742	798,662	122,871	860,097
2006	1,375,670	275,134	894,186	137,567	962,969
2007	1,517,940	303,588	986,661	151,794	1,062,558
2008	1,679,010	3,335,802	1,091,357	167,901	1,175,307
2009	1,867,510	373,502	1,213,882	186,751	1,307,257
2010	2,060,780	412,156	1,339,507	206,078	1,442,546
2011	2,169,820	433,964	1,410,383	216,982	1,518,874
2012	2,332,790	466,558	1,516,314	233,279	1,632,953
2013	2,483,870	496,774	1,614,516	248,387	1,738,709

Source: BOBLME (2015)

At 10% the Bay of Bengal and Malacca Strait region as a whole had the highest estimated rate of illegal catches by foreign flagged and foreign owned vessels. The southern part of Myanmar (Tanintharyi Coast) is one of the main regional hotspots for illegal fishing with large volumes (estimated to be 572,000t in 2014) of low value fish being removed illegally by trawlers and purse seiners from Myanmar waters. This fish is believed to be destined for further processing into surimi, fish meal and fish blocks, probably in Ranong, Thailand.

During the projects socio economic, health and opinion surveys of 164 villagers in the coastal communities near the project, 92% of respondents identified that their families were fishermen. The main fish source caught most was fish in the pelagic or open ocean (73%), followed by coastal reef (22%) and mangrove (5%). Regards to the mostly types of marine fish caught, 75% of respondents indicated that the fish were other than those listed in the interviews, which have different local names.

88% of respondents indicated that over the last 10 years the fishing yield has decreased. For the cause of the change, they thought overfishing (67%), followed by global climate change (21%). The amount of fish caught, 98% of the respondents said that were sold, which the most types of marine products sold include fish (92%) followed by other aquatic animals, as outlined in the questionnaire (6%)

13 ILO (2015) Value chain analysis and competitiveness strategy: marine capture fisheries: Myeik and Yangon, Myanmar retrieved from https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_446510.pdf

5.5.2 Marine Transportation

A list of ports in Myanmar is shown in **Table 5-18**. The nearest ports to the exploration blocks are Dawei Port and Myeik Port where is around 90nM and 105nM away from nearest exploration wells respectively. The most traffic is to Yangon Port, approximately 180nM . The Port of Yangon, situated on the Yangon River about 32 km inland from Elephant Point on the Gulf of Martaban, is the primary port of Myanmar and handles about 90 % of the country's exports and imports (Myanmar Port Authority, 2012). The coastal area including the Ayeyarwady delta is used by some river traffic including traffic to Yangon (Hydrographer of the Navy 1978).

Table 5-18: Myanmar Ports

Port	Region/State
Yangon	Yangon
Sittwe, Kyaukphu, Thandwe	Rakhine
Pathein	Ayeyarwady
Mawlamyine	Mon
Dawei, Myeik, Kawthoung	Tanintharyi

Source: http://www.aseanports.com/apa_members/apa_myan/index.html, June 2017

There are more than 500,000 ships of all sizes passing through these three routes every year. Blocks M12, M13, & M14 is far from these international routes, thus marine traffic is expected to be low. However, there exists the potential for oil tanker routes to be established near Blocks M12, M13, & M14. Potential oil tanker lanes from the major oil tanker lane to Malacca Strait to Yangon in 2017 are shown in **Figure 5-32**.

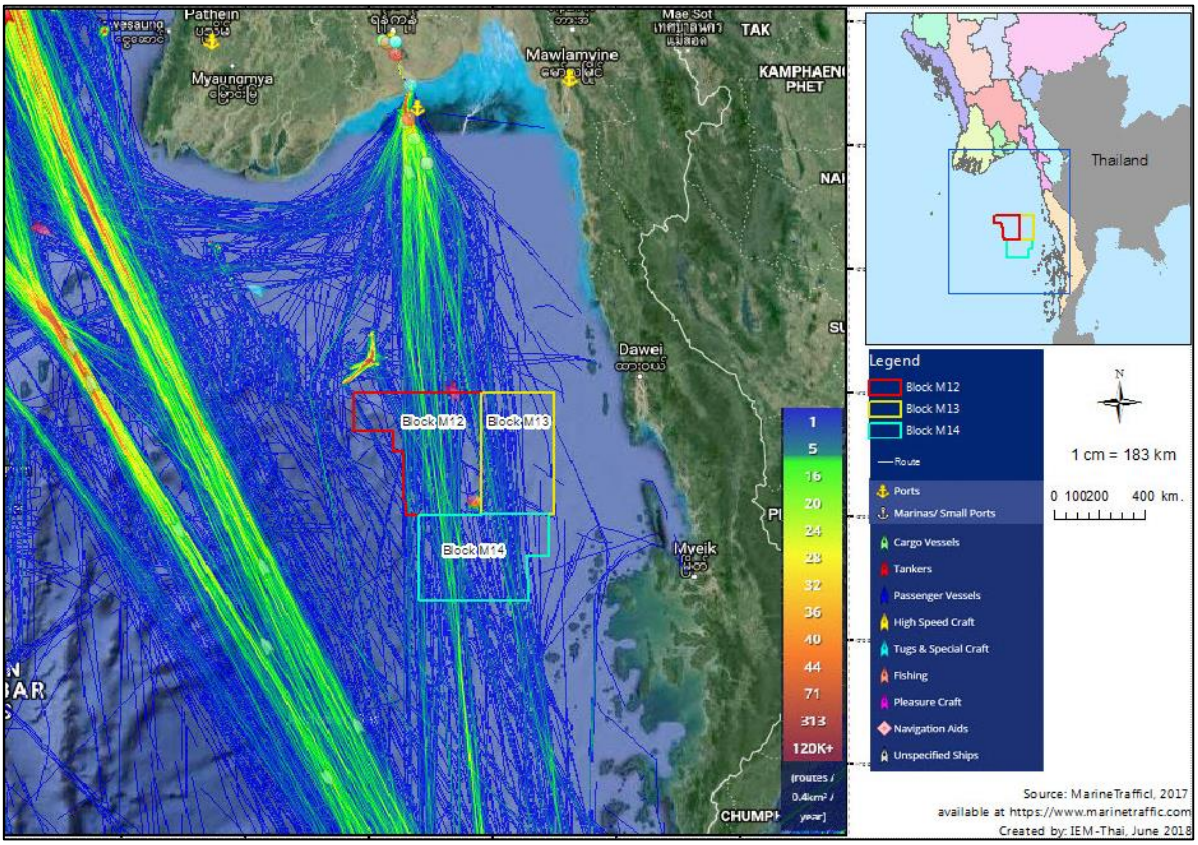


Figure 5-32: Vessel Traffic throughout Blocks M12, M13, & M14

5.5.3 Offshore Oil and Gas Infrastructure

The existing offshore oil and gas facilities in the Andaman Sea consist of the Yadana, Zawtika and Yetagun gas field developments. These are shown in **Figure 5-33**, and described briefly below.

The Yadana gas field at the boundary of offshore Blocks M-5 and M-6 situated in the Gulf of Martaban and operated by Total S.A. is located around 60 km offshore and consists of offshore platforms, subsea gas pipelines and onshore support, land pipeline and a control and maintenance centre along with a gas metering station. The offshore gasfield has three well-head platforms, one accommodation platform and one production platform. The facilities include a 36 inch 346 km subsea pipeline to shore in the Dawei area, and a 63km onshore pipeline connecting through the Tanintharyi Region to the Thai border. A 24 inch Myanmar Domestic Gas Pipeline is routed from the Yadana Field, and passes through Block M-3 and then to the Dawnyein Pipeline Center and then in to Yangon (both receiving and transmission station). The Yadana Field has been producing since 1998.

The Zawtika gas and condensate field development, operated by Petroleum Authority of Thailand Exploration and Production International (PTTEP International) includes the Zawtika, Kakonna and Gawthaka fields, located in blocks M9 and M11 of the Gulf of Martaban. The facilities are spread across an area of 11,746 square kilometres. The facilities include three wellhead platforms, an integrated processing and living quarters platform, and 18 km infield pipelines and an approx. 230 km 28 inch export pipeline to shore, and 72 km onshore pipeline to Thailand.

The Zawtika development has been exporting gas since 2014.

Gas from the Zawtika development is transported via pipeline to Yangon for domestic use and to Thailand via an overland pipeline from the Dawei area.

The Yetagun gas and condensate field currently operates within Block M14 in the Gulf of Martaban, covering an area of approx. 24,130 km . The participating interest in the blocks is PCML (10.91%), PC Myanmar Inc (30%), Myanma Oil & Gas Enterprise (20.45%), JX Nippon Oil & Gas Exploration Corporation (19.32%) and PTTEP (19.32%). The development includes the Yet A drilling/wellhead platform, Yet B processing platform, the leased Yetagun floating storage and offloading (FSO) vessel, and installation of an approx. 202 km-long 24 inch offshore pipeline and a 270 km-long 24 inch onshore pipeline from the Dawei area to Thailand, and an operating centre and metering station. The Yetagun booster compression platform (Yet C) was commissioned in July 2012. The Yetagun North Field is located 12 km north-east of the main field. The satellite field's development includes the Yet D platform and two production wells with an 11.2 km pipeline from Yet D to the existing Yet C platform.

The Yetagun Field has been in production since year 2000.

Two fibre optic cable lines pass west of Blocks M12, M13, and M14, which are branches of international cable lines, also pass through the Andaman Sea to Myanmar as shown in **Figure 5-34**.

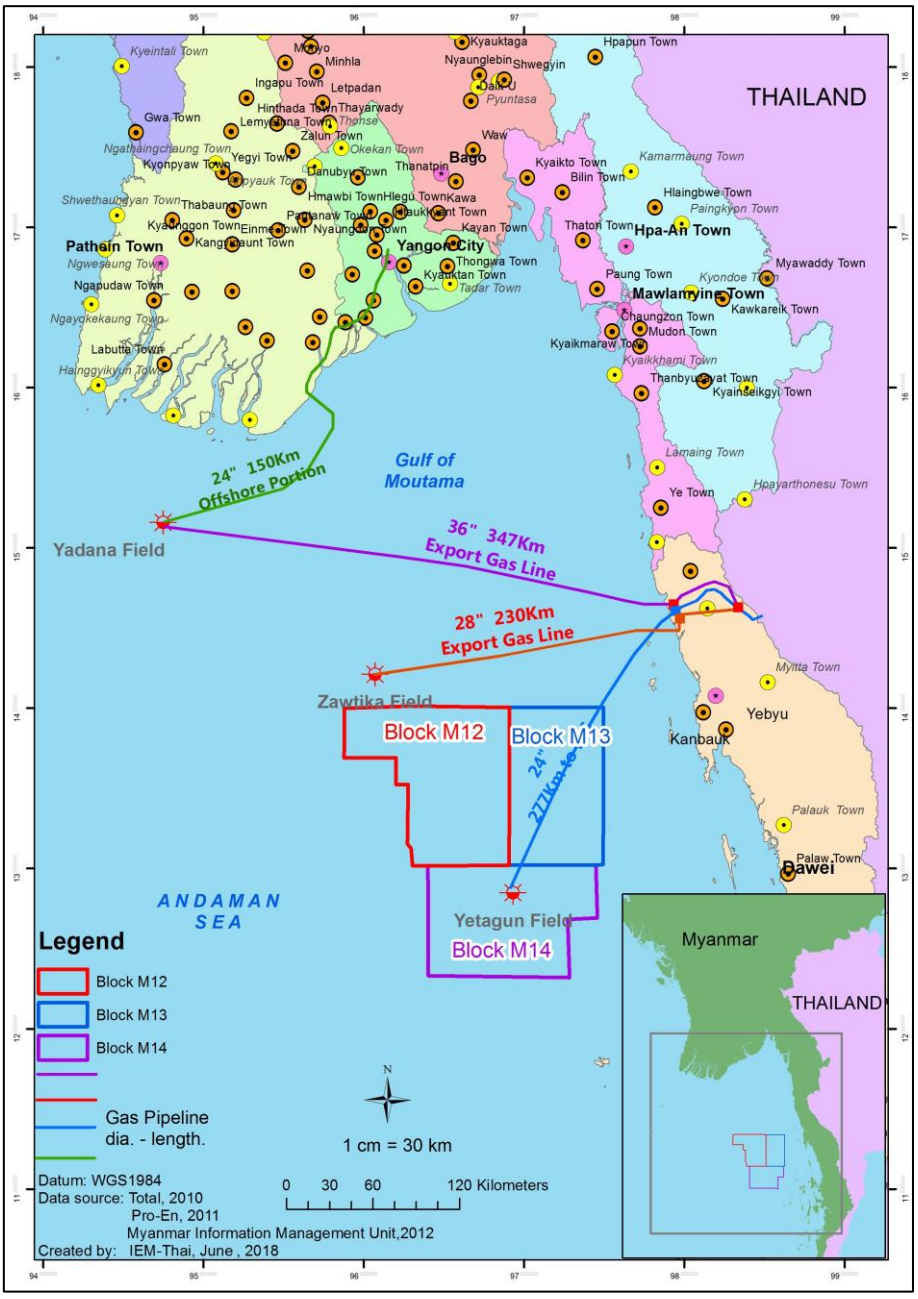


Figure 5-33: Existing Gas Pipelines in the Andaman Sea Area

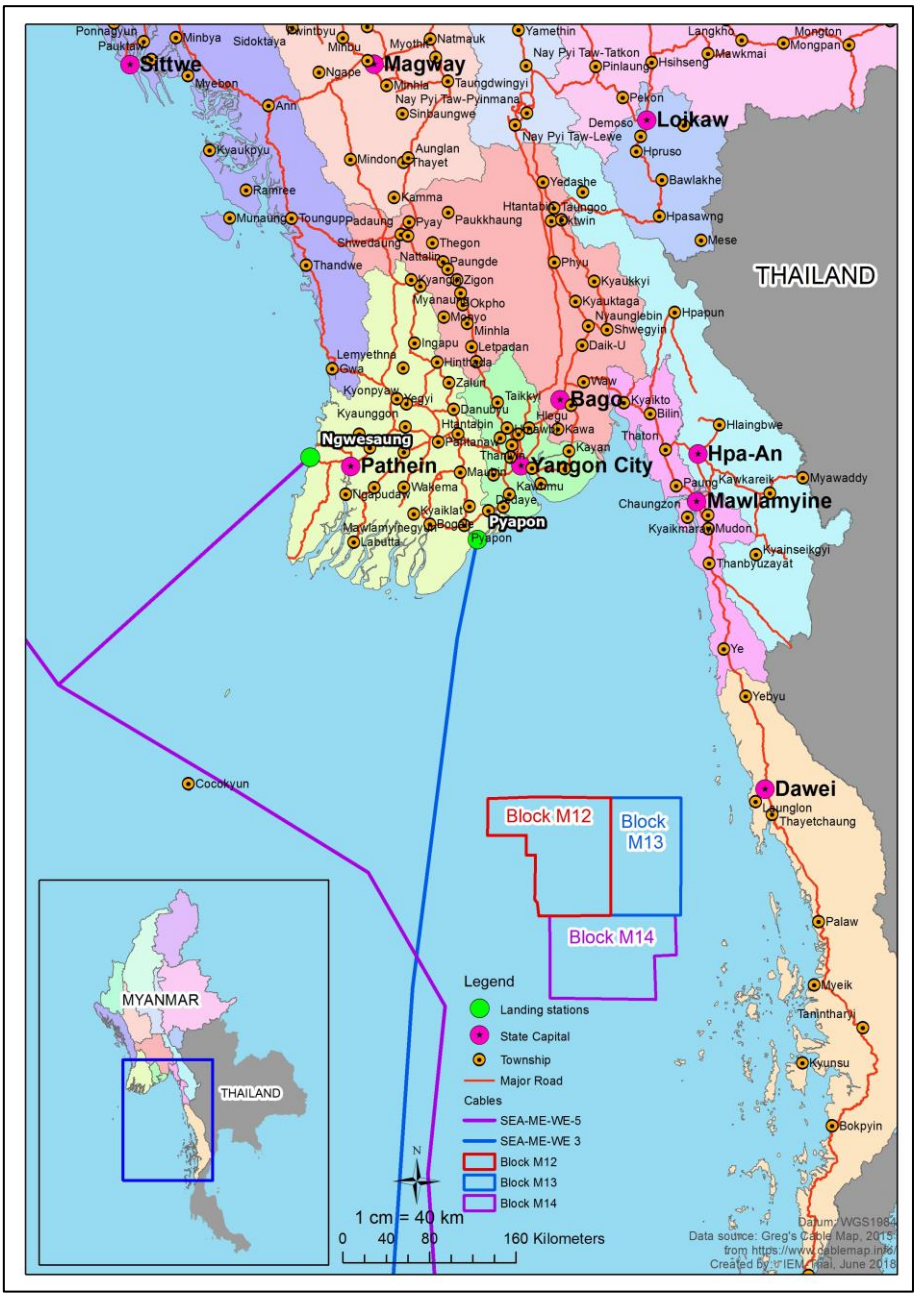


Figure 5-34: Subsea Cable Lines in the Andaman Sea

5.6 Quality of Life Values

5.6.1 Administration

In Myanmar, states and regions are divided into districts. These districts consist of townships that include towns, wards and village-tracts. Village-tracts are groups of adjacent villages. The administrative structure of the states, regions and self-administering bodies is outlined in the new constitution adopted in 2008.

Myanmar is divided into 15 States and Regions. Accordingly, the 2014 Census results show that Yangon Region has the largest population (7.36 million), followed by Ayeyawady (6.18 million), Mandalay (6.16 million), Shan (5.82 million), and Sagaing (5.32 million). These five States and Regions account for almost 60 % of the total population of the country.

Tanintharyi region covers an area of 43,344.91 km^2 and is shown in **Figure 5-35**. It is consists of three districts include:

Dawei district consists of four townships – Dawei, Launglon, Thayetchaung and Yebyu. Dawei is a city in south-eastern Myanmar and is the capital of the Tanintharyi Region, it is a port at the head of the Dawei River estuary, 30 km (18.6 mi) from the Andaman Sea and getting a proposed special economic zone plus deep sea port called the Dawei Port Project. It is undergoing construction providing a road link to Thailand, port, and a rail connection.

Myeik, formerly "Mergui" , consists of four townships – Myeik, Tanintharyi, Kyusu and Palaw is a city in Tanintharyi Region in Myanmar (Burma), located in the extreme south of the country on the coast of an island on the Andaman Sea. Myeik is small, but it is a very important town in Myanmar. It is also the coastal capital of Coastal Command.

Kawthaung consists of two townships – kawthaung and Bokpyin is a town located in the southernmost part of Myanmar, in the Tanintharyi Region. To its east is the Thai border town of Ranong. To its west, and south-west, the Andaman Sea opens up to the Indian Ocean and Bokpyin Township is located to the north. Most of the terrain in the area is mountainous.

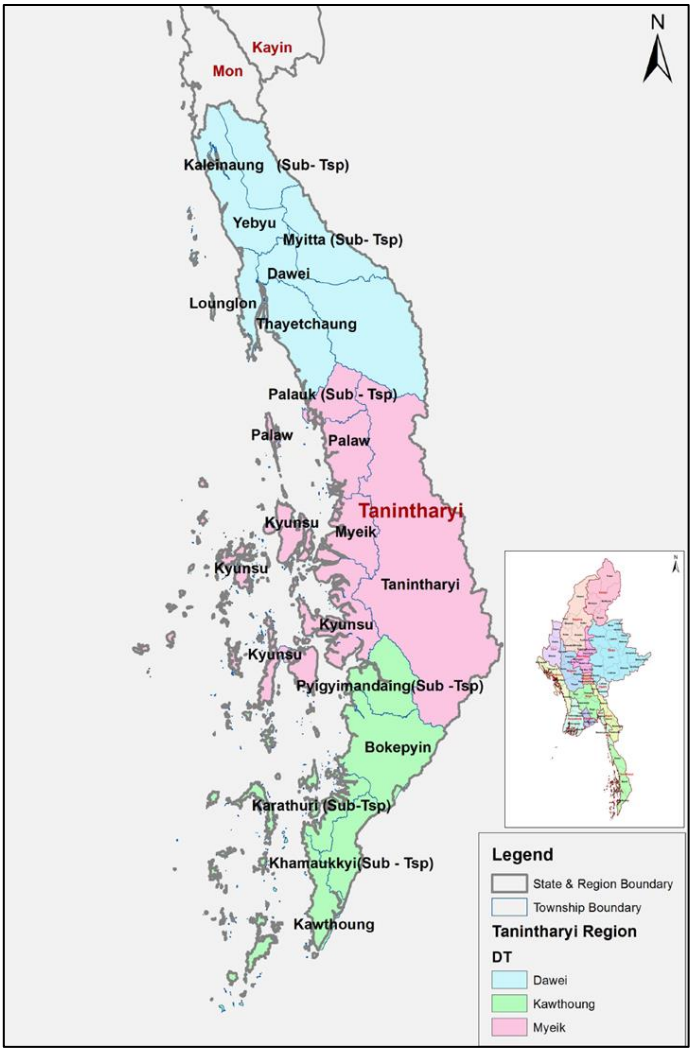


Figure 5-35: Tanintharyi Region Administration

The project is located offshore from the Tanintharyi Administrative Region (**Figure 5-36**), which covers the long narrow southern part of Myanmar. It is bordered by the Andaman Sea to the west and the Tenasserim Hills, beyond which lies Thailand to the east. To the north is the Mon State. There are many islands off the coast, the large Merqui Archipelago in the southern and central coastal areas and the smaller Moscos Islands off the northern shores.

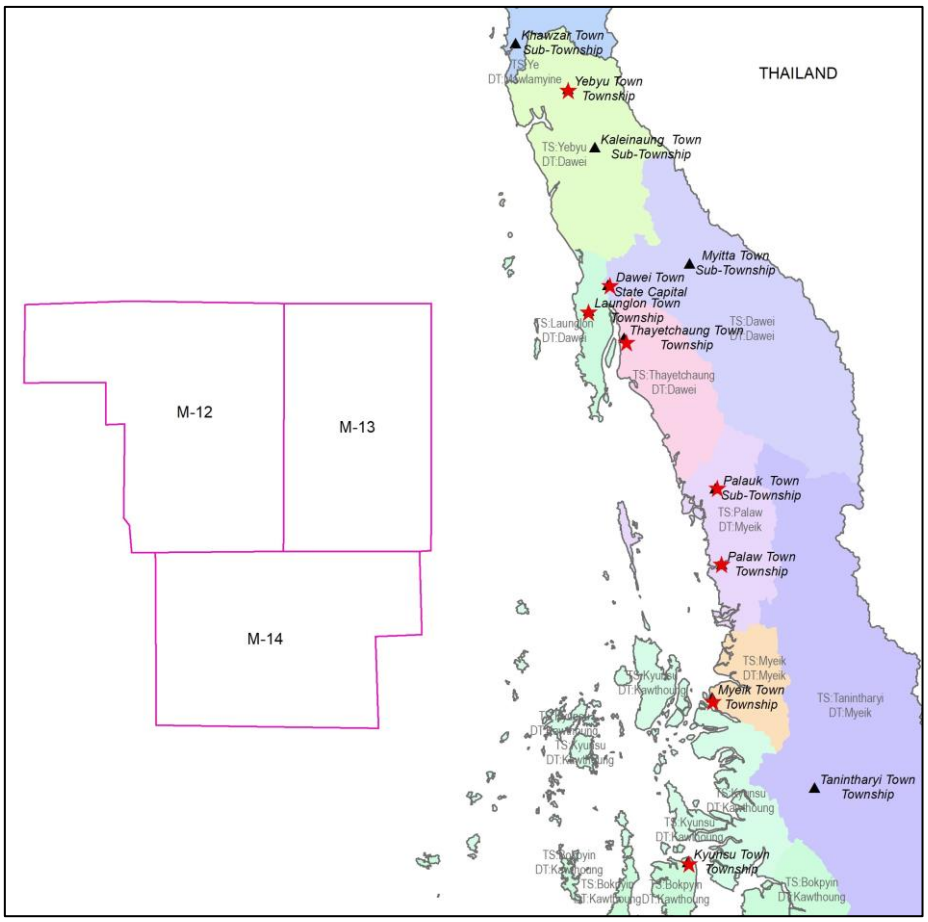


Figure 5-36: Administrative Regions near Blocks M12, M13, & M14

5.6.2 Governance

Each state or region has a Regional Government or a State Government consisting of a Chief Minister, other Ministers and an Advocate General. Legislative authority would reside with the State Hluttaw or Regional Hluttaw made up of elected civilian members and representatives of the Armed Forces.

The General Administration Department (GAD) under the Ministry of Home Affairs acts as the backbone of the local administration. Thus, at the township level the overall administration (and coordination functions) falls under the authority of township administrators, who are appointed by the GAD and replaced on a three-year basis. In addition sectorial line ministries deliver services and have departments at the township level and refer to the Union level government. While elections take place for the region/state level parliament (which has limited powers) and for the village tract/ward level (which forms the main point of interaction between the state and its citizens), no elected bodies exist at the township or district levels - although this may change in the future.

Low population density and poor accessibility of some villages present a challenge to governance-related communications, which like much of rural Myanmar, remains local and often communicated

through personal networks. The 10 Household Head remains the key source of information for the majority of people, meaning the role and existing capacities of these individuals merit closer attention. The Village Tract Administrator (VTA) is not the main conduit for day-to-day information, but name recognition among citizens is very high. The fact that the VTAs have been appointed following an election does not amount to the democratisation of local governance. In Tanintharyi, both VTAs and citizens primarily associate the VTAs' role with 'law and order' functions, which may be even stronger in post-conflict areas of Tanintharyi. Whether the representative mandate inferred on the VTA as an elected leader will eventually translate into demands for more responsiveness is contingent on the perceptions of the role, community expectations and level of personal initiative.[14]

5.6.3 Demographics

The 2014 Myanmar Population and Housing Census (2014 MPHC) was conducted from 29th March to 10th April 2014. The 2014 MPHC shows that Myanmar's total population was 51,486,253 persons as of 29th March, 2014. Of these, 24,824,586 were males and 26,661,667 were females. This overall number includes an estimated population of 1,206,353 persons who were not enumerated in certain specific areas of the country. The census enumerated a total population of 50,279,900.

Tanintharyi Region has population of 1,408,401 inhabitants, It is among the least populous Regions/States in Myanmar making up only 2.7 percent of the country's population, ranking only above Chin (0.9%), Kayah (0.6%) and Nay Pyi Taw (2.3%). With a population density of 32 persons per km^2, the Region is among the most sparsely populated of Myanmar's 14 States/Regions, for which the average is 76 persons per km2. The Region is primarily rural, with an urban population of 338,419 (24%) versus a rural population of 1,069,982 people (76%). There are 700,619 (49.8%) men and 707,782 (50.2%) women in the region. The average household has 4.8 persons per household (the national average is 4.4). Township population size in Tanintharyi varies significantly: the region's the most populous is Myeik follow by Dawei and Kawthaung.

Myeilk has population of 284,489 with a population density of 200.6 persons per km^2. There are 139,592 (49.1%) men and 144,897 (50.9%) women. Dawei has population of 125,605 with a population density of 29.4 persons per km^2. There are 60,004 (47.8%) men and 65,561 (52.2%) women. Kawthoung has population of 116,980 with a population density of 84.1 persons per km^2. There are 59,507 (50.9%) men and 57,473 (49.1%) women.

The population pyramid for Tanintharyi Region in 2014, presented in **Figure 5-37**, is pot-shaped, displaying a similar shape to the Union population pyramid. This shape illustrates a declining proportion of children in the population and a bulge in the population aged 5-14 years. The pot-shape also indicates a rapid growth of the population of young people in Tanintharyi Region.

5.6.4 Ethnicity

The majority of the region's population of 1.41 million (2014 MPHC) is of Bamar ethnicity. There are some who self-identify as members of sub-groups such as the Dawei/Tavoyan people. Language with various local dialects is spoken by almost all of the population. Several defined ethnic minorities are also present in Tanintharyi, including the Karen/Kayin, Mon, Shan and Rakhine. Pa-O are also present and Moken / Salon people inhabit some of the islands.[15]

14 UNDP Local Governance Mapping – The State of Local Governance: Trends in Tanintharyi Region
15 The State of Local Governance: Trends in Tanintharyi - UNDP Myanmar 2014

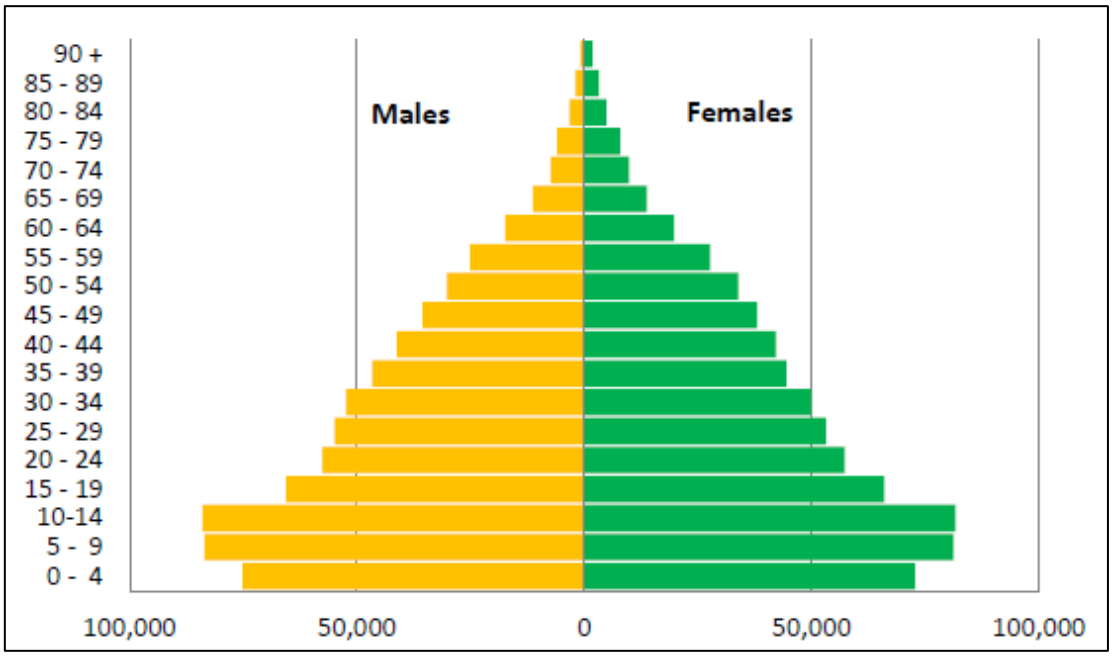


Figure 5-37: Demographic Pyramid of Tanintharyi Region (Myanmar Census, 2014)

5.6.5 Regional Development

The Union Government of Myanmar has prepared a long term national development plan, the National Comprehensive Development Plan (NCDP) (2011-2031).[16]

Myanmar has a history of national and sector development plans, and large number of new long-term government reform plans were developed during 2013 and 2014. The Framework for Economic and Social Reforms (FESR) identifies policy priorities for the period 2012 to 2015. It acts as a bridge between the Fifth Five-Year Plan (2011-12 to 2015-16) on one hand and, on the other, the reform-oriented National Comprehensive Development Plan (2011-31) and the future five-year plans that will support it. The Ministry of National Planning and Economic Development co-ordinates and drafts the FESR after consulting with other ministries and departments. The FESR reflects the progress that the new government has made since it was elected in March 2011 and its continuing commitment to the socio-economic reform goals in the near future in: tax and public finance, monetary policy and finance, trade and investment, private sector development, health and education, food security and agriculture, governance and transparency, mobile phones and the Internet, infrastructure, and government effectiveness and efficiency.[17] The new long-term plans also included: The 'first' Five-Year Plan (2011–16); the Myanmar National Spatial Development Plan containing goals for urban development; the Myanmar Tourism Master Plan (2013–20); the National Strategic Plan for Women Advancement (2013–22); and the Comprehensive Education Sector Review (2014–20).

Similar to other States and Regions, planning activities at township level in Tanintharyi is limited in scope and focuses on collecting data and information for decision-making at the Union level, and increasingly at the Regional level. Unlike other key township committees, for which there are more specific rules, the composition of the Township Planning and Implementation Committees (TPIC)

16 Dr.Than Htut ,Deputy Director-General , Foreign Economic Relations Department, Ministry of National Planning and Economic Development The Government of the Republic of the Union of Myanmar 2013.
17 Economic Outlook for Southeast Asia, China and India 2015: Strengthening Institutional Capacity, http://dx.doi.org/10.1787/saeo-2015-en

under the Ministry for National Planning and Economic Development (MoNPED) is flexible across the three townships in Tanintharyi, and contingent on the needs of each particular one.

In 2014-15, Tanintharyi was allocated 1 billion Kyats (1 million USD), which was then distributed by equal shares among townships. These funds allocated to townships through the Poverty Reduction Fund (PRF) are substantial on a per township basis. The investment impact of the PRF is more diluted for large townships such as Myeik. In 2013-14 and a Constituency Development Fund (CDF) was established by the Union parliament whereby each township was allocated an additional 100 million Kyats (100,000 USD) for development projects, selected in consultation with Members of the Hluttaws. For 2014-15 the amount remained the same, 100 million Kyats per township (100,000 USD).

The Dawei Special Economic Zone Development aims to connect Myanmar to Thailand through a US$50-billion industrial area and deep-sea port. The development plan for the SEZ is broken down into five phases with different duration, all within 75 years. The entire zone may ultimately extend to 205 square kilometres (80 square miles).

The National Myanmar Ecotourism Policy and Management Strategy (2015-2020) is focused on tourism and protected areas. Protected areas are to develop an ecotourism strategy/management plan which supports conservation objectives. Lampi Marine National Park is the first national PA to have developed a General Management Plan (approved by MONREC in Nov 2014) and a Draft Ecotourism plan in line with National Policy. The plan includes a 4-year Action Plan to guide the activities to be implemented in this National Park.[18]

The Myanmar Investment Commission (MIC) has approved hotel projects in Ngalonelapel, 155 island, Kayinkwa, Ngakhinnyo, Kyunphila, Ngaman and Boywe islands in Myeik Archipelago of Tanintharyi Region according to the Myeik Division of the Hotels and Tourism Ministry. Altogether 13 hotels are due to be built on these islands.[19]

5.6.6 Coastal Socio-Economic Context

Tanintharyi's economy is driven mainly by agriculture, forestry, mining, fisheries and to some extent tourism. The region has been affected by ethnic armed conflict which has remained at relatively low levels since 1948. Non-state armed groups have operated and continue to have a presence in northern and eastern parts, particularly those more remote areas in the Region. Some parts of the Region which continue to feel the repercussions of the conflict have Internally Displaced Persons (IDPs) and people living in neighbouring Thailand as refugees. Access to electricity and bad road infrastructure continue to be major challenges.

The rubber and palm oil plantations have been a prominent employer in the Region, but have also been the cause of environmental and social impacts such as deforestation, displacement and land grabbing. The development of Dawei Special Economic Zone (SEZ) and deep-sea port is one of the largest and most high profile infrastructure projects in Myanmar. It is expected to transform the Region's economy, but it has also attracted criticism from civil society and local communities whose land has been affected. Some groups argue that a focus on promoting tourism and protecting local biodiversity is more sustainable than establishing a large industrial zone.

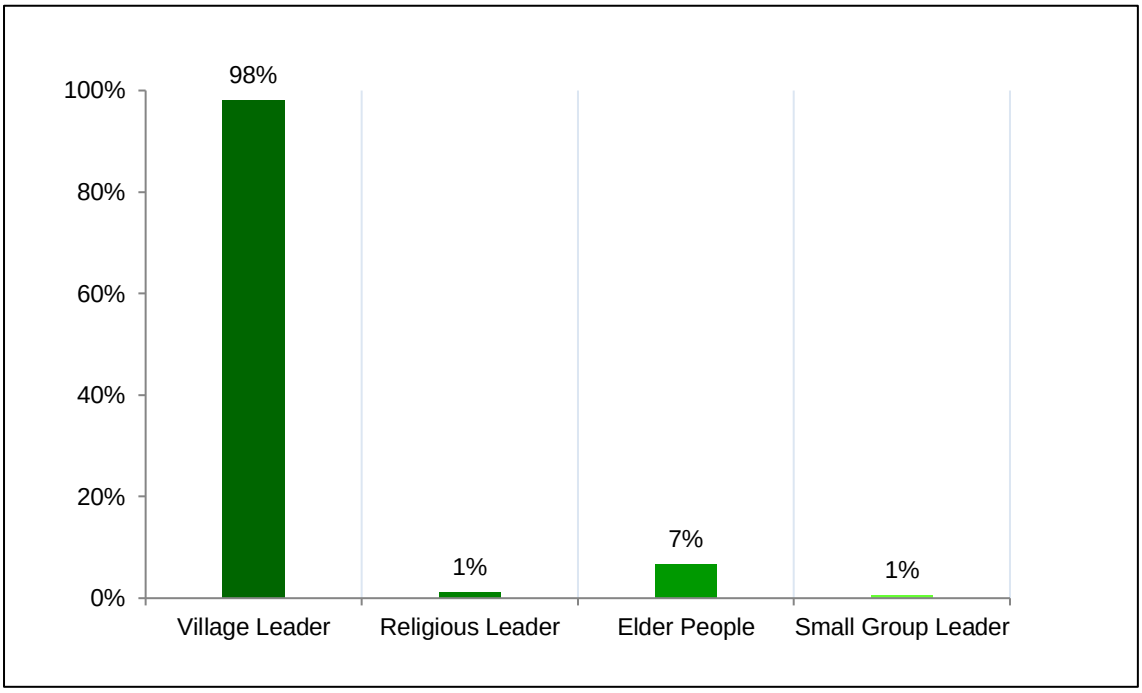
There is no resident population in the offshore project area. The quality of life issues addressed pertain to certain parts of the population in Tanintharyi coastal communities and the general population of Myanmar. People along the coast generally live in small villages. Data for the socio-economic baseline of the Project area has been derived from a review of various technical reports, government, and on-line sources as well as from local consultation undertaken in coastal communities. A summary of the information acquired in the interviews is provided below.

18 Stakeholder Consultation: Lampi Marine National Park Ecotourism PlanYangon, 28th May 2015, OIKOS
19 Ngalonelapel, 155 island, Kayinkwa, Ngakhinnyo, Kyunphila, Ngaman and Boywe islands.

5.6.6.1 Community Decisions

At the community level, local villagers identified the elected Village Leader is responsible for most (98 %) of community decision making. (**Chart 5-1**)

Chart 5-1: Responsibility for community decision making in coastal communities



5.6.6.2 Household Characteristics

The survey identified the age structure of the respondents' families, and showed that 29% of household members are between 30-40 years of age followed by those in the range of 50-60 and 20-30 years of age. The average households had 5 family members, which is above the regional average of 4.8 per household. Of the respondents, 63% were Bama, with 35% indigenous and 2% reporting as other Myanmar race. 99% of the respondents were Buddhist.

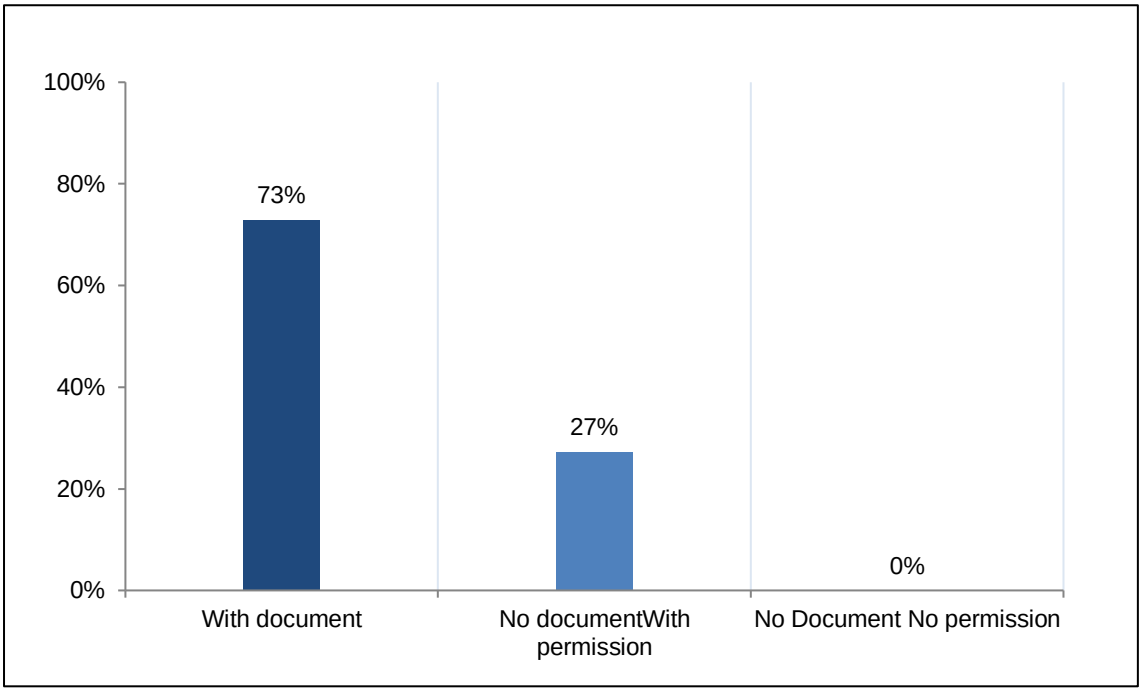
5.6.6.3 Housing

The slightly from the 2014 census which indicated that approx. 67.6 % of the households in the Region live in housing units with thatched roofs made of dhani/Theke/in leaf, and 27.7 % use corrugated sheets. The vast majority (96%) of the villagers surveyed had lived in this location for over 10 years with only 4% living in the area between one to ten years.

5.6.6.4 Home Ownership

The conditions of housing units are important characteristics which indicate the quality of life of the population. The 2014 Census showed that 77% are owners of their housing, while 11% are renter of their housing In the both villages surveys for this project, the majority (97%) of the households surveyed, own the land where they live. The natures of ownerships vary: 73% of the households have documents to show ownership, and 27% have no formal land ownership documents but have permission. (**Chart 5-2**)

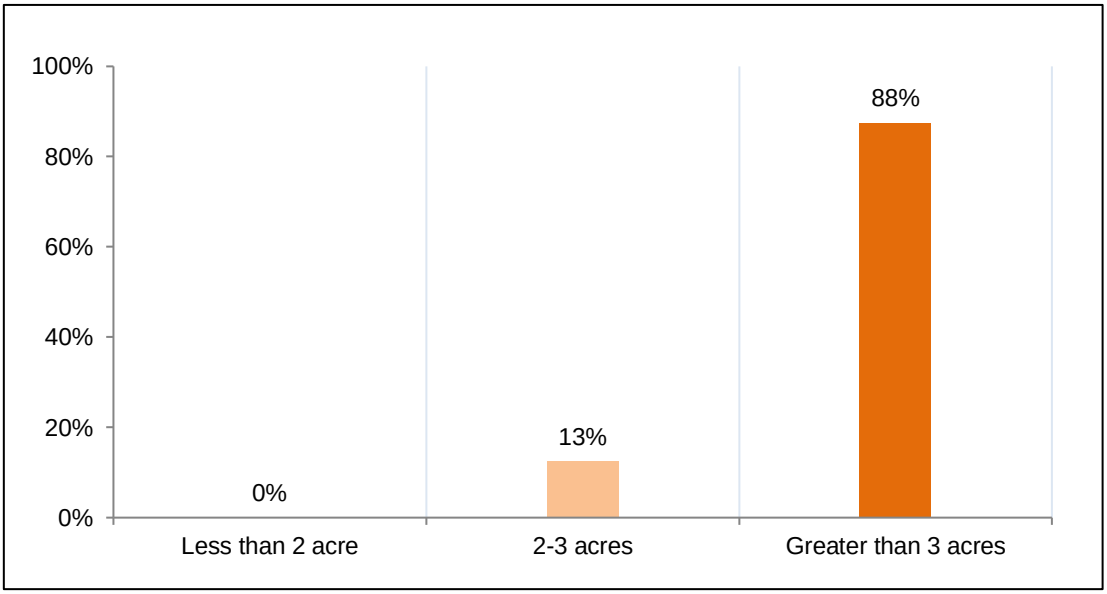
Chart 5-2: Ability to demonstrate land ownership in coastal communities



5.6.6.5 Farmland Ownership

Land Ownership patterns vary in Myanmar. In the coastal areas surveyed approx. 97% do not have agriculture land. Approx. 88% of the farmers surveyed own more than 3 acres. (**Chart 5-3**)

Chart 5-3: Area of farmland owned by households reported in coastal communities



5.6.6.6 Income and Employment in coastal areas near M12, M13 & M14

Approx. 97% of the respondents had an average daily wage of over 2,000 kyat. The survey group indicated that 26% had an annual income of 2,000,001-3,000,000 kyat and above 5,000,000 kyat; 25% had an annual income of 1,000,001-2,000,000 kyat; and 20% with an annual income of 3,000,001-5,000,000 kyat (**Chart 5-4**). When asked whether they felt they had sufficient money respondents indicated that 64% have enough money but do not have savings, while 24% do not have enough money or savings and 13% have enough money and savings. The primary occupation of those surveyed were fisherman (75%). (**Chart 5-5**)

Chart 5-4: Annual household income reported in coastal communities

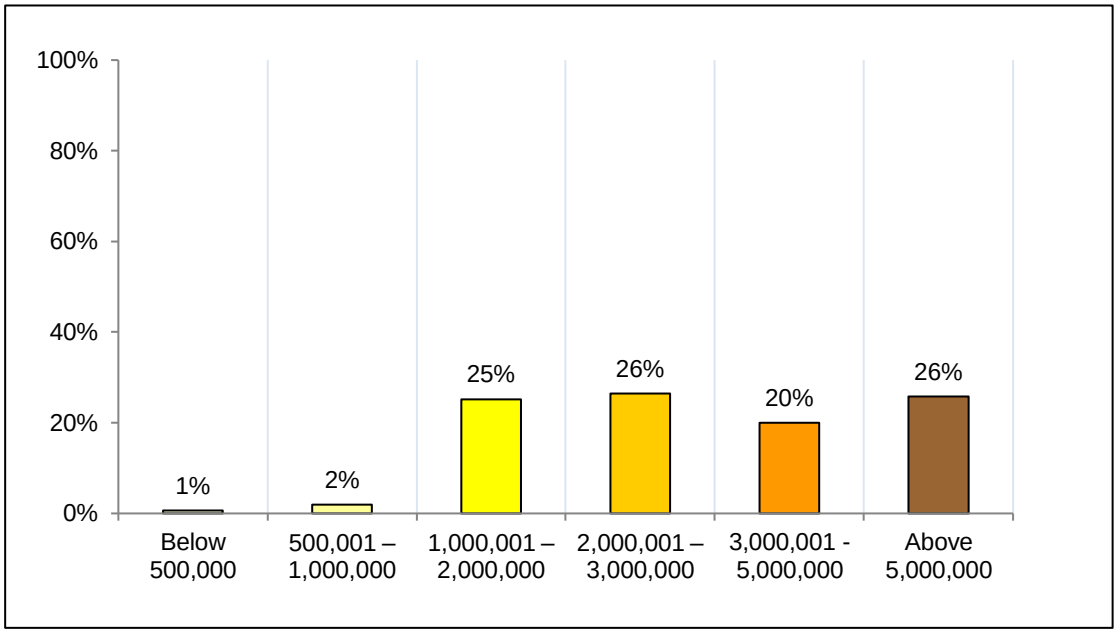
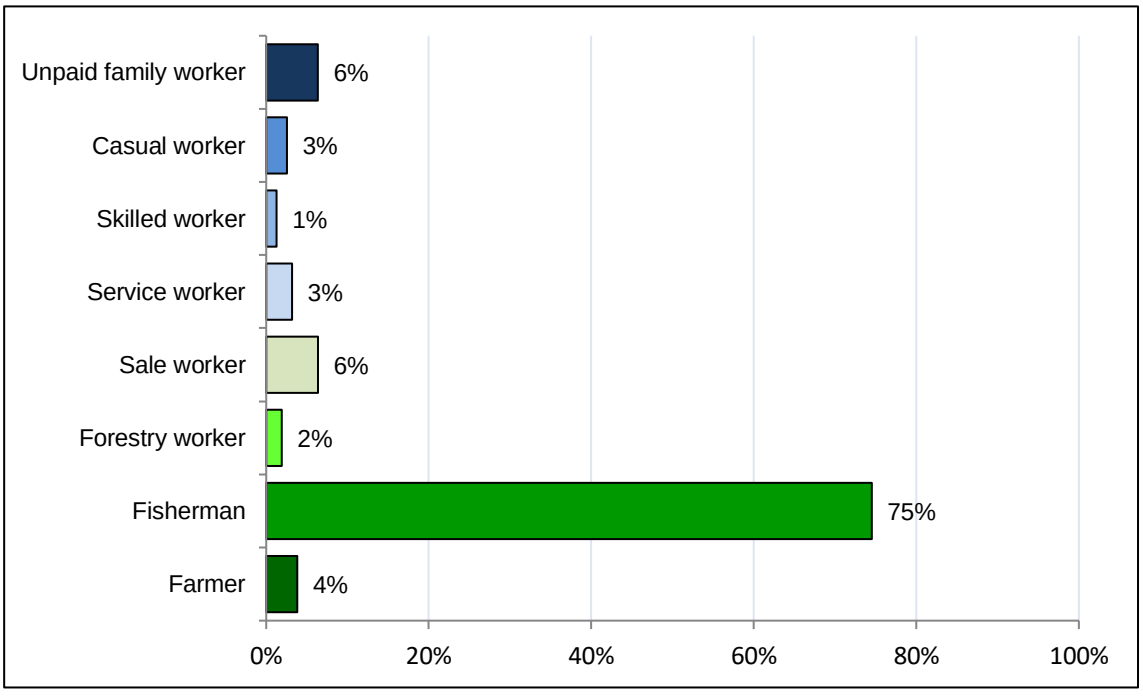


Chart 5-5: Primary occupation reported in coastal communities



Regarding available labour, 80% of those surveyed indicated that labourers were not available. All respondents of those surveyed indicated that oil and gas projects did not affect the availability of labour.

5.6.6.7 Migration

Of the total survey group 97% do not migrate for work. (**Chart 5-6**) When individuals migrate for work, (50%) migrate for 6-12 months on average or 1-3 months on average. 6 months. The summer season and rainy season was greatest period during which people migrated for work. (**Chart 5-7**)

Chart 5-6: Pattern of migration reported in coastal communities

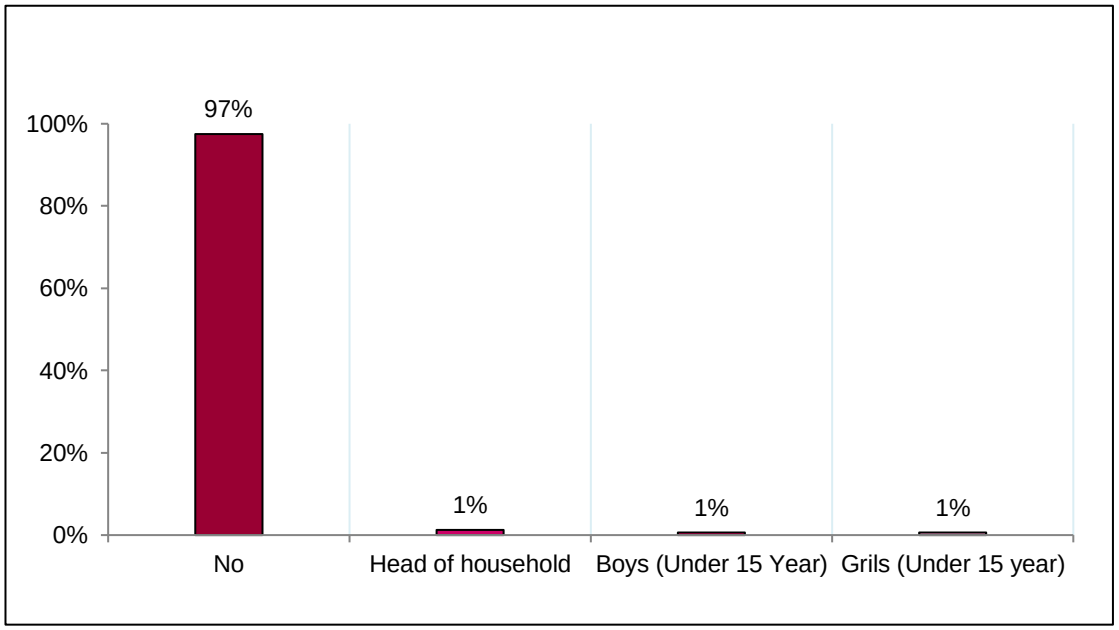
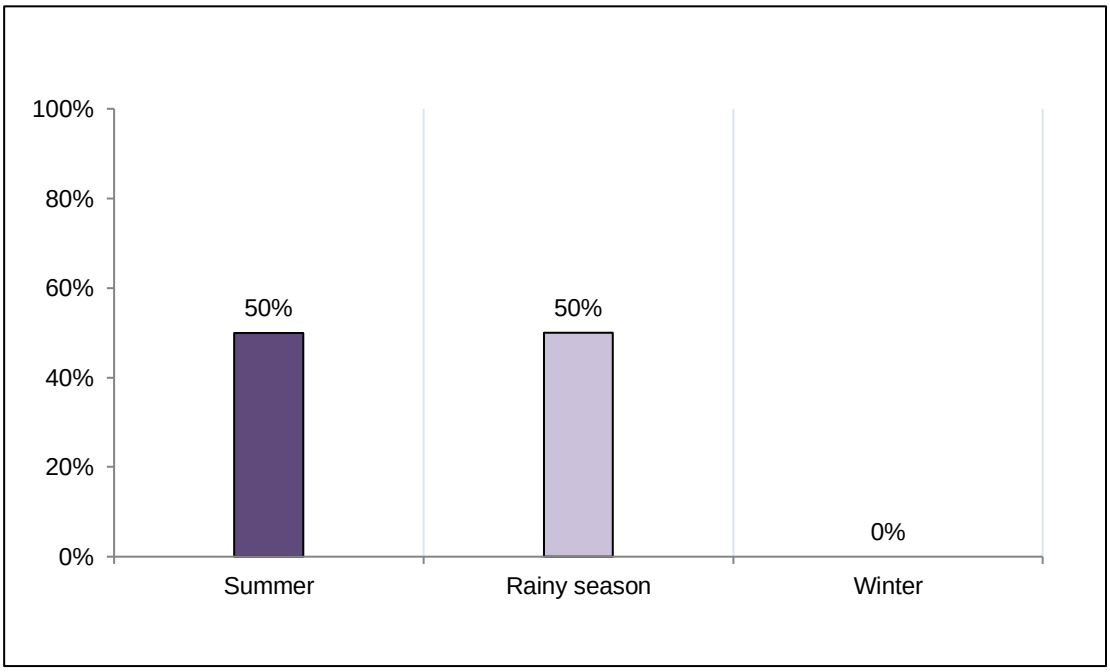
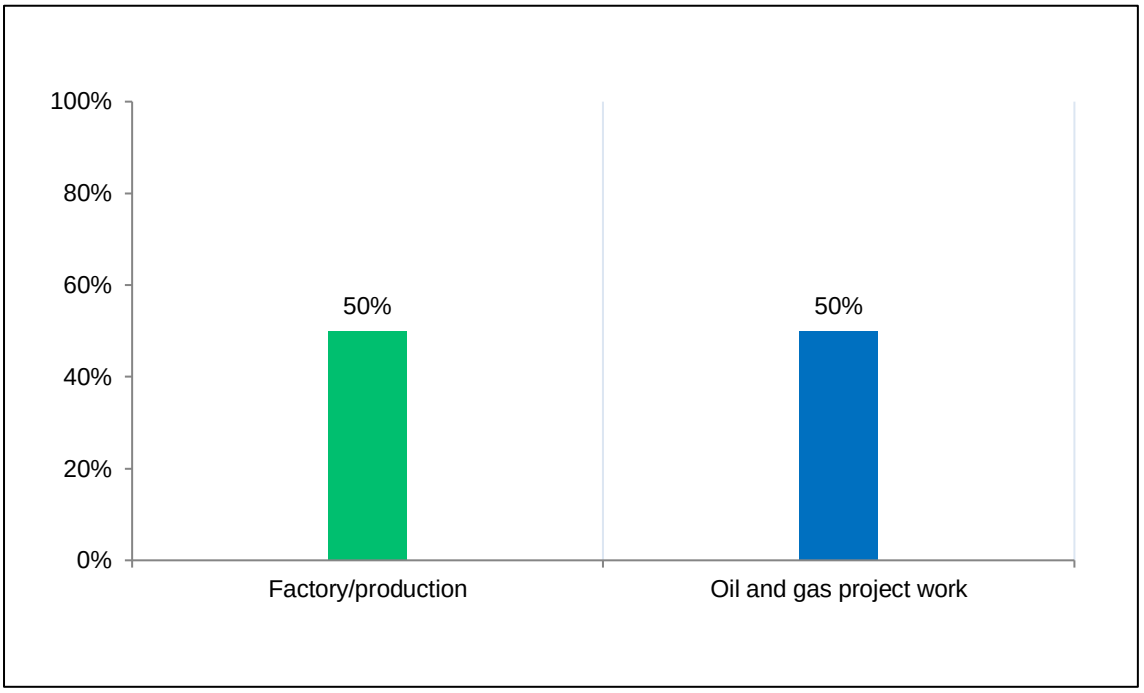


Chart 5-7: Season of job migration reported in coastal communities



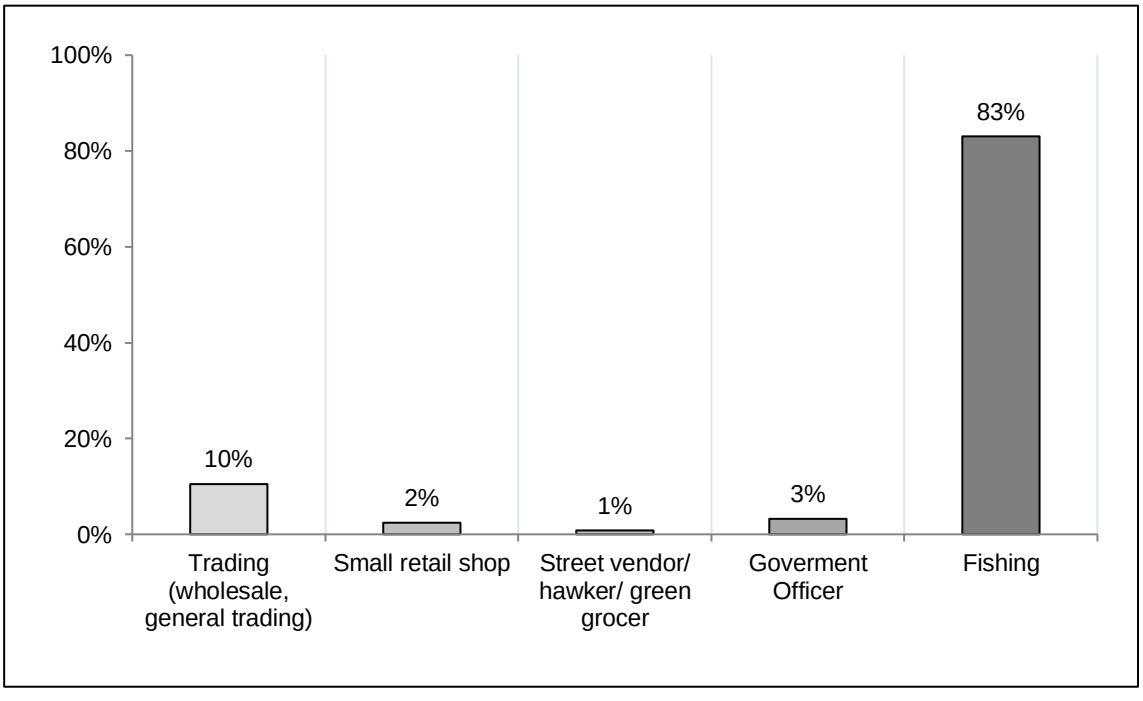
The main type of work for which the survey group migrated was factory/production (50%) or Oil and gas project work (50%). (**Chart 5-8**) The majority (33%) of workers who migrated went both Within State/Division/Township and abroad.

Chart 5-8: Type of work pursued by migrating workers reported in coastal communities



The majority of households 72% were participate in off-farm activities. Primary business activity participates, 83% were involved in fishing. (**Chart 5-9**)

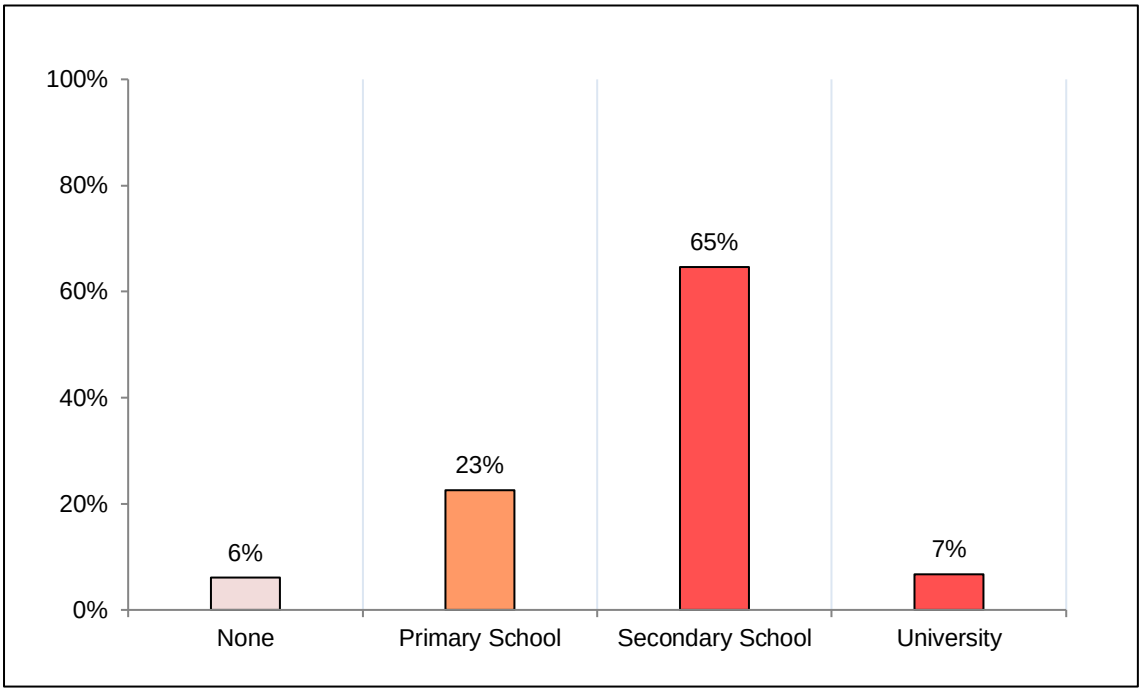
Chart 5-9: Type of household activity reported in coastal communities



5.6.6.8 Education

The majority (92%) of household members indicated that education was accessible to their family. Approx. 65% of those surveyed had secondary school education as the highest form of education in their household. (**Chart 5-10**)

Chart 5-10: Education levels reported in coastal communities



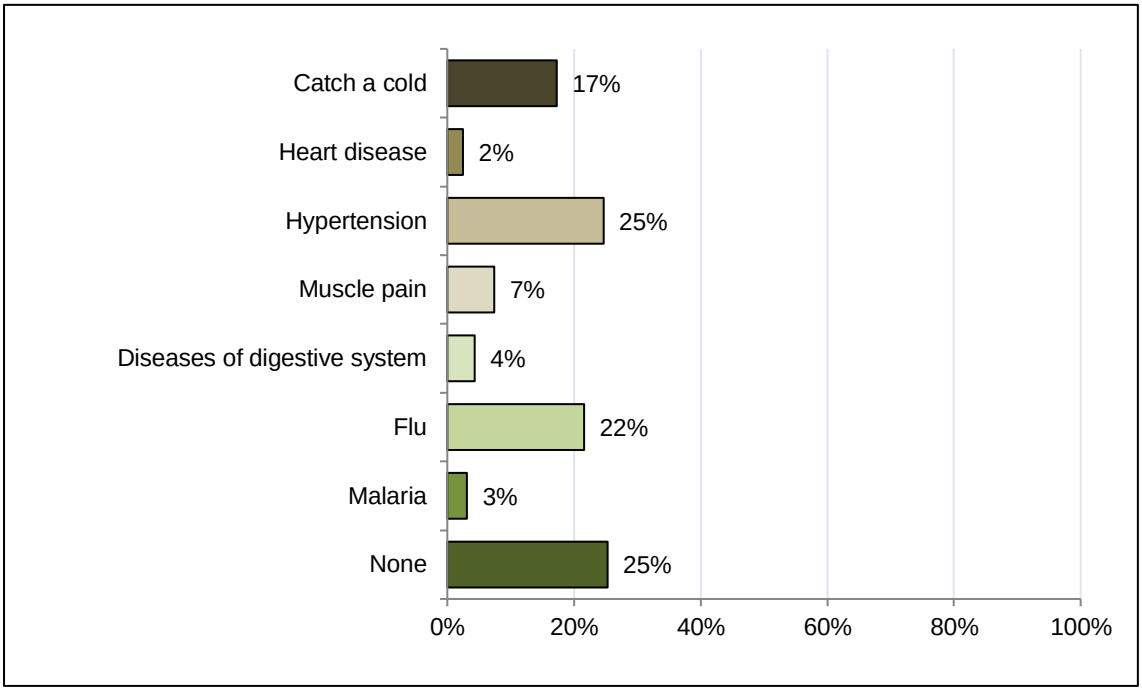
5.6.6.9 Public Health

The information on disability in the 2014 National Census included four categories (seeing, hearing, walking and remembering/mental) and the degree of difficulty a respondent experienced for each type. A total of 2,311,250 people (4.6%) have at least one type of disability. The most common type of disability is seeing (2.5%), followed by walking (1.9%), remembering/mental (1.7%) and lastly hearing (1.3%). The disability prevalence is higher among females (4.8%) than males (4.4%). By State and Region, the highest prevalence is reported in Ayeyawady (7.6%), Chin (7.4%) and Tanintharyi (7%), while the lowest is observed in Nay Pyi Taw, the administrative capital city[20].In general villagers in the coastal villages surveyed do not suffer from high incidence of serious health issues or disability.

When villagers were asked what common illnesses they had, 24% said they did not have one, with hypertension being the most common illness (23%), followed by flu (21%). (**Chart 5-11**)

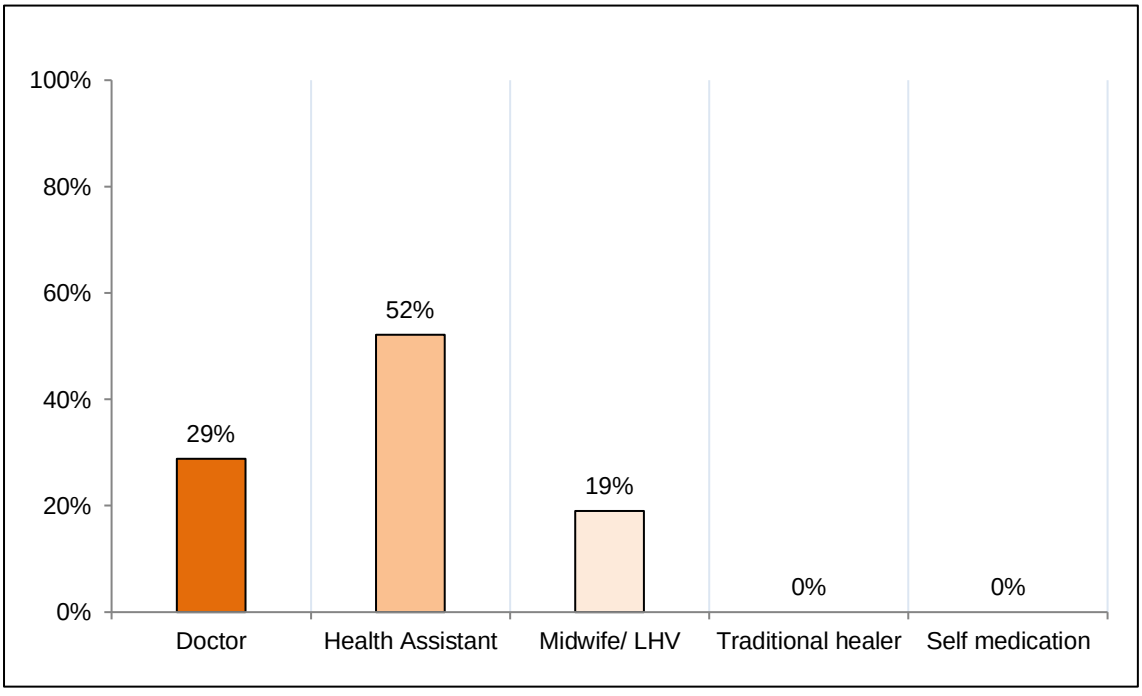
20 2014 MPHC Census

Chart 5-11: Health conditions reported by communities in coastal communities



According to the Ministry of Health, per 100,000 populations, there are 63 hospital beds, 22 midwives, 22 nurses, and 11 medical doctors available in the Tanintharyi Region. 52% of the survey group indicated that health care is available to them. The primary type of health services being used was health assistant (52%) followed by doctor (29%) and mindwife/LHV (19%). (**Chart 5-12**)

Chart 5-12: Treatment/ health services in coastal communities



5.6.6.10 Health Statistics

The 2014 census collected information on births and deaths which showed that for every 1,000 children born in Myanmar, 62 die before reaching their first birthday. This rate is higher in rural areas (68) than in urban areas (41). The Tanintharyi Region has a rate of 71 deaths per 1,000 live births.

The under-five mortality rate is 72 at Union level with Tanintharyi have a higher rate at 84.[21] In 2012, at the Union level the leading causes of morbidity in the under-fives were "All other causes" (23.5%) "Diarrhoea and gastroenteritis of presumed infectious origin" (18.5%), and "Acute upper respiratory infections of multiple and unspecified sites" (10.0%). The leading causes of mortality in the under-fives were "All other Causes" (19.9%), "Disorders related to short gestation and low birth weight, not elsewhere classified" (19.0%), and "Birth asphyxia" (14.3 %).[22]

All villagers (91%) surveyed use a mosquito net while sleeping. Based on national surveys, the Tanintharyi Region experience 2166.9 malaria cases per 100,000 people with only 1.2 malaria mortalities per 100,000 people in 2012.

5.6.6.11 Sanitation

The 2014 Census shows that in the rural areas of Tanintharyi the main sources of drinking water are protected well/spring (35%), unprotected well/spring (21.1 %) , while 11 % drinking water are tap water/ piped and bottled/ purifier water. These sources of drinking water are classified as improved.

Water treatment was reported by 64% of respondents did not treat water before drinking; only 36% of them treat water before drinking. Which 61% use ceramic/sand filter while 31% boil their drinking water to make it safe.

The main type of toilet facility in the rural areas of the region is improved pit latrine (water seal), 66.6% of households surveyed reported using this facility. It is important to note that 15.6% of rural households do not have a toilet facility in the region.

5.6.6.12 Tourist Attractions and Recreational Areas

In Myanmar, tourism is a relatively recent and developing sector, but the number of visitors is increasing yearly, and the government has been encouraging tourism. The total number of tourists arriving in Myanmar during 2015-2017 is shown in **Table 5-19**. In the 2016-2017 fiscal years, 3,079,272 tourists visited Myanmar.

Table 5-19: Number of International Tourist Arrivals in Myanmar, 2015-2017

Year	Tourists			
	Total	by Air	by Sea	by Land
2015-2016	4,722,045	1,244,192	315,700	3,162,153
2016-2017	3,079,272	1,254,536	350,253	1,474,483

Source: Central Statistical Organization, Ministry of National Planning and Economic Development, http://www.csostat.gov.mm/

Tanintharyi region covers the long narrow southern part of Myanmar on the Kra Isthmus. It borders the Andaman Sea to the west, Thailand to the east and Mon State to the north. The capital is Dawei and the other main city is Myeik. Myeik Archipelago is inhabited by the Salone tribes and there are festivals and occasions to visit throughout the year. Tanintharyi Development Committee made efforts to boost the tourism business by drawing a master plan for sustainable tourism in the region, especially the Myeik Archipelago. Myiek Archipelago boasts more than 800 islands rich in natural resources, corals and traditional cultures that could be attractive to tourists. Myeik Archipelago could

21 2014 MPHC Census
22 Annual Hospital Statistics Report 2012 Department of Health Planning in collaboration with Department of Health November 2014 Nay Pyi Taw

also be a choice destination for luxury cruise passengers. According to the Ministry of Hotels and Tourism, cruise ships carrying 3,201 tourists visited the Myeik Archipelago between January and November 2016.[23]

The nearest tourist attractions to Blocks M12, M13, & M14 are Moscos Island Wildlife Sanctuary approximately 34 km away from the Block edge. The proposed well sites are much farther away than that. Tourist attractions in the Tanintharyi Region include islands and beaches. The following areas could have relevance in the context of the wider area of interest relevant to this EIA.

Moscos Island Wildlife Sanctuary

Moscos Island Wildlife Sanctuary is situated in Dawei District, Tanintharyi Region. The sanctuary comprises the south, middle and north Moscos group of islands in the northern part of the Andaman Sea. Except for some rocky islands, they are covered with evergreen forest. The size reported in the list provided by FD in 2009 (49 km), although it is one of the four marine protected areas, mostly the terrestrial part of the islands is protected. The most common forest type (75%) is evergreen forest. Swiftlets, Collocalia fuciphaga, make nests on the rocky islands of the sanctuary which have a very high commercial value. No tourism is allowed in the island but Maungmagan scenic beach, which is situated on the coast in front of middle Moscos, is one of the most famous tourist attractions of Myanmar. It is15 km south from Dawei town and airport, thus accessible in less than 2 hours travel from Yangon. There is only one beach resort in Kanton village, mostly hosting Myanmar tourists[24].



Maungmagan Beach and Dawei Peninsula

A beautiful beach in Thanintharyi Region, Maungmagan is a seaside village ten miles north of the town of Dawei. Most people in this region belong to the fishing community, fishing being a traditional livelihood in this area. Maungmagan Beach is used by the fishermen and their fishing boats returning after a night's fishing at sea and for carrying out preparations to go out to sea again in the evening. The Maungmagan Beach is one beach of several popular beaches in the Dawei Peninsula.

Local products here are traditional Dawei Longyi, dried fishes, cheek woods, Cashew nus, Bebel nuts. You may also enjoy reasonable tropical fruits such as pine apple, mango, durian, etc.



23 http://www.thaibizmyanmar.com/en/thai-myanmar/Non-paper%20-%2025%20Jan%202018%20-%20Overview%20of%20Tanintharyi%20Region.pdf
24 https://web.archive.org/web/20120417063155/http://www.banca-env.org/ebook.pdf

Myeik Archipelago

The Myeik Archipelago off the coast of Central Thanintharyi comprises over 800 islands. This area is becoming a top tourist destination. The Lampi Marine National Park is located in the Myeik Archipelago. Lampi MNP was designates as an ASEAN Heritage Park in 2003, an Important Bird Area in 2004 and is considered a Significant MNP in the Indian Ocean. The Myeik Archipelago is very rich in biodiversity and is called the 'Mother Land' of the Moken people. The Myeik Archipelago also has a rich history of maritime trade and piracy with the water around the 800 largely desolate islands believed to conceal hundreds of shipwrecks. The area is attracting increasing numbers of scuba divers who are keen to explore the possibilities of valuable historical sites and artefacts under the sea.

Shoe Island

Cock's Comb Island

Nyaung Oo Phee Island

Myeik is formerly known as Mergui, in colonial era. The local people call it Beik. Myeik is a beautiful port town of Andaman sea, in the center of Tanintharyi Division. Myeik is famous for its products such as pearl, rubber, edible bird's nest, dried fish, dried prawn and Ngapi (shrimp paste). Myeik will be the further gateway to the Mergui Archipelago.

6. IMPACT AND RISK ASSESSMENT AND MITIGATION MEASURES

6.1 Methodology

An Environmental Impact Assessment (EIA) seeks to identify and, to the extent possible, quantify the potential negative impacts and positive benefits of a proposed project with respect to the environment (physical, ecological, human use, quality of life, and health values). Once these impacts have been identified, prevention, mitigation, and monitoring measures are proposed to prevent and/or mitigate possible negative impacts, and enhance positive impacts. An Environmental, Social, and Health Impact Assessment process incorporates a number of key steps as shown in **Figure 6-1** and discussed in detail in the following sections:

- Exploration Drilling Project – **Chapter 4**
- Environmental, Social and Health Setting – **Chapter 5**
- Stakeholder Involvement – **Chapter 9**
- Screening and Scoping – **Chapter 6**
- ESH Impact Assessment – **Chapter 6**
- Prevention & Mitigation Measures – **Chapter 6**
- Environmental, Social and Health Management Plan **– Chapter 8**

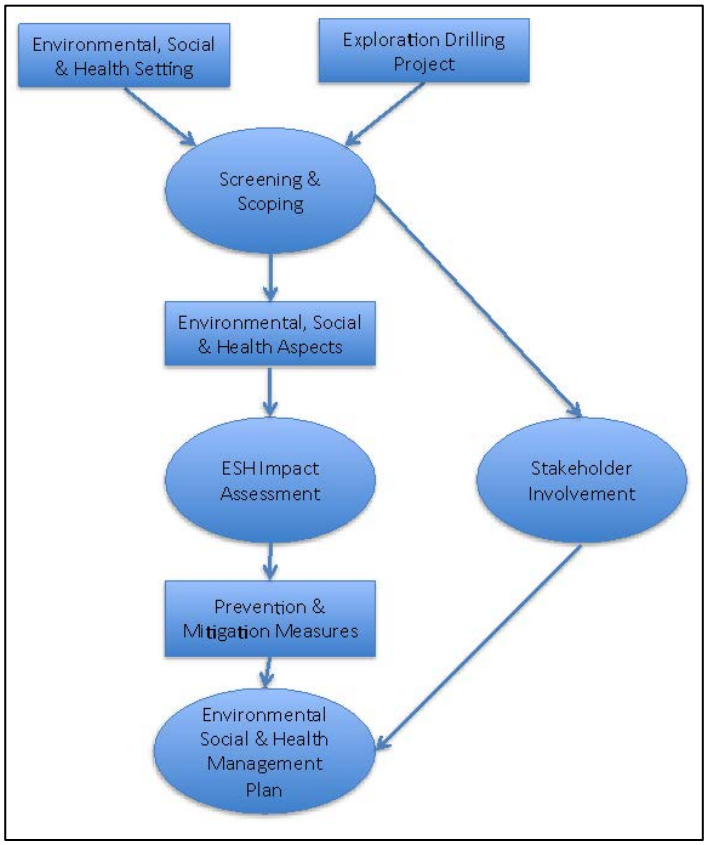


Figure 6-1: Method for Environmental, Social, and Health Impact Assessment

The assessment approach is risk-based, with the objective to make a conclusion on the level of risk development activities will pose to environmental, socio-economic and health receptors. This section describes the impact assessment process undertaken to evaluate the level of risk to environmental, socio-economic and health receptors from activities associated with the planned seismic and exploration drilling program. This description provides an account of the identification of potential impacts and benefits and the evaluation of their significance (scale of Risk Ranking). The EIA methodology applied is modified from Adapted from Nigel Rossouw (2003); Sippe (1999); and United Nations University (2007).

Activities associated with exploration drilling program are assessed to systematically identify potential impacts and the associated level of risk. This process assists in prioritising the development of management measures to achieve an overall acceptable level of risk.

Environmental Impact Assessment Terminology

Defining Impacts

Direct (or primary) – impact that results from a direct interaction between some feature of a planned action and the receiving environment (e.g. between an effluent discharge and receiving water quality)

Secondary – impact that follows on from the primary interactions between the project and its environment as a result of subsequent interactions within the environment (e.g. loss of part of a habitat affects the viability of a species population over a wider area)

Indirect – impact that result from other developments or activities that are encouraged to happen as a consequence of the original development (e.g. a new development stimulates a requirement for improved road access).

Cumulative – impacts that act together to affect the same environmental resource or receptor. Several types can be identified:

i. **Temporal**: a series of impacts that occur year in year out, that in themselves are not important, build up to the point that they become important.

ii. **Accumulative**: the overall effect of different types of impact (e.g. air pollution + noise + traffic + visual blight) on a single receptor (e.g. a community or a habitat) where each singly may not be important but combined they are.

iii. **Additive**: where impact from the planned activity occurs at the same time as impact from activities being undertaken by other parties (these may be already occurring, committed developments for the future or developments that may happen in the foreseeable future).

iv. **Interactive**: where two different types of impact (which may not in themselves be important) react with each other to create a new impact (that might be important).

v. **Synergistic**: where two impacts interact together (e.g. changes in air quality with respect to two different pollutants) to create an impact that is greater than the sum of their parts.

Permanent: Impact that occurs once in the development of a project and causes a permanent change in the affected receptor or resource (e.g. the felling of old growth forest as a result of occupation of a site, the diversion of a watercourse).

Short-term: impact that is predicted to last only for a limited period (e.g. during construction, seismic studies, drilling or decommissioning) but will cease on completion of the activity, or as a result of mitigation/ reinstatement measures and natural recovery.

Long-term: impact that will continue over an extended period (e.g. noise from operation of a development, impact from operational discharges or emissions). This includes impact that may be intermittent or repeated rather than continuous over an extended time period (e.g. repeated seasonal disturbance of species as a result of well operations, impact results from annual maintenance activities).

Non-normal Impact: impact that result from unplanned events – incidents – within the project (e.g. breakdowns, failures) or in the external environment affecting the project (e.g. flood, seismic activity, landslip). In these cases the assessment should take into account of the probability of the event.

Local: impact that affects locally important environmental resources or a single habitat/biotype.
Regional: impact that affects regionally important environmental resources or is felt at a regional scale as determined by administrative boundaries, habitat type.

National: impact that affects nationally important environmental resources or affects an area that is nationally important or protected.

International: impact that affects internationally important environmental resources such as areas protected by International Conventions.

Trans-boundary: impact that is experienced in one country as a result of activities in another.

Source of impact – as an interaction between the proposed activity and an Environment, Social or Health component

Negative impact – negative change from the existing situation due to the above interaction

Benefit – any positive change from the existing situation due to the above interaction

Mitigation – the actions undertaken by Project Proponent to maximize benefits and to minimize any potential negative impact.

Activity - Work associated with the Development during construction, commissioning, operation and decommissioning. For exampling: drilling, road construction

Aspect - Associated with each activity are a number of aspects (or stressors). These are components of an activity that may have a potential to impact on the biological, socio-economic or cultural environment. For example: emissions, waste, noise.

Significance/Risk Ranking - The level of impact associated with an aspect.

Likelihood - The probability or frequency of an environmental impact actually occurring.

Residual significance/risk level - The level of significance/risk after the application of preventative and mitigation measures.

Risk - The chance of something happening that will have an impact on objectives.

6.1.1 Screening

Screening of issues is an important first step in an EIA. The purpose of the screening step is to review all proposed project activities in order to identify potential environmental, social and health issues.

This screening step enables the detailed impact assessment component of this EIA to focus on the key issues that are relevant to people and the environment.

In this report, a matrix checklist was used to screen key issues of environmental, social and health impacts both in a normal situation for each project phase (preparation / installation phase before drilling phase, drilling phase and well abandonment phase) and emergency situation for unplanned events.

6.1.1.1 Screening Methodology

In order to ensure a systematic evaluation of project activities and their possible impact on the environment, a thorough listing of project activities and environmental, social and health elements was obtained by the following means:

- ✓ Consultations with the PCML planning the project activity;
- ✓ Applying International guidelines for onshore oil and gas exploration;
- ✓ Applying International guidelines for health impact assessment;
- ✓ Applying the World Bank checklist for onshore oil and gas development**;**
- ✓ IFC Environmental, Health, and Safety General Guidelines (2007);
- ✓ IFC Performance Standards on Environmental and social Sustainability (2012); and
- ✓ IEM's experience with similar projects.

Each of the activities carried out during the phases of the project was screened against each resource value, to determine if any impact may occur and therefore requires a more detailed assessment of impact.

6.1.2 Scoping of Environmental, Social, and Health Impacts

The Scoping of the proposed project:

- defines the study area, area of influence, time boundaries, project phases, and potential stakeholders;
- starts the process of understanding the applicable regulations and standards, and their context for Project design and completion of the EIA;
- makes a provisional identification of Environmental Impacts, focusing in particular on the environmental, social and health issues that need to be addressed in subsequent EIA studies;
- provides an indication of the depth and breadth of the subsequent EIA investigations including what baseline data and information are required, what further studies and investigations must be carried out, and how such data collection, studies and investigations shall be undertaken;
- provides an opportunity for consultants, relevant authorities, project developers, and interested and affected parties to express their views and concerns regarding the proposal before an EIA proceeds; and
- identifies potentially affected communities and other stakeholders with an interest in the Project.

6.1.3 Environmental Impact Assessment

6.1.3.1 Assessment of Potential Environmental and Social Impacts

The environmental, social, and health impact assessment can be subdivided into 2 categories, which will dictate how the assessment will proceed:

- Normal situation:
  - Environmental and social impacts will be assessed at each project phase:
    - Preparation/ Installation Phase
    - Drilling phase
    - Well testing phase
    - Well abandonment phase
  - Health impacts will be assessed during the overall project period because project activities operate over a short-term duration and impacts on health from each project phase are similar.
- Unplanned situation: All impacts from unplanned situations on environmental, social, and health aspects relevant to the project are assessed.

The approach to assess the significance of potential impacts is discussed briefly below.

Assessment of the level of impact significance requires consideration of the impact level (i.e. magnitude of the environmental effect, its geographical scale and duration) in relation to the receptor sensitivity (i.e. the key receptors and resources considered).

The overall significance is presented through a matrix of sensitivity of the **Receptor Sensitivity** and the **Impact Level**, as shown in **Table 6-1**.

Table 6-1: Significance Matrix for Environmental Impacts

Receptor Sensitivity	Impact Level		
	Low	Medium	High
Low value/sensitivity receptor or resource, impact disturbs degraded area or slightly disturbs area with value for conservation, causes small changes in species and diversity, within standards, small local change in human use and quality of life values over a short-term duration, reversible over short-term.	Negligible	Low	Medium
Medium value/sensitivity receptor or resource, Impact disturbs an area that has a value for conservation or causes change in species diversity. Impact important on a local or regional level, within standards, moderate change in human use and quality of life values at moderate level over a long-term duration, reversible over medium-term.	Low	Medium	High
High value/sensitivity receptor or resource, rare or endangered species or habitat impacted on a national or international level, exceeding standards, large permanent change in human use and quality of life values at a regional level, long-term or no reversible.	Medium	High	High

The impact assessment is based on four categories of impact significance level, as described in **Table 6-2**. These inform the level of mitigation that is considered appropriate to be applied for a given impact.

Table 6-2: Categories of Impact Significance

Significance Level	Definition
High	Impact is classified as high and can cause numerous effects. Major impacts affect an entire population or species in sufficient magnitude to cause a decline in abundance and /or change in distribution. Large permanent change in human use and quality of life values at a regional and national level. Fatality from an accident or occupational illness. Impacts cannot be managed or resolved by any mitigation measures.
Medium	Impact may result in changes that affect the value of resources and environment. Moderate impacts affect a portion of a population and may bring about a change in abundance and / or distribution but does not threaten integrity of population. Impact may affect moderate change in human use and quality of life values at a local and regional level over a long-term duration. Major injury or health effects (including Permanent Partial Disability). Mitigation measures are required to manage or reduce the potential impacts and monitoring measures are required to determine effectiveness of mitigation measures.
Low	Impact may result in changes in resources and environment but this change does not decrease value of these resources and environment. Minor impacts affect individuals within a population over a short period of time. Local change in human use and quality of life values over a short-term duration. Minor injury or health effects (Lost Time Injury). Impact can be managed and resolved by implementation of general mitigation measures.
Negligible	Impact has no effect.

Source: Adapted from Rossouw (2003) and Sippe (1999).

The degree of significance (categories as defined in **Table 6-2**) depends upon the level (i.e. magnitude, extent and duration) of impacts and the sensitivity of the resource value that they may impact. The criteria used to inform the significance ranking of impacts on a qualitative basis, are provided in **Table 6-3**.

Table 6-3: Criteria used to determine Impact Significance

Criteria	Score	Detail
Extent	**3** **2** **1**	• **High –** Are of impact is beyond 5 km and impact extends to regional and national level. • **Medium -** Area of impact is beyond the project area but is in a limited area of 1 - 5 km. • **Low -** Area of impact is in the project area within a radius of 1 km.
Duration	**3** **2** **1**	• **Long Term** - Permanent impact**,** Impact will remain after well abandonment. Impact occurs in long-term duration (> 5 yr.). • **Medium** - Impact can be reversible overtime (1 – 5 yr.), period of impact occurrence is within the project period, Impact occurs over mid-term duration (1 – 5 yr.). • **Short term** - Impact can be quickly reversible (< 1 yr.), Period of impact occurrence is less than the project period, Impact occurs in short-term duration (< 1 yr.).
Magnitude	**3** **2** **1**	• **High –** Exceeds regulatory standards, changes the original structure of the environmental or social system or ecosystem. • **Medium –** Within regulatory standards, but changes some factors in the environmental or social system or ecosystem but does not change the structure. • **Low –** Within regulatory standards, with small changes in some factors for the environmental or social system or ecosystem but does not change the structure. • **Negligible –** no detectable impact on the environment or socio economic conditions. • **Positive –** Impact has a positive effect on the environment or socio economic conditions.

Criteria	Score	Detail
Receptor Sensitivity	**3** **2** **1**	• **High** – High value/sensitivity receptor or resource, rare or endangered species or habitat impacted on a national or international level, exceeding standards, large permanent change in human use and quality of life values at a regional level, long-term or no reversible. • **Medium** – Medium value/sensitivity receptor or resource, Impact disturbs an area that has a value for conservation or causes change in species diversity. Impact important on a local or regional level, within standards, moderate change in human use and quality of life values at moderate level over a long-term duration, reversible over medium-term. • **Low** – Low value/sensitivity receptor or resource, impact disturbs degraded area or slightly disturbs area with value for conservation, causes small changes in species and diversity, within standards, small local change in human use and quality of life values over a short-term duration, reversible over short-term.. • **Negligible** – no detectable sensitivity.

Source: Adapted from Nigel Rossouw (2003); Sippe (1999); and United Nations University (2007)

The above Matrix Method is used to consider the Impact Level and Receptor Sensitivity as follows:

Significance = Impact Level x Receptor Sensitivity

Note: Impact Level is determined using magnitude, extent, and duration of impacts. Receptor Sensitivity is determined using the values of resources and environment that are lost or decreased as a result of the project activities.

Stage 1: Analysis of Impact Level

Analysis of impact level is determined using the sum of magnitude, extent, and duration of the impact.

Impact Level = Magnitude + Extent + Duration

Total Score for Impact Level	Impact Level	Score
7-9	High	3
4-6	Medium	2
1-3	Low	1

Stage 2: Receptor Sensitivity Ranking

Impact Level	Score
High	3
Medium	2
Low	1

Stage 3: Impact Significance Evaluation

Significance Level of Environmental Impact			Impact Level		
			Low	Medium	High
			1	2	3
Receptor Sensitivity	Low	1	Negligible (1)	Low (2)	Low (3)
	Medium	2	Low (2)	Medium (4)	Medium (6)
	High	3	Low (3)	Medium (6)	High (9)

6.1.4 Identification of Management Measures

The first priority of environmental management is always to **prevent adverse impacts**, thereafter management measures with other objectives are considered. Environmental management measures can be varied and the measures themselves can have a variety of objectives.

World Bank guidelines for a best practice approach to the management of environmental and social impacts are presented in **Table 6-4**. Many of the recommendations set out in the design component are designed to meet the criterion for 'avoidance'.

Table 6-4: Primary objectives of mitigation measures for adverse environmental impacts.

First priority is avoidance of negative impacts; the objectives are listed in decreasing order of priority

Avoidance	▪ Avoiding activities that could result in adverse impacts. ▪ Avoiding resources or areas considered as sensitive.
Prevention	▪ Preventing the occurrence of negative environmental impacts and / or preventing such an occurrence having negative environmental impacts.
Preservation	▪ Preventing any future actions that might adversely affect an environmental resource. Typically achieved by extending legal protection to selected resources beyond the immediate needs of the project.
Minimisation	▪ Limiting or reducing the degree, extent, magnitude or duration of adverse impacts. This can be achieved by scaling down, relocating, redesigning elements of a project.
Rehabilitation	▪ Repairing or enhancing affected resources, such as natural habitats or water sources, particularly when previous development has resulted in significant resource degradation.
Restoration	▪ Restoring affected resources to an earlier (and possibly more stable and productive) state, typically 'background / pristine' condition.
Compensation	▪ Creation, enhancement or protection of the same type of resource at another suitable and acceptable location, compensating for lost resources.

Source: The World Bank. Environment Department. January 1999. Environmental Management Plans. Environmental Sourcebook Update. Number 25

For activities where the risk level is higher than low, management measures are required to prevent or mitigate the risk to an acceptable level. Prevention measures are put in place to prevent a hazard or event from occurring such as avoidance or reduction at source and pollution control equipment. Mitigation measures are put in place to prevent or minimise the actual impact. This can include spill response plans, monitoring and offsets.

Measures to prevent or mitigate (reduce) the severity of potentially significant impacts will be developed and linked back to the related activities, and an Environmental Management Plan (EMP) will be prepared. The EMP brings together the environmental, social and health management requirements needed to prevent or reduce potential impacts from activities and accidental events, and will form part of the EIA Report and company commitment to the project.

6.1.5 Residual Impact Significance

Following the identification of potential environmental and social impacts, their significance is assessed, taking into account those proposed mitigation measures already incorporated into the design of the project and, where appropriate, any further mitigation measures that are considered feasible and justified. Mitigation measures are applied to eliminate or reduce the extent, duration and or magnitude of a potential impact to an acceptable level. These remaining impacts are described as residual impacts.

One objective of the IEE/EIA is to understand the significance of these residual impacts that will remain after mitigation measures have been designed into the intended activity and if some form of monitoring or measurement might be justified.

6.2 Environmental Screening

The Screening Matrix and Results of Screening (**Table 6-6**) to (**Table 6-8**) identifies Environmental, Social and Health impacts that may occur as a result of planned project activities and unplanned events.

Each of the potential impacts was assessed qualitatively based on our screening methodology. All project activities were identified and potential impacts on the environment, social or health systems was defined.

Table 6-5: Screening Matrix

Environmental Parameters		Physical Resources				Ecological Resources			Human Use Values				Quality of Life Values			Health	
Project Activities/Events		Air Quality / GHG emissions	Seawater Quality	Sediment Quality	Underwater Noise	Marine Biota	Endangered Species	Sensitive / Protected Areas	Fishing	Shipping	Waste Management	Pipeline/Cable Underwater Structures	Socio-economy	Cultural-Archaeological	Visual Aesthetics /Tourism	Public Health	Occupational Health and Safety
	General Project Activities (All Phases)																
1	Crew/Materials Transport	■				▒	▒	▒	■	■			▒	▒		▒	▒
2	Shore Base Support												▒	▒		▒	▒
3	Offshore Fuel Storage & Handling	▒	▒	▒		▒	▒	▒					▒			▒	▒
4	Hazardous Materials Handling and Storage		▒	▒		▒	▒	▒					▒			▒	▒
5	Wastewater Disposal		■			▒	▒	▒	▒		▒					▒	▒
6	Non-Hazardous and Hazardous Waste Handling and Storage		▒	▒		▒	▒	▒			▒		▒			▒	▒
7	Energy Use	■														▒	▒
8	Labour, Equipment & Services supply												▒	▒		▒	▒
9	Presence of Equipment and Facilities					▒	▒	▒	■	■						▒	▒
	Installation																
10	Rig Placement		▒	▒		▒	▒		■	■		▒				▒	▒
	Drilling																
11	Drilling & Completion of Wells		▒	▒	■	▒	▒		■	■						▒	▒
12	Mud & Cuttings Disposal		■	■		■	■		▒		▒					▒	▒
	Well Testing																
13	Flaring	■							▒							▒	▒
	Abandonment																
14	Well Suspension															▒	▒
15	Rig Decommissioning			▒		▒	▒	▒	▒	▒						▒	▒
	Unplanned Events																
16	Collision								▒	■						▒	■
17	Fuel/Chemical/Waste Spill		■	▒		■	▒	▒	■	■	▒					▒	▒
18	Well Blowout	■	■	▒		■	▒	▒	■	■					▒	▒	■
19	Typhoon								▒	▒			▒			▒	▒
20	Fire or Explosion	■			▒										▒	▒	■

Key:

	No Impact
▒	Potential Impact
■	Probable Impact

Table 6-6: Results of Screening Environmental, Social, and Health Impacts for Exploration Drilling

Indicator	Source of Impact		Detail/Reason
	Project Phase	Activity	
Physical Resources			
Air Quality/Climate	Installation Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Energy Use	Deterioration from fuel combustion/GHG Emissions
	Drilling Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Energy Use	Deterioration from fuel combustion/GHG Emissions
	Well Testing Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Energy Use	Deterioration from fuel combustion/GHG Emissions
	Abandonment Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Energy Use	Deterioration from fuel combustion/GHG Emissions
	Unplanned Events	Well Blowout Fire or Explosion	Deterioration from fuel combustion/GHG Emissions
Seawater Quality	Installation Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Wastewater Disposal Non-Hazardous and Hazardous Waste Handling and Storage Rig Placement	Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)
	Drilling Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Wastewater Disposal Non-Hazardous and Hazardous Waste Handling and Storage Drilling and Completion of Wells Mud & Cuttings Disposal	Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)
	Well Testing Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Wastewater Disposal Non-Hazardous and Hazardous Waste Handling and Storage	Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)
	Abandonment Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Wastewater Disposal Non-Hazardous and Hazardous Waste Handling and Storage	Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)

Indicator	Source of Impact		Detail/Reason
	Project Phase	Activity	
	Unplanned Events	Accidental Release Well Blowout	Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)
Sediment Quality	Installation Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Rig Placement	Potential contamination from spills Sediment disturbance and increase in suspended solids
	Drilling Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Drilling & Completion of Wells Mud & Cuttings Disposal	Potential contamination from spills Change in sediment particle size and chemistry from mud and cuttings deposition
	Well Testing Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage	Potential contamination from spills
	Abandonment Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage	Potential contamination from spills
	Unplanned Events	Accidental Release Well Blowout	Potential contamination from spills
Underwater Noise	Installation Phase	None	None
	Drilling Phase	Drilling	Increased underwater noise from site sonar scan und underwater drilling and installation
	Well Testing Phase	None	None
	Abandonment Phase	None	None
	Unplanned Events	Explosion	Increased noise from possible explosion
Ecological Resources			
Marine Biota Endangered Species Sensitive/Protected Areas	Installation Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Wastewater Disposal Hazardous Materials Handling and Storage Presence of Equipment and Facilities Rig Placement	Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem
	Drilling Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Wastewater Disposal Hazardous Materials Handling and Storage Presence of Equipment and Facilities Drilling & Completion of Wells Mud & Cuttings Disposal	Potential deterioration of seawater quality from spills, leakages and discharge of mud and cuttings could affect the marine ecosystem. Mud and cuttings discharge can increase turbidity, and may be toxic to marine organisms. Mud and cuttings deposition can result in sediment contamination and sediment accumulation affecting benthos
	Well Testing Phase	Crew/Materials Transport Offshore Fuel Storage &	Potential deterioration of seawater quality from spills, leakages and discharges could affect the marine ecosystem

Indicator	Source of Impact		Detail/Reason
	Project Phase	Activity	
		Handling Wastewater Disposal Hazardous Materials Handling and Storage Presence of Equipment and Facilities Flaring	
	Abandonment Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Wastewater Disposal Hazardous Materials Handling and Storage Presence of Equipment and Facilities Rig Decommissioning	Potential deterioration of seawater quality from spills, leakages and discharges could affect the marine ecosystem
	Unplanned Events	Accidental Release Well Blowout	Potential deterioration of seawater quality from spills, leakages and discharges could affect the marine ecosystem

Table 6-7: Social Aspects

Indicator	Source of Impact		Detail/Reason
	Phase	Activity	
Social			
Aspect		**Activity**	**Potential Impact**
Fishing	Installation Phase	Crew/Materials Transport Wastewater Disposal Presence of Equipment and Facilities Rig Placement	Removal of fishing equipment and other obstacles from the drilling area may cause damage to fishing equipment Loss of fishing area could directly affect the income of fishermen Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.
	Drilling Phase	Crew/Materials Transport Wastewater Disposal Presence of Equipment and Facilities Drilling & Completion of Wells Mud & Cuttings Disposal	Loss of fishing area could directly affect the income of fishermen Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.
	Well Testing Phase	Crew/Materials Transport Wastewater Disposal Presence of Equipment and Facilities Flaring	Loss of fishing area could directly affect the income of fishermen Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.

	Abandonment Phase	Crew/Materials Transport Wastewater Disposal Presence of Equipment and Facilities Decommissioning	Loss of fishing area could directly affect the income of fishermen Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption. Fishermen can return to fish in the exclusion zone after rig demobilization (positive impact)
	Unplanned Events	Accidental Release Collision Well Blowout	Loss of fishing area could directly affect the income of fishermen Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.
Shipping	Installation Phase	Crew/Materials Transport Presence of Equipment and Facilities Rig Placement	Increased traffic Potential disruption to traffic in case of accident
	Drilling Phase	Crew/Materials Transport Presence of Equipment and Facilities Drilling and Completion of Wells	Increased traffic Potential disruption to traffic in case of accident
	Well Testing Phase	Crew/Materials Transport Presence of Equipment and Facilities	Increased traffic Potential disruption to traffic in case of accident
	Abandonment Phase	Crew/Materials Transport Presence of Equipment and Facilities Rig Decommissioning	Increased traffic Potential disruption to traffic in case of accident
	Unplanned Events	Accidental Release Collision Well Blowout	Potential disruption to traffic in case of accident
Waste Management	Installation Phase	Non-hazardous and Hazardous Waste Handling and Storage Wastewater	Pressure on existing waste management facilities Waste contamination to environment. Reduced well-being due to exposure or perceived exposure to hazards
	Drilling Phase	Non-hazardous and Hazardous Waste Handling and Storage Wastewater Mud & Cuttings	Pressure on existing waste management facilities Waste contamination to environment. Reduced well-being due to exposure or perceived exposure to hazards
	Well Testing Phase	Non-hazardous and Hazardous Waste Handling and Storage Wastewater	Pressure on existing waste management facilities Waste contamination to environment. Reduced well-being due to exposure or perceived exposure to hazards
	Abandonment Phase	Non-hazardous and Hazardous Waste Handling and Storage Wastewater	Pressure on existing waste management facilities Waste contamination to environment. Reduced well-being due to exposure or

			perceived exposure to hazards
	Unplanned Events	Accidental Release	Waste contamination to environment. Reduced well-being due to exposure or perceived exposure to hazards
Pipeline/Cable/ Underwater Structures	Installation Phase	Rig Placement	Possible damage to underwater cable lines and petroleum pipelines during rig installation resulting in interruption of service
	Drilling Phase	None	None
	Well Testing Phase	None	None
	Abandonment Phase	None	None
	Unplanned Events	None	None
Socio-Economy	Installation Phase	Crew/Materials Transport Shore Base Support Offshore Fuel Storage & Handling Wastewater Disposal Hazardous Materials Handling and Storage Non-hazardous and Hazardous Waste Handling and Storage Labour, Equipment & Services Supply	Increased employment/income and procurement opportunities for people, business and services in surrounding area
	Drilling Phase	Crew/Materials Transport Shore Base Support Offshore Fuel Storage & Handling Wastewater Disposal Hazardous Materials Handling and Storage Non-hazardous and Hazardous Waste Handling and Storage Labour, Equipment & Services Supply	Increased employment/income and procurement opportunities for people, business and services in surrounding area
	Well Testing Phase	Crew/Materials Transport Shore Base Support Offshore Fuel Storage & Handling Wastewater Disposal Hazardous Materials Handling and Storage Non-hazardous and Hazardous Waste Handling and Storage Labour, Equipment & Services Supply	Increased employment/income and procurement opportunities for people, business and services in surrounding area
	Abandonment Phase	Crew/Materials Transport Shore Base Support Offshore Fuel Storage & Handling Wastewater Disposal Hazardous Materials Handling and Storage Non-hazardous and Hazardous Waste Handling and Storage Labour, Equipment & Services Supply	Increased employment/income and procurement opportunities for people, business and services in surrounding area
	Unplanned Events	None	None
Cultural/ Archaeological	Installation Phase	Crew/Materials Transport Shore Base Support Labour, Equipment & Services	Possible disruption or damage of underwater archaeological sites, such as shipwrecks.

		Supply Rig Placement	Potential for conflict between local culture and outside workers.
	Drilling Phase	None	None
	Well Testing Phase	None	None
	Abandonment Phase	None	None
	Unplanned Events	None	None
Visual Aesthetics / Tourism	Installation Phase	None	Project located deep offshore without tourism / visual value.
	Drilling Phase	None	Project located deep offshore without tourism / visual value.
	Well Testing Phase	None	Project located deep offshore without tourism / visual value.
	Abandonment Phase	None	Project located deep offshore without tourism / visual value.
	Unplanned Events	Accidental Release Blowout Fire or Explosion	Reduced attractiveness of area due to reduced visual aesthetics from increased industrial activity, releases or accidental spills.

Table 6-8: Health Aspects

Indicator	Source of Impact		Detail/Reason
	Phase	Activity	
Health			
Public Health Occupational Health	All Phases	All activities	All components and phases of the project have some potential to impact occupational health and safety, due to accidents, exposure to air pollutants, noise, exposure to water contaminated by accidental spills, concern and stress about accidents, spills, wastes, noise, etc.

The assessment of each aspect addressed in this EIA will include the following components:

- Description of the source and characteristic of the potential impacts.
- Identification of receptors sensitive to potential impacts.
- Description and evaluation of potential impacts.
- Identification of management measures to reduce potential impacts.
- Determinations of the residual significance or risk after management measures are included.
- A summary assessment table with residual significant/risk rankings.

The study area for the environmental impact assessment includes the area within a 1 km and up to a 5 km radius of the drilling well areas. The study area for the social impact assessment includes the project stakeholders and communities in the coastal areas of Thanintharyi Region. For the health impact assessment, workers employed for installation, drilling and abandonment, as well as people who live in close proximity to the shore-bases and available health services are included in the assessment.

For each resource value a summary impact evaluation table will be provided as follows (**Table 6-9**):

Table 6-9: Example Impact Evaluation Table

Resource Value	Impact Description				
	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High
Residual Significance	Positive	Negligible	Low	Medium	High

6.3 Environmental Impact Assessment During Installation Phase

From the screening process the following must be assessed to determine their impacts during the installation phase:

- Air Quality
- Sea Water Quality
- Sediment Quality
- Marine Biota
- Endangered Species
- Sensitive/Protected Areas

6.3.1 Assessment of Impacts to Air Quality and Climate

6.3.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Air Quality/Climate	Installation Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Energy Use	Deterioration from fuel combustion/GHG Emissions

6.3.1.2 Assessment of Air Quality and Green House Gas (GHG) Emissions

Air emissions from the Blocks M12, 13 & 14 Exploration Drilling Project activities during the installation phase will be primarily generated from engine combustion of boat engines and electricity generators on boats from crew and materials transport, fuel storage and handling, and rig mobilization and installation. Collectively these sources all fall under the category of "energy use".

6.3.1.2.1 Air Pollutants

Environmental impacts from air pollutants released from energy use during side-sonar scan operation, transportation, and rig mobilization are summarized in **Table 6-10**.

Table 6-10: Potential Environmental Impacts of Emissions from Energy Use and Transportation

Emission Species	Environmental Impact
CO	Contributes indirectly to climate change by enhancing low-level ozone formation.
CO_2	A GHG. Contributes to climate change.
NO_X	Contributes to the formation of acidic species that can be deposited by wet and dry processes, impacting aquatic and terrestrial ecosystems.
SO_2	Contributes to the formation of acidic species that can be deposited by wet and dry processes, impacting aquatic and terrestrial ecosystems.

Source: Adapted from MSDS sheets

The installation phase will be completed within a short period of time (about 15 days/well). In addition, these air pollutants are emitted to the atmosphere in very small quantities. As a result, these

pollutants will be rapidly dispersed and diluted in the atmosphere. Therefore, impacts on air quality during the installation phase are expected to be of low magnitude, local in extent, and short-term in duration. The impact disturbs an area in the offshore with no sensitive receptors nearby and therefore considered to have limited conservation value; therefore the sensitivity of the receptor or resource is rated as low.

Without mitigation measures, the significance of impacts on air quality from air pollutants emitted during the installation phase is rated as low (**Table 6-11**).

Table 6-11: Significance Ranking of impacts from Air Pollutants to Air Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Management Measures

Impacts from crew and materials transport, fuel storage and handling, and rig mobilization and installation or energy use can be mitigated through the use of the following measure:

- Routine inspection and preventive maintenance as per maintenance schedule/ recommended by manufacturers to ensure efficiency of combustion.
- Set up appropriate drilling rig mobilization schedule to minimize preparation time.

Residual Significance

With these management measures, the extent and magnitude of impacts from air pollutants on air quality will be reduced resulting in a residual significance ranked that is **negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.3.1.3 Assessment of Impacts from Greenhouse Gases (GHG)

GHG emissions from energy use, in the form of diesel generators and mobile combustion (marine and road transportation), are estimated following the Tier 1 approach of IPCC (2006) for stationary combustion and mobile combustion. GHG emissions are estimated using emission factors and global warming potentials for the three main greenhouse gases (CO_2, CH_4 and N_2O).

Energy Use for Drilling Rig

Estimated fuel consumption during the installation phase includes consumption by tug boats for towing the drilling rig, and by drilling rig for installing anchors of the drilling rig. Consumption of the rig power plant is estimated to amount to approximately 11,130 L/day. Greenhouse gas emissions in terms of CO_2 equivalent are estimated according to the emission factors presented in **Table 6-12**, and the following equation:

$$Emissions_{GHG,\,fuel} = Fuel\ Consumption_{fuel} \times Emission\ Factor_{GHG,\,fuel}$$ **Equation 6-1**

where:

$Emissions_{GHG,\,fuel}$ = emissions of a given GHG by type of fuel (kg GHG)

$Fuel\ Consumption_{fuel}$ = amount of fuel combusted (TJ)

$Emission\ Factor_{GHG,\,fuel}$ = default emission factor of a given GHG by type of fuel (kg gas/TJ)

Using unit conversion factors of 1 kg = 10^{-3} tonne = 10^{-6} Gg, and the IPCC default net calorific value for gas/diesel oil of 43.33 TJ/Gg, fuel consumption (in terms of energy) can be calculated as follows:

$Fuel\ Consumption_{Diesel}$ = Diesel Use (L/day) x Diesel Density (0.8397 kg/L[1]) x 10^{-6} Gg/kg x 43.33 (TJ/Gg) **Equation 6-2**

= 11,130 (L/day) x 0.8397 kg/L x 10^{-6} Gg/kg x 43.33 (TJ/Gg)

= 0.405 TJ/day

$Emission\ Factor_{CO2,\,Diesel}$ = 74,346.6 kg CO_2 eq/TJ (from **Table 6-12**) resulting in:

$Emissions_{CO2,\,Diesel}$ (kg) = 0.405 TJ/day x 74,346.6 kg CO_2 eq/TJ

= 30,107.1 kg CO_2/day

= 30.11 tonnes CO_2/day

For a total of 45 days of the installation phase (15 days/well), the total emission of greenhouse gases for the drilling rig during the installation phase is therefore estimated to be at a maximum of 1,355.0 tonnes.

Table 6-12: Emission Factor for Fuel Use by Generators (Stationary Combustion)

Types	Unit	CH_4	N_2O	CO_2	Total GHG
Diesel	kg/TJ	3	0.6	74,100	
	kg CO_2 eq*/TJ	69	177.6	74,100	74,346.6

Source: IPCC (2006)
* Global warming potentials (100 year time horizon): CO_2 = 1; CH_4 = 23; N_2O = 296

1 IEA (2004), Density of Oil Products, Energy Statistics Working Group Meeting

Energy Use for Marine Transportation

PCML will have two primary towing/supply vessels, as well as one additional shared vessel for this exploration drilling program, which each consume diesel oil at approximately 20 tonnes/day. Consequently, maximum daily fuel consumption rate of the support vessels will be at 23,818 L/day, totaling to 71,454 L/day.

GHG emissions from boat transportation are estimated following the Tier 1 approach of the IPCC guideline (**Equation 6-1**) for mobile combustion, with an emission factor for navigation combustion of 74,853 kg CO_2 eq/TJ (from **Table 6-13**) and fuel consumption of 71,454 L/day (2.60 TJ/day, estimated using **Equation 6-2**). This results in CO_2 emission of 194.6 tonnes CO_2 eq/day. For a total of 45 days of the installation phase (15 days/well), the maximum total emission of greenhouse gases is therefore estimated to be at a maximum of 8,757.0 tonnes.

Table 6-13: Emission Factor for Navigation of Support Vessels

Types	Unit	CH_4	N_2O	CO_2	Total
Diesel	kg/TJ	7	2	74,100	
	kg CO_2 eq*/TJ	161	592	74,100	74,853

Source: IPCC (2006)

* Global warming potentials (100 year time horizon): CO_2 = 1; CH_4 = 23; N_2O = 296

The total release of CO_2 during the installation phase is estimated to be 10,112.0 tonnes of CO_2 eq, as shown in **Table 6-14**. When compared with available data on Myanmar's national CO_2 equivalent GHG emissions of 184,710,000 tonnes in 2012, including land use change (World Resources Institute, Climate Analysis Indicators Tool (CAIT)), the GHG emissions arising from the proposed activities are insignificant (approximately 0.0054 %), and therefore will not significantly impact the environment.

Table 6-14: Estimated Total GHG Emissions for Installation Phase

Project Phase	Activity	One Time CO_2 Release (ton CO_2)
Installation (45 days)	Power generation on rig	1,355.0
	Boat transportation	8,757.0
	Total	10,112.0

As the project area is located in an open area in the sea and is not located near any sensitive area (at least 68 NM away from the Thanintharyi Coastal zone and 85 NM away from Moscos Islands), the Receptor Sensitivity of impacts on air quality is considered low.

Without mitigation measures, the significance of impacts from GHG Emissions from energy use during the installation phase is rated as low.

Table 6-15: Significance Ranking of impacts from Energy Use GHG Emissions

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Management Measures

Impacts from GHG Emissions from energy use during installation phase can be mitigated as follows:

- Routine inspection and preventive maintenance as per maintenance schedule/ recommended by manufacturers to ensure efficiency of combustion.
- Set up appropriate drilling rig mobilization schedule to minimize preparation time.

Residual Significance

With these management measures, the extent and magnitude of impacts from energy use GHG Emissions will be reduced resulting in a residual significance ranked that is **negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.3.2 Assessment of Impacts to Seawater Quality

6.3.2.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Seawater Quality	Installation Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Wastewater Disposal Non-Hazardous and Hazardous Waste Handling and Storage Rig Placement	Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)

An impact assessment on seawater quality from activities during the project installation phase is summarized below. Activities could that may impact seawater quality include: drilling rig installation and wastewater and waste management which includes discharge of oil containing wastewater; wastewater and sewage, storage and disposal of hazardous and non-hazardous waste.

6.3.2.2 Assessment of Impacts from Drilling Rig Installation

Rig installation and anchoring of support vessels can disturb the seafloor and consequently cause a temporary suspension of the sediments. This can result in an increase in suspended solids and a temporary increase in turbidity to the seawater where rig installation and anchoring take place.

Results of seawater analysis during Blocks M12, 13 & 14 secondary baseline survey reveal that seawater in the project area contains a total suspended solids concentration of $< 2 – 11$ mg/L, with turbidity ranging from 0.2 – 0.9 NTU (**Section 3.2.4.3**). The seawater within the project area has low sensitivity to impacts from sediment disturbance.

Even though rig installation and anchoring are likely to cause an increase of total suspended solids and turbidity levels, the impact is temporary. Also, the sediment disturbance due to rig installation

will only last for about one day, and the suspended particles should re-settle, allowing the seawater to return to its natural condition within a short period of time. Moreover, sediment disturbance will be limited to the areas on which the ship is anchored. The sediment re-suspension will occur only in the area adjacent to the rig and the area to which an anchor is attached. Therefore, the magnitude, extent and duration of the impacts on seawater quality are considered low.

Considering sensitivity of the area subjected to the impact in terms of environment and society, the project location has low sensitivity as the wells are located offshore, and the nearest sensitive receptor to the project is at least 68 NM away from the Thanintharyi Coastal zone and 85 NM away from Moscos Islands. Therefore, the Receptor Sensitivity of the impacts on seawater quality is considered low.

Without mitigation measures, the significance of impacts associated with rig installation and anchoring on seawater quality is rated as low.

Table 6-16: Significance Ranking of impacts Rig Installation and Anchoring on Seawater Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts on seawater from rig installation and anchoring can be mitigated as follows:

- Conduct Side Scan Sonar to acquire information on topography of the seabed before installing the rig
- Verify the designated coordinates before installing the rig to avoid a repeat rig installation

Residual Significance

With these management measures, the extent and magnitude of impacts from rig installation and anchoring on Seawater Quality will be reduced resulting in a residual significance ranked that is **negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.3.2.3 Assessment of Impacts from Wastewater and Waste Management

Discharge of wastewater from the survey vessel, support vessels and tug boats during rig mobilization and installation could contribute to seawater quality deterioration. Wastewater to be discharged into the sea can be divided into two types:

Drainwater - Bilge and drainage waters may be contaminated with oily wastes. All drains on vessels collect water potentially contaminated with hydrocarbons and direct it to a waste oil storage tank. Collected wastewater is then passed through an oil water separator to meet MARPOL discharge standards. Oil and grease concentration in bilge and drainage water would be limited to MARPOL

73/78 standards Annex 4, i.e. greater than 12 nautical miles (22.2 km) from land, oil content of effluent must be less than 100 ppm; within 12 nautical miles (22.2 km) from land oil content of effluent must be less than 15 ppm. Separated oil is collected in the slop tank.

Domestic Wastewater - The main sources of domestic wastewater are from sanitation facilities and the food canteen facilities of support vessels, tug boats and the survey vessel. For a total of 15 days of rig mobilization and installation (for 45 days for 3 exploration wells), the domestic wastewater is estimated to be 405 m^3 at a rate of 60 liters/person/day, maximum rig crew number of 120 persons, and support vessel crew of 24-30 (approximately 8-10 crew members/vessel).

Domestic wastewater from the tugboats and support vessels is discharged at a distance greater than 12 nautical miles (22.2 km) from shoreline. According to MARPOL 73/78 Annex 4, no treatment is required at a distance greater than 12 nautical miles (22.2 km) from shoreline. Domestic wastewater from the survey vessel will also be at a distance greater than 12 nautical miles (22.2 km) from shore. Although no treatment is required, the domestic wastewater from the survey vessel will be collected and sent to a wastewater-treatment unit on the vessel itself, and treated water will be discharged at a distance greater than 12 nautical miles (22.2 km) from the closest shore. All discharge practices will follow MARPOL 73/78 Annex 4.

Seawater quality results from the Blocks M12, 13 & 14 secondary baseline survey reveal that all measured parameters are typical of a natural marine environment. The wastewater discharge into seawater would increase suspended solids and BOD, and decrease dissolved oxygen in the seawater due to microbial activities. The impacts of changes in the seawater components will be temporary and reversible. The extent of impacts is limited to the area adjacent to the discharge. All discharge practices will follow MARPOL and Myanmar regulations. Therefore, the magnitude, extent and duration of the impacts on seawater quality are considered low. In addition, the wastewater will be discharged far from the shore and sensitive areas and cause small changes to the environment. Therefore, the Receptor Sensitivity of the impacts on seawater quality is considered low.

Without mitigation measures, the significance of impacts associated with wastewater discharge on seawater quality during the installation phase is rated as low.

Table 6-17: Significance Ranking of impacts from Wastewater Discharge on Seawater Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Mitigation of the impact regarding wastewater discharge on seawater quality during the installation can be further enhanced by implementing the following measures:

- Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety;
- The drilling rig shall be equipped with bund wall to prevent oil and chemical spills. Any spilled oil and chemical will be collected into a sealed container;
- Support vessel will divert contaminated water from different parts of vessels to treatment unit before discharge into sea;

- Wastewater discharge from project's vessels will at least comply with the regulation of MARPOL 73/78 Annex I and II;
- Provide an efficient wastewater treatment system to ensure that the quality of the discharge meets the criteria of MARPOL 73/78;
- Collect oil-contaminated water in an oil-water separator and treat the water to a quality meeting MARPOL 73/78 standards;
- In case an oil spill accident on the platform, 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 by a government authorized agency;
- Food waste must be shredded to smaller than 25 mm before discharge to sea;

Residual Significance

With these management measures, the extent and magnitude of impacts from wastewater discharge on Seawater Quality will be reduced resulting in a residual significance ranked that is **negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.3.3 Assessment of Impacts to Seabed Sediment Quality

6.3.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Sediment Quality	Installation Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Rig Placement	Potential contamination from spills Sediment disturbance and increase in suspended solids

6.3.3.2 Assessment of Impacts from General Project Activities

Fuel storage and use, hazardous materials, and hazardous and non-hazardous waste can lead to spills that may directly affect surface water quality, and indirectly affect sediments; these impacts are possible to occur in every phase of an exploration drilling project.

Sediments in all sampling stations consist mainly of slightly silty sand. Petroleum hydrocarbon concentrations (C6-C9, C10-C19, and C20-C36 fractions) in sediments collected at all locations were below detection and levels of TOC ranged from <0.10 – 0.29 %.

Some pollutants (such as heavy metals, organic compounds, etc.) from chemicals, wastes, and oil spills could deposit on the surface of seabed sediments or absorb to organic contents in sediment; this could directly affect the quality of seabed sediments and indirectly affect benthos inhabiting seabed sediments. The magnitude, extent, and duration of impacts on seabed sediments resulting from fuel storage and use, hazardous materials, and hazardous and non-hazardous waste could range from low to high, depending on spill quantities, spill location, chemical and physical properties of the spilled substances, and environmental conditions where a spill takes place (e.g. weather and water-current conditions, etc).

The well locations are situated offshore and away from sensitive areas (at least 68 NM away from the Thanintharyi Coastal zone and 85 NM away from Moscos Islands). The sensitivity of the receptor, bottom sediments and benthos, is considered low for a spill at the well locations as the quality of sediments collected from all well locations are typical of a deep offshore marine environment, and the sensitivity is considered medium for a spill near the shore. Therefore, the Receptor Sensitivity of the impact on seabed sediments resulting from project activities during the installation phase is considered low.

Without mitigation measures, the significance of impacts from fuel storage and handling, hazardous materials and hazardous waste on sediment quality during the installation phase is rated as low.

Table 6-18: Significance Ranking Of Impacts From Fuel Storage And Handling, Hazardous Materials And Hazardous Waste On Sediment Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

The impact from fuel storage and handling, hazardous materials and hazardous waste on sediment quality can be mitigated by:

- Each vessel greater than 400 gross tons will comply with all fuel storage, waste treatment and disposal regulations/procedures (MARPOL73/78, PCML and contractor procedures)
- All contactors must comply with the waste management regulations, and relevant laws, as well as monitor operations
- Separate and store each type of waste (separate non-hazardous waste and hazardous waste) into appropriate containers having clear labels
- Do not drop any waste into the sea
- Store, separate, transport and dispose of waste using appropriate procedures and disposal facilities.
- Implement PCML's Spill Response Plan
- Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety
- Provide appropriate lights and warning signals on all vessels to prevent accidental collision
- Use support vessels to warn all ship traffic to prevent accidental collision

Besides these mitigation measures, PCML has established an emergency response plan for an oil spill incident for different levels of severity.

Residual Significance

With these management measures, the extent and magnitude of impacts from fuel storage and handling, hazardous materials and hazardous waste on sediment quality will be reduced resulting in a residual significance ranked that is **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.3.3.3 Assessment of Impacts from Drilling Rig Installation

Seabed sediments may be physically disturbed during rig installation and anchoring, when the drilling rig is anchored into the sediment for a stable drilling platform and when support vessels and tugboats attach anchors to the seafloor, respectively. Sediment disturbance and re-suspension would be around the anchor location. However, the area impacted by the drilling rig anchors is small and the rig placement process usually takes only about one day. Impacts on sediments are expected to be similar to impacts regarding rig installation on seawater quality during the installation phase which are discussed in **Section 6.3.2.**

Therefore, impacts associated with rig installation on seabed sediment are expected to be of low magnitude, local in extent, short-term in duration, reversible, and of high probability. Also, the Receptor Sensitivity of the receptor (sediments) in the project area is considered low as all well locations are located far from environmental sensitive areas.

Without mitigation measures, the significance of impacts from rig installation on seabed sediment quality during installation phase is rated as low.

Table 6-19: Significance Ranking Of Impacts From Rig Installation On Seabed Sediment Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

The impact associated with rig installation on sediment quality can be mitigated by:

- Confirm correct positioning of the drilling rig before anchoring the rig to seafloor
- Use rig installation method that causes less sediment dispersion.

Residual Significance

With these management measures, the extent and magnitude of impacts from rig installation on seabed sediment quality will be reduced resulting in a residual significance ranked that is **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.3.4 Assessment of Impacts to Biological Resources

6.3.4.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Marine Biota Endangered Species Sensitive/Protected Areas	Installation Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Wastewater Disposal Hazardous Materials Handling and Storage Presence of Equipment and Facilities Rig Placement	Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem

The activities which may have an impact on plankton, larvae, benthos, marine animals, rare/endangered species, and marine ecosystems during the project installation phase prior to drilling are summarized below.

6.3.4.2 Assessment of Impacts from Site Survey and Drilling Rig Transport

The operation of seafloor survey vessel, support vessel, and tug boat may result in increased marine transportation and noise. The increased activity may disturb marine mammals, causing them to migrate from the project area.

Project vessels will cruise at low speeds, and operate for a short duration, so disturbed marine mammals that migrate from the project area may return when the disturbance stops. The risk of collision between marine mammals and vessels is slightly increased. However, no marine mammals have been observed around the proposed well locations during surveys carried out over the last few years.

The significance of the impact to marine mammals from increased marine vessel activity is considered insignificant.

6.3.4.3 Assessment of Impacts from Drilling Rig Installation

Rig installation may impact marine benthos due to seabed sediment disturbance. The magnitude of the impact on benthos is rated as low. Sediment disturbance will occur in a local area and for short duration. The seabed at the proposed exploration well location consists of sand and coarse silt. After exploration drilling activities finish, benthos should return to the disturbed sediment habitat. Re-colonization of benthic communities can be extremely rapid. Studies have shown maximum abundance, total biomass, and diversity of benthic organisms after 20 to 24 weeks to be the same as background after 4 to 8 months (Diaz-Castaneda et al., 1989). Therefore, the magnitude of impact from drilling rig installation to marine benthos is rated as low.

The offshore activities may affect water quality in the project area by increasing suspended solids volume and turbidity; however, it will occur for a short duration and is not predicted to have an impact on plankton. Disturbance of sediment will mostly occur near the seabed where plankton are

found in low quantities; therefore, the magnitude of impact on plankton from drilling rig installation is considered low.

There are no sensitive marine ecosystems such as coral reef, seagrass, and mangrove forest in the proposed well locations but transportation and rig installation may have an impact on marine mammals, benthos, and plankton.

Therefore, impacts associated with rig installation on marine ecosystems are expected to be of low magnitude, local in extent, short-term in duration. The Receptor Sensitivity of the receptor (marine ecosystems) in the project area is considered low because the wells are not located in sensitive marine ecosystems.

The overall impact on marine ecosystems from transportation and rig installation is rated as low.

Table 6-20: Significance Ranking Of Impacts On Marine Ecosystems From Transportation And Rig Installation

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Notwithstanding the predicted lack of impact on marine mammals or marine ecosystem from transportation, it is prudent for PCML to:

- Avoid transportation near areas with marine mammals
- Before drilling rig installation, establish a 1 km^2 zone around the rig area to observe marine mammals
- If any endangered marine animal is found in the project area before rig installation, use sonar waves to deter endangered marine animals from entering the area
- Record marine mammals found in project area and report to local authorities

Residual Significance

With these management measures, the extent and magnitude of impacts on marine ecosystems from transportation and rig installation will be reduced resulting in a residual significance ranked that is **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.3.4.3.1 Wastewater and Waste Management

Wastewater discharge during rig mobilization, and rig installation, including drain water and domestic water, will affect seawater quality (**Section 6.3.2**) and thus the marine ecosystem.

Without mitigation measures, the significance of impacts associated with wastewater discharge on seawater quality is rated as low. In the absence of mitigation measures, the significance level of impacts on the marine ecosystem caused by wastewater discharge is also rated as low:

Table 6-21: Significance Ranking Of Impacts Wastewater Discharge On Seawater Quality And Marine Ecosystems

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts from wastewater discharge on marine ecosystem can easily be mitigated through the use of simple mitigation measures:

- Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety
- Provide effective wastewater treatment system to ensure that the quality of the discharge meets the criteria of MARPOL 73/78
- Food waste must be shredded to smaller than 25 mm before discharge to sea. It will be discharged at the farthest distance from the shoreline and not less than 12 nautical miles (from shoreline) which follow the criteria of MARPOL 73/78

Residual Significance

With these management measures, the extent and magnitude of impacts from wastewater discharge on seawater quality and marine ecosystems will be reduced resulting in a residual significance ranked that is **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4 Environmental Impact Assessment During Drilling Phase

From the screening process the following must be assessed to determine their impacts during the drilling phase:

- Air Quality
- Sea Water Quality
- Sediment Quality
- Underwater Noise

- Biological Resources

6.4.1 Assessment of Impacts to Air Quality and Climate

6.4.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Air Quality/Climate	Drilling Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Energy Use	Deterioration from fuel combustion/GHG Emissions

Air emissions from the Blocks M12, 13 & 14 Exploration Drilling Project activities during the drilling phase will be primarily generated from fuel combustion during transportation and power generation.

Air quality may also be adversely affected from fugitive emissions. Fugitive emissions may come from hazardous materials and wastes, such as paints, waste oil, and/or solvents. Volumes of fugitive emissions from chemicals and hazardous materials, and non-hazardous and hazardous waste are negligible and considered insignificant.

Combustion emissions from activities during the drilling phase are estimated below.

6.4.1.2 Assessment of Impacts from Air Pollutants

Diesel generators will be used as a source of power supply for the power plant on the rig. Estimated fuel consumption for the rig power plant amounts to 11,130 L/day, or 11.13 m^3/day. Based on compilation of air pollution emission factors established by the U.S. Environmental Protection Agency (EPA), estimated quantities of air pollutants emitted from the fuel combustion are presented in **Table 6-22**. Air pollutants generated from diesel oil combustion for the rig will consist of carbon monoxide, nitrogen dioxide, and sulphur dioxide. The total emission values are a worst case scenario: three exploration wells will be drilled over 105 days of drilling operations (35 days/well).

Table 6-22: Emission of Air Pollutants from the Rig

Air Pollutant	Emission Factor (kg/TJ)[1]	Emission of Air Pollutant (tonne/day)	Total Emission (tonnes)
Drilling Rig Generator – (11.13 m^3/day), 105 days for 3 wells (35 days/well)			
Nitrogen Oxides (NO_x)	1,896	0.768	80.64
Sulphur Oxides (SO_x)	126	0.051	5.355
Carbon Monoxide (CO)	410	0.166	17.43

Sources:
1: US.EPA, "Compilation of Air Pollution Emission Factors, Volume 1, Stationary Point and Area Sources", Fifth Edition, January 1995; http://www.epa.gov/ttn/chief/ap42/ch03/bgdocs/b03s03.pdf.
Note: Density of diesel oil is 0.8397 kg/L for calculation, IEA (2004), Densities of Oil Product, Energy Statics Working Group Meeting; Net Calorific Values is 43.33 TJ/Gg for calculation, IEA (2009), CO_2 Emission From Fuel Combustion, Documentation For Beyond 2020 Files

6.4.1.3 Assessment of Impacts from Greenhouse Gases (GHG)

Combustion products from fuel use are the same whether the fuel is used for drilling, well testing or transportation. Regular maintenance of the power generators and equipment will be conducted to

minimize fuel use and emissions. The main impact from these activities is the emission of greenhouse gases and their contribution to climate change.

GHG emissions from diesel generators and mobile combustion (transportation) are estimated following the Tier 1 approach of IPCC (2006) for stationary combustion and mobile combustion. GHG emissions are estimated using emission factors and global warming potentials for the three main greenhouse gases (CO_2, CH_4 and N_2O).

Power Generation for Drilling Rig

Estimated fuel consumption for the rig power plant amounts to 11,130 L/day, or 11.13 m^3/day. Greenhouse gases emission in terms of CO_2 equivalent is estimated according to **Equation 6-1,** where the emission factor for stationary combustion is 74,346.6 kg CO_2 eq/TJ, as shown in **Table 6-12**, and the fuel consumption is 11,130 L/day (0.405 TJ/day, estimated using **Equation 6-2**). This results in CO_2 emission of 30.11 tonnes CO_2 eq/day. For 105 days of drilling operations (35 days/well), the total emission of greenhouse gases from power generation on the drilling rig is therefore estimated to be 3,161.6 tonnes.

Marine Transportation

PCML will have two primary towing/supply vessels, as well as one additional shared vessel for this exploration drilling program, which each consume diesel oil at approximately 20 tonnes/day. Consequently, maximum daily fuel consumption rate of the support vessels will be at 23,818 L/day, totaling to 71,454 L/day.

GHG emissions from boat transportation are estimated following the Tier 1 approach of the IPCC guideline (**Equation 6-1** for mobile combustion), with an emission factor of 74,853 kg CO_2 eq/TJ, as shown in **Table 6-13** and fuel consumption of 71,454 L/day (2.60 TJ/day, estimated using **Equation 6-2**). This results in CO_2 emission of 194.6 tonne/day. For 105 days of drilling operations (35 days/well), the total emission of greenhouse gases is therefore estimated to be 20,433.0 tonnes.

The total release of CO_2 during the drilling phase is estimated to be 23,594.6 tonnes of CO_2 eq, as shown in **Table 6-23**. When compared with available data on Myanmar's national CO_2 equivalent GHG emissions of 184,710,000 tonnes in 2012, including land use change (World Resources Institute, Climate Analysis Indicators Tool (CAIT)), the GHG emissions arising from the proposed activities are insignificant (approximately 0.0128 %), and therefore will not significantly impact the environment.

Table 6-23: Estimated Total GHG Emissions for Drilling Phase

Project Phase	Activity	One Time CO_2 Release (tonnes CO_2)
Drilling (105 days)	Power generation on rig	3,161.6
	Marine transportation	20,433.0
	Total	23,594.6

The drilling phase will end within a short period of time (about 35 day/well or 105 days for all 3 wells). In addition, these air pollutants are emitted in small quantities into a wide open atmosphere. As a result, these pollutants will be rapidly dispersed and diluted in the atmosphere. Therefore, impacts on air quality during the drilling phase are expected to be of low magnitude, local in extent, and short-term in duration.

As the project area is located in an open area in the sea and is not located near any sensitive area (at least 68 NM away from the Thanintharyi Coastal zone and 85 NM away from Moscos Islands), the Receptor Sensitivity of impacts on air quality is considered low.

Without mitigation measures, the impact on air quality from energy use during the drilling phase is rated as low.

Table 6-24: Significance Ranking Of Impacts of Energy Use On Air Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts on air quality from energy use and transportation during drilling phase can be mitigated as follows:

- Routine inspection and preventive maintenance as per maintenance schedule/ recommended by manufacturers to ensure efficiency of combustion.
- Set up appropriate exploration drilling schedule to minimize drilling time.

Residual Significance

With these management measures, the extent and magnitude of impacts from energy use on air quality will be reduced resulting in a residual significance ranked that is **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.2 Assessment of Impacts from Underwater Noise

6.4.2.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Underwater Noise	Drilling Phase	Drilling	Increased underwater noise from site sonar scan und underwater drilling and installation

A number of activities associated with the Blocks M12, 13 & 14 Exploration Drilling project have the potential to create noise. However, the most significant activities that may cause noise impact are during drilling of exploration wells. Noise levels for the various project activities are listed in **Table 6-25**. Noise from the project activities may have impact on both marine mammals and seabirds, and on worker's health. Effects on worker health are discussed in **Section 6.11.4.3**.

6.4.2.2 Assessment of Impacts from Noise

Environmental Impact on Fish, Marine Mammals and Seabirds

Noise can cause direct and indirect impacts to seabirds, fish and marine mammals. Seabirds and mammals in close proximity to the noise source would be disturbed and the typical response would be avoidance.

Noise effects on birds include hearing loss, increased heart rate, and increased hatching times. In addition, noise can result in behavioural changes, such as fright reactions, altered mating behaviour, flushing and desertion of nests (Dufour, 1980). Many of these effects are not applicable to an offshore setting like Blocks M12, 13 & 14. Seabirds in the Blocks M12, 13 & 14 area would most likely react to noise by a fright reaction resulting in avoidance.

The use of sound by marine animals is widespread and may involve passive listening and/or active communication or echolocation systems. Sound is used by most groups of marine animals ranging from invertebrates to the great whales and is far more common among many tropical species of invertebrates and fishes than generally perceived. Many marine animals can produce very intense focused sounds. The highest source level yet measured is within the beam of a bottlenose dolphin *(Tursiops truncatus)* echolocation click, at 229 dB re 1 µPa-m (peak-peak value) over a broad band up to 120 kHz (McCauley, 1994).

Fish are able to detect low-level noise up to several kilometres away from its source. Fish normally avoid noise levels greater than 160 dB, and pathological damage is possible at noise levels greater than 230 dB (McCauley, 1994).

Potential effects from noise on marine mammals include changes in hearing sensitivity and changes in behavioural patterns, including changes in vocalization behaviour, breathing, diving patterns, and active avoidance of noise sources[2]. Noise effects from offshore oil and gas operations on gray whales from playback studies are summarized in **Table 6-26**. Studies of short-term behavioural responses to these underwater noises indicate a 50% chance that whales will respond to continuous broadband noise when sound levels exceed ca 120dB and to intermittent noise when levels exceed ca 170dB, usually by changing their swimming course to avoid the source. Gray whales were 'startled' at the sudden onset of noise during playback studies, but demonstrated a flexibility in swimming and calling behaviour that may allow them to circumvent increased noise levels (Moore and Clarke 2002).

Table 6-25: Noise Level Produced During Project Activities

Project Activity	Source	Noise Level	Reference
Crew/Material Transport Product Transport	Vessel	110 dB(A) (Engine Room)	Bahtiarian (1998)
Platform Installation Rig Mobilization and Placement Well Closure Platform & equipment decommissioning	Vessel	160-190 dB (at source); 120-150 dB at 100 m	Evans and Nice (1996)
Installation Wells	Drilling rig	85–127 dB (at source); <25 dB at 100 m	Evans and Nice (1996)

Table 6-26: Gray Whale Avoidance to Offshore Oil and Gas Operations

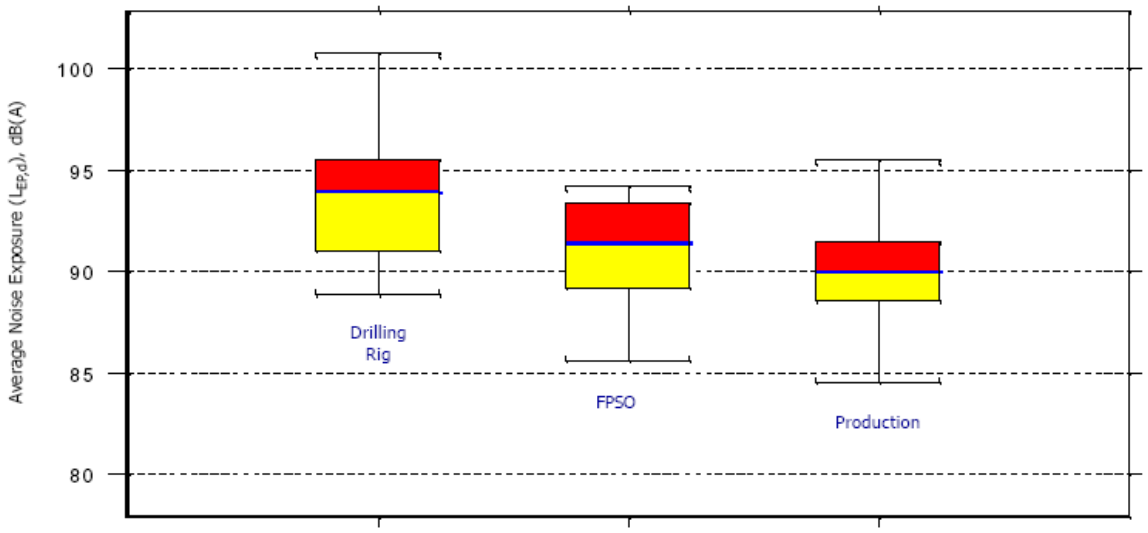
	Probability of Avoidance (Noise level dB re 1µ Pa)		
	0.10	**0.50**	**0.90**

2 http://dels.nas.edu/dels/rpt_briefs/ocean_noise_final.pdf

Helicopter	115	120	>127
Drillship	110	117	>122
Drilling Platform	114	117	>128

Source: as compiled by Moore and Clarke (2002)

Figure 6-2: Average Noise Levels on Offshore Drilling Rigs



Source: http://www.hse.gov.uk/offshore/noise/noise.pdf

Figure 6-2 shows an average noise exposure on a drilling rig at approximately 94 dB. The noise levels generated on the drilling rig are below levels causing pathological damage to fish, but are high enough to result in avoidance reactions by fish and marine mammals, thus preventing pathological damage. Furthermore, seabirds are likely to avoid the area.

The potential environmental impacts of underwater noise generation are considered to be of low magnitude, of short-term duration, and local in extent.

All drilling locations are located offshore and far from sensitive areas; therefore, Receptor Sensitivity on the impacts on environment is considered low.

The significance of environmental impacts caused by noise generation on Fish, Marine Mammals and Seabirds during installation, drilling, and abandonment phases is rated as low.

Table 6-27: Significance Ranking Of Impacts of Noise on Fish, Marine Mammals and Seabirds

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts from noise generated during drilling phase on environment can be mitigated through the use of the following mitigation measures:

- Side Scan Sonar operation should be started with low frequency acoustic waves for at least 20 minutes before starting operation with high frequency to allow marine mammals, fish and seabirds to avoid the areas of such operation.
- If marine mammals are present during seafloor survey with Side-Scan Sonar or Drilling, the operation will be temporarily ceased for at least 20 minutes after the mammals have left the area.

Residual Significance

With these management measures, the extent and magnitude of impacts from underwater noise on Fish, Marine Mammals and Seabirds will be reduced resulting in a residual significance ranked that is **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.3 Assessment of Impacts from Seawater Quality

6.4.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Seawater Quality	Drilling Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Wastewater Disposal Non-Hazardous and Hazardous Waste Handling and Storage Drilling and Completion of Wells Mud & Cuttings Disposal	Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)

During the drilling phase, seawater can be affected by fuel storage and handling, hazardous materials, hazardous and non-hazardous waste, and wastewater. Impacts on seawater quality resulting from waste management and wastewater activities are discussed below.

6.4.3.2 Assessment of Impacts from Fuel Storage and Handling

Fuel handling and storage can lead to spills that may affect surface water quality. The severity of environmental impacts from fuel storage and handling are dependent on the location of occurrence, spill quantity, chemical and physical properties of the substances spilt, and environmental conditions where the spill takes place (e.g. weather and water-current conditions, etc.)

Diesel fuel transfer is a major activity during the drilling phase that may lead to oil spill from the drilling rig. Fuel spills from the drilling rig during transfer may occur as a result of:

- connection leakage – dripping of fuel onto drilling rig;
- damaged transfer hose – jet spray from the damage point;
- rupture of transfer hose – extensive spilling of contents in the hose.

Marine fuel spills potentially occurring during fuel handling would be small. Typical spills resulting from fuel handling are 1,500 L to 15,000 L (US National Oceanic and Atmospheric Administration (NOAA), 1999).

For the Exploration Drilling project, a spill of diesel fuel from the Drill Rig was modelled with the oil spill model OSIS version 3.1. **Table 6-28** presents distance from the well to shore and the closest sensitive area.

Table 6-28: Distance from the Project to the Closest Sensitive Areas

Closest Sensitive Areas	Distance (NM)
Thanintharyi Coastal Zone	68 NM
Moscos Islands	85 NM

IEM evaluated a worst-case diesel spill to sea scenario.

- The amount of diesel fuel spilt was 150,000 L (largest spill from fuel handling);
- Fuel loss occurred over a 10-min period (instant loss of containment)
- W Wind with speed 30 knots (note Typical winds in November Max 32 knots and Mean Speed of 11 knots with Predominate Direction of NE-E)
- Air temperature 25 °C and water temperature 25 °C.
- In the Andaman Sea, water circulates from the north Indian Ocean, Bay of Bengal, southwards along the coast of Myanmar and Thailand, extending southwest of Phuket Island and turning to the Indian Ocean.

The results reveal that a diesel spill at the well with a W wind would be totally dispersed at sea within 8 hr 40 minutes. The spill length of 2.16 NM would not reach shore or any sensitive area.

An important receptor of impacts from an oil spill is the ecosystem in the area where the oil spill takes place; the ecosystem would be affected by the deterioration of seawater and seabed sediment quality. All well locations are located far from shore and sensitive areas (at least 68 NM away from the Thanintharyi Coastal zone and 85 NM away from Moscos Islands).

Seawater samples representing the Blocks M12, 13 & 14 drilling program met *the Standards.*

The seawater analysis revealed seawater in the project location is of good quality, meaning the seawater in the proposed well locations is not sensitive to the potential impacts on water quality. Also, the proposed well locations are located far from shore and sensitive receptors. However, impacts on water quality resulting from an oil spill could potentially lead to consequent environmental impacts, such as impacts on sediment quality, marine biota, fisheries, etc. Therefore, Receptor Sensitivity of the impact is considered low for an offshore spill and medium for a near-shore spill.

Without mitigation measures, the significance of impacts resulting from a fuel oil spill on seawater quality is rated as low-medium for offshore spills and medium for near shore spills.

Table 6-29: Significance Ranking Of Impacts from a Fuel Spill on Seawater

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr

Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

PCML will implement mitigation measures to reduce the risk of spills and minimize impacts, as outlined in Chapter 2 (Project Description) and listed below:

- Each vessel greater than 400 gross tons will comply with all fuel storage, waste treatment and disposal regulations/procedures (MARPOL73/78, PCML and contractor procedures)
- Provide appropriate lights and warning signals on all vessels to prevent accidental collision, and comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety
- Conduct Table Top Oil Spill Response for Tier 3 event
- Use support vessels to warn off non-related vessel traffic to prevent accidental collision
- Regularly monitor safety zone within 500 m-radius surrounding drilling rig to prevent any accidents
- Regularly patrol by safety vessels to observe leaks, spills and determine potential causes
- Conduct drills according to Emergency Response Plan and Tropical Storm Emergency Plan
- The drilling rig shall be equipped with a bund wall to prevent oil and chemical spills. Any spilled oil and chemicals will be collected into a sealed container

Residual Significance

With these management measures, the extent and magnitude of impacts from a Fuel Spill on Seawater will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

It should be noted that the assessment of impact from oil spill on seawater quality was conducted with no respect to storm events in the Gulf of Martaban. If PCML gets a warning of a depression or tropical cyclone entering within 550 nautical miles from the project area, PCML will immediately cease all working activities on the rig. Then, the rig will be demobilized and moved from the project area to the safety area.

6.4.3.3 Assessment of Impacts from Hazardous Materials

The chemicals most likely used during the project's operation are listed in

Table 6-31, along with their potential hazards. Most of the drilling mud chemicals are classified as non-toxic to aquatic biota. The concentration of these chemicals in the low toxicity Water Based Mud (KCL/PHPA/Glycol) is less than their toxic concentration and the chemicals will be rapidly diluted by seawater immediately after discharge. Therefore, it is unlikely that marine biota would be exposed to toxic concentrations. No ecological toxicity information is available on the remaining chemicals.

The most likely scenario would be an operational spill on the drilling rig with a small amount of chemical going overboard. Although some chemicals may be toxic, a spill offshore would rapidly dilute the chemical to below toxic levels. A spill nearshore will be less diluted and could affect the nearshore area of the shore base. The potential impacts from these accidental hazardous material

releases on the environment are expected to be local in extent and are rated as medium severity for a nearshore spill and low severity for an offshore spill. The impacts regarding a hazardous-material spill would require a short term recovery period, and are expected to be of low probability. In addition, receptor sensitivity is considered low for an offshore spill and medium for a nearshore spill.

In the absence of mitigation measures, significance of environmental impacts resulted from an accidental spill of chemicals and hazardous materials is rated as low for offshore spills and medium for nearshore spills.

Table 6-30: Significance Ranking Of Impacts from Chemicals and Hazardous Materials on Marine Biota

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

PCML will implement mitigation measures to reduce the risk of spills and minimize impacts, as outlined below:

- Implement Hazardous Materials Management Tracking System and manifests for transport
- Regularly patrol by safety vessels to observe leaks, spills and determine potential causes

Residual Significance

With these management measures, the extent and magnitude of impacts from a Fuel Spill on Seawater will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

Table 6-31: Environmental Characteristics of Components in the Drilling Fluids

Chemical Compound	Biota Affected	Toxicity[1]
Soda ash M3 (Disodium carbonate)	Fish, Algae, daphnia and aquatic invertebrates	Lepomis macrochirus $LC_{50(96h)}$: 300 mg/l Nitzschia $LC_{50(120h)}$: 242 mg/l Daphnia magna $LC_{50(48h)}$: 265 mg/l
Caustic Soda or sodium hydroxide	Fish	Fish $LC_{50\ (96h)}$: 43mg/l[2]
Bentonite spud or Crystalline silica (impurity)	N/A	No data
Barite or Crystalline silica (all)	N/A	No data
Starch	N/A	No data
Polyanionic cellulose	N/A	No data
DUO-TEC - Xanthan - GumGlyoxal	 N/A Fish, Algae, daphnia and	 No data Leuciscus idus $LC_{50(96h)}$: 680mg/l, Pseudokirchneriella subcapitata $LC_{50(96h)}$: ≤242 mg/l,

	aquatic invertebrates	Desmodesmus subspicatus $LC_{50(72h)}$: >500 mg/l, Daphnia magna $LC_{50(48h)}$: 404 mg/l
Citric acid or monohydrate	Fish and aquatic invertebrates	Lepomis macrochirus $LC_{50(96h)}$: 1516 mg/l Daphnia magna $LC_{50(72h)}$: 120 mg/l
Poly plus dry	N/A	No data
Calcium Carbonate	N/A	No data
Aliphatic amines	N/A	No data

Source: [1]MSDS

6.4.3.4 Assessment of Impacts from Waste Management

Hazardous Waste – During the exploration drilling operations in Blocks M12, 13 & 14, the various amounts of hazardous waste produced from the 3 exploration wells include slop oil, spent lube oil, greases and hydraulic fluids, batteries, rags and materials contaminated with oil, grease, solvents, and containers e.g., drums/sacks contaminated with hazardous materials. Over 105 days of the drilling phase, it is estimated that 1.8 tonnes of hazardous waste (0.5 ton/month) would be produced.

Hazardous waste transportation, treatment, and disposal will be managed by the drilling contractor. The drilling contractor will prepare proper containers for the various hazardous wastes. The hazardous waste containers will be clearly labeled and stored in a designated area. The drilling contractor will collect and properly treat the wastes.

Therefore, the impact from hazardous waste spillage during PCML's operation offshore is expected to be of low-medium magnitude, local-regional in extent, and short-medium term in duration (depending on quantity of waste oil spilt), and of very low probability.

An important receptor of impacts regarding hazardous waste spillage is the ecosystem in the area where the dirty oil spill takes place; the ecosystem would be affected through the deterioration of seawater and seabed sediment quality. As all well locations are located far from shore and sensitive areas (at least 68 NM away from the Thanintharyi Coastal zone and 85 NM away from Moscos Islands), the receptor sensitivity is considered medium. However, a nearshore spill can lead to more severe impacts; therefore, the important of impacts from a spill near shore is considered medium.

Without mitigation measures, the significance of impacts resulting from hazardous waste on seawater quality is rated as medium.

Table 6-32: Significance Ranking Of Impacts from Hazardous Waste on Seawater Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

PCML has prepared an Emergency Response Plan for an oil spill incident with different levels and mitigation measures to reduce the risk of spills and minimize impacts. Mitigation measures for impacts associated with hazardous waste spills will be the same as the mitigation measures listed above for impacts associated with fuel storage and handling, and include:

- Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety
- Implement Hazardous Materials Management Tracking System and manifests for transport
- Separate each category of non-degradable and hazardous waste into appropriate containers. Label and transfer these containers for further disposal.
- Store, separate, transport and dispose of waste using appropriate procedures and disposal facilities.
- The drilling rig shall be equipped with a bund wall to prevent oil and chemical spills. Any spilled oil and chemicals will be collected into a sealed container.

Residual Significance

With these management measures, the extent and magnitude of impacts from Hazardous Waste on Seawater will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

Non-Hazardous Waste - Non-hazardous wastes produced during installation, drilling and abandonment phases of the Blocks M12, 13 &14 Exploration Drilling project include: trash, food waste, paper, plastic and scrap wood and metals.

It is estimated that for a maximum of 105 days of drilling operation (35 days/well), the total amount of non-hazardous waste would be approximately 14– 18 tonnes (4-5 ton/month). The non-hazardous waste will be segregated by type, clearly labelled, and then properly disposed onshore. Food waste from kitchens and canteens will be kept separate from non-food waste. Food waste will be shredded into small pieces and then discharged overboard, potentially providing food for marine animals, at a distance of greater than 12 nautical miles (22.2 km) from shoreline according to MARPOL 73/78 Annex 5.

Based on PCML's non-hazardous waste management procedures outlined above, the potential impacts from non-hazardous waste on seawater quality are of medium magnitude, short-term duration, local in extent, and require a short-term recovery period, and Receptor Sensitivity of the impacts is considered low.

Without mitigation measures, the significance of non-hazardous waste impacts on seawater quality is rated as medium.

Table 6-33: Significance Ranking Of Impacts from Non-Hazardous Waste on Seawater Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

PCML will implement mitigation measures to minimize impacts associated with non-hazardous waste, as outlined below:

- Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety
- Store, separate, transport and dispose of waste using appropriate procedures and disposal facilities.
- Food waste must be shredded to smaller than 25 mm before discharge to sea

Residual Significance

With these management measures, the extent and magnitude of impacts from Non-Hazardous Waste on Seawater will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.3.5 Assessment of Impacts from Wastewater

Wastewater will be management as per MARPOL requirements. As with the other phases, sources of wastewater that would be generated during the drilling phase are bile and drainage contaminated with oil wastes, and domestic wastewater. The impacts resulting from wastewater discharge on seawater during the installation phase was discussed in detail in **Section 6.3.2**. The impacts on seawater quality during the drilling phase are expected to be similar to those during the installation phase.

Therefore, the potential impacts from these wastewater releases on seawater quality during the drilling phase are expected to be of medium magnitude, short-term duration, local in extent, and require a short-term recovery period. The receptor sensitivity is considered low. Therefore significance ranking is medium.

Table 6-34: Significance Ranking Of Impacts from Wastewater on Seawater Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

PCML will implement the same mitigation measures as listed for impacts associated with wastewater discharge on seawater quality during the installation phase (**Section 6.3.2**) to minimize those impacts during the drilling phase.

Residual Significance

With these management measures, the extent and magnitude of impacts from Wastewater on Seawater will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.3.6 Assessment of Impacts from Discharge of Mud and Cuttings

Drilling generates various types of waste: drill cuttings, drilling mud residue, liquids (brine and acids), and possibly drilling chemicals and additives. The release of mud and cuttings may affect water quality (increased levels of suspended solids, metals, toxicity) and cause oxygen depletion (due to the organic content).

Environmental impacts from drilling can result from the toxicity of drilling mud constituents. The Blocks M12, 13 & 14 exploration wells will be drilled with Water Based Mud (WBM). Mud constituents used for drilling the Blocks M12, 13 & 14 wells and their environmental hazard information are summarized in

Table 6-31**.**

The available ecological toxicity information indicates that most of the chemicals in the WBM are classified as non-toxic to aquatic biota. Most of drilling chemicals are classified as not acutely toxic. The concentration of these chemicals in the low toxicity Water-Based Muds (WBM) is less than the toxic concentrations and the chemicals will be rapidly diluted by seawater immediately after discharge. Therefore, it is unlikely that marine biota would be exposed to toxic concentrations.

According to a study by Neff (1987)[3], water column organisms will never be exposed to drilling mud for long enough or at sufficiently high concentrations to cause acute or sub-lethal responses.

The amount of drill cuttings discharged can be estimated by calculating the volume of each section (i.e. from hole interval height and hole diameter). Measured depth is used for the calculation. It is estimated that approximately 502 m^3 of cuttings are generated per well.

Mud will be removed from the cuttings to the extent possible. PCML will discharge cuttings with a maximum of 12.5% Cuttings Base Fluid Retention (CBFR). Therefore, it is estimated that a total of 62.71 m^3 of drilling mud will be discharged into the sea. The recovered mud will be re-conditioned and returned to the mud circulation system. The mud in casings will come out and be treated through the shaker system, and reused.

Mud and Cuttings Treatment

The drilling fluids and drilled waste cuttings disposal will be completed according to the regulations and field testing for the properties will be carried out before dumping. Barite will be tested for presence of heavy metal and QA/QC test will be done to ensure no heavy metals are present.

The potential environmental impacts to seawater caused by the release of drilling mud and cuttings are considered to be of medium magnitude, medium in extent, and short term in duration. Because the mud and cuttings will be discharged at well locations located far from shore and sensitive receptors, the receptor sensitivity of impacts associated with mud and cuttings discharge on seawater quality is considered low.

Without mitigation measures, the significance of impacts caused by a release of drilling mud and cuttings on seawater quality is rated as medium.

Table 6-35: Significance Ranking Of Impacts from Drilling Mud and Cuttings on Seawater Quality

	Level and Type of Impact

3 Neff, J. M. (1987). Biological Effects of Drilling Fluids, Drill Cuttings and Produced Waters, in Boesch, D.F. and Rabalais N. N. (eds) (1987). Long-Term Environmental Effects of Offshore Oil and Gas Development, pp. 469-538. Elsevier Applied Science Publishers, London.

	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

PCML will implement the following mitigation measures to minimize impacts associated with mud and cuttings discharge:

- Select the appropriate drilling method to reduce the amount of drilling mud and cuttings discharged
- To the extent possible, use seawater and low-toxicity drilling muds which can be rapidly degraded in natural environment
- Discharge all the cuttings overboard through a caisson at a depth of approximately 3 m below the sea surface (depending on tidal height)

Residual Significance

With these management measures, the extent and magnitude of impacts from Drilling Mud and Cuttings on Seawater will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.4 Assessment of Impact on Seabed Sediment Quality

6.4.4.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Sediment Quality	Drilling Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Drilling & Completion of Wells Mud & Cuttings Disposal	Potential contamination from spills Change in sediment particle size and chemistry from mud and cuttings deposition

6.4.4.2 Assessment of Impacts on Sediment Quality from Discharge of Mud and Cuttings

The pattern of seafloor sediment topography could be affected by drilling mud and cuttings discharge. This impact can be mitigated by proper management of mud and cuttings disposal. Drilling waste can be managed in different ways, each with its benefits and drawbacks. The impacts from different management options are outlined in **Table 6-36**.

Table 6-36: Potential Impact from Drilling Waste Management Alternatives

Management Options		Negative Impact
Discharge to sea (100%)	Leave	1. Potential impacts on water quality, sediments and aquatic biota upon discharge.
	Dredge and then dispose onshore	1. Potential impacts on water quality, sediments and aquatic biota upon discharge. 2. Potential impacts on water quality, sediments and aquatic biota during dredging. 3. Potential accidents as a result of dredging near drilling rig. 4. Potential spills to seawater during transport with potential impacts on water quality, sediments and aquatic biota. 5. Potential spills on land during transport with potential impacts on surface water quality, groundwater quality, soils, aquatic and terrestrial biota. 6. Lost space in landfills. 7. Potential seepage from landfill with potential impacts on surface water quality, groundwater quality, soils, aquatic and terrestrial biota.
Zero discharge	Transport to land and then landfill	1. Potential spills to seawater during transport with potential impacts on water quality, sediments and aquatic biota. 2. Potential spills on land during transport with potential impacts on surface water quality, groundwater quality, soils, aquatic and terrestrial biota. 3. Lost space in landfills. 4. Potential seepage from landfill with potential impacts on surface water quality, groundwater quality, soils, aquatic and terrestrial biota.

Considering the alternatives, the management approach with the least amount of impact is discharge to sea. The impacts for this discharge option are expected to be minimal:

- An overview of management approaches[4] indicated that smothering of biota from water based mud and cuttings is limited to 25 m from the discharge point, with species diversity affected within 100 m from the discharge. These effects were temporary.

A total of 502 m^3 of drilling cuttings are expected to be generated from each exploration drilling well, which will be eventually discharged at sea after being treated overboard. Mud will be removed from the cuttings to the extent possible. PCML will discharge cuttings with a maximum of 12.5% Cuttings Base Fluid Retention (CBFR). It is estimated that 62.71 m^3 of drilling mud will be discharged into the sea.

The disposal of drilling waste for this project follows standard procedures used in the Gulf of Martaban. PCML will conduct leachate testing of the mud and cuttings, which will conform with IFC EHS Guidelines for Offshore Oil and Gas Development (2015). The analysis of drilling fluids and cuttings characteristics for water-based muds require the following details and parameters met before sea discharge:

- Mercury 1 mg/kg dry weight in stock barite
- Cadmium 3 mg/kg dry weight in stock barite
- Maximum chloride concentration must be less than four time's ambient concentration of fresh or brackish receiving water
- Discharge via a caisson at least 15 meters below sea surface**

4 Joint E&P Forum and UNEP. 1997. Environmental management in oil and gas exploration and production. An overview of issues and management approaches.

From the Blocks M12, 13 & 14 baseline survey, sediments in all sampling stations consist mainly of slightly silty sand. As the seafloor sediment analysis reveals generally good quality seafloor sediments, the sediments in the environment are expected to have low sensitivity to the potential impacts resulting from mud and cuttings discharge. Also, the proposed well locations are located far from sensitive areas and the closest shore. The receptor sensitivity of the impacts associated with mud and cuttings discharge on seabed sediments is considered low.

Therefore, the significance of impacts from mud and cuttings disposal on seabed sediments characteristics is rated as low.

Table 6-37: Significance Ranking Of Impacts from Drilling Mud and Cuttings on Seabed Sediment Characteristics

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts on seabed sediment characteristics can be mitigated by the following mitigation measures:

- Select the appropriate drilling method to reduce the amount of drilling mud and cuttings discharged
- Design and use slim hole drilling to minimize the amount of mud and cuttings

Residual Significance

With these management measures, the extent and magnitude of impacts from Drilling Mud and Cuttings on Seabed Sediment Characteristics will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.4.3 Assessment of Impacts on Sediment Quality from Hazardous Materials, Hazardous and Non-Hazardous Waste

During the drilling phase, fuel storage and use, hazardous materials, hazardous and non-hazardous waste, and drilling waste (i.e. mud and cuttings) can lead to spills that may directly affect surface water quality, and indirectly affect sediments. The impacts from these project activities on sediment quality are similar to those on seawater quality (**Section 6.4.3.6**).

Sediments in all sampling stations consist mainly of slightly silty sand. Petroleum hydrocarbon concentrations (C6-C9, C10-C19, and C20-C36 fractions) in sediments collected at all locations were below detection and levels of TOC ranged from <0.10 – 0.29 %.

Hazardous materials, hazardous and non-hazardous waste, and drilling waste (i.e. mud and cuttings) can affect sediment quality by increasing the concentration of organic compounds, reducing the concentration of oxygen in sediments. In addition, concentrations of heavy metals and toxicity could

possibly increase as a result of deposition of drilling waste. The habitat of marine benthos could change due to possible changes in toxicity, abundance, and loss of shelter. Also, mud and cuttings could smother marine benthos.

The available ecological toxicity information indicates that most of the chemicals in the WBM are classified as non-toxic to aquatic biota. Information on ecological toxicity, shown in

Table 6-31**,** reveals that most drilling chemicals are classified as not acutely toxic. The concentration of these chemicals in the low toxicity Water-Based Mud (WBM) and thus mud and cuttings is less than their toxic concentration. In addition, the chemicals will be rapidly diluted by seawater immediately after discharge. Therefore, it is unlikely that marine biota would be exposed to toxic concentrations.

According to a study by Neff (1987)[5], aquatic organisms will never be exposed to drilling mud for long enough or at sufficiently high concentrations to cause acute or sub-lethal responses.

The potential environmental impacts to seafloor sediment caused by the release of drilling mud and cuttings on seafloor sediment are expected to be of low-medium magnitude, local in extent and of short term duration.

All well locations are located far from shore, sensitive areas and areas in which rare/protected marine species have been seen, and sediment quality within the well areas generally met the quality specified by *the Standards.* Thus, the receptor sensitivity of the receptors, marine biota and seabed sediments in the area, is considered low.

Therefore, the significance of impacts caused by a release of drilling mud constituents on seafloor sediment quality is rated as low.

Table 6-38: Significance Ranking Of Impacts from Drilling Mud and Cuttings on Seabed Sediment Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts on seabed sediment quality can be mitigated by the following mitigation measures:

- Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety
- Each vessel greater than 400 gross tons will comply with all fuel storage, waste treatment and disposal regulations/procedures (MARPOL73/78, PCML and contractor procedures)
- Conduct Table Top Oil Spill Response for Tier 3 event
- Regularly monitor safety zone within 500 m-radius surrounding drilling rig to prevent any accidents

5 Neff, J. M. (1987). Biological Effects of Drilling Fluids, Drill Cuttings and Produced Waters, in Boesch, D.F. and Rabalais N. N. (eds) (1987). Long-Term Environmental Effects of Offshore Oil and Gas Development, pp. 469-538. Elsevier Applied Science Publishers, London.

- Regularly patrol by safety vessels to observe leaks, spills and determine potential causes
- Implement Hazardous Materials Management Tracking System and manifests for transport.
- To the extent possible, use seawater and low toxicity drilling mud which can be rapidly degraded in natural environment
- The drilling rig shall be equipped with bund wall to prevent oil and chemical spills. Any spilled oil and chemicals will be collected into a sealed container. Support vessels will divert contaminated water from different parts of ship to treatment before drainage to the sea.
- Separate each category of non-degradable and hazardous waste into appropriate containers. Label and transfer these containers for further disposal.
- Store, separate, transport and dispose of waste using appropriate procedures and disposal facilities.

Residual Significance

With these management measures, the extent and magnitude of impacts from Drilling Mud and Cuttings on Seabed Sediment Quality will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.4.5 Assessment of Impacts on Biological Resources

6.4.5.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Marine Biota Endangered Species Sensitive/Protected Areas	Drilling Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Wastewater Disposal Hazardous Materials Handling and Storage Presence of Equipment and Facilities Drilling & Completion of Wells Mud & Cuttings Disposal	Potential deterioration of seawater quality from spills, leakages and discharge of mud and cuttings could affect the marine ecosystem. Mud and cuttings discharge can increase turbidity, and may be toxic to marine organisms. Mud and cuttings deposition can result in sediment contamination and sediment accumulation affecting benthos

6.4.5.2 Assessment of Impacts from Wastewater and Waste Management on Marine Biota

Drilling discharges into the sea during drilling activities may cause an impact on seawater and sediments (see **Sections 6.4.3** and **6.4.4**) and may affect the community of marine biota not only at the surface level but also the seabed. The significance of impacts on seawater and sediments from drilling activity is assessed as low; therefore, its impact on marine biota caused by physical disturbance and

wastewater discharge is also rated as low, local in extent, short-term duration (drilling duration is 35 days per well), and low magnitude; the recovery time will be short. Receptor Sensitivity is ranked as low.

Table 6-39: Significance Ranking Of Impacts from Wastewater and Waste Management on Marine Biota

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Although the significance of impacts on marine biota caused by physical disturbance and wastewater discharge is rated as low, PCML still implements mitigation measures for decreasing the likelihood of impacts. The mitigation measures are the same as those described in **Sections 6.4.3** and **6.4.4** (Seawater and Sediment Quality section).

Because the project has properly prepared the mitigation measures for preventing impacts from physical disturbance and wastewater discharge during drilling activity, the residual impact following mitigation is thus rated as *negligible*.

Residual Significance

With these management measures, the extent and magnitude of impacts from Wastewater and Waste Management on Marine Biota will be reduced resulting in a residual significance ranked that is **negligible**.

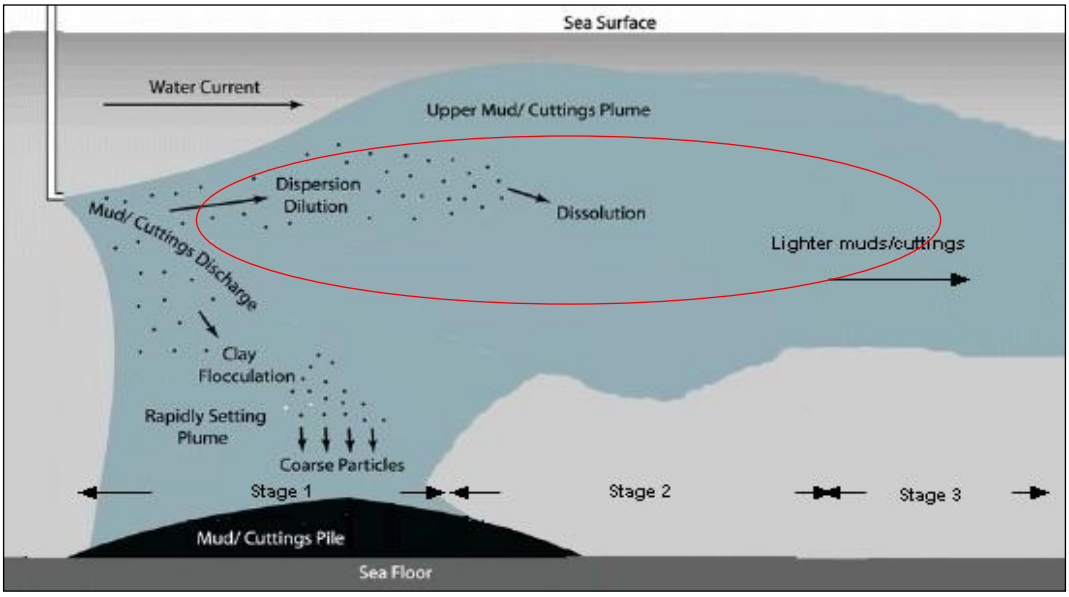
Residual Significance	Positive	Negligible	Low	Medium	High

6.4.5.3 Assessment of Impacts from Mud and Cuttings on Marine Biota

The impact caused by mud and cuttings discharge on marine biota on the surface level of seawater includes three aspects: turbidity, toxicity of drilling mud and cuttings, and heavy metal/barite contamination.

The small particles, especially silt particles (4-62 microns) and clay particles (≤4 microns), slowly settle or do not settle to the seabed. These small particles are suspended and disperse far away from the release site. However, the concentration of these fine solids decreases as the distance increases, as shown in **Figure 6-3**. Small suspended particles might have an effect on marine biota, such as invertebrate, larvae, and fish. The effects from small particles (less than 62 microns) on marine biota are therefore assessed.

Figure 6-3: Distribution of Small Particles from Drilling Releases to the Sea



Source: APASA, 2009

The small particles discharged to the sea can cause effects on sea water quality such as increasing suspended solids and turbidity, decreasing light penetration, and reducing dissolved oxygen, particularly in deeper areas (Appleby and Scarrett, 1989; Cramer, 1974). In addition, small particles might affect marine biota. There are several studies and literature reviews that show the effects of suspended solid on marine biota. The details are summarized below:

Impact on Invertebrate Species: Filter feeding invertebrates are generally less tolerant of turbid conditions than other aquatic species. Increases in suspended sediment concentration (to 50-100 mg/L) decreased ingestion rates to potential starvation levels (Arruda et al., 1983). The suspended clay was found to reduce Daphnia feeding rates (Kark 199, McCabe and O'Brien 1983). Ellis (1936) reported that under highly turbid conditions, mussels and clams usually close their shells. Either the mussel cannot feed or silt laden food is rejected as pseudofaeces and the animal starves.

In addition, suspended solids and turbidity may be toxic for invertebrate species and result in decreased abundance of invertebrate species, physiological changes, and decreased primary productivity and growth rate. Suspended sediments have been found to be acutely toxic to amphipods (Forbes 1987). Gammon (1970) found that suspended loads between 40-120 mg/L resulted in a 25% reduction in macroinvertebrate density; at a sediment load of more than 120 mg/L, macroinvertebrate density decreased by 60%.

The most harmful physiological effect of suspended solids on invertebrates is the clogging of their filter feeding apparatus and digestive organs. Other physiological impacts associated with increased suspended sediments include reduced fecundity and brood size, and retarded development of eggs and larvae (Appleby and Scarratt 1989; McKee and Wolf 1963). In addition, the study done by Lloyd (1985) showed that increases of suspended solid concentration from 5-25 mg/L and 25-10 mg/L may reduce the primary productivity of invertebrate species by 3-13% and 13-50%, respectively. Growth rates are often delayed or reduced in many organisms, likely as a result of reduced feeding activity as well as diminished food value (Appleby and Scarratt 1989; Kirk 1992; Paffenhofer 1972).

Impacts on Fish: Generally, tolerance to suspended sediments varies considerably between fish species, depending on the particle sizes and types, and water quality parameters. For example, larger particles having greater angularity have generally been found to be more lethal than smaller and smoother particles (Applied by and Scarratt 1989; Newcombe 1994).

An increase of suspended sediments in aquatic ecosystem might affect several fish species or cause changes in behavior (movement and avoidance), feeding impairment, physiological changes, or decreased growth rates and production/abundance. There are many studies that show these effects. For example, McLeay et al. (1984) found that Arctic grayling were displaced at suspended sediment concentrations of 300 mg/L or greater. Moreover, the increase of suspended solids in water might reduce the feeding activities of fish. Reduced light penetration affects sight feeding fish by reducing efficiency of prey location. Turbidity can reduce the feeding ability of predatory fish even under abundant food conditions. Gardner (1981) reported the turbidity from suspended clay particles (0.5-4 microns) significantly reduced the feeding rate of bluegills on *Daphnia*. Gregory and Northcote (1993) reported that a reduction in feeding activity of juvenile Coho salmon was noted at suspended sediment concentrations of 300 mg/L. In addition, it was found that concentrations at which reduced growth rates have been documented range from 50 mg/L to 130 mg/L (Buck, 1956).

As mentioned above, silt and clay particles can cause effects on marine biota. Therefore, the discharge of mud and cutting from the drilling activities, especially small particles (less than 62 micron) might affect invertebrate, larvae, and fish.

The receptor sensitivity of impacts associated with mud and cuttings discharge on seawater turbidity is considered low. Therefore, the impact of increased seawater turbidity on marine biota is rated as low, local in extent, short term duration, and of low magnitude.

Therefore, the significance of impacts caused by the release of mud and cuttings on marine biota is rated as low.

Table 6-40: Significance Ranking Of Impacts from Mud and Cuttings on Marine Biota

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.4.5.4 Assessment of Impacts from Mud and Cuttings on Benthos

Mud and cutting discharge into the sea can increase sediment accumulation, and lead to contamination of heavy metal and hydrocarbon in sediment. This can affect benthos communities indirectly as detailed below:

- Mud and cutting discharges can cause changes in the physical characteristics of seabed sediment, both sediment structure and particle size distribution, and affect the habitat of benthos; however, this will occur in a limit area.
- Mud and cuttings discharges can decrease oxygen in seabed sediment that lead to anaerobic conditions due to the increase of organic substances and anaerobic microorganisms in cutting piles.
- Mud and cuttings discharges may affect benthos due to physical and chemical stress; for example, respiration processes will be obstructed or benthos may be exposed to potentially toxic mud and cuttings.

The results of many researchers indicate that the impact on the benthos community caused by mud and cutting discharge is of a different severity level depending upon many factors, such as the amount of deposition of cuttings on the seabed and oceanography during discharge, and characteristics of discharged material (OGP, 2003).

A study of environmental effects, monitoring data, and literature review indicate that benthic organisms are commonly affected by drilling discharges through changes in diversity and abundance, most common within 50 to 500 m of the drilling area. Cuttings piles could smother benthic organisms within 100 m of the drilling area, although no quantification of the effect could be found. Mobile species are likely to avoid the area (Hurley and Ellis, 2004)[6].

Extensive studies at production platforms in the Gulf of Mexico indicate that effects on benthic invertebrates were confined to within 100 to 200 m. The effects in the Gulf of Mexico were a combination of toxic effects from elevated metal concentrations and organic enrichment caused by deposition of mud and cuttings during drilling and produced water discharge (Peterson et al., 1996)[7].

A search for effect data for smothering or burial resulted in a dataset containing 39 effect values for 32 species (24 molluscs, five crustaceans, and three polychaetes). For burial the 50 and 5% hazardous levels were determined at 5.4 (3.7–7.9) and 0.63 (0.31–1.06) cm, respectively (median and 5–95% confidence interval). Effect data were based on instantaneous and complete burial, while for drilling discharges the formation of the burying layer is a slow process. Normally, non-sessile species are slowly covered by drilling discharges and have time to escape burial and move upwards at a rate equal to the deposition rate (Smit et al. 2008)[6]. The proposed wells in the Blocks M12, 13 & 14 are drilled over a period of about 35 days a well. This will allow marine biota to escape.

Recolonisation of benthic communities can be extremely rapid. Studies have shown maximum abundance, total biomass, diversity of benthic organisms after 20 to 24 weeks and the same quantity as background after 4 to 8 months (Diaz-Castaneda et al., 1989)[8].

Most of the drilling mud chemicals are classified as non-toxic to aquatic biota, and the concentration in the Low Toxicity Water-Based Mud is below the toxic levels and would therefore not impact zooplankton. According to a study by Neff (1987)[3], water column organisms will never be exposed to drilling mud for long enough or at sufficiently high concentrations to cause acute or sub-lethal responses.

As a result the impacts of mud and cuttings on marine benthos is considered local in extent, short term in duration and of low magnitude. Receptor sensitivity is considered to be low.

Therefore, the significance of impacts caused by a release of drilling mud and cuttings on marine Benthos is rated as low.

Table 6-41: Significance Ranking Of Impacts from Mud and Cuttings on Marine Benthos

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High

6 Hurley G. and J. Ellis. 2004. Environmental effects of exploratory drilling offshore Canada: Environmental effects monitoring. Data and literature review – Final report. Prepared for: The Canadian Environmental Assessment Agency, Regulatory Advisory Committee (RAC)

7 Peterson, C.H., M.H. Kennicutt II, R.H. Green, P. Montagna, D.E. Harper, Jr., E.N. Powell, and P.F. Roscigno. (1996). Can. J. Fish. Aquat. Sci. (53):2637-2654.

8 Diaz-Castaneda, V., Richard, A. & Frontier, S. (1989). Preliminary results on colonization, recovery and succession in a polluted areas of the southern North Sea (Dunkerque's Harbour, France). Scientia Marina, 53, 705-716. [http://www.marlin.ac.uk/bio_pages/Bio_DetEco_CMS.AbrNucCor.htm]

Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.4.5.5 Assessment of Impacts from Mud and Cuttings on Sensitive Ecosystems

As mentioned previously, the significance of impacts caused by a release of drilling mud and cuttings on seawater (**Section 6.4.3.6)** and marine biota was rated as low.

Consequently, the impact on endangered species is negligible.

Therefore, the significance of impacts caused by a release of drilling mud and cuttings on sensitive ecosystem is rated as negligible.

Toxicity of Mud and Cuttings from Drilling

WBM is a drilling mud type widely determined by the petroleum developing industry and environmental regulatory organizations to have little to no toxicity, with no need to be treated by special methods. This conclusion is also accepted by UNEP, who thoroughly studied the environmental impact caused by WBM discharge (UNEP, 1985 and GESAMP, 1993). The analysis result of WBM toxicity indicated the component is of low toxicity and heavy metals in the mud are poorly absorbed by biota (Hurley and Ellis, 2004; Neff, 2005; Andrew et al., 2006). The main component of WBM consist of 75% seawater, 15% barite, 7% bentonite and 3% other materials.

The impacts of mud and cuttings discharge is ranked as: low in magnitude, local in extent and of short term duration. Receptor Sensitivity is ranked as low. Therefore, the significance of impacts from mud and cuttings discharge on sensitive marine ecosystems is rated as low.

Table 6-42: Significance Ranking Of Impacts from Mud and Cuttings on Sensitive Ecosystems

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

The mitigation measures to minimize the impact on marine biota and sensitive ecosystem during drilling phase are similar to the measures for seawater and sediment quality.

Residual Significance

With these management measures, the extent and magnitude of impacts from Mud and Cuttings on sensitive marine ecosystems will be reduced resulting in a residual significance ranked that is negligible.

Residual Significance	Positive	Negligible	Low	Medium	High

6.5 Environmental Impact Assessment during Well Testing Phase

From the screening process the following must be assessed to determine their impacts during the well testing phase:

- Air Quality
- Sea Water Quality
- Sediment Quality
- Biological Resources

6.5.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Air Quality/GHG	Well Testing Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Energy Use Flaring	Deterioration from fuel combustion/GHG Emissions

6.5.2 Assessment of Impacts from Air Quality and Climate

Air emissions from the Blocks M12, 13 & 14 Exploration Drilling Project activities during the testing phase will be primarily generated from fugitive emission, transportation, fuel combustion, and flaring.

6.5.2.1 Assessment of Impacts from Air Pollutants

Major sources of air pollution emission are combustion from the rig generators and combustion from the flaring system. Air pollutants generated from diesel oil combustion for the rig and from the well fluid flaring system on the rig will consist of carbon monoxide, nitrogen dioxide, and sulphur dioxide. Based on compilation of air pollution emission factors established by the U.S. Environmental Protection Agency (EPA), estimated quantities of carbon monoxide, nitrogen dioxide, sulphur dioxide are shown in **Table 6-43**. The total emission values are a worst case scenario: a maximum of three exploration wells will be tested over 30 days of testing operations (10 days/well).

- *Combustion from diesel generators*: Diesel generators will be used as a source of power supply for the power plant on the rig. Estimated fuel consumption for the rig power plant amounts to 11,130 L/day, or 11.13 m^3/day. Estimated quantities of air pollutants emitted from fuel use are presented in **Table 6-43.**
- *Combustion from flaring*: The total estimated gas generated will be approximately 50,000 standard cubic feet per day. The excess gases will be flared off at the flare boom. Estimated quantities of air pollutants emitted from flaring are presented in **Table 6-43.**

Table 6-43: Estimated Total Air Pollutant Emissions for Well Testing Phase

Air Pollutants – Fuel Use	Emission Factor (kg/TJ)	Emission of Air Pollutant	Total Emission (tonnes)

		(tonne/day)	
Diesel Generators on the Rig (11,130 L/day) – 30 days of testing (10 days/well)			
Nitrogen Oxides (NO_x)	1,896	0.768	23.04
Sulphur Oxides (SO_x)	126	0.051	1.53
Carbon Monoxide (CO)	410	0.166	4.98
Air Pollutants – Excess Gas Flaring	**Emission Factor (lb/10^6 Btu)**	**Emission of Air Pollutant (lb/day)**	**Total Emission (tonnes)**
50,000 scf/day, 5 x 10^7 BTU/day for 3 wells (30 days of testing)			
Carbon Monoxide (CO)	0.37	18.5	0.25
Total Hydrocarbons	0.14	7	0.10
Nitrogen Oxides (NO_x)	0.068	3.4	0.05

Sources: US.EPA, "Compilation of Air Pollution Emission Factors, Volume 1, Stationary Point and Area Sources", Fifth Edition, January 1995; http://www.epa.gov/ttn/chief/ap42/ch03/bgdocs/b03s03.pdf.
Note: Density of diesel oil is 0.8397 kg/L for calculation, IEA (2004), Densities of Oil Product, Energy Statics Working Group Meeting; Net Calorific Values is 43.33 TJ/Gg for calculation, IEA (2009), CO_2 Emission From Fuel Combustion, Documentation For Beyond 2020 Files
1scf natural gas is approximately equivalent to 1,000 BTU
1 tonne = 2,204.62 lbs

6.5.2.2 Assessment of Impacts from Greenhouse Gases (GHG)

Combustion products from fuel use are the same whether the fuel is used for drilling, well testing or transportation. Regular maintenance of the power generators and equipment will be conducted to minimize fuel use and emissions. The main impact from these emissions is the emission of greenhouse gases and their contribution to climate change.

GHG emissions from diesel generators and mobile combustion (transportation) are estimated following the Tier 1 approach of IPCC (2006) for stationary combustion and mobile combustion. GHG emissions are estimated using emission factors and global warming potentials for the three main greenhouse gases (CO_2, CH_4 and N_2O).

Power Generation on Drilling Rig

Estimated fuel consumption for the rig power plant amounts to 11,130 L/day, or 11.13 m^3/day. Greenhouse gases emission in term of CO_2 equivalent is estimated according to **Equation 6-1**, where the emission factor for stationary combustion is 74,346.6 kg CO_2 eq/TJ, from **Table 6-12**, and the fuel consumption is 11,130 L/day (0.405 TJ/day, calculated using **Equation 6-2**). This results in CO_2 emission of 30.11 tonnes CO_2 eq/day. For a maximum of 30 days of testing operations (10 days/well), the total emission of greenhouse gases is therefore estimated to be 903.3 tonnes.

Marine Transportation

PCML will have two primary towing/supply vessels, as well as one additional shared vessel for this exploration drilling program, which each consume diesel oil at approximately 20 tonnes/day. Consequently, maximum daily fuel consumption rate of the support vessels will be at 23,818 L/day each, totaling to 71,454 L/day.

GHG emissions from boat transportation are estimated following the Tier 1 approach of the IPCC guideline (**Equation 6-1**, for mobile combustion), with an emission factor of 74,853 kg CO_2 eq/TJ (from **Table 6-13**) and fuel consumption of 71,454 L/day (2.60 TJ/day, estimated using **Equation 6-2**). This results in CO_2 emission of 194.6 tonne/day. For 30 days of testing operations (10 days/well), the total emission of greenhouse gases is therefore estimated to be 5,838.0 tonnes.

Flaring

The estimated gas generated will be less than 0.05 million standard cubic feet per day. Estimated quantities of air pollutants emitted from flaring are estimated from **Equation 6-3** as follows:

Excess Gas Flaring – GHG emissions from flaring are calculated using an emission factor of 0.00122 Gg CO_2 eq/1000m^3, from **Table 6-44**. Emissions are calculated based on volume of excess gases flared per day and the number of flaring days:

$$CO_2 Emissions\ (tonne\ CO_2) = gas\ produced\ (scf)\ x\ (2.8317\ x10^{-2})\ (m^3/scf)\ x\ (1.22x10^{-3})\ (tonne\ CO_2/m^3) = gas\ produced\ (scf)\ x\ (3.45x10^{-5})\ (tonne\ CO_2/scf)$$

Equation 6-3

Table 6-44: Emission Factor for Fugitive Emissions (Flaring) for Oil Gas

Types	Unit	CH_4	N_2O	CO_2	Total
All types of gas	Gg/1,000 m^3	7.6 x 10^{-7}	2.1 x 10^{-8}	1.2 x 10^{-3}	
	Gg CO_2 eq/1,000 m^3 (or tonne/m^3) Heavy oil production*	1.75 x 10^{-5}	6.22 x 10^{-6}	1.2 x 10^{-3}	1.22 x 10^{-3}

Source: IPCC (2006)
* Global warming potentials (100 year time horizon): CO_2 = 1; CH_4 = 23; N_2O = 296

As a worst case of testing three exploration wells, the well testing will be carried out over 30 days (10 days/well). GHG emissions from flaring during well testing are estimated by the amount of excess gases to be flared (less than 0.05 mmscf/day) and an emission coefficient is 0.0000345 tCO_2 eq/scf. Using **Equation 6-3**:

Total CO_2 released = 0.05 x 10^6 scf/day x 30 days x 0.0000345 tCO_2 eq/mscf

= 51.8 tonnes eq CO_2

The total release of CO_2 during the testing phase is estimated to be 6793.1 ton of CO_2 eq, as shown in **Table 6-45**. When compared with available data on Myanmar's national CO_2 equivalent GHG emissions of 184,710,000 tonnes in 2012, including land use change (World Resources Institute, Climate Analysis Indicators Tool (CAIT)), the GHG emissions arising from the proposed activities are insignificant (approximately 0.0037 %), and therefore will not significantly impact the environment.

Table 6-45: Estimated Total GHG Emissions for Testing Phase

Project Phase	Activity	One Time CO_2 Release (ton CO_2)
Testing (30 days)	Power generation on rig	903.3
	Boat transportation	5,838.0
	Flaring - Gas	51.8
	Total	6793.1

The testing phase will end within a short period of time (about 10 days/well or 30 days for a maximum of three wells to be tested). In addition, these air pollutants are emitted to the atmosphere in small quantities. As a result, these pollutants will be rapidly dispersed and diluted in the atmosphere. Therefore, impacts on air quality during the drilling phase are expected to be of low magnitude, local in extent, and short-term in duration.

The project area is located in an open area in the sea is not located near any sensitive area (at least 68 NM away from the Thanintharyi Coastal zone and 85 NM away from Moscos Islands). The receptor sensitivity is considered low.

Without mitigation measures, the impact on air quality from flaring during and energy use during the well testing phase is rated as low.

Table 6-46: Significance Ranking Of Impacts from Flaring and Energy Use on Air Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts on air quality from flaring and energy use during the testing phase can be mitigated as follows:

- Strictly follow manuals of equipment and machinery used for operations
- Routine inspection and preventive maintenance as per maintenance schedule/recommended by manufacturers to ensure efficiency of combustion
- Control or properly manage fuel usage
- Set up appropriate well testing schedule to minimize time

Residual Significance

With these management measures, the extent and magnitude of impacts from Flaring and Energy Use on Air Quality will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.5.3 Assessment of Impacts on Seawater

6.5.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Seawater Quality	Well Testing Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Wastewater Disposal Non-Hazardous and Hazardous Waste Handling and Storage	Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)

During the testing phase, seawater can be affected by fuel storage and handling, hazardous materials, hazardous and non-hazardous waste, and wastewater. Potential impacts during testing phase will be similar to those during drilling phase (**Sections 6.4.3**); significance of the impacts during testing will be similar to those during drilling. The mitigation measures proposed for the impacts during drilling can be applied to the impacts during well testing.

6.5.3.2 Assessment of Impacts to Seawater from Fuel Storage and Handling, Hazardous Materials, and Waste Management

Wastes generated during well testing, including hazardous and non-hazardous wastes, and wastewater, are expected to be the same as those generated during drilling. However, testing wastes will be also generated from activities during the testing phase, which will consist of crude oil, and excess gas. These testing wastes require proper management to prevent an accidental spill as it could cause deterioration in water quality. A crude oil spill can increase concentration of BOD in seawater, decrease dissolved oxygen (DO) in the seawater, and subsequently could adversely affect marine biota inhabiting the environment. However, it is unlikely that a crude oil spill with a large quantity would occur during well testing.

Impacts on seawater quality from fuel storage and handling, hazardous, material, and hazardous wastes are expected to be medium in magnitude, local in extent, short term in duration. The Receptor sensitivity is considered low.

Without mitigation measures, the significance of impacts resulting from fuel storage and handling, hazardous material, and hazardous waste on seawater and seabed sediments quality is rated as medium.

Table 6-47: Significance Ranking Of Impacts From Fuel Storage And Handling, Hazardous, Material, And Hazardous Wastes On Seawater Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts on seawater and seabed sediments quality can be mitigated by the following mitigation measures:

- Each vessel greater than 400 gross tons will comply with all fuel storage, waste treatment and disposal regulations/procedures (MARPOL73/78, PCML and contractor procedures)
- Provide appropriate lights and warning signals on all vessels to prevent accidental collision. Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety.
- Conduct Table Top Oil Spill Response for Tier 3 event
- Regularly monitor safety zone within 500 m-radius surrounding drilling rig to prevent any accidents
- Implement Hazardous Materials Management Tracking System and manifests for transport
- Conduct drills according to Emergency Response Plan and Tropical Storm Emergency Plan
- Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety

- The drilling rig shall be equipped with bund wall to prevent oil and chemical spills. Any spilled oil and chemicals will be collected into a sealed container. Support vessels will divert contaminated water from different parts of ship to treatment before drainage to the sea.
- Separate each category of non-degradable and hazardous waste into appropriate containers. Label and transfer these containers for further disposal.
- Store, separate, transport and dispose of waste using appropriate procedures and disposal facilities.

Residual Significance

With these management measures, the extent and magnitude of impacts from fuel storage and handling, hazardous material, and hazardous waste on seawater quality will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.5.3.3 Assessment of Impacts from Non-Hazardous Waste Management on Seawater Quality

Non-hazardous wastes produced during the testing phase of the Blocks M12, 13 & 14 Exploration Drilling project are expected to be same as those generated during the drilling phase which include food waste, paper, plastic and scrap wood and metals.

It is estimated that over 30 days of the testing phase, the total amount of non-hazardous waste would be approximately 4 – 5 tonnes (4-5 ton/month). The non hazardous waste will be segregated by type, clearly labelled, and then properly disposed of onshore. Food waste from kitchens and canteens will be kept separate from non-food waste. Food waste will be shreded into small pieces and then discharged into seawater to feed marine animals at the distance of greater than 12 nautical miles (22.2 km) from shoreline according to MARPOL 73/78 Annex 5.

Based on PCML's non-hazardous waste management procedures outlined above, the potential impacts from non-hazardous waste on seawater quality are of medium magnitude, short-term duration, local in extent, and require a short-term recovery period. The resource sensitivity is considered low.

Without mitigation measures, the significance of non-hazardous waste impacts is rated as medium.

Table 6-48: Significance Ranking Of Impacts From Non-Hazardous Waste On Seawater Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

PCML will implement mitigation measures to minimize impacts associated with non hazardous waste during, as outlined below;

- Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety
- Store, separate, transport and dispose of waste using appropriate procedures and disposal facilities.
- Food waste must be shredded to smaller than 25 mm before discharge to sea.

Residual Significance

With these management measures, the extent and magnitude of impacts from Non-Hazardous Waste On Seawater Quality will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.5.3.4 Assessment of Impacts from Wastewater on Seawater Quality

Wastewater management will be carried out as per MARPOL requirements. As with the other phases, wastewater which would be generated during the drilling phase are bilge and drainage contaminated with oil wastes, and domestic wastewater. The impacts from wastewater discharge on seawater during the testing phase are expected to be similar to those during the other phases. Impacts from wastewater discharge are discussed in **Section 6.3.2** (impacts from wastewater discharge on seawater quality during the installation phase).

Therefore, the potential impacts from wastewater releases on seawater quality during the testing phase are expected to be of medium magnitude, short-term duration, local in extent, and require a short-term recovery period, while the receptor sensitivity is considered low.

Therefore the significance of the impacts associated with wastewater discharge on seawater quality during the testing phase is rated as medium.

Table 6-49: Significance Ranking Of Impacts From Wastewater Discharge On Seawater Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

PCML will implement the same mitigation measures as listed for impacts on seawater during the installation phase (**Section 6.3.2**) to minimize impacts associated with wastewater discharge during testing phase.

Residual Significance

With these management measures, the extent and magnitude of impacts from Wastewater Discharge On Seawater Quality will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.5.4 Assessment of Impacts on Seabed Sediment Quality

6.5.4.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Seabed Sediment Quality	Well Testing Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage	Potential contamination from spills

During the testing phase, seabed sediments can be affected by fuel storage and handling, hazardous materials, hazardous and non-hazardous waste, and wastewater. Potential impacts during testing phase will be similar to those during drilling phase (**Sections 6.4.4**); significance of the impacts during testing will be similar to those during drilling. The mitigation measures proposed for the impacts during drilling can be applied to the impacts during well testing.

6.5.4.2 Assessment of Impacts on Sediment from Fuel Storage and Handling, Hazardous Materials, and Waste Management

Wastes generated during well testing, including hazardous and non-hazardous wastes, and wastewater, are expected to be the same as those generated during drilling. However, testing wastes will be also generated from activities during the testing phase, which will consist of crude oil, and excess gas. These testing wastes require proper management to prevent an accidental spill as it could cause deterioration in water and sediment quality. A crude oil spill can increase concentration of BOD in seawater, decrease dissolved oxygen (DO) in the seawater, and subsequently could adversely affect seafloor sediments and marine biota inhabiting the environment. However, it is unlikely that a crude oil spill with a large quantity would occur during well testing.

Impacts on seabed sediments quality from fuel storage and handling, hazardous, material, and hazardous wastes are expected to be low in magnitude for an offshore spill, local in extent, short term in duration. The Receptor sensitivity is considered low.

Without mitigation measures, the significance of impacts resulting from fuel storage and handling, hazardous material, and hazardous waste seabed sediments quality is rated as low.

Table 6-50: Significance Ranking Of Impacts From Fuel Storage And Handling, Hazardous, Material, And Hazardous Wastes On Seabed Sediments Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts on seawater and seabed sediments quality can be mitigated by the following mitigation measures:

- Each vessel greater than 400 gross tons will comply with all fuel storage, waste treatment and disposal regulations/procedures (MARPOL73/78, PCML and contractor procedures)
- Provide appropriate lights and warning signals on all vessels to prevent accidental collision. Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety.
- Conduct Table Top Oil Spill Response for Tier 3 event
- Regularly monitor safety zone within 500 m-radius surrounding drilling rig to prevent any accidents
- Implement Hazardous Materials Management Tracking System and manifests for transport
- Conduct drills according to Emergency Response Plan and Tropical Storm Emergency Plan
- Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety
- The drilling rig shall be equipped with bund wall to prevent oil and chemical spills. Any spilled oil and chemicals will be collected into a sealed container. Support vessels will divert contaminated water from different parts of ship to treatment before drainage to the sea.
- Separate each category of non-degradable and hazardous waste into appropriate containers. Label and transfer these containers for further disposal.
- Store, separate, transport and dispose of waste using appropriate procedures and disposal facilities.

Residual Significance

With these management measures, the extent and magnitude of impacts from fuel storage and handling, hazardous material, and hazardous waste on sediment quality will be reduced resulting in a residual significance ranked that is **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.5.5 Assessment of Impacts on Biological Resources

6.5.5.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Marine Biota Endangered Species Sensitive/Protected Areas	Well Testing Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Wastewater Disposal Hazardous Materials Handling and Storage Presence of Equipment and	Potential deterioration of seawater quality from spills, leakages and discharges could affect the marine ecosystem

		Facilities	

6.5.5.2 Assessment of Impacts of Waste Oil, and Wastewater on Marine Biota

There are three main phases in well testing: Well Cleanup, Stimulation, and Build-up test or Drawdown test. During the well testing phase, marine biota can be affected by waste oil, and wastewater. In addition, the well test area will have waste oil drip and catchment containers available around any sampling points.

Therefore an impact regarding well testing phase is expected to be of low magnitude, local in extent, short-term in duration; and receptor sensitivity is considered low.

Therefore, the significance of impacts from Waste Oil, and Wastewater during well testing phase on marine biota is rated as low.

Table 6-51: Significance Ranking Of Impacts From Waste Oil and wastewater On Marine Biota

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

6.5.5.3 Assessment of Impacts from Flaring on Marine Animals

The function of the flaring system is to flare the excess gas separated from the separator. The flare gas may affect marine animals and seabirds. The closest bird habitats are the coastal areas on the Thanintharyi Region shoreline. However, the wells are located at least 68 NM away from the Thanintharyi Coastal zone and 85 NM away from Moscos Islands that are the closest bird habitats. Seabirds flying in the area may also be affected by light and smoke.

Flaring impacts on marine animals and seabirds is considered to be local in extent, of low magnitude and short term in duration. Receptor sensitivity is considered to be low.

Therefore, the significance of impacts from well testing phase on marine animals and birds is rated as low.

Table 6-52: Significance Ranking Of Impacts From Flaring On Marine Animals and Seabirds

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High

Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts on marine animals can be mitigated by the following mitigation measures:

- Flaring operations will be continually monitored for excessive smoke. If any environmental concerns arise then the well will be shut in.

Residual Significance

With these management measures, the extent and magnitude of impacts from flaring on marine animals and seabirds will be reduced resulting in a residual significance ranked that is **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6 Environmental Impact Assessment During Well Abandonment Phase

From the screening process the following must be assessed to determine their impacts during the well abandonment phase:

- Air Quality
- Sea Water Quality
- Sediment Quality
- Biological Resources

6.6.1 Assessment of Impacts on Air Quality and Climate

6.6.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Air Quality/Climate	Abandonment Phase	Crew/Materials Transport Offshore Fuel Storage & Handling Energy Use	Deterioration from fuel combustion/GHG Emissions

6.6.1.2 Assessment of Impacts on Air Quality and Climate

Impacts on air quality during the abandonment phase are expected to be similar to those during the installation phase. Therefore, the significance and the Receptor Sensitivity of the impacts during the well abandonment phase will be technically identical to those during the installation phase. Also, the same mitigation measures should be applied to the impacts during the well abandonment phase.

Magnitude of impacts is low, extent is local and duration is short term. Receptor sensitivity is considered to be low.

Therefore without mitigation measures, the impact on air quality from energy use during the well abandonment phase is rated as low.

Table 6-53: Significance Ranking Of Impacts From Energy Use On Air Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts on air quality from energy use during the well abandonment phase can be mitigated as follows:

- Routine inspection and preventive maintenance as per maintenance schedule/ recommended by manufacturers to ensure efficiency of combustion
- Set up appropriate drilling rig demobilization schedule to minimize demob time

Residual Significance

With these management measures, the extent and magnitude of impacts from energy on air quality will be reduced resulting in a residual significance ranked that is **negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6.2 Assessment of Impacts on Seawater Quality

6.6.2.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Seawater Quality	Abandonment Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Wastewater Disposal Non-Hazardous and Hazardous Waste Handling and Storage	Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)

6.6.2.2 Assessment of Impacts on Seawater Quality from Well Abandonment and Rig Demobilization

At time of abandonment, piping used for drill string would be cut at below mud level after the well has been plugged with cement. The supporting anchors of the drilling rig will be retracted back. Sediment disturbance would be only in the areas where the anchors were located. Removal of drilling facilities and structures can re-suspend sediments, leading to deterioration of seawater quality. These potential impacts are similar to those discussed for installation of the drilling rig (**Section 6.3.2)** which

were rated of low significance. The significance of environmental impacts caused by drilling rig demobilization is also rated as low.

Therefore impacts caused by decommissioning are expected to be of medium magnitude, local in extent, short-term in duration; and receptor sensitivity is considered low.

Without mitigation measures, the significance of impacts associated with well abandonment and rig demobilization on seawater quality is rated as medium.

Table 6-54: Significance Ranking Of Impacts From Well Abandonment and Rig Demobilization on Seawater

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts on seawater from rig decommissioning can be mitigated as follows:

- Use rig decommissioning method that minimizes sediment dispersion

Residual Significance

With these management measures, the extent and magnitude of impacts from well abandonment and rig demobilization on seawater quality will be reduced resulting in a residual significance ranked that is **low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6.2.3 Assessment of Impacts on Seawater Quality from Fuel, Hazardous Materials, and Hazardous Waste Handling, and Accidental Spills

Impacts associated with fuel, hazardous materials, and hazardous waste handling, and accidental spills during well abandonment phase are similar to those during the installation phase that was described in **Section 6.3.2.**

Therefore impacts regarding fuel, hazardous materials, and hazardous waste handling, and accidental spills are expected to be of low-medium magnitude for offshore spills and medium for nearshore spills, local in extent, short term in duration; and receptor sensitivity is considered low for offshore spills and medium for nearshore spills.

Without mitigation measures, impacts from fuel, hazardous materials, and hazardous handling, and accidental spills on Seawater Quality are rated as low-medium for offshore spills and medium for nearshore spills.

Table 6-55: Significance Ranking Of Impacts From Fuel, Hazardous Materials, and Hazardous Waste Handling, and Accidental Spills on Seawater Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High

Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Mitigation measures for impacts regarding fuel, hazardous materials, and hazardous waste handling, and accidental spills during installation phase on seawater quality (**Section 6.3.2**) can be applied to those during the well abandonment phase and should further include:

- Use the appropriate well Plug & Abandonment method in order to prevent the leakage of petroleum hydrocarbons and other compounds from well

Residual Significance

With these management measures, the extent and magnitude of impacts from Fuel, Hazardous Materials, and Hazardous Waste Handling, and Accidental Spills on seawater quality will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6.2.4 Assessment of Impacts on Seawater Quality from Non-Hazardous Waste

Impacts associated with non-hazardous waste handling during the well abandonment phase are similar to those during the drilling phase, for which detailed assessments were provided in **Section 6.3.2.**

Therefore, the significance of the impacts associated with non-hazardous waste handling on seawater quality during the well abandonment phase will be technically identical to those during the drilling phase.

Impacts are of medium magnitude, local in extent, of short term duration; receptor sensitivity is low.

Therefore without mitigation measures, during the well abandonment phase the significance of impacts associated with non-hazardous waste handling on seawater quality is rated as medium.

Table 6-56: Significance Ranking Of Impacts From Non-hazardous Waste on Seawater Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Also, the mitigation measures proposed for the impacts during the drilling phase should be applied to the impacts during the well abandonment phase.

Residual Significance

With these management measures, the extent and magnitude of impacts from non-hazardous waste on seawater quality will be reduced resulting in a residual significance ranked that is **low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6.2.5 Assessment of Impacts on Seawater Quality from Wastewater

Impacts associated with wastewater discharge during well abandonment phase are similar to those during preparation and installation, for which detailed assessments were provided in **Section 6.3.2**.

Therefore, impacts from wastewater discharge on seawater quality during the well abandonment phase are expected to be of medium magnitude, local in extent, short-term in duration; Receptor Sensitivity is considered low.

Therefor without mitigation measures, the significance of impacts associated with wastewater discharge on seawater quality is rated as medium.

Table 6-57: Significance Ranking Of Impacts From Wastewater on Seawater Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Mitigation of the impacts regarding wastewater discharge on seawater quality during installation phase can be applied to those during well abandonment.

Residual Significance

With these management measures, the extent and magnitude of impacts from wastewater on seawater quality will be reduced resulting in a residual significance ranked that is **low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6.3 Assessment of Impacts on Seabed Sediment Quality

6.6.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Sediment Quality	Abandonment Phase	Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Rig Decommissioning	Potential contamination from spills

During well abandonment phase seabed sediment characteristics and quality can be affected by:

- Well abandonment and rig demobilization
- Fuel, hazardous materials, and hazardous and non-hazardous waste handling
- Accidental spills

6.6.3.2 Assessment of Impacts on Sediment from Well Abandonment and Rig Demobilization

Well abandonment and rig demobilization could potentially result in impacts on sediment characteristics. Impacts associated with rig demobilization during well abandonment phase are similar to those during the installation phase; detailed assessments were provided in **Section 6.3.3**.

Therefore impacts regarding well abandonment and rig demobilization are expected to be of low magnitude, local in extend, short-term in duration; Receptor Sensitivity is considered low.

Without mitigation measures, the significance of impacts associated with well abandonment and rig demobilization on seabed sediment and quality is rated as low.

Table 6-58: Significance Ranking Of Impacts From Well Abandonment and Rig Demobilization on Seabed Sediment Characteristics and Quality

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts on seabed sediments from rig demobilization can be mitigated as follows:

- Use rig demobilization method that cause less sediment dispersion
- Cut well casing below the sea floor level
- All offshore installation will be removed from the project area

Residual Significance

With these management measures, the extent and magnitude of impacts from Well Abandonment and Rig Demobilization on Seabed Sediment Characteristics and Quality will be reduced resulting in a residual significance ranked that is **negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6.3.3 Assessment of Impacts on Sediment from Fuel, Hazardous Materials, Waste Management, and Accidental Spills

Impacts associated with fuel, hazardous materials, and hazardous waste handling, and accidental spills on seabed sediments quality during the well abandonment phase are expected to be similar to those for installation (**Section 6.3.3**).

Therefore impacts regarding fuel, hazardous materials, and hazardous and non-hazardous waste handling, and accidental spills are expected to be of low magnitude, local in extend, short term in duration; and Receptor Sensitivity is considered low for offshore spills and medium for nearshore spills.

Without mitigation measures, the significance of impacts from Fuel, Hazardous Materials, Waste Management, and Accidental Spills on seabed sediments characteristics and quality is rated as low-medium for offshore spills and medium for nearshore spills.

Table 6-59: Significance Ranking Of Impacts on Sediment From Fuel, Hazardous Materials, and Hazardous Waste Handling, and Accidental Spills

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Mitigation measures for impacts regarding fuel, hazardous materials, and hazardous waste handling, and accidental spills during the installation phase on sediment quality (**Section 6.3.3**) can be applied to impacts on seabed sediments quality during well abandonment. PCML has established the Oil Spill Response Plan to mitigate potential impacts and to reduce risks of an oil spill incident.

Residual Significance

With these management measures, the extent and magnitude of impacts from *Fuel, Hazardous Materials, Waste Management, and Accidental Spills on seabed sediments characteristics and quality* will be reduced resulting in a residual significance ranked that is **negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.6.4 Assessment of Impacts on Biological Resources

6.6.4.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Marine Biota	Abandonment Phase	Crew/Materials Transport Offshore Fuel Storage	Potential deterioration of seawater quality from spills, leakages and discharges could affect the marine

Endangered Species Sensitive/Protected Areas		& Handling Wastewater Disposal Hazardous Materials Handling and Storage Presence of Equipment and Facilities Rig Decommissioning	ecosystem

6.6.4.2 Assessment of Impacts on Marine Biota

The effects on marine biota and sensitive ecosystem in abandonment phase are similar to those discussed during the installation phase.

Sediment disturbance would be only in the small areas where the anchors are placed. The sediment disturbance would increase suspended solids in the area, potentially affecting pelagic marine biota.

Rig abandonment is likely to cause an increase of suspended solids and turbidity; consequently, the activities could affect the spawning areas of marine organisms, if present. However, because the period of rig placement and removal is short (approximately 1 day each) and the rig covers only a small area relative to the entire spawning area, the impacts on spawning area are considered low.

During well abandonment, piping used for the drill string would be cut at below mud level after the well has been plugged with cement. The supporting anchors of the drilling rig will be retracted back. The potential impacts for abandonment are similar to those discussed for installation of the drilling rig, which were rated of low significance. The significance of environmental impacts caused by drilling rig demobilization is also rated as low.

The potential environmental impacts caused by rig replacement and abandonment of the Blocks M12, 13 & 14 exploration drilling project are considered to be of low magnitude, short-term duration, and local in extent. Receptor sensitivity is considered to be low.

Therefore, the significance of impacts from rig decommissioning on marine biota is rated as low.

Table 6-60: Significance Ranking Of Impacts From Rig Decommissioning on Marine Biota

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

The mitigation measures to minimize the impact on marine biota and sensitive ecosystem during abandonment phase are similar to the measures on seawater and sediment quality.

Residual Significance

With these management measures, the extent and magnitude of impacts from Rig Decommissioning on Marine Biota will be reduced resulting in a residual significance ranked that is **Negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7 Social Impact Assessment During Installation Phase

The social impact assessment considers the activities of exploration drilling. The activities during the installation phase before drilling consist of: (1) Communicating the project description information to relevant organizations, affected people or stakeholders at least one month prior to the project start date; (2) Preparation and compensation prior to the drilling operation; (3) Rig mobilization and installation.

From the screening process the following must be assessed to determine their impacts during the installation phase:

- Fisheries
- Shipping
- Land Transportation
- Waste Management
- Socio-economy
- Submarine Cable & Gas Pipelines
- Historical/Archaeological

6.7.1 Assessment of Impacts to Fisheries

Activities during the installation phase might have negative impacts on fisheries due to damage of fishing equipment, loss of fishing areas, and accidents.

6.7.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Fishing	Installation Phase	Crew/Materials Transport Wastewater Disposal Presence of Equipment and Facilities Rig Placement	Removal of fishing equipment and other obstacles from the drilling area may cause damage to fishing equipment Loss of fishing area could directly affect the income of fishermen Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.

6.7.1.2 Assessment of Impacts to Fishing Equipment

During the installation phase, it is essential to remove fishing equipment and other obstacles from the drilling area. PCML will collect data on the number, coordinates, and the owners of fishing equipment in the expected drilling area from the relevant provincial fisheries associations.

The removal of fishing equipment and other obstacles from the drilling area may cause damage. Therefore, PCML will communicate equipment collection details and the project schedule to MOGE, who will inform fisheries associations in provinces near the project area where fishermen work. These organizations will then communicate the project schedule to fishermen, who will avoid the laying of new fishing equipment or remove the equipment from the project area. At least 1 month prior to

operations, PCML will confirm the location and size of all fishing equipment in the project area to prevent damage to the fishing equipment and to project property.

The impacts from the damage of fishing equipment will be local in extent, short-term in duration, and low magnitude. Receptor sensitivity is considered to be medium

Significance Evaluation

The significance of social impacts on damage of fishing equipment associated with the installation phase is rated as medium.

Table 6-61: Significance Ranking Of Social Impacts From Damage of Fishing Equipment.

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts from installation activities on fishing equipment can be mitigated through the use of the following measures:

- Inform MOGE regarding project activities at least 30 days month prior to commencement, so that MOGE can inform relevant fisheries associations
- Record the fishing equipment removed.
- If fishing equipment becomes damaged or must be removed, compensation will be made according to agreements with MOGE
- Implement PCML's Public Relations Plan and Grievance Mechanism.

Residual Significance

With these management measures, the extent and magnitude of social impacts from Damage of Fishing Equipment will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.1.3 Assessment of Impacts from Loss of Fishing Area

Loss of fishing area will directly affect the income of fishermen. However, fishermen can still fish by moving to other fishing areas outside the project area.

During the installation phase, seafloor survey and rig mobilization and installation will cause a decrease in the fishing area. Seafloor survey and rig installation will each cover an approximate area

of 1 km$^{2.}$ Therefore, the loss of fishing area from seafloor survey and rig mobilization and installation is 0.0002% of total area of the Andaman Sea (600,000 km^2).

The fishing areas located near Blocks M12, 13 & 14 are large compared to the project area. Therefore, the overall loss of fishing area due to the project is small.

The impacts on the loss of fishing area will be local in extent, short-term in duration, low magnitude. The receptor sensitivity is considered to be medium.

Significance Evaluation

The significance of social impacts from the loss of fishing area associated with the installation phase is rated as Medium.

Table 6-62: Significance Ranking to Fisheries From Loss of Fishing Area

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts from installation activities on loss of fishing area can be mitigated through the use of the following measures:

- 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 and Fisheries, and water police)
- Inform MOGE regarding project activities at least 30 days month prior to commencement, so that MOGE can inform relevant fisheries associations
- Implement PCML's Community Awareness Plan and Grievance Mechanism.

Residual Significance

With these management measures, the extent and magnitude of social impacts from Loss of Fishing Area will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.1.4 Assessment of Impacts to Fishing from Rig Placement and Crew/Materials Transport

Project activities may cause ship collisions or accidents that would potentially affect fishermen and project equipment. During the installation phase, seafloor survey and rig mobilization and installation activities could potentially result in collisions or accidents. During seafloor survey, the survey vessel will survey in and around the drilling area with a velocity of 3-5 knots. During rig mobilization and installation, tug boats will be used to mobilize the drilling rig to the well location at a velocity of 2-3

knots. The project area will also be patrolled by three support vessels during the entire installation, drilling, and demobilization period. The support vessels will survey a 500-m radius safety zone around the rig.

These impacts may affect fishermen in Thanintharyi Region in Myanmar, especially those that use large commercial fishing boats. However, the project will inform MOGE regarding project activities at least 30 days month prior to commencement, so that MOGE can inform relevant fisheries associations.

The impacts on ship collisions/accidents will be local in extent, short-term in duration, and of medium magnitude. Receptor sensitivity is considered to be medium.

Significance Evaluation

The significance of impacts on ship collisions/accidents associated with the installation phase is rated as medium.

Table 6-63: Significance Ranking Of Social Impacts From Ship Collisions

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts from installation activities on ship collisions can be mitigated through the use of the following measures:

- Establish 500 m safety zone around the drilling rig
- Provide appropriate lights and warning signals on all vessels to prevent accidental collision
- Use support vessels to warn fishing boats and other transportation ships of traffic through project area to prevent accidental collision

Residual Significance

With these management measures, the extent and magnitude of social impacts from Ship Collision will be reduced resulting in a residual significance ranked that is **Medium**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.2 Assessment of Impacts to Shipping

6.7.2.1 Scope of Assessment

Receptor	Phase	Activity	Potential Impact

Shipping	Installation Phase	Crew/Materials Transport Presence of Equipment and Facilities Rig Placement	Increased traffic Potential disruption to traffic in case of accident

6.7.2.2 Assessment of Impacts to Shipping

During the installation phase, seafloor surveys will be conducted by a survey vessel. The survey vessel will survey in and around the drilling area with a velocity of 3-5 knots. In general, the seafloor survey will take about 18-24 hours. The drilling rig will be mobilized to the well location by tug boat at a velocity of 2-3 knots. When the drilling rig is at the well location, the area surrounding the rig will be patrolled by three support vessels. Rig installation requires about 1 day.

Seafloor survey, rig mobilization and installation will obstruct navigation, therefore sensitive receptors are maritime operators and other ships that travel through or around the project area. There is one shipping route in the west part of the block areas, however, the wells are expected to only have light marine traffic. Commercial ships travel depending on the shipping route set by the ship's captain, which is generally based on traveling the shortest distance between origin and destination. The number of other ships that travel through the project area is small. Some maritime operators that travel through the project area may potentially cause a collision between commercial ships and project ships. However, most shipping routes in the Gulf of Martaban are traveled by small and medium commercial ships. Only light traffic would be anticipated around the project area as it is located offshore. Moreover, PCML will communicate the project description information to affected people or stakeholders and governmental offices about 1 month prior to the project start date.

The impacts will be local in extent, short-term in duration, and of medium magnitude. The receptor sensitivity is considered to be medium.

Significance Evaluation

The significance of impacts on marine transportation associated with the installation phase is rated as medium.

Table 6-64: Significance Ranking Of Social Impacts From Marine Transportation

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts from installation activities on marine transportation between commercial ships of maritime operators and project ships can be mitigated through the use of the following measures:

- 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 and Fisheries, and water police)
- Establish 500 m safety zone around the drilling rig

- Use support vessels to warn fishing boat and other transportation ships off traffic through project area to prevent accidental collision
- Provide appropriate lights and warning signals on all vessels to prevent accidental collision

Residual Significance

With these management measures, the extent and magnitude of social impacts from Marine Transportation will be reduced resulting in a residual significance ranked that is **Low**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.3 Assessment of Impacts from Waste Management

6.7.3.1 Scope of Assessment

Receptor	Phase	Activity	Potential Impact
Waste Management	Installation Phase	Non-hazardous and Hazardous Waste Handling and Storage	Waste contamination to environment. Reduced well-being due to exposure or perceived exposure to hazards

6.7.3.2 Assessment of Impacts from Waste Management

Wastes generated from the proposed project during the installation phase will consist of sanitary wastewater, drainage water, hazardous waste and non-hazardous waste. This section assesses the management practices for the waste.

Sanitary wastewater includes wastewater from both the sanitation facilities and the food canteen facilities. Sanitary wastewater from support vessels will be discharged directly to sea at a distance of over 12 nautical miles (22.2 km) from the nearest shore. Sanitary wastewater from the drilling rig will be piped to the wastewater treatment system on board prior to discharge. The discharge location will be at greater than 12 nautical miles (22.2 km) from the nearest shore.

Drainage water consists of ballast water and deck drainage from the support vessels and the drilling rig, and may be contaminated with oil and grease. Drainage water will be collected and treated at the oil/water separator, which is installed on the rig and support vessels. The oil/water separator will separate water from oil prior to discharging the water portion to the sea. Treated wastewater shall comply with MARPOL 73/78 Annex 4 requirements.

Non-Hazardous Waste includes paper, plastic, and uncontaminated materials etc.

Hazardous Waste includes all types of used oil, oil-contaminated water, expired cooling agents, fluorescent lights, chemical and expired chemical and solution, contaminated clothes, chemical containers, batteries, used PPE, residual material contaminated with oil or chemical, etc.

All hazardous and non-hazardous waste will be collected, stored, and segregated in arranged containers. There will be a manifest each time waste is transported including copies of records identifying type, amount of waste, and time for rig and ship used to transport.

All wastes are treated/disposed according to applicable regulations. The impacts on waste management will thus be local in extent, short term in duration and of low magnitude. Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of social impacts from waste management associated with the installation phase is rated as low.

Table 6-65: Significance Ranking Of Social Impacts From Waste Management

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts from installation activities on waste management can be mitigated through the use of the following measures:

- Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety
- The drilling rig shall be equipped with bund wall to prevent oil and chemical spills. Any spilled oil and chemical will be collected into a sealed container. Support vessel will divert contaminated water from different parts of ship to treatment before drainage to the sea.
- Provide effective wastewater treatment system to ensure that the quality of the discharge meets the criteria of MARPOL 73/78.
- Water that contaminated with oil will be collected and treated at the oil/water separator prior to discharging the water portion to the sea.
- Food waste must be shredded to smaller than 25 mm before discharge to sea. The distance of the drilling rig to the nearest shore is greater than 12 nautical miles (22.2 km) and thus complies with MARPOL 73/78 Annex 5 requirements.
- Hazardous and non-hazardous wastes will be manifested and transported to shore for disposal at an appropriate waste management facility.

Residual Significance

With these management measures, the extent and magnitude of social impacts from Waste Management will be reduced resulting in a residual significance ranked that is **negligible**.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.4 Assessment of Impacts on Submarine Cable & Petroleum Pipelines

6.7.4.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Pipeline/Cable/Under water Structures	Installation Phase	Rig Placement	Possible damage to underwater cable lines and petroleum pipelines during rig installation resulting in interruption of service

6.7.4.2 Assessment of Impacts on Submarine Cables & Petroleum Pipelines

There are no submarine cables in the project area. The well sites areas will be located away from the existing Yetagun pipelines. The pipeline locations within the Yetagun field are of know location and will avoided during all drilling activities.

Therefore, the project is not expected to have any impact on submarine cable or gas and petroleum pipelines.

Significance Evaluation

The significance of impacts on submarine cable & gas and petroleum pipelines associated with the installation phase is rated as insignificant.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.5 Assessment of Impacts on Socio-Economy

6.7.5.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Socio-Economy	Installation Phase	Crew/Materials Transport Shore Base Support Offshore Fuel Storage & Handling Hazardous Materials Handling and Storage Rig Placement Non-hazardous and Hazardous Waste Handling and Storage Labour, Equipment & Services Supply	Increased employment/income and procurement opportunities for people, business and services in surrounding area

6.7.5.2 Assessment of Impacts

During the installation phase of the Blocks M12, 13 &14 Exploration Drilling project, contractors plan to have 120 workers for drilling and 8-10 workers on each of the three primary support vessels.

Since the drilling rig and support vessel contractors are self-sufficient with respect to manpower, there will be no new employment generated from these activities. In addition, PCML will employ 8-10 full-time workers at the shore bases in order to support project activities such as boat supply, transportation of drilling equipment and materials to the rig.

The above employment generation will have a have a positive but minor effect on the socio-economy in the local area.

The impacts on the socio-economy from the project will be local in extent, short-term in duration, and of low magnitude but positive (beneficial).

The significance of social impacts from the socio-economy during installation is rated as a low positive benefit.

Table 6-66: Significance Ranking Of Impact on Socio-Economy

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Social impacts from installation activities and related employment on the socio-economy are positive and can be further enhanced by the following measures:

- Employ qualified local workers
- Purchase local supplies and services, whenever possible

Residual Significance

With these management measures, the extent and magnitude of impacts on the socio-economy will be optimized resulting in a residual significance ranked positive.

Residual Significance	Positive	Negligible	Low	Medium	High

6.7.6 Assessment of Impact to Historical, Archaeological and Cultural Resources

6.7.6.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Cultural/Archaeological	Installation Phase	Crew/Materials Transport Shore Base Support Labour, Equipment & Services Supply Rig Placement	Possible disruption or damage of underwater archaeological sites, such as shipwrecks. Potential for conflict between local culture and outside workers.

6.7.6.2 Assessment of Impacts on Archaeological Resources

Platform installation and anchor drag could damage underwater archaeological sites. This may damage or destroy the archaeological sites, which are a source of education, historical and archaeological knowledge in Myanmar. There are no known underwater archaeological resources near the project area.

Any underwater structure would pose a risk to rig installation and cause potential tipping and sinking of the rig. To prevent this potential problem, a site survey is done prior to rig placement to identify and avoid potential hazards to rig installation. If an underwater archaeological site is identified during the site survey, the area of this find would be avoided and the rig would be installed in a different area. In addition, local authorities would be notified.

All crew will be mobilized directly to the drilling rig with very limited interactions with coastal communities; therefore the potential for conflict between local culture and outside workers is negligible.

The impacts on underwater archaeological resources will be local in extent, short-term in duration, and of low magnitude. Receptor sensitivity is considered low.

Significance Evaluation

The significance of impacts on underwater archaeological resources associated with the Platform Installation is rated as low.

Table 6-67: Significance Ranking Of Social Impacts From Platform Installation

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

However, during the installation phase, the project will survey the sea floor by side scan sonar. If any underwater archaeology resources are found in the project area, mitigation measures will include:

- Prohibition of anchor drag
- Contact archaeologist at relevant authorities when artefacts are found to determine the appropriate action
- Limit drilling rig employees interaction with coastal communities.

Residual Significance

With these management measures, the extent and magnitude of impacts on Archaeological resources from Platform Installation will have a residual significance ranked as negligible.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8 Social Impact Assessment During Drilling Phase

From the screening process the following must be assessed to determine their impacts during the well drilling phase:

- Fisheries
- Shipping
- Waste Management
- Socio-economy

6.8.1 Assessment of Impacts to Fisheries

6.8.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Fisheries	Drilling Phase	Crew/Materials Transport Wastewater Disposal Presence of Equipment and Facilities Drilling & Completion of Wells Mud & Cuttings Disposal	Loss of fishing area could directly affect the income of fishermen Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.

The drilling activities of the project may cause adverse effect to fisheries in terms of loss of fishing area, ship collisions or accidents, and waste contamination in ocean, which may impact aquatic biota.

6.8.1.2 Assessment of Impacts from Loss of Fishing Area

The size of survey area for the drilling phase is equal to the area used for mobile activities and placing the rig. The area used is approximately 1 km^2 that consists of the rig pad and 500 m of surrounding area. Therefore, the loss of area from project activities is 0.0002% of the total area of the Andaman Sea (600,000 km^2). The duration of drilling one well is 35 days. Further impact information relevant to this phase is described in **Section 6.7.1**.

The primary sensitive receptor from project activities is deep offshore fishermen from the Myeik Fisheries Federation, who fish in the project area. The loss of fishing area will cause a loss of income. However, fishermen may still fish 500 m outside of the project area, which represents a small area within the fishing block.

The social impacts from loss of fishing area will be local in extent, short-term in duration and of low magnitude. The receptor sensitivity is considered to be medium.

Significance Evaluation

The significance of social impacts from loss of fishing area during the drilling phase is rated as medium.

Table 6-68: Significance Ranking Of Social Impacts From Platform Installation

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Loss of fishing area impacts from drilling activities can be mitigated through the use of the following measures:

- Implement PCML's Community Awareness Plan and Grievance Process.

Residual Significance

With these management measures during the drilling phase, the extent and magnitude of social impacts from loss of fishing area will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8.1.3 Assessment of Impacts to Quantity and Quality of Fishery Products and Aquatic Biota

During the drilling phase, the quantity and quality of aquatic biota may decrease due to waste contamination in the sea. Contaminants may consist of non-hazardous and hazardous waste and mud and cuttings from drilling activities. The project will implement a waste management system to prevent spills of contaminants into the sea. For mud and cuttings, low toxicity mud is used for drilling activities. Contaminants may affect demersal fish, squid/octopus, pelagic fish, crab and shrimp/prawn. The fishery resources are economically important to the marine catch from the Thanintharyi Region. Fishermen are thus indirect stakeholders/receptors of potential impacts, because waste contamination in the sea can cause a reduction in the aquatic biota, which would ultimately reduce fishermen's revenue.

The social impacts from impacts to the quality of fishery products and aquatic biota will be local in extent, short term in duration, and of low magnitude. Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of social impacts from possible contamination of fishing and aquatic biota associated with the drilling phase is rated as Low.

Table 6-69: Significance Ranking Of Social Impacts From Ship Collisions

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High

Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

The social impact from possible contamination of fishing and aquatic biota during drilling activities can be mitigated through the use of the following measures:

- Each vessel greater than 400 gross tons will comply with all fuel storage, waste treatment and disposal regulations/procedures (MARPOL73/78, PCML and contractor procedures)
- Provide appropriate lights and warning signals on all vessels to prevent accidental collisions.
- Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety.
- Conduct Table Top Oil Spill Response for Tier 3 event
- Regularly monitor 500-m safety zone surrounding drilling rig to prevent any accidents
- Have support vessels regularly patrol the project area to check for leaks or spills, and to try to determine potential causes or sources
- Implement Hazardous Materials Management Tracking System and manifests for transport
- Conduct drills according to Emergency Response Plan and Tropical Storm Emergency Plan
- Design and use slim hole drilling to minimize the quantity of mud and cuttings
- Use seawater and Water-Based Mud (WBM) that will rapidly degrade in the natural environment
- Discharge all the cuttings overboard through a caisson at a depth of approximately 3 m below the sea surface (depending on tidal height)
- The drilling rig shall be equipped with bund wall to prevent oil and chemical spills. Any spilled oil and chemicals will be collected into a sealed container. Support vessels will divert contaminated water from different parts of ship to treatment before drainage to the sea.
- Separate non-hazardous and hazardous wastes, and use proper waste disposal methods for the project
- Store, separate, transport and dispose of waste using appropriate procedures and disposal facilities.
- Provide effective wastewater treatment system to ensure that the quality of the discharge meets the criteria of MARPOL 73/78
- Food waste must be shredded to smaller than 25 mm before discharge to sea, and discharged at a distance of greater than 12 nautical miles (22.2 km) from shoreline to the criteria of MARPOL 73/78.

Residual Significance

With these management measures during the drilling phase, the extent and magnitude of social impacts from possible contamination of fishing and aquatic biota will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8.1.4 Assessment of Impacts to Fisheries from Crew/Materials Transport

During the drilling phase, the support vessels will be used to support the drilling activities and will patrol around the safety zone to prevent other boats from entering the project area during drilling. However, in the unlikely event that a fishing boat goes unnoticed and enters the 500 m radius surrounding the project area, there is a potential for ship collision to occur. In addition, transportation between the rig and shore base is another potential source of ship collisions.

Any ship collision may impact the quality of life and property of fishermen, as well as have an environmental impact due to waste/oil contamination to environment. The stakeholders are the deep offshore fishermen in from the Myeik Fisheries Federation who carry out fishing activities near the transportation routes of the project.

The impacts on ship collisions/accidents will be local in extent, short term in duration, and of medium magnitude. Receptor sensitivity is considered to be medium.

Significance Evaluation

The significance of social impacts from ship collisions/accidents associated with the drilling phase is rated as medium.

Table 6-70: Significance Ranking Of Social Impacts From Ship Collisions

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Ship collisions/accidents during drilling activities can be mitigated through the use of the following measures, similar to those used during the installation phase (**Section 6.7.1**):

- Establish 500 m safety zone around the drilling rig
- Provide appropriate lights and warning signals on all vessels to prevent accidental collision
- Use support vessels to warn fishing boats and other transportation ships of traffic through project area to prevent accidental collision

Residual Significance

With these management measures during the drilling phase, the extent and magnitude of social impacts from ship collisions will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8.2 Assessment of Impacts to Shipping

6.8.2.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Shipping	Drilling Phase	Crew/Materials Transport Presence of Equipment and Facilities Drilling and Completion of Wells	Increased traffic Potential disruption to traffic in case of accident

6.8.2.2 Assessment of Impacts to Shipping from Crew/Materials Transport and Presence of Equipment and Facilities

Due to the project's location offshore in the Gulf of Martaban, marine vessels are the major vehicle used for transportation and project activities. The main types of vessels consist of support vessels, and vessels for transporting chemicals and waste between the drilling rig and Thaketa, Myanmar and the Ranong, Thailand shore bases. With the additional boat traffic there is an increased risk for collisions to occur.

Commercial ships travel depending on the shipping route set by the ship's captain, which is generally based on traveling the shortest distance between origin and destination. Some maritime operators that travel through the project area may potentially cause a collision between commercial ships and project ships. However, small and medium commercial ships travel most shipping routes in the Andaman Sea. There is one shipping route in the west part of the block areas; however, the drill sites are expected to only have light marine traffic.

The impacts will be local in extent, short term in duration, and of medium magnitude. Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of social impacts from marine transportation during the drilling phase is rated as medium.

Table 6-71: Significance Ranking Of Shipping From Crew/Materials Transport

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Marine transport accidents between commercial vessels and project vessels can be mitigated through the use of the following measures:

- Establish 500 m safety zone around the drilling rig
- Provide appropriate lights and warning signals on all vessels to prevent accidental collision
- Use support vessels to warn fishing boats and other transportation ships of traffic through project area to prevent accidental collision

Residual Significance

With these management measures during the drilling phase, the extent and magnitude of impacts to Shipping from Crew/Materials transportation will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8.3 Assessment of Impacts to Waste Management

6.8.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Waste Management	Drilling Phase	Non-hazardous and Hazardous Waste Handling and Storage Wastewater Disposal Mud and Cuttings Disposal	Pressure on existing waste management facilities Waste contamination to environment. Reduced well-being due to exposure or perceived exposure to hazards Potential deterioration of seawater quality from spills, leakages and discharge of mud and cuttings could affect the marine ecosystem. Mud and cuttings discharge can increase turbidity, and may be toxic to marine organisms. Mud and cuttings deposition can result in sediment contamination and sediment accumulation affecting benthos

The types of waste produced during the drilling phase consist of mud and cuttings, sanitary wastewater, hazardous waste, and non-hazardous waste. Different types of waste will be treated with different methods. Some types of waste will be disposed of in the landfill. The assessment of impacts from waste management can be classified as follows: 1) management of waste from drilling rig and support vessels, 2) management of waste from the shore bases.

6.8.3.2 Assessment of Impacts from Mud and Cuttings Disposal

Drill cuttings are formation particles generated by the drill bit during the drilling process and vary in size from small slivers (less than 10 mm in length) to dispersed clays and ultra fine particulates (less than 0.002 mm). The exact nature of the cuttings will depend on the geological formations drilled through. A total of 502 m^3 of drilling cuttings are expected to be generated from each exploration drilling well, which will be eventually discharged at sea after being treated overboard. Mud will be removed from the cuttings to the extent possible. PCML will discharge cuttings with a maximum of 12.5% Cuttings Base Fluid Retention (CBFR). It is estimated that 62.71 m^3 of drilling mud will be discharged into the sea.

The disposal of drilling waste for this project follows standard procedures used in the Gulf of Martaban. PCML will conduct leachate testing of the mud and cuttings, which will conform with IFC EHS Guidelines for Offshore Oil and Gas Development (2015).

The impacts will be local in extent, short-term in duration, of low magnitude. Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of social impacts from mud and cuttings disposal during the drilling phase is rated as low.

Table 6-72: Significance Ranking Of Social Impacts From Mud and Cuttings Disposal

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Mitigation measures for the management of mud and cuttings are as follows:

- Each vessel greater than 400 gross tons will comply with all fuel storage, waste treatment and disposal regulations/procedures (MARPOL73/78, PCML and contractor procedures).
- Provide appropriate lights and warning signals on all vessels to prevent accidental collision. Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety.
- Conduct Table Top Oil Spill Response for Tier 3 event
- Regularly monitor safety zone within 500 m-radius surrounding drilling rig to prevent any accidents
- Have safety vessels regularly patrol the project area to check for leaks or spills, and to try to determine potential causes or sources
- Implement Hazardous Materials Management Tracking System and manifests for transport
- Conduct drills according to Emergency Response Plan and Tropical Storm Emergency Plan
- Select the appropriate drilling method to reduce the amount of drilling mud and cuttings discharged
- Design and use slim hole drilling to minimize the amount of mud and cuttings
- Use WBM that rapidly degrade in natural environment
- Discharge all the cuttings overboard through a caisson at a depth of approximately 3 m below the sea surface (depending on tidal height)

Residual Significance

With these management measures during the drilling phase, the extent and magnitude of social impacts from mud and cuttings disposal will have a residual significance ranked as negligible.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8.3.3 Assessment of Impacts from Wastewater

Wastewater from the project consists of drain water, and sanitary wastewater from drilling rig and support vessels

Sanitary wastewater includes wastewater from both the sanitation facilities and the food canteen facilities of drilling rig and support vessels. Total wastewater quantity is estimated to be 945 m^3 for 105 operation days using a rate of 60 liters/person/day, maximum rig crew number of 120 persons, and support vessel crew of 24-30 (approximately 8-10 crew members/vessel). Sanitary wastewater from the drilling rig will be piped to the wastewater treatment system on board prior to discharge. Sanitary wastewater from support vessels will be discharged directly to sea at a distance of over 12 nautical miles (22.2 km) from the nearest shore. These methods comply with MARPOL 73/78 (Annex 4) requirements.

Drainage water consists of ballast water and deck drainage from both support vessels and the drilling rig may be contaminated with oil and grease. Drainage water will be collected and treated at the oil/water separator, which is installed on the rig and support vessels. Treated wastewater shall comply with MARPOL 73/78 Annex 4 requirements, which regulate pollution prevention of vessel and ship drainage (oil content not over 100 ppm discharged at more than 12 nautical miles (22.2 km) from the nearest shore or not over 15 ppm at less than 12 nautical miles (22.2 km)). Separated oil and grease will be collected in an oil container for further onshore disposal.

Therefore, the impacts will be local in extent, short-term in duration, and of low magnitude. Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of social impacts from wastewater during the drilling phase is rated as low.

Table 6-73: Significance Ranking Of Social Impacts From Wastewater Disposal

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

The mitigation measures for discharge of wastewater are similar to those for release of non-hazardous waste, and are as follows:

- Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety
- The drilling rig shall be equipped with bund wall to prevent oil and chemical spills. Any spilled oil and chemical will be collected into a sealed container. Support vessel will divert contaminated water from different parts of ship to treatment before drainage to the sea.
- Provide effective wastewater treatment system to ensure that the quality of the discharge meets the criteria of MARPOL 73/78

Residual Significance

With these management measures during the drilling phase, the extent and magnitude of social impacts from wastewater disposal will have a residual significance ranked as negligible.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8.3.4 Assessment of Impacts from Non-Hazardous and Hazardous Waste

Non-Hazardous Waste includes paper, plastic, and uncontaminated materials etc. The amount of non-hazardous waste is expected to be 4-5 tons per month.

Hazardous Waste includes all types of used oil, oil-contaminated water, expired cooling agents, fluorescent lights, chemicals and expired chemical solutions, contaminated clothes, chemical containers, batteries, used PPE, residual material contaminated with oil or chemical, etc. The amount of hazardous waste is expected to be 0.5 tons per month.

The quantity of non-hazardous and hazardous waste is derived from PCML's exploration drilling experience in The Andaman Sea.

All produced wastes (both hazardous and non-hazardous wastes) will be collected in suitable containers in order to prevent waste spills. In case of leakage or spill of hazardous wastes from a container, all workers will be evacuated from that area and the HSE team will clean up the affected area with a spill kit that has been prepared on the rig. Moreover, the rig will have a bunded area to ensure waste does not spill into the sea. In addition, clean-up equipment will be provided in the vessel used for waste transport. If a waste spill occurs, this equipment will be used for immediate clean-up of any waste spills.

All wastes will be transported from the drilling rig to the shore base in Thaketa, Myanmar and the Ranong shore base located in Thailand. The drilling contractor will deliver the wastes to their waste segregation site and segregate all waste before transporting to disposal facilities according to waste types. Overall waste management is under the supervision of the drilling contractor.

The impacts will be local in extent, short-term in duration, and of low magnitude. Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of social impacts from solid waste during the drilling phase is rated as low

Table 6-74: Significance Ranking Of Social Impacts From Non-Hazardous and Hazardous Waste

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

The mitigation measures for non-hazardous and hazardous waste are:

- All contactors must comply with the waste management regulations, and relevant laws, as well as monitor operations
- Separate and store each type of waste (separate non-hazardous waste and hazardous waste) into appropriate containers having clear labels
- Do not drop any waste into the sea
- Store hazardous waste in containers that are durable and safe for transport/transfer. Also, store them in areas away from fire sources.
- Record and examine the type and quantity of waste
- Store, separate, transport and dispose of waste using appropriate procedures and disposal facilities.
- Ensure manifest of hazardous waste is kept

Residual Significance

With these management measures during the drilling phase, the extent and magnitude of social impacts from hazardous and non-hazardous waste will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.8.4 Assessment of Impacts to Socio-Economy

6.8.4.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Socio-Economy	Drilling Phase	Crew/Materials Transport Shore Base Support Offshore Fuel Storage & Handling Wastewater Disposal Hazardous Materials Handling and Storage Non-hazardous and Hazardous Waste Handling and Storage Labour, Equipment & Services Supply	Increased employment/income and procurement opportunities for people, business and services in surrounding area

6.8.4.2 Assessment of Impacts to Socio-Economy

During the drilling phase of the Blocks M12, 13 & 14 Exploration Drilling project, contractors plan to employ 120 workers for drilling and 8-10 workers on each of the three primary support vessels.

Since the drilling rig and support vessel contractors are self-sufficient with respect to manpower, there will be no new employment from these activities.

The above employment generation will have a have a positive but minor effect on the socio-economy in the local area.

The impacts on the socio-economy from the project will be local in extent, short-term in duration, and of low magnitude but positive (benefit). Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of social impacts from employment during installation is rated as a low positive benefit.

Table 6-75: Significance Ranking Of Social Impacts From Employment

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts from installation activities on the socio-economy are positive and can be further enhanced by the following measures:

- Employ qualified local workers
- Purchase local supplies and services, whenever possible

Residual Significance

With these management measures during the drilling phase, the extent and magnitude of social impacts from employment can be optimized and will have a residual significance ranked as Positive.

Residual Significance	Positive	Negligible	Low	Medium	High

6.9 Social Impact Assessment During Well Testing Phase

From the screening process the following must be assessed to determine their impacts during the well testing phase:

- Fisheries
- Shipping
- Waste Management
- Socio-economy

6.9.1 Assessment of Impact to Fisheries

6.9.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Fisheries	Well Testing Phase	Crew/Materials Transport Wastewater Disposal Presence of Equipment and Facilities	Loss of fishing area could directly affect the income of fishermen Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.

Impacts on fisheries during the testing phase will be similar to those during drilling, including the loss of fishing area and accidental collision of ships

6.9.1.2 Assessment of Impact from Loss of Fishing Area

Testing for each well location will take approximately 10 days. The testing area is approximately 1 km^2, which represents 0.0002% of the total area of the Andaman Sea. This may impact fisherman due to loss of income, but fisherman can still fish by moving to other fishing areas or fishing outside the safety zone (500 meters radius around project). Other impacts related to loss of fishing area were described for the drilling phase, in **Section 6.8.1**.

The impacts will be local in extent, short-term in duration, and of low magnitude. Receptor sensitivity is considered to be medium.

Significance Evaluation

The significance of impacts on loss of fishing areas during the testing phase is rated as low.

Table 6-76: Significance Ranking Of Impacts on Fisheries From Loss of Fishing Area

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km

Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Mitigation measures for loss of fishing area are as follows:

- Implement PCML's Community Awareness Plan and Grievance Mechanism.

Residual Significance

With these management measures during the testing phase, the extent and magnitude of social impacts from loss of fishing area will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.9.1.3 Assessment of Impacts on Fisheries from Crew/Materials Transport

During the testing phase, the support vessels will be used to support the testing activities and will patrol around the safety zone in order to prevent other boats from entering the project area during testing. However, in the unlikely event that a fishing boat goes unnoticed and enters the 500 m radius surrounding the project area, there is a potential for ship collision to occur. In addition, transportation between the rig and shore base is another potential source of ship collisions.

The impacts on ship collisions/accidents will be local in extent, short-term in duration, and of medium magnitude. Receptor sensitivity is considered to be low

Significance Evaluation

The significance of impacts on ship collisions/accidents during the testing phase is rated as medium.

Table 6-77: Significance Ranking Of Social Impacts From Ship Collisions/Accidents

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Ship collisions during testing activities can be mitigated through the use of the following measures, which are similar to those in the installation phase (**Section 6.7.1**):

- Establish 500 m safety zone around the drilling rig
- Provide appropriate lights and warning signals on all vessels to prevent accidental collision
- Use support vessels to warn fishing boats and other transportation ships of traffic through project area to prevent accidental collision

Residual Significance

With these management measures during the testing phase, the extent and magnitude of social impacts from ship collisions/accidents will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.9.2 Assessment of Impacts to Shipping

6.9.2.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Shipping	Well Testing Phase	Crew/Materials Transport Presence of Equipment and Facilities	Loss of fishing area could directly affect the income of fishermen Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.

6.9.2.2 Assessment of Impacts to Shipping from Crew/Materials Transport

Due to the project area's location offshore in the Gulf of Martaban, marine vessels are the major vehicle used for transportation and project activities. The main types of vessels consist of support vessels, and vessels for transporting chemicals and waste between the drilling rig and shore bases. Due to marine vessel traffic, there is a potential for collisions to occur.

Commercial ships may be traveling in any direction, depending on the shipping route set by the ship's captain, which is generally based on traveling the shortest distance between origin and destination. Some maritime operators that travel through the project area may potentially cause a collision between commercial ships and project ships. However, small and medium commercial ships travel most shipping routes in the Andaman Sea. Shipping routes are generally near the coastline, therefore only light traffic around would be anticipated around the project area as it is located offshore.

The impacts will be local in extent, short-term in duration, and of medium magnitude. Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of impacts on marine transportation during the testing phase is rated as medium.

Table 6-78: Significance Ranking Of Social Impacts From Ship Collisions/Accidents

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High

Significance	Positive	Negligible	Low	Medium	High

Marine transport accident between commercial vessels and project vessels can be mitigated through the use of the following measures:

- Establish 500 m safety zone around the drilling rig
- Provide appropriate lights and warning signals on all vessels to prevent accidental collision
- Use support vessels to warn fishing boats and other transportation ships of traffic through project area to prevent accidental collision

By following these mitigation measures, the potential impact on marine transport can be minimized during the testing phase.

Residual Significance

With these management measures during the testing phase, the extent and magnitude of social impacts from ship collisions/accidents will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.9.3 Assessment of Impacts from Waste Management

6.9.3.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Waste Management	Well Testing Phase	Non-hazardous and Hazardous Waste Handling and Storage Flaring	Pressure on existing waste management facilities Waste contamination to environment. Reduced well-being due to exposure or perceived exposure to hazards

During testing phase, the produced reservoir fluids will be separated on board by a separator to gas, oil and water.

6.9.3.2 Assessment of Impacts from Flaring

The separated oil and excess gas will be flared off the flare boom. The function of flaring system is to flare the excess hydrocarbons separated from the separator before emitting to the atmosphere. The flare boom is constructed from a steel pipe with multi-head burners for efficient combustion. Based on PCML's previous drilling experience, the estimated gas generated will be less than 0.05 million standard cubic feet per day.

The separated oil and excess gas is disposed on-site by flaring without residual waste. Therefore, the impacts will be local in extent, short-term in duration, and of low magnitude. Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of impacts on flaring during the testing phase is rated as low.

Table 6-79: Significance Ranking Of Impacts From Flaring and Waste Management

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts on flaring can be mitigated through the use of the following measures:

- The well is expected to be dry gas bearing however in the event those hydrocarbon liquids are produced, high efficiency burners with adequate air will be used to ensure the most efficient burning
- Flaring operations will be continually monitored for excessive smoke. If any environmental concerns arise then the well will be shut in.
- The well test area should have waste oil drip and catchment containers available around any sampling points
- The drains on the skids of well test vessels should be blocked off or closed where possible

Residual Significance

With these management measures during the testing phase, the extent and magnitude of impacts on waste management from flaring will have a residual significance ranked as negligible.

Residual Significance	Positive	Negligible	Low	Medium	High

6.9.3.3 Assessment of Impacts from Hazardous & Non-Hazardous Waste and Wastewater

Wastes generated during well testing include hazardous and non-hazardous wastes, and wastewater.

The social impacts from accidental spills will be local in extent, short-term in duration, and of low magnitude. Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of social impacts from accidental spills associated with the testing phase is rated as low.

Table 6-80: Significance Ranking Of Social Impacts From Accidental Spills

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr

Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts from accidental spills can be mitigated through the use of the following measures:

- Separate and store each type of waste (separate non-hazardous waste and hazardous waste) into appropriate containers having clear labels
- Do not drop any waste into the sea
- Store hazardous waste in containers that are durable and safe for transport/transfer. Also, store them in areas away from fire sources.
- Record and examine the type and quantity of waste
- Store, separate, transport and dispose of waste using appropriate procedures and disposal facilities.
- Ensure manifest of hazardous waste is kept

Residual Significance

With these management measures during the testing phase, the extent and magnitude of social impacts from accidental spills will have a residual significance ranked as Negligible.

Residual Significance	Positive	Negligible	Low	Medium	High

6.9.4 Assessment of Impacts on Socio-Economy

6.9.4.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Socio-Economy	Well Testing Phase	Crew/Materials Transport Shore Base Support Offshore Fuel Storage & Handling Wastewater Disposal Hazardous Materials Handling and Storage Non-hazardous and Hazardous Waste Handling and Storage Labour, Equipment & Services Supply	Increased employment/income and procurement opportunities for people, business and services in surrounding area

6.9.4.2 Assessment of Impacts on Socio Economy

During the testing phase of the Blocks M12, 13, & 14 Exploration Drilling project, contractors plan to have 120 workers for testing and 8-10 workers on each of the three primary support vessels.

Since the drilling rig and support vessel contractors are self-sufficient with respect to manpower, there will be no new employment from these activities. In addition, PCML will employ 8-10 full-time workers at the shore bases in order to support project activities such as boat supply, transportation of

drilling equipment and materials to rig. Currently, these workers are working on the shore bases; from time to time there will be 3-4 additional short-term workers hired to support shore base activities.

The above employment generation will have a have a positive but minor effect on the socio-economy in the local area.

The social impacts from an enhanced socio-economy from the project will be local in extent, short-term in duration, and of low magnitude but positive (benefit).

The significance of impacts on the socio-economy during testing is rated as a low benefit.

Table 6-81: Significance Ranking Of Social Impacts From Accidental Spills

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts from testing activities on the socio-economy are positive and can be further enhanced by the following measures:

- Employ qualified local workers
- Purchase local supplies and services, whenever possible

Residual Significance

With these management measures during the testing phase, the extent and magnitude of social impact benefits can be enhanced and will have a residual significance ranked as Positive.

Residual Significance	Positive	Negligible	Low	Medium	High

6.10 Social Impact Assessment During Abandonment Phase

From the screening process the following must be assessed to determine their impacts during the abandonment phase:

- Fisheries
- Shipping
- Waste Management
- Socio-economy

6.10.1 Assessment of Impacts on Fisheries

6.10.1.1 Scope of Assessment

Resource/Receptor	Project Phase	Activities	Potential Impacts
Fisheries	Abandonment Phase	Crew/Materials Transport Wastewater Disposal Presence of Equipment and Facilities Decommissioning	Loss of fishing area could directly affect the income of fishermen Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption. Fishermen can return to fish in the exclusion zone after rig demobilization (positive impact)

Activities in the abandonment phase of the project may have an impact on marine fisheries. The impact will be similar to those during installation prior to drilling, including the loss of fishing area and accidental collision of ships. The stakeholders affected by the project would be deep offshore fisherman from Myeik Fisheries Federation.

6.10.1.2 Loss of Fishing Area

Abandonment for each well location will take approximately 15 days and then the rig will be moved to another well. The abandonment area is equivalent to the area of rig mobilization and installation, approximately 1 km^2, which represents 0.0002% of total area of the Andaman Sea. This impact will affect the loss of income of fisherman. However, fisherman can still fish by moving to other fishery resources or fishing outside the safety zone (500 meters radius around project). For other basic information used to determine the impact, refer to **Section 6.7.1**. In addition, the exploration drilling campaign will take approximately 75 days to complete. Once the program is completed, fishermen can return to the exclusion zone to fish. Therefore, the impact will be temporary.

Therefore, the impacts will be local in extent, short-term in duration, and of medium magnitude. Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of social impacts from loss of fishing areas with the abandonment phase is rated as medium.

Table 6-82: Significance Ranking Of Social Impacts From Loss of Fishing Area

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Mitigation measures for potential impacts during the abandonment phase are the same that are used for the drilling phase:

- Implement PCML's Community Awareness Plan and Grievance Mechanism.

Residual Significance

With these management measures during the abandonment phase, the extent and magnitude of social impact from loss of fishing area will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.10.1.3 Assessment of Impacts on Fishing from Crew/Materials Transport

Project activities during the abandonment phase may cause ship collision, which could potentially impact fishermen and project equipment. This impact is similar to the installation phase.

Therefore, the impacts on the ship collision will be local in extent, short-term in duration, and of medium magnitude. Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of impacts on ship collision accident with the abandonment phase is rated as medium.

Table 6-83: Significance Ranking of Impacts on Fishing from Crew/Materials Transport

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Social impacts during abandonment phase from ship collision can be mitigated through the use of the following measures

- Provide appropriate lights and warning signals on all vessels to prevent accidental collision
- Use support vessels to warn fishing boats and other transportation ships of traffic through project area to prevent accidental collision

Residual Significance

With these management measures during the abandonment phase, the extent and magnitude of Impacts on Fishing from Crew/Materials Transport will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.10.2 Assessment of Impacts on Shipping

Resource/Receptor	Project Phase	Activities	Potential Impacts
Shipping	Abandonment Phase	Crew/Materials Transport Presence of Equipment and Facilities Rig Decommissioning	Increased traffic Potential disruption to traffic in case of accident

Potential impacts during well abandonment are the same as for installation phase (**Section 6.7.2**).

Therefore, the social impacts from marine transportation will be local in extent, short-term in duration, and of medium magnitude. Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of impacts on marine transportation with the abandonment phase is rated as medium.

Table 6-84: Significance Ranking Of Impacts on Shipping from Crew/Materials Transport

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts from the activities of the project on marine transportation can be mitigated as below.

- Establish safety zone of 500 meters radius around the rig
- Provide appropriate lights and warning signals on all vessels to prevent accidental collision

- Use support vessels to warn fishing boats and other transportation ships of traffic through project area to prevent accidental collision

Residual Significance

With these management measures during the abandonment phase, the extent and magnitude of social impact from marine transportation will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.10.3 Assessment of Impacts to Waste Management

Resource/Receptor	Project Phase	Activities	Potential Impacts
Waste Management	Abandonment Phase	Non-hazardous and Hazardous Waste Handling and Storage	Pressure on existing waste management facilities Waste contamination to environment. Reduced well-being due to exposure or perceived exposure to hazards

Waste from the well abandonment phase is similar to waste from installation phase (**Section 6.7.3**), which consists of: sanitary wastewater, drainage water, hazardous waste and non-hazardous waste

Sanitary wastewater includes wastewater from both the sanitation facilities and the food canteen facilities. Sanitary wastewater from support vessels will be discharged directly to sea at a distance of over 12 nautical miles (22.2 km) from the nearest shore. Sanitary wastewater from the drilling rig will be piped to the wastewater treatment system on board prior to discharge. The discharge location will be at greater than 12 nautical miles (22.2 km) from the nearest shore.

Drainage water consists of ballast water and deck drainage from the support vessels and the drilling rig, and may be contaminated with oil and grease. Drainage water will be collected and treated at the oil/water separator, which is installed on the rig and support vessels. The oil/water separator will separate water from oil prior to discharging the water portion to the sea. Treated wastewater shall comply with MARPOL 73/78 Annex 4 requirements.

Non-Hazardous Waste includes bits of paper, plastic, and uncontaminated materials etc.

Hazardous Waste includes all types of used oil, oil-contaminated water, expired cooling agents, fluorescent, chemical and expired chemical and solution, contaminated clothes, chemical containers, batteries, used PPE, residual material contaminated with oil or chemical, etc.

All wastes will be collected, stored, and segregated in arranged containers. There will be a manifest each time waste is transported including copies of records identifying type, amount of waste, and time for rig and ship used to transport. Moreover, all wastes produced during the project activities will be transported and treated by the drilling contractor.

The social impacts from waste management will be local in extent, short-term in duration, and of low magnitude. Receptor sensitivity is considered to be low.

Significance Evaluation

The significance of social impacts from waste management associated with the abandonment phase is rated as low.

Table 6-85: Significance Ranking Of Social Impacts From Marine Transportation

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts from waste management can be mitigated through the use of the following measures:

- All contactors must comply with the waste management regulations, and relevant laws, as well as monitor operations
- Separate and store each type of waste (separate non-hazardous waste and hazardous waste) into appropriate containers having clear labels
- Do not drop any waste into the sea
- Store hazardous waste in containers that are durable and safe for transport/transfer. Also, store them in areas away from fire sources
- Record and examine the type and quantity of waste
- Store, separate, transport and dispose of waste using appropriate procedures and disposal facilities.
- Ensure manifest of hazardous waste is kept

Residual Significance

With these management measures during the abandonment phase, the extent and magnitude of social impact from waste management will have a residual significance ranked as negligible.

Residual Significance	Positive	Negligible	Low	Medium	High

6.10.4 Assessment of Impacts to Socio-Economy

Resource/Receptor	Project Phase	Activities	Potential Impacts
Socio-Economy	Abandonment Phase	Crew/Materials Transport Shore Base Support Offshore Fuel Storage & Handling Wastewater Disposal Hazardous Materials Handling and Storage Non-hazardous and Hazardous Waste Handling and Storage Labour, Equipment & Services Supply	Increased employment/income and procurement opportunities for people, business and services in surrounding area

During rig demobilization phase of the Blocks M12, 13 &14 Exploration Drilling project, there will be 120 workers for drilling and 8-10 workers on each of the three primary support vessels.

Since the drilling rig and support vessel contractors are self-sufficient with respect to manpower, there will be no new employment from these activities. In addition, PCML will employ 8-10 full-time workers at the shore bases in order to support project activities such as boat supply, transportation of drilling equipment and materials to rig. Currently, these workers are working on the shore bases; from time to time there will be 3-4 additional short-term workers hired to support shore base activities.

The above employment generation will have a have a positive but minor effect on the socio-economy in the local area. The social impacts from an enhanced socio-economy from the project will be local in extent, short-term in duration, and of low magnitude but positive (benefit). Receptor sensitivity is considered to be low.

The significance of impacts on the socio-economy during abandonment phase is rated as a low benefit.

Table 6-86: Significance Ranking Of Social Impacts From Marine Transportation

	Level and Type of Impact				
	+1	0	1	2	3
Impact Criteria	Positive	Negligible	Low	Medium	High
Extent			< 1 km	1 - 5 km	> 5 km
Duration			0 - 1 yr	1 - 5 yr	> 5 yr
Magnitude	Positive	Negligible	Low	Medium	High
Receptor Sensitivity	Positive	Negligible	Low	Medium	High
Significance	Positive	Negligible	Low	Medium	High

Impacts from installation activities on the socio-economy are positive and can be further enhanced by the following measures:

- Employ qualified local workers
- Purchase local supplies and services, whenever possible

Residual Significance

With these management measures during the abandonment phase, the extent and magnitude of social impact from an enhanced socio economy will have a residual significance ranked as Positive.

Residual Significance	Positive	Negligible	Low	Medium	High

6.11 Health Impact Assessment

The HIA assesses the significance of potential health impacts on the community around the shore base in Thaketa, Myanmar and the Ranong shore base located in Thailand, and on occupational health on the drilling rig and support vessels. The significance of impacts is considered from various factors such as type of threat, environmental factor, health status, impact on livelihood.

6.11.1 Evaluation Criteria and Method

A general guideline for conducting an HIA and integrating the HIA into an EIA has been developed. The criteria used to evaluate the significance of health impacts are provide in **Table 6-87**.

Table 6-87: Impact Assessment Criteria

Impact characteristic	Description
Magnitude	○ Chance of negative and severe impacts: Are changes from impact major or minor? Are changes gradual or sudden? Can changes be managed within the local capacity/capability? Are changes within an acceptable level?
Geological boundary	○ The physical area/extent of impacts (local, regional, or international levels). Do impacts expand into significant/valued areas (e.g. conserved/protected areas)?
Duration and frequency	○ Are impacts intermittent, repetitive (how often) or continuous?
Cumulative impacts	○ Do impacts increase or magnify the effects of existing impacts? Do the cumulative impacts exceed the maximum acceptable level?
Risk	○ Probability of impacts occurring.
Socio-economic significance	○ Extent to which impacts might influence economy of the communities or social structure
People who are affected	○ Distribution of impacts on various groups of people, especially among the difference type of characteristics people and the risk groups such as native communities, children, elderly, and pregnant women etc.
Sensitivity of the community	○ Sensitivity and awareness of people towards impacts, whether there have been similar problems in the past, and whether there has been an establishment of a group or an organization relating to such issues or not.
Recovery	○ Time taken to reduce impacts or to recover, both naturally and by human assistance/intervention
Expense	○ Expense to reduce impacts, the responsible parties and whether the expense has to be paid immediately or not.
Capability of responsible agencies	○ Current potential of responsible agencies to manage impacts, whether there are supporting existing laws and regulations and whether local governmental organizations can handle impacts.
Positive impacts or benefits	○ Do the projects generate any positive impacts and if so in what ways? (do projects support quality of life values? living conditions in the community?)

6.11.1.1 Health Impact Assessment Methodology

Procedures for HIA are as follows:

1) **Screening:** Consider whether the project requires an EIA; if yes, an HIA should be done alongside the EIA.

2) **Scoping:** Identified project activities with potential to health impacts and various potential factors; hazardous chemicals or health threats, environment, factors of exposure, health impact, impacts on society and lifestyle. Details are shown in **Table 6-88**.

Table 6-88: Factors for Determining Scope and Type of Health Impact

Factor	Detail
Hazardous Chemicals or Health Threats	• Chemicals: heavy metals, toxic organic compounds. • Physical: noise and vibration • Biological: virus, bacteria. • Ergonomic: lifting of heavy material and inappropriate posture • Psychological: stress, annoyance, and nuisance • Social: lack of community relationship
Environment	• Change of environment quality: water quality, air quality • Change of utilization or acquiring resources: water use • Physical: noise, dust, radius, vibration
Factors of Exposure	• Exposure pathway: mouth or skin • Risk group: workers or people around the project area
Health Impact	• Death rate • Injury rate from infectious diseases or non-infectious diseases, acute or chronic effect • Rate of emotional impact, stress • Injuries and accidents • Impacts on next generation • Impacts on high-risk groups • Stimulate or enhance the severity of the disease • Cumulative impacts
Impacts on Society and Lifestyle	• Impacts on income, employment, and socio-economics • Impacts on local income, industrial sector and local agriculture • Impacts on migration and settlement • Impacts on environmental health • Impacts on society, culture, and lifestyle. • Impacts on education • Impact on social support network • Benefits to health from project operation

3) Assessment: Assess baseline information/profiling; determine significance; and report the results.

The Health Impact Assessment of this project will apply a Risk Assessment Matrix by considering the likelihood and severity of consequences.

- Likelihood is presented in the form of the probability that the risk might affect health. The score is assigned by considering past data and calculating the probability based on previous information on threats from environmental exposure, as shown in **Table 6-89**.
- Severity of consequences is set by analysis of severity of heath impacts, considering the worst case scenario, as shown in **Table 6-90**.

Table 6-89: Setting of Criteria of Likelihood by Consideration of Risk Opportunity Causing Health Impact

Incident Potential Rating	Score	Definition
Very low	1	No evidence that the situation could occur
Low	2	Can occur in theory, but no report of occurrence in the region or abroad
Medium	3	Occurred in one instance in Myanmar or abroad from the development of a similar project
High	4	Occurred in more than one instance in Myanmar or abroad from the development of a similar project
Very high	5	Have evidence of situation occurring during project operation in the same project, and occurred in Myanmar or abroad

Note: The definition might be adjusted depending on discretion of expertise and project characteristic.
Source: Adaptation from Department of Health, Philippines, available from http://doh.gov.ph/ehia.htm (2009)

Table 6-90: Setting of Severity of Consequences

Severity of Consequences	Score	Definition
No Significance	1	**No injuries or illness:** no effect on work or lifestyle and does not cause illness in community
Low	2	**Few injuries or illnesses**: impacts work or lifestyle: requires 2-3 days for recovery • Mild effects (skin irritation, food poison from bacteria)
Medium	3	**Medium injuries or illness:** impacts work or lifestyle: long-term/continuous group risk • Moderate effects (loud noise or disturbance, work condition.
High	4	**Permanent illness:** • Cause of disease has severe impacts which cause permanent illness in workers or communities risk groups (i.e. cancer from chemical exposure).
Very high/deadly	5	**Death:** • Cause of diseases is enhancing the severity of effect or effect to large population/over the handle of local governmental organizations

Note: The definition might be adjusted depending on discretion of expertise and project characteristic.
Source: Adaptation from Department of Health, Philippines, available from http://doh.gov.ph/ehia.htm (2009)

The significance rating of health impacts is determined using the likelihood and consequence of a particular health impact in a Matrix as shown in **Table 6-91**. If the significance of risk is rated as medium or high, suitable management or mitigation measures must be set to minimize impacts. If the significance of risk is rated as very high, specific mitigation measures must be adopted to reduce the impacts to an acceptable level. Details are shown in **Table 6-92**.

Table 6-91: Example of Significance Rating of Health Impact by using Matrix Method

Example of Health Risk Assessment Matrix			Likelihood				
			Very low	Low	Medium	High	Very high
			1	2	3	4	5
Severity of Consequences	Insignificant	1	Low (1)	Low (2)	Low (3)	Medium (4)	Medium (5)
	Low	2	Low (2)	Medium (4)	Medium (6)	Medium (8)	High (10)
	Medium	3	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)
	High/ Crisis	4	Medium (4)	Medium (8)	High (12)	High (16)	Very high (20)
	Very high/death	5	Medium (5)	High (10)	High (15)	Very high (20)	Very high (25)

Note: The definition might be adjusted depending on discretion of expertise and project characteristic.
Source: Adaptation from Department of Health, Philippines, available from http://doh.gov.ph/ehia.htm (2009)

Table 6-92: Example of Significance of Risk and Definition

Risk Level	Rating	Definition
Low	1-3	Acceptable level/ without control risk/ does not require additional management.
Medium	4-9	Acceptable level but must be controlled to prevent increased risk to unacceptable levels.
High	10-16	Unacceptable level/ the risk must be managed/ reduced to acceptable level.
Very High	17-25	Unacceptable level/ the risk must be managed/ reduced to acceptable level immediately.

Note: The definition might be adjusted depending on discretion of expertise and project characteristic following the HIA guideline criteria in HIA guideline (ONEP, 2008)
Source: Adaptation from Department of Health, Philippines, available from http://doh.gov.ph/ehia.htm (2009)

6.11.1.2 Screening

The PCML exploration drilling project is required to do an EIA. Therefore an HIA must be done alongside the EIA.

Project activities may affect the health of communities and workers. Project activities in each phase, such as the transportation of equipment/machines during installation phase, rig mobilization, installation and decommissioning during drilling phase and well abandonment, may cause acute or chronic impact to workers and communities' health. However, the duration of each activity is short. The installation phase of each well is 15 days, the drilling phase is 35 days per well, well testing is 10 days per well and well abandonment is 15 days per well.

Because the project well are offshore, the impact on public health is indirect and of low significance. The health impact assessment for the project will focus on project activities which impact communities around the shore base and occupational health for all project phases.

The potential health impacts identified as significant are presented in **Table 6-93**.

6.11.1.3 Project Scoping

The study area for the HIA consists of 2 sites:

- Offshore site: drilling rig; and
- Onshore site: shore base located at shore base in Thaketa, Myanmar and the Ranong shore base located in Thailand, used for storage, transfer and transport of materials and waste.

It is expected that 120 workers will be employed on the drilling rig, 8-10 workers on each of the supply/safety vessels and 8-10 extra people at the shore bases in Thaketa, Myanmar and the Ranong shore base located in Thailand. This scoping process will focus on work conditions such as occupational health and safety, and psychological impact, in each phase.

Table 6-93: Potential Health Impacts on Communities and Workers

Project Phase and activities	Potential Health Effect	Health Impact	
		Community	Worker
Installation Phase			
- Wastewater	- Unhygienic practice of ballast water and waste water may		+

Project Phase and activities	Potential Health Effect	Health Impact	
		Community	Worker
	cause disease		
- Waste Management	- Waste disposal, leaks or spills may lead to gastroenteritis	+	+
	- Marine accidents from hazardous waste transportation	+	+
- Rig Installation	- Injuries/death	+	+
- Equipment, material and rig transportation	- Transportation accident	+	+
	- Psychological disturbance	+	
Drilling Phase			
- Wastewater	- Unhygienic practice of ballast water and waste water may cause disease		+
- Waste Management	- Waste disposal, leaks or spills may lead to gastroenteritis	+	+
	- Marine accidents from hazardous waste transportation	+	+
- Drilling and Discharge of Mud and Cuttings - Drilling - Noise - Mud chemical mixing handle and discharge - Hydrogen Sulfide; H_2S	Injuries/death		+
	- Hearing impairment		+
	- Acute impact	+	+
Well Testing Phase			
- Wastewater	- Unhygienic practice of ballast water and waste water may cause disease		+
- Waste Management	- Waste disposal, leaks or spills may lead to gastroenteritis	+	+
	- Marine accidents from hazardous waste transportation	+	+
- Well Testing	- Air emission from flaring may cause hazards to health such as respiratory irritation or exacerbation of asthma. Light may have impacts on physiological and mental health of workers.	+	+
	- Acute impact		+
Well Abandonment			
- Wastewater	- Unhygienic practice of ballast water and waste water may cause disease		+
- Waste Management	- Waste disposal, leaks or spills may lead to gastroenteritis	+	+
	- Marine accidents from hazardous waste transportation	+	+
- Rig Demobilization and Well Abandonment	- Serious injuries/death	+	+
	- Transportation accident	+	+

Remark: + possibly cause impact

6.11.1.4 Health Impact Assessment

Health impacts, both "perceived" and real, were considered. Following the WHO health categories on types of health impacts, the potential impacts from the project were grouped and assessed as follows: communicable diseases; non-communicable diseases; accidents and injuries; malnutrition; psychosocial disorders (substance abuse); and social well-being (quality of life, equity).

Health impact assessment is considered from:

- Project information and environmental setting (**Chapter 2** and **Chapter 3**) which include health profiles, attitude survey, and sensitive groups
- Assessment and rating of health impact, as shown in **Table 6-89**, **Table 6-90** and **Table 6-92**, which include likelihood, severity and significance of health impact
- Mitigation measures

6.11.2 Health Impact Assessment for All Phases

From the screening process the following must be assessed to determine their health impacts:

- Public Health
  - Transportation
- Occupational Health
  - Air Quality
  - Hydrogen Sulfide (H2S)
  - Noise
  - Chemicals
  - Wastewater
  - Non-Hazardous Waste
  - Hazardous/Hazardous Waste
  - Accidents at Work Site
  - Transportation

6.11.3 Assessment of Impacts on Public Health

6.11.3.1 Assessment of Impacts from Transportation

Transportation of crew, materials and waste from the shore base in Thaketa, Myanmar and the Ranong shore base located in Thailand could result in accidents, resulting in injuries to the public.

Most of the material and equipment require for the installation phase is imported and will be transported by vessels and barges. Staff and crew members will be transported from the shore base to the rig by both barges and helicopter.

The majority of land transportation during the project duration is waste transportation. Wastes from the proposed project consist of solid and hazardous waste, which is transferred from the drilling rig and supply vessels to shore base in Thaketa, Myanmar and the Ranong shore base located in Thailand base and disposed of by the drilling contractor.

The potential health impacts on communities from hazardous exposure are considered to be of potential high severity, potentially long-term in duration in the case of serious accidents, medium in extent.

Without mitigation measures, the severity of health impacts from project activities arising from land and marine transportation is rated medium due to possibility of accidents and injury. The likelihood of severe accidents is rated as low.

The significance of impacts on community health is therefore rated as medium and impacts need to be controlled.

Likelihood	Severity of Impact	Impact Significance
Low	Medium	Medium

Impacts on community health from transportation of crew, materials and waste can be mitigated as follows:

- a safety zone of about 500-m radius will be established around the drilling rig.
- The area will be patrolled by 3 supporting vessels during the entire installation, drilling and demobilization period.
- PCML will provide project information to relevant stakeholders, such as fisheries and communities close to the shore base site at least 30 days prior to drilling operations.

Residual Significance

With these management measures for mitigating community health impacts, the extent and magnitude of health impact from transportation of crew, materials and waste will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.11.4 Assessment of Impacts on Occupational Health

6.11.4.1 Assessment of Impacts from Air Quality

Many studies have shown impacts from air quality on health depending on the type of pollutant, concentration level, and personal characteristics of the exposed population. The project activities and equipment, diesel-fuelled generators, transportation, and flaring are expected to emit air pollutants, including particulate matter (PM), carbon monoxide (CO), methane (CH_4), nitrogen oxides (NO_x), sulfur dioxides (SO_2) and carbon dioxide (CO_2).

At the local level, air pollutants with potential health impacts are PM, NO_x, SO_2, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and heavy metals from flaring operations and combustion emissions. These air pollutants are well known causes of acute and chronic health effects such as respiratory illnesses/irritation, cardiovascular diseases, exacerbation of asthma, lung cancer, and psychological stress/annoyance.

At the global level, pollutants of concern are global warming gases (greenhouse gases) such as CO_2, NO_x, and CH_4. Emission of these greenhouse gases can contribute to a hotter climate and severe weather conditions. Global warming has no direct impact on health but indirect impacts predicted are an increase in communicable diseases, such as malaria and dengue fever, and threatened food security and livelihoods due to frequent occurrences of drought or flooding. The maximum total air emissions for the Blocks M12, 13 & 14 exploration drilling project are estimated at 50,611.7 tonnes CO_2 equivalent, as shown in **Table 6-94**. When compared with available data on Myanmar's national CO_2 equivalent GHG emissions of 184,710,000 tonnes in 2012, including land use change (World Resources Institute, Climate Analysis Indicators Tool (CAIT)), the GHG emissions arising from the

proposed activities are insignificant (approximately 0.0274 %), and therefore will not significantly impact the environment.

Table 6-94: Estimated Total GHG Emissions for Drilling Phase

Project Phase	One Time CO_2 Release (ton CO_2)
Installation	10,112.0
Drilling	23,594.6
Testing	6793.1
Abandonment	10,112.0
Total	50,611.7

During drilling and well testing activities, various machinery and equipment generate pollution including dust, air emission and light, which may cause annoyance and reduce the quality of life of workers. Flaring and light may have impacts on the physiological and mental health of workers.

Air emissions impacts from energy use and transportation during installation and drilling operations could be adversely affected from fugitive emissions. Fugitive emissions could come from hazardous materials and wastes, such as paints, waste oil, and/or solvents. Volumes of fugitive emissions from chemicals and hazardous materials, and non-hazardous and hazardous waste are negligible and considered insignificant.

Emissions due to flaring could cause an increase in the concentration of polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs analyzed as BTEX), and heavy metals (Cd, Cr, Cu, Pb and Zn). These parameters are commonly found as by-products of inefficient flares and are considered hazardous to health when present in sufficient concentrations.

This Blocks M12, 13 &14 Exploration Drilling Project will be completed within a short period of time (about 75 days/well or 225 days for the 3 wells). In addition, all well locations are located in an open area offshore and these air pollutants are emitted to the atmosphere in very small quantities.

Without mitigation measures, the severity of health impacts from combustion and flaring emissions is rated low. The likelihood of these impacts is rated as low.

The significance of health impacts is therefore rated as low.

Likelihood	Severity of Impact	Impact Significance
Low	Medium	Medium

In order to mitigate potential impacts PCML will provide:

- an efficient flaring system, and
- suitable respiratory protection, such as protective clothing, full face visors and resuscitators to project workers.

Residual Significance

With these management measures for mitigating community health impacts, the extent and magnitude of health impact from transportation of crew, materials and waste will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.11.4.2 Assessment of Impacts from Hydrogen Sulfide (H_2S)

The presence of H_2S in the Blocks M12, 13 & 14 exploration wells is unknown at this stage. During drilling, H_2S could potentially accumulate in certain systems (such as shale shakers). H_2S is categorized as an extremely toxic gas. H_2S in the blood will reduce oxygen-carrying capacity, thereby depressing the nervous system. Concentrations of 20-50 ppm will result in eye irritation; concentrations of 50-500 ppm will cause respiratory tract irritation; concentrations exceeding 500 ppm will cause unconsciousness and death. Therefore H_2S could be harmful to occupational health through the respiratory pathway.

Without mitigation measures, the severity of health impacts from H_2S is rated medium. Due to the unknown amount of H_2S in the wells, the likelihood of these impacts is rated as medium. H_2S impacts on occupational health will be local in extent, short term in duration, irreversible in case of death and of medium magnitude.

The significance of health impacts is therefore rated as medium and impacts need to be controlled.

Likelihood	Severity of Impact	Impact Significance
Medium	Medium	Medium

Although H_2S is not expected to be present in harmful concentrations, PCML will implement measures to ensure that there are no impacts on the occupational health of its workers.

- PCML has installed combustion and H_2S gas detection monitoring systems in required areas.
- Alarms are distributed around the rig to ensure that all personnel are advised of a gas presence. The alarm stations each consist of two strobe lights, which signal blue for high level H_2S and clear for high level combustible gas. A horn sounds when the strobe is activated to draw attention to the light.
- PCML staff will be trained on the H_2S emergency response plan, and
- provided suitable respiratory protection, such as protected clothing, full face visors and resuscitators.

Residual Significance

With these management measures, the extent and magnitude of health impact from H_2S will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.11.4.3 Assessment of Impacts from Noise

Activities on the drilling rig may cause high noise levels exceeding the Occupational Safety & Health Administration (OSHA) workplace standard of 90 dB(A) (for eight hours exposure per day). Therefore hearing of workers could be affected.

Rig mobilization, placement, well abandonment and platform & equipment decommissioning cause the highest noise levels: about 120-190 dB(A) at vessel and 120-150 dB(A) at 100 m from the noise source. Other high noise levels are generated by crew/material transportation and drilling of exploration wells which produce 110 dB(A) and 85 -127 dB(A), respectively.

Equipment and areas with high noise levels on the rig have been identified, such as on the drilling floor, near the crane engines, in the main engine room, etc. Workers who work regularly in these high-noise areas will be provided with hearing protection equipment, such as ear muffs and ear plugs. Warning signs are posted at the entrance to these high-noise areas.

Without mitigation measures, the severity of health impacts from noise is rated medium due to possibility of hearing impacts. Because noise levels are high during many project activities, the likelihood of hearing impacts is rated as high.

The significance of health impacts is therefore rated as medium and impacts need to be controlled.

Likelihood	Severity of Impact	Impact Significance
High	Medium	Medium

In order to mitigate potential impacts from noise:

- The project will provide each worker with Personnel Protective Equipment (PPE), which includes hearing protection such as earplugs and earmuffs. They are designed to shield against dangerous noise over a high frequency range while allowing the wearer to hear lower frequency sounds.
- In addition, personnel will be provided with safety training to ensure that all workers practice under safety operation and regulation of work.
- The vessel and machine will be properly maintained and serviced according to the maintenance schedule.

Residual Significance

With these management measures, the extent and magnitude of health impact from high noise will have a residual significance ranked as low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.11.4.4 Assessment of Impacts from Chemicals

For drilling of the exploration wells, Seawater, and Water Based Mud (WBM) will be used. Most chemicals used in the WBM are non-hazardous; however, exposure to many of the chemicals could cause irritation and in some cases lung damage (**Table 6-95**). The workers who are responsible for mixing the chemicals for the drilling mud, and those that handle these chemicals may be potentially at risk. Workers can be exposed to the chemicals through the following exposure routes: inhalation, dermal or eye contact, and ingestion.

Table 6-95: Permissible Exposure Limits (PEL) over 8-hour TWA

Chemicals	Permissible Exposure Limit (8-hr TWA)
Soda ash M3 or Disodium carbonate)	Not applicable
Caustic Soda or sodium hydroxide	2 mg/m^3 (WEL-TWA, respirable dust)
Bentonite spud	0.1 mg/m^3 of Australia (WEL-TWA, respirable dust)
Barite	0.1 mg/m^3 of Australia (WEL-TWA, respirable dust)
Starch	Not applicable
Polyanionic cellulose	Not applicable
DUO-TEC - Xanthan - GumGlyoxal	 Not applicable 0.1 mg/m^3 TLV
Citric acid	4 mg/m^3 (WEL-TWA respirable dust)
Poly plus dry	Not applicable
Calcium Carbonate	4 mg/m^3 (WEL-TWA, respirable dust)
Aliphatic amines	Not applicable

Source: 1. MSDS, Chemical Data Bank, Pollution Control Department of Thailand

Health impact from the project chemicals mostly consist of irritation to the skin, eye and respiratory tract for short-term exposure, with varying health impacts for longer term exposure. Potential illnesses from project chemicals can be categorized by disease outcome as shown in **Table 6-96**.

Table 6-96: Potential Occupational Illness from Project Chemicals

Disease	Example
Respiratory disease	Asthma, benign pneumoconiosis (baritosis)
Skin disease	Contact dermatitis (allergic or irritant)
Cancers and malignant blood disease	Bladder cancer, kidney cancer, leukemia
Poisoning	Poisoning by chemicals

Source; Disease category obtained from IPIECA/OGP, Health Performance Indicators; A guide for the Oil and Gas Industry

Without mitigation measures, the severity of health impacts from exposure to chemicals is rated medium due possible lung damage. The likelihood of chemical exposure of the workers responsible for preparing the drilling mud is rated as medium.

The significance of health impacts is therefore rated as medium and impacts need to be controlled.

Likelihood	Severity of Impact	Impact Significance
Medium	Medium	Medium

In order to mitigate potential impacts from chemicals PCML will:

- implement safety procedures for proper storage, handling, and disposal of mud chemicals recommended under the MSDS. Hazard prevention measures as demonstrated in MSDS will be strictly followed.
- Handling and mixing of the chemicals will be allowed only in well ventilated areas.
- Personnel directly involved with handling and mixing chemicals are provided with awareness training on the hazards of the chemicals.
- PPE usage, such as dust masks or respirators, gloves, coveralls, eye glasses, safety boots, full face visors, eye shield will be strictly enforced.
- Hazardous chemicals will be segregated from non-hazardous ones.
- PCML will provide eye wash stations located at practical locations throughout the rig. The MSDS are provided in the storage areas.
- Chemical spill kits are provided onsite, including containers and absorbent materials to clean up spills.
- In case of accidental workers exposure, an onsite health clinic is equipped with first aid equipment and medic(s) to provide immediate response.
- For serious injuries or emergencies, PCML has contracted an international health service provider for medical evacuation and repatriation services. PCML can request this service by placing an emergency call to an alarm center at any time: 24 hours a day, 365 days a year.

Residual Significance

With these management measures, the extent and magnitude of health impact from hazardous chemical exposure will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.11.4.5 Assessment of Impacts from Wastewater

Project wastewater consists of effluent from sanitation facilities, drainage, food canteen facilities and ballast water. Total wastewater quantity generated during the project is expected to be 2,025 m^3. Drainage water will be collected and treated at the oil/water separator, which is installed on the rig and three support vessels. The oil/water separator will separate water from oil prior to discharging the water portion to the sea at a distance of over 12 nautical miles (22.2 km) from the nearest shore. Treated wastewater shall comply with MARPOL 73/78 annex 4 and 26 requirements, which regulate pollution prevention of vessel and ship drainage (oil content < 100 ppm discharged at more than 12 nautical miles (22.2 km) from the nearest shore or not over 15 ppm at less than 12 nautical miles (22.2 km)). Results of treated water are under the MARPOL 73/78 and Myanmar NEQG.

Unhygienic practices in the work place can promote the spread of vector-borne diseases amongst project employees. The drainage system may act as a vector breeding area and contaminate ballast water with bacteria, cholera or any non-indigenous organisms. There is the potential for contamination of supply and usage water, which can cause epidemic diseases such as cholera disease. However, the drilling rig will be towed from drilling locations that are close to Blocks M12, 13 & 14. Therefore, no non-indigenous organisms are expected to contaminate ballast water. Also, the water treatment units on the rig will achieve water quality meeting MARPOL discharge standards.

Without mitigation measures, the severity of health impacts from wastewater is rated medium due to possibility of vector borne diseases. However with containment and treatment systems on board the rig and vessels, the likelihood of impacts is rated as low.

The significance of health impacts is therefore rated as medium and impacts need to be controlled.

Likelihood	Severity of Impact	Impact Significance
Low	Medium	Medium

For mitigating possible impacts from wastewater PCML will:

- regularly maintain the perimeter drainage and treated water systems to be efficient.
- PCML will ensure that the drilling rig does not become a breeding ground area for any disease vectors.
- Supply and usage water will be kept in water tanks to avoid contamination from any vectors.
- PCML will strictly enforce good housekeeping practices to prevent vector born diseases from spreading on the drilling site.
- Health awareness training will be provided to project workers to improve hygienic practices on site.

Residual Significance

With these management measures, the extent and magnitude of health impact from wastewater will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.11.4.6 Assessment of Impacts from Non-hazardous and Hazardous Waste

Non-Hazardous Waste

Non-hazardous wastes produced from project activities are composed of waste, food waste, paper, and scrap wood and metals. It is estimated that 4-5 tonnes of domestic rubbish will be produced per month

of operation (This amount is derived from PCML's previous exploration drilling experience in Myanmar Operations). Solid wastes may have an impact on occupation health such as physical health, mental health, and quality of life: for example, food remains may cause foul smells, unpleasant ambience, act as a fire hazard and provide a habitat for disease carriers including bacteria flies.

The waste is non-hazardous in nature. Without mitigation measures, the severity of health impacts from non-hazardous waste is therefore rated low and the likelihood of impacts as low.

The significance of health impacts is therefore rated as low.

Likelihood	Severity of Impact	Impact Significance
Low	Medium	Low

Mitigation measures will include:

- Food wastes will be separated from non-food waste and macerated before discharge overboard.
- The remaining non-hazardous waste will be classified and sorted before treatment, disposal or recycle.
- These wastes will be contained in sealed containers and stored at the shore base for appropriate disposal.

Residual Significance

With these management measures, the extent and magnitude of health impact from hazardous chemical exposure will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

Hazardous Waste

Based on previous similar operations, the amount of hazardous waste produced during operation is expected to be 0.5 ton/month. Hazardous wastes generated by this project consist of slop oil, spent lube oil, greases and hydraulic fluids, batteries, rags and materials contaminated with oil, grease, solvents, and mercury and containers. The hazardous waste will be managed by the drilling contractor onshore for transportation and hazardous waste treatment after the operation is finished.

In cases of spillage during handling and transport, hazardous waste may impact personnel. Exposure impacts can cause irritation to eyes, skin and the respiratory tract and, in the case of flammable hazardous waste, can cause a fire and potentially put project personnel at risk.

Without mitigation measures, the severity of health impacts from hazardous waste is rated medium due to the hazardous nature of the waste. The likelihood of impacts is rated as low.

The significance of health impacts is therefore rated as medium and impacts need to be controlled.

Likelihood	Severity of Impact	Impact Significance
Low	Medium	Medium

In order to mitigate potential impacts from Hazardous wastes:

- Hazardous wastes will be stored in closed containers on covered skips for collection and disposal by the drilling contractor.

- In addition, awareness programs and Personnel Protective Equipment (PPE), such as goggles, face shields, gloves, footwear and specialized clothing when handling chemicals, are provided to all personnel involved with transporting and handling hazardous waste.
- PCML will provide chemical and oil spill response plan and spill kits.

Residual Significance

With these management measures, the extent and magnitude of health impact from hazardous waste exposure will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.11.4.7 Assessment of Impacts from Industrial Accidents at Work Site

Occupational accidents can cause injuries and illnesses to workers at the drilling site, and in worst-case scenario, death. PCML's operations involve handling of tools and heavy equipment which can harm worker's health if proper safety training and procedures are not implemented strictly. The project activities which have potential to cause accidents are rig installation, rig mobilization, drilling, well testing and well abandonment. These activities can cause collisions, objects falling and cutting. Collision accidents caused by unplanned events are discussed in **Section 6.12.3**.

Statistics on Occupational injuries in the petroleum industry in from Oil & Gas UK are shown in **Table 6-97**, indicate that the highest number of injuries and fatalities is in the oil refinery and gas separation sector followed by the drilling sector.

Table 6-97: Oil & Gas UK Performance Summary

Year	Fatalities	Major/Specified Injuries	Over-Seven-Day Injuries	Dangerous Occurrences	Man-Hours
2007	1	30	98	410	43,464,025
2008	0	26	90	343	47,167,713
2009	0	36	95	343	44,009,650
2010	0	23	85	397	43,897,119
2011	2	25	72	347	45,081,195
2012	0	27	70	260	51,339,945
2013	0	32	81	316	56,695,543
2014	2	16	103	306	56,793,896
2015	0	15	68	262	53,778,551
2016	1	18	65	232	52,332,393
10-year average	0.6	24.8	82.7	321.6	49,456,003

Source: Oil & Gas UK, 2016

Without mitigation measures, the severity of health impacts from accidents is rated as medium based on the permanent partial disabilities observed during drilling. The likelihood of partial disabilities is rated as medium.

The significance of health impacts from site accidents is therefore rated as Low.

Likelihood	Severity of Impact	Impact Significance
Low	Medium	Medium

Accidents are mitigated by:

- safety training and awareness programs to ensure that all project personnel are aware of the potential risks and have the necessary skills to perform their work in a safe and responsible manner.

- PPE is provided to all workers on site. Minimum PPE includes safety boots, eye shield, helmet and ear plugs. Gloves, safety glasses, full face visors, dust masks and work vest for overboard work are also provided, depending on the nature of the work.
- Gas, fire and H_2S detection and alarm systems are provided around the rig in order to ensure that all personnel are advised of gas conditions. Fire and smoke detection systems are installed and provide entire coverage for the rig. Portable fluid fire extinguishers of appropriate types and sufficient number are in accommodation spaces, service spaces and fire stations.
- Drilling Rig's survival equipment is composed of four life rafts, inclusive of deck cradles, hydrostatic release units and emergency packs. The total capacity is about 120 persons. PCML will provide 120 life jackets, 10 lifebouys, 10 life rings and 2 escape nets for over side disembarkation.
- PCML's HSE will be enforced to ensure that all safety standards and regulations are applied and provide necessary support in case of accidents.
- A workplace safety and health committee will be established with the intention of achieving a safe and healthy workplace.
- An Emergency Response Plan such as blowout, fire/explosion, fuel or chemical spill, tropical cyclone and cyclone response plan and hydrogen sulphide (H_2S) contingency plan is in place to ensure that accidents are effectively managed.
- First aid kits, burn kit, resuscitators, and stretchers are provided at the clinic located onsite and served by two trained medics.
- For serious injuries or emergencies, PCML has contracted an international health service provider for medical evacuation and repatriation services. PCML can request this service by placing an emergency call to an alarm center at any time: 24 hours a day, 365 days a year.

Residual Significance

With these management measures, the extent and magnitude of health impact from hazardous chemical exposure will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.11.4.8 Assessment of Impacts from Transportation

The exploration drilling program will involve the transportation of equipment, material, rig transportation, crew, crude oil and waste. Project transportation will include land and marine transportation.

Most of the material and equipment for exploration drilling operations is imported and will be transported by vessels and barges. Staff and crew members will be transported from the shore base to the rig by both barges and helicopter. The safety zone around the project site is 500 m around the drilling rig. Three supporting vessels will patrol the area during the entire installation, drilling and demobilization period.

Waste transportation contributes to the majority of land transportation during the project period. Wastes from the proposed project consist of solid and hazardous waste which transferred from the drilling rig and supply vessels to the shore base in Thaketa, Myanmar and the Ranong shore base located in Thailand and disposed of by the drilling contractor.

Impacts from accidents and exposure to waste are discussed above and not included transportation here. Without mitigation measures, the severity of health impacts from land and marine transportation is rated low. The likelihood of impacts is rated as very low.

The significance of health impacts from land and marine transportation is rated as low.

Likelihood	Severity of Impact	Impact Significance
Very Low	Low	Low

In order to mitigate potential impacts from land and marine transportation:

- PCML will provide project information to relevant stakeholders such as fisheries and communities close to the shore base site at least 30 days prior to drilling operations.
- First aid kits, burn kit, resuscitators, and stretchers are provided at the clinic located onsite and served by trained medics.
- For serious injuries or emergencies, PCML has contracted an international health service provider for medical evacuation and repatriation services. PCML can request this service by placing an emergency call to an alarm center at any time: 24 hours a day, 365 days a year.

Residual Significance

With these management measures, the extent and magnitude of health impact from land and marine transportation will have a residual significance ranked as Low.

Residual Significance	Positive	Negligible	Low	Medium	High

6.12 Impact Assessment for Unplanned Events

6.12.1 Unplanned Events Considered

For the PCML Offshore Exploration Drilling Project, the unplanned events considered were:

(1) Collision;

(2) Fuel/Chemical Spill from Drilling Rig;

(3) Blowout;

(4) Tropical Cyclone (Typhoon);

(5) Fire & Explosion

These unplanned events will be assessed by determining possible causes, likely receptors affected, probability and consequences of the events and the level of significance (high, medium low or insignificant).

6.12.2 Risk Determination for Unplanned Events

The significance of risk of unplanned events is determined by assessing the potential impact of an activity on the environment, social or health conditions and the likelihood of that risk occurring with effective management measures in place. The residual risk is an indication of the significance of an environmental, social or health impact and the probability of the event occurring, after application of management measures.

Where no meaningful measurable environmental, social or health impact can occur, a rating of negligible has been given. Where a positive impact has been identified a rating of positive impact has been given.

The probability of a specific event occurring can be determined either in terms of historical precedence or by calculation.

6.12.2.1 Probability

The probability of a specific event occurring can be determined either in terms of historical precedence or by calculation. Probability has been categorized as shown in **Table 6-98**.

Table 6-98: Criteria for Probability Frequency

Probability of Occurrence		
Likelihood	**Score**	**Frequency**
<1 in 100,000 (Remote)	1	<Once in 100 Projects
1 in 5,000 – 100,000 (Unlikely)	2	Once in 50-100 Projects
1 in 100 – 5000 (Quite Likely)	3	Once in 10-50 Projects
1 in 10 – 100 (Likely)	4	Once in 1-10 Projects
1 in 1 – 10 (Very Likely)	5	Once per Project
1 in 1 (Definte)	6	> Once per project

6.12.2.2 Consequence

The consequence of an event occurring is determined according to a number of themes:

- Environment (physical and ecological)
- Society (including socio-economic)

- Health and Safety
- Reputation

Each of these has a set of pre-defined criteria associated with them, which classify the level of consequence as shown in **Table 6-99**.

Table 6-99: Criteria for Consequence Severity

Level of Consequence	Score	Issues	Definitions
A+	7	Environment	Regional scale, long-term Impact
		Society	Civil unrest; closure of plant
		Health and Safety	Multiple off-site and on-site fatalities or permanent disabilities
		Reputation	International concerns; major ventures terminated
A	6	Environment	Large scale, long-term (decades)Impact
		Society	Public protest; disruption of production; loss of livelihood to sector
		Health and Safety	Multiple on site fatalities or permanent disabilities
		Reputation	Persistent national concerns; long-term impact
B	5	Environment	Medium scale, medium term (years) impact
		Society	Official complaints; loss of livelihood > 10 persons
		Health and Safety	Major illness/disability
		Reputation	Medium term national concerns; operations curtailed
C	4	Environment	Medium scale, short-term (months) impact
		Society	Long-term nuisance; loss of income > 10 persons
		Health and Safety	Illness or injury leading to lost time > 4 days
		Reputation	Short-Term regional concerns; close scrutiny
D	3	Environment	Short-Term (weeks) impact
		Society	Temporary nuisance; > 5 third party complaints
		Health and Safety	Illness or injury leading to lost time < 4 days
		Reputation	Short-Term local concern; some impact on asset
E	2	Environment	Localised (immediate area), temporary Impact
		Society	Temporary nuisance; < 5 third party complaints
		Health and Safety	Illness or injury requiring first aid or medication
		Reputation	Local mention only; freedom to operate unaffected
F	1	Environment	No measurable impact
		Society	No complaints
		Health and Safety	No injury or illness
		Reputation	No injury or illness

6.12.2.3 Risk Matrix

The level of risk can then be identified using a matrix comparing probability with consequence, as shown in **Table 6-101**. The matrix consists of:

- Score of consequence (row) from 7 to 1: to indicate increasing severity of the consequence if such risk occurred.
- Score of probability (column) from 1 to 6: on the basis of historical evidence or calculation.

Risk Significance Level = Consequence x Probability

The risk level can be separated into four levels "Low (Score = 1-4)", Medium (Score = 5-12), "High (Score = 14-20) or "Severe (Score = 21-45)", shown in **Table 6-100**.

If the risk is determined to be "Medium" or "High", it needs to be managed to reduce the frequency of occurrence or to mitigate any consequences to achieve a risk which is "As Low As Reasonably Possible" (ALARP). If the risk is determined to be "Severe" (i.e. unacceptable), specific actions must be developed to reduce the risk to an acceptable level, which may involve a full Quantified Risk Assessment (QRA).

Table 6-100: Significance of Unplanned Events Risk

Risk Level	Rating	Definition
Low	1-4	Acceptable level/ without control risk/ does not require additional management.
Medium	5-12	Acceptable level but must be controlled to prevent increased risk to unacceptable levels.
High	14-20	Unacceptable level/ the risk must be managed/ reduced to acceptable level.
Very High	21-42	Unacceptable level/ the risk must be managed/ reduced to acceptable level immediately.

Note: The definition might be adjusted depending on discretion of expertise and project characteristic
Source: Adaptation from Thai Guideline for Onshore Exploration Drilling (2009)

Table 6-101: Risk Assessment Matrix

Risk Assessment Matrix						***Frequency/Likelihood***					
					Likelihood	<1 in 100,000	1 in 5,000 – 100,000	1 in 100 – 5000	1 in 10 – 100	1 in 1 - 10	1 in 1
					Frequency	<Once in 100 Projects	Once in 50-100 Projects	Once in 10-50 Projects	Once in 1-10 Projects	Once per Project	> Once per Project
						1	2	3	4	5	6
Consequence	**Environment**	**Society**	**Health and Safety**	**Reputation**		***Remote***	***Unlikely***	***Quite Likely***	***Likely***	***Very Likely***	***Definite***
	Regional scale, long-term impact	Civil unrest; closure of plant	Multiple off -site and on-site fatalities or permanent disabilities	International concerns; major ventures terminated	**A+ (7)**	**Medium (7)**	**High (14)**	**Severe (21)**	**Severe (28)**	**Severe (35)**	**Severe (42)**
	Large scale, long-term (decades) impact	Public protest; disruption of production; loss of livelihood to sector	Multiple on-site fatalities or permanent disabilities	Persistent national concerns; long-term impact	**A (6)**	**Medium (6)**	**Medium (12)**	**High (18)**	**Severe (24)**	**Severe (30)**	**Severe (36)**
	Medium scale, medium term (years) impact	Official complaints; loss of livelihood > 10 persons	Major illness/ disability	Medium term national concerns; operations curtailed	**B (5)**	**Medium (5)**	**Medium (10)**	**High (15)**	**High (20)**	**Severe (25)**	**Severe (30)**
	Medium scale, short-term (months) impact	Long-term nuisance; loss of income > 10 persons	Illness or injury leading to lost time > 4 days	Short-term regional concerns; close scrutiny	**C (4)**	**Low (4)**	**Medium (8)**	**Medium (12)**	**High (16)**	**High (20)**	**Severe (24)**
	Short-term (weeks) impact	Temporary nuisance; > 5 third party complaints	Illness or injury leading to lost time < 4 days	Short-term local concern; some impact on asset	**D (3)**	**Low (3)**	**Medium (6)**	**Medium (9)**	**Medium (12)**	**High (15)**	**High (18)**
	Localised (immediate area), temporary impact	Temporary nuisance; < 5 third party complaints	Illness or injury requiring first aid or medication	Local mention only; freedom to operate unaffected	**E (2)**	**Low (2)**	**Low (4)**	**Medium (6)**	**Medium (8)**	**Medium (10)**	**Medium (12)**
	No measurable impact	No complaints	No injury or illness	No mention	**F (1)**	**Low (1)**	**Low (2)**	**Low (3)**	**Low (4)**	**Medium (5)**	**Medium (6)**

6.12.3 Assessment of Impacts from Collision

Collisions could potentially occur during transport of materials, crew and/or crude oil, and during mobilization, drilling, production and abandonment.

Statistics of collisions in Myanmar are not readily available. The International Maritime Organization (IMO) keeps records of serious and very serious casualties of maritime accidents. Out of a total of 6,530 accidents that occurred over a 17-year period from 1995-2012, two were in Myanmar waters. One incident occurred in 2000, when a general cargo ship (the ASEAN Liberty) had an unspecified incident off Myanmar port. A second incident occurred in 2007, when the general cargo ship DOLPHIN II (flag State Panama) sank in bad weather off the west coast of Myanmar, en route to Yangon (Myanmar) from Chittagong (Bangladesh).[9]

Information from other jurisdictions was investigated to determine risk frequency and consequence.

The Bureau requires that all Collisions be reported. Effective July 17, 2006, MMS revised the regulations for incident reporting for Collisions are summarized in **Table 6-102**. The 122 collisions from 2008-2015.

Table 6-102: Collision Statistics for Oil and Gas Installations in the Gulf of Mexico

OTHER ***	2008		2009		2010		2011		2012		2013		2014		2015 ytd	
	GOM	PAC	GOM	PAC	GOM	PAC	GOM	PAC	GOM	PAC	GOM	PAC	GOM	PAC	GOM	PAC
Minor (≤ $25,000 damage)	8	0	7	0	1	0	2	0	1	0	7	0	5	0	0	0
Major (> $25,000 damage)	14	0	22	0	7	0	12	0	8	1	16	0	7	0	4	0
COLLISION TOTAL FOR THE YEAR	22	0	29	0	8	0	14	0	9	1	23	0	12	0	4	0
COMBINED TOTAL FOR THE YEAR	22		29		8		14		10		23		12		4	

Source: BSEE Database as of 3-Aug-2015

Therefore, the frequency or likelihood of collision is considered to be unlikely (once per 50-100 projects). Statistics indicate that fatalities are rare and a collision could result in multiple on-site fatalities, therefore, consequences to health and safety (H) are conservatively rated as "A". A collision could result in short-term regional concern and close scrutiny. Its consequence to reputation (R) is therefore rated as "C".

A collision would have a short-term impact (weeks-long) on the environment (E) and is rated as "D". Social impacts (S) are considered to cause long-term nuisance, such as loss of income for more than 10 (> 10) persons and are, thus, rated as "C"

9 International Maritime Organization. http://gisis.imo.org/Public/MCI/Default.aspx

The overall impact of a possible collision and related oil spill is ranked as medium, as shown in **Table 6-103**.

In conclusion, a collision is rated as having a medium, but mitigable and avoidable risk.

Likelihood of Impact	Severity of Impact	Impact Significance
Unlikely	Medium	Medium

The risk significance of collisions will be reduced by using the following mitigation measures:

- 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 and Fisheries, and water police)
- Establish 500 m safety zone around the drilling rig.
- Use support vessels to warn off traffic.
- Provide appropriate lights and warning signals on all vessels to prevent accidental collision.
- Should an incident occur, PCML's Emergency Response Plan would be implemented. Emergency response exercises will be held once a year.

Residual Risk

With these management measures, the extent and magnitude of impact from a collision will have a residual risk ranked as medium.

Residual Significance	Positive	Negligible	Low	Medium	High

Table 6-103: Collision Impacts

						Frequency/Likelihood					
					Likelihood	<1 in 100,000	1 in 5,000 – 100,000	1 in 100 – 5000	1 in 10 – 100	1 in 1 - 10	1 in 1
					Frequency	<Once in 100 Projects	Once in 50-100 Projects	Once in 10-50 Projects	Once in 1-10 Projects	Once per Project	> Once per project
						1	2	3	4	5	6
Consequence	**Environment (E)**	**Society (S)**	**Health and Safety (H)**	**Reputation (R)**		***Remote***	***Unlikely***	***Quite Likely***	***Likely***	***Very Likely***	***Definite***
	Regional scale, long temperate impact	Civil unrest; closure of plant	Multiple off-site and on-site fatalities or permanent disabilities	International concerns; major ventures terminated	**A+ (7)**						**Severe**
	Large scale, long-term (decades) impact	Public protest; disruption of production; loss of livelihood to sector	Multiple on-site fatalities or permanent disabilities	Persistent national concerns; long-term impact	**A (6)**		**H**				
	Medium scale, medium term (years) impact	Official complaints; loss of livelihood > 10 persons	Major illness/ disability	Medium term national concerns; operations curtailed	**B (5)**		**Medium**		**High**		
	Medium scale, short-term (months) impact	Long-term nuisance; loss of income > 10 persons	Illness or injury leading to lost time > 4 days	Short-Term regional concerns; close scrutiny	**C (4)**		**R S**				
	Short-Term (weeks) impact	Temporary nuisance; > 5 third party complaints	Illness or injury leading to lost time < 4 days	Short-Term local concern; some impact on asset	**D (3)**		**E**				
	Localised (Immediate area), temporary impact	Temporary nuisance; < 5 third party complaints	Illness or injury requiring first aid or medication	Local mention only; freedom to operate unaffected	**E (2)**	**Low**					
	No measurable impact	No complaints	No injury or illness	No mention	**F (1)**						

6.12.4 Assessment of Impacts from Fuel/Chemical Spill

Fuel spills may potentially occur during transport, handling and storage of fuel used or produced by the proposed offshore Blocks M12, 13 &14 Petroleum Exploration Project. This section reviews the historical spills that have most threatened the environment offshore. It focuses on the frequency of large spills in the OCS. **Table 6-104**)

Table 6-104: Large (≥1,000 bbl) U.S. OCS Platform Spills, 1964 to 2015

Spill Date	Planning Area1 Block Number	Water Depth (feet)	Miles to Shore	Volume Spilled (bbl)	Operator	Spill Description: Cause and Consequences
4/8/1964	EI 208	94	48	2,559	Continental Oil	Freighter struck Platform A, fire, platform and freighter damaged
10/3/1964	Hurricane			11,869	Event Total	Five platforms destroyed during Hurricane Hilda
	EI 208	94	48	5,180	Continental Oil	Platforms A, C, and D destroyed, blowouts (several days)
	SS 149	55	33	5,100	Signal O&G	Platform B destroyed, blowout (17 days)
	SS 199	102	44	1,589	Tenneco Oil	Platform A destroyed, lost storage tank
7/19/1965	SS 29	15	7	1,6882	Pan American	Well #7 drilling, blowout (8 days), minimal damage
1/28/1969	6B 5165 Santa Barbara Channel, CA	190	6	80,000	Union Oil	Well A-21drilling, blowout (10 days), 50,000 bbl during blowout phase, subsequent seepage 30,000 bbl (over decades), 4,000 birds killed, considerable oil on beaches
3/16/1969	SS 72	30	6	2,500	Mobil Oil	Submersible rig Rimtide drilling in heavy seas bumped by supply vessel, rig shifted and sheared wellhead, blowout (3 to 4 days)
2/10/1970	MP 41	39	14	65,000	Chevron Oil	Platform C, fire of unknown origin, blowout 12 wells (49 days), lost platform, minor amounts of oil on beaches
12/1/1970	ST 26	60	8	53,000	Shell Oil	Platform B, wireline work, gas explosion, fire, blowout (138 days). Four fatalities, 36 injuries, loss of platform, loss of 2 drilling rigs, minor amounts of oil on beaches
1/9/1973	WD 79	110	17	9,935	Signal O&G	Platform A oil storage tank structural failure
1/26/1973	PL 23	61	15	7,000	Chevron Oil	Platform CA storage barge sank in heavy seas
11/23/1979	MP 151	280	10	1,5003	Texoma Production	Mobile Offshore Drilling Unit (MODU) Pacesetter III's diesel tank holed, workboat contact in heavy seas
11/14/ 1980	HI 206	60	27	1456	Texaco Oil	Platform A storage tank overflow during Hurricane Jeanne evacuation
9/24/2005	Hurricane			5,066	Event Total	One platform and two rigs destroyed by Hurricane Rita
	EI 314	230	78	2,0002	Forest Oil	Platform J destroyed, lost oil on board and in riser
	SM 146	238	78	1,494	Hunt Petroleum	Jack-up Rig Rowan Fort Worth swept away, never found
	SS 250	182	69	1,5724	Remington O&G	Jack-up Rig Rowan Odessa legs collapsed
4/20/2010	MC 252	4,992	53	4,900,000	BP E&P	DWH rig, gas explosion, blowout (87 days to cap well), fire. Eleven fatalities, multiple injuries, loss of drilling rig sank, considerable oil on beaches, wildlife affected, and temporary closure of area fisheries
1Planning Area in GOM unless otherwise noted. GOM Planning Areas: EI - Eugene Island, HI - High Island, MC - Mississippi Canyon, MP - Main Pass, PL - South Pelto, SS - Ship Shoal, SM - South Marsh Island, ST - South Timbalier, WC - West Cameron, WD - West Delta GOM Planning Area Maps http://www.boem.gov/GOM- Official-Protraction-Diagrams/						
2Condensate						
3Diesel						
4Fuel and other petroleum products						
Source: U.S. DOI/BSEE OCS Spill Database, December 2015						

The frequency or likelihood of a fuel or chemical spill is considered conservatively as quite likely. The spill volume is relatively small, so the consequence of a worse case spill (nearshore) could be rated as short-term impact to environment "D", temporary nuisance on social "D", illness/injury requiring first aid or medication to health and safety "E", and short-term local concern to reputation "D".

The risk of impacts on health and safety, social and PCML's reputation is considered medium, as shown in **Table 6-105**, and can be considered significant. The risk of spills should be mitigated by implementing safety mitigation measures.

Likelihood of Impact	Severity of Impact	Impact Significance
Quite Likely	Medium	Medium

PCML will implement the following mitigation measures regarding fuel/chemical spills:

- Implement safety procedures as outlined in PCML's Oil Spill Response Plan.
- Ensure that Oil Spill Response service contract with service provider are in places.
- Proper training in the use and handling of the relevant chemicals and standard safety procedures implemented by all contractors.
- Appropriate medical care will be provided, clean-up will be carried out, and incident or accident reports will be filed.
- Provide spill clean up kits and training for designated rapid response team to clean up any spills.
- Store all chemicals in secured storage area with impervious (cement or plastic sheet) floor and bund wall. Handle all chemicals according to their MSDS.
- Investigate, correct and file incident or accident reports.

Residual Risk

With these management measures, the extent and magnitude of impact from fuel/chemical spills will have a residual risk ranked as medium.

Residual Significance	Positive	Negligible	Low	Medium	High

Table 6-105: Fuel/Chemical Spill Impacts

						Frequency/Likelihood					
					Likelihood	<1 in 100,000	1 in 5,000 – 100,000	1 in 100 – 5000	1 in 10 – 100	1 in 1 - 10	1 in 1
					Frequency	<Once in 100 Projects	Once in 50-100 Projects	Once in 10-50 Projects	Once in 1-10 Projects	Once per Project	> Once per project
						1	2	3	4	5	6
Consequence	**Environment (E)**	**Society (S)**	**Health and Safety (H)**	**Reputation (R)**		***Remote***	***Unlikely***	***Quite Likely***	***Likely***	***Very Likely***	***Definite***
	Regional scale, long temperate impact	Civil unrest; closure of plant	Multiple off-site and on-site fatalities or permanent disabilities	International concerns; major ventures terminated	**A+ (7)**						Severe
	Large scale, long-term (decades) impact	Public protest; disruption of production; loss of livelihood to sector	Multiple on-site fatalities or permanent disabilities	Persistent national concerns; long-term impact	**A (6)**						
	Medium scale, medium term (years) impact	Official complaints; loss of livelihood > 10 persons	Major illness/ disability	Medium term national concerns; operations curtailed	**B (5)**				**High**		
	Medium scale, short-term (months) impact	Long-term nuisance; loss of income > 10 persons	Illness or injury leading to lost time > 4 days	Short-Term regional concerns; close scrutiny	**C (4)**			**Medium**			
	Short-Term (weeks) impact	Temporary nuisance; > 5 third party complaints	Illness or injury leading to lost time < 4 days	Short-Term local concern; some impact on asset	**D (3)**			**E S R**			
	Localised (immediate area), temporary impact	Temporary nuisance; < 5 third party complaints	Illness or injury requiring first aid or medication	Local mention only; freedom to operate unaffected	**E (2)**	**Low**		**H**			
	No measurable impact	No complaints	No injury or illness	No mention	**F (1)**						

6.12.5 Assessment of Impacts from Blowout

A blowout is the uncontrolled release at the surface after an uncontrolled flow of formation fluids into the borehole. A blowout can result in the release of hydrocarbons (oil or gas) into the sea and surrounding environment at high pressure. This situation can cause effects on marine biota and the environment such as seabed sediment, seawater, benthos, plankton, fish, etc. The characteristics and dispersion of hydrocarbons released from blowout depend on physical and chemical properties of hydrocarbons in the target reservoir, meteorology, and hydrology. Important factors of meteorology and hydrology that have an influence on dispersion of hydrocarbons include current velocity, wind velocity, wave energy, wave breaking height, and air and water temperatures.

A blowout can lead to a disturbance of the seabed sediment and can cause it to be contaminated with hydrocarbons. Impacts on seabed sediment from blowout can cause continuous effects on benthos living in and around the area where blowout occurs. Benthos may be deposited by dispersed sediment or might be exposed to sediment contaminated with hydrocarbons resulting in toxicity.

In addition, blowouts can affect sea water quality. The dispersion of sediment and hydrocarbons from a blowout can cause an increase in water turbidity and cause seawater to become contaminated with hydrocarbons. As seawater quality deteriorates, marine biota (such as phytoplankton, zooplankton, fish, marine mammals, etc) may be affected. In areas where a hydrocarbon plume occurs, the amount of plankton will decrease due to the toxicity of hydrocarbons and the increase in water turbidity.

Moreover, hydrocarbon plumes (both oil and gas) may be toxic for fish and marine mammals. From the research of Patin (1999), it was found that natural gas can rapidly disperse to fish tissue by passing through fish gills. Fish may react to natural gas after exposure, moving away from the source to avoid the gas plume. Acute toxicity to fish may occur at a concentration of natural gas of about 1 mg/L. However, toxicity of natural gas to the marine environment is still not clearly known (Patin, 1999). EnCana (2006) found that in most cases of natural gas leakage under seawater, fish can avoid the area where the plume occurs. In addition, EnCana found that the overall impact from natural gas leakage does not cause any danger to fish. In addition to the effects on the marine environment, blowouts may cause severe danger to workers on the rig, especially in case of fire. This emergency situation may result in injury or death.

The SINTEF Offshore Blowout Database is a comprehensive event database for blowout risk assessment. The database includes information on 642 (December 2016) offshore blowouts/well releases that have occurred world-wide since 1955 and overall exposure data from the US Gulf of Mexico, Outer Continental Shelf and the North Sea. The blowouts/well releases are categorized in several parameters, emphasizing blowout causes. Data from the US Gulf of Mexico Outer Continental Shelf (US GoM OCS), Norwegian and UK waters are in general better documented than blowouts from other regions. From 1 January 1980 through 31 December 2014, a total of 292 blowouts/well releases from the US GoM OCS and the North Sea were consolidated in the database.

A user-friendly interface allows for customized search patterns. Statistics collected by the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) for blowouts in the Gulf of Mexico (with the most offshore oil and gas installations in the world) are summarized in **Table 6-106**. From 2006 to 2010, there were 27 blowouts. Of these, drilling activities accounted for 7 blowouts. Blowouts during 2006-2010 resulted in twelve fatalities and no injuries (all fatalities occurred during the Deepwater Horizon spill). From these data, it can be concluded that the probability of a blowout during exploration drilling is very low. There have been no blowouts in PCML's previous operation for Exploration and Petroleum Production Projects in Myanmar.

Table 6-106: Blowout Statistics for the Gulf of Mexico (2006-2010)

Year	# Blowouts	Details				Activities	Fatalities	Injuries
		Flow Underground	Flow Surface	Diverter Flow	Surface Equipment Failure			
2006	2	0	0	0	2	Production (1); Drilling (1);	1	0
2007	7	1	3	0	3	Production (2); Drilling (1); Workover (3); Other (1);	0	0
2008	8	1	3	1	3	Production (2); Drilling (4); Completion (1); Other (1);	0	0
2009	6	0	2	0	4	Production (1); Drilling (1); Completion (1); Motor Vessel (1); Other (3);	0	0
2010	4	0	1	0	3	Production (3); Completion (1);	11	0
Total	**27**	**2**	**9**	**1**	**15**		**12**	**0**

Source: www.boemre.gov/incidents/blowouts.htm

Based on the data presented in **Table 6-106**, the frequency or likelihood of a blowout is considered conservatively as unlikely. The spill volume could be large, so the consequence of a worse case spill reaching shore could be rated as large scale long-term impact to environment "A", long-term nuisance on social "C", multiple on-site fatalities to health and safety "A", and medium term national concern to reputation "B".

The risk of impacts from blowouts is considered medium, as shown in **Table 6-107**, and can be considered significant. The risk of blowouts should be mitigated by implementing safety mitigation measures.

Likelihood of Impact	Severity of Impact	Impact Significance
Unlikely	Medium	Medium

PCML will implement proper mitigation measures for preventing blowout:

- Perform a seafloor survey prior to exploration drilling in order to survey shallow gas pockets. (If shallow gas pocket is found in the drilling area, PCML will avoid the drilling of exploration wells that pass through the gas pocket and find a suitable location for drilling in order to prevent blowout.
- Install blowout preventer (BOP) in order to prevent blowout of hydrocarbons to environment.
- Hire drilling contractor with skill and experience from offshore drilling operations. The contractor will have skilled manpower and good equipment with a high standard for preventing blowouts. Workers must be trained in monitoring and prevention of blowouts.
- Always check down-hole pressure and mud circulating system.

- Provide emergency response plan in case of oil/gas spill and training following this plan. Training for using oil removal equipment will be provided.
- Ensure that Oil Spill Response service contract with service provider are in places.

Residual Risk

With these management measures, the extent and magnitude of impact from a blowout will have a residual risk ranked as medium.

Residual Significance	Positive	Negligible	Low	Medium	High

Table 6-107: Blowout Impacts

						Frequency/Likelihood					
					Likelihood	<1 in 100,000	1 in 5,000 – 100,000	1 in 100 – 5000	1 in 10 – 100	1 in 1 - 10	1 in 1
					Frequency	<Once in 100 Projects	Once in 50-100 Projects	Once in 10-50 Projects	Once in 1-10 Projects	Once per Project	> Once per Project
						1	2	3	4	5	6
Consequence	**Environment (E)**	**Society (S)**	**Health and Safety (H)**	**Reputation (R)**		***Remote***	***Unlikely***	***Quite Likely***	***Likely***	***Very Likely***	***Definite***
	Regional scale, long temperate impact	Civil unrest; closure of plant	Multiple off-site and on-site fatalities or permanent disabilities	International concerns; major ventures terminated	**A+ (7)**						Severe
	Large scale, long-term (decades) impact	Public protest; disruption of production; loss of livelihood to sector	Multiple on-site fatalities or permanent disabilities	Persistent national concerns; long-term impact	**A (6)**		**H E**				
	Medium scale, medium term (years) impact	Official complaints; loss of livelihood > 10 persons	Major illness/ disability	Medium term national concerns; operations curtailed	**B (5)**		**R**		**High**		
	Medium scale, short-term (months) impact	Long-term nuisance; loss of income > 10 persons	Illness or injury leading to lost time > 4 days	Short-Term regional concerns; close scrutiny	**C (4)**		**S**	**Medium**			
	Short-Term (weeks) impact	Temporary nuisance; > 5 third party complaints	Illness or injury leading to lost time < 4 days	Short-Term local concern; some impact on assets	**D (3)**						
	Localised (immediate area), temporary impact	Temporary nuisance; < 5 third party complaints	Illness or injury requiring first aid or medication	Local mention only; freedom to operate unaffected	**E (2)**	**Low**					
	No measurable impact	No complaints	No injury or illness	No mention	**F (1)**						

6.12.6 Assessment of Impacts from Typhoon

Tropical cyclones occur in the Gulf of Martaban. Myanmar is particularly vulnerable to cyclones originating in the Bay of Bengal during pre- and post-monsoon seasons from April to May and from October to November. These cyclones result in heavy rains, floods and storm surges, especially in the coastal region of Rakhine State. Cyclone-related disasters occur in this region every 3 to 4 years. On May 1-3, 2008, Cyclone Nargis occurred in the Bay of Bengal, and was the deadliest cyclone to hit the country. Myanmar Cyclones over the period 2008-2017 are listed **Table 6-108**.

Table 6-108: List of Myanmar Cyclones (2008-2017)

Name	SSHS Category	Year
Nargis	Category 4	2008
Giri	Category 4	2010
Viyaru	Tropical Storm	2013
Komen	Tropical Storm	2015
Roanu	Tropical Storm	2016
Duanmu	Tropical Storm	2016
Kyant	Tropical Storm	2016
Maarutha	Tropical Storm	2017
Mora	Severe Cyclonic Storm	2017

Primarily tropical cyclones represent a threat to the safety of offshore personnel and could result in multiple fatalities and damage to assets. Damage may also result in the leakage of materials held on the rigs, platforms or the supply vessels which could compound the effects of a tropical cyclone on the environment. Damage or loss of assets and human life in these circumstances could have a significant impact on the reputation of PCML. As tropical cyclones are a likely occurrence in the Project area, their frequency has been rated as "Very Likely"**.** Their consequences are potentially very serious in terms of Health (rated "A") and Reputation (rated "B") and serious in terms of environment (rated "E") and social (rated "D") as shown in **Table 6-109**. Although tropical cyclones cannot be directly mitigated, the effects on PCML's operations can be managed.

In conclusion, tropical cyclones are rated as having a medium-high impact that needs to be managed.

Likelihood of Impact	Severity of Impact	Impact Significance
Very Likely	Medium -High	Medium-High

PCML will implement the following mitigation measures regarding typhoons:

- Implement PCML's Tropical Storm Emergency Plan and Emergency Response Plan
- Proper training and safety procedures will be the main preventative measures to reduce the potential risk.
- In the unlikely event an accident should occur, the Emergency Response Plan would be implemented, which includes evacuation of personnel during severe circumstances.

Residual Risk

With these management measures, the extent and magnitude of impact from Tropical Cyclones will have a residual risk ranked as medium.

Residual Significance	Positive	Negligible	Low	Medium	High

Table 6-109: Tropical Cyclone Impacts

						Frequency/Likelihood					
					Likelihood	<1 in 100,000	1 in 5,000 – 100,000	1 in 100 – 5000	1 in 10 – 100	1 in 1 - 10	1 in 1
					Frequency	<Once in 100 Projects	Once in 50-100 Projects	Once in 10-50 Projects	Once in 1-10 Projects	Once per Project	> Once per project
						1	2	3	4	5	6
Consequence	**Environment**	**Society**	**Health and Safety**	**Reputation**		***Remote***	***Unlikely***	***Quite Likely***	***Likely***	***Very Likely***	***Definite***
	Regional scale; long temperate impact	Civil unrest, closure of plant	Multiple off-site and on-site fatalities or permanent disabilities	International concerns; major ventures terminated	**A+ (7)**						Severe
	Large scale; long-term (decades) impact	Public protest, disruption of production, loss of livelihood to sector	Multiple on-site fatalities or permanent disabilities	Persistent national concerns; long-term impact	**A (6)**			**H**			
	Medium scale; medium term (years) impact	Official complaints, loss of livelihood > 10 persons	Major illness/ disability	Medium term national concerns; operations curtailed	**B (5)**			**R**	**High**		
	Medium scale; short-term (months) impact	Long-term nuisance, loss of income > 10 persons	Illness or injury leading to lost time > 4 days	Short-Term regional concerns; close scrutiny	**C (4)**			**Medium**			
	Short-Term (weeks) impact	Temporary nuisance. > 5 third party complaints	illness or injury leading to lost time < 4 days	Short-Term local concern; Some impact on asset	**D (3)**			**S**			
	Localised (Immediate area) Temporary impact	Temporary nuisance. < 5 third party complaints	illness or injury requiring first aid or medication	Local mention only. Freedom to operate unaffected.	**E (2)**	**Low**		**E**			
	No measurable impact	No complaints	No injury or illness	No mentions	**F (1)**						

6.12.7 Assessment of Impacts from Fire or Explosion

Fire is an inherent risk in drilling for gas and oil because of their flammability. The most serious accidents on drilling ships and platforms of various types (semi-submersible, submersible, mobile, stationary) during 2010-2015 are given in **Table 6-110**.

Table 6-110: Serious accidents on drilling ships and platforms of various types

The Gulf of Mexico	Fire, burst, large oil slippage	"Deepwater Horizon" drilling platform sank in the Gulf of Mexico at the coast of Louisiana which was after a powerful explosion on the platform followed by the 36-hour fire. 11 people were lost.
18.12.2011 The Sea of Okhotsk	Capsizing of the platform	"Kol'skaya" drilling platform turned over in stormy weather when it was towing from Kamchatka to Sakhalin. The waves were 5-6 meters high and the water temperature was a zero degrees. According to the latest data, only 14 people among 67 victims are rescued.
25.03.2012 The North Sea	Gas condensate leakage	There was a large leak of natural gas on "Elgin" offshore platform belonging to "Total" company. The accident caused a security threat of people and environment.
23.07.2013 The Gulf of Mexico	Flow of gas, burst and fire	The staff of tried to put the anti-blowout preventer in action, but operation was not successful. 44 people were evacuated. After that there was burst followed by fire.
23.10.2014 The Caspian Sea	Burst and fire	On the "SOKAR" platform there were burst and fire. The accident causes are unknown. 12 people fell into the sea.
1.04.2015 The Gulf of Mexico	Fire on the platform	There was burst on the "Abkatun Alfa" platform belonging to the Pemex company. The platform lit up. Nearly 300 people were evacuated, 16 people were injured, 4 people were lost.

The causes of accidents on offshore drilling rigs are detailed in **Table 6-111**.

Table 6-111: Causes of accidents on offshore drilling rigs

The causes of accidents	The accidents terminated to loss of platforms		Serious accidents		Insignificant damages	
	quantity	loss, million dollars	quantity	loss, million dollars	quantity	loss, million dollars
Burst and fire	33	521.5	19	52,1	12	1,86
Collision	-	-	2	2,0	37	1,95
Storm	24	234,6	17	65,8	20	6,6
Round trip of jacket legs	3	21,0	13	49,9	6	3,3
Preparation for transportation	4	205,0	-	-	1	0,1
Transportation	9	56,2	16	84,4	3	0,75
Drilling	9	59,0	11	34,8	-	-
Unknown	10	85,5	7	150,4	11	3,75

Reference: International Journal of Applied and Fundamental Research (2015).

Based on the Gulf of Mexico statistics (Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE)), there were a total of 130 incidents involving fires and explosions during 2010 in the Gulf of Mexico. These incidents resulted in 129 fires and 4 explosions. Only 10 fires occurred during drilling: these fires did not result in injuries or pollution[10].

The consequence of a fire to health and safety may be lethal, although statistics suggest fatalities are very rare and injuries and lost time incidents are much more common. The risk to Health and Safety (H) can thus be conservatively rated as "B" (Major illness or disability). The consequence of this risk

10 http://www.boemre.gov/incidents/firesexplosion.htm

to Social (S) can be rated as a temporary nuisance, or "D". The risk to environment (E) as localized and temporary impacts, rated as "E" and to reputation as some impact on assets, rated as "D".

Because the frequency/likelihood of a fire can be considered quite likely, as shown in **Table 6-111**, the risk of impacts is considered medium for environment, PCML's reputation and society, and high for health and safety, as shown in **Table 6-112**. The significance of a fire to Environment, Social, Health and Safety, and Reputation can be considered significant and should be mitigated by implementing safety mitigation measures.

In conclusion, fire is rated as having a medium-high but mitigable and avoidable risk.

Likelihood of Impact	Severity of Impact	Impact Significance
Quite Likely	Medium	Medium

PCML will implement the following mitigation measures regarding fire:

- Install fire extinguishers, alarms and windsocks (to be audible and visible from whole site).
- PCML will implement its Emergency Response Plan Procedure to mitigate impacts if a fire occurs as well as to minimize the risk of a fire.

Residual Risk

With these management measures, the extent and magnitude of impact from a fire or explosion will have a residual risk ranked as medium.

Residual Significance	Positive	Negligible	Low	Medium	High

Table 6-112: Fire Impacts

						Frequency/Likelihood					
					Likelihood	<1 in 100,000	1 in 5,000 – 100,000	1 in 100 – 5000	1 in 10 – 100	1 in 1 - 10	1 in 1
					Frequency	<Once in 100 Projects	Once in 50-100 Projects	Once in 10-50 Projects	Once in 1-10 Projects	Once per Project	> Once per project
						1	2	3	4	5	6
Consequence	**Environment**	**Society**	**Health and Safety**	**Reputation**		***Remote***	***Unlikely***	***Quite Likely***	***Likely***	***Very Likely***	***Definite***
	Regional scale; long temperate impact	Civil unrest, closure of plant	Multiple off-site and on-site fatalities or permanent disabilities	International concerns; major ventures terminated	**A+ (7)**						**Severe**
	Large scale; long-term (decades) impact	Public protest, disruption of production, loss of livelihood to sector	Multiple on-site fatalities or permanent disabilities	Persistent national concerns; long-term impact	**A (6)**						
	Medium scale; medium term (years) impact	Official complaints, loss of livelihood > 10 persons	Major illness/ disability	Medium term national concerns; operations curtailed	**B (5)**			**H**	**High**		
	Medium scale; short-term (months) impact	Long-term nuisance, loss of income > 10 persons	Illness or injury leading to lost time > 4 days	Short-Term regional concerns; close scrutiny	**C (4)**			**Medium**			
	Short-Term (weeks) impact	Temporary nuisance. > 5 third party complaints	illness or injury leading to lost time < 4 days	Short-Term local concern; Some impact on asset	**D (3)**			**R S**			
	Localised (Immediate area) Temporary impact	Temporary nuisance. < 5 third party complaints	illness or injury requiring first aid or medication	Local mention only. Freedom to operate unaffected.	**E (2)**	**Low**		**E**			
	No measurable impact	No complaints	No injury or illness	No mentions	**F (1)**						

6.13 Summary of Residual Significance/Risk Rankings from Exploration Drilling

The residual risk rankings of the impact assessment of the Exploration Drilling unplanned events on environmental, social, health and unplanned aspects are summarized below in **Table 6-113** to **Table 6-118**.

Table 6-113: Installation Phase Significance Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Physical Environmental Impact Assessment			
1. Air Quality	2.1 Crew/Materials Transport	2.1.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	Negligible
	2.2 Offshore Fuel Storage & Handling	2.2.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	Negligible
	2.3 Energy Use	2.3.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	Negligible
2. Seawater Quality	2.1 Offshore Fuel Storage & Handling	2.1.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Negligible
	2.2 Hazardous Materials Handling and Storage	2.2.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Negligible
	2.3 Wastewater Disposal	2.3.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Negligible
	2.4 Non-Hazardous and Hazardous Waste Handling and Storage	2.4.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Negligible
	2.5 Rig Placement	2.5.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Negligible
3. Sediment Quality	3.1 Offshore Fuel Storage & Handling	3.1.1 Potential contamination from spills, sediment disturbance and increase in suspended solids	Negligible
	3.2 Hazardous Materials Handling and Storage	3.2.1 Potential contamination from spills, sediment disturbance and increase in suspended solids	Negligible
	3.3 Rig Placement	3.3.1 Potential contamination from spills, sediment disturbance and increase in suspended solids	Negligible

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Ecological Environmental Impact Assessment			
4. Marine Biota, Endangered Species, Sensitive/Protected Areas	4.1 Crew/Materials Transport	4.1.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	4.2 Offshore Fuel Storage & Handling	4.2.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	4.3 Wastewater Disposal	4.3.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	4.4 Hazardous Materials Handling and Storage	4.4.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	4.5 Presence of Equipment and Facilities	4.5.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	4.6 Rig Placement	4.6.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
Social Impact Assessment			
5. Fishing	5.1 Crew/Materials Transport	5.1.1 Removal of fishing equipment and other obstacles from the drilling area may cause damage to fishing equipment 5.1.2 Loss of fishing area could directly affect the income of fisherman 5.1.3 Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment. 5.1.4 Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.	Low
	5.2 Wastewater Disposal	5.2.1 Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.	Low
	5.3 Presence of Equipment and Facilities	5.3.1 Loss of fishing area could directly affect the income of fisherman 5.3.2 Project activities may result in collisions or accidents that would potentially affect fishermen and project	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
		equipment.	
	5.4 Rig Placement	5.4.1 Loss of fishing area could directly affect the income of fisherman 5.4.2 Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment.	Low
6. Shipping	6.1 Crew/Materials Transport	6.1.1 Increased traffic 6.1.2 Potential disruption to traffic in case of accident	Low
	6.2 Presence of Equipment and Facilities	6.2.1 Increased traffic 6.2.2 Potential disruption to traffic due to placement	Low
	6.3 Rig Placement	6.3.1 Increased traffic 6.3.2 Potential disruption to traffic due to placement	Low
7. Waste Management	7.1 Non-Hazardous and Hazardous Waste Handling and Storage	7.1.1 Waste contamination to environment, reduced well-being due to exposure or perceived exposure to hazards. 7.1.2 Pressure on existing waste management facilities.	Negligible
	7.2 Wastewater Disposal	7.2.1 Waste contamination to environment, reduced well-being due to exposure or perceived exposure to hazards.	Negligible
8. Pipeline/Cable/ Underwater Structures	8.1 Rig Placement	8.1.1 Possible damage to underwater cable lines and petroleum pipelines during rig installation resulting in interruption of service.	Negligible
9. Socio-Economy	9.1 Shore Base Support	9.1.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	9.2 Offshore Fuel Storage & Handling	9.2.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	9.3 Hazardous Materials Handling and Storage	9.3.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	9.4 Non-Hazardous and Hazardous Waste Handling and Storage	9.4.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	9.5 Rig Placement	9.5.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	9.6 Labour, Equipment Services Supply	9.6.1 Employment/income and procurement opportunities	Positive

		for people, business and services in surrounding area	
Cultural Impact Assessment			
10. Historical, Archaeological and Cultural Resources	10.1 Crew/Materials Transport	10.1.1 Possible disruption or damage of underwater archaeological sites, such as shipwrecks. 10.1.2 Potential conflict between local culture and outside workers.	Negligible
	10.2 Rig Placement	10.2.1 Possible disruption or damage of underwater archaeological sites, such as shipwrecks.	Negligible

Table 6-114: Drilling Phase Significance Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Physical Environmental Impact Assessment			
1. Air Quality	2.4 Crew/Materials Transport	2.4.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	Negligible
	2.5 Offshore Fuel Storage & Handling	2.5.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	Negligible
	2.6 Energy Use	2.6.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	Negligible
2. Seawater Quality	2.1 Offshore Fuel Storage & Handling	2.1.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
	2.2 Hazardous Materials Handling and Storage	2.2.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
	2.3 Wastewater Disposal	2.3.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
	2.4 Non-Hazardous and Hazardous Waste Handling and Storage	2.4.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
	2.5 Mud & Cuttings	2.5.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
3. Sediment Quality	3.1 Offshore Fuel Storage & Handling	3.1.1 Potential contamination from spills, sediment disturbance and increase in suspended solids	Negligible

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
	3.2 Hazardous Materials Handling and Storage	3.2.1 Potential contamination from spills, sediment disturbance and increase in suspended solids	Negligible
	3.3 Mud & Cuttings	3.3.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
4. Underwater Noise	4.1 Crew/Materials Transport	4.1.1 Increased noise from machines and equipment	Negligible
	4.2 Energy Use	4.2.1 Increased noise from machines and equipment	Negligible
Ecological Environmental Impact Assessment			
5. Marine Biota, Endangered Species, Sensitive/Protected Areas	5.1 Crew/Materials Transport	5.1.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	5.2 Offshore Fuel Storage & Handling	5.2.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	5.3 Wastewater Disposal	5.3.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	5.4 Hazardous Materials Handling and Storage	5.4.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	5.5 Presence of Equipment and Facilities	5.5.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	5.6 Mud & Cuttings	5.6.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Negligible
Social Impact Assessment			
6. Fishing	6.1 Crew/Materials Transport	6.1.1 Removal of fishing equipment and other obstacles from the drilling area may cause damage to fishing equipment 6.1.2 Loss of fishing area could directly affect the income of fisherman 6.1.3 Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment. 6.1.4 Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
	6.2 Wastewater Disposal	6.2.1 Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.	Low
	6.3 Presence of Equipment and Facilities	6.3.1 Loss of fishing area could directly affect the income of fisherman 6.3.2 Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment.	Low
	6.4 Drilling & Completion of Wells	6.4.1 Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.	Low
	6.5 Mud & Cuttings	6.5.1 Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.	Low
7. Shipping	7.1 Crew/Materials Transport	7.1.1 Increased traffic 7.1.2 Potential disruption to traffic in case of accident	Low
	7.2 Presence of Equipment and Facilities	7.2.1 Increased traffic 7.2.2 Potential disruption to traffic due to placement	Low
8. Waste Management	8.1 Non-Hazardous and Hazardous Waste Handling and Storage	8.1.1 Waste contamination to environment, reduced well-being due to exposure or perceived exposure to hazards. 8.1.2 Pressure on existing waste management facilities.	Negligible
	8.2 Wastewater Disposal	8.2.1 Waste contamination to environment, reduced well-being due to exposure or perceived exposure to hazards.	Negligible
	8.3 Mud and Cuttings	8.3.1 Waste contamination to environment, reduced well-being due to exposure or perceived exposure to hazards.	Negligible
9. Socio-Economy	9.1 Shore Base Support	9.1.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	9.2 Offshore Fuel Storage & Handling	9.2.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	9.3 Hazardous Materials Handling and Storage	9.3.1 Employment/income and procurement opportunities for people, business and services in surrounding	Positive

		area	
	9.4 Non-Hazardous and Hazardous Waste Handling and Storage	9.4.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	9.5 Rig Placement	9.5.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	9.6 Labour, Equipment Services Supply	9.6.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive

Table 6-115: Well Testing Phase Significance Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Physical Environmental Impact Assessment			
1. Air Quality	2.7 Crew/Materials Transport	2.7.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	Negligible
	2.8 Offshore Fuel Storage & Handling	2.8.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	Negligible
	2.9 Energy Use	2.9.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	Negligible
	2.10 Flaring	2.10.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	Low
2. Seawater Quality	2.1 Offshore Fuel Storage & Handling	2.1.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
	2.2 Hazardous Materials Handling and Storage	2.2.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
	2.3 Wastewater Disposal	2.3.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
	2.4 Non-Hazardous and Hazardous Waste Handling and Storage	2.4.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
3. Sediment Quality	3.1 Offshore Fuel Storage & Handling	3.1.1 Potential contamination from spills, sediment disturbance and increase in suspended solids	Negligible

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
	3.2 Hazardous Materials Handling and Storage	3.2.1 Potential contamination from spills, sediment disturbance and increase in suspended solids	Negligible
Ecological Environmental Impact Assessment			
4. Marine Biota, Endangered Species, Sensitive/Protected Areas	4.1 Crew/Materials Transport	4.1.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	4.2 Offshore Fuel Storage & Handling	4.2.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	4.3 Wastewater Disposal	4.3.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	4.4 Hazardous Materials Handling and Storage	4.4.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	4.5 Presence of Equipment and Facilities	4.5.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	4.6 Flaring	4.6.1 The flare gas may affect sea water quality and marine animals; and seabirds may be attracted to the light.	Negligible
Social Impact Assessment			
5. Fishing	5.1 Crew/Materials Transport	5.1.1 Removal of fishing equipment and other obstacles from the drilling area may cause damage to fishing equipment 5.1.2 Loss of fishing area could directly affect the income of fisherman 5.1.3 Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment. 5.1.4 Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.	Low
	5.2 Wastewater Disposal	5.2.1 Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.	Low
	5.3 Presence of Equipment and Facilities	5.3.1 Loss of fishing area could directly affect the income of fisherman 5.3.2 Project activities may result	Low

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
		in collisions or accidents that would potentially affect fishermen and project equipment.	
6. Shipping	6.1 Crew/Materials Transport	6.1.1 Increased traffic 6.1.2 Potential disruption to traffic in case of accident	Low
	6.2 Presence of Equipment and Facilities	6.2.1 Increased traffic 6.2.2 Potential disruption to traffic due to placement	Low
7. Waste Management	7.1 Non-Hazardous and Hazardous Waste Handling and Storage	7.1.1 Waste contamination to environment, reduced well-being due to exposure or perceived exposure to hazards. 7.1.2 Pressure on existing waste management facilities.	Negligible
	7.2 Wastewater Disposal	7.2.1 Waste contamination to environment, reduced well-being due to exposure or perceived exposure to hazards.	Negligible
	7.3 Flaring	7.3.1 The separated oil and excess gas will be flared off the flare boom.	Negligible
8. Socio-Economy	8.1 Shore Base Support	8.1.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	8.2 Offshore Fuel Storage & Handling	8.2.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	8.3 Hazardous Materials Handling and Storage	8.3.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	8.4 Non-Hazardous and Hazardous Waste Handling and Storage	8.4.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	8.5 Labour, Equipment Services Supply	8.5.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive

Table 6-116: Well Abandonment Phase Significance Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
Physical Environmental Impact Assessment			
1. Air Quality	2.1 Non-Hazardous and Hazardous Waste Handling and Storage	2.1.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	Negligible
	2.2 Offshore Fuel Storage & Handling	2.2.1 Deterioration of air quality due to emissions and	Negligible

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
		GHG Release contributing to climate change	
	2.3 Energy Use	2.3.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	Negligible
	1.1 Non-Hazardous and Hazardous Waste Handling and Storage	1.1.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Negligible
2. Seawater Quality	2.1 Offshore Fuel Storage & Handling	2.1.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
	2.2 Hazardous Materials Handling and Storage	2.2.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
	2.3 Wastewater Disposal	2.3.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
	2.4 Rig Decommissioning	2.4.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Low
3. Sediment Quality	3.1 Offshore Fuel Storage & Handling	3.1.1 Potential contamination from spills, sediment disturbance and increase in suspended solids	Negligible
	3.2 Hazardous Materials Handling and Storage	3.2.1 Potential contamination from spills, sediment disturbance and increase in suspended solids	Negligible
	3.3 Rig Decommissioning	3.3.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Negligible
Ecological Environmental Impact Assessment			
4. Marine Biota, Endangered Species, Sensitive/Protected Areas	4.1 Crew/Materials Transport	4.1.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	4.2 Offshore Fuel Storage & Handling	4.2.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	4.3 Wastewater Disposal	4.3.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	Negligible
	4.4 Hazardous Materials Handling and Storage	4.4.1 Potential deterioration of seawater quality from wastewater discharge, spills	Negligible

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
		and disturbance could affect the marine ecosystem	
	4.5 Rig Decommissioning	4.5.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	Negligible
Social Impact Assessment			
5. Fishing	5.1 Crew/Materials Transport	5.1.1 Removal of fishing equipment and other obstacles from the drilling area may cause damage to fishing equipment 5.1.2 Loss of fishing area could directly affect the income of fisherman 5.1.3 Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment. 5.1.4 Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.	Low
	5.2 Wastewater Disposal	5.2.1 Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption.	Low
	5.3 Presence of Equipment and Facilities	5.3.1 Loss of fishing area could directly affect the income of fisherman 5.3.2 Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment.	Low
	5.4 Rig Decommissioning	5.4.1 Fishermen can return to fish in the exclusion zone after rig demobilization	Low
6. Shipping	6.1 Crew/Materials Transport	6.1.1 Increased traffic 6.1.2 Potential disruption to traffic in case of accident	Low
	6.2 Presence of Equipment and Facilities	6.2.1 Increased traffic 6.2.2 Potential disruption to traffic due to placement	Low
7. Waste Management	7.1 Non-Hazardous and Hazardous Waste Handling and Storage	7.1.1 Waste contamination to environment, reduced well-being due to exposure or perceived exposure to hazards. 7.1.2 Pressure on existing waste management facilities.	Negligible
	7.2 Wastewater Disposal	7.2.1 Waste contamination to environment, reduced well-being due to exposure or perceived exposure to hazards.	Negligible

8. Socio-Economy	8.1 Shore Base Support	8.1.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	8.2 Offshore Fuel Storage & Handling	8.2.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	8.3 Hazardous Materials Handling and Storage	8.3.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	8.4 Non-Hazardous and Hazardous Waste Handling and Storage	8.4.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive
	8.5 Labour, Equipment Services Supply	8.5.1 Employment/income and procurement opportunities for people, business and services in surrounding area	Positive

Table 6-117: Health Impacts Residual Risk Rankings

Public Health Impact Assessment				
1. Public Health	1.1 Transportation	1.1.1	Possible impact to public health from accidents, exposure to air pollutants, noise, exposure to fuel/chemicals/waste or contamination from accidental spills, concern and stress about accidents, spills, wastes, noise, etc.	Low
Occupational Health Impact Assessment				
2. Occupational Health	2.1 Air Quality	2.1.1	Possible impact to occupational health from accidents, exposure to air pollutants, or stress about possible health related matters	Low
	2.2 Hydrogen Sulfide	2.2.1	Possible impact to occupational health from accidents, exposure Hydrogen Sulfide	Low
	2.3 Noise	2.3.1	Possible impact to occupational health from accidents, noise	Low
	2.4 Chemicals	2.4.1	Possible impact to occupational health from accidents, exposure to air pollutants, exposure to chemicals or contamination from accidental spills, concern and stress about accidents, spills	Low
	2.5 Wastewater	2.5.1	Possible impact to occupational health from accidents, exposure to wastewater or contamination from accidental spills, concern and stress about accidents, spills, wastes	Low
	2.6 Non-Hazardous Waste	2.6.1	Possible impact to occupational health from accidents, exposure to non-hazardous waste or contamination from accidental spills, concern and stress about accidents, spills, wastes	Low
	2.7 Hazardous Waste	2.7.1	Possible impact to occupational health from accidents, exposure to hazardous waste or contamination from accidental spills, concern and stress about accidents, spills, wastes	Low
	2.8 Accidents at Work Site	2.8.1	Possible impact to occupational health from accidents in the work	

			place, exposure to air pollutants, noise, exposure to fuel/chemicals/waste or contamination from accidental spills, concern and stress about accidents, spills, wastes, noise, etc	Low
	2.9 Transportation	2.9.1	Possible impact to occupational health from accidents, exposure to air pollutants, noise, exposure to fuel/chemicals/waste or contamination from accidental spills, concern and stress about accidents, spills, wastes, noise, etc	Low

Table 6-118: Unplanned Events Residual Risk Rankings

Environmental Factors/Events	Activity	Potential Impacts	Residual Risk
1. Collisions	1.1 Ship Transportation	1.1.1 Possible collisions causing release of fuel/chemicals/wastes causing contamination of the sea, damage to vessels and possible injury and or loss of life	Medium
2. Fuel, Chemical or Hazardous Waste/Materials Spill	3.1 Storage of Fuel, chemicals, hazardous materials or waste	3.1.1 Potential risk of spills to the environment affecting air quality, surface water quality, sediment quality, biota and people	Medium
3. Blowout	1.2 Drilling	1.2.1 Release of uncontrolled volumes of hydrocarbons, Fire and Explosion causing impact to facilities and possible injuries and loss of life and contamination of the sea	Medium
4. Typhoons	5.1 Weather	5.1.1 Disruption to drilling and shipping activity and possible damage to facilities and possible loss of life	High
5. Fire or Explosion (not associated with Blowout)	2.1 Fuel and chemical Storage	2.1.1 Possible explosion or fire on ship or drilling rig causing physical damage and possible injuries or loss of life and contamination of the sea	Medium

6.14 Conclusion

All environmental and social issues are ranked as negligible or low and can be managed to minimize potential impacts. As the well locations are deep offshore and far from the coastal area, experience shows that fishing will be limited to a very small number of deep offshore fisherman. Although the actual restricted fishing area of the exclusion zone is small compared to the Andaman Sea, the perception of the fisherman is that a large portion of their fishing areas are being blocked by the increased activity in offshore oil & gas industry. This is a regional issue that should be considered in the CSR development plans of PCML to ensure the entire Thanintharyi Region including the fisheries industry are included and represented. Currently, CSR activities have been concentrated in the Dawei District focused around the on-shore pipeline locations and other facilities of the Yetagun field. This has resulted in stakeholder from Myeik District having a negative perception towards the project. It is important for these issues to be addressed with future consultation and CSR activities as part of the overall Yetagun Field development plans.

Occupational and Public Health issues are also all ranked as low. A specific waste management plan will be prepared to ensure that all wastes are managed to international standards. Hydrogen Sulphide is a potentially serious issue that requires monitoring equipment to be installed and tested, as well as having personnel trained on use of emergency response equipment.

Unplanned Events have all been ranked as having a medium residual risk, with the exception of typhoons which are ranked as high due to the high possibility of occurrence in the Gulf of Martaban. The key to ensuring that unplanned events do not happen is linked to ongoing training programs and the implementation specific offshore emergency response plan and oil spill contingency plans.

To mitigate the potential for a blowout, a subsea BOP needs to be installed and tested. Drilling procedures need to be carefully implemented. The risk of fire and related explosions requires that regular monitoring and inspection measures are in place, with all fire extinguishing facilities maintained and managed on the offshore drill rig.

Recommendations:

The following recommendations are provided:

- Implement recommended stakeholder engagement program before site installation phase to inform offshore fisherman of the upcoming activities.
- Prepare a site specific waste management plan.
- Apply PCML's Emergency Response Plan.
- Apply PCML's Oil Spill Contingency Plan.
- Conduct recommended training program prior to project initiation.
- Identify & implement CSR programs related to fishery resource development to increase the relations between PCML and the deep offshore fisherman.
- Adopt and implement the EMP provided in **Chapter 8**.

7. CUMULATIVE IMPACTS ASSESSMENT

7.1. Methodology and Approach

The IFC notes that good practice requires that, at a minimum, project sponsors assess during the EIA process whether their development may contribute to cumulative impacts on Valued environmental and social components (VECs) and/or may be at risk from cumulative effects on VECs they depend on.

VECs are environmental and social attributes that are considered to be important in assessing risks; they may be:

- physical features, habitats, wildlife populations (e.g., biodiversity),
- ecosystem services,
- natural processes (e.g., water and nutrient cycles, microclimate),
- social conditions (e.g., health, economics), or
- cultural aspects (e.g., traditional spiritual ceremonies).

The IFC suggests a useful preliminary approach for developers in emerging markets to conduct of a rapid cumulative impact assessment (RCIA). It entails a desk review that, in consultation with the affected communities and other stakeholders, enables the developer to determine whether its activities are likely to significantly affect the viability or sustainability of selected VECs. The proposed approach recognizes that, especially in emerging markets, the many challenges associated with managing a good CIA process include lack of basic baseline data, uncertainty associated with anticipated developments, limited government capacity, and absence of strategic regional, sectoral, or integrated resource planning schemes.

The approach includes:

- follow a six-step RCIA process,
- engage stakeholders as early as possible and throughout the decision-making process, and
- clearly record the fundamental reasoning behind each important decision made, supporting it with as much technical evidence as possible.

The RCIA logical framework, which is an iterative six-step process including: scoping (Steps 1 and 2), VEC baseline determination (Step 3), assessment of the contribution of the development under evaluation to the predicted cumulative impacts (Step 4), evaluation of the significance of predicted cumulative impacts to the viability or sustainability of the affected VECs (Step 5), and design and implementation of mitigation measures to manage the development's contribution to the cumulative impacts and risks (Step 6). IFC defines cumulative impacts as those that result from the successive, incremental, and/or combined effects of developments when added to other existing, planned, and/or reasonably anticipated future ones.

The objective of the cumulative impact assessment is to identify those environmental, social or health aspects that may not on their own constitute a significant impact but when combined with impacts from past, present or reasonably foreseeable future activities associated with this and/or other projects, result in a larger and more significant impact(s).

Cumulative impact factors, include project resources and receptors, geographic and temporal boundaries, and other projects or developments near the planned project.

7.2. Cumulative Impact Assessment

7.2.1. Projects and Developments in Vicinity of Proposed Well Sites

The Yetagun Field (consisting of Yetagun Main and Yetagun North) is located in Andaman Sea, offshore of Myanmar in Blocks M12, M13 and M14. PC Myanmar (Hong Kong) Limited (PCML) assumed operatorship of the blocks on 12th September 2003.

The block is currently producing approximately 180 MMSCAF of Gas a day for export from Myanmar to Thailand. Due to the depletion of gas reserves, PCML would like to conduct exploration drilling to identify potential reservoirs to increase gas production.

A 3D Seismic survey had been carried out and completed by December 2016. This project is classified as an exploration drilling project in an established development block. The drill locations in Blocks M12,M13, & M14 are located 90 NM away from Dawei, the capital of Tanintharyi Region, and 105 NM from Myeik.

The blocks locations are shown in **Figure 7-1**.

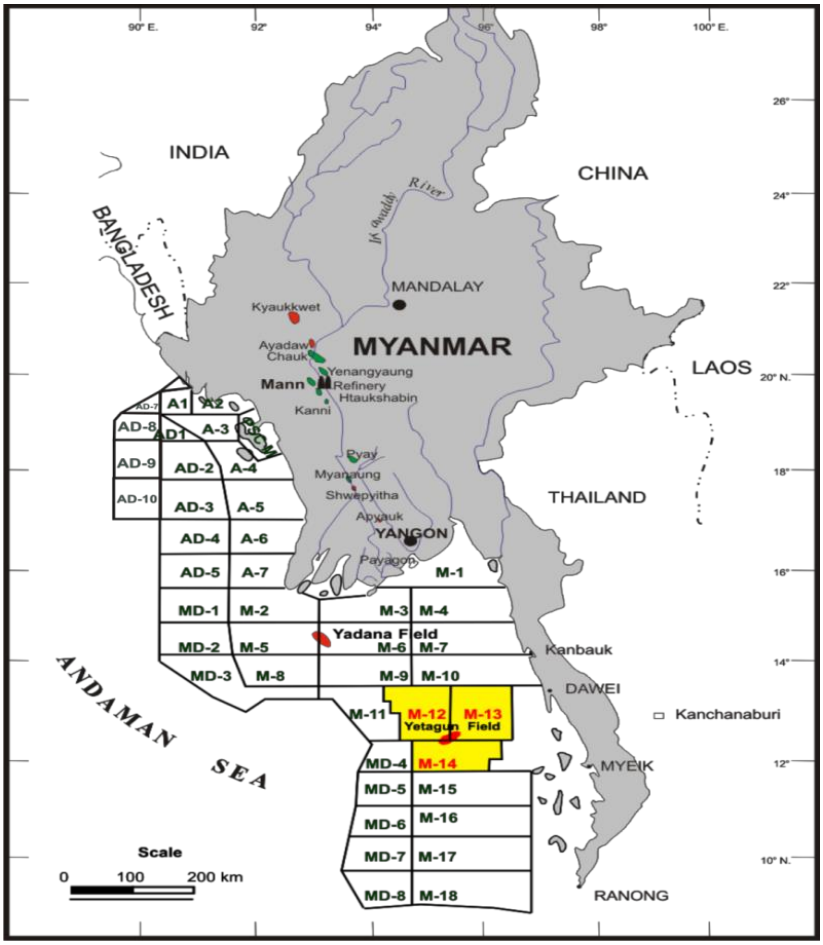


Figure 7-1: Blocks M12, M13, & M14

7.2.2. Projects and Developments in Vicinity of Proposed Well Sites

The existing offshore oil and gas facilities in the Andaman Sea consist of the Yadana, Zawtika and Yetagun gas field developments. These are shown in **Figure 7-2**, and described briefly below.

The Yadana gas field at the boundary of offshore Blocks M-5 and M-6 situated in the Gulf of Martaban and operated by Total S.A. is located around 60 km offshore and consists of offshore platforms, subsea gas pipelines and onshore support, land pipeline and a control and maintenance centre along with a gas metering station. The offshore gasfield has three well-head platforms, one accommodation platform and one production platform. The facilities include a 36 inch 346 km subsea pipeline to shore in the Dawei area, and a 63km onshore pipeline connecting through the Tanintharyi Region to the Thai border. A 24 inch Myanmar Domestic Gas Pipeline is routed from the Yadana Field, and passes through Block M-3 and then to the Dawnyein Pipeline Center and then in to Yangon (both receiving and transmission station). The Yadana Field has been producing since 1998.

The Zawtika gas and condensate field development, operated by Petroleum Authority of Thailand Exploration and Production International (PTTEP International) includes the Zawtika, Kakonna and Gathaka fields, located in blocks M9 and M11 of the Gulf of Martaban. The facilities are spread across an area of 11,746 square kilometres. The facilities include three wellhead platforms, an integrated processing and living quarters platform, and 18 km infield pipelines and an approx. 230 km 28 inch export pipeline to shore, and 72 km onshore pipeline to Thailand.

The Zawtika development has been exporting gas since 2014.

Gas from the Zawtika development is transported via pipeline to Yangon for domestic use and to Thailand via an overland pipeline from the Dawei area.

The Yetagun gas and condensate field currently operates within Block M14 in the Gulf of Martaban, covering an area of approx. 24,130 km . The development includes the Yet A drilling/wellhead platform, Yet B processing platform, the leased Yetagun floating storage and offloading (FSO) vessel, and installation of an approx. 202 km-long 24 inch offshore pipeline and a 270 km-long 24 inch onshore pipeline from the Dawei area to Thailand, and an operating centre and metering station. The Yetagun booster compression platform (Yet C) was commissioned in July 2012. The Yetagun North Field is located 12 km north-east of the main field. The satellite field's development includes the Yet D platform and two production wells with an 11.2 km pipeline from Yet D to the existing Yet C platform.

The Yetagun Field has been in production since year 2000.

Two fibre optic cable lines pass west of Blocks M12, M13, and M14, which are branches of international cable lines, also pass through the Andaman Sea to Myanmar.

A 3D Seismic survey had been carried out and completed by December 2016. The seismic coverage is approximately 1104 sq. km. Three (3) exploration/appraisal well are planned to be drilled from Q4 2018 to Q2 2019. The exploration wells would have to be drilled with a semi-sub/drill ship. The project duration would be about 75 days for each well. The exploration drilling campaign would start after the completion of the monsoon season of 2018.

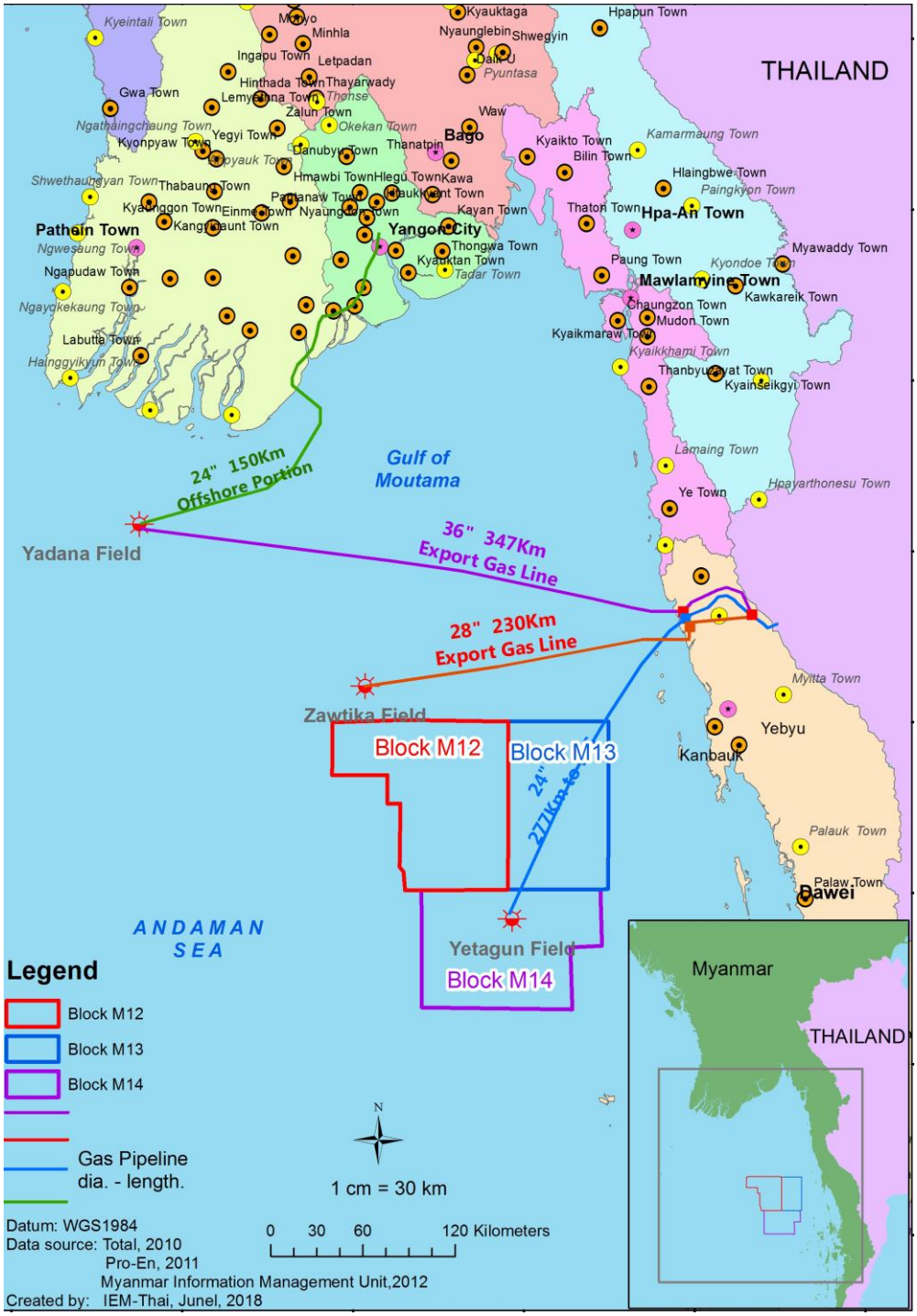


Figure 7-2: Existing Gas Pipelines in the Andaman Sea Area

7.2.3. Summary of Public Consultation Meetings Results

The regional centers where township meetings were held included Myeik and Dawei. Village level town hall meetings were also held at Kywe Ku (Myeik), and San Hlan (Dawei) The following summary of the public consultation meetings is provided below:

Meeting were also held with the Myeik District Fisheries Federation, GAD (Myeik & Dawei), ECD (Myeik & Dawei), CDC (Myeik & Dawei), Myeik Department of Fisheries. Note Dawei Department of Fisheries personnel were not available. Media were present for town hall meetings in Myeik and Dawei. Public disclosure occurred via MCN TV News Channel and Facebook page, and DVB media issued information on the news and on their Facebook page.

The public in this area recognizes the need for energy as 68% identified this as a main development priority for their community. Many questions were raised as to when the energy grid will be more developed in the Myeik/Dawei area. In particular the public wants to know what benefit the project will bring. Questions were also raised as to what profits has the existing developments already achieved.

Other common themes included what type of CSR programs will be implemented in addition to the programs already in place by PCML. In Myeik the lack of CSR programs was noted. Fishermen are concerned about their industry and the drastic reduction of available fish stocks off the coast of Myanmar. The fishermen are concerned about further possible impact by the oil and gas industry. Various questions were raised by fisherman as to what compensation would be provided for the 500 m exclusion zone around the drill sites and what compensation would be provided in the event of a serious impact to their livelihood. The Myeik fisherman feel that the restriction zone around the drilling rig and existing offshore platforms and pipelines is impacting their ability to harvest fish. Other questions were raised that asked if sensitive areas would be affected by the project. The closest sensitive area to the planned drill sites is over 50 km away. Further questions were raised concerning possible impacts from the planned development on fish species, coral, seagrass and nearby islands. It was made clear that none of the sensitive areas shown on the map would be affected by the exploration drilling project. All potential impacts from this project will be very localized and can be mitigated with standard international practice.

Participants indicated that 69% supported the project, while 28% were unsure, and 3% did not support the project.

7.2.4. Assessment of the Potential Cumulative Impacts

The screening/scoping of planned and unplanned project related activities and the timing of the projects listed above assisted to identify potential environmental, social, health aspects where cumulative impacts could possibly occur.

These areas of potential cumulative impact include: Endangered species; Fishing; Shipping; and Socio Economy. Other possible areas of cumulative impact were screened out due to project distance from each other and well as the timing of various projects. For Socio Economy, at a national level even though an exploration drilling project is short term, there will be increased benefits in terms of jobs and income at a national level that builds on similar benefits of the other oil and gas production projects.

Environmental Parameters		Physical Resources				Ecological Resources			Human Use Values			Quality of Life Values			Health	
Project Activities/Events		Air Quality / GHG emissions	Seawater Quality	Sediment Quality	Noise	Marine Biota	Endangered Species	Sensitive / Protected Areas	Fishing	Shipping	Tourism	Socio-economy	Cultural-Archaeological	Visual Aesthetics	Public Health	Occupational Health and Safety
	General Project Activities (All Phases)															
1	Yadana Production															
2	Zawtika Production															
3	Yetagun Production															
4	Block M9 Drilling															
5	Block M12, M13, M14 Drilling															
9	Key Areas of Potential Cummulative Impact.															

Key:

	No Impact
	Potential Impact
	Positive Impact
	Potential Cummulative Impact

7.2.5. Possible Environmental and Social Cumulative Impact Aspects

Table 7-1: Environmental Aspects

Aspect	Activity	Potential Impact
Biological Resources	Wastewater (installation, drilling, abandonment)	Potential deterioration of seawater quality from wastewater discharge could affect the marine ecosystem
	Waste Management (installation drilling, abandonment)	Potential deterioration of seawater quality from spills or leakages could affect the marine ecosystem
	Drilling Rig Installation (installation)	Increased noise may disturb marine biota
	Discharge of Mud and Cuttings (drilling)	Mud and cuttings discharge can increase turbidity, and may be toxic to marine organisms. Mud and cuttings deposition can result in sediment contamination and sediment accumulation affecting benthos
	Drilling Rig Demobilization (abandonment)	Increased marine transportation may increase risk of collision with marine mammals

Table 7-2: Social Aspects

Aspect	Activity	Potential Impact
Fisheries	Site Survey (installation)	Removal of fishing equipment and other obstacles from the drilling area may cause damage to fishing equipment Loss of fishing area could directly affect the income of fishermen Project activities may result in collisions or accidents that would potentially affect fishermen and project
	Wastewater (installation, drilling, abandonment)	
	Waste Management (installation, drilling, abandonment)	
	Drilling Rig Installation (installation)	

	Discharge of Mud and Cuttings (drilling)	equipment
	Fuel Storage and Handling (drilling)	Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption
	Hazardous Waste (drilling)	
	Drilling Rig Demobilization (abandonment)	Fishermen can return to fish in the exclusion zone after rig demobilization (positive impact)
Shipping	Drilling Rig Installation (installation)	Increased traffic
	Waste Management (installation, drilling, abandonment)	Potential disruption to traffic in case of accident
	Transportation of Drilling Rig (installation, abandonment)	Possible injury or death to personnel; and localized contamination of environment
	Overall drilling operations (drilling)	
	Well Testing (testing)	
Socio-Economy	All operational phases	Increased employment/income and procurement opportunities for people, business and services in surrounding area

7.2.6. Influence of Exploration Drilling Project on Related Potential Cumulative Impacts

The screening and assessment of planned and unplanned project related activities to identify potential environmental or social aspects assisted to highlight potential areas where cumulative impacts could possibly occur. This includes consideration of impacts on key receptors including marine fauna and associated habitats, water quality, sediment quality, air quality, and key socio-economic values (fishing and shipping) relevant to the offshore block, as well as the socio economy.

An evaluation of the potential for cumulative impacts or impact interactions has been carried out for the aspects and impacts highlighted. The assessment has considered activities (projects) scheduled to occur in the study area and where there may be a potential for cumulative impacts or impact interactions to arise. The characteristics and location of the M12, M13, and M14 exploration drilling activities, in combination with the size of the offshore exploration blocks, have been considered together with the Yadana Production Project, Zawtika Production Project, Yetagun Production Project, and Block M9 exploration drilling project. The cumulative impacts considered are summarised below:

- Cumulative impact of temporary reduction in available fishing area,
- Cumulative impact of project activity on sensitive marine fauna, and
- Cumulative impact of shipping on increased traffic and potential accidents.

Cumulative impact of temporary reduction in available fishing area

On the basis of information acquired during, it is expected that fishing activity in this area is limited, however, there is a potential for tuna fishery to occur. The potential for impact on this fishery as a result of the exploration drilling activities occurring at the same time as development activities in other blocks has been considered.

The exploration drilling activities in M12, M13, and M14 will temporarily restrict the total area available for fishing within an exclusion zone of 500 meters around each exploration drilling well, or less than 1 per cent of the area of the Block at any one time for a duration of approximately 2 months per well. These similar exclusions zones are in place around other exploration drilling wells and

production platforms. Similarly the exclusion areas remain to be a very small percentage of the total area of the development blocks and or fishing concession area.

Subject to early notification through marine notices as well as in-field fisheries liaison by the chase vessels, it will be possible for fishing vessels to avoid the area of the survey and continue to fish in the area throughout this period. Similarly, a survey in a neighbouring block may have an equal potential for fishing to be diverted away from the immediate area around the drilling and production areas.

As these offshore blocks are very large, and any unavailable area will only represent a small percentage of the total fishing area available, the potential cumulative impact level of the M12, M13, and M14 exploration drilling wells and similar activities being conducted in a neighbouring blocks at the same time is ranked as negligible. From public involvement meetings however the sensitivity of this issue is ranked as medium. Therefore the significance level of possible cumulative impacts of temporary reduction in available fishing area from M12, M13, and M14 exploration drilling activities is determined to be ranked as low.

Key mitigation measures to be implemented will include:

- Notification to fisherman of planned activities 30 days prior to implementation
- Infield chase boats to inform fisherman of the safety zone around exploration drilling wells.

Residual Impact

Taking into account the above assessment of potential interactions from other development projects, the possible cumulative impacts of temporary reduction in available fishing area from M12, M13, and M14 exploration drilling activities is determined to have a residual impact ranking of low.

Cumulative impact of project activity on sensitive marine fauna

Although the offshore blocks are very large, there is potential for cumulative impact or impact interaction on marine fauna, particularly mammals recognizing that 5 development interests may be going on at the same time.

There is also potential for an increase in the noise levels experienced by sensitive marine fauna should exploration drilling and or seismic activities be conducted in close proximity of each other.

There are several reasons why a certain distance should be maintained between simultaneous development activities to minimise the potential for cumulative impact. One is to minimise the potential for impact interactions associated with the soft start procedure which is designed to limit the disturbance by allowing animals to move away from the survey, but in the event the surveys and drilling activities are carried out in close proximity of each other this compromises the effectiveness of the mitigation. The second is to limit the potential impact for additional disturbance or injury due to an increase in absolute noise levels experienced by fauna in close proximity to two simultaneous high energy sources.

The average noise exposure on a drilling rig is approximately 94 dB. The noise levels generated on the drilling rig are below levels causing pathological damage to fish, but are high enough to result in avoidance reactions by fish and marine mammals, thus preventing pathological damage.

The likelihood of this occurring however is minimal. Three of the existing projects are in production phase. Exploration drilling activities are quite far apart and short term in nature.

The potential cumulative impact on sensitive fauna of known development projects is therefore predicted to be of a behavioural nature, and is concluded to be temporary and transient and ranked as low. The receptor sensitivity is ranked as medium. Therefore, impact significance is ranked as low.

8. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

8.1 Introduction

This environmental, social and health management plan has been developed to prevent, minimize and monitor potential environmental, social and health impacts associated with PCML's planned exploration drilling program.

For each project activity, management measures have been defined to prevent and/or reduce the likelihood or magnitude of impacts and/or to limit the extent of an impact if one does occur. The proposed management measures will take into account applicable policies, guidelines, regulations, industry best practices, expert judgment, design techniques, and operational control. Monitoring measures too have been defined to determine if there are changes to the environment and to ensure that mitigation measures are effective.

The following hierarchy of control will be used to identify appropriate management measures:

- Eliminate the risk by removing the hazard.
- Substitute of a hazard with a less hazardous one.
- Prevention of potential events.
- Control the magnitude of an impact.
- Mitigation of the impact of an event on the environment e.g. (bunding for potential hydrocarbon spills).
- Monitoring environmental change and mitigation effectiveness.
- Emergency response and contingency planning to enable recovery from the impact of an event.
- Public consultation and disclosure.

8.2 Scope Of This Document

The purpose of this EMP is to provide ESH management actions, monitoring requirements and roles and responsibilities for ensuring that this drilling program is implemented in a sustainable manner.

In particular, the EMP will provide:

- Project Description by Project phase (pre-construction, construction, operation, decommissioning, closure and post-closure);
- Project's Environmental, Socio-economic and, where relevant, Health Policies and Commitments, legal requirements and institutional arrangements;
- Summary of Impacts and Mitigation Measures;
- Overall budget for implementation of the EMP;
- Management and Monitoring Sub-Plans by Project phase (installation, drilling, well testing, and decommissioning); the Management and Monitoring Sub-Plans will address relevant environmental and social management and monitoring issues as follows;

Management Sub-Plan	Included/Not Included	Comment
Underwater Noise	Not Included	Underwater Noise from exploration drilling is localized and of low level in an open water setting.
Vibrations	Not Included	Vibrations for the exploration drilling program has not been defined as an issue.
Water Quality	Not Included	All Discharges from the ship and rig are minor, short term and must meet MARPOL 73/78
Air Quality	Not Included	Air emissions are minor and short term. No sector specific guidelines for air emissions are provided in the Myanmar National Environmental Quality (Emissions) Guidelines (NEQ Guidelines)
Occupational and Community Health	Not Included	Occupational and Community Health are dealt with through operational guidelines and procedures.
Employment and Training	Not Included	Training requirements for the project are defined separately within the MP
Cultural Heritage	Not Included	There is no cultural heritage as verified through communication with the Department of Archaeology and communities.
Emergency Response	Included	An overall ERP has been prepared by PCML and a summary ERP has been included for this project.
Waste Management	Included	A waste management plan has been included for this project
Oil Spill Response	Included	An overall OSP has been prepared and a summary OSP has been included for this project.
Biodiversity Plan	Included	A Biodiversity Plan has been prepared and included for this project.

8.3 Project Description

The Yetagun Field (consisting of Yetagun Main and Yetagun North) is located in Andaman Sea, offshore of Myanmar in Blocks M12, M13 and M14. PC Myanmar (Hong Kong) Limited (PCML) assumed operatorship of the blocks on 12th September 2003. The participating interest in the blocks is PCML (10.91%), PC Myanmar Inc (30%), Myanma Oil & Gas Enterprise (20.45%), JX Nippon Oil & Gas Exploration Corporation (19.32%) and PTTEP (19.32%).

The block is currently producing approximately 180 MMSCAF of Gas a day for export from Myanmar to Thailand. Due to the depletion of gas reserves, PCML would like to conduct exploration drilling to identify potential reservoirs to increase gas production.

A 3D Seismic survey had been carried out and completed by December 2016. The prospects had been identified to image the deep lower Miocene section. The seismic coverage is approximately 1104 sq. km. The Seismic results have been processed and new target reservoirs have been identified for exploration drilling purpose. PCML plans to conduct exploration drilling on these identified potential reservoirs. The exploration drilling campaign would include drilling three (3) exploration wells within the project area.

The three (3) field prospects have been identified in the Yetagun blocks. They are Yetagun South East, Yeaunglan & Ye-Taung (**Figure 8-1**)

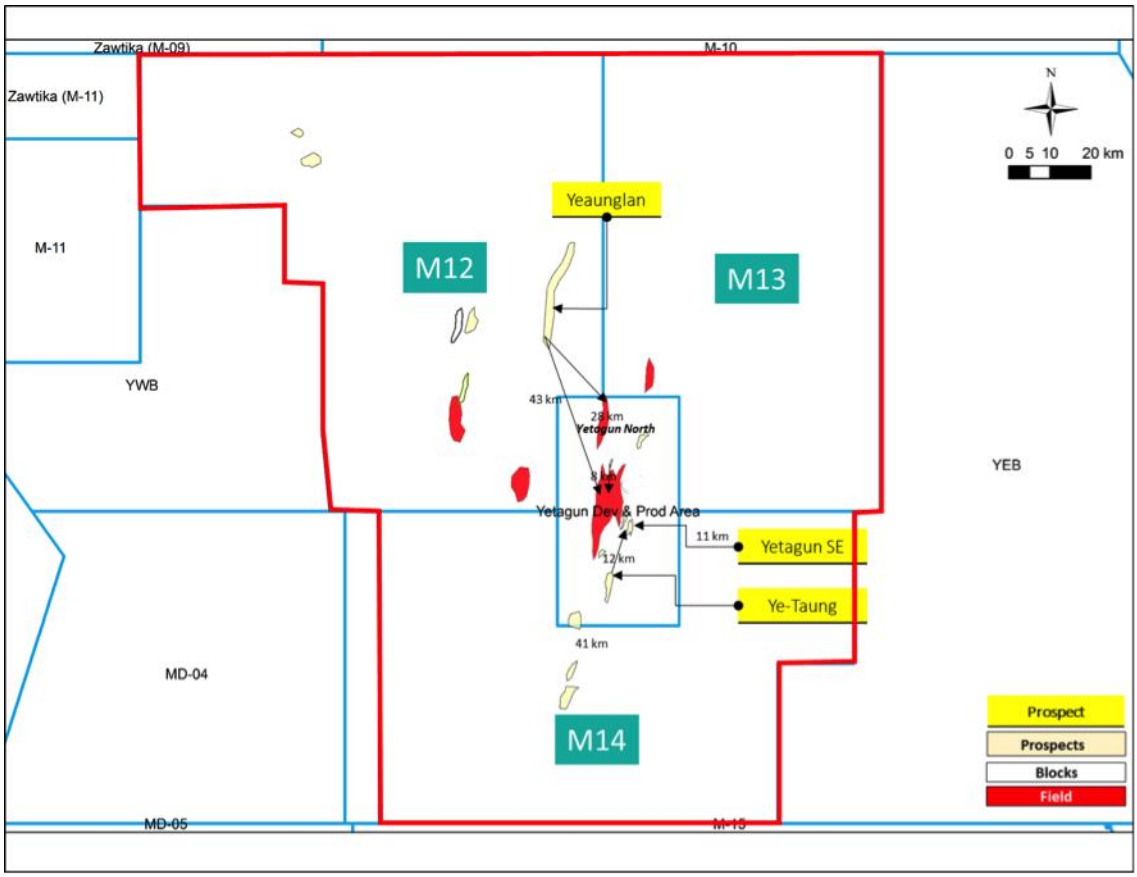


Figure 8-1: Prospective Field locations

The drilling would take place in open water. Due to PCML experience in Myanmar waters, a semi-submersible/drill-ship is the preferred drilling rig type.

The supporting vessels, Anchor Handling Tug Vessel (AHTS) would also be mobilized from a nearby country to reduce diesel consumption and cost. These ships would normally be around 70 meters in length and about 10,000bhp. There will be 3 supporting vessel for the drilling rig in the campaign.

Once the well had been constructed, cemented and logged, the target reservoir would be identified through logging activities. The 7" liner would then be perforated and well tested. A well test assembly would be lowered into the hole and a lighter fluid (Nitrogen/base oil) would be injected into the string. An underbalanced situation would be created where the formation fluids would be able to flow. There would be a surface test separator that would separate the fluids into water, gas and condensate. This separator would allow the measurement of the hydrocarbon flow. The produced fluid would then be flared to avoid any hydrocarbon spilled into the environment. The figure below shows a typical surface layout for the well testing equipment.

The exploration well will be either suspended or abandoned after the completion of operations at the well site. The temporary or permanent abandonment procedures for any well will be designed for that particular well after the well has been drilled and evaluated. The abandonment procedures will be based upon industry wide practice and procedures, taking into consideration both environmental protection and safety issues. If the well test results indicate that there no commercial viable reservoir is found; the well will be permanently plugged and abandoned.

8.4 Legal Requirements

Laws relating to environmental, social and health issues for this planned exploration drilling project are included in Chapter 3.

A summary of the International and Myanmar environmental standards applicable to this project are provided below.

8.4.1 Air Emissions - MARPOL Annex VI/IFC 2007

Vessels will be in compliance with applicable MARPOL 73/78 Regulations for the prevention of air pollution from ships (Annex I) (as applicable or required by vessel class). Vessels will have a SEEMP providing for fuel efficient vessel operations.

The drilling rig will have International Air Pollution Prevention (IAPP) certificates. Certification under MARPOL will confirm that engines and other combustion emission sources on the vessel (excluding emission sources directly associated with the extraction of hydrocarbons, such as flaring) meet IMO standards.

IFC 2007 states that Projects with significant sources of air emissions, and potential for significant impacts to ambient air quality, should prevent or minimize impacts by ensuring that Emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines.

8.4.2 Non-Hazardous/Hazardous Waste and Vessel Oil in Water Discharges - MARPOL Annex I & V

The support vessels will operate in compliance with MARPOL Annex I: any oil-in-water content of discharges should not exceed 15 ppm.

General waste (excluding food) will not be disposed of to sea in line with MARPOL Annex V requirements. Combustible wastes will be segregated and disposed by incinerator on-board, should an incinerator be available on the selected vessel. Non-combustible and recyclable wastes will be stored in containers and returned to the selected vessel shore base for disposal. Food waste will be macerated into smaller pieces (25 mm) prior to discharge overboard (if discharged <12 nm from shore.

Hazardous wastes will be stored on the vessels in appropriate containers with labels. Hazardous waste storage will be designated in accordance with their Safety Data Sheet (SDS). Hazardous wastes will be sent to a licensed disposal facility by a licensed waste contractor.

8.4.3 Underwater Sound Generation, - JNCC Guidelines (1)

The JNCC Guidelines for minimising the risk of injury and disturbance to marine mammals from seismic surveys, 2010

A visual check for marine mammals, marine turtles and whale sharks within 0.6 miles (1 km) (observation zone) of the drilling rig or vessel for 20 minutes prior to commencing drilling activities.

During periods of low visibility (where the observation zone cannot be clearly viewed out to 1 km), including night-time, the drilling activities may proceed, provided that:

There have not been three or more marine mammal, marine turtle or whale shark shut down situations during the preceding 24 hour period; or

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

8.4.4 Spills - MARPOL Annex I

Annex I – Regulations for the Prevention of Pollution by Oil; Chapter 5 – Prevention of pollution arising from an oil pollution incident; Regulation 37 - Shipboard oil pollution emergency plan

Every oil tanker of 150 gross tonnage and above and every ship other than an oil tanker of 400 gross tonnage and above shall carry on board a shipboard oil pollution emergency plan approved by the Administration.

IFC (2015) states that to prevent spills from offshore facilities that:

76. A Spill Response Plan (SRP) should be prepared, and the capability to implement the plan should be in place. A preliminary SRP is recommended, commencing at the project development phase and based on the initial project design, and it should include community consultation and feedback.

77. The SRP should address potential oil, chemical, and fuel spills from offshore facilities and support vessel—including tankers—and pipeline ruptures and leaks. The SRP should include all appropriate oil spill response tools and options in order to allow responders, in cooperation with the appropriate authorities, to develop response strategies that mitigate environmental impacts to the greatest extent practicable.

8.4.5 Drilling fluids and cuttings (water-based drilling fluid), NEQs and IFC (2015)

1) WBDF: Reinject or ship-to-shore, no discharge to sea except:
   - In compliance with 96 hr. LC-50 of Suspended Particulate Phase (SPP)-3% vol. toxicity test first for drilling fluids or alternatively testing based on standard toxicity assessment species[e] (preferably site-specific species)
2) WBDF cuttings: Reinject or ship-to-shore, no discharge to sea except:
   - Facilities located beyond 3 miles (4.8 km) from shore;
   - Hg: 1 mg/kg dry weight in stock barite
   - Cd: 3 mg/kg dry weight in stock barite
   - Maximum chloride concentration must be less than four times the ambient concentration of fresh or brackish receiving water
   - Discharge via a caisson (at least 15 m below sea surface is recommended whenever applicable; in any case, a good dispersion of the solids on the seabed should be demonstrated)

8.4.6 Produced Water (IFC 2015)

Reinject. Discharge to sea is allowed if oil and grease content does not exceed 42 mg/l daily maximum; 29 mg/L monthly average

8.4.7 Flow-Back Water (IFC 2015)

Reinject or reuse. Discharge to sea is allowed if oil and grease content does not exceed 42 mg/L daily maximum; 29 mg/L monthly average. An environmental risk assessment to determine the maximum site-specific allowable concentrations should be conducted for all other chemicals

8.4.8 Completion and Well Work-Over Fluids (IFC 2015)

Ship-to-shore or reinject. No discharge to sea except:

- Oil and grease content does not exceed 42 mg/L daily maximum; 29 mg/L monthly average
- Neutralize to attain a pH of 5 or more
- In compliance with 96 hr. LC-50 of SPP-3% vol. toxicity test first for drilling fluids[e] or alternatively testing based on standard toxicity assessment species (preferably site-specific species)

8.5 Environmental Management of PCML

PCML is committed to ensuring that its business operates in an environmentally responsible manner. The company recognises that it must conduct its operations in a safe and environmentally responsible manner consistent with established industry best practices. For the exploration drilling program, PCML makes the following commitments:

- Ensure drilling contractor operates in compliance with all relevant PCML Corporate and Myanmar government policies, laws and regulations:
- Maintain manifests for all wastes (solids, liquids) and continue to identify methods to reduce such wastes where practicable;
- Ensure emissions result in air quality meeting International Environmental Conventions/Protocols/Agreement for Ambient Air Quality standards;
- Minimize particulate emissions to prevent harm to people and the environment;
- Account for all industrial and domestic waste and dispose of these wastes in an environmentally appropriate manner;
- Prevent spills and loss of potential contaminants to seawater;
- Restore the environment impacted by the Company to a condition appropriate to its use or remediation “in-kind”;
- Define recovery procedures for all potential incident scenarios;
- Ensure efficient energy use and conservation;
- Where possible, provide local employment, training and skill upgrading to the local workforce;
- Ensure all contractors and subcontractors adhere to HSE policy guidelines and procedures; and
- Maintain up-to-date management and monitoring objectives.

8.5.1 Environmental Management of Contractors

Contractors will be required to provide specific procedures to meet the criteria described in this report. Procedures will be required to cover the following areas:

- Health and Hygiene;
- HSE Training, Drills and Exercises;
- Reporting of Occupational Accident / Incident and Unsafe Act and/or Conditions;
- HSE Reviews and Audits;
- Hazardous Materials Handling and Personal Protective Equipment (PPE);
- Emergency Procedures and Contingency Plans;
- Worker Codes of Conduct; and
- Transportation Policies and Procedures.

8.5.2 Roles and Responsibilities

For the effective implementation of PCML HSE Management System, the HSE roles, responsibilities and accountabilities of managing environmental, social and health issues are outlined below with the onsite roles and responsibilities shown in **Table 8-1**.

Head (Myanmar Asset)

(1) Head shall have the responsibility and accountability for the implementation of HSE Management System within Myanmar Asset.

(2) He/she is responsible and accountable for the provision of adequate resources, including competent personnel, to implement the arrangements specified in the HSE Management System within Myanmar Asset.

(3) In the execution of HSE-critical activities, he/she is responsible and accountable for the conduct of the required HSE risk assessment, including the identification and implementation of HSE controls, such that harm to people, environment, asset and reputation are eliminated and/or minimised.

(4) He/she is responsible and accountable for ensuring the technical and operational integrity of facilities and equipment that PCML design, procure, fabricate, install, acquire, operate and maintain; including facilities and equipment used by Contractors engaged in work for the Company.

(5) He/she, in turn, delegate the responsibility for the implementation of the HSE Management System in their respective Myanmar Asset, including agreed HSE objectives, plans and targets to the respective Senior Managers/Managers within Myanmar Asset.

(6) In addition, the Head (Myanmar Asset) shall also meet the HSE roles, responsibilities and accountabilities as specified in their respective Position Description.

Senior Managers – Well, Exploration

(1) Senior Managers shall have the responsibility and accountability for the implementation of HSE Management System within Myanmar Asset.

(2) They are responsible and accountable for the provision of adequate resources, including competent personnel, to implement the arrangements specified in the HSE Management System within Myanmar Asset.

(3) In the execution of HSE-critical activities, they are responsible and accountable for the conduct of the required HSE risk assessment, including the identification and implementation

of HSE controls, such that harm to people, environment, asset and reputation are eliminated and/or minimised.

(4) They are responsible and accountable for ensuring the technical and operational integrity of facilities and equipment that PCML design, procure, fabricate, install, acquire, operate and maintain; including facilities and equipment used by Contractors engaged in work for the Company.

(5) They, in turn, delegate the responsibility for the implementation of the HSE Management System in their respective Country and/or Department, including agreed HSE objectives, plan and targets to the respective Managers within Myanmar Asset.

(6) In addition, the Senior Managers – Well, Exploration shall also meet the HSE roles, responsibilities and accountabilities as specified in their respective Position Description.

Senior Managers/Managers – Human Resources, Procurement, Finance, and Other Support Functions

(1) Senior Managers/Managers shall have the responsibility and accountability for the implementation of HSE Management System within Myanmar Asset.

(2) They are responsible and accountable for the provision of adequate resources, including competent personnel, to implement the arrangements specified in the HSE Management System within Myanmar Asset.

(3) They, in turn, delegate the responsibility for the implementation of the HSE Management System in their respective Myanmar operation, including agreed HSE objectives, plans and targets to the respective Managers within Myanmar Asset.

(4) They are responsible for providing advice on the respective functional areas (e.g. competency, legal compliance, procurement, finance, etc.) to support the effective implementation of the HSE Management System throughout PCML operations.

(5) In addition, the Managers – Human Resources, Procurement, Finance, and Other Support Functions shall also meet the HSE roles, responsibilities and accountabilities as specified in their respective Position Description.

Managers – Production, Maintenance & Engineering Department and Sub-surface Department

(1) Senior Managers/Managers shall have the responsibility and accountability for the implementation of HSE Management System within their respective operational areas.

(2) They are responsible and accountable for the provision of adequate resources, including competent personnel, to implement the arrangements specified in the HSE Management System within their respective operational areas.

(3) In the execution of HSE-critical activities, they are responsible and accountable for the conduct of the required HSE risk assessment, including the identification and implementation of HSE controls, such that harm to people, environment, asset and reputation are eliminated and/or minimised.

(4) They are responsible and accountable for ensuring the technical and operational integrity of facilities and equipment within the respective operational areas, through reliability analysis and execution of required maintenance activities.

(5) They, in turn, delegate the responsibility for the implementation of the HSE Management System in their respective operational areas, including agreed HSE objectives, plans and targets to the respective Senior Managers/Managers within their respective operational areas.

(6) In addition, the Senior Managers/Managers – Production, Maintenance, Petroleum Engineering and Reliability Engineering shall also meet the HSE roles, responsibilities and accountabilities as specified in their respective Position Description.

Company Site Representative

(1) Company Site Representatives shall have the responsibility and accountability for the implementation of HSE Management System, including the associated procedures and guidelines, within their respective facility/worksite.

(2) They are responsible for ensuring that employees and Contractors personnel under their supervision are fully competent to carry out tasks allocated to them, including emergency response preparedness capabilities.

(3) In the execution of HSE-critical activities, they are responsible and accountable for the conduct of the required HSE risk assessment, including the identification and implementation of HSE controls, such that harm to people, environment, asset and reputation are eliminated and/or minimised.

(4) They are responsible and accountable for ensuring the technical and operational integrity of facilities and equipment within the respective facility/worksite, through execution of required maintenance activities.

(5) They, in turn, delegate the responsibility for the implementation of the HSE Management System in their respective facility/worksite, including agreed HSE objectives, plan and target to the respective Supervisors and/or Team Leaders within the facility/worksite.

(6) In addition, Company Site Representatives shall also meet the HSE roles, responsibilities and accountabilities as specified in their respective Position Description.

Senior Manager/ Manager (Health, Safety and Environment – HSE)

(1) HSE Senior Manager shall have the responsibility and accountability in driving the implementation of HSE Management System within his respective facility/area of responsibility.

(2) He is responsible and accountable for providing the required advice on HSE, towards attaining full compliance to the requirement of the HSE Management System within his respective facility/area of responsibility.

(3) He is responsible for engagement/contact on HSE matters with regulatory authorities and industry associations within his respective facility/area of responsibility.

(4) He is responsible for maintaining an HSE assurance program, including for Contractors, to support the effective implementation of the HSE Management System within facility/area of responsibility.

(5) He is responsible for maintaining an effective crisis management and emergency response capabilities within facility/area of responsibility.

(6) In addition, the Senior Managers/Managers, Health, Safety and Environment (HSE) shall also meet the HSE roles, responsibilities and accountabilities as specified in their respective Position Description.

HSE Liaison/Focal Person

(1) HSE Liaison/Focal Person is an employee in line departments appointed to coordinate HSE matters for their respective Department. The appointment of HSE Liaison/Focal Person shall be made in writing by the respective Head (Myanmar Operation)/Senior Manager.

(2) HSE Liaison/Focal Person should be responsible for the followings:

a) Disseminating HSE information within the respective Department;

b) Coordinating the provision of HSE advice to Department;

c) Tracking to closure the implementation of HSE Recommended Action Items (HSERAI) for the Department;

d) Tracking the implementation of HSE trainings for the Department;

e) Compiling and submitting HSE performance reports (e.g. incident report, man-hours); and

f) Coordinating and/or conducting HSE briefing to new staff and transferees within the Department.

Daily Site Operations / Tool box Meetings

The Person-in-Charge of all facility/worksite shall conduct daily site operations meeting to discuss daily planned activities, as well as sharing of HSE-related information, e.g. incidents, unsafe acts and unsafe conditions, lesson learnt, etc. Emphasis shall be given to potential impact of hazardous activities, including concurrent activities, such that harm to people, environment, asset and reputation are eliminated and/or minimised.

Table 8-1:Onsite Roles and Responsibilities

Position	Role	Responsibilities	Specific Tasks
Drilling Site Manager	Management commitment	Promote commitment to HSE and Waste Management Procedure (WMP) among all staff and contractors	• Ensure HSE and WMP is on Management agenda and discussed where appropriate at weekly Operations meeting Guidance for efficient disposal
Third Party Consultant	Auditing	Ensure HSE and WMP is implemented property	• Conduct HSE and WMP auditing as part of EMP
HSE Focal (Safety Officer)	Responsibility for HSE Monitoring and Reporting	• Ensure HSE and WMP is implemented property • Oversee implementation of HSE and WMP • HSE and WMP Education	• Educating on site staffs, visitor and contractors. • Track waste being disposed • Arrange for disposal and prepare datasheet. • Ensure that segregated waste is disposed of as described in this manual. • Audit waste disposal facilities every 6 months • Identify waste in terms of categories • Update the nature and quantity of waste disposal data. • Finding ways to get more storage space and to utilize recycle methods • Report monthly as part EMP
Drilling Safety Officer	Monitoring and Reporting	• Oil/ diesel waste • Chemical waste • Scheduled waste	• Making sure that all chemicals come to the site with correct material SDS. • Making sure that all expired chemicals and unidentified chemicals are not in the site. • Report monthly as part of EMP
Drilling Medical Officer	Monitoring and Reporting	Medical waste	• Track waste being disposed • Arrange for disposal • The safe disposal of sanitary products • Inspect disposal facilities every 6 months • Report monthly as part of EMP
Drilling Supervisor	Supervision & Control	Non-hazardous waste Waste	• Keep facilities clean. • Fixing time for emptying or rubbish bins and collection of disposed materials. • Record all non-hazardous waste before dispose. • Safe disposal of waste at approved disposal site. • Report monthly as part of EMP

Position	Role	Responsibilities	Specific Tasks
Drilling Material & Logistics Coordinator	Monitoring and Reporting	Identifying and tracking	• Completion of required transfer notes/ waste manifest/ waste consignment notes. • Keeping accurate records of skip contents for the cargo. • Safe packing and transportation of hazardous waste when required. • Ensuring items sent from rig/ Yangon is correct and liaison with relevant parties in the event of unidentified items. • Making sure that all chemicals come to the site with correct material SDS.
Catering Manager	Contractor	Follow HSE and WMP for site related works	• Keep rig kitchen and eating areas clean. • Record canteen waste and remove all kitchen waste daily. • Report weekly as part of EMS
Representative	Contractor	Follow HSE and WMP for site related works	• Ensure that all received items are correct as mentioned in the cargo manifest. • Keep all cargo manifests as record for auditor. • Ensuring that follow the instruction in waste disposing.
Representative	Recycle/ Re-User (third party)	Follow HSE and WMP for related works	• Ensure that all received items are correct as mentioned in the cargo manifest. • Keep all cargo manifests (copy) as record for auditor. • Ensuring that follow the instruction in waste recycling/ reusing

8.5.3 Training Requirements

The following training is required for this project.

HSE Induction

All new employees and transferees, including Contractors, shall be given a formal induction of the facility/worksite, including familiarisation with emergency procedures.

Pre-Mobilisation The key HSE requirements and/or deliverables during the pre-mobilisation phase shall include, amongst others, the followings:

Training and review of standard Work Procedures/Work Instructions, incorporating the identified HSE controls will be conducted prior to project start up.

A training program for HSE requirements and/or deliverables during this phase (e.g. HSE Plan, HSE Training, Emergency Response Plan, etc.) shall be implemented accordingly, as specified in the contract.

Mobilisation A seminar will be provided to review all HSE requirements and/or deliverables during the mobilisation phase shall include, amongst others, the following:

(1) Communication of HSE Plan, including HSE Key Performance Indicators and Target;

(2) Verification of personnel competencies, including HSE training; and

(3) Personnel screening for drug and alcohol, in accordance with PETRONAS Drug and Alcohol Policy.

Additionally, as part of the mobilization, an audit should be carried out to verify conformance to HSE requirements as specified in the contract.

Training shall be conducted to ensure personnel are aware of the existence of procedures and work instructions, understand their applicability and are competent to apply their requirements.

8.5.4 Standards and Regulations

HSE Legislation, International Convention and Protocol

All relevant HSE legislations and applicable international conventions and protocols shall be fully complied with throughout PCML operations. Where PCML HSE standards are more stringent, the requirement of the Company HSE standards shall apply.

Line management shall ensure that HSE Legal Register, incorporating all relevant provisions, shall be developed and maintained for PCML's Facilities and/or Work Locations, including offices.

For Contractors' facilities, full compliance to legislative requirements shall be demonstrated, either through HSE Legal Register or equivalent.

The **HSE Legal Register** shall indicate the status of compliance, including detailed information on compliance, for all applicable provisions. For cases of non-compliance, if any, detail information of the non-compliance as well as proposed action plans to ultimately attain compliance, shall also be documented accordingly.

Verifications

Compliance to the above expectations may be demonstrated by the following documentations:

(1) Availability and comprehensiveness of HSE Legal Register, or equivalent (for Contractors);
(2) Records of work practices conform to legal requirements;
(3) Relevant HSE monitoring reports/records e.g. records on Noise Monitoring programme, equipment certificate, Environmental Monitoring Reports, etc.; and
(4) Minutes of HSE Meetings.

8.6 Summary of Environmental Impacts, Mitigation & Monitoring Measures

During the environmental impact assessment, a number of potentially significant impacts were identified. In some cases, even though the impacts were of low significance, mitigation measures were provided as part of PCML's environmental management guidelines. This section outlines the mitigation measures that are to be employed to reduce the extent, duration, magnitude or likelihood of an impact if one does occur. In addition, environmental monitoring measures will be undertaken to assess whether the mitigation measures are effective and if performance meets EIA commitments; these are outlined in the next section.

8.6.1 General Mitigation Measures for Project Operation

Table 8-2 shows the general mitigation measures for project operation.

Table 8-2: General Mitigation Measures for Project Operation

General Measures
1 . Mitigation and monitoring measures set forth in this document must be incorporated into contractual agreements for all contractors, including: design, construction, and operation in order to obtain practical and effective execution of the project.
2. Report compliance with these mitigation and monitoring measures to MOGE in congruence with schedule.
3. Provide stakeholder relation plans to explain the project description before starting (at least 15 days prior), including schedule for project installation and drilling/testing periods, mitigation and monitoring measures for affected communities located near the project area.
4. Operator must set up a contact point to receive any complaints from the stakeholder regarding its exploration activities. Further, the Operator must provide assistance and rectify the cause of such complaints as determined appropriate, as soon as possible.
5. If impacts and/or damages result from project activities, the Operator must implement all necessary measures to mitigate these impacts and/or damages as soon as possible.
6. MOGE will investigate complaints lodged by people living in the surrounding area concerning any disturbance by project activities, or any damage of public infrastructure resulting from project operations. The Operator will inform the public within 30 days if the investigation proves that the Operator did not comply with mitigation and monitoring measures.
7. During the project period, if archaeological finds are encountered in the project area, the project team must stop all activities immediately and report the findings to the appropriate government office, e.g. Local Archeological Department, Fossil Research Center and Geological Museum within 7 days of the discovery. In addition, the project team must cooperate with the government agencies in an effort to verify the findings in the project area. If it is proven that these findings are archaeological finds or fossils, the Operator must follow the regulations strictly.
8.Should the Operator wish to make changes to the exploration activities, or change the methodology of operations, or conduct the activities significantly different from what was proposed in the EIA; details regarding the changes, along with revised assessment and appropriate mitigation and monitoring measures in accordance with such change(s) will be submitted to the MOGE for approval before commencing.
9. The Operator will start operations only when the Operator has received the necessary approval, permit or agreement from the landowner or responsible agency. All activities will operate under the control of MOGE.

8.6.2 Environmental, Social, and Health Impacts and Mitigation Measures

A summary of EHS impact and mitigation measures for the offshore exploration campaign shown **Table 8-3**.

Table 8-3: EMP Commitment Table for PCML M12, M13 & M14 Exploration Drilling

Installation Phase

Environmental Factors /Events	Activity	Potential Impact/Issue	Mitigation Measures	Residual Impact	Specific Action	Responsible Team Member	Phase	Records
Environmental Mitigation Measures								
Physical Resources								
1 Air Quality / Climate	1.1 Crew/Materials Transport 1.2 Offshore Fuel Storage & Handling 1.3 Energy Use	1.1.1 Deterioration of air quality due to exhaust emissions 1.1.2 GHG Release contributing to climate change	1.1.1.1 Routine inspection and preventive maintenance as per maintenance schedule/ recommended by manufacturers to ensure efficiency of combustion. 1.1.1.2 Use of low sulphur fuel (sulphur content not to exceed 0.05% m/m) when it is available. 1.1.1.3 Vessels will have a SEEMP providing for fuel efficient vessel operations, in accordance with the requirements of Annex VI MARPOL 73/78 (as applicable or required by vessel class). 1.1.1.4 Vessels will be in compliance with applicable MARPOL 73/78 Regulations for the prevention of air pollution from ships (Annex I) (as applicable or required by vessel class). 1.1.1.5 The drilling rig will have International Air Pollution Prevention (IAPP) certificates, in	Negligible	• Contractor to provide maintenance schedule • Contractor to provide fuel specifications • Contractor to have SEEMP • Contractor to provide MARPOL IAPP certification for rig and vessels.	PCML/ Rig Contractor	Installation Phase	Copy of marine fuel specifications SEEP MARPOL IAPP certificates

Environmental Factors /Events	Activity	Potential Impact/Issue	Mitigation Measures	Residual Impact	Specific Action	Responsible Team Member	Phase	Records
			accordance with the requirements of Annex VI MARPOL 73/78 (as applicable or required by vessel class). Certification under MARPOL will confirm that engines and other combustion emission sources on the vessel (excluding emission sources directly associated with the extraction of hydrocarbons, such as flaring) meet IMO standards.					
2 Seawater & Sediment Quality	2.1 Offshore Fuel Storage & Handling 2.2 Hazardous Materials Handling and Storage 2.3 Wastewater Disposal 2.4 Non-Hazardous and Hazardous Waste Handling and Storage 2.5 Rig Placement	2.1.1 Potential contamination due to discharges or spill of fuel, mud or chemicals (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	2.1.1.1 The drilling rig will comply with applicable MARPOL 73/78 Annex IV requirements (Reg 4 and 8), including: a. Vessels will have valid International Sewage Pollution Prevention (ISPP) Certificate. b. Discharge of sewage into the sea is prohibited, except when the vessel has in operation an approved sewage treatment plant or when the ship is discharging comminuted and disinfected sewage using an approved system at a distance of more than 3 nm from the nearest land. c. Sewage which is not comminuted or disinfected	Negligible	• Contractor to provide MARPOL ISPP certification and maintain vessel discharge log book for drilling rig. • Contractor to provide MARPOL IOPP certification and maintain vessel discharge log/oil record book for drilling rig and vessels. • Contractor to provide spill kits to contain any chemical/fuel/waste spillage • PCML to provide Emergency Response Plan and	PCML / Rig Contractor	Installation Phase	MARPOL ISPP certificate Vessel discharges log book Incident records Waste Manifest Records Oil Record Book

Environmental Factors /Events	Activity	Potential Impact/Issue	Mitigation Measures	Residual Impact	Specific Action	Responsible Team Member	Phase	Records
			has to be discharged at a distance of more than 12 nm from the nearest land. 2.1.1.2 The drilling rig and support vessels will comply with applicable MARPOL 73/78 Annex I requirements (Reg 7, 14 and 17) including: 2.1.1.3 Vessels will have valid IOPP certificate. 2.1.1.4 Bilge water contaminated with hydrocarbons must be contained and disposed of onshore, unless the oil in water (OIW) content is within15 ppm and an IMO approved oil/water separator (as applicable or required by vessel class) is used to treat the bilge water. 2.1.1.5 Vessels will maintain an oil record book. 2.1.1.6 No direct overboard drainage from sludge/drain/dirty oil/bilge water collecting tanks. Provide appropriate lights and warning signals on all vessels to prevent accidental collision. 2.1.1.7 A current IOPP Certificate for the drill ship will be provided prior to the drilling program. 2.1.1.8 Comply with all International Maritime		Oil Spill Response Plan • Contractor to contract a licensed Hazardous Waste Facility for disposal of hazardous wastes • PCML to provide Waste Management Plan			

Environmental Factors /Events	Activity	Potential Impact/Issue	Mitigation Measures	Residual Impact	Specific Action	Responsible Team Member	Phase	Records
			Organization (IMO) standards regarding vessel seaworthiness and maritime safety. 2.1.1.9 In case of spill, implement PCML's Spill Contingency Plan. 2.1.1.10 Use support vessels to warn off non-related vessel traffic to prevent accidental collision. 2.1.1.11 Support vessels to observe leaks, spills and determine potential causes. 2.1.1.12 The drilling rig shall be equipped with a bund wall to prevent oil and chemical spills. Any spilled oil and chemicals will be collected into a sealed container. 2.1.1.13 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 at licensed Hazardous Waste Facility. 2.1.1.14 Store, separate, transport and dispose of waste following PCML's Waste Management Plan. 2.1.1.15 All contracted vessels will comply with IMO Ballast					

Environmental Factors /Events	Activity	Potential Impact/Issue	Mitigation Measures	Residual Impact	Specific Action	Responsible Team Member	Phase	Records
			Water requirements. 2.1.1.16 Food waste must be shredded to smaller than 25 mm before discharge to sea.					
Biological Resources								
3 Marine Biota, Endangered Species, Sensitive/Protected Areas	3.1 Crew/Materials Transport 3.2 Offshore Fuel Storage & Handling 3.3 Wastewater Disposal 3.4 Hazardous Materials Handling and Storage 3.5 Presence of Equipment and Facilities 3.6 Rig Placement	3.1.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine animals and the ecosystem	3.1.1.1 Comply with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety. 3.1.1.2 Provide an effective wastewater treatment system to ensure that the quality of the wastewater discharge meets the criteria of MARPOL 73/78. 3.1.1.3 Food waste must be shredded to smaller than 25 mm before discharge to sea. 3.1.1.4 Regularly monitor the safety zone (500 m-radius surrounding drilling rig) to prevent any accidents. 3.1.1.5 Regularly patrol by support vessels to observe leaks, spills and determine potential causes. 3.1.1.6 Comply with all fuel storage, waste treatment and disposal regulations/procedures (MARPOL 73/78 regulations and PCML standards/ procedures). 3.1.1.7 Store, separate, transport and dispose of waste following PCML's Waste	Negligible	PCML to identify high valued marine habitat area and ensure support vessels avoid these areas PCML to provide a marine mammal observer on a support vessel during installation period Contractor to provide rig and vessel certifications	PCML / Rig Contractor	Installation Phase	Marine Mammal Siting Log Incident Records Discharge Log

Environmental Factors /Events	Activity	Potential Impact/Issue	Mitigation Measures	Residual Impact	Specific Action	Responsible Team Member	Phase	Records
			Management Plan. 3.1.1.8 Avoid transportation near areas with endangered marine animals. 3.1.1.9 During rig installation, provide a marine mammal observer to look for endangered marine animals around rig area from the support vessels. 3.1.1.10 If any endangered marine animal is found in the project area before rig installation, use sonar wave to prevent endangered marine animals entering the area. 3.1.1.11 Support vessels will not travel greater than 6 knots within 300m of a whale, if sighted, (caution zone) and approach no closer than 100m from a whale. 3.1.1.12 Vessel bridge crew to maintain continuous visual watch of any hazards (including marine mammals and marine turtles). 3.1.1.13 Avoid vessel collision with marine mammals and turtles. 3.1.1.14 Record observed endangered marine animals found in project area.					
Social Mitigation Measures								
Human Use Values								
4 Fisheries	4.1 Crew/Materials Transport	4.1.1 Removal of fishing	4.1.1.1 At least 30 days prior to rig mobilization, coordinate with	Low	PCML to provide and implement Grievance	PCML	Installation Phase	Drilling Rig and vessel

Environmental Factors /Events	Activity	Potential Impact/Issue	Mitigation Measures	Residual Impact	Specific Action	Responsible Team Member	Phase	Records
	4.2 Offshore Fuel Storage & Handling 4.3 Wastewater Disposal 4.4 Hazardous Materials Handling and Storage 4.5 Presence of Equipment and Facilities 4.6 Rig Placement	equipment and other obstacles from the drilling area may cause damage to fishing equipment 4.1.2 Loss of fishing area could directly affect the income of fisherman 4.1.3 Project activities may result in collisions or accidents that would potentially affect fishermen and project equipment. 4.1.4 Quantity and quality of aquatic biota could decrease from project activities, causing a reduction in the amount of fish suitable for sale/consumption. 4.1.5 Accidental collision	MOGE, who will then issue "Notice to Mariner" regarding project activities to appropriate parties. (i.e. Department of Fisheries, Ministry of Livestock and Fisheries, and Marine Police Force) 4.1.1.2 Implement PCML's Public Relations Plan and Grievance Mechanism. 4.1.1.3 At least 15 days prior to rig mobilization meet with Fishing Associations to update plans. 4.1.1.4 Establish 500 m safety zone around the drilling rig. 4.1.1.5 Use support vessels to warn off traffic. 4.1.1.6 Drilling rig and support vessels will comply with international regulations for collision avoidance (COLREGs 1972), navigation and watch keeping, including: 4.1.1.7 Maintaining look-outs (e.g. visual, hearing, radar etc.), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar). 4.1.1.8 Navigation light display requirements, Including visibility, light position/shape and noise signals appropriate to activity. 4.1.1.9 Maintenance of minimum		Mechanism with fisherman Certification of compliance with SOLAS specifications for Navigation PCML to prepare and issue Notice to Mariners			certifications Grievance Record Book Notice to Mariners

Environmental Factors /Events	Activity	Potential Impact/Issue	Mitigation Measures	Residual Impact	Specific Action	Responsible Team Member	Phase	Records
			safe manning levels. 4.1.1.10 Maintenance of navigation equipment in efficient working order (compass/radar / communications). 4.1.1.11 Navigational systems and equipment as specified in Regulation 19 of Chapter V of SOLAS. 4.1.1.12 Automatic Identification System installed as applicable or required by vessel class, in accordance with Regulation 19 of Chapter V of SOLAS. 4.1.1.13 The drilling rig and vessels will comply with MARPOL 73/78 (annex IV and I) requirements. 4.1.1.14 Record the fishing equipment removed. 4.1.1.15 Implement PCML's Public Relations Plan and Grievance Mechanism.					
5 Shipping	5.1 Crew/Materials Transport 5.2 Presence of Equipment and Facilities 5.3 Rig Placement	5.1.1 Increased shipping traffic 5.1.2 Accidental collision	5.1.1.1 At least 30 days prior to rig mobilization, coordinate with MOGE, who will then issue "Notice to Mariner" regarding project activities to appropriate parties. 5.1.1.2 Establish 500 m safety zone around the drilling rig. 5.1.1.3 Use support vessels to warn off traffic. 5.1.1.4 Provide appropriate lights and warning signals on all vessels to prevent accidental	Low	Inspection to confirm implementation of relevant navigational and communication requirements for drilling rig and support vessels operating at sea.	PCML / Rig Contractor	Installation Phase	Incident Records Rig and vessel certificates of compliance

Environmental Factors /Events	Activity	Potential Impact/Issue	Mitigation Measures	Residual Impact	Specific Action	Responsible Team Member	Phase	Records
			collision. 5.1.1.5 Drilling rig and support vessels will comply with international regulations for collision avoidance (COLREGs 1972), navigation and watch keeping, including: 5.1.1.6 Maintaining look-outs (e.g. visual, hearing, radar etc.), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar). 5.1.1.7 Navigation light display requirements, Including visibility, light position/shape and noise signals appropriate to activity. 5.1.1.8 Maintenance of minimum safe manning levels. 5.1.1.9 Maintenance of navigation equipment in efficient working order (compass/radar / communications). 5.1.1.10 Navigational systems and equipment as specified in Regulation 19 of Chapter V of SOLAS. 5.1.1.11 Automatic Identification System installed as applicable or required by vessel class, in accordance with Regulation 19 of Chapter V of SOLAS .					

Environmental Factors /Events	Activity	Potential Impact/Issue	Mitigation Measures	Residual Impact	Specific Action	Responsible Team Member	Phase	Records
6 Waste Management	6.1 Non-Hazardous and Hazardous Waste Handling and Storage 6.2 Wastewater Disposal	6.1.1 Direct impact on seawater quality, seabed sediment, and marine organism 6.1.2 Indirect impact on fisherman	6.1.1.1 All contractors must comply with the with PCML's Waste Management Plan. 6.1.1.2 Do not drop any non-food solid waste into the sea. 6.1.1.3 Store hazardous waste in containers that are durable and safe for transport/transfer. Also, store them in areas away from fire sources. 6.1.1.4 Record and examine the type and quantity of waste. 6.1.1.5 Store, separate, transport, and dispose of waste following PCML's Waste Management Plan. 6.1.1.6 Ensure manifest records of all transported waste are kept.	Negligible	PCML to ensure contractor follows PCML site specific waste management plan Contractor to provide waste handling equipment, waste storage containers, and spill response equipment	PCML / Waste Contractor	Installation Phase	Waste Manifest Records
7 Pipeline/Cable/ Underwater Structures	7.1 Rig Placement	7.2 Possible damage to underwater cable lines and petroleum pipelines during rig installation resulting in interruption of service.	7.1.1 Identify all underwater structures and avoid drilling or anchoring in these areas	Negligible	PCML to site planned wells away from any underwater structures	PCML	Installation Phase	Map of underwater structures near planned drill locations
Quality of Life Values								
8 Socio-Economic	8.1 Shore Base Support 8.2 Offshore Fuel Storage &	8.1.1 Employment/income and procurement opportunities for	8.1.1.1 Develop plan for enhanced utilization of local goods and services. 8.1.1.2 Sub-contractor terms of	Positive	PCML to meet with local authorities to discuss and prepare plan for local	PCML	Installation Phase	Employment Records Records of

Environmental Factors /Events	Activity	Potential Impact/Issue	Mitigation Measures	Residual Impact	Specific Action	Responsible Team Member	Phase	Records
	Handling 8.3 Hazardous Materials Handling and Storage 8.4 Non-Hazardous and Hazardous Waste Handling and Storage 8.5 Rig Placement 8.6 Labour, Equipment Services Supply	people, business and services in surrounding area	contract to include requirement for hiring locals, especially for unskilled and semi-skilled workforce.		employment and purchase of local goods and services.			local purchases

Drilling Phase

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
Environmental Mitigation Measure								
Physical Resources								
1 Air Quality / Climate	1.1 Crew/Materials Transport 1.2 Offshore Fuel Storage & Handling 1.3 Energy Use	1.1.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	1.1.1.1 Routine inspection and preventive maintenance as per maintenance schedule/ recommended by manufacturers to ensure efficiency of combustion.	Negligible	Contractor to provide maintenance schedule	PCML/ Rig Contractor	Exploration Drilling Phase	Copy of maintenance schedule
2 Underwater Noise	2.1 Drilling	2.1.1 Increased underwater noise from site sonar scan und underwater drilling and installation	2.1.1.1 Side Scan Sonar operation should be started with low frequency acoustic waves for at least 20 minutes before starting operation with high frequency to allow marine mammals, fish and seabirds to avoid the areas of such operation. 2.1.1.2 If marine mammals are present during seafloor survey with Side-Scan Sonar or Drilling, the operation will be temporarily ceased for at least 20 minutes after the mammals have left the area	Negligible	If marine mammals are present during seafloor survey with Side-Scan Sonar or Drilling, the operation will be temporarily ceased for at least 20 minutes after the mammals have left the area	PCML/ Rig Contractor	Exploration Drilling Phase	Marine Mammal Sighting Log
3 Seawater & Sediment Quality	3.1 Offshore Fuel Storage & Handling 3.2 Hazardous Materials Handling and Storage 3.3 Wastewater Disposal	3.1.1 Deterioration due to spill of fuel/chemicals/drilling mud	3.1.1.1 Each vessel greater than 400 gross tons will comply with all MARPOL73/78 fuel storage, waste treatment and disposal regulations. 3.1.1.2 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.	Low	Contractor to provide Drill Cuttings and Fluids Plan Drilling Contractor to use WBDF as practicable during the drilling activity	Rig Contractor	Exploration Drilling Phase	Waste Manifests Environmental Monitoring Report Mud & Cuttings Log Vessel Discharges

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
	3.4 Non-Hazardous and Hazardous Waste Handling and Storage 3.5 Mud & Cuttings		3.1.1.3 Comply with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety. 3.1.1.4 Regularly monitor safety zone within 500 m-radius surrounding drilling rig to prevent any accidents. 3.1.1.5 Regularly patrol by support vessels to observe leaks, spills and determine potential causes. 3.1.1.6 Use Blowout Preventer-BOP to control blowout. 3.1.1.7 WBDF to be used as far as practicable during the drilling activity. 3.1.1.8 Drill cuttings will comply with IFC environmental, health and safety guidelines for offshore oil and gas development (2015). 3.1.1.9 A Drill Cuttings and Fluid Plan will be submitted to ECD. 3.1.1.10 PCML will maintain a list of indicative Drilling Chemicals. 3.1.1.11 Water sample collection and analysis and surface plankton samples will be taken near the well location. 3.1.1.12 Sediment sampling will be conducted near the well location. 3.1.1.13 PCML to inform ECD for additional chemicals and		Chemicals for discharge or release to sea to be selected and approved as per the PCML Chemical Assessment Process and included on the Chemical Selection List. Contractor to conduct bulk operational discharges under the drilling rig PTW system. A Drill Cuttings and Fluid Plan will be submitted to ECD PCML will maintain a list of indicative Drilling Chemicals. Water sample collection and analysis and surface plankton samples will be taken near the well location. Sediment sampling will be conducted near the well location. PCML will provide the list of chemicals used in the Environmental Monitoring Report. This will include the list of chemicals not in the EIA and details of			Log Book Chemical MSDS Records for all Chemicals

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
			environmental mitigation measure as per relevant international guidelines, via the Environmental Monitoring Report.		the further assessment process.			
		3.1.2 Degradation due to sediment disturbance, mud & cutting disposal	3.1.2.1 Select the appropriate drilling method to reduce the amount of drilling mud and cuttings discharged. 3.1.2.2 Use seawater and Water-Based Mud (WBM) that will rapidly degrade in the natural environment.	Low	Use seawater and Water-Based Mud (WBM)	Rig Contractor	Exploration Drilling Phase	Mud & Cuttings Log
		3.1.3 Degradation from other discharges	3.1.3.1 Comply with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety. 3.1.3.2 The drilling rig shall be equipped with bund wall to prevent oil and chemical spills. Any spilled oil and chemicals will be collected into a sealed container. 3.1.3.3 Support vessels will divert contaminated water from different parts of ship to treatment before drainage to the sea. 3.1.3.4 Store, separate, transport and dispose of waste following PCML's Waste Management Plan. 3.1.3.5 Provide effective wastewater treatment system to ensure that the quality of the wastewater discharge meets the criteria	Low	Comply with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety. Provide effective wastewater treatment system to ensure that the quality of the wastewater discharge meets the criteria of MARPOL 73/78.	Rig Contractor	Exploration Drilling Phase	Vessel Discharges Log Book

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
			of MARPOL 73/78. 3.1.3.6 Food waste must be shredded to smaller than 25 mm before discharge to sea.					
Biological Resources								
4 Marine Biota, Endangered Species Sensitive and Protected Areas	4.1 Crew/Materials Transport 4.2 Offshore Fuel Storage & Handling 4.3 Wastewater Disposal 4.4 Hazardous Materials Handling and Storage 4.5 Presence of Equipment and Facilities 4.6 Rig Placement 4.7 Mud & Cuttings Disposal	4.1.1 Toxicity effects from oil /hazardous material spill and blowout 4.1.2 Aquatic Biota and Endangered marine animals migrate from the survey area	4.1.2.1 Comply with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety. 4.1.2.2 Provide an effective wastewater treatment system to ensure that the quality of the wastewater discharge meets the criteria of MARPOL 73/78. 4.1.2.3 Food waste must be shredded to smaller than 25 mm before discharge to sea. 4.1.2.4 Regularly monitor the safety zone (500 m-radius surrounding drilling rig) to prevent any accidents. 4.1.2.5 Regularly patrol by support vessels to observe leaks, spills and determine potential causes. 4.1.2.6 Comply with all fuel storage, waste treatment and disposal regulations/procedures (MARPOL 73/78 regulations and PCML standards/ procedures). 4.1.2.7 Store, separate, transport and dispose of waste following PCML's Waste Management Plan.	Negligible	During rig installation, provide a marine mammal observer to look for endangered marine animals around rig area from the support vessels. If any endangered marine animal is found in the project area before rig installation, use sonar wave to prevent endangered marine animals entering the area. Vessel bridge crew to maintain continuous visual watch of any hazards (including marine mammals and marine turtles). Avoid vessel collision with marine mammals and turtles. Record observed endangered marine animals found in project area.	Rig Contractor	Exploration Drilling Phase	Marine Mammal Siting Log Incident Records Discharge Log

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
			4.1.2.8 Avoid transportation near areas with endangered marine animals. 4.1.2.9 During rig installation, provide a marine mammal observer to look for endangered marine animals around rig area from the support vessels. 4.1.2.10 If any endangered marine animal is found in the project area before rig installation, use sonar wave to prevent endangered marine animals entering the area. 4.1.2.11 Support vessels will not travel greater than 6 knots within 300m of a whale, if sighted, (caution zone) and approach no closer than 100m from a whale. 4.1.2.12 Vessel bridge crew to maintain continuous visual watch of any hazards (including marine mammals and marine turtles). 4.1.2.13 Avoid vessel collision with marine mammals and turtles. 4.1.2.14 Record observed endangered marine animals found in project area. 4.1.2.15 Use Blowout Preventer-BOP to control blowout.					

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
Social Mitigation Measures								
Human Use Values								
5 Fisheries	5.1 Crew/Materials Transport 5.2 Wastewater Disposal 5.3 Presence of Equipment and Facilities 5.4 Drilling & Completion of Wells 5.5 Mud & Cuttings	5.1.1 Impacts from fishing area restriction, tainting or contamination of fish from spills, discharges, and collisions 5.1.2 Accidental collision	5.1.1.1 Implement PCML's Public Relations Plan and Grievance Mechanism. 5.1.1.2 Establish a 500 m safety zone around the drilling rig. 5.1.1.3 Use support vessels to warn off traffic. 5.1.1.4 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.	Low	PCML to provide and implement Grievance Mechanism with fisherman PCML to prepare and issue Notice to Mariners	PCML	Exploration Drilling Phase	Drilling Rig and vessel certifications Grievance Record Book Notice to Mariners
6 Shipping	8.1 Crew/Materials Transport 8.2 Presence of Equipment and Facilities	6.1.1 Increased shipping traffic 6.1.2 Accidental collision	6.1.1.1 Established a 500 m safety zone around the drilling rig. 6.1.1.2 Use support vessels to warn off traffic. 6.1.1.3 Provide appropriate lights, warning signals, communication tools, and a reflected radar signal on all vessels to prevent accidental collision.	Low	Inspection to confirm implementation of relevant navigational and communication requirements for drilling rig and support vessels operating at sea.	PCML / Rig Contractor	Exploration Drilling Phase	Incident Records Rig and vessel certificates of compliance
7 Waste Management	9.1 Non-Hazardous and Hazardous Waste Handling and Storage 9.2 Wastewater Disposal 9.3 Mud and Cuttings	7.1.1 Direct impact on seawater quality, seabed sediment, and marine organism 7.1.2 Indirect impact on fisherman 7.1.3 Pressure on existing waste management facilities	7.1.1.1 Store, separate, transport and dispose of waste following PCML's Waste Management Plan. 7.1.1.2 Do not drop any non-food solid waste into the sea. 7.1.1.3 Store hazardous waste in containers that are durable and safe for transport/transfer. Also, store them in areas away from fire sources. 7.1.1.4 Record and examine the	Negligible	PCML to ensure contractor follows PCML site specific waste management plan Contractor to provide waste handling equipment, waste storage containers, and spill response equipment	PCML / Waste Contractor	Exploration Drilling Phase	Waste Manifest Records

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
			type and quantity of waste. 7.1.1.5 Ensure manifest of hazardous waste is kept.					
Quality of Life Values								
8 Socio-Economy	10.1 Shore Base Support 10.2 Offshore Fuel Storage & Handling 10.3 Hazardous Materials Handling and Storage 10.4 Non-Hazardous and Hazardous Waste Handling and Storage 10.5 Labour, Equipment Services Supply	8.1.1 Employment/income and procurement opportunities for people, business and services in surrounding area	8.1.1.1 Enhance utilization of local goods and services as much as possible.	Positive	PCML to meet with local authorities to discuss and prepare plan for local employment and purchase of local goods and services.	PCML	Exploration Drilling Phase	Employment Records Records of local purchases

Well Testing Phase

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
Environmental Mitigation Measure								
Physical Resources								
1 Air Quality/Climate	1.1 Crew/Materials Transport 1.2 Offshore Fuel Storage & Handling 1.3 Energy Use 1.4 Flaring	1.1.1 Deterioration of air quality due to emissions and GHG Release contributing to climate change	1.1.1.1 Implement proper maintenance of equipment. 1.1.1 Routine inspection and preventive maintenance as per maintenance schedule/ recommended by manufacturers to ensure efficiency of combustion. 1.1.2 Control the proper usage of fuel. 1.1.3 Set up appropriate well testing schedule to minimize time.	Low	The well test duration will be minimized to the extent possible. Engine maintenance to minimize unburned hydrocarbons.	PCML/ Rig Contractor	Well Testing Phase	Copy of maintenance schedule
2 Seawater & Sediment Quality	2.1 Offshore Fuel Storage & Handling 2.2 Hazardous Materials handling and Storage 2.3 Wastewater Disposal 2.4 Non-Hazardous and Hazardous Waste Handling and Storage	2.1.1 Potential contamination from spills, sediment disturbance and increase in suspended solids	2.1.1.1 Each vessel greater than 400 gross tons will comply with all MARPOL 73/78 fuel storage, waste treatment and disposal regulations. 2.1.1.2 Provide appropriate lights and warning signals on all vessels to prevent accidental collision. 2.1.1.3 Comply with all International Maritime Organization (IMO) regulations and standards regarding vessel seaworthiness and maritime safety. 2.1.1.4 Regularly monitor safety zone within 500 m-radius surrounding drilling rig to	Low	Comply with all International Maritime Organization (IMO) regulations and standards regarding vessel seaworthiness and	PCML	Well Testing Phase	Incident records Waste Manifest Records Oil Record Book

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
			prevent any accidents. 2.1.1.5 Regularly patrol by support vessels to observe leaks, spills and determine potential causes. 2.1.1.6 Use Blowout Preventer-BOP to control blowout.					
		2.1.2 Degradation from other discharges	2.1.2.1 Comply with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety. 2.1.2.2 The drilling rig shall be equipped with bund wall to prevent oil and chemical spills. Any spilled oil and chemicals will be collected into a sealed container. 2.1.2.3 Support vessels will divert contaminated water from different parts of ship to treatment before drainage to the sea. 2.1.2.4 Store, separate, transport and dispose of waste following PCML's Waste Management Plan. 2.1.2.5 Provide effective wastewater treatment system to ensure that the quality of the wastewater discharge meets the criteria of MARPOL 73/78. 2.1.2.6 Food waste must be shredded to smaller than 25 mm before discharge to sea.	Low	Comply with all MARPOL and IMO standards	PCML	Well Testing Phase	Discharge Log

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
Biological Resources								
3 Marine Biota, Endangered Species, Sensitive and Protected Areas	3.1 Crew/Materials Transport 3.2 Offshore Fuel Storage & Handling 3.3 Wastewater Disposal 3.4 Hazardous Materials Handling and Storage 3.5 Presence of Equipment and Facilities 3.6 Flaring	3.1.1 Toxicity from effluents or accidental spills 3.1.2 Aquatic Biota and Endangered marine animals migrate from the survey area	3.1.1.1 Comply with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety. 3.1.1.2 Provide an effective wastewater treatment system to ensure that the quality of the wastewater discharge meets the criteria of MARPOL 73/78. 3.1.1.3 Food waste must be shredded to smaller than 25 mm before discharge to sea. 3.1.1.4 Regularly monitor the safety zone (500 m-radius surrounding drilling rig) to prevent any accidents. 3.1.1.5 Regularly patrol by support vessels to observe leaks, spills and determine potential causes. 3.1.1.6 Comply with all fuel storage, waste treatment and disposal regulations/procedures. (MARPOL 73/78, PCML and contractor procedures) 3.1.1.7 Store, separate, transport and dispose of waste following PCML's Waste Management Plan.	Negligible	Store, separate, transport and dispose of waste following PCML's Waste Management Plan. Record aquatic biota and endangered marine animals found in project area.	PCML / Rig Contractor	Installation Phase	Marine Mammal Siting Log Incident Records Discharge Log

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
			3.1.1.8 Record aquatic biota and endangered marine animals found in project area.					
Social Mitigation Measures								
Human Use Values								
4 Fisheries	4.1 Crew/Materials Transport 4.2 Wastewater Disposal 4.3 Presence of Equipment and Facilities	4.1.1 Impacts from fishing area restriction, tainting or contamination of fish from spills, discharges, and collisions 3.1.3 Accidental collision	4.1.1.1 Implement PCML's Public Relations Plan and Grievance Mechanism. 4.1.1.2 Establish a 500 m safety zone around the drilling rig. 4.1.1.3 Use support vessels to warn off traffic. 4.1.1.4 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.	Low	PCML to provide and implement Grievance Mechanism with fisherman PCML to prepare and issue Notice to Mariners	PCML	Well Testing Phase	Grievance Record Book Notice to Mariners
5 Shipping	8.1 Crew/Materials Transport 8.2 Presence of Equipment and Facilities	5.1.1 Increased shipping traffic 5.1.2 Accidental collision	5.1.1.1 Established a 500 m safety zone around the drilling rig. 5.1.1.2 Use support vessels to warn off traffic. 5.1.1.3 Provide appropriate lights, warning signals, communication tools, and a reflected radar signal on all vessels to prevent accidental collision.	Low	Inspection to confirm implementation of relevant navigational and communication requirements for drilling rig and support vessels operating at sea.	PCML / Rig Contractor	Well Testing Phase	Incident Records Rig and vessel certificates of compliance
6 Waste Management	9.1 Non-Hazardous and Hazardous Waste Handling and Storage 9.2 Wastewater Disposal 9.3 Flaring	6.1.1 Direct impact on seawater quality, seabed sediment, and marine organism	6.1.1.1 Do not drop any non-food solid waste into the sea. 6.1.1.2 Store hazardous waste in containers that are durable and safe for transport/transfer. Also, store them in areas away	Negligible	PCML to ensure contractor follows PCML site specific waste management plan Contractor to	PCML / Waste Contractor	Well Testing Phase	Waste Manifest Records

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
		6.1.2 Indirect impact on fisherman 6.1.3 Pressure on existing waste management facilities.	from fire sources. 6.1.1.3 Record and examine the type and quantity of waste. 6.1.1.4 Store, separate, transport and dispose of waste following PCML's Waste Management Plan. 6.1.1.5 Ensure manifest of hazardous waste is kept.		provide waste handling equipment, waste storage containers, and spill response equipment			
Quality of Life Values								
7 Socio-Economy	10.1 Shore Base Support 10.2 Offshore Fuel Storage & Handling 10.3 Hazardous Materials Handling and Storage 10.4 Non-Hazardous and Hazardous Waste Handling and Storage 10.5 Labour, Equipment Services Supply	7.1.1 Employment/income and procurement opportunities for people, business and services in surrounding area	7.1.1.1 Enhance utilization of local goods and services as much as possible.	Positive	PCML to meet with local authorities to discuss and prepare plan for local employment and purchase of local goods and services.	PCML	Well Testing Phase	Employment Records Records of local purchases

Abandonment Phase

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
Environmental Mitigation Measures								
Physical Resources								
1 Air Quality / Climate	1.1 Crew/Materials Transport 1.2 Offshore Fuel Storage & Handling 1.3 Energy Use	1.1.1 Deterioration due to combustion and fugitive emissions	1.1.1.1 Conduct routine inspection and preventive maintenance as per maintenance schedule recommended by manufacturers to ensure efficiency of combustion.	Negligible	Conduct routine inspection and preventive maintenance as per maintenance schedule	PCML	Abandonment phase	Maintenance Log
2 Seawater & Sediment Quality	2.1 Offshore Fuel Storage & Handling 2.2 Hazardous Materials handling and Storage 2.3 Wastewater Disposal 2.4 Rig Decommissioning	2.1.1 Potential contamination (increased levels of suspended solids, metals, toxicity) and oxygen depletion (organic matter)	3.1.1.1 Comply with all fuel storage, waste treatment and disposal regulations/procedures. (MARPOL 73/78 regulations and PCML standards/ procedures). 3.1.1.2 Provide appropriate lights and warning signals on all vessels to prevent accidental collision. **3.1.1.3** Comply with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety.	Low	Comply with all MARPOL and IMO standards	PCML	Abandonment phase	Discharge Log
		2.1.2 Degradation from other discharge	2.1.2.1 Comply with all International Maritime Organization (IMO) standards regarding vessel seaworthiness and maritime safety. 2.1.2.2 Provide effective wastewater treatment system to ensure that the quality of the wastewater discharge meets the criteria of MARPOL 73/78. 2.1.2.3 Food waste must be shredded to smaller than 25 mm before discharge to sea.		Comply with all MARPOL and IMO standards	PCML	Abandonment phase	Discharge Log
Biological Resources								

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
3 Marine Biota, Endangered Species, Sensitive/ Protected Areas	4.1 Crew/Materials Transport 4.2 Offshore Fuel Storage & Handling 4.3 Wastewater Disposal 4.4 Hazardous Materials Handling and Storage 4.5 Rig Decommissioning	3.1.1 Potential deterioration of seawater quality from wastewater discharge, spills and disturbance could affect the marine ecosystem	3.1.1.1 Avoid transportation near areas with endangered marine animals. 3.1.1.2 Record endangered marine animals in project area.	Negligible	Avoid transportation near areas with endangered marine animals.	PCML	Abandonment phase	Marine Mammal Siting Log Incident Records Discharge Log
Human Use Values								
4 Fisheries	6.1 Crew/Materials Transport 6.2 Wastewater Disposal 6.3 Presence of Equipment and Facilities 6.4 Rig Decommissioning	4.1.1 Limited fishing area due to 500 m safety zone 4.1.2 Accidental collision	4.1.1.1 Implement PCML's Public Relations Plan and Grievance Mechanism. 4.1.1.2 Use support vessels to warn off traffic. 4.1.1.3 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.	Low	PCML to provide and implement Grievance Mechanism with fisherman PCML to prepare and issue Notice to Mariners	PCML	Abandonment phase	Grievance Record Book Notice to Mariners
5 Shipping	7.1 Crew/Materials Transport 7.2 Presence of Equipment and Facilities	5.1.1 Increased shipping traffic 5.1.2 Accidental collision	5.1.1.1 Use support vessels to warn off traffic. 5.1.1.2 Provide appropriate lights and warning signals on all vessels to prevent accidental collision. 5.1.1.3 Set a safety zone around the project area (500 m radius of exploration well) to prevent disturbance or accident caused by fishing boat collisions with drilling rig or supporting vessel.	Low	Inspection to confirm implementation of relevant navigational and communication requirements for drilling rig and support vessels operating at sea.	PCML / Rig Contractor	Abandonment phase	Incident Records Rig and vessel certificates of compliance
6 Waste Managem	8.1 Non-Hazardous	6.1.1 Direct impact on	6.1.1.1 Do not drop any non-food solid waste into the sea.	Negligible	PCML to ensure contractor follows	PCML / Waste Contractor	Abandonment Phase	Waste Manifest

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
ent	and Hazardous Waste Handling and Storage 8.2 Wastewater Disposal	seawater quality, seabed sediment, and marine organism 6.1.2 Indirect impact on fisherman	6.1.1.2 Store hazardous waste in containers that are durable and safe for transport/transfer. Also, store them in areas away from fire sources. . 6.1.1.3 Store, separate, transport and dispose of waste following PCML's Waste Management Plan. 6.1.1.4 Ensure manifest of hazardous waste is kept.		PCML site specific waste management plan Contractor to provide waste handling equipment, waste storage containers, and spill response equipment			Records
Quality of Life Values								
7 Socio-Economy	9.1 Shore Base Support 9.2 Offshore Fuel Storage & Handling 9.3 Hazardous Materials Handling and Storage 9.4 Non-Hazardous and Hazardous Waste Handling and Storage 9.5 Labour, Equipment Services Supply	7.1.1 Increased in industrial expenditure and income (positive impact)	7.1.1.1 Enhance utilization of local goods and service as much as possible.	Positive	Enhance utilization of local goods and service as much as possible.	PCML	Abandonment phase	Records of local purchases

Public and Occupational Health Impacts

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
Health Mitigation Measures								
Health								
1 Occupational Health	1.1 Air Quality 1.2 Hydrogen Sulfide 1.3 Noise 1.4 Chemicals 1.5 Wastewater 1.6 Non-Hazardous Waste 1.7 Hazardous Waste 1.8 Accidents at Work Site 1.9 Transportation	1.1.1 Possible impact to occupational health from accidents, exposure to air pollutants, noise, exposure to fuel/chemicals/waste or contamination from accidental spills, concern and stress about accidents, spills, wastes, noise, etc.	1.1.1.1 Implement PCML's HSE Management System. 1.1.1.2 Implement strict mitigation measures for impacts on air and noise. 1.1.1.3 Provide personal protective equipment (PPE) for all workers. 1.1.1.4 Provide first-aid kits and first-aid rooms on vessels and at the shore base. 1.1.1.5 Cooperate with the nearest health center/hospital in order to immediately support response to emergency events. 1.1.1.6 Implement steps of operation for occupational, health, and safety; and the protection and controlling of accidents: ▪ Safety method for working with machines/equipment ▪ Procedure for safety operation ▪ Procedure for work permission ▪ Provide MSDS for all chemicals ▪ Comply with all fuel storage, waste treatment and disposal regulations (MARPOL 73/78 regulations and PCML standards/ procedures)	Low	PCML to provide Medivac contract for medical emergencies PCML to Provide ERP	PCML / Rig Contractor	All Phases	Incident Reports

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
			▪ Compliance monitoring system and manifest system for hazardous wastes 1.1.1.7 Provide a suitable work environment. 1.1.1.8 Provide fire protection equipment and manual for emergency management at project site. 1.1.1.9 Set a 500 m safety zone around the project area and provide boats to notify fishing boats and commercial vessels to avoid entering the operation area. 1.1.1.10 Provide safety measures relating to chemical hazards: ▪ Store chemicals in closed containers and place in a chemical storage area with good ventilation. ▪ Provide chemical protection equipment for workers handling chemicals and check the equipment usage of workers, such as respiratory protection devices, chemical protection gloves, dust protection glasses, and safety suite. ▪ Provide eye wash in chemical storage area, drilling rig area, and solid control system area.					
		10.1 Injuries or illness due to unsanitary	10.2.1 Provide appropriate sanitation at working locations such as clean	Low	Provide appropriate sanitation at working locations	PCML / Rig Contract or	All Phases	Incident Reports

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
		conditions	water and consumer goods 10.2.2 Prepare sanitary housing for workers and provide health management systems and sanitation facilities with an adequate number of workers.		such as clean water and consumer goods			
2 Public Health	2.1 Transportation	2.1.1 Health and Safety potentially affected by accident or injuries 2.1.2 Reduced psychological wellbeing from concern regarding exposure or perceived exposure to hazard	2.1.1.1 Implement PCML's Public Relations Plan and Grievance Mechanism. 2.1.1.2 At least 30 days prior to rig mobilization, coordinate with MOGE, who will then issue "Notice to Mariner" regarding project activities to appropriate parties. 2.1.1.3 Establish 500 m safety zone around the drilling rig. 2.1.1.4 Use support vessels to warn off traffic. 2.1.1.5 Provide appropriate lights and warning signals on all vessels to prevent accidental collision.	Low	PCML to carry out public engagement. PCML to provide Grievance Mechanism Contractor to provide rig and vessel certifications	PCML / Rig Contractor	All Phases	Incident Reports Complaints Record

Unplanned Events

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
1 Collision	1.1 Ship Transportation	1.1.1 Possible collisions causing release of fuel/chemicals /wastes causing contamination of the sea, damage to vessels and possible injury and or loss of life	1.1.1.1 At least 30 days prior to rig mobilization, coordinate with MOGE, who will then issue "Notice to Mariner" regarding project activities to appropriate parties. (i.e. Department of Fisheries, Ministry of Livestock and Fisheries, and Marine Police Force) 1.1.1.2 Establish 500 m safety zone around the drilling rig. 1.1.1.3 Use support vessels to warn off traffic. 1.1.1.4 Provide appropriate lights and warning signals on all vessels to prevent accidental collision. 1.1.1.5 Provided adequate life-saving equipment as per SOLAS requirement. 1.1.1.6 Should an incident occur, PCML's Emergency Response Plan would be implemented. Emergency response drills will be held once a year.	Medium	PCML/Contractors to provide ERP for Rig/Vessels	PCML / Rig Contractor	All Phases	Incident Report
2 Fuel, Oil, Chemical or Hazardous Waste/Materials Spill	2.1 Storage of Fuel, chemicals, hazardous materials or waste	2.1.1 Potential risk of spills to the environment affecting air quality, surface water quality, sediment quality, biota and people	2.1.1.1 Implement safety procedures as outlined in PCML's Oil Contingency Plan. 2.1.1.2 Implement PCML's Spill Contingency Plan and conduct rehearsal/training for staff to handle oil spill situations. 2.1.1.3 Ensure that Oil Spill Response service contract with service provider are in places. 2.1.1.4 Appropriate medical care will be	Medium	PCML to provide ERP PCML to provide Oil Spill Response Plan Contractor to provide Spill kits	PCML / Rig Contractor	All Phases	Incident Report

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
			provided, clean-up will be carried out, and incident or accident reports will be filed. 2.1.1.5 Store all chemicals in secured storage area with impervious (cement or plastic sheet) floor and bund wall. Handle all chemicals according to their MSDS. 2.1.1.6 Investigate, correct and file incident or accident reports.					
3 Blowout	3.1 Drilling	3.1.1 Hydrocarbon discharge into the sea, impact to environment	3.1.1.1 Check shallow gas pockets during site survey before rig installation and exploration drilling. 3.1.1.2 Check pressure in drilling well and mud circulation. 3.1.1.3 Conduct Table Top Oil Spill Response Drill for Tier 3 event and implement the plan in the unlikely event of an occurrence. 3.1.1.4 Ensure that Oil Spill Response service contract with service provider are in places. 3.1.1.5 Test and Certify BOP in accordance with API 53	Medium	Contractor to provide BOP Test Certification PCML to provide ERP PCML to provide Oil Spill Response Plan	PCML / Rig Contractor	Drilling, Testing and Abandonment Phases	BOP Test Certificate Incident Report
4 Tropical cyclone/Typhoon	4.1 Weather	4.1.1 Injuries or death 4.1.2 Damage to rig's structure 4.1.3 Impact on environment	4.1.1.1 Implement PCML's Tropical Storm Emergency Plan and Emergency Response Plan. 4.1.1.2 Conduct drills according to Emergency Response Plan and Tropical Storm Emergency Plan. 4.1.1.3 In the unlikely event an accident should occur, the Emergency Response Plan would be implemented, which includes evacuation of personnel during severe circumstances.	High	Cyclone Emergency Response Plan	PCML / Rig Contractor	All Phases	Incident Report

Environmental Factors /Events	Activity	Potential Impact	Mitigation Measures	Residual Impact Significance	Specific Action	Responsible Team Member	Phase	Records
5 Fire or Explosion	5.1 Fuel and chemical Storage	5.1.1 Possible explosion or fire on ship or drilling rig causing physical damage and possible injuries or loss of life and contaminatio n of the sea	5.1.1.1 Provide fire protection equipment and manual for emergency management at project site, and provide the appropriate practice complying with mitigation measures. 5.1.1.2 Implement Emergency Response Plan in case of fire occurrence.	Medium	PCML to provide ERP PCML to provide Oil Spill Response Plan	PCML / Rig Contractor	All Phases	Incident Report

8.6.3 Environmental, Social, and Health Impacts and Monitoring Measures

A summary of EHS impact and monitoring measures for the offshore exploration drilling campaign are shown in **Table 8-4**.

Table 8-4: Environmental, Social, and Health Monitoring Measures

Monitoring Parameter	Methodology	Location	Report	Timescale/ Frequency of Monitoring	PCML Contractor
Air Emissions	Volume of Gas Flared Calculation of GHG emissions from gas flared	Rig	Air Emissions Report	After Well Testing	Contractor
Mud and Cutting Characteristics	Methodology • Mud and Cuttings will be analyzed by using Waste Extraction Test and Leaching Test and analyzed according to *the Notification of the Ministry of Industry, B.E. 2548 (2005), Re: Waste or Unusable Material Disposal, Thailand*. Number of Samples • 4 mud samples from every interval well diameter. • 6 cutting samples from every interval well diameter of all discharge points overboard.	At drilling well location	Hazardous/Non-Hazardous analysis of mud and cutting characteristics for the following parameters: • Metals (Total Hg, As, Cd, Ba, Pb, Cu, Total Cr, Zn, Fe, Mn and Ni) Total Petroleum Hydrocarbon (C6-C9, C10-C19 and C20-C36)	Once-off during drilling exploration well	PCML
Mud and Cutting Characteristics	Methodology Mud and cuttings will be tested by using 96-hour LC-50 international standard method and practice by acceptable reputation organizations/institutes/universities Number of Samples • 4 mud samples from every interval well diameter. . • 6 cutting samples from every interval well diameter of all discharge points overboard	At drilling well location	Acute toxicity test of mud and cutting characteristics for the following details: • 96-hour LC-50 of Suspended Particulate Phase (SPP)-3% vol. toxicity test first for drilling fluids with seabass fish (*Latescalcarifer*) and black tiger prawn (*Penaeusmonodon*)	Once-off during drilling exploration well section	PCML

Monitoring Parameter	Methodology	Location	Report	Timescale/ Frequency of Monitoring	PCML Contractor
Mud and Cuttings End of Well Report	Analyse Daily Mud Report and end of well report to evaluate cuttings discharged	• At the Rig	Monitoring report to confirm in accordance with IFC (2015) that WBDF cuttings meet the following: • Hg: 1 mg/kg dry weight in stock barite • Cd: 3 mg/kg dry weight in stock barite • Maximum chloride concentration must be less than four times the ambient concentration of fresh or brackish receiving water	• Once during drilling operation • Once upon well completion	PCML
Seawater Quality	Method • Analytical Methods followed to Standard Methods for the Examination of Water and Wastewater, recommended by APHA-AWWA-WEF • Compare to Environmental Baseline Sampling Report and determine if any variances are due to project implementation	• At the same surface water sampling station before having project (Baseline) • Water sources which a potentially affected (in case of spillage of leakage)	Monitoring Report to compare baseline data and post project data Physical parameters: • pH • Conductivity • Temperature • SS • TDS • Salinity Chemical Parameters: • DO • BOD • TPH and Oil and Grease • Cl, SO_4 Metals: • As, Ba, Cd, Cr, Cu, Pb, Fe, Mn, Ni Se, Zn, Hg	• Weekly • In an event of spillage and leakage	PCML

Monitoring Parameter	Methodology	Location	Report	Timescale/ Frequency of Monitoring	PCML Contractor
Sediment Quality	• Sediment grab sample as per baseline survey	Same locations as baseline sampling	Monitoring report to include sediment sampling results and comparison to baseline results of: • Arsenic, Copper, Lead, Zinc, Chromium, Nickel, Aluminium, Barium, Cadmium, Mercury, Vanadium, Iron • Total organic Carbon • ATPH • Benthic Communities	Once upon well completion	PCML
Marine Life	• Visual observations of marine life noting time and locations	Drilling Rig & Vessels	• Marine Life Observations Report	All phases	Contractors
Chemical use for drilling	• Daily record type of chemicals and volume used	Project area	• Chemical Use Report	Daily and report after drilling is completed	PCML
Hazardous and Non-hazardous waste	• Track waste volume by type and disposal location daily	At all project locations	• Manifest Disposal and Tracking Report	All phases	PCML
Accidental Releases and Leaks	• Record any accidental releases or leaks	Rig and Vessels	• Accidental Discharge Report	Weekly Post Project	Contractor PCML

Monitoring Parameter	Methodology	Location	Report	Timescale/ Frequency of Monitoring	PCML Contractor
Social	• Record of Grievances • Monitor, investigate and implement suitable solutions	Project area, community around project area, and transportation route	• Complaint • Monitoring and solving	All phases	PCML
Oil Spill Response Plan	• Conduct oil spill equipment deployment test and oil spill table top exercise	Drill Rig	• OSRP Drill Response	During Installation Phase	PCML
Emergency Response Plan	• Record the Number and type of emergency drills conducted; and • Response efficiency	Drill Rig	• ERP Drill Report	Monitor each ERP drill for each situation	PCML
Incident Reporting	• Record accidents or near misses generated during all phases by identifying cause(s) and severity of impact(s), as well as operated mitigation measures • Conduct summary report for accident investigation	Project area, community around project area and transportation routes	• Accidental statistics • Cause of accidents • Mitigation measures	All phases	PCML
Compliance Reporting	• Compliance with EMP	At all project locations	• Audit of Management Measures	Post Project	PCML
Post Project Opinion Survey	• Post project opinion survey to determine community attitude toward the project	Nearby community and Fishing Associations	• Opinion Survey of Communities near project area	Post Project	PCML

Monitoring Parameter	Methodology	Location	Report	Timescale/ Frequency of Monitoring	PCML Contractor
Training	• Details of crew inductions • Training sessions	Rig/Vessels	• Training Report	Post Project	PCML

1 = Extracted by using Waste Extraction Test Method and Leaching Test Method and also classify that analyzed cuttings is non-hazardous waste or hazardous waste by using analysis method and standard values

8.7 Management and Monitoring Sub-Plans

Management and monitoring sub-plans are provided in this section for key parameters that may be impacted by the proposed project, including:

- Waste Management Plan
- Biodiversity Action Plan
- Community Consultation and Grievance Mechanism
- Emergency Response Plan
- Oil Spill Response Plan

Management actions are defined to prevent or mitigate potential issues from occurring and monitoring will provide:

(1) Data on waste-stream emissions to ensure an ongoing assessment of operating standards and to measure performance against established requirements (objectives, targets, and performance criteria).
(2) Data on the environment to measure changes from the original environmental conditions.

The baseline survey reported in this EIA provided information on the relevant chemical, biological and social environment before start-up of operations. Follow-up monitoring will be done to determine any possible changes as a result of the proposed PCML Exploration Drilling Project.

Discharges and emissions from the proposed project are monitored to determine compliance with regulations and/or company standards.

Monitoring therefore includes ambient monitoring of the environment and monitoring of discharges.

An independent monitor will be in the field for the duration of project activities. The monitor too will audit compliance with guidelines, regulations and mitigation measures. Monitoring measures for the installation, drilling, well testing and abandonment are outlined in the following plans.

8.8 Waste Management Plan

8.8.1 Objectives

This WMP is designed for use in all activities associated with this drilling project.

The target users of this Plan are the drilling field personnel (drilling storage, rig, etc.), who will be responsible for the actual handling and management of wastes generated from project activities.

The objectives of the Waste Management Plan (WMO) are to:

- Provide a framework of the relevant legislation related to the management of offshore wastes
- Outline PCML's Performance Standards for waste management
- Provide a description of the proposed management procedures for the transport, treatment, storage, removal and or disposal of all wastes.
- Provide the requirements for the recording and tracking of all wastes generated.

8.8.2 Legal Requirements

The section provides a description of the legal framework relevant to the management of the wastes produced during offshore drilling activities.

Non-Hazardous/Hazardous Waste and Vessel Oil in Water Discharges - MARPOL Annex I & V

The support vessels will operate in compliance with MARPOL Annex I: any oil-in-water content of discharges should not exceed 15 ppm.

General waste (excluding food) will not be disposed of to sea in line with MARPOL Annex V requirements. Combustible wastes will be segregated and disposed by incinerator on-board, should an incinerator be available on the selected vessel. Non-combustible and recyclable wastes will be stored in containers and returned to the selected vessel shore base for disposal. Food waste will be macerated into smaller pieces (25 mm) prior to discharge overboard (if discharged <12 nm from shore.

Hazardous wastes will be stored on the vessels in appropriate containers with labels. Hazardous waste storage will be designated in accordance with their material Safety Data Sheet (SDS). Hazardous wastes will be sent to a licensed disposal facility by a licensed waste contractor.

Basel Convention: The Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted on 22nd March 1989 by the Conference of Plenipotentiaries in Basel, Switzerland.

The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. The provisions of the Convention center around the following principal aims:

- the reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes, wherever the place of disposal;
- the restriction of transboundary movements of hazardous wastes except where it is perceived to be in accordance with the principles of environmentally sound management;
- a regulatory system applying to cases where transboundary movements are permissible.

The Ministry of Natural Resources and Environmental Conservation is the main institutional body responsible for setting a framework for waste management at the national level. Similarly, all major cities across Myanmar are administrated by City Development Committees that are responsible for providing municipal waste management services.

Existing Laws and Regulations are as follows:

National Level

- The Constitution of the Republic of the Union of Myanmar (2008);
- Myanmar Investment Law (2016)
- Environmental Conversation Law (March, 2012);
- Environmental Conservation Rules (June 2014);
- Environmental Impact Assessment Procedures (Dec, 2015);
- National Environmental Quality (Emission) Guideline (2015);
- Hazardous Waste Notification (Draft 2016);

MONREC has established environmental quality standards, the National Environmental Quality Standard [Legal Reference: ECL 2012 (Article 2c) and EQS 2016]. ECD / MONREC have indicated that the discharge standards shown in **Table 8-5** are applicable for Offshore Oil and Gas activities. These are in accordance with international standards.

Table 8-5: Myanmar Discharge Standards Applicable to Offshore Oil and Gas activities

Parameter	Guideline
Drilling fluids and cuttings (non-aqueous drilling fluid)	Non-aqueous drilling fluid, re-inject or ship-to-shore; no discharge to sea Drilled cuttings, re-inject or ship-to-shore; no discharge except: Oil concentration lower than 1% by weight on dry cuttings* Mercury maximum 1 mg/kg dry weight in stock barite Cadmium maximum 3 mg/kg dry weight in stock barite Discharge via a caisson at least 15 meters below sea surface**
Drilling fluids and cuttings (water-based drilling fluid)	Water-based drilling fluid, re-inject or ship-toshore; no discharge to sea Water-based drilled cuttings, re-inject or ship-to-shore; no discharge except: Mercury 1 mg/kg dry weight in stock barite Cadmium 3 mg/kg dry weight in stock barite Maximum chloride concentration must be less than four time's ambient concentration of fresh or brackish receiving water Discharge via a caisson at least 15 meters below sea surface**
Produced water	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/le
Completion and well work-over fluids	Ship-to-shore or re-inject, no discharge to sea except: Maximum one day oil and grease discharge should not exceed 42 mg/l; 30 day average should not exceed 29 mg/l Neutralize to attain a pH of 5a or more
Produced sand	Ship-to-shore or re-inject, no discharge to sea except when oil concentration lower than 1% by weight on dry sand
Hydrotest water	Send to shore for treatment and disposal Discharge offshore following environmental risk analysis, careful selection of chemicals Reduce use of chemicals
Cooling water	The effluent should result in a temperature increase of no more than 3°C at edge of the zone where initial mixing and dilution take place; where the zone is not defined, use 100 meters from point of discharge
Desalination brine	Mix with other discharge waste streams if feasibleb
Sewage	Compliance with MARPOL 73/78b
Food waste	Compliance with MARPOL 73/78b
Storage displacement	Compliance with MARPOL 73/78b

Parameter	Guideline
Bilge water	Compliance with MARPOL 73/78b
Deck drainage	Compliance with MARPOL 73/78b

Note:
a Standard unit
b In nearshore waters, carefully select discharge location based on environmental sensitivities and assimilative capacity of receiving waters
** It is noted that, in the 2015 IFC EHS Guidelines for Offshore Oil and Gas Development, Table 1: Effluent Levels from Offshore Oil and Gas Development, the guideline is less specific, as follows: "Discharge via a caisson (at least 15 m below surface is recommended whenever applicable; in any case, a good dispersion of the solids on the seabed should be demonstrated)"

The following Standards and Guidelines are to be considered:

- ISO 14001:2015, Environmental Management Systems - Requirements with Guidance for use;
- International Finance Corporation (IFC), General Environmental, Health, and Safety General Guide-lines, 2007;
- International Finance Corporation (IFC) Environmental, Health, And Safety Guidelines For Offshore Oil And Gas Development, 2015;

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP).

8.8.3 Overview Maps and Site Layout

There are no applicable overview maps, satellite images, or site layout maps associated with this Waste Management Plan.

8.8.4 Management Actions

The Drilling Contractor will be responsible for waste management during the drilling program, and will be required to be in compliance with the local legislation and Environmental Management and Monitoring Plan (EMP). PCML will regularly conduct inspections and audits during operations to ensure compliance to contract requirements. .

The following guidance applies to the management of nonhazardous and hazardous waste. Waste management should be addressed through a Waste management system that addresses issues linked to waste minimization, generation, transport, disposal, and monitoring.

IFC (2007) notes that Facilities that generate and store wastes should practice the following:

- Establishing waste management priorities at the outset of activities based on an understanding of potential Environmental, Health, and Safety (EHS) risks and impacts and considering waste generation and its consequences.
- Establishing a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes.
- Avoiding or minimizing the generation waste materials, as far as practicable.
- Where waste generation cannot be avoided but has been minimized, recovering and reusing waste.
- Where waste cannot be recovered or reused, treating, destroying, and disposing of it in an environ-mentally sound manner.

Efforts should be made to eliminate, reduce or recycle wastes at all times, in line with the waste hierarchy. At a minimum, the waste materials should be segregated into non-hazardous and hazardous wastes for consideration for reuse, recycling, or disposal.

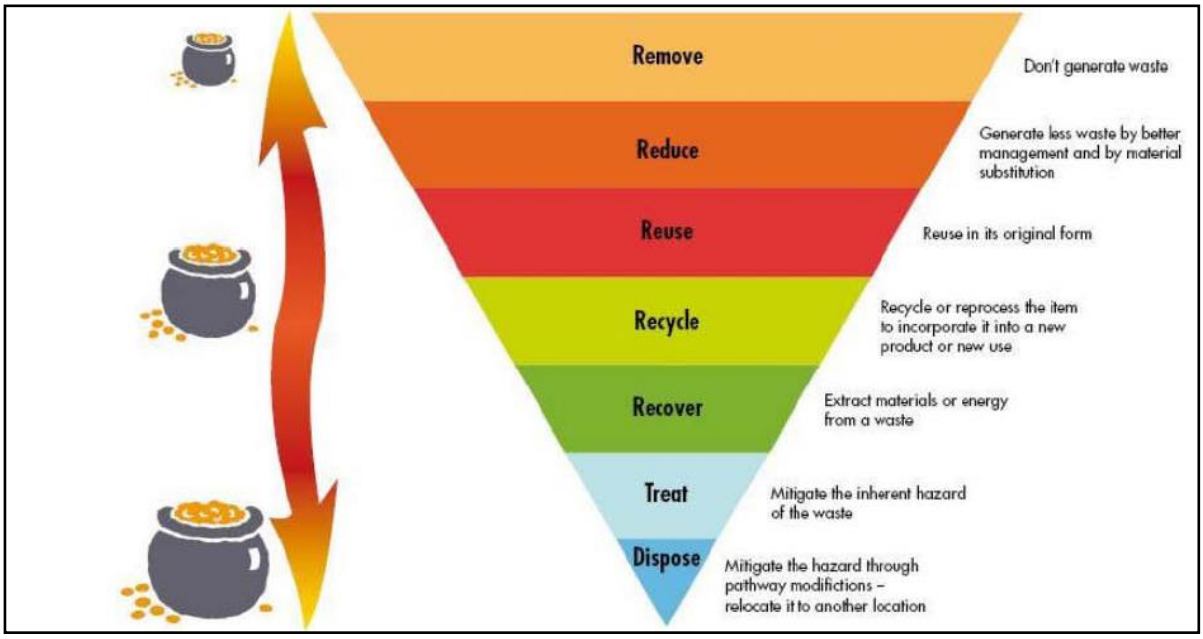
Waste management planning should establish a clear strategy for wastes that will be generated including options for waste elimination, reduction or recycling or treatment and disposal, before any wastes are generated.

Emissions, discharges and waste generation will conform to applicable government regulations in Myanmar.

All wastes produced will be assessed and classified by type prior to treatment, transport, disposal or recycling. Wastes are classified as:

- Drilling Mud and Cuttings;
- Wastewater (effluent);
- Hazardous waste (e.g., chemical waste, waste oil etc.);
- Non-hazardous solid waste (e.g., wood, paper, steel, food waste etc
- Air emissions;
- Noise
- Fluids Produced from the Separators During Drilling and Testing.

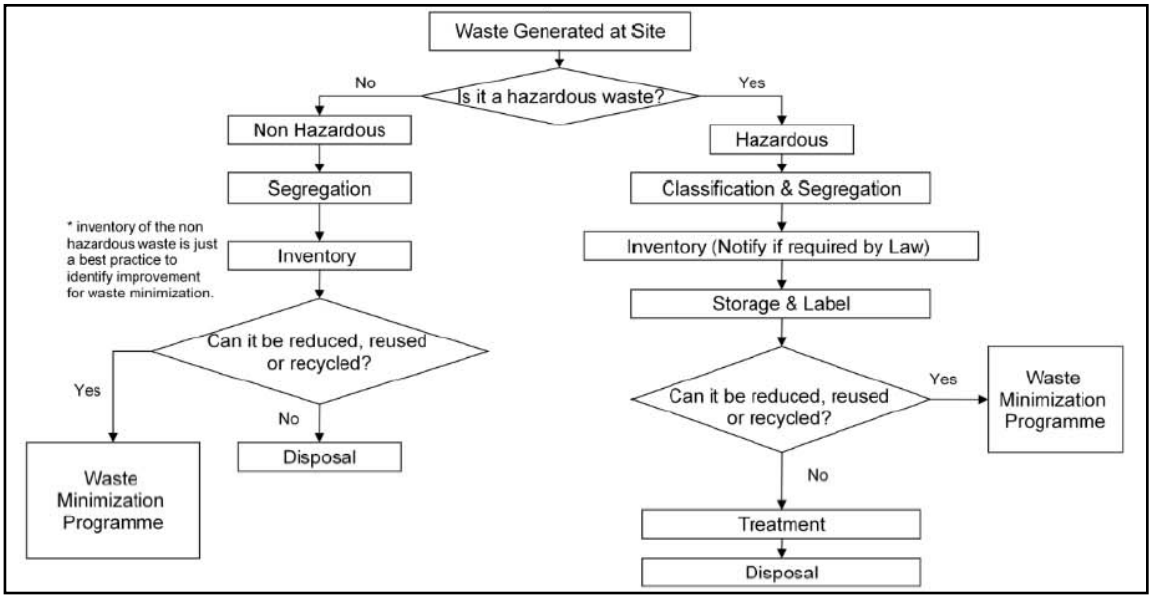
The PCML exploration program will handle waste according to PETRONAS Standards. The waste management will follow the best practices shown in **Figure 8-2**.



Source: PCML, 2018

Figure 8-2: Waste Management Best Practice

All wastes will be classified and segregated before responsible disposal. The classification and segregation process is shown in **Figure 8-3**.



Source: PCML, 2018

Figure 8-3: Waste Classification and Segregation Process

All wastes will be collected, stored, and segregated in arranged containers, as shown in **Figure 8-4**.

All provided containers will be as follows:

- Install adequately in the working area, accommodation and office area,
- Make from durable materials compatible with the waste to be collected, leakage proof, sturdy, stable and easily handled,
- Prevent the ingress of animals, escaping odor and place under cover to avoid leachate.
- Medical or clinical waste shall be separated from other wastes because, they may contain infectious agents and potentially toxic substance for example sharp objects shall be packed in puncture-proof containers.

Containers used for medical waste shall be marked prominently with universal warning signs and/or the word “Medical waste”. Used needles and syringes represent a particular threat as failure to dispose of them safely may lead to recycling and repacking. Where possible, management of medical/clinical wastes should be integrated into existing healthcare waste management system.

Figure 8-4: Example of Hazardous Waste Containers

	
Non-Hazardous Waste Skip	**Hazardous Waste Skip**

Diesel generators will be used as a source of power supply for the drilling rig. The generators will operate 24 hr/day throughout all project activities on the rig during the project's duration (75 days). Estimated fuel consumption is 36.60 m^3/day. Based on a compilation of air pollution emission factors established by the U.S. Environmental Protection Agency (EPA), air pollutant emissions from the generators on the rig during the worst case drilling and testing of the well is 156.55 tons nitrogen oxides, 10.42 tons sulphur oxides and 33.84 tons of carbon monoxide.

Air pollutant emissions from flaring of produced gas at the well will be 0.02 ton nitrogen oxides, 0.03 ton total hydrocarbons, and 0.08 ton of carbon monoxide.

Emissions of greenhouse gases from the Block M12, 13 & M14 Exploration Drilling Project are estimated for the different project phases:

- Preparation (electric power generation and marine transportation): a one-time release of 2789.5 tonnes CO2 eq;
- Drilling (power generation, marine transportation, and road transportation): a one-time release of 15,268.8 tonnes CO2 eq;
- Testing (power generation, marine transportation, flaring): a one-time release of 2,953.6 tonnes CO_2 eq.
- Abandonment (electric power generation and marine transportation): a one-time release of 5285.3tonnes CO2 eq;

This entire project is estimated to generate a worst case maximum of to 26,297.2 of CO2 equivalent for three well locations, based on 75 days per well.

Other releases to the atmosphere will arise as a result of fugitive emissions of methane and non-methane hydrocarbons from a range of sources including, fuel bunkering, transfer operations. Particulate emissions (dust) will also arise during bulk materials transfer operations, such as barite or cement loading, from the bulk handling system vents.

Releases of ozone depleting substances (ODS) may arise during maintenance of HVAC systems as well as from fugitive sources associated with such equipment.

Compared to the continuous emissions from the online power generation equipment on the offshore drilling unit and supply vessels, quantities of fugitive emissions are unlikely to be significant.

Sanitary wastewater includes wastewater from both the sanitation facilities and the food canteen facilities on the drilling rig and support vessels. Total wastewater quantity is estimated to be 2025 m^3 for 75 operation days for 3 wells using a rate of 60 liters/person/day, maximum rig crew number of 120 persons, and support vessel crew of 24-30 (approximately 8-10 crew members/vessel). Sanitary wastewater from support vessels will be discharged directly to sea at a distance of over 12 nautical miles from the nearest shore. Sanitary wastewater from the drilling rig will be piped to the on-board wastewater treatment system prior to discharge. The discharge location will be at greater than 12 nautical miles from the nearest shore. These methods comply with MARPOL 73/78 (Annex 4) requirements.

Treated effluent must comply with MARPOL 73/78 Annex 26 requirements as specified below:

1. pH: 6-8.5
2. Biochemical Oxygen Demand (BOD) < 25 mg/L
3. Chemical Oxygen Demand (COD) < 125 mg/L
4. Total Suspended Solids (SS) < 35 mg/L
5. Total Coliform < 100 individuals/ 100 ml

Drainage water consists of ballast water and deck drainage from both support vessels and the drilling rig, and may be contaminated with oil and grease. Drainage water will be collected and treated at the oil/water separator, installed on the rig and both support vessels. The oil/water separator will separate water from oil prior to discharging the water portion to the sea. Treated wastewater shall comply with MARPOL 73/78 Annex 4 requirements, which regulate pollution prevention of vessel and ship drainage (oil content < 100 ppm discharged at more than 12 nautical miles from the nearest shore or not over 15 ppm at less than 12 nautical miles). Separated oil and grease will be collected in an oil container for further onshore disposal.

Drill Cuttings

A total of 502 m^3 of drilling cuttings are expected to be generated from the exploration drilling program, which will be eventually discharged at sea after being treated overboard.

Drilling Mud

Mud will be removed from the cuttings to the extent possible. PCML will discharge cuttings with a maximum of 12.5% Cuttings Base Fluid Retention (CBFR). It is estimated that 62.71 m^3 of drilling mud will be discharged into the sea. The recovered mud will be re-conditioned and returned to the mud circulation system. The mud in casings will come out and be treated through the shaker system, and reused. After completion of the drilling campaign, there will be less than 200 m^3 of WBM left in their mud tanks; the drilling mud will be kept for future campaigns or returned to the drilling mud suppliers.

Solid wastes from the proposed project consist of non-hazardous waste and hazardous waste.

Non-Hazardous Waste includes paper, plastic, and other uncontaminated materials. Based on PCML's previous exploration drilling experience in The Andaman Sea and The Gulf of Thailand, the amount of non-hazardous waste is expected to be 4-5 tons per month.

Hazardous Waste includes all types of used oil, oil-contaminated water, expired cooling agents, fluorescent lights, chemical and expired chemical and solution, contaminated clothes, chemical containers, batteries, used PPE, residual material contaminated with oil or chemical, etc.

The estimated volume of dirty oil onboard the supply vessels is around 0.2-0.4 m^3 per month, which will be handled and disposed by the drilling contractor. Based on previous experience with similar projects, the total amount of hazardous waste is expected to be 0.5 ton per month.

Non-hazardous and hazardous wastes will be segregated and appropriately disposed of by the drilling contractor according to the PCML Waste Management Plan.

The waste disposal facilities available for PCML wastes are as follows:

- Yangon City Development Committee (YCDC) surface disposal yards and incinerator,
- Hazardous Waste area a DOWA Thilawa Waste Management Facility,

Dumping at sea (e.g. biodegradable waste, treated drilling mud & cutting, blasting grit, treated produced water.)

All contractor personnel will be trained on the PCML Waste Management Plan, so they can become familiar with the reporting procedures and the entities involved in the management of the wastes derived by the drilling activities. Training of personnel will take place at the following frequency:

- New Personnel will be initially trained to ensure familiarity with the Waste Management Plan prior to beginning their job assignments (applicable to all shift changes);
- Specific training will be provided for the management of hazardous wastes;
- Refresher training will be conducted whenever there are inadequacies in management of waste (classification, storage, handing) or when deviations from the Waste Management Plan are observed.

Steps toward the establishment of due diligence includes:

- Regular performance of environmental audits or inspections
- The establishment of periodic exercising of contingency plans
- Knowledge and compliance with applicable legislation
- Employee/contractor training
- Establishing and maintaining codes and operating procedures, and
- Maintaining detailed records and inventories

8.8.5 Monitoring Plans

Monitoring Parameter	Methodology	Report	Timescale/ Frequency of Monitoring	PCML Contractor
Air Emissions	Volume of Gas Flared Calculation of GHG emissions from gas flared	Air Emissions Report	After Well Testing	Contractor
Mud and Cutting Characteristics	<u>Methodology</u> • Mud and Cuttings will be analyzed by using Waste Extraction Test and Leaching Test and analyzed according to *the Notification of the Ministry of Industry, B.E. 2548 (2005), Re: Waste or Unusable Material Disposal, Thailand*. <u>Number of Samples</u> • 4 mud samples from every interval well diameter. • 6 cutting samples from every interval well diameter of all discharge points overboard.	Hazardous/Non-Hazardous analysis of mud and cutting characteristics for the following parameters: • Metals (Total Hg, As, Cd, Ba, Pb, Cu, Total Cr, Zn, Fe, Mn and Ni) Total Petroleum Hydrocarbon (C6-C9, C10-C19 and C20-C36)	Once-off during drilling exploration well	PCML
Mud and Cutting Characteristics	<u>Methodology</u> Mud and cuttings will be tested by using 96-hour LC-50 international standard method and practice by acceptable reputation organizations/institutes/universities <u>Number of Samples</u> • 4 mud samples from every interval well diameter. . • 6 cutting samples from every interval well diameter of all discharge points overboard	Acute toxicity test of mud and cutting characteristics for the following details: • 96-hour LC-50 of Suspended Particulate Phase (SPP)-3% vol. toxicity test first for drilling fluids with seabass fish (*Latescalcarifer*) and black tiger prawn (*Penaeusmonodon*)	Once-off during drilling exploration well section	PCML
Mud and Cuttings End of Well Report	Analyse Daily Mud Report and end of well report to evaluate cuttings discharged	Monitoring report to confirm in accordance with IFC (2015) that WBDF cuttings meet the following: • Hg: 1 mg/kg dry weight in stock barite • Cd: 3 mg/kg dry weight in stock barite Maximum chloride concentration must be less than four times the ambient concentration of fresh or brackish receiving water	• Once during drilling operation • Once upon well completion	PCML

Monitoring Parameter	Methodology	Report	Timescale/ Frequency of Monitoring	PCML Contractor
Hazardous and Non-hazardous waste	• Track waste volume by type and disposal location daily	• Manifest Disposal and Tracking Report	All phases	PCML
Accidental Releases and Leaks	• Record any accidental releases or leaks	• Accidental Discharge Report	Weekly Post Project	Contractor PCML

8.8.6 Implementation Schedule

Prior to disposal, each batch of drilling waste will be analyzed to determine if it is hazardous and to obtain specifications required by the contractor.

A Manifest System of all waste leaving the site will be maintained and licensed contractors will track the waste to its point of disposal.

The Waste Register will be reviewed and verified on a weekly basis.

8.8.7 Budgets

The estimated cost of the waste management program for this project is USD 25,000

8.8.8 Responsibilities

Roles and responsibilities for the involved parties are reported in the following Section.

Prior to waste management collection, transportation and disposal, DOWA will conduct laboratory analytic tests on an amount of sampled wastes to correctly establish waste classification; other complementary information can be collected from Material Safety Data Sheets and process knowledge. This will assist to ensure that proper storage and handling procedures are in place.

DOWA Waste Manifest System

Slip A – Waste Generator Copy (Confirm waste collection)
Slip B – Transportation Company (Office Use)
Slip C – Transportation Company to waste Generator (Delivery approved)
Slip D - Waste services Company copy (office use) (Record of waste Transport)
Slip E – Waste services Company to Waste Generator (Treatment approved)

See Waste Management Plan Appendix C – DOWA Waste Manifest System

Drilling Contractor (Producers of waste): issue five (5) copies of the Waste Manifest (SLIP A-E in carbon copies) reporting the following:

- date and number of issuance;
- issuer name and signature (drilling manager name & signature);
- waste generator company name , transportation company (DOWA or a third party company) and waste service company (DOWA);
- waste classification:
- kind: hazardous, non hazardous, others,
- name: identification of the waste (e.g. plastic, glass, wood, etc …),
- quantity: description of waste amount or waste weight estimation,
- style of packing: description of containers,
- remark: actual weight waste from DOWA,
- waste classification code is to be assigned by DOWA,
- Request the transportation company signature for all the waste manifest copies;
- keep the first copy (SLIP A);
- deliver the second copy (SLIP B) to the transporter company;

- deliver the third copy (SLIP C) to the Drilling Contractor HSE Manager, who is the custodian of the documentation;
- deliver the fourth (SLIP D) to the waste transport company and;
- the fifth (SLIP E) copies to Drilling Contractor HSE Manager to confirm that treatment of waste has been completed.

Drilling Contractor HSE Manager:

- is primarily responsible for ensuring implementation of the Waste Management Plan throughout the area of collection;
- checks to ensure chemically and physically incompatible wastes are not mixed at the site temporary storage area;
- keep the third copy of the Waste Manifest (SLIP C) filled in and signed by the Transporter (DOWA or third party company);
- keeps the fifth (SLIP E) copy to confirm waste has been treated by DOWA
- receives a monthly summary for the waste disposed, checks it and sends to PCML HSE Manager.

Transporter (DOWA or third party company):

- delivers the wastes to the waste service company (DOWA) and cross checks the data reported on the Waste Manifest from PCML with the DOWA;
- the wastes are weighed by DOWA, the waste amount in reported in the "remark" space and waste code and customer code are filled in by DOWA representative:
- delivers the SLIP D to Transporter office and SLIP E to PCML to confirm waste has been treated.
- the waste service company (DOWA) signs E

DOWA Representative:

- verify that the waste is correctly labeled before transferring it to the authorized treatment/disposal facilities;
- avoid any overloading of vehicles with waste and ensure cleanliness of vehicles leaving the site;
- ensure the vehicles collecting the waste from site are decontaminated and clean;
- checks to ensure chemically and physically incompatible wastes are not mixed;
- weigh the wastes and confirm the exact amount, the waste code, the customer code and signs and dates the SLIPS C, D and E;
- SLIP D is kept by DOWA and SLIP E comes back in original copy to Drilling Contractor by email;
- DOWA will also provide the details of the final disposal for the waste and will attach the waste tracking form to the original copy of the SLIP E;
- prepare and submit monthly summary to the Drilling Contractor providing the following information:
  - types of waste recycled, treated or stored,
  - area/location of treatment, recycling or storage,
  - quantity of waste treated, recycled or stored (weight),
  - date of waste treated, recycled or stored,
  - Area/location of waste generation.

8.9 Biodiversity Action Plan

8.9.1 Objectives

The objective is to protect and conserve marine biodiversity, maintain marine ecosystem services, and sustainably managing living natural resources that are fundamental to sustainable development within the project area.

8.9.2 Legal Requirements

Myanmar applicable legislation and regulation include:

- The Constitution of the Republic of the Union of Myanmar (2008);
- National Environmental Quality (Emission) Guideline (2015);
- Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law (1994);
- Rules on Protection of Wildlife, And Protected Area Conservation Law, 2003 and The Protection Of Wildlife, And Wild Plant And Conservation Of Natural Areas Rules, 2002.
- The Myanmar Marine Fisheries Law, 1990, amended 1993.

The IFC General EHS Guidelines for air quality, noise, waste management and wastewater are relevant for biodiversity protection.

The International Finance Corporation (IFC) has developed a series of Performance Standards that aim at protecting the environment. Performance Standard 6 “recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development”. The requirements set out in this Performance Standard have been guided by the Convention on Biological Diversity, which defines biodiversity as “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems” (IFC, October 2012).

The guidance notes accompanying Performance Standard 6 indicate that in situations where there is the potential of significant negative impacts to biodiversity the project proponent should develop a Biodiversity Action Plan (BAP), to guide its activities so as to protect the natural environment.

8.9.3 Overview Maps and Site Layout

There are no applicable overview maps, satellite images, or site layout maps associated with this Biodiversity Action Plan.

8.9.4 Management Actions

PCML’s actions for marine conservation of biodiversity include: actions outlined in the EIA, and new conservation-related activities specific to Marine Protected Areas or Sensitive Areas.

Commitments in the EIA to be implemented for the Protection of Marine Biodiversity

- Vessels will have valid International Sewage Pollution Prevention (ISPP) Certificate.

- Discharge of sewage into the sea is prohibited, except when the vessel has in operation an approved sewage treatment plant or when the drill ship is discharging comminuted and disinfected sewage using an approved system at a distance of more than 3 nm from the nearest land. Sewage which is not comminuted or disinfected has to be discharged at a distance of more than 12 nm from the nearest land.

- Garbage discharged by the drill ship is passed through a grinder so that it is capable of passing through a screen with no opening wider than 25 millimetres: this applies to support vessels within the 1,640 ft (500 m) safety zone.

- Contractor to conduct bulk operational discharges under the drill ship Permit to Work (PTW) system and in accordance with relevant regulations.

- Vessel WMP will include: Waste handling equipment, waste storage containers, and spill response equipment appropriate to the type and volume of potential spills.

- All hazardous wastes will be segregated prior to onshore disposal.

- General waste (excluding food) will not be disposed of to sea.

- Vessels >400 tonnes will have a Garbage Record Book.

- All contracted vessels will comply with IMO Ballast Water requirements.

- Implementation of PCML's invasive marine species management process

- A 500 m radius safety zone will be maintained around the drill ship as required.

- Support vessels will not travel greater than 6 knots within 300m of a whale, if sighted, (caution zone) and approach no closer than 100m from a whale, if sighted.

- Vessel bridge crew to maintain continuous visual watch of any hazards (including marine mammals and marine turtles).
- A marine mammal observer will be utilized during drilling program to monitor and record marine mammal, marine turtle and whale shark observations.

- Drill ship and support vessels must operate in compliance with MARPOL 73/78 Annex I (Reg. 7, 17 and 37) including: Vessels will hold a valid International Oil Pollution Prevention Certificate (IOPP) certificate Vessels will hold an Oil Spill Response Plan on board to implement in a spill incident requiring capability beyond the Shipboard Oil Pollution Emergency Plans (SOPEP). Vessels will maintain an oil record book.

- Shipboard Oil Pollution Emergency Plans (SOPEPs) will be developed, approved and kept on-board vessels, as applicable or required by vessel class. PCML will conduct a marine assurance audit of vessels to demonstrate compliance with relevant standards.

- Vessel standard operating procedures and a fuel bunkering plan will be prepared and implemented.

- Bunding will be in place for chemical and hydrocarbon storage/bunkering areas where potential contamination can occur.

- Implementation of the following controls as a minimum during fuel bunkering: Bunkering to commence during daylight hours; Visual monitoring of gauges, hoses, fittings and the sea surface before and during bunkering; Dry break couplings fitted to transfer hose.

- Spill response kits will be located in proximity to chemical and hydrocarbon storage/bunkering areas and appropriately stocked/replenished as required.

- Crew must be trained as required by ERP and OSRP.

- Implementation of the PCML Oil Spill Response Plan and Emergency Response Plan

- All chemical and/or hydrocarbon wastes will be segregated into clearly marked containers prior to onshore disposal by a licensed waste management contractor,

New general BAP actions:

- PCML will organize information meetings for local residents and fisherman on Marine Conservation. Age-appropriate materials on marine conservation will be made available to local schools.

8.9.5 Monitoring Plans

The Biodiversity Action Plan will provide a record of the species occurrence, abundance and distribution throughout the Project activities in the most sensitive habitats identified within the area of influence of the Project.

The monitoring activities will focus around each drill rig location where biodiversity resources could possibly be influenced by the drill site or vessels.

In addition to the Mud and Cuttings and Seawater Quality monitoring programs mentioned in the waste management plan a Marine Mammal Observer will be placed on a supply vessel near the rig to monitor all sea life near the rig.

Monitoring Parameter	Methodology	Location	Report	Timescale/ Frequency of Monitoring	Contractor
Marine Mammal Observer (MMO)	Visual observations of marine life noting time and locations	Rig Supply Vessel	MMO Weekly Report	Visual monitoring during daylight hours	PCML MMO Contractor

8.9.6 Implementation Schedule

The monitoring activities will begin at the project initiation and installation phase and be conducted through the drilling, well testing, abandonment phases.

8.9.7 Budgets

The estimated budget for the Marine Biodiversity Plan is estimated to be USD $10,000

8.9.8 Responsibilities

Drilling Contractor – Overall responsibility for protection of marine biota, endangered species and protected/sensitive areas.

Drilling Contractor HSE Manager – Responsible for ensuring that the Biodiversity Action Plan (BAP) is implemented.

PCML Manager, Health, Safety and Environment (HSE) – Responsible for review, monitoring and audit of the contractor BAP

Marine Mammal Observer- Responsible for observing, recording and reporting on marine mammals and other marine life activity within the project area over the project lifetime.

8.10 Community Consultation & Grievance Mechanism

8.10.1 Objectives

Prior to prior to initiation of the offshore exploration drilling project, as part of the ongoing stakeholder consultation and engagement plan, PCML will undertake to implement a Grievance Mechanism. This will include the following objectives:

- Appoint a community liaison officer;
- Engagement with communities
- Dissemination of Information;
- Monitor Feedback and Community Attitudes, and
- Implement a Grievance Mechanism

8.10.2 Legal Requirements

Myanmar applicable legislation and regulation include:

- The Constitution of the Republic of the Union of Myanmar (2008);
- The Myanmar Investment Law (2016);
- Myanmar Environmental Conservation Laws (2012);
- Environmental Conservation Rules (2014);
- Draft Administrative Instruction of Environmental Impact Assessment Procedure (2015);
- Draft Environmental Impact Assessment Guidelines for Onshore and Offshore Oil and Gas Developments (December 2015);
- Draft Guideline on Public Participation in Myanmar's EIA Processes (2017);
- National Environmental Quality (Emission) Guideline (2015);
- Public Health Law (1972);
- The Prevention and Control of Communicable Disease Law (1995);
- The Control of Smoking and Consumption of Tobacco Product Law, 2006 (Section 9);
- The Farmland Law and Farmland Rules, 2012 (Section 30);
- The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013 (Section 16,17,23,27).

The management and mitigation measures of the Plan are aligned with the IFC guidelines detailed here below.

IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts.

Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders.

8.10.3 Overview Maps and Site Layout

There are no applicable overview maps, satellite images, or site layout maps associated with this Community Consultation & Grievance Mechanism.

However Based on stakeholder mapping and information collected during EHS baseline discussions, this EIA has engaged the following stakeholder groups:

1. Coastal Stakeholders including Village heads and villagers;
2. Fishermen;
3. Non Government Organizations; and
4. Authorities at the Dawei and Myeik District Level.

For initial public consultation, the regional centers where township meetings were held included Myeik and Dawei. Village level town hall meetings were also held at Kywe Ku (Myeik), and San Hlan (Dawei) The following summary of the public consultation meetings is provided below:

Meetings were also held with the Myeik District Fisheries Federation, GAD (Myeik & Dawei), ECD (Myeik & Dawei), CDC (Myeik & Dawei), Myeik Department of Fisheries. Note Dawei Department of Fisheries personnel were not available. Media were present for town hall meetings in Myeik and Dawei. Public disclosure occurred via MCN TV News Channel and Facebook page, and DVB media issued information on the news and on their Facebook page.

For the EIA Report discussions, the regional centers where township meetings were held included Thayet Chaung, Lang Lone, Myeik and Dawei. Media were present for the town hall meetings in Myeik and Dawei. Public disclosure was conducted via reporters from MyaWaDi Newspaper, Dawei Watch, MRTV.MWD, Hinthar Media, Elevn Media Myawaddy, DVB, Myanma Alin/ Kyay Mone, Thanintharyi Journal, Myeik Local Newspaper.

8.10.4 Management Actions

To facilitate information exchange a community liaison officer will be appointed. Villages near project activities must be advised 2 weeks in advance of project initiation. Appointment of local village leaders in fishing villages could possibly fulfill this role.

Engagement with local communities that may be impacted by PCML business activities shall be conducted to create awareness on Company's operations, including the associated HSE controls and recovery measures. Where there are legislative requirements to conduct such engagements, these requirements shall be fully complied with. To facilitate information exchange a community liaison officer will be appointed. Villages previously consulted must be advised 2 weeks in advance of project initiation.

The objective of these activities is to distribute information to affected stakeholders and communities within the potential project reach. A combination of communication methods will be used to ensure the target groups within the project area are reminded and aware of the proposed plans. PCML will periodically inform the local authorities the project plans throughout all phases of the project.

Before project commencement, the Local Authority will be formally notified of the upcoming project. A meeting with the village heads will be conducted at least 2 weeks before project launch. This meeting will be used to inform the community project activities. The meeting will also introduce key staff members and ensure contact details are exchanged. The community leaders will be asked to relay the information to their communities.

PCML understands the importance of listening to stakeholder concerns and addressing any valid issues to maintain good relations and demonstrate respect for the neighbouring communities in which

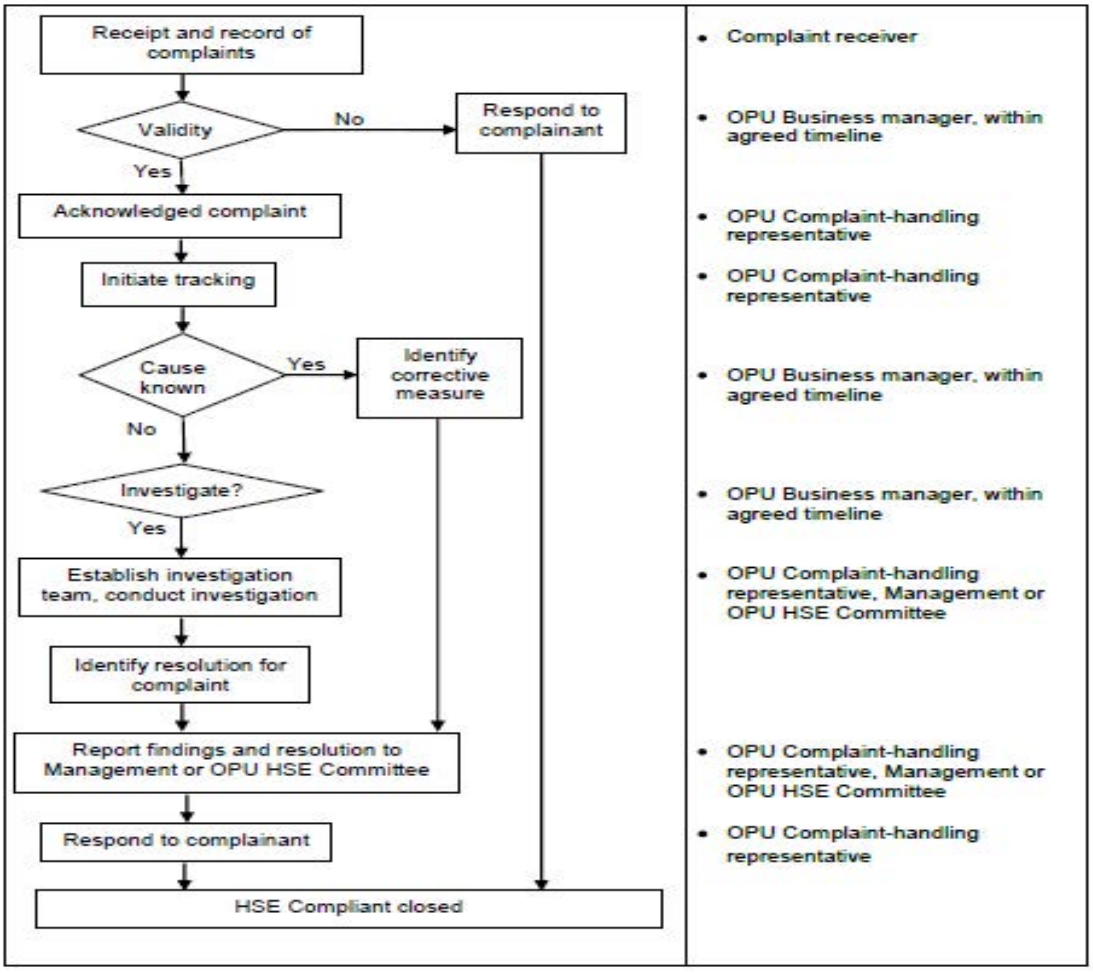
it operates. Fishing associations are concerned about overall offshore development and the potential impacts it has on their fishing options. PCML is aware of this and will have regular communication with them.

The following techniques and mechanisms will be utilized to ensure effective feedback to any community grievances raised.

All HSE Grievances will be processed immediately and according to the HSE Stakeholder Complaint Procedure. Access to complaint-handling process should be free-of-charge to the complaintant. All Complaintants should be treated courteously and be kept informed of the progress of their complaint, being addressed in an equitable, objective and unbiased manner through the complaint-handling process.

The flow of activities in HSE Complaint process is shown in **Figure 8-5** below.

Figure 8-5: HSE Complaint Process Flow



8.10.5 Monitoring Plans

Monitoring Parameter	Methodology	Report	Timescale/ Frequency of Monitoring	PCML Contractor
Social	• Record of Grievances • Monitor, investigate and implement suitable solutions	• Complaint • Monitoring and solving	All phases	PCML
Incident Reporting	• Details of any environmental or social incidents	• Incident Report	Weekly Post Project	PCML
Post Project Opinion Survey	• Post project opinion survey to determine community attitude toward the project	• Opinion Survey of Communities near project area	Post Project	PCML

8.10.6 Implementation Schedule

The Community Consultation Plan and Grievance Mechanism will be conducted during all phases of the project's operations. Four weeks prior to site operations, the stakeholder (fishing associations, village headman, household representatives and community leaders) will be informed about project activities and Grievance Mechanism. PCML will attend monthly meetings at the district office with fishing associations, village headman, household representatives to address any issues regarding PCML's project as required.

8.10.7 Projected Budgets and Responsibilities

Budget

The estimated budget to implement this program is USD $15,000

Responsibilities

In the role of **Community Liaison Office and Secretary of Grievance Resolution Committee,** you are expected to ensure effective implementation of Grievance Mechanism for Myanmar Assets by confirming:

(1) Acts as a focal person to engage with community and to receive grievances;
(2) Forms cross-functional team to develop and implement as per PTG 18.92.04 Grievance Mechanism and WW ALL XX S 05 26 Grievance Mechanism Guideline.
(3) Responsible to receive, acknowledge and register all requests / complaints / enquiry & grievance;
(4) Conduct initial assessment and advise Grievance Custodian to assign Issue Owner;
(5) Establish, maintain and update grievance mechanism database;
(6) Permanent secretary to Grievance Resolution Committee;
(7) Report grievances received and actions taken to the Grievance Resolution Committee;
(8) Communicate the process and progress of grievance resolution to complainant;
(9) Analyse grievances together with HSE function and recommend appropriate actions to prevent recurrence of grievances within the control of Myanmar Asset; and
(10) Responsible to proactively conduct regular dialogue or engagement with stakeholders.

In the role of **Issue Owner and Grievance Resolution Committee Members**, you are expected ensure effective implementation of Grievance Mechanism for Myanmar Assets by confirming:

Roles and Responsibilities of Issue Owner

(1) Function/ department that is most relevant to the cause of grievance; completes Forms and leads investigation team;
(2) Sets and monitors timeframe;
(3) Conducts investigation, and recommend resolution to Grievance Resolution Committee;
(4) Supports CLO on dialogue or engagement with Complaint to achieve a mutually agreed solution; and
(5) Responsible for the implementation and follow-up of agreed action items once the mutually agreed solution has been approved by the Grievance Resolution Committee.

Roles and Responsibilities of Grievance Resolution Committee and Members

(1) Committee that consists of cross-functional senior management of Myanmar Assets;
(2) Complainant, subject matter experts and third party mediator can be invited if deemed necessary by the Committee;
(3) Deliberates on options for resolution and approves the mutually agreed resolution;
(4) Deliberates on appeal cases;
(5) Endorse the case closure; and
(6) Deliberate the grievance trends and endorse the intervention plans.

8.11 Emergency Response Plan

8.11.1 Objectives

To prevent and eliminate the risk of personal injury, occupational illnesses and damage to properties.

This document should be used in conjunction with the following according to the nature of the emergency.

- Oil Spill Contingency Plan
- Mobile drilling rig emergency procedures (contractors)
- MEDEVAC / CASEVAC Procedures
- Accident Reporting Procedures
- Diving Emergency Procedures (Contractors)
- General Procedures for Simultaneous Operations.

8.11.2 Legal Requirements

Myanmar applicable legislation and regulation include:

- The Constitution of the Republic of the Union of Myanmar (2008);
- The Myanmar Investment Law (2016);
- Myanmar Environmental Conservation Laws (2012);
- Environmental Conservation Rules (2014);
- National Environmental Quality (Emission) Guideline (2015);
- Public Health Law (1972);
- The Prevention and Control of Communicable Disease Law (1995);
- The Control of Smoking and Consumption of Tobacco Product Law, 2006 (Section 9);
- The Petroleum and Petroleum Products Law, 2017, Section 8 (m), Section 9 (a, c, d), Section 19(a,b,e), Section 10 (a,c,d,f);
- The Myanmar Fire Force Law, 2015 (Section 25);
- The Explosive Act (1887)
- The Explosive Substances Act (1908)
- The Factories Act (1951)
- The Oilfields Act (1918)
- The Welfare of Labors of Oilfield Act, 1951(After notification);
- The Motor Vehicles Law (2015) and Rule (1987);
- Myanmar Insurance Law (1993 - Section 16);
- The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013 (Section 16,17,23,27);
- Import and Export Law, 2012 (Section 7).

8.11.3 Overview Maps and Site Layout

There are no applicable overview maps, satellite images, or site layout maps associated with this Emergency Response Plan.

8.11.4 Management Actions

PCML will ensure the contractor will have an Emergency Response Procedures Manual that includes response procedures for blowout, fire, earthquake, medical emergency, release of hazardous/toxic substances, etc. PCML has an Emergency Response Plan (ERP) that will be updated specifically for each well site operations and site specific location.

This ERP is considered a standard E&P Emergency Management System and is based on Industry accepted standards and practices (e.g. ISO, BCI, EMI, BS etc.).

A hazard is the potential to cause harm, including ill-health or injury, damage to property, facility, products or the environment, production losses or increased liabilities. All hazards within the Operating Unit should be identified ('what can go wrong?') and assessed for consequence ('what will happen, and how serious will it be if it does go wrong?') and, if practicable, for risk (determined by the chance that a specified undesired event will occur and the severity of the consequences of the event).

Hazards must be considered in the context of the ever changing operating environment.

Emergency Situations include:

- Major gas release / H2S
- Explosion / fire
- Accommodation fire
- Blow-out Contingency Plan
- Oil spill land
- Hazmat spill
- Helicopter incident
- Man missing
- Loss or damage of radioactive source
- Traffic accident
- Medevac
- Bomb threat / terrorist act
- Fatality

Classification of an incident is subjective and may change after additional facts are gathered. After the Duty Managers have been notified, the incident may be re-classified as deemed appropriate. PETRONAS three-tiered response definitions provide the following classification.

Tier 1 - A situation where the emergency response is within the control and capability of the ERT, with or without the assistance from response agencies and / or authorities.

Tier 2 - A situation where the emergency response is beyond the control and capability of the ERT, thus requires EMT support as well as involvement from external response agencies and / or authorities.

Tier 3 - A situation where the emergency response and management is beyond the control and

capability of the EMT, thus, requires CMT support as well as involvement and management from multiple external response agencies and / or authorities.

During an emergency situation, the centre of operation is known as the Emergency Control Centre (ECC). All information and coordination, regarding emergency management operations, shall flow through the ECC. The centre is staffed by the Emergency Management Team (EMT) and shall include one Incident Commander and members of the appointed representatives.

Within this framework, the EMT can provide, equipment, supplies, facilities, managerial and technical services in support of site ERT mitigation and control efforts. The Incident Commander and the other team members shall be involved in providing all required supports.

Under PETRONAS Incident Command System, the HSE Department has been delegated with primary responsibility for coordinating PCML emergency preparedness, planning, management, and emergency assistance functions. The department also has been delegated with responsibility for establishing emergency assistance policy. In this stewardship role, the department has the lead in developing this plan.

PCML Emergency Control Centre (ECC)

The PCML Emergency Control Centre (ECC) is located at Training Building, Yangon Office. The ECC is utilized by the PCML Emergency Management Team (EMT) when managing emergencies occurring in Myanmar Operations.

The EMT comprises of core group and support personnel. These personnel are assisted (when mobilized) by the PCSB HQ-EMT, based at Head Office, Kuala Lumpur. The core team members are as follows for Tier 1 & 2.

Emergency:

a) Incident Commander
b) Operations Section Chief
c) Planning Section Chief
d) Logistics Section Chief
e) Finance and HR Section Chief.
f) HSE & Liaison Officer
g) Computer Operator

The core group is supported by the following group but not limited to as IC can call out other subject matter experts upon agreed by GM:

a) Administration Support Team
b) Next-Of-Kin Response Team
c) Media Response Team (Information)
d) IT/Telecommunications Team
e) Technical/Specialist Group
f) Contractor Representative

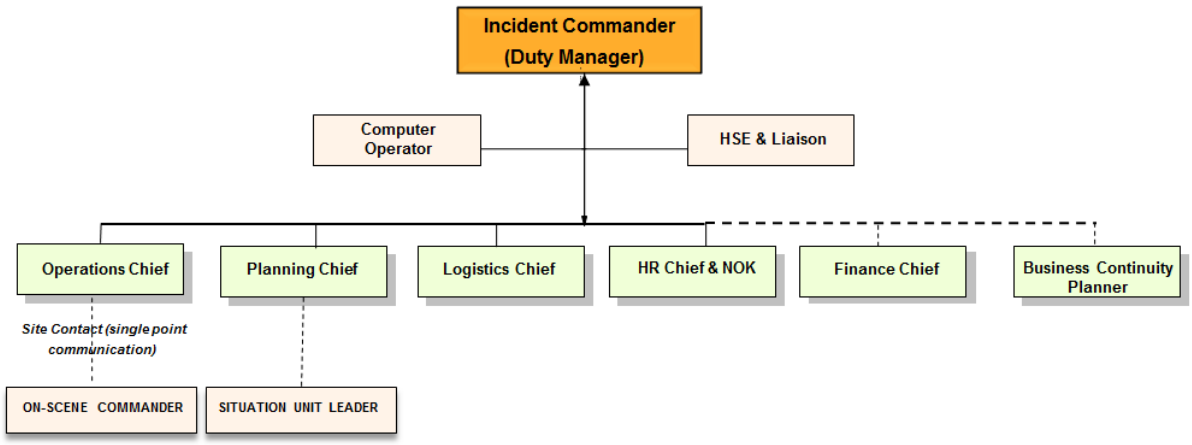


Figure: MYA Emergency Management Team (Core Group)

The response to an emergency occurring at the site or facility is undertaken by the facility Emergency Response Team, under the direct supervision of the PIC. The site emergency response team comprises of personnel that are assigned to carry out specific emergency duties. (refer to site Emergency Response Plan for details).

At minimum, the composition of the site ERT are as follow:
For manned facilities, two (2) complete DCTs shall be in place consisting of the following:

a) 1 x OSC
b) 1 x Emergency Operation Centre (EOC) Support (e.g. RO)
c) 1 x DCT Commander
d) 2 x DCT Team, each comprising 1 x DCT Leader,
   2 x Fire Fighter,
   2 x Fire Fighter with Breathing Apparatus (BA), and
   1 BA Coordinator.

The team shall be involved, when responding to emergency situation(s) and carry out mitigation and control (first responder), pending arrival of emergency assistance and supports.

(1) Proceed to the ECC at Yangon Office.
(2) Report to the IC or other assigned EMT members.
(3) Set up your workstation and review your position responsibilities.
(4) Establish and maintain an event/or position log, which chronologically describes your actions taken.
(5) Determine your resource needs, such as a computer, phone, plan copies, and other reference documents.
(6) The IC will alert the Head, Myanmar Operation and UPSTREAM Support Team Duty Manager according to the incident notification matrix.

Efficient communication is essential during any emergency. The importance of keeping the Emergency Management Team fully informed of the development of the emergency situation cannot be emphasized too highly. The IC requires such information to enable him to plan his response to the emergency and pass accurate information to UPSTREAM Support Team Duty Manager.

All emergency messages from the site or facility shall be addressed to the IC at Yangon Office (via MYA Switchboard Operator, contact number (+95 1 515011 / 526411) or Duty Mobile phone (+95 9 519 3367). The IC is the designated emergency contact point for the receipt of notification of an emergency and any request for assistance and shall remain contactable at all times during the period when on duty.

Upon notification of an emergency:

(1) The IC will inform the Head, Myanmar Operation and call out the on-duty EMT members.

(2) The IC will inform UST Duty Manager and follow up by fax or mail of NF

(3) The IC will inform the relevant government authorities (MOGE) within 24 hours.

(4) PETRONAS COMCEN shall cascade information to other GROUP Management.

The EMT will assist in identifying appropriate counter-measures to meet emergency mission-critical needs, synchronizing support, and encouraging incorporation of mitigation measures, where possible.

Additionally, they track overall progress of response effort, particularly noting program deficiencies and problem areas.

Upon arrival at the ECC, every member shall review the followings with the IC:

- What had happened?
- When did it happen?
- Where exactly it happens?
- How did it happen?
- What action had been taken?
- Are there people involved?
- What effect it has on operations or productions?
- Has contact been made with other agencies?
- What support is required?

The EMT members are the focal persons for delivering emergency recovery assistance programs. The members ensure that third party agencies that might have appropriate emergency assistance programs are notified in support of mitigation efforts.

The overall responsibility for the safety of the site rests with the PIC. He has the authority and responsibility to take the immediate response actions required to control any emergency; including directly mobilizing or requesting the use of necessary resources such as aircraft, materials, etc., if required.

At Yangon office, the IC will be the overall in charge and responsible for directing key personnel, authorizing or obtaining authorization of any funds required for materials, equipment, contract services or specialist personnel necessary to bring the emergency under control. It is the IC responsibility to establish contact and advise the management at PCSB Head Office, brief them on the emergency and the actions being taken.

The IC shall respond to all requests for assistance from the PIC without delay. It is the sole responsibility of the PIC to identify such requirements, and of the IC and EMT to implement them. If outside assistance is required from other Agencies, such as for the use of equipment, all requests will be channeled through the IC. Requirements should subsequently be confirmed by fax or in writing. It

will be the IC responsibility to ensure that all relevant authorities and organizations are informed and reports subsequently prepared and submitted.

In the absence of the Duty Incident Commander for any reason, the replacement will be proposed by HSE Department and agreed by GM to act as IC. Once PCML EMT is exhausted, back up EMT will be notified by HSE Department and agreed by General Manager. Back up EMT team will keep on handling the emergency situation.

To the maximum extent possible, internal local resources at site shall be used as the first line of support for emergency recovery operations. Arrangements and working collaboration should be made with other agencies as an additional option for resource support after an emergency declaration.

Once PCML resources and capabilities are exhausted, HQ EMT assistance may be provided to support operational requirements and priorities. Utilization can be requested from the EMT.

Resources are acquired using the standard company procurement vehicle such as a purchase order, blanket purchase agreement, or contract. Additionally, the IC may authorize purchase under the emergency provision power directing completion of a specific task.

- In the event of any emergency it is necessary to notify the Myanmar Government. Unless specifically advised otherwise, the only government agency to be notified will be the Myanmar Oil & Gas Enterprise (MOGE) who is the official operator of each PSC (Production Sharing Contract).
- MOGE is to be notified immediately of any incident. Initial contact should be by telephone or radio. This should be followed up by fax as soon as possible. When cleared by the PCML General Manager, the EMT's IC on duty who has the necessary contact numbers will initiate contact with MOGE.
- MOGE will then contact any other government agencies required i.e. police, medical, military, customs, immigration etc. Where required, MOGE should be asked to assist in dealing with other government agencies for issues such as arranging clearance for emergency flights, immigration matters and liaison with the Armed Forces if required. For example, the Armed Forces may be involved in assisting in maritime or land based search and rescue operations or in dealing with terrorist threat or other security issues.
- Contact with Malaysian or other embassies in Myanmar may be necessary in connection with notification of Next of Kin, repatriation of casualties or fatalities, evacuation of personnel due to socio-political developments and other issues. The General Manager will decide whether or not and when such contact will be initiated.

8.11.5 Monitoring Plans

Drills for the following Emergency Situations should be conducted, monitored and reported for effectiveness during each drilling program:

- Major gas release / H2S
- Explosion / fire
- Accommodation fire
- Blow-out Contingency Plan
- Oil spill land
- Hazmat spill
- Helicopter incident
- Man missing

- Loss or damage of radioactive source
- Traffic accident
- Medevac
- Bomb threat / terrorist act
- Fatality

Monitoring Parameter	Methodology	Location	Report	Timescale/ Frequency of Monitoring	PCML Contractor
Emergency Drills	• Record the Number and type of emergency drills conducted; and • Response efficiency	Drill Rig	ERP Drill Report	Monitor each ERP drill for each situation	PCML
Environmental or Social Incidents	• Record accidents or near misses generated during construction by identifying cause(s) and severity of impact(s), as well as operated mitigation measures	Rig and Vessels	Incident Report	Weekly	Contractor

8.11.6 Implementation Schedule

The emergency response plan must be customized for the location one month prior to project initiation to ensure that personnel are trained as required.

8.11.7 Budgets

The estimated budget to implement the ERP is included in the drilling rig contract.

8.11.8 Responsibilities

Incident Commander
The authority to manage any emergency is delegated to MYA appointed Incident Commander.

Operations Section Chief
A member of EMT responsible to the IC on all matters related to operations and emergency communication.

Planning Section Chief
A member of EMT responsible to the IC on all matters that are related to technical and secretarial supports. The job includes maintaining an accurate timed log of events, instructions and communications during the emergency period.

Logistics Section Chief
A member of EMT responsible to the IC on all matters related to logistics and resources.

Finance Section Chief & HR Section Chief

A member of EMT responsible to the IC on all matters related to finance and administration. But as per the requirement of emergency situation the Finance & HR Section Chief will split into Finance Section Chief and HR & NOK officer. The additional man power will take over from Finance & HR Section Chief to concentrate more on either Finance part or HR part.

HSE & Liaison Officer

A member of EMT responsible is to the IC on all matters that are related to HSE, Security and Liaison with relevant external agencies. But as per the requirement of emergency situation the HSE & Liaison Officer will split into Safety officer, Liaison officer and Security officer. The additional man power will take over from HSE & Liaison to concentrate more on either Security, Safety part or Liaison part in order to response effectively.

Situation Unit Leader

Roles & Responsibilities

- Ensure proper and effective log keeping is maintained and keep current information for the situation status report.
- Ensure that major information to be compiled by EMT members and are available for recording.
- Ensure that all status boards and other displays are kept current and that posted information is neat and legible.
- Produce situation status report as instructed by Planning chief and distribute to EMT members.
- Prepare Situation Analysis objectives for the Initial Action Planning meeting.
- Make a list of key issues to be addressed; in consultation with EMT members, identify objectives to be accomplished during the initial Operational Period.
- Keep the Incident Commander and EMT members informed of significant events.
- Assist the Incident Commander's action planning meetings and during a quick update session after the end of each operational period.
- Prepare and maintain Incident Status Display
- Collect and maintain current incident data
- Prepare periodic predictions as requested by IC
- Prepare, post and disseminate resource and situation status information as required, in the Emergency Control Center
- Prepare Incident Status Summary
- Provide photographic services and maps

Computer Operator

Roles & Responsibilities

- Record all incoming and outgoing messages from the main log of events and emergency response messages forms and incorporate into the computer log in related order.
- Assist in accessing any other information held on the computer such as Emergency Contacts.
- Type and print reports, draft press releases and any other material required by the EMT members.

Head, Myanmar Operation

The Head, Myanmar Operation is the legitimate Corporate Management representative, responsible

for all business activities and as such retains overall control of all response efforts to incidents or emergencies occurring in jurisdictional areas.

Legal Officer

The legal officer is responsible for all business activities and as such retains overall control of all response efforts to incidents or emergencies occurring in legal areas.

8.12 Oil Spill Response Plan

8.12.1 Objectives

The primary purpose of this OSRP is to establish effective emergency procedures to respond to oil spill affecting the operations of PCML to:

(1) ensure minimal adverse effect to the environment,
(2) minimize the spread of hydrocarbons,
(3) provide the tools to identify the most appropriate response tactics,
(4) protect sensitive areas; and
(5) mitigate negative effects.

The OSRP:

a) Describes the expectations, scope and content of the oil spill response and management systems for PCML;
b) Provides guidance to the PCML Emergency Management Team (EMT) for the response to, and control of, a hydrocarbon spill associated with the operations in PCML;
c) Identifies the way in which the overall response in PCML will be coordinated;
d) Sets out roles and responsibilities of key personnel;
e) Identifies internal and external sources of support, assistance and resources to aid response;
f) Describes local response strategies and organisations; and
g) Defines internal and external notification procedures, response organisations, resources and personnel.

This OSRP is used mainly for condensate or diesel spill incident caused by PCML Operations within the area of Yetagun field where PCML is the operator of the Production Sharing Contract (PSC). In case that Oil Spill occurs beyond the Response Area, the OSRP should be used flexibly in line with PCML's business activities.

The scope of this OSRP covers all installations and facilities managed by and/or operated for PCML including but not limited to the drilling rig, wellhead platforms, FSO, supply vessels and infield pipeline. It focuses primarily on the response to
the condensate or diesel spill.

Exploration drilling activities will have a specific Oil Spill Response Plan developed, which will bridge with PCML OSRP.

This OSRP covers spills of oil associated with PCML operations including;

- Drilling & Production: Oil spills arising from development drilling and production activities.
- Field Support: Oil spills arising from activities involving the field support vessels.
- Port Spills: Oil spills from the supply/ logistics base port, SBMs, wharfs/jetties.

This plan is part of the MO Emergency Management Plan. The Emergency Response (ER) manual must be referred to in any emergency inclusive of an oil spill. It provides details of the management philosophy utilised by PCSB when defining the organization and resources used in the response to an emergency and details the overall responsibilities required to handle effectively any emergency which

may arise.

This document is linked either directly or via bridging documents to:

- ENVIRONMENTAL CONSERVATION LAW 2012, The Pyidaungsu Hluttaw Law No. 9 / 2012
- PORT PLAN – Port oil spill contingency plan arrangements for FSO.
- PETRONAS CRISIS AND EMERGENCY MANAGEMENT PLANS (CEMP) - PETRONAS has a number of internal documents that should be used in conjunction with this OSRP. These include the Corporate Crisis Management Plan. A number of additional, parallel documents have also been prepared by PETRONAS which include Incident Notification Guidelines, and Accident Reporting and Notification Procedures.

8.12.2 Legal Requirements

National Legislative Framework

- Environmental Conservation Law 2012, The Pyidaungsu Hluttaw Law No.9/2012
- The Oil Field Act 1952
- The Factories Act 1951
- Law Relating to The Fishing Rights of Foreign Fishing Vessels, 1989
- The Myanmar Marine Fisheries Law, 1990
- The Freshwater Fisheries Law ,1991

International Conventions

Myanmar acceded and implemented several key international conventions relating to prevention and control of oil pollution from ships namely MARPOL 73/78, OPRC 1990, CLC 1992 and Fund 1992 under the umbrella of the international Maritime Organization (IMO).

MARPOL 73/78
International Convention for the Prevention of Marine pollution from ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL) 73/78), and it entered into force on 2 October 1983 (Annexes I and II is compulsory). The convention includes regulations aimed at preventing and minimizing pollution from ships – both accidental pollution and that from routine operations and currently includes six technical Annexes. Annex 1 - Regulation for the Prevention of Pollution by Oil is relevant to this Oil Spill Plan.

International Convention on Oil Pollution Preparedness, Response and Cooperation 1990 (OPRC 1990)
This Convention establishes preparatory methods for contingency plan, reporting procedures for oil, technical cooperation within the region or internationally, and the promotion of research and development in the area of oil spill management among the state parties. The Convention has the following key elements at its heart:

a) precautionary and preventative measures are important in the avoidance of oil pollution in the first instance;
b) prompt and effective action is essential to minimize possible damages in the event of pollution;
c) contingency planning needs to be emphasized and the role of the oil and shipping industries should be included within these plans;

d) the need for mutual assistance, international cooperation and information exchange (on response capabilities and reporting incidents);
e) the "polluter pays" principle; and
f) the importance of related international instruments on liability and compensation, including the 1992 Civil Liability Convention (CLC 1992) and the 1992 Fund Convention.

The OPRC Convention has 19 articles and 10 Resolutions covering both administrative and technical aspects. In summary, these call for Parties to carry out the following actions in relation to oil spill contingency planning:

a) ships, port and oil industry facilities posing a risk of oil spills should have oil pollution emergency plans, under the coordination of a national contingency planning for major incidents;
b) there should be clear oil pollution reporting procedures;
c) reports of oil pollution should be properly assessed and all States whose interests may be affected informed; national and regional systems for preparedness and response should be developed, including the designation of competent national authorities and the compilation of national contingency plans;
d) provision should be made for the supply of technical support and equipments to Parties requesting assistance to combat spills;
e) the necessary legal and administrative measures should be taken to facilitate customs and immigration procedures in an emergency, where outside assistance has been mobilized;
f) technical cooperation between Parties should be active in the field of training, planning, research and development; and
g) Parties should work together with the oil and shipping industries to establish suitable pollution combating equipment stockpiles and training programmes.

International Convention on Civil Liability for Oil Pollution Damage 1992 (CLC 1992)

The 1969 CLC entered into force in 1975 and lays down the principle of strict liability (i.e. liability even in the absence of fault) for tanker owners and creates a system of compulsory liability insurance. Claims for compensation for oil pollution damage (including clean-up costs) may be brought against the owner of the tanker which caused the damage or directly against the owner's P&I insurer. The tanker owner is normally entitled to limit his liability to an amount which is linked to the tonnage of the tanker causing the pollution. The Convention requires ships covered by to maintain insurance or other financial security in sums equivalent to the owner's total liability for one incident.

The Convention applies to all seagoing vessels actually carrying oil in bulk as cargo, but only ships carrying more than 2,000 tons of oil are required to maintain insurance in respect of oil pollution damage. This does not apply to warships or to other vessels owned or operated by a State and used for the time being for Government non-commercial service. On May 30, 1996 the 1992 protocol came into force. It widened the scope of the Convention to cover pollution damage caused in the exclusive economic zone (EEZ) or equivalent area of a State party. The Protocol covers pollution damage as before but environmental damage compensation is limited to costs incurred for reasonable measures to reinstate the contaminated environment. It also allows expenses incurred for preventive measures to be recovered even when no spill of oil occurs, provided there was grave and imminent threat of pollution damage.

International Convention on the Establishment of an International Fund for Compensation of Oil Pollution Damage 1992 (FUND 1992)

International Convention on the Establishment of an International Fund for compensation for Oil Pollution Damage was adopted at a conference held in Brussels in 1971. It is supplementary to the 1969 Civil Liability Convention.

The purposes of the Fund Convention are:

a) To provide compensation for pollution damage to the extent that the protection afforded by the 1969 Civil Liability Convention is inadequate.
b) To give relief to ship owners in respect of the additional financial burden imposed on them by compliance with safety at sea and other conventions.
c) To give effect to the related purposed set out in the Convention.

Under the first of its purposes, the Fund is obliged to pay compensation to the victims of oil pollution damage who are unable to obtain adequate or any compensation from the ship owner or his guarantor under 1969 Convention. Victims of oil pollution damage may be compensated beyond the level of the ship owner's of liability. However, the Fund's obligations are limited so that the total payable for victims by the ship owner and the fund shall not exceed 30 million SDR (about US$41million) for any one. In effect, therefore the fund's maximum liability for each incident is limited to 16 million SDR (under 1971 Convention – limits were raised under the 1992 Protocol). The Convention contains provisions on the procedure for claims, rights and obligations, and jurisdictions.

On May 30, 1996 the 1992 Fund Protocol came into force. As was the case with the 1992 Protocol to the CLC convention, the main purpose of the Protocol was to modify the entry into force requirements and increase compensation amounts. The scope of coverage was extended in line with the 1992 CLC Protocol. The 1992 Protocol established a separate, 1992 International Oil Pollution Compensation Fund, known as the 1992 Fund.

8.12.3 Requirements for Emergency Response Procedures

Operator of premises involved in activities such as oil exploration, production, refining, bringing in oil tanker into Myanmar, involved in bunkering and to ship transfer of oil or any other activity that poses potential oil spill threat regardless type or quantity of oil handled must have in place their Emergency Response Procedures (ERP) or Contingency Plans. These plans should also identify resources available in terms of equipment and trained personnel for the purpose of immediate response in case of emergency. Refer to guideline on Preparation of Tier 1 Contingency Plan.

Operators of such premises should also ensure that their plans supplement the PCML OSRP and these plans identify available OSR resources within the proximity of their business in case the need for external assistance arises. Initiation of regular joint oil spill response exercises between the private and public sector is encouraged.

8.12.4 Sources of Spill and Oil Spill Scenario

The most likely sources of spills are:

Fuel transfer and storage – Spills may occur during refueling activities as a result of hose rupture,

coupling failure, or overfilling of tanks. Leaking and rupture (however remote) may also occur. The volume of fuel spillage in these situations is likely to be small and further minimized by continued monitoring, secondary containment, and prompt shutdown;

Well testing – Drill stem testing, although of limited duration, could result in small spills of oils. These will be contained on the bounded deck of the platform and will drain to drain – tanks for recovery;

Condensate transfer – Typical causes of accidental spills are pipeline rupture or connection failure. Continuous monitoring and the installation of automatic shutoff devices on pipelines will reduce the chance and the amount of this type of spill;

Maintenance – The spillage of lubricant or fuel oils could occur during maintenance work on the platforms and the FSO;

Fire or explosion – Fire or explosion at the platforms or the FSO could result in a major oil spill. Strict regulations and high standards of safety equipment, servicing, maintenance, and training serve to ensure that fire and explosion are extremely rare events;

Shipping accidents – Failure of oil or fuel tanker during shipping or mooring may result the release of either part or all of the tanker contents. Implementation of standard operating procedures, continuous monitoring and strict personnel training will minimize the chance of a shipping accident.

Drilling Rig

Spillage of fuel:

(1) Fuel loss during transfer – maximum 100 bbl

(2) Storage tank failure – maximum loss not expected to exceed 3,000 bbl during drilling, 5,000 bbl during production.

Spillage of drilling mud:

(1) Mud tank rupture – maximum loss 2,500 bbl

Standby/Supply Vessel

Spillage of fuel:

(1) Fuel loss during transfer – maximum 100 bbl

(2) Storage tank failure – maximum loss not expected to exceed 3,600 bbl during operation

(3) Ship collision – loss of the cargo tanks in the back; maximum loss 1200 – 3600 bbl

(4) Ship sinks with full load – though highly unlikely (given the specific gravity of the cargo), it may result in the loss of 3,600 bbl;

8.12.5 PCML Emergency Organisation

PCML has limited resources but in the event of an emergency situation would adopt an organisational structure based on the Incident Command System (ICS) as shown below in Figure 2.2. The personnel listed above would together form the framework for the PCML Emergency Management Team

(EMT) and sitebased Emergency Response Team (ERT). The Emergency Coordination Centre (ECC) is located the PCML office in Yangon.

PCSB has established an ECC in the Head Office in Kuala Lumpur, Malaysia.

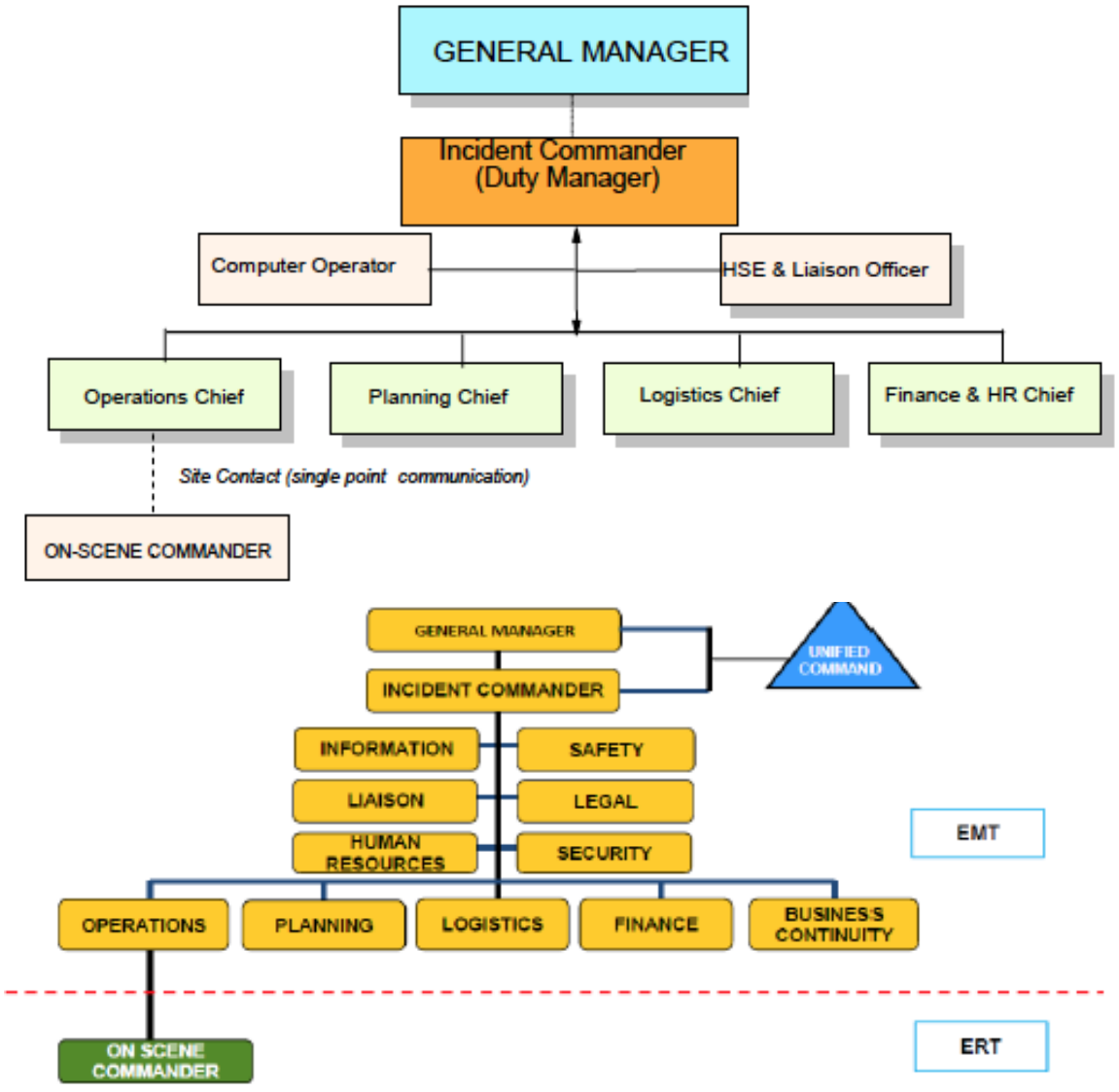


Figure 2.2: PCML Emergency Organisation

The Emergency Organisation will be manned based on the weekly duty roster.

The OSC would initially report the spill to the Incident Commander. Thereafter, when the ECC has been established, the OSC would report via the Operations Chief who would in turn keep the Incident Commander fully appraised. The Incident Commander will provide the interface between the EMT in PCML and the CMT at PETRONAS Head Office, Kuala Lumpur.

The ICS structure is extremely flexible and can be partially activated in the case of minor spills (Tier 1) or expanded in the event of a full blown emergency (Tier 2 or Tier 3). The PETRONAS philosophy with regard to dealing with oil spills of different sizes/ severity is outlined in Figure 2.3.

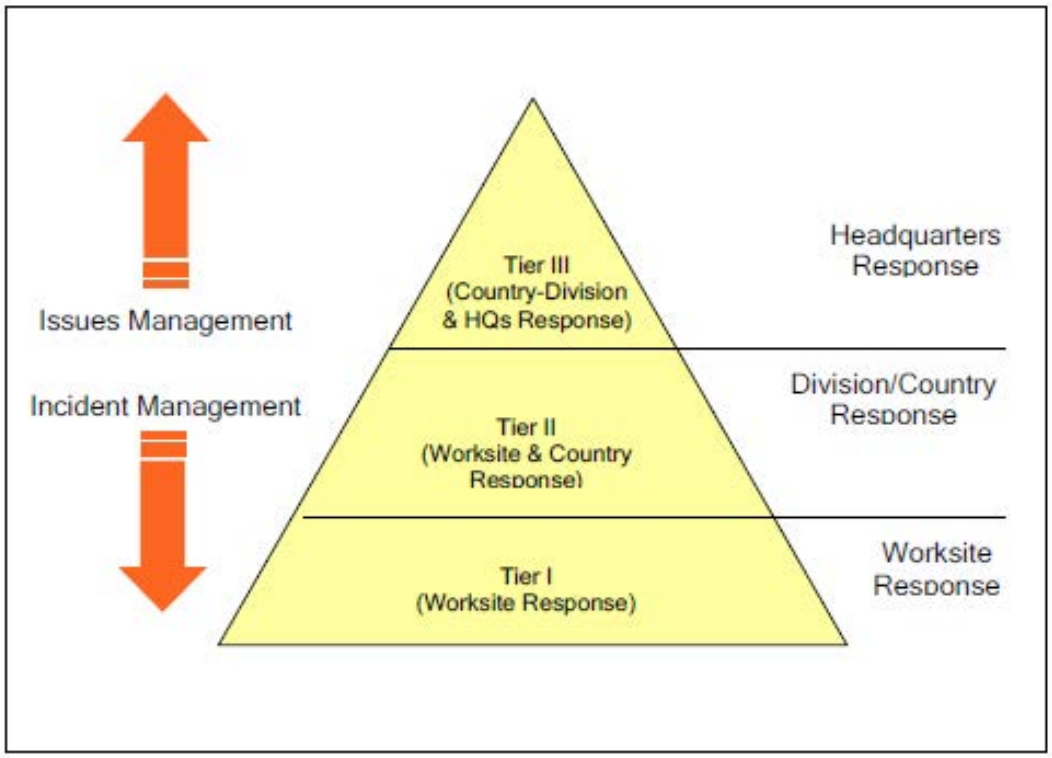


Figure 2.3: PETRONAS Response Levels

Technical Support Team may include PCML staff who are not occupied in the ECC and other personnel who are trained in the Oil Spill Response technique, especially in the beach cleaning etc.
In addition to other technical advisors, the Technical Support Team may include the On-site Commander, Beach Cleaning Advisor and Beach Cleaning Group Leader and Strike Team Leader.

The PCSB HQ EMT will normally be mobilized in the event of a major emergency and will be responsible for technical and safety advice, and supply of resources beyond the capabilities of PCML EMT. The duties and responsibilities can be outlined as follows:

- Notify COMCEN PETRONAS
- Provide advice on safety and technical matter.
- Coordinate the approval of press release.
- Make corporate decisions.

8.12.6 Overview Maps and Site Layout

There are no applicable overview maps, satellite images, or site layout maps associated with this Oil Spill Response Plan.

8.12.7 Management Actions

The purpose of the three tier levels (see Table 2.1) is to establish, as soon as possible, what is the correct level of response needed to combat the spill. The serveity of the spill depends on the size and complexity of the response and the potential consequences for people, environment, assets and reputation.

Table 2.1: Tier Assessment Criteria

Tier 1	**Spills which can be dealt with using local, in-house resources.**	
❑ Spill can be easily managed using on-site oil spill response resources ❑ Source of spill has been stopped ❑ Spill contained ❑ Spill likely to naturally dissipate		❑ Day time release ❑ Oil is moving away from the coastline or not moving to sensitive areas ❑ <5 barrels
Tier 2	**Spills that require mobilisation of oil spill response resources from established service providers.**	
❑ Danger of fire or explosion ❑ Concentrated oil accumulating in close proximity to the drilling rig/vessel, onshore storage tank, etc. ❑ Possible continuous release ❑ Tier 1 resources overwhelmed, requiring additional resources ❑ Night time or poor visibility		❑ Heavy fuel or crude oil ❑ Oil spill is moving towards the coastline/inland waterway ❑ Oil predicted to impact sensitive areas (e.g. water intakes, fisheries, tourist areas) ❑ Local/National media attention ❑ 5-1000 barrels
Tier 3	**Spills which require the mobilisation of national resources.**	
❑ Actual or potentially serious threat to life, property, industry ❑ Tier 2 resources overwhelmed, requiring the mobilisation of government- owned and/or national resources international oil spill response contractor(s)		❑ Significant shoreline impact ❑ Potential to impact neighboring countries ❑ International media attention ❑ >1000 barrels

PCML tiered response system flowchart is shown in Figure 2.4

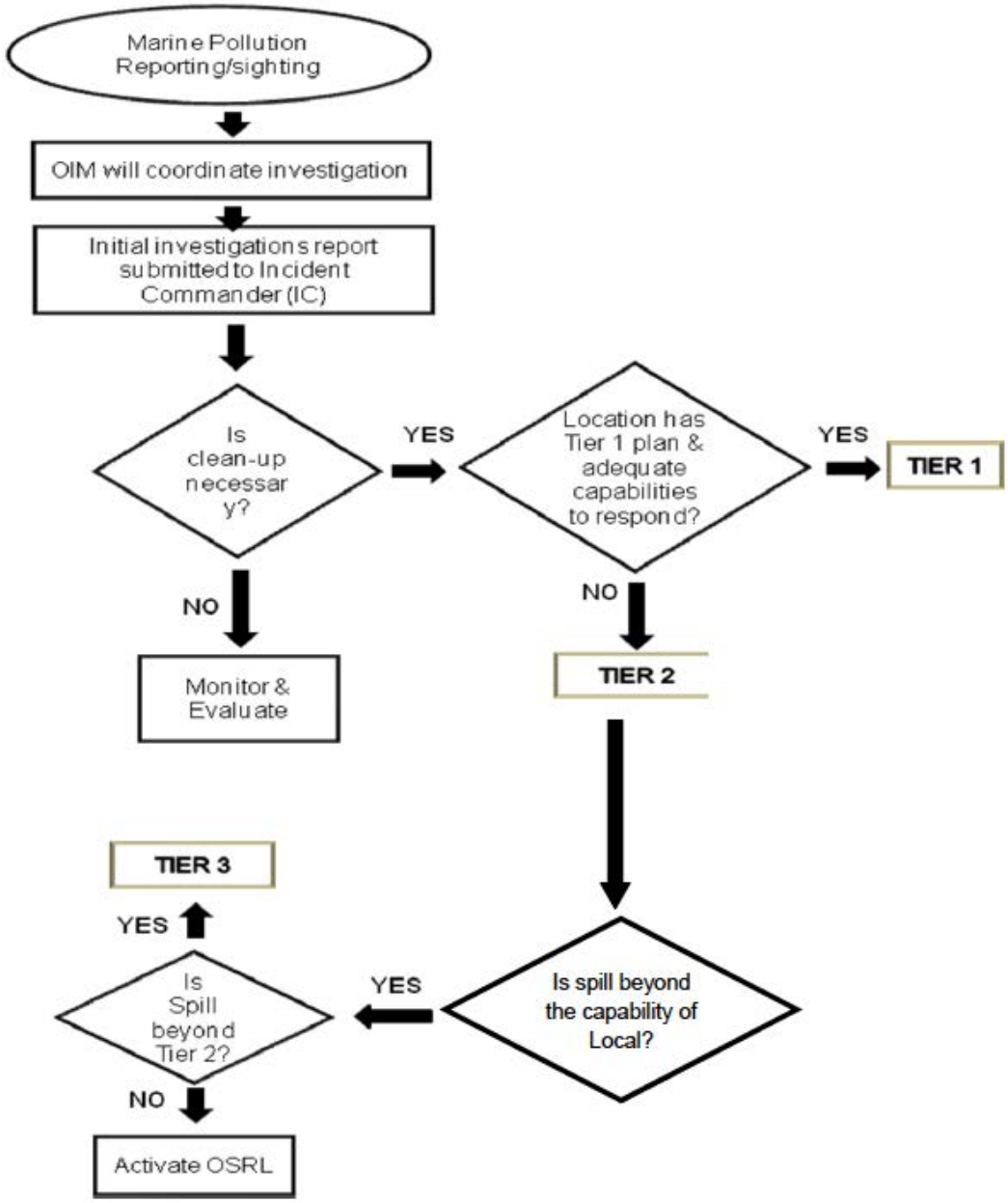


Figure 2.4: PCML Tered Response System Flowchart

Tier 1 Spills

Spill that can be controlled in-house using PCML own resources (equipment and personnel) less than 5 barrels but not occurring at sensitive area.

Tier 2 Spills

The response capability will be provided primarily by the sources of equipment, materials and personnel in Yangon and sources from other operators, contractors and service providers. Incidents of this level would, in most cases, involve not only SERT but also all or parts of the Emergency Management Team (EMT), based in Yangon.

Tier 3 Spills

In addition to all the resources of PCML and PCSB HQ, the response equipment would be provided by OSRL.

End of Emergency

The end of the emergency will be declared in a different way depending on the Tier:

- For Tier 1 oil spills, the On-Scene Commander will order the closure of oil spill response operations. The OSC will also be responsible for informing the Incident Commander and all personnel that had been involved or notified, that the emergency has terminated.
- For Tier 2 oil spills, the Incident Commander will order the termination of oil spill response operations. The Incident Commander will also be responsible for informing all personnel and organisations that had been involved or notified, that the emergency has terminated.
- For Tier 3 oil spills, the end of the emergency will be declared by the Head of Country.

The "End of Emergency" will be declared when any of the following circumstances occurs:

- All resources affected by the spill have reverted to the agreed status;
- It is not effective to continue pollution fighting or cleanup operations.

8.12.8 Monitoring Plans

Monitoring will be implemented to demonstrate compliance with both regulatory and PCML procedures. This will include daily drilling reports, incident reports, quarterly reviews, and internal auditing.

Refuelling will be visually monitored. Accidental releases will be recorded as incidents and reported to MOGE as per EIA Procedure (Article 107).

Monitoring Parameter	Methodology	Location	Report	Timescale/ Frequency of Monitoring	PCML Contractor
Oil Spill Response Plan	Conduct oil spill drill to test equipment and or table top exercise	Drill Rig	OSRP Drill Response	During Installation Phase	PCML
Accidental Releases and Leaks	Record any accidental releases or leaks	Rig/Vessels	Accidental Discharge Report	Weekly Post Project	Contractor PCML

8.12.9 Implementation Schedule

The OSRP is to be implemented in advance of the drill rig mobilization and installation phase.

The schedule for training and exercises is outlined under roles and responsibilities

8.12.10 Budgets

The cost to implement the OSRP for the exploration drilling program is included in the drill rig cost.

8.12.11 Roles and Responsibilities

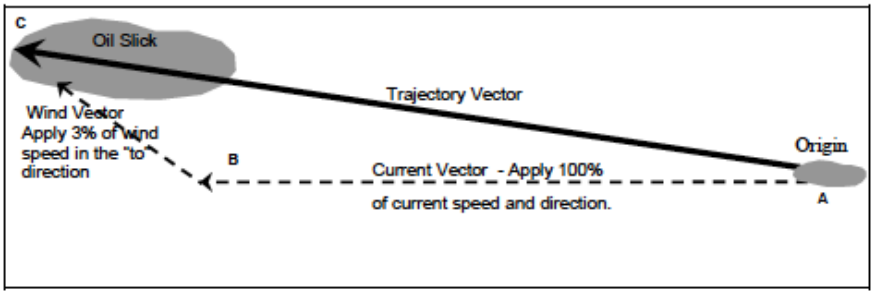
SPILL OBSERVER **Reports to: Dependent upon location of spill observer:** **Onboard installation - Control Room and PIC** **Onboard Vessel – Vessel Master**	
Step	**Actions**

Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY**
	❑ Raise the alarm as soon as possible by verbal means e.g. radio or in person
	❑ Inform the installation Control Room / OIM / Vessel Master of the incident and provide as much information as possible:
	  ❑ Location of pollution incident.
	  ❑ Source of spill.
	  ❑ Extent of spill.
	  ❑ Time of incident.
	  ❑ Potentially hazardous situations/equipment.
	❑ If trained and safe to do so, take reasonable actions to stop the source of the spill until relieved by suitable/ competent individual.
	❑ If unsafe to remain at spill site, leave and instruct other personnel to evacuate the hazardous area.
	❑ Start a **Personal Log** and record time and details of own actions and own decisions.

Further Actions	❑ If safe to do so, continue monitoring the spill, keeping the **OSC** informed until the Damage Control Team arrives. ❑ Be prepared to direct the Damage Control Team to the spill. ❑ If trained and if required, assist the Damage Control Team.
Final Actions	❑ After the incident, take part in the debriefing ❑ Provide recommendations based on observations made during the response.

OFFSHORE ON-SCENE COMMANDER (OSC) **Coordinates the tactical offshore oil spill response activities.** **OIM/ Vessel Master assumes OSC position for spills in water.** **Reports to: Operations Chief.**	
Step	**Actions**

Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY**
	❑ OIM assumes role of **OSC** if spill enters water, regardless of size.
	❑ Make an initial assessment of the incident.
	  ❑ Spill source and cause
	  ❑ Type of hydrocarbon
	  ❑ Size and location
	  ❑ Injuries
	  ❑ Hazards
	❑ If the volume of condensate/ diesel/oil spilt is unknown, estimate the maximum volume which may have spilt and assume 'worst case scenario'
	❑ Mobilise the Damage Control Team, brief the team of the situation.
	❑ Start a Personal Log and record time and details of own actions and own decisions
	❑ Arrange for offshore oil samples to be collected and sent for analysis
	❑ Authenticate the reported emergency details by speaking with the original Observer and obtain full details of the incident
	❑ If the spill or leak is from a vessel, provide guidance to the Vessel Master on taking action to stop operations and move the vessel to safety
	❑ If the spill leak is from an onshore operation, cordon off the area (i.e. Port operations)
	❑ Decide on whether to discontinue or cease operations
	❑ Decide if there is a need to evacuate an area
	❑ For all spills immediately notify Incident Commander (verbally).
	  ❑ For Tier 1 spills send Initial Notification Form (**Appendix 4.0**, INF) within 1 hour.
	  ❑ For Tier 2/3 spills send INF followed by **POLREP** as soon as practicable.
	❑ For Tier 2/3 spills liaise with Operations Chief on additional actions and/or resources required, and the practical deployment of resources.

OFFSHORE ON-SCENE COMMANDER (OSC)	
Coordinates the tactical offshore oil spill response activities. **OIM/ Vessel Master assumes OSC position for spills in water.** **Reports to: Operations Chief.**	
Step	**Actions**
Initial Actions	❑ Identify tasks that must be performed to implement the initial strategy and identify task leaders for tactical response ❑ Agree a danger zone for the spill (i.e. a safe distance from the spill which the Damage Control Team must enforce). ❑ If necessary request a helicopter through the Operations Chief to provide aerial observation. Aerial surveillance will allow you to observe and record the size and location of the slick. ❑ The colour of the oil on water will indicate its thickness. Using the Bonn Agreement Oil Appearance Code (BAOAC, **Appendix 5.2 – Aerial Surveillance Form**) colour chart, calculate the volume of oil based on the area and colour of oil visible from the aerial observation. ❑ Once the scale and movement of the spill are known, and if required, request assistance from the field support vessels.  **Figure 5.2: Predicting movement of oil on water** ❑ Obtain information on tides & direction/speed of current and wind. ❑ Using the information on current and wind, predict the trajectory and speed of movement of the spill as illustrated in **Figure 5.2** above. ❑ Draw the slick on a chart (map) with co-ordinates, showing position and predicted movement of the oil. ❑ Notify Operations Chief via Situation Report (SITREP, **Appendix 4.9**).
Further Actions	❑ Request support/additional procurement of equipment, manpower and services via the Operations Chief. ❑ Maintain real time knowledge of the situation and continue to evaluate the spill. ❑ Keep the Operations Chief updated with the **SITREP** form. ❑ Prepare to meet and brief specialist response personnel if these have been mobilised.

OFFSHORE ON-SCENE COMMANDER (OSC)	
Coordinates the tactical offshore oil spill response activities. OIM/ Vessel Master assumes OSC position for spills in water. Reports to: Operations Chief.	
Step	**Actions**
Final Actions	❑ When safe to restart, approve restart of normal site operations ❑ Hold debrief for onsite personnel who were involved in the response ❑ Collate all information received and personal logs of actions taken ❑ Send logs of the incident and other relevant records to the Planning Chief.

INCIDENT COMMANDER	
Responsible for the overall management of the incident. **Establish response priorities (People, Environment, Asset & Reputation).** **Establish Incident Objectives, Strategy, and Tactical Direction.** **Establish the Termination Criteria in consultation with relevant authorities.** **Monitor scene safety.** **Establish and monitor incident organization adequacy.** **Conduct planning meetings and briefings, as required.** **Approve and authorize the implementation of an Incident Action Plan.** **Approve requests for additional resources or for the release of resources.** **Authorise the release of Holding Statement and draft Press Release.** **Reports to: Incident Commander (Kuala Lumpur)**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ Following notification from **OSC**, discuss incident details and make an assessment of incident severity and collate all information received. ❑ For Tier 2/3 spills liaise with Operations Chief over requirement for additional resources to ensure optimal response. ❑ For all spills > 5bbls notify the Incident Commander in Kuala Lumpur verbally within 1 hour. ❑ Once a **POLREP** is received from the OSC and/ or sufficient information is available, ensure that appropriate Authorities are notified. ❑ Start a Personal Log and record time and details of own actions and decisions. ❑ Establish Incident Objectives, Strategy, and Tactical Direction. ❑ Establish the Termination Criteria in consultation with relevant authorities.
Further Actions	❑ Maintain close contact with the **OSC** via the Operations Chief and obtain regular updates regarding the situation at the spill site. Ensure adequate resources are available. ❑ In the event of Tier 2/ 3 spills, brief Head – MO for external communication with the relevant Authorities and receive regular briefings on same. ❑ Mobilise EMT and support groups as required (ensure roles adequately filled).

INCIDENT COMMANDER	
Responsible for the overall management of the incident. **Establish response priorities (People, Environment, Asset & Reputation).** **Establish Incident Objectives, Strategy, and Tactical Direction.** **Establish the Termination Criteria in consultation with relevant authorities.** **Monitor scene safety.** **Establish and monitor incident organization adequacy.** **Conduct planning meetings and briefings, as required.** **Approve and authorize the implementation of an Incident Action Plan.** **Approve requests for additional resources or for the release of resources.** **Authorise the release of Holding Statement and draft Press Release.** **Reports to: Incident Commander (Kuala Lumpur)**	
Step	**Actions**
Further Actions	❑ Provide initial briefing giving details of actions taken. ❑ Receive regular briefings from Chiefs in EMT. ❑ Provide Incident Commander in Kuala Lumpur with regular updates verbally and using **SITREP** forms. ❑ Discuss feedback/ guidance received to brief Chiefs in the EMT. ❑ In the event that Tier 3 resources are required, authorize procurement of OSRL services (refer to **Appendix 4.6 and 4.7**). ❑ In the event of a well blow-out, ensure regular updates received on capping/ relief well progress.
Final Actions	❑ Obtain approval from relevant authorities on incident close-out/termination. ❑ Conduct debrief session for EMT members who were involved in the response. ❑ Complete and hand-in Log to Planning Chief. ❑ Authorise final close-out report.

OPERATIONS CHIEF	
Focal point for communications with OSC. **Responsible for managing all tactical operations and resources of the oil spill incident, which include:** • **Ground or surface-based tactical resources;** • **Aviation (Air) resources (i.e. helicopters and fixed-wing aircraft);** • **Staging Areas** **Reports to: Incident Commander**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ After being notified of the incident, establish direct contact with the OSC to establish details. ❑ Collate all information received from the OSC. ❑ Liaise with the Incident Commander over the requirement for additional resources. ❑ Attend initial briefing. ❑ For Tier 2/3 spills, notify Logistics Chief and ensure that requirements for Staging Areas are made ready. ❑ Start a Personal Log and record time and details of own actions and decisions. ❑ If Tier 2 resources are required, coordinate with OSC, HSE & Liaison Officer and Logistics Chief to arrange mobilisation of own resources and request available external resources. ❑ In the event that Tier 3 resources may be required, coordinate with Logistics Chief to arrange resources from OSRL and for receiving the resources and transportation to the site.
Further Actions	❑ Maintain close contact with the OSC and obtain regular updates regarding the situation. ❑ Attend briefings and maintain regular contact with EMT (e.g. Planning and Logistics functions to ensure adequate provision of resources in line with Action Plan). ❑ Provide Incident Commander with regular updates (e.g. **SITREP**s). ❑ For Tier 2 incidents, continue to liaise with OSC, HSE & Liaison Officer and Logistics Chief and ensure that additional resources have been mobilised for Tier 2 support.

OPERATIONS CHIEF	
Focal point for communications with OSC. **Responsible for managing all tactical operations and resources of the oil spill incident, which include:** • **Ground or surface-based tactical resources;** • **Aviation (Air) resources (i.e. helicopters and fixed-wing aircraft);** • **Staging Areas** **Reports to: Incident Commander**	
Step	**Actions**
Further Actions	❑ Liaise with OSRL in the event that Tier 3 resources are required. ❑ Act as operational focal point to ensure that that all response resources (internal and external) are coordinated to provide an effective and efficient response in line with operational action plans.
Final Actions	❑ Attend debrief for onsite personnel who were involved in the response. ❑ Complete and hand-in Log to Planning Chief. ❑ Be prepared to provide input to the after action report.

LOGISTICS CHIEF	
Responsible for obtaining personnel, equipment, materials and supplies needed to mount and sustain emergency response operations and for providing services necessary to ensure that emergency response operations are carried out in a safe and efficient manner. **Reports to: Incident Commander**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ On notification of the incident, report to the ECC ❑ Obtain briefing by Incident Commander ❑ Check Status Boards for the latest information, log arrival on the White Board in the ECC ❑ Start a Personal Log and record time and details of own actions and decisions and all own incoming/ outgoing calls. ❑ Confirm the initial incident severity classification, with the Incident Commander and Operations Chief. ❑ Place aerial surveillance helicopters and support vessels on standby ❑ Advise on the response equipment available ❑ Ensure early availability of MSDS Sheets ❑ Advise and coordinate the EMT on all logistical requirements ❑ Liaise with the Finance & HR Chief to coordinate actions and requirements for Oil Spill Responders i.e. accommodation and transportation, catering and medical services, and sanitation facilities.
Further Actions	❑ Establish a system for recording and tracking all equipment ❑ Establish a refuelling and maintenance schedule for equipment being used ❑ Establish necessary backup systems that can be used to support personnel affected by the incident and those in the response teams ❑ Coordinate Search and Rescue activities ❑ Request aircraft and observer for aerial surveillance activities or equipment transportation ❑ Assist the Planning Chief with the development of the site clean up and waste disposal plan
Further Actions	❑ Ensure all logistical support is provided, e.g. transport and support facilities for all response activities. ❑ Prepare for the potential arrival of Tier 3 equipment and personnel. ❑ Obtain data related with weather, wind, tide, current information, relay information to Planning Chief for oil spill modelling.

LOGISTICS CHIEF	
Responsible for obtaining personnel, equipment, materials and supplies needed to mount and sustain emergency response operations and for providing services necessary to ensure that emergency response operations are carried out in a safe and efficient manner. **Reports to: Incident Commander**	
Step	**Actions**
Final Actions	❑ Attend debrief for onsite personnel who were involved in the response. ❑ Complete and hand-in Log to Planning Chief. ❑ Be prepared to provide input to the after action report

HSE & LIAISON OFFICER	
Responsible to develop and recommend measures for ensuring that all activities in the response to the oil spill are carried out in a safe manner, minimising risk to personnel, the public and environment. **Assess and/or anticipate hazardous and unsafe situations.** **Reports to: Incident Commander**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ Once notified by Incident Commander, report to ECC ❑ Obtain briefing by Incident Commander ❑ Check Status Boards for the latest information, log arrival on the White Board in the ECC ❑ Start a Personal Log and record time and details of own actions and decisions and all own incoming/outgoing calls. ❑ Obtain situation status information and response activities from Operations Chief, and collate all information received from the OSC.
Further Actions	❑ Attend Briefings and maintain contact with Chiefs in the EMT. ❑ Develop the site safety, first aid and medical evacuation plans. ❑ Coordinate medical support and provide advice on personnel safety and fire prevention. ❑ Coordinate regular site inspection of all operational sites for compliance with Health & Safety requirements. ❑ Liaise with OSC, Logistics Chief and Operations Chief to ensure that all operations are undertaken safely and within the requirements of applicable legislation.
Final Actions	❑ Attend debrief for onsite personnel who were involved in the response. ❑ Complete and hand-in Log to Planning Chief. ❑ Be prepared to provide input to the after action report

NOK & MEDIA Officer	
Responsible to develop and obtain approvals for releasing information to the media, to response teams and other appropriate agencies and organizations. **Assess and/or anticipate hazardous and unsafe situations.** **Reports to: Incident Commander**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ Once notified by Incident Commander, report to ECC ❑ Obtain briefing by Incident Commander ❑ Check Status Boards for the latest information, log arrival on the White Board in the ECC ❑ Start a Personal Log and record time and details of own actions and decisions and all own incoming/outgoing calls. ❑ Obtain situation status information and response activities from Chiefs in the EMT, and collate all information received from the OSC. ❑ Monitor media coverage of the incident and develop press strategy accordingly with assistance from ECC HQ. ❑ Notify PCSB HQ Incident Commander upon approval by the IC. ❑ **THE POLREP MUST BE SENT WITHOUT DELAY EVEN IF INCOMPLETE** ❑ Missing information can be transferred in a Situation Report Form at a later stage.
Further Actions	❑ Maintain close dialogue with local communities and authorities to disseminate and gather information. ❑ Engage with local communities to seek their involvement and assistance in cleanup activities. ❑ Keep Incident Commander updated of developments and media reports. ❑ Prepares draft press statements for endorsement by IC and approval by HQ. ❑ Set up a Media Centre to respond to media enquiries. ❑ Maintain close contact with the PETRONAS Regional Office and provide updates in status on a regular basis. ❑ Attend briefings and maintain contact with Coordinators
Final Actions	❑ Attend debrief for onsite personnel who were involved in the response. ❑ Complete and hand-in Log to Planning Chief. ❑ Be prepared to provide input to the after action report

PLANNING CHIEF	
Responsible for all matters related to technical and information support. Coordinates, supervise and organize technical specialist supports. **Maintains an accurate timed log of events, instructions and communications.** **Reports to: Incident Commander**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ Attend initial briefing by Incident Commander. ❑ Ensure that the ECC is set up properly and that appropriate equipment and supplies are in place. ❑ Start to collect, analyse information and ensure that information regarding the emergency situation and location of critical resources is displayed at the event boards ❑ Start a Personal Log or equivalent and record time and details of own actions and decisions.
Further Actions	❑ Ensure proper and effective log keeping is maintained by members of the EMT ❑ Ensure that status boards are kept current, neat and legible. ❑ Support Incident Commander in delivery of regular incident briefings. ❑ Maintain contact with EMT Coordinators to ensure that all significant events and issues are recorded. ❑ Provide Incident Commander and members of the EMT regular updates ❑ Recommend (as required) the activation of support teams in anticipation of or immediately following an incident or emergency. (e.g. environmental team, medical team, shoreline assessment team, dispersant application team). ❑ Prepare and disseminate Oil Spill Response Strategy, Objectives and Action Plan ❑ Ensure that worksites activities are integrated into the overall planning process.
Final Actions	❑ Attend debrief and provide support for incident investigation ❑ Complete and hand-in Log to Computer Operator ❑ Be prepared to provide input to the after action report

FINANCE AND HR CHIEF	
Manages all financial aspects of an incident. **Ensures accurate recording of daily personnel time.** **Managing all financial matters pertaining to vendor contracts, leases, and fiscal agreements.** **Establishes local sources for equipment and supplies, rental agreements, and document billing invoices.** **Maintains an accurate time log of events, instructions and communications.** **Administers all claims for compensation and injuries, including medical claims.** **Provides cost analysis and maintains accurate records of incident cost.** **Reports to: Incident Commander**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ Attend initial briefing by Incident Commander. ❑ Ensure that the ECC is set up properly and that appropriate equipment and supplies are in place. ❑ Start to collect, analyse information and ensure that information regarding the emergency situation and location of critical resources is displayed at the event boards ❑ Start a Personal Log or equivalent and record time and details of own actions and decisions.
Further Actions	❑ Ensure proper and effective log keeping is maintained by members of the EMT ❑ Ensure that status boards are kept current, neat and legible. ❑ Support Incident Commander in delivery of regular incident briefings. ❑ Maintain contact with EMT Chiefs to ensure that all significant events and issues are recorded. ❑ Provide Incident Commander and members of the EMT regular updates. ❑ Monitor and records all expenses of all resources deployed for the cleanup operations and prepares expense reports ❑ Monitor timeliness and accuracy of personnel documentation and financial records. ❑ Arrange adequate facilities for labor force (shelter, toilet, catering) ❑ Establish sources for equipment supplies and rentals and maintain agreements.

FINANCE AND HR CHIEF	
Manages all financial aspects of an incident. **Ensures accurate recording of daily personnel time.** **Managing all financial matters pertaining to vendor contracts, leases, and fiscal agreements.** **Establishes local sources for equipment and supplies, rental agreements, and document billing invoices.** **Maintains an accurate time log of events, instructions and communications.** **Administers all claims for compensation and injuries, including medical claims.** **Provides cost analysis and maintains accurate records of incident cost.** **Reports to: Incident Commander**	
Final Actions	❑ Attend debrief and provide support for incident investigation ❑ Complete and hand-in Log to Planning Chief. ❑ Be prepared to provide input to the after action report

COMPUTER OPERATOR **Responsible for maintaining an accurate written record of all the information and actions carried out by the EMT within the ECC. Planning Chief to assign this role from available resources.** **Reports to: Planning Chief**	
Step	**Actions**
Initial Actions	❑ On notification of the incident report to the ECC and log arrival ❑ Obtain briefing by Incident Commander ❑ Switch on computer and start Event Log Sheet Excel file. ❑ Update Event Log Sheet with the latest information (ensuring information is current, neat and legible) ❑ Maintain a dated and timed record of EMT information, actions and communications
Further Actions	❑ Liaise with Planning Chief and other Section Chiefs and update Status Boards ❑ Commence a time record for key information about the incident including: • Record the EMT members present • Record the latest status on the Status Board • Record actions to be taken ❑ Record Briefings and Time Outs
Final Actions	❑ Attend debrief and provide support for incident investigation ❑ Collate all personal logs ready for incident review and provide to Incident Commander.

8.12.12 Training, Exercises and Review

PCML personnel will receive training relating to the current OSRP through a Plan Roll-Out Workshop. Specific operator training in the use of oil spill response equipment will be provided.

The International Maritime Organisation (IMO) and PIMMAG provide details of recommended training courses (Appendix 6.1).

PCML shall ensure that the key individuals identified in this OSRP are trained appropriately. An overview of the training required is summarised below in Table 6.1.

Table 6.1: Level of Training Required for PCML personnel

Emergency Response Role / Job Title	Course Standard		
	IMO Level 3	IMO Level 2	IMO Level 1
Senior Manager & All PCML EMT	✓		
HSE Staff	✓	✓	
Managers including OIMs, PSM and Drilling Supervisor		✓	✓
Damage Control Team (DCT)			✓

8.12.13 Exercises

Table 6.2: Overview of Exercises

Exercise	Description	Frequency
Oil Spill Contingency Plan Workshop	• Familiarisation of staff with roles, procedures and responsibilities; • Review of each section of the plan by encouraging discussion to make useful and practical improvements to the plan.	Yearly
Notification	• Practice of the procedures to alert and call out the emergency management teams; • Conducted telephone or radio test, depending on the source of initial oil spill report; • Test communications systems, availability of personnel, travel options and ability to transmit information quickly and accurately. Duration: 1-2 hours, held at any time of the day or night.	Weekly Weekly Communications test once a month.
Tabletop	• Simulated oil spill incident to test teamwork, decision-making and procedures; • Planning of a realistic scenario, clearly defined objectives for participants, exercise inputs, and a well briefed team in control of the running and debriefing of the exercise. Duration: 2-8 hours.	Yearly
Equipment Deployment **Offshore and Shoreline Oil Recovery Equipment**	• Designed to give personnel a chance to become familiar with equipment, or part of a detailed and specific emergency response scenario, where maps, messages, real-time weather and other factors can be included; • Test / evaluation of the capability of equipment, personnel or functional teams within the wider oil spill response; • Verification of availability of oil spill response equipment and its working order; • Level of difficulty can be varied by increasing the pace of the simulation or by increasing the complexity of the decision-making and co-ordination needs. Duration: 1 day.	As and when required

9. PUBLIC CONSULTATION AND DISCLOSURE

9.1 Methodology and Approach

9.1.1 Purpose and Objectives

The primary objective of public consultation and disclosure is to maximize public understanding of the project through information distribution and exchange between the project proponent and the communities that might be affected directly or indirectly by the proposed project activities.

Stakeholder consultation is a process, which involves the two-way sharing of information and knowledge, seeking to understand the concerns of others and building relationships based on collaboration. It allows stakeholders to understand the potential risks, impacts and opportunities of the project in order to achieve positive outcomes.

The main objectives of stakeholder consultation are:

- to ensure that adequate information is provided to those affected by a project;
- to provide these groups with sufficient opportunity to voice their opinions and concerns;
- to ensure that comments are received in a timely manner so that they can be taken into account in project decisions.

9.1.2 Approach

The main steps in a successful stakeholder consultation are the following:

- stakeholder identification and analysis, which consists of identification of the various individuals or groups who (i) are affected or likely to be affected (directly or indirectly) by the project, or (ii) may have a relevant interest in the project;
- stakeholder consultation plan, which defines how communication with the identified stakeholders will be handled throughout project preparation and implementation, including the type of grievance procedure envisaged;
- information disclosure, provides awareness and helps stakeholders understand the planned project and possible risks, impacts and opportunities of the project.

Public Consultation will be conducted at appropriate townships and villages, which are nearby proposed project locations.

The relevant stakeholders will include, but not limited to, communities who live near the proposed project area, fishermen, villagers, Government Authorities, media, local NGO, INGO, CSO, etc.

As Blocks M12, M13, & M14 is located in offshore, it is found that the relevant stakeholders shall include, but not limited to fishery groups who operate in project area which possibly come from Tanintharyi Region. These stakeholders are the target groups for the public consultation.

The comments and concerns of the stakeholders consulted during this EIA have been considered and incorporated into the project design and mitigation measures. This chapter presents the key findings from public consultation and disclosure. It also provides recommendations for future consultation to be implemented throughout the execution of the project.

9.1.3 Determining the Sample Sizes

There are 9 villages on the coastal line that may be affected from project, including: San Hlan, Ti Zit, Nyaw Pyin, Kywe Ku, Maung Ma Kan, Kywe Min Kone, Ka Net Thi Ri, Htoo Seik, Mi Kyaung Aw (Kyunsu Ts). The three coastal villages Kywe Ku, Htoo Seik, and San Hlan were selected as representative villages to collect the socio-economic questionnaires.

The sample size for the socio-economic and opinion questionnaire survey was collected as follows:

(1) Within 1 km – no households present

(2) Coastal Villages – nearby potentially affected villages determined according to Yamane (1973) with the confidence level at 90% as following formula;

$$n = \frac{N}{\left(1 + Ne^2\right)}$$

where n = Sample size
N= Number of population – households in this study
e = Level of precision at 0.1 in this study

Equation 1

From the above instructions the sample size was calculated as follows:

The project area consists of 10 coastal villages with an approximate 3600 households (HH) total. Using **Equation 1** the minimum sample size in the area is:

$$n = \frac{3600}{1 + 3600\ (0.1)^2} = 97 \text{ samples}$$

The total number of samples obtained was 163. The number of samples collected exceeded the minimum for 90% confidence level.

9.1.4 Stakeholder Identification and Analysis

Stakeholder is 'any individual or group who may be directly or indirectly affected by the Project, as well as those who may have an interest in or influence over the project'. The objective of stakeholder identification is therefore to establish which organisations and individuals may be directly or indirectly affected (positively and negatively) by the Project ("affected parties") and those that may have an interest in the project ("other interested parties").

When identified, stakeholders will be classified according to their importance to the success of the Project and their influence or potential impact over its implementation and outcome. Different issues are likely to concern different stakeholders, therefore stakeholders will be grouped based on their connections to the project; having an understanding of the connections of a stakeholder group to the project helps identify the key objectives of consultation. The process of stakeholder mapping also aims to identify which stakeholder may have a positive or negative impact or influence on the project.

Mapping of stakeholders in the PCML Blocks M12, M13 & M14 project include:

Stakeholders in the Concerned Region	Likely interest/ Responsibilities
Stakeholder	
Fishermen	• Possible impact/benefit
Myanmar Fisheries Federation	• Possible impact/benefit
Maritime Vessel Traffic	• Possible impact/benefit
Port Workers	• Possible impact/benefit
Coastal Communities	• 10 Coastal villages that may be affected from project

Stakeholders in the Concerned Region	Likely interest/ Responsibilities
Local Government (Local)	
Chief Minister	• Administration
Member Ministers	
Ministry of Home Affairs	
General Administration Department	
District Commissioner	
Township Commissioner/Administrator	
Village Head	
Regional Police Force	
Township Police Officer	• Security • Civil jurisdictions
Government - State and Regional (Departments under concerned Ministry)	
Navy	• Security • Marine jurisdictions
Representative of ECD or Forestry Department / Ministry of Environmental Conservation and Forestry	• Environmental Conservation
Department of Fishery (DoF) of the Ministry of Livestock and Fisheries	• Concerned fishery vessels and notification of maritimers about offshore work
Ministry of Transport (Myanmar Port Authority - MPA)	• Port Clearance and Customs
Ministry of Finance and Revenue (Myanmar Custom Department)	• Customs
Ministry of Immigration and Population	• Administration
Ministry of Home Affairs	• Administration
Township Medical officer (TMO) Township Health Department or Township Hospital/ Ministry of Health	• Provision of all health care services • Collaboration with organizations such as WHO, UN and NGO etc.
Fire Services Department /Ministry Of Social Welfare, Relief And Resettlement	• Protection and prevention of fire disaster and natural disaster
Departmental Head of Labour Relations /Ministry of Labour	• Maintains peaceful workplace between the employer or employer organizations and the worker or the labour organizations
NGO / INGOs	**NGOs / INGOs** • FFI • UNICEF • World Vision • Psi • A Nar Gat A Lin Yaung • Elder Care Association • Dawei Millennium Centre (DMC) • A Nar Gat Kyal Lay Myar Group • Development Force Group • Kyal Sin Alin Group • Neit Sa Du Wa Group

Stakeholders in the Concerned Region	Likely interest/ Responsibilities
	• UNHCR • Coastal Resource Conservation Group • Pyit Sote Pan Alinn Tan Free Social Service • DD Health Support Foundation

9.2 Summary of Consultations and activities undertaken

Based on stakeholder mapping and information collected during EHS baseline discussions, this EIA has engaged the following stakeholder groups:

1. Coastal Stakeholders including Village heads and villagers;
2. Fishermen;
3. Non Government Organizations; and
4. Authorities at the Dawei and Myeik District Level.

Public consultation allows for scoping of issues that are of significance to the communities. Their concerns can assist in identification of potential project impacts that are unique and specific to the communities where the project is situated. Similarly, recommendations from the affected communities on how to manage the potential impacts are essential in developing mitigation measures and management practices for eliminating/reducing negative impacts and enhancing positive impacts.

Consultations also maximize stakeholder understanding of the proposed project through information exchange between the project proponent and the communities that might be affected directly or indirectly by the proposed project activities.

At the Scoping Phase Public Consultation was initially conducted with relevant stakeholders including, but not limited to, coastal communities who fish in the project area from the Tanintharyl areas, government authorities, media, NGOs, CSOs, and regional centers that serve as a logistical base for manpower and supply of the offshore appraisal and exploration drilling program.

Prior to initiating the public consultation for the Scoping Phase, a meeting was held with the Chief Minister of Thanintharyi Region to obtain support and approval for meetings with stakeholders in Dawei and Myeik. Stakeholder engagement meetings were conducted with Thanintharyi Regional Authorities (District administration head officer), Regional and District Department of Fisheries, and the Environmental Conservation Department (ECD). In addition public meetings were held at the Township level in Dawei and Myeik. Totally 222 people attended the town hall meetings and involved in this Public Consultation. The stakeholder consultation included:

The following provides a summary of public consultation and disclosure activities:

- Stakeholders Meeting/Focus Group Discussions with communities, non-governmental organizations (NGOs), fisherman, and government officials in Dawei and Myeik (stakeholder invitees included; General Administration Department (District, Township, local village leader), Environmental Conservation Department (ECD), Department of Fishery, Department of Forestry, Local Port Authority/ Ministry of Transport (MOT), Parliament Member (House of Representatives), Parliament Member (House of nationalities), NGO/CSOs.)
- 163 Attitude and Opinion Survey of fisherman in 3 coastal villages
- Collection of traditional ecological information.
- Public disclosure via MCN TV News Channel and Facebook page, and DVB media issued information on the news and on their Facebook page.

The scoping phase public consultation program was completed on 11-15 June 2018 (**Table 9-1**).

Table 9-1: 1st Public Consultation Schedule and Stakeholders

Day	Time	Activity
June 11	2:00 - 4:30 pm	Meetings with Myeik GAD, Department of Fisheries and Environmental Conservation Department and Myeik Fisheries Federation.
June 12	9:00 - 11:00 am	Town hall Meeting with Myeik Township Stakeholders
June 12	2:00 - 4:30 pm	Meeting with Fisherman in Kywe Ku Village
June 14	9:00 – 11:30 pm	Meeting with Dawei GAD, Department of Fisheries and Environmental Conservation Department and NGOs (as available)
June 14	2:00 – 4:30 pm	Town hall Meeting with Dawei Township Stakeholders
June 15	9:30 – 11:30 am	Meeting with Fisherman in San Hlan Village

IEM conducted the 2nd stakeholder consultation from 23th to 26th July 2018 in four coastal townships. (**Table 9-2**) The 2nd Public Stakeholder consultation was conducted with coastal townships. Totally 246 people attended and were involved in this Public Consultation. The stakeholder consultation included:

- Stakeholders Meeting/Focus Group Discussions with communities, non-governmental organizations (NGOs), international NGOs, and community interest groups in urban and rural areas;

Table 9-2: 2nd Public Consultation Schedule and Stakeholders

Day	Time	Activity
23/07/2018	3:00 – 6:00 pm	Town hall Meeting with Thayet Chaung Township stakeholders
24/07/2018	9:00 – 12:00 am	Town hall Meeting with Laung Lon Township stakeholders
24/07/2018	3:00 – 6:00 pm	Town hall Meeting with Dawei Township / District Stakeholders
26/07/2018	9:00 – 12:00 am	Town hall Meeting with Myeik Township / District Stakeholders

9.3 Results of Consultations

9.3.1 First Public Consultation

The regional centers where township meetings were held included Myeik and Dawei. Village level town hall meetings were also held at Kywe Ku (Myeik), and San Hlan (Dawei). Minutes of community meetings are provided in **Appendix 4**.

Meetings were also held with the Myeik District Fisheries Federation, GAD (Myeik & Dawei), ECD (Myeik & Dawei), CDC (Myeik & Dawei), Myeik Department of Fisheries. Note Dawei Department of Fisheries personnel were not available. Media were present for town hall meetings in Myeik and Dawei. Public disclosure occurred via MCN TV News Channel and Facebook page, and DVB media issued information on the news and on their Facebook page.

This program occurred during the week of 11 – 15 June, 2018. The meeting format of each meeting included:

1. Introduction speech by each meeting host (i.e. Dawei/Myeik Township Administrator)
2. Introduction to PCML personnel
3. Introductory speech by MOGE representative
4. PCML Project Presentation
5. Presentation about Environmental Impact Assessment
6. Question and Answer Session

Overall 69% of the people attending the public meetings were supportive of the project and 28% were still unsure. Less than 2.5% did not support the project.

In general, the Township and Village authorities appreciated the information received on the planned project, key issues and EIA approach, and the opportunity to raise questions. Brochures were also provided at each meeting for participants to further review the planned project after the meeting and to share with others.

The public in this area recognizes the need for energy as 68% identified this as a main development priority for their community. Many questions were raised as to when the energy grid will be more developed in the Myeik/Dawei area. In particular the public wants to know what benefit the project will bring. Questions were also raised as to what profits has the existing developments already achieved.

Other common themes included what type of CSR programs will be implemented in addition to the programs already in place by PCML. In Myeik the lack of CSR programs was noted. Fishermen are concerned about their industry and the drastic reduction of available fish stocks off the coast of Myanmar. The fishermen are concerned about further possible impact by the oil and gas industry. Various questions were raised by fisherman as to what compensation would be provided for the 500 m exclusion zone around the drill sites and what compensation would be provided in the event of a serious impact to their livelihood. The Myeik fisherman feel that the restriction zone around the drilling rig and existing offshore platforms and pipelines is impacting their ability to harvest fish.

Other questions were raised that asked if sensitive areas would be affected by the project. The closest sensitive area to the planned drill sites is 50 km away. Further questions were raised concerning possible impacts from the planned development on fish species, coral, seagrass and nearby islands.

It was made clear that none of the sensitive areas shown on the map would be affected by the exploration drilling project. All potential impacts from this project will be very localized and can be mitigated with standard international practice.

The stakeholders at the township meeting and at the villages raised two main concerns as detailed in **Table 9-3**.

Table 9-3: Key Points from 1st Public Consultation Meetings

Question / Comment	Response	Mitigation Measures
Questions on project benefit, export amount of and the budget from the export in regard to the development of the Tanintharyi energy grid and electrical prices.	There are four projects in Myanmar and they are creating foreign income. They are Yadanar, Yetagun, Zawtiga and Shwe projects. The income amount and the amount of export are included in the 2013-2014 report had been disclosure and posted on the relevant website. MOGE are also preparing the detail plans with as the income from the production of oil and gas and the export amount for 2014-2015 and 2015-2016 reports will also be disclosure. These projects are managed by the Central Government last years. Companies are doing CSR activities related with health and education. But, it is difficult to help for the support of the local electricity. Mainly, the drilling of oil and gas is for the first priority of local electric availability. The access to electricity in Taninthari region depends on master plans, long-term and short-term plans of electricity and it is the whole national level. The comments you said would be recorded and submitted to the relevant authorities who could do management.	• Implement PCML's Community Awareness Plan and Grievance Mechanism. • Implement PCML's Public Relations Plan and Grievance Mechanism.
The 500 meters is regarded as the exclusion zone during the drilling stage. How many meters will be regarded during the production phase? Is it sure as the exclusion zone is 6 mile? If so, can we catch fishes from 7 miles?	This EIA is for the exploration drilling. Exploration drilling is 500m for the safety zone. If we will find any oil and gas, we will prepare the separate EIA phase and we will come back with the additional information. But for the existing platforms and future platforms they will have the exclusion zone for the safety of PCML. We will prepare the separate EIA in the future for the production. The exclusion zone is regarded 5 miles from the drilling rig and 500 m from the pipeline.	• At least 30 days prior to rig mobilization, coordinate with MOGE, Navy, Department of Marine Administration, to issue "Notice to Mariner" regarding project activities. • Clearly mark exclusion zones for permanent installation on nautical maps. • Implement PCML's Community Awareness Plan, Public Relations Plan and Grievance Mechanism..
What types of CSR programs will be implemented in addition to the programs already in place by PCML. In Myeik the lack of CSR programs was noted	The company has been conducting CSR programs for villages with a main focus for health sector is student health care. We conducted awareness program of health care and free medical treatment programs by hiring staff at the clinic and hospitals. In terms of your first part of question for the role of local community in CSR program, company couldn't make decide for CSR plan. We listened the comments from local community and identified the local needs. This is the first stage. As a second stage, we plan to implement the sectors that are identified by local community. And we discussed with regional and local authorities and regarded the estimated budget for the implementation. Then, we implement our programs. As we implement the CSR program in	• PCML to continue CSR activities in compliance with MOGE's "Guidelines for Implementation of CSR Programmes". • PCML to consider implementing CSR Programs in Dawei and Myeik focused on supporting fishery resources and protection when MOGE and Regional Government advise to do.

Question / Comment	Response	Mitigation Measures
	this region, participation of many local community are included. And there are some parts that are responsible by local community. Later, we will explain in detail how we implemented our programs in each sector and each project	
The fishermen are concerned about further possible impact by the oil and gas industry. Various questions were raised by fisherman as to what compensation would be provided for the 500 m exclusion zone around the drill sites and what compensation would be provided in the event of a serious impact to their livelihood. The Myeik fisherman feel that the restriction zone around the drilling rig and existing offshore platforms and pipelines is impacting their ability to harvest fish	Blocks M12, M13 and M14 are located 110 nm far from Dawei. There are located on offshore, not onshore area. It is 120 nm far from Myeik. The well sites are located 100 miles from Dawei, 80 miles from Mosco Kyun Wildlife Sanctuary, 65 miles from Myeik Archipelago and 45 miles from the Shark Protected Area. The area of the block (about 29000 sq km) is very wide. But 500 m for the exclusion zone is small. PCML contracted Production Sharing Contract with MOGE for the blocks M12, M13 and M14 in 1990-1992. It takes 30 years. The gases were produced from Yetagun Project since 2000. From 2000 up to 2030, the gas will be produced from 3 blocks of Yetagun project. The project's duration is 30 years.	• At least 30 days prior to rig mobilization, coordinate with MOGE, Navy, Department of Marine Administration, to issue "Notice to Mariner" regarding project activities. • Establish 500 m safety zone around the drilling rig. • Use support vessels to warn off traffic. • Implement PCML's Community Awareness Plan, Public Relations Plan and Grievance Mechanism.
Questions were raised that asked if sensitive areas would be affected by the project.	The proposed areas (well sites) are located:100 miles from Dawei and 120 miles from Myeik, 80 miles from Mosco Kyun Wildlife Sanctuary, 65 miles from Myeik Archipelago and 45 miles from the Shark Protected Area. And then please see the map. Here is the proposed location that are marked on the map. There are no coral reefs because the water is very deep and over 100m deep. Sub-contractor would conduct sediment samplings collection there. Based on their experiences, there is nothing special in this area.	• Comply with all Myanmar and International Maritime Organization (IMO) regulations or standards regarding vessel seaworthiness and maritime safety. • Implement PCML's Oil Spill Response Plan. • Wastewater discharge from project's vessels will at least comply with the regulation of MARPOL 73/78 Annex I and II.
EIA report must include our negative feelings about oil and gas project and the beliefs that we would have no benefits from these projects.	Comment was noted to be included in report.	• Implement PCML's Community Awareness Plan, Public Relations Plan and Grievance Mechanism.
Can there be the blowout when drilling the blocks?	A blowout is due to the drilling into very large pressures. We will install the machines that are resistant to the pressure. The equipment used is designed for thesepressure to limit risk of blowout.	• Install appropriate blow-out preventer. • Check pressure in drilling well and mud circulation. • Conduct Table Top Oil Spill Response Drill for Tier 3 event and implement the plan in the unlikely event of an occurrence. • Ensure that Oil Spill Response service contract with service provider are in places.

The photographs of the 1st public consultation are detailed in **Figure 9-1**.

Presentation about EIA in Dawei District

Question by U Tint Lwin in Dawei District

Questions in Myeik District

Questions & Comments from U San Maung, President of MFF in Myeik District

Daw Tin Nwe Nyo, Explain about Yetagon CSR (PCML) in San Hlan Fishing Village

Question by U Maung Maung Htay in Kywe Ku Fishing village

Figure 9-1: Photographs of First Public Consultation Meetings

9.3.2 Second Public Consultation

The regional centers where township meetings were held included Thayet Chaung, Lang Lone, Myeik and Dawei. Media were present for the town hall meetings in Myeik and Dawei. Public disclosure was conducted via reporters from MyaWaDi Newspaper, Dawei Watch, MRTV.MWD, Hinthar Media, Elevn Media Myawaddy, DVB, Myanma Alin/ Kyay Mone, Thanintharyi Journal, Myeik Local Newspaper. Minutes of community meetings are provided in **Appendix 5**.

This consultation occurred during the week of 23th to 26th July 2018, 2018. The meeting format of each meeting included:

- Dr. Soe Moe Aung (MOGE) started the consultation process with the introduction to the meeting, explaining the objectives of the meeting
- U Phyoe Paing Soe (PCML Co., Ltd) explained about seismic survey.
- U Phoe Kyaw (PCML Co., Ltd) presented about exploration drilling with video.
- Daw Khin Su Su Naing (Senior Consultant_ ERM) giving an overview of environmental impacts assessment and potential impacts from infill drilling and 3D seismic survey processes.
- Dylan Jenkins (IEM) and U Khun Set Thar (EQM Co., Ltd) presented about environmental potential impacts from exploration drilling.
- Daw Tin Nwee Nyo (Yetagun) explained about Corporate Social Responsibility (CSR) program of Yetagun Project.
- Question and Answer (Discussion)

The stakeholders at the 2nd public consultation at the township meeting and at the villages raised similar concerns as the 1st public consultation. They key issues, concerns and recommendations regarding the exploration drilling are as follows. Many concerns were raised by the Meik Fishing Association. They do not believe that there concerns are being expressed to the government agencies. The fisherman are concerned about potential impacts to their livelihood, particularly fishing and crabbing. They have asked questions about the potential impacts of exploration drilling on their fishing operations. Also they feel that the exclusion zones are too large and there fishing activities are restricted. Of key importance is that they do not receive any project benefits and do not receive any CSR programs. At the same time even while they are producing energy in their region, the price they pay for electricity is four to eight times higher.

The fisherman in Meik would also like to receive more information on the results of the EIA and particularly the sampling results as they are concerned about impacts from mercury as an example. It is clear that further consultation is needed with the Meik Fisherman's association. Mitigation measures have been developed to address the issues raised during consultation meetings. The following meeting notes provide a more detailed presentation of the issues raised and response provided.

Table 9-4: Key Points from 2nd Public Consultation Meetings

Question / Comment	Response	Mitigation Measures
The main problem is electricity in Tanintharyi Region. This province is not on the energy grid and there are no direct energy benefits for them. Although projects are located in our region, they do not share any benefits for local people.	This current project is not a new agreement and continues from the existing agreement. New wells are needed to expand the existing field and increase production. The government has been distributing been distributing energy from Yadanar and Zawtika gas fields. We recognize that the energy grid does still not benefit the Tanintharyi	• Host authority to discuss with relevant ministries to how to ensure that Tanintharyi Province benefits from energy production.

	Region The economic benefit from the oil industry goes directly to the government. And then government is to allocate benefits back to the provinces. The main contract is between the Company and the Union Government. The CSR activities are also planned for supporting local development. According to the government plan, if the natural gas production increases, the government will supply for the regions who need electricity. An LNG plant is now being constructed in Kangbauk Township. The Department of Electricity (DOE) and Myanma Oil and Gas (MOGE) is not the same. Oil and gas processes are being run under the MOGE. The Generation and transmission of electricity is being performed by Department of Electricity. According to the DOE plan. DOE have a plan to implement Mawlamyaing- Yay-Dawei transmission line and Dawei-Myeik- Bokepyin transmission line. The implementation is scheduled as Dawei- Myeik transmission line in 2021-2022, Myeik- Bokepyin in 2021- 2022 and Bokepyin- Kawthaung in 2022-2023.	
The next fact I want to say about fishery is that the fishery zones of Tanintharyi are facing overfishing. The fishery resources are also declining till 60%. Although the law had determined 10 miles from sea board for onshore, onshore fisherman are extending away from sea board. And also they are expending the depth of fishnet till the sea bed due to the declination of fishery resources. Concerning environmental damage, fish might eat wastes generated from drilling operations. May we have negative impacts if we eat these fishes? We are afraid of waste disposal although company will be conducting the monitoring program. Another concern about this project is Mercury. If there is leakage of Mercury, it will effect on fishes and marine animals in the water. So, I want to know how to manage mercury?	The wastes from Yetagun project are discharged in compliance with National Emission Quality Guideline (NEQG). If the waste is over the NEQG, we carry it to the land. Kitchen wastes are discharged regularly. Waste impacts are reduced according to international standards. We have to submit Environmental Monitoring Plan to ECD as the requirements of EIA report. We will use modeling to know where the drilling cuttings will go. According to National Environmental Quality (Emission) Guidelines, we are going to analyze the content of the drilling cuttings. We will dispose these drilling cuttings only after treatment until achieving acceptable levels. An acceptable level for mercury is 1 mg/kg and for oil and gas is 6.9 ppm according to the guideline.	• Store, separate, transport and dispose of waste following PCML's Waste Management Plan.
If environment and marine animals within blocks are affected negatively and fishing in the blocks is prohibited, fishery and our livelihood would be seriously disturbed. How will the company handle these problems?	Total duration of exploration drilling is about 7 months and these operations are temporary. If gas reservoir is found economic, gas pipelines will be connected to the first phase. It takes about 75 days to drill one exploration well. The actual duration may be shorter. To prevent the traffic problems, I would	• At least 30 days prior to rig mobilization, coordinate with MOGE, Navy, Department of Marine Administration, to issue "Notice to Mariner" regarding project activities. • Implement PCML's

	like to urge local communities to fish according to the 'Mariner Notice'.	Community Awareness Plan, Public Relations Plan and Grievance Mechnaism.
I would like to discuss about CSR programs. As the project area is about 30 miles far from LaungLon, it seems closer to our ethnic regions. Usually, Yetagun conducted many CSR programs in the towns/villages which have accessible roads but a few programs in coastal areas. There are 18 ethnic villages in LaungLon Township. As CSR have been conducted only in 2 or 3 villages among these villages, CSR programs should be reviewed. I found that the meeting was held together by MOGE, project proponent and EIA Company. I wonder why the meeting was held like this. Although local communities want to have open-talk only with EIA Company, In next meetings, we want to discuss with EIA Company. Thanks, for the construction of road between KaLainAung and DaMinSeik. And I request to construct the road between Zarti and Fat Wa. I think that this project will support the local development. We should consider not only physical effects but also mental damage. You should estimate local people feelings and concerns and listen to the public voice. We study the atmosphere and water body but we should study the soil.	Even if the meeting is held together like this, all information related to the project could be explained at the same time. If the EIA Company come to held presentation separately and the project company come to present the relevant project information in another meeting, local communities could also face inconvenience to attend the various meetings. Concerning the meeting, all presentations could be conducted together by MOGE, Project Company and EIA Company. If local communities want to talk openly just with EIA Company, EIA Company would stay to listen and record your comments after this meeting but the Project Company and MOGE would go back. I would like to request the fishermen not to go back after meeting and to explain us about fishing activities. Moreover, your comments and discussion wanted to be listened and recorded if you want to talk openly EIA Company only. Please understand us that the meetings are held together like this for many reasons. We would consider the construction of these roads as possible corporate social responsibility (CSR).	• PCML to continue CSR activities in compliance with MOGE's "Guidelines for Implementation of CSR Programmes". • PCML to consider implementing CSR Programs in Dawei and Myeik focused on supporting fishery resources and protection when MOGE and Regional Government advise to do.
Can earthquake occur due to production of Oil and Gases?	In Myanmar, Bago earthquake occurs one time in 100 years. Earthquake in Myanmar can't occur due to production of oil and gas but due to subduction and collision of Indian plate and Burmese plate.	• Implement PCML's Community Awareness Plan, Public Relations Plan and Grievance Mechanism.
The project is 90 miles from Loung Lon, 96 miles from Dawei, 105 miles from Myeik and 85 miles from island. How many advantages and disadvantages can the project affect the tourism industry? How much impacts can the project affect marine tourism and fishing area?	Water depth of the project is about 300 ft and these are not suitable for coral reef and scuba-driving. Scuba-diving is suitable at about 30 ft and so may not affect the tourism industry. We have waste management plan for the project. So, the tourism sector may improve in the future.	• At least 30 days prior to rig mobilization, coordinate with MOGE, Navy, Department of Marine Administration, to issue "Notice to Mariner" regarding project activities. • Implement PCML's Community Awareness Plan, Public Relations Plan and Grievance Mechanism.
During operation, the exclusion zone is about 500m. I know that drilling operations would take about 75 days per well and exclusion zone is 500m. Fishermen have experienced that drilling	Prior to seismic survey, "Mariner Notice" has to be announced in newspaper. In mariner notice, the boundaries/edges of the seismic vessel path are included only. The drilling rig would be mobilized	• At least 30 days prior to rig mobilization, coordinate with MOGE, Navy, Department of Marine Administration, to issue "Notice to

duration was more than 75 days and exclusion zone was wider than 500m. The reliable information about drilling duration and exclusion area should be provided. As fishing days are about 20 days per month, fishermen would have many difficulties in their livelihood if they could not fish in these days. What is the exclusion zone of drilling rig?	and safety zone is 500m around it. The Law-protected area is assigned by five nautical miles radius from safety zone. We have no allowance to enter and operate in this area.	Mariner" regarding project activities. • Implement PCML's Community Awareness Plan, Public Relations Plan and Grievance Mechanism.
I have 3 questions to ask you. One is the potential short term impact on fishery and do you have any plan to give compensation for grievance. Another one is the potential long term impact. Yetagun project has been operating for 20 years extracting non-renewable resources. Local people suffered from spiritual wounds. Electricity fee is very expensive in our area and do you have any plan to distribute electricity generated from oil and gas of the project. The last one is that sharing resources is included in 21 Century Pinlong Peace Conference. I have known about the contact will last 20-30 years. I would like to know if the regional government can have authority for management.	The project contract is not a new one. The production of the existing well is degrading and therefore infilling will be carried out in order to fulfill the expected production. The project activities including exploration, drilling and infilling will be done near the existing Yetagun platform. The project is to extract oil and gas and these are sold with the fixed prices by sending with national oil and gas pipe line to other cities. There are three steps to get electricity; generation, transmission and distribution. Although oil and gas will be sold with the fixed price for generation, transmission line is still required. If the electricity for this area will be connected with national grid, it will be better for electricity. PCML has a mechanism. If the project will pass through on the land, there is Form (7) for land acquisition. Government has to fix the compensation amount for damaged crops. The project proponent has to comply with the laws and regulation. If there were laws and regulation to give compensation for the project located in the sea, we will comply with the government instruction.	• Implement PCML's Community Awareness Plan, Public Relations Plan and Grievance Mechanism.
I would like to suggest that to disclose in the contract how much % of the profit will be used for the CSR program.	We give taxes to the government according to the contract. We have to share profit with proportion to government and MOGE by complying the contract. The CSR program is not included in the contract. Yetagun perform CSR program specifically for local development. Sharing profit with proportion means that all proponents have to invest sharing amount for hiring ships, drilling cost and constructing platform when exploration drilling starts. The amount of profit depends on the investment amount and therefore it is called as sharing profit with proportion.	• PCML to continue CSR activities in compliance with MOGE's "Guidelines for Implementation of CSR Programmes". • PCML to consider implementing CSR Programs in Dawei and Myeik focused on supporting fishery resources and protection when MOGE and Regional Government advise to do.
Most of the members in fishery association are now in this meeting room and we would like to know the restricted	The restricted area is radius 5 miles from the drilling rig. This restricted area is also marked on	• At least 30 days prior to rig mobilization, coordinate with MOGE, Navy, Department of

area for fishing and drilling rag. Is that sure "the restricted area is 5 miles radius from the drilling rig"? Because we wanted to confirm this distance. We cannot enter this restricted area. When the fishing boat is 6 miles away from drilling rig, and if drilling rig security will catch that boat, how would you solve for this case? The fishery association have known that fishing boats cannot enter the radius 10 miles. The navy guards usually stay 10 miles away from the restricted border. Therefore, the restricted area is totally 20 miles distance from the drilling rig. We would like to suggest that to disclose the restricted distance in newspaper and magazines. We know that it is disclosed in the nautical map. We would like you to disclose this information in newspaper and magazines because we would like to have a cover when there will be a problem relating to the restricted area.	the nautical map. We have not seen that fishing boats are entering the restricted area. It will be disclosed in the nautical map.	Marine Administration, to issue "Notice to Mariner" regarding project activities. • Clearly mark exclusion zones for permanent installation on nautical maps. • Notify exclusion zones for permanent installation in local newspapers • Implement PCML's Community Awareness Plan, Public Relations Plan and Grievance Mechanism.
I would like to know that third party stand by company or Petronas or local people. Locals cannot get any benefits from oil and gas project. We don't agree the project that has no benefits on local area. If there are damages on crops by the project on land, there is farmland form for giving compensation. When drilling starts, there may have noise and vibration. I would like to know that do you have plan to consider grievance for fishery like the way you did for grievance on land. We all are trying to conserve for marine resources by reducing 10 % for catching fishes and restricting for breeding season 3 months. I would like you to consider for marine resources and local fishery. Local people's attitude and perception on the project is the key point in international oil and gas projects. The project cannot get licence without local people agreement. In the Union Government, there is no fisherman and they do not know about the fishery. The Regional government has no authority on this project and local people have no power as well. And, I would like you to suggest	I would like to explain about third party. Third party is a organization hired to analyse the environmental and social condition depending on the project. The information "fishing within 10 miles" got from the previous observation, but now we have known that offshore fishery goes over 100 miles distance from the shore. In the report, we will inscribe the information from local people comments, suggestions and conducting surveys as well. We would like to ask fishery survey at the end of this meeting. We will describe all the information in the report. If comments and suggestion of local people do not include, the report will not be a complete report. Third party has to assess the potential impacts and the environment, describe the mitigation measures for the impacts and consulting for management mechanism. The project activities such as exploration drilling and infilling will be done near the existing platform. The project timeline is 30 years contract and it started in 2000. The time remaining for the project is 12 years from now. Thank you for your suggestion and comments. Third party will inscribe these comments and suggestions in the report.	• Implement PCML's Community Awareness Plan, Public Relations Plan and Grievance Mechanism. • PCML to consider implementing CSR Programs in Dawei and Myeik focused on supporting fishery resources and protection when MOGE and Regional Government advise to do.

that to extend the schedule for more discussion and comments. The current project, M-12, M-13 and M-14 blocks, have been contracted with the previous government and process to continue by the current government. These blocks are located near the fishing grounds. I would like to know how many years remain according to the contract. And, can these blocks be managed by local when the contract date ends? As a local people, I would like you to stop the project because these 3 blocks are the most dangerous and nearest to the shore. If we disagree with this project, would you stop? Is this meeting holding after the project starts? If the project will be processed to continue, although local people disagree with the project, the public consultation meetings are nonsense. We have no fishes to catch because of the project impacts. The projects come and hold public consultation meeting in our area and finally they do as they want to do. Don't care for us. Don't invite us for public consultation meeting because it leads to time and money waste. However we protest the project, the project will continue to process. This meeting is just for show. If so, the project will last for long life. Local people were affected by the project, but there is no positive impact for local area. We all do not agree with the project.	There is a contract with the Government for sharing the profit with the proportion based on the production. The production of the existing well is degrading and therefore infilling is done to fulfill the expected production. If the production amount is less than the amount in the contract, the government has to compensate according to regulation of the contract. The project is not the new one. The project activities will be operated within the limited duration. We came and disclose that how to do project activities with the least impacts by the project and to listen local people comments and suggestion. When we do the EIA process, the report has to be disclosed to the public. This report has to be sent to Department of Fishery and relevant administrative offices. It will be also disclosed on the internet website. If you have questions and comments, you can contact to the address stated. The aim of this meeting is to disclose about the project information to local people and to collect comments and suggestion of local people. We record your voices with recorder and then note down as meeting minutes. And then we have to inscribe this meeting minutes in the report and assessment will be based on this information. Therefore, the assessment for the whole project is impossible during this meeting (within three hours).	

The photographs of the 2nd public consultation are detailed in **Figure 9-2**.

	
Presentation by U Phoe Kyaw, PCML, Dawei Distict	Questioned by U Soe Tint, Taninthari Fishery Department
	
Questioned by Daw Ye Ye Htwe at Langlone Township	Question by U Kyaw Kyaw Lwin(Chairman, Dawei fishery federation) in Thayetchaung Township
	
Presentation by Dylan Jenkins (IEM) and U Khun Set Thar (EQM Co., Ltd)	Question by U San Maung, Myeik Fishery Association

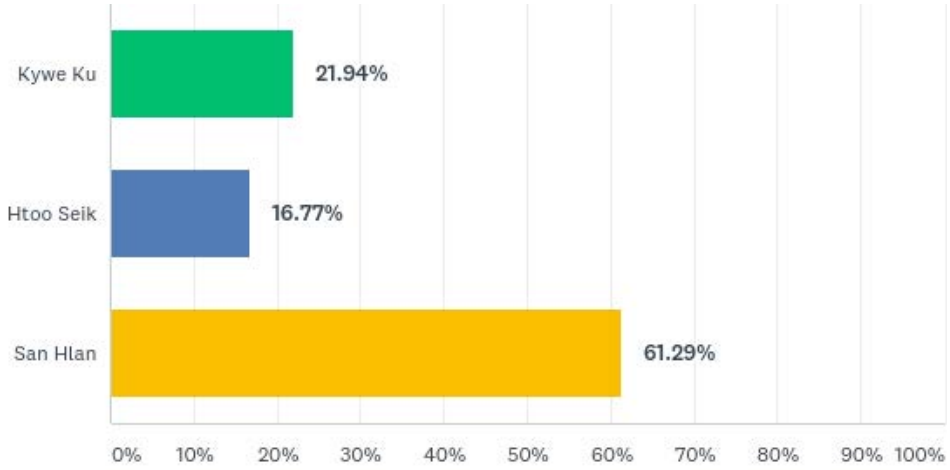
Figure 9-2: Photographs of 2nd Public Consultation Meetings

9.3.3 Public Opinions about the Project in the Development Area

9.3.3.1 Overview

The villages surveyed included Kywe Ku (Myeik) 22%, Htoo Seik (Myeik) 7%, and San Hlan (Dawei) 61%. (**Chart 9-1**)

Chart 9-1: Villages Interviewed



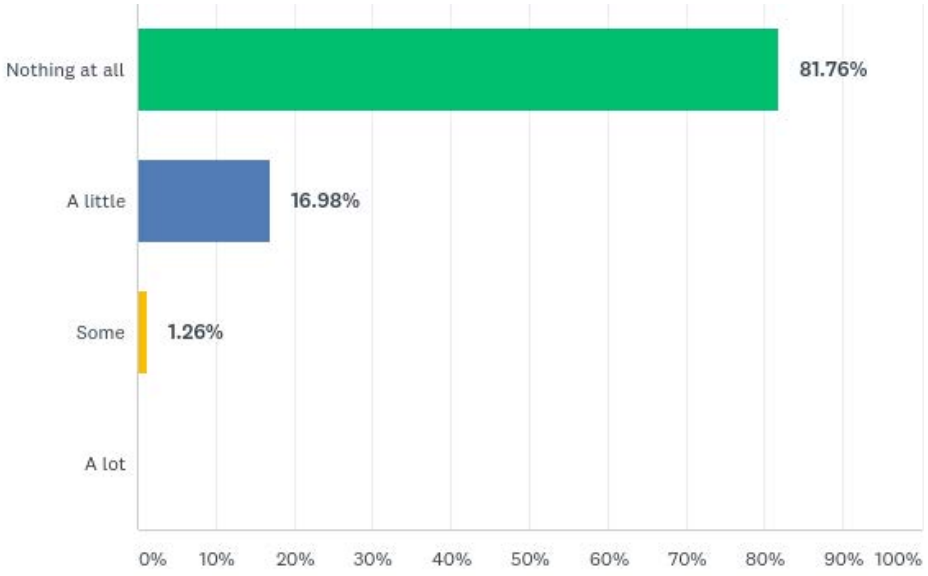
Of those that attended the meetings and completed the project opinion survey: 58% were male and 42% were female; 99% were Buddhist; 35% 75% were fisherman; and 48% had completed secondary school education.

9.3.3.2 The Project

Obtaining opinions was designed to collect information and opinions on the prospective impacts before the project commencement.

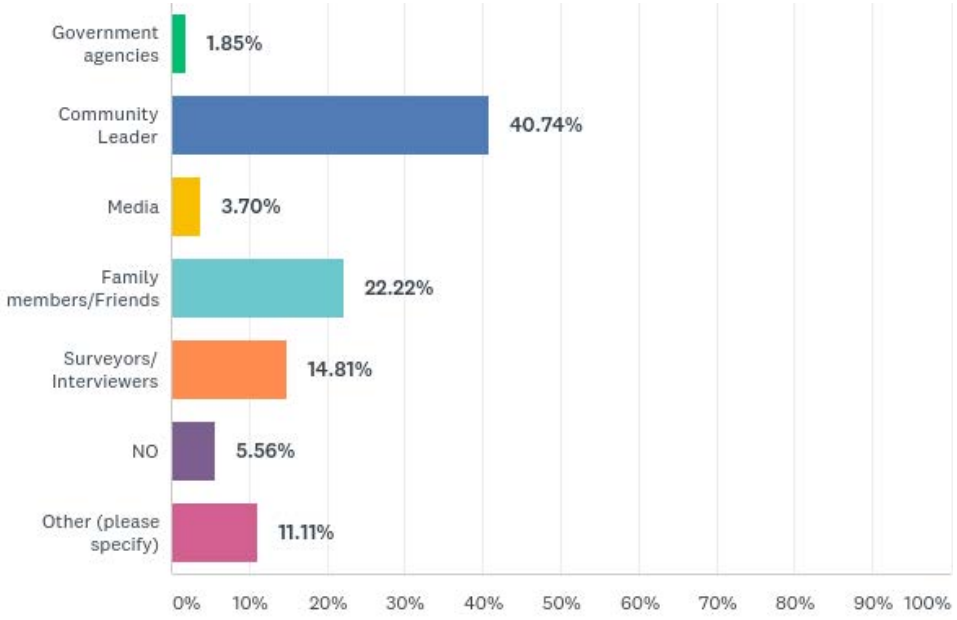
The Participants indicated that 18% had some information about the project. (**Chart 9-2**)

Chart 9-2: Project Awareness



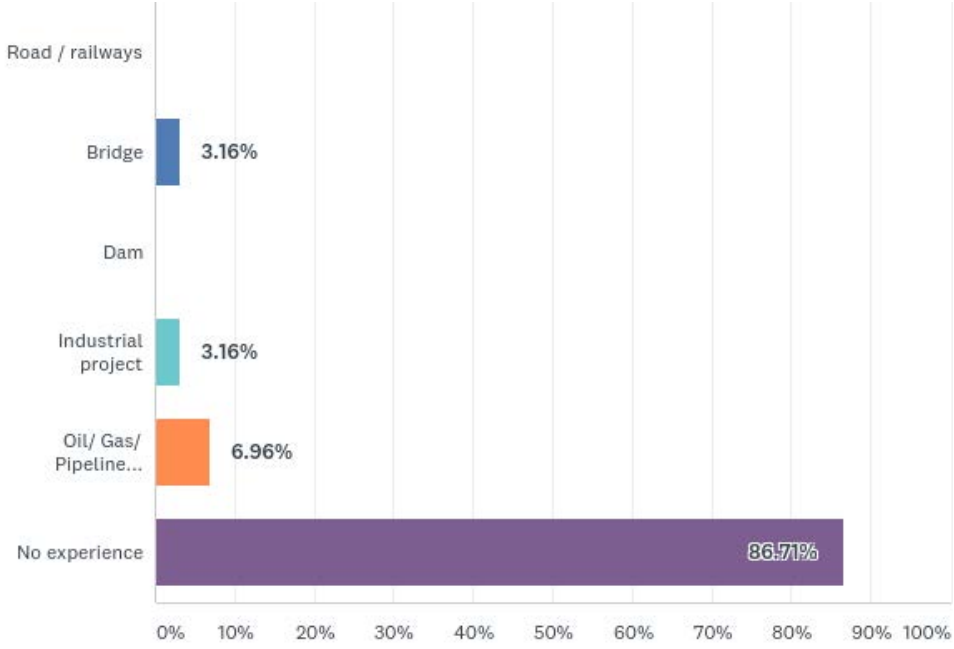
The majority of villagers learned of the project from community leaders (41%).

Chart 9-3: How did you know about this project?



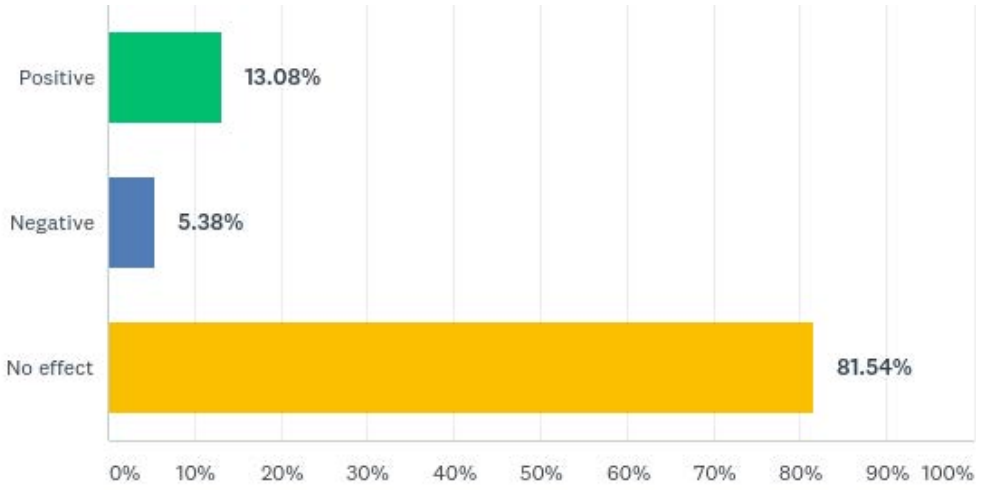
The majority (82%) of coastal fisherman indicated that they had no experience with other project development before, while 7% had experience with the oil / gas / pipeline projects, 3% had experience with bridge and industrial projects.

Chart 9-4: What kinds of other projects did you experience before?



Villagers indicated that project developments had no effect (82%), and positive effect (13%) and a negative effect (5%).

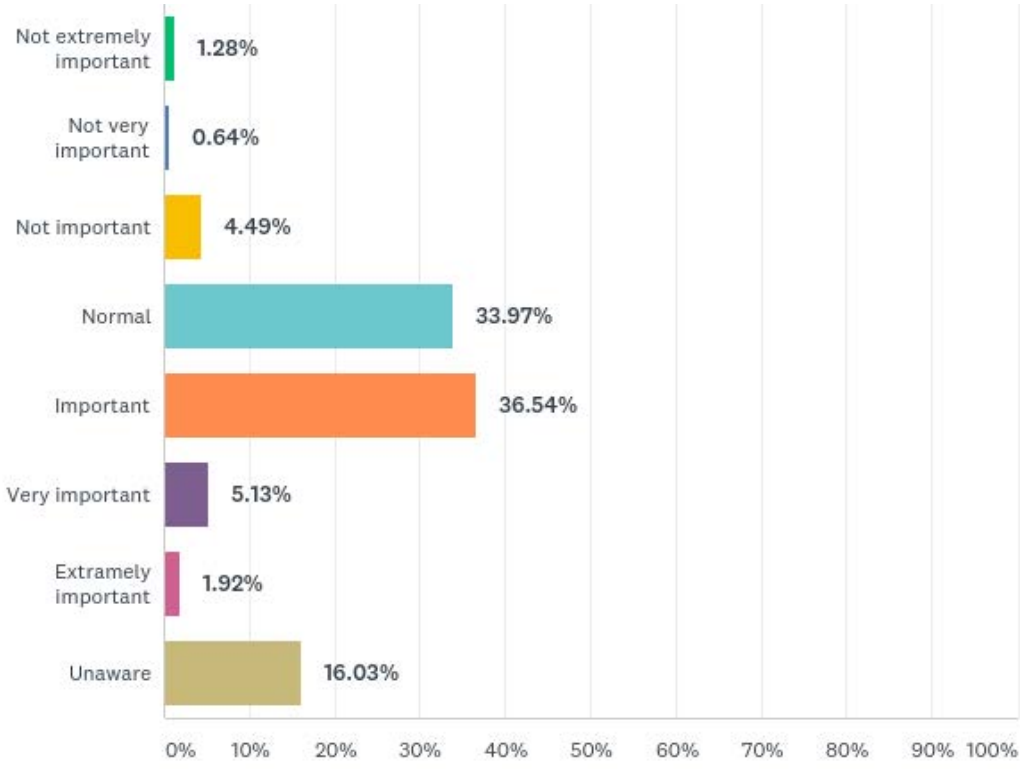
Chart 9-5: How did it affect your community?



9.3.3.3 Development Interests

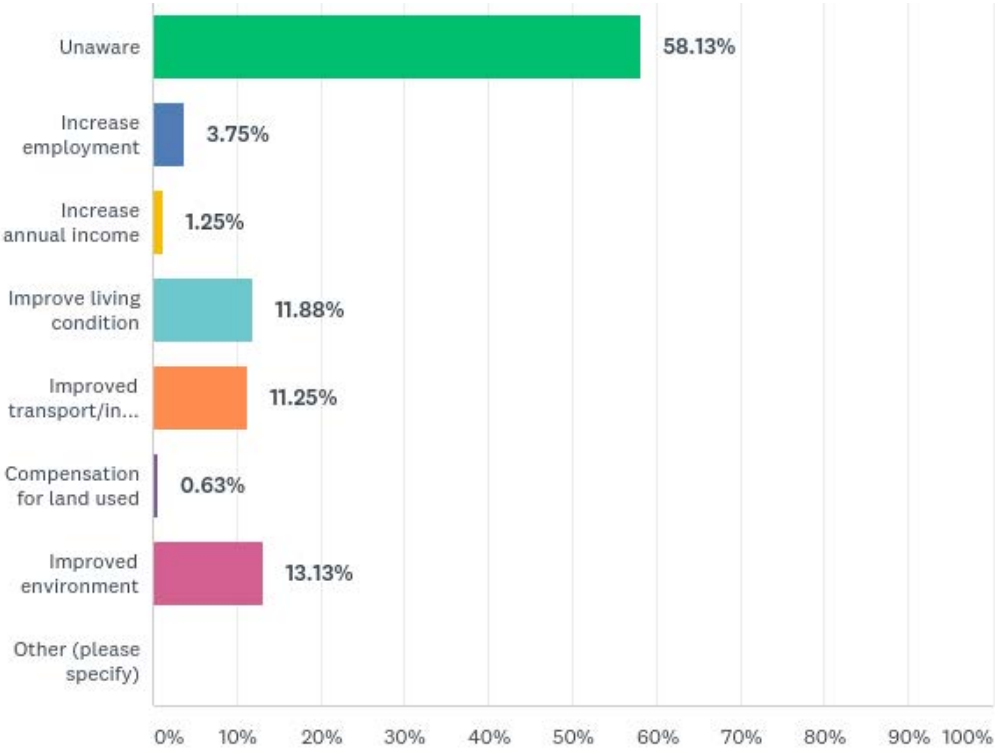
Participants indicated that the project was important (37%) and very important (5%). (**Chart 9-6**)

Chart 9-6: How important is oil and gas drilling activity to the community?



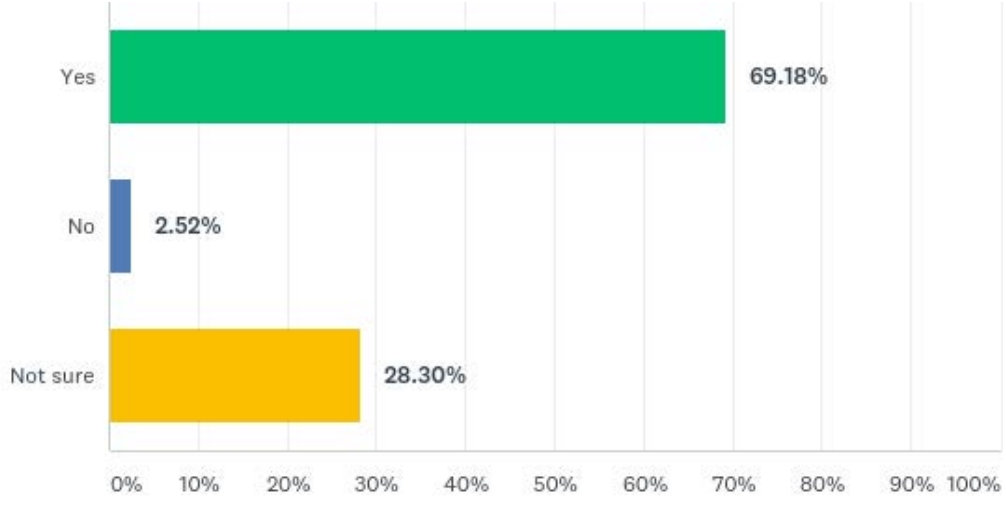
Participants indicated that 13% anticipated and improved environment, 12% anticipated improved living conditions and 11% anticipated improved transportation. While 58% were unaware of what positive impacts would result. (**Chart 9-7**)

Chart 9-7: What are the most positive impacts of the project that you anticipate?



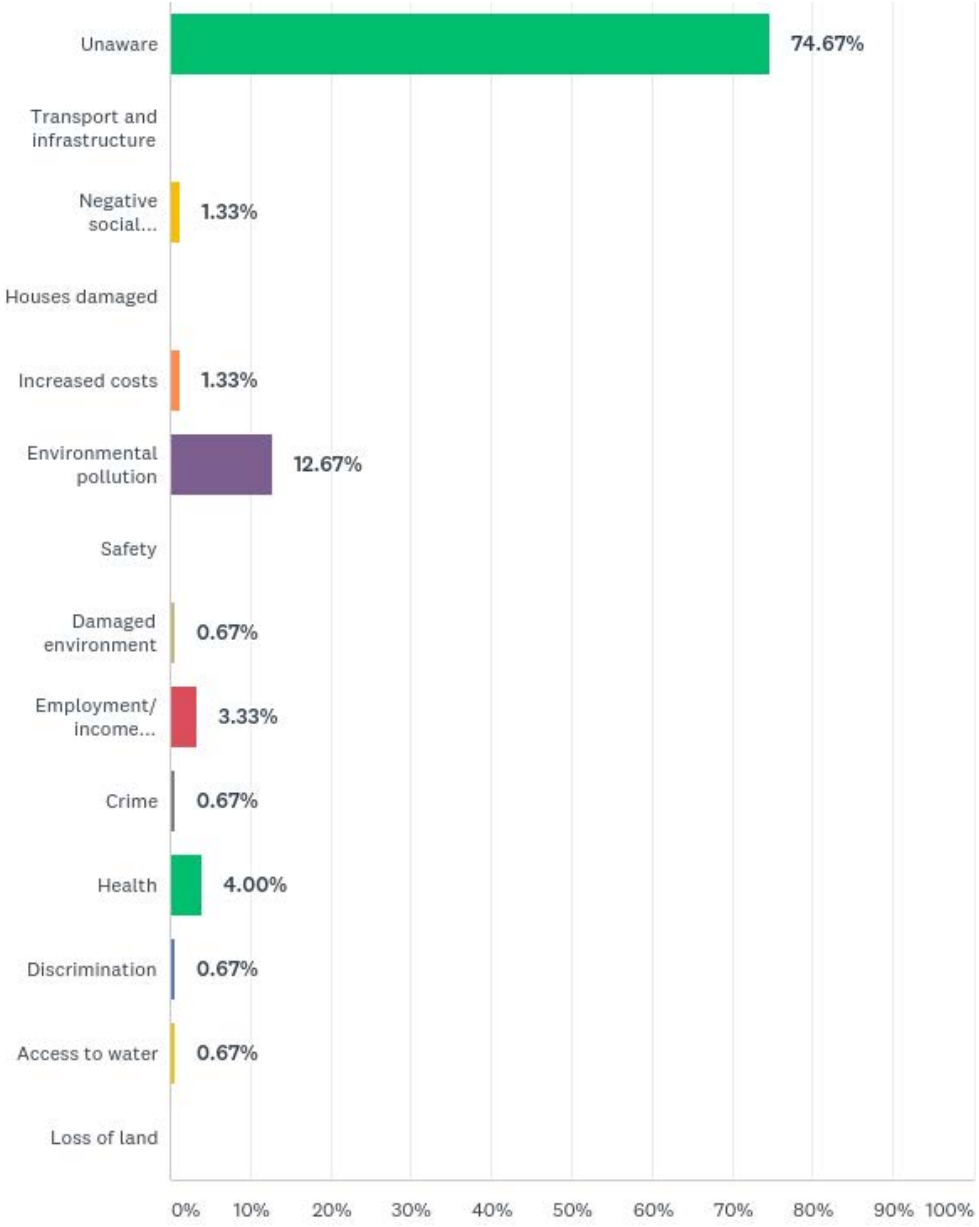
Participants indicated that 69% supported the project, while 28% were unsure, and 3% did not support the project. (**Chart 9-8**)

Chart 9-8: Do you agree with the proposed project?



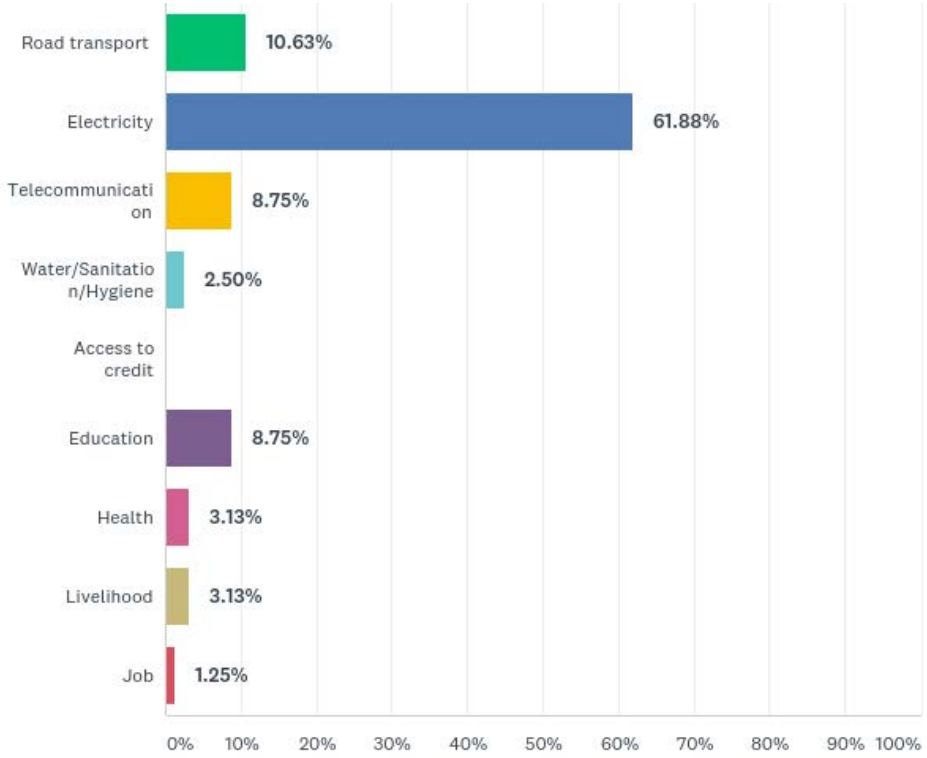
Participants indicated that they were concerned about Environmental Pollution (13%), Health (4%), while most (75%) were unaware (**Chart 9-9**).

Chart 9-9: What are the three most negative impacts of the project that you are concerned about?



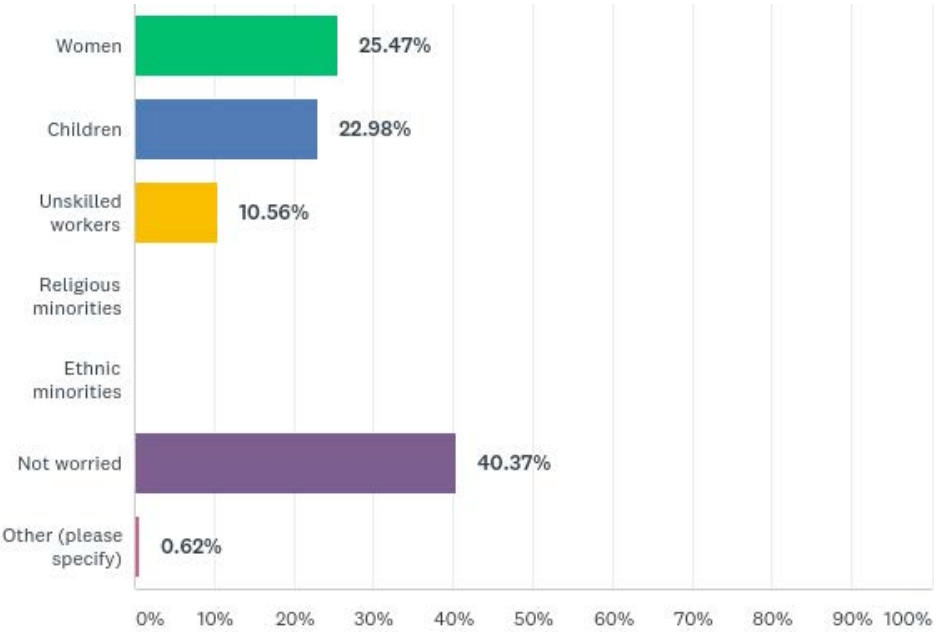
Participants indicated that development priorities included: Electricity (62%), Road transport (11%), Telecommunications (9%) and Eduction (9%). (**Chart 9-10**)

Chart 9-10: What is the development priority for the community?



Groups of possible concern are children (51%), women affected from the project (24%) and No concern (22%), unskilled workers, religious and ethnic minorities accounted for the remaining 3% of responses

Chart 9-11: Which three groups or categories are likely to be most negatively affected from the project?



9.3.4 Perceptions of the potential Impacts of the project.

To allow subjective data to be quantified, the stakeholders' perceptions about the project and its impacts are quantified using a ranking system. The interviewees are asked to score their perceptions as to whether they felt that the proposed activities would have a positive or negative impact on 34 issues.

The answer ranks attitude in 7 levels from extremely negative to extremely positive (of scale -3 to +3). Minus scales imply negative attitude, while plus scales indicate the opposite. Zero indicates a neutral perception regarding impacts from the project. The ranking system is outlined in **Table 9-5**.

Table 9-5: Ranking System

Negative Attitude	Neutral Attitude	Positive Attitude
-1 Slightly Negative	0 No Effect	+1 Slightly Positive
-2 Negative	-	+2 Positive
-3 Very Negative	-	+3 Very Positive

Attitude responses, both positive and negative, were deemed significant based on the criteria outlined in **Table 9-6**.

Table 9-6: Significant Criteria

Significant scores are highlighted in orage if response greater than:	
Criteria	**Response (%)**
-3, +3	5%
-2, +2	10%
-1, +1	15%
0	20%

The attitude survey results identify the perceptions of the level of impact potentially caused by the planned development activities. This assists the company to understand how the stakeholders view the project. If responses to certain issues are determined to be significant, then they should be further addressed to ensure that the public have factual information about the project and clearly understand the likely effect of the project.

When read a statement describing the planned project, the interviewees were asked their perceptions about the positive and negative impacts of the project. Those perceptions determined to be significant perceived to be negative or positive impacts are highlighted in the **Table 9-7** below.

Table 9-7: Perceptions of Potential Impacts of the Project in Blocks M12, 13 & 14

Those highlighted below are considered significant values.

	Very negative	Negative	Slightly negative	No effect	Slightly positive	Positive	Very positive
Sediment quality	0%	2%	67%	31%	0%	0%	0%
Marine water quality	0%	2%	70%	28%	0%	0%	0%
Air quality	0%	0%	69%	31%	0%	0%	0%
Noise	0%	0%	66%	34%	0%	0%	0%
Fish	0%	5%	60%	36%	0%	0%	0%
Marine Mammals	0%	1%	73%	27%	0%	0%	0%
Sea Birds	0%	0%	73%	27%	0%	0%	0%
Coral	0%	1%	71%	29%	0%	0%	0%
Mangroves	0%	1%	46%	53%	0%	0%	0%
Local Fisheries	0%	3%	44%	54%	0%	0%	0%
Shipping	0%	0%	33%	67%	0%	0%	0%
Local Industry	0%	0%	16%	82%	1%	0%	0%
Local Transportation	0%	0%	14%	78%	7%	0%	0%
Recreation	0%	0%	20%	74%	7%	0%	0%
Local Economy	0%	0%	15%	83%	2%	0%	0%
Housing	0%	0%	0%	100%	0%	0%	0%
Health	0%	0%	14%	86%	0%	0%	0%
Education	0%	0%	1%	99%	0%	0%	0%
Spiritual	0%	0%	0%	100%	0%	0%	0%
Safety	0%	0%	0%	100%	0%	0%	0%
Crime	0%	0%	0%	100%	0%	0%	0%
Family Structure	0%	0%	0%	96%	3%	1%	0%
Job opportunities	0%	0%	0%	85%	15%	0%	0%
Income	0%	0%	0%	93%	7%	0%	0%
Scenery	0%	0%	0%	99%	1%	0%	0%
Local culture	0%	0%	0%	100%	0%	0%	0%
Religious Building	0%	0%	0%	98%	2%	0%	0%
Cemetery	0%	0%	0%	98%	2%	0%	0%
Historic buildings/sites	0%	0%	0%	98%	2%	0%	0%

The villagers surveyed perceive that the project will have a slightly negative impact on sediment quality, marine water quality, air quality, noise, fish, marine mammals, sea birds, coral, mangroves, local fisheries, shipping, local industry, local transportation, recreation and local economy. Significant issues that were perceived as receiving a positive impact from the project are job opportunities.

The company should address these issues and provide accurate information to the public prior to project initiation. If stakeholders understand the likely effects and have realistic expectations, it will reduce the risk of negative perceptions, and/or high expectations from project benefits and therefore increase project manageability.

9.4 Further Ongoing Consultation

Before operations begin, additional public consultations and disclosure prior to project implementation are required. This will be initiated 30 days before the exploration drilling program is started. Once the project is initiated and throughout project execution a communication process and schedule must be defined. Consultations conducted early on prior to project commencement will assist to ensure that the concerns of the stakeholders are considered, and that mitigation measures are developed to address them.

Similarly, ongoing stakeholder consultations throughout project execution are essential in order to identify and address new impacts, as well as assess the effectiveness of mitigation measures through stakeholder comments and complaints. Overall, stakeholder consultations promote increased understanding between the project owner and affected communities, resulting in stakeholder acceptance of the project.

A Grievance Mechanism has been established in the form of Complaint Process that is provided in the EIA / SIA Management Plan. A Stakeholder Consultation Log will be kept to document all consultation carried out throughout the entire life cycle of the project. A Community Liaison Officers (CLO) will be appointed to facilitate the grievance process and also to provide information/clarification to the local community.

Stakeholder consultations throughout project implementation (construction, operation, and decommissioning) will be handled through the Stakeholder Involvement Program as provided in **Section 8: Environmental Management Plan**.

9.5 Disclosure

The project disclosure was conducted in compliance with Paragraph 61, EIA Procedure. PCML has disclosed the planned project information via PCML website and at PCML Yangon Office.

The 1st project Disclosure of the planned project has been achieved via the media who attended meetings in Dawei and Myeik. Public disclosure was conducted via MCN TV News Channel and Facebook page, and also DVB media issued information on the news and on their Facebook page

The 2nd project disclosure has been achieved via the media who attended meetings with the Myanmar Fisheries Federation and Public Meetings in Dawei and Myeik. This disclosure was conducted via reporters from MyaWaDi Newspaper, Dawei Watch, MRTV.MWD, Hinthar Media, Elevn Media Myawaddy, DVB, Myanma Alin/ Kyay Mone, Thanintharyi Journal, Myeik Local Newspaper.

The EIA Phase project disclosure will be announced after the Submission of EIA Study of Offshore Blocks M12, M13 & M14 Exploration Drilling Campaign via the PCML website and with a public notice of Myanmar and English Languages through a Myanmar Government Newspaper.

In addition copies of the submitted EIA will be provided for public viewing at the following locations:

- PCML's office in Yangon
- Environmental Conservation Department, Thanintharyi Region
- Dawei District General Administrative Department Office, Thanintharyi Region
- Myeik District General Administrative Department Office, Thanintharyi Region
- On PCML's website as follows: www.petronas.com.my

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Appendix 1
IEM & EQM ECD Registrations

REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 0011 Date 01 JUL 2017

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.

(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၅၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို အဖွဲ့အစည်းအား ထုတ်ပေးလိုက်သည်။)

(a)	Name of Organization (အဖွဲ့အစည်းအမည်)	International Environmental Management Co. Ltd.
(b)	Name of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ အမည်)	Mr. Ronald David Livingstone
(c)	Citizenship of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ နိုင်ငံသား)	Canadian
(d)	Identity Card /Passport Numberof the representative person in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ်အမှတ်)	HG068880
(e)	Address of organization (ဆက်သွယ်ရန်လိပ်စာ)	No. 148/B, Dhamma Zedi Road, Bahan Township, Yangon ron@iem-global.com , www.iem-global.com
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Organization
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 March 2018

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation

Areas of Expertise Permitted
(ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Ecology and Biodiversity
2. Socio-Economy
3. Biology and Environmental management, Risk Assessment
4. Geotechnical and Environmental Engineering
5. GIS
6. Marine Science

REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 0009 Date 07 JUL 2017

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.

(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၅၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို အဖွဲ့အစည်းအား ထုတ်ပေးလိုက်သည်။)

(a)	Name of Organization (အဖွဲ့အစည်းအမည်)	Environmental Quality Management Co., Ltd. (EQM)
(b)	Name of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ အမည်)	Dr. Ohnmar May Tin Hlaing
(c)	Citizenship of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ နိုင်ငံသား)	Myanmar
(d)	Identity Card /Passport Numberof the representative person in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	12/Da Ga Ta (N) 024452
(e)	Address of organization (ဆက်သွယ်ရန်လိပ်စာ)	No 233, Block 23, Sayeepin Lane, Thuwunna, Thingungyun Township, Yangon contact@eqmmyanmar.com , 012330291
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Organization
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 March 2018

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation

Areas of Expertise Permitted
(ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Ecology and Biodiversity
2. Ground water and Hydrology
3. Meteorology, Modeling for Air Quality
4. Modeling for Water Quality
5. Socio-Economy

Appendix 2
Oil Spill Response Plan

095/003/008
Rev. 3 Nov 2013

PETRONAS

PCML
OIL SPILL RESPONSE PLAN

PC MYANMAR (HONG KONG) LIMITED

FOREWORD

Authority for original issue

Issue Approval

Issue of this document has been formally approved by:

Signature :	
Name:	Ahmad Lutpi Haron
Position:	General Manager PC Myanmar (HK) Limited
Date:	

Document Custodian

The following person has been assigned as the document custodian:

Signature :	
Name :	Sunny@ Linn Thura Htun
Position:	Health, Safety and Environment Manager PC Myanmar (HK) Limited
Date :	

Prepared by

Signature :	
Name :	Tharaphi Htay
Position:	Executive, Environment Management PC Myanmar (HK) Limited
Date :	

Proprietary Information

Table of Contents

1. Introduction

1.1. PCML Operations

PC Myanmar (Hong Kong) Limited (PCML) is a wholly owned subsidiary of PETRONAS INTERNATIONAL CORPORATION LIMITED (PICL). The company was originally incorporated by Premier Oil on 21st July 1989 under the name of Premier Petroleum Myanmar Limited (PPML). In November 2003, PCML took over the operatorship of the Yetagun.

Yetagun Gas Field, which is located in Block M12, M13 and M14, is currently the only producing field in Myanmar Operations. It was developed and commenced production on 7th May 2000. The field contains a proven reserve of 3.2 Tcf of natural gas, and is currently producing about 460 MMscf/day of natural gas and12,500 bbl/day of condensate.

Condensate produced from the Yetagun gas field is routed to a Floating Storage Offloading unit for storage and export via a 2.5 km, 6 inches flexible pipeline. The FSO is capable of storing up to 610,000 barrels of condensate.

Dry gas from the Yetagun platform is sent to Kanbauk, known as POC, via a 182 km, 24 inches pipeline. The landing pressure ranges is approximately 92 – 125 bars. The gas is subsequently sent, at a reduced pressure, to the Metering Station, which is 68 km away at the border between Myanmar and Thailand. The current design capacity of Metering Station is 460 MMscf/day.

There is an airstrip at Kanbauk (Ohnpinkwin) where PCML's Helicopter is based to service the offshore operation and emergency response.

There is a jetty in the Heinze Channel which is used to bring supplies for the POC and to transport items from the POC warehouse to the offshore operation.

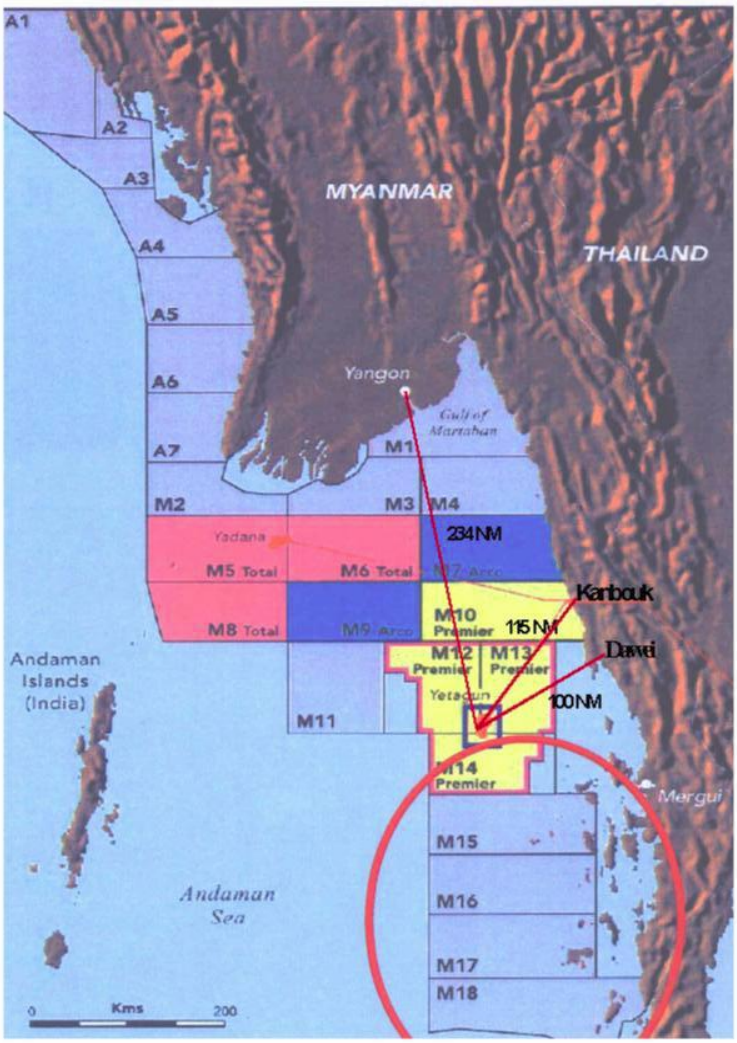

Figure 1.2: LAYOUT OF MO OFFSHORE YETAGUN GAS FIELD

Table 1.1: List of PCML Installations

Installation	Type
Yetagun A	Drilling/wellhead platform
Yetagun B	Living quarters/production platform
Yetagun C	Booster compressor platform
FSO	Floating Storage and Offloading
POC	Onshore Pipeline Operating Centre
MS	Onshore Metering Station
ROW	68 km Onshore Pipeline Right of Way

This Oil Spill Response Plan (OSRP) has been prepared for the above operations in accordance with the international best practice guidelines of the International Maritime Organization (IMO) and International Petroleum Industry Environmental Conservation Association (IPIECA). Federal and State requirements and regulations are also taken into account. The OSRP has been developed taking into account the oil spill risk profile, Tier 1, Tier 2 and Tier 3 response arrangements, and in accordance with national and international legislative requirements. It has been designed to interface with PETRONAS' existing emergency response framework.

All PCML EMT and ERT personnel are required to be familiar with this Plan.

1.2. Purpose

The primary purpose of this OSRP is to establish effective emergency procedures to respond to oil spill affecting the operations of PCML to:

(a) ensure minimal adverse effect to the environment,

(b) minimize the spread of hydrocarbons,

(c) provide the tools to identify the most appropriate response tactics,

(d) protect sensitive areas; and

(e) mitigate negative effects.

The OSRP:

a) Describes the expectations, scope and content of the oil spill response and management systems for PCML;

b) Provides guidance to the PCML Emergency Management Team (EMT) for the response to, and control of, a hydrocarbon spill associated with the operations in PCML;

c) Identifies the way in which the overall response in PCML will be coordinated;

d) Sets out roles and responsibilities of key personnel;

e) Identifies internal and external sources of support, assistance and resources to aid response;

f) Describes local response strategies and organisations; and

g) Defines internal and external notification procedures, response organisations, resources and personnel.

This OSRP is used mainly for condensate or diesel spill incident caused by PCML Operations within the area of Yetagun field where PCML is the operator of the Production Sharing Contract (PSC). In case that Oil Spill occurs beyond the Response Area, the OSRP should be used flexibly in line with PCML's business activities.

The scope of this OSRP covers all installations and facilities managed by and/or operated for PCML including but not limited to the drilling rig, wellhead platforms, FSO, supply vessels and infield pipeline. It focuses primarily on the response to the condensate or diesel spill.

Exploration drilling activities will have a specific Oil Spill Response Plan develop and which will bridge with PCML OSRP.

1.3. Scope of Document

This OSRP covers spills of oil associated with PCML operations including;

- **Drilling & Production:** Oil spills arising from development drilling and production activities.
- **Field Support:** Oil spills arising from activities involving the field support vessels.
- **Port Spills:** Oil spills from the supply/ logistics base port, SBMs, wharfs/jetties.

This plan is part of the MO Emergency Management Plan. The Emergency Response (ER) manual must be referred to in any emergency inclusive of an oil spill. It provides details of the management philosophy utilised by PCSB when defining the organisation and resources used in the response to an emergency and details the overall responsibilities required to handle effectively any emergency which may arise.

This document is linked either **directly or via bridging documents** to:

- **ENVIRONMENTAL CONSERVATION LAW 2012, The Pyidaungsu Hluttaw Law No. 9 / 2012**
- **PORT PLAN** – Port oil spill contingency plan arrangements for FSO.
- **PETRONAS CRISIS AND EMERGENCY MANAGEMENT PLANS (CEMP)** – PETRONAS has a number of internal documents that should be used in conjunction with this OSRP. These include the Corporate Crisis Management Plan. A number of additional, parallel documents have also been prepared by PETRONAS which include Incident Notification Guidelines, and Accident Reporting and Notification Procedures.

1.4. Structure of Document

This OSRP is a single volume document comprises six main sections along with Appendices, organized in line with PCSB-CEMP. The plan consists of the following sections:

I. The preliminary pages cover acronyms and abbreviations, guidelines for changes and revision.

II. Section 1, contained the Introduction, detailing the purpose and scope of the plan. It also introduces assumption planning and emergency response framework.

III. Section 2 discussed the Emergency Organization, describing the integration of response and mitigation actions and organizational relationship. This section covers the summary of emergency responsibilities of each emergency management team member. It describes specific planning roles and preparedness responsibilities.

IV. Section 3, described the Roles and Responsibility, covers the duties of the team members. It describes specific activities and action plans for the EMT.

V. Section 4, entitled Call-out, Mobilization and Communication, which cover the overview of notification and mobilization protocols for the emergency management teams.

VI. Section 5, described the Pre-Incident Action Plans, covers the action checklist for the EMT. The checklists should be referred to during an oil spill incident to ensure the essential actions are being taken.

VII. Section 6, described the Training, Exercises and Review, covers the competency required of the ERT, EMT and Support Groups. It also specifies the review requirements of the OSRP to ensure that the necessary improvements are adequately addressed.

1.5. National Legislative Framework

1.5.1. Environmental Conservation Law 2012, The Pyidaungsu Hluttaw Law No. 9/2012

(a) To implement the above law;

(b) To lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process;

(c) To emerge a healthy and clean environment and to conserve natural and cultural heritage;

(d) To reclaim ecosystems as may be possible which are starting to degenerate and disappear;

(e) To manage and implement for decrease and loss of natural resources and for enabling the sustainable use beneficially;

(f) To implement for promoting public awareness and cooperation in educational programmes

(g) To promote international, regional and bilateral cooperation

(h) To cooperate with Government departments, organizations, international organizations, non-government organizations and individuals

1.5.2. Other National Legislations

Other national legislations that address marine pollution are:

I. The Oil Field Act 1952

II. The Factories Act 1951

III. Law Relating to The Fishing Rights of Foreign Fishing Vessels, 1989

IV. The Myanmar Marine Fisheries Law, 1990

V. The Freshwater Fisheries Law ,1991

1.6. Related International Conventions

Myanmar acceded and implemented several key international conventions relating to prevention and control of oil pollution from ships namely MARPOL 73/78, OPRC 1990, CLC 1992 and Fund 1992 under the umbrella of the international Maritime Organization (IMO).

1.6.1. MARPOL 73/78

International Convention for the Prevention of Marine pollution from ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL) 73/78), and it entered into force on 2 October 1983 (Annexes I and II is compulsory). The convention includes regulations aimed at preventing and minimizing pollution from ships – both accidental pollution and that from routine operations and currently includes six technical Annexes:

I. Regulation for the Prevention of Pollution by Oil
II. Regulation for control of Pollution by Noxious Liquid Substance in Bulk
III. Prevent of Pollution by Harmful substances Carried by Sea In Packaged Form
IV. Prevent of Pollution by Sewage from Ships
V. Prevent of Pollution by Garbage from Ships
VI. Prevention of Air Pollution From Ships

1.6.2. International Convention on Oil Pollution Preparedness, Response and Cooperation 1990 (OPRC 1990)

This Convention establishes preparatory methods for contingency plan, reporting procedures for oil, technical cooperation within the region or internationally, and the promotion of research and development in the area of oil spill management among the state parties. The Convention has the following key elements at its heart:

(a) precautionary and preventative measures are important in the avoidance of oil pollution in the first instance;

(b) prompt and effective action is essential to minimize possible damages in the event of pollution;

(c) contingency planning needs to be emphasized and the role of the oil and shipping industries should be included within these plans;

(d) the need for mutual assistance, international cooperation and information exchange (on response capabilities and reporting incidents);

(e) the “polluter pays” principle; and

(f) the importance of related international instruments on liability and compensation, including the 1992 Civil Liability Convention (CLC 1992) and the 1992 Fund Convention.

The OPRC Convention has 19 articles and 10 Resolutions covering both administrative and technical aspects. In summary, these call for Parties to carry out the following actions in relation to oil spill contingency planning:

(a) ships, port and oil industry facilities posing a risk of oil spills should have oil pollution emergency plans, under the coordination of a national contingency planning for major incidents;

(b) there should be clear oil pollution reporting procedures;

(c) reports of oil pollution should be properly assessed and all States whose interests may be affected informed; national and regional systems for preparedness and response should be developed, including the designation of competent national authorities and the compilation of national contingency plans;

(d) provision should be made for the supply of technical support and equipments to Parties requesting assistance to combat spills;

(e) the necessary legal and administrative measures should be taken to facilitate customs and immigration procedures in an emergency, where outside assistance has been mobilized;

(f) technical cooperation between Parties should be active in the field of training, planning, research and development; and

(g) Parties should work together with the oil and shipping industries to establish suitable pollution combating equipment stockpiles and training programmes.

1.6.3. International Convention on Civil Liability for Oil Pollution Damage 1992 (CLC 1992)

The 1969 CLC entered into force in 1975 and lays down the principle of strict liability (i.e. liability even in the absence of fault) for tanker owners and creates a system of compulsory liability insurance. Claims for compensation for oil pollution damage (including clean-up costs) may be brought against the owner of the tanker which caused the damage or directly against the owner's P&I insurer. The tanker owner is normally entitled to limit his liability to an amount which is linked to the tonnage of the tanker causing the pollution. The Convention requires ships covered by to maintain insurance or other financial security in sums equivalent to the owner's total liability for one incident.

The Convention applies to all seagoing vessels actually carrying oil in bulk as cargo, but only ships carrying more than 2,000 tons of oil are required to maintain insurance in respect of oil pollution damage. This does not apply to warships or to other vessels owned or operated by a State and used for the time being for Government non-commercial service. On May 30, 1996 the 1992 protocol came into force. It widened the scope of the Convention to cover pollution damage caused in the exclusive economic zone (EEZ) or equivalent area of a State party. The Protocol covers pollution damage as before but environmental damage compensation is limited to costs incurred for reasonable measures to reinstate the contaminated environment. It also allows expenses incurred for preventive measures to be recovered even when no spill of oil occurs, provided there was grave and imminent threat of pollution damage.

1.6.4. International Convention on the Establishment of an International Fund for Compensation of Oil Pollution Damage 1992 (FUND 1992)

International Convention on the Establishment of an International Fund for compensation for Oil Pollution Damage was adopted at a conference held in Brussels in 1971. It is supplementary to the 1969 Civil Liability Convention.

The purposes of the Fund Convention are:

(a) To provide compensation for pollution damage to the extent that the protection afforded by the 1969 Civil Liability Convention is inadequate.

(b) To give relief to ship owners in respect of the additional financial burden imposed on them by compliance with safety at sea and other conventions.

(c) To give effect to the related purposed set out in the Convention.

Under the first of its purposes, the Fund is obliged to pay compensation to the victims of oil pollution damage who are unable to obtain adequate or any compensation from the ship owner or his guarantor under 1969 Convention. Victims of oil pollution damage may be compensated beyond the level of the ship owner's of liability. However, the Fund's obligations are limited so that the total payable for victims by the ship owner and the fund shall not exceed 30 million SDR (about US$41million) for any one. In effect, therefore the fund's maximum liability for each incident is limited to 16 million SDR (under 1971 Convention – limits were raised under the 1992 Protocol). The Convention contains provisions on the procedure for claims, rights and obligations, and jurisdictions.

On May 30, 1996 the 1992 Fund Protocol came into force. As was the case with the 1992 Protocol to the CLC convention, the main purpose of the Protocol was to modify the entry into force requirements and increase compensation amounts. The scope of coverage was extended in line with the 1992 CLC Protocol. The 1992 Protocol established a separate, 1992 International Oil Pollution Compensation Fund, known as the 1992 Fund.

1.7. Interface with Other Plans

Where there is site specific plan or related Standard Operating Procedures (SOPs) at state, Myanmar Operations to facilitate effective implementation of response measures the PCML OSRP will interface with these plans.

1.7.1. Requirements for Emergency Response Procedures

Operator of premises involved in activities such as oil exploration, production, refining, bringing in oil tanker into Myanmar, involved in bunkering and to ship transfer of oil or any other activity that poses potential oil spill threat regardless type or quantity of oil handled must have in place their Emergency Response Procedures (ERP) or Contingency Plans. These plans should also identify resources available in terms of equipment and trained personnel for the purpose of immediate response in case of emergency. Refer to guideline on Preparation of Tier 1 Contingency Plan.

Operators of such premises should also ensure that their plans supplement the PCML OSRP and these plans identify available OSR resources within the proximity of their business in case the need for external assistance arises. Initiation of regular joint oil spill response exercises between the private and public sector is encouraged.

1.8. Risk Assessment Process

Evaluating oil spill risks requires consideration of three factors:

(a) Hazard identification - identification of risk activities/ operations where spills can occur. The potential spill scenarios for the current operation will be dictated by a whole range of operational factors, weather conditions, reservoir characteristics and fuel inventories on the rig.

(b) Probability – an evaluation of the probability/likelihood of a spill occurring calculated using historical data and the data relevant for a specific location and the organisation.

(c) Consequence – an assessment of the potential consequences should a spill occur, taking into account oil type, location, etc.

The analysis of probability and consequence allows scenarios to be categorised in terms of risk using a standard Risk Assessment Matrix (RAM). Probability and consequence can be expressed in a number of different ways. For the purposes of the current Risk Assessment, the following basis has been applied which is adapted from the standard PETRONAS approach to risk assessment (**Figure 2.1**).

IMPACT		Severity	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
		People	Slight Injury	Minor Injury	Major Injury	Single Fatality	Multiple Fatalities
		Asset	Slight Damage	Minor Damage	Local Damage	Major Damage	Extensive Damage
		Environment	Slight Impact	Minor Impact	Localized Impact	Major Impact	Massive Impact
		Reputation	Slight Impact	Limited Impact	Considerable Impact	Major National Impact	Major International Impact
LIKELIHOOD	E Almost Certain	Happens several times per year at location	E1	E2	E3	E4	E5
	D Likely	Happens several times per year in company	D1	D2	D3	D4	D5
	C Possible	Incident has occurred in our company	C1	C2	C3	C4	C5
	B Unlikely	Heard of incident in industry	B1	B2	B3	B4	B5
	A Remotely likely to happen	Never heard of in industry	A1	A2	A3	A4	A5

Figure 2.1: PCSB Risk Assessment Matrix

Descriptions on the probability/likelihood and the severity/impact to environment and reputation are presented in **Table 2.1**, **Table 2.2** and **Table 2.3** respectively.

Table 2.1: Assessment of the Probability/Likelihood of Spills

Likelihood/ Probability	Rank	Definition
Not Applicable/ Extremely remote	**A**	Never heard of in E&P Industry
Slight, Low/ Remote	**B**	Heard of incident in the E & P industry or can occur in OPU
Unlikely	**C**	Has occurred in OPU or can occur at Division
Possible	**D**	Has occurred at Division or can occur at location
Likely	**E**	Has occurred at location

Table 2.2: Assessment of the Severity/Impact of Spills on Environment

IMPACT ON ENVIRONMENT	
Severity	Description (Meet one OR all of the criteria)
1 Insignificant	1. Spill/leak causing negligible impact to local environment, contained within the secondary containment and does not reach water and soil, and no volatilization to atmosphere. 2. Noise, air emission, discharges not exceeding company or legislative limits.
2 Minor	1. Spill/leak contained within secondary containment: • causing volatilization to atmosphere • causing limited contamination of soil or water within the containment area • causing non-permanent impacts to the environment 2. Noise, air emission, discharges not exceeding legislative limit but exceeding company limit (where available). 3. No immediate cumulative and/or delayed effect.
3 Moderate	1. Spill/leak causing limited contamination to soil or water outside the secondary containment but remain contained within facility perimeter (for onshore operation)** OR resulting in Potential Consequence A, B or C below. 2. Noise, air emission, discharges not exceeding company or legislative limits OR resulting in Potential Consequence A, B or C below. Note: Potential Consequence A. Cumulative and/or delayed environmental impact B. Short term recovery action <1 month C. Rehabilitation period <6 months ***For offshore operation, spill/leak into marine environment but limited potential contamination to marine water.*
4 Major	1. Spill/leak spreading outside the facility perimeter, managed to be contained/recovered but causing major contamination OR resulting in Potential Consequence A, B or C below. 2. Noise, air emission, discharges exceeding legislative limit with possible prosecution OR resulting in Potential Consequence A below. Note: Potential Consequence A. Immediate effect with serious damage to environment B. Medium term recovery action (1-3 months) C. Rehabilitation period 6-12 months
5 Catastrophic	1. Spill/leak spreading outside the facility perimeter, causing massive contamination OR resulting in Potential Consequence A, B or C below. 2. Noise, air emission, discharges resulting in legal prosecution with possible shutdown of facility, OR resulting in Potential Consequence A below. Note: Potential Consequence A. Severe environmental damage B. Long term recovery action (>3 months) C. Rehabilitation period >12 months

Table 2.3: Assessment of the Severity/Impact of Spills on Reputation

IMPACT ON REPUTATION	
Severity	Description (Meet one OR all of the criteria)
1 Insignificant	**Slight Impact** • Public awareness may exist, but there is no public concern.
2 Minor	**Limited Impact** • Local public concern or complaints. • Local media and/or local political attention with potentially negative impact for company operations.
3 Moderate	**Considerable Impact** • Regional public concern. Extensive adverse attention in local media. • National media and/or regional political attention resulting in negative impact on company operations. • Adverse stance of local government and/or action Groups.
4 Major	**National Impact** • National public concern. Extensive adverse attention in the national media. • Regional/national policies with potentially restrictive measures and/or impact on grant of licences** • Mobilisation of pressure or action groups.
5 Catastrophic	**International Impact** • International public attention. Extensive adverse attention in international media. • National/international policies with potentially severe impact on access to new areas, grants of licences** and/or tax legislation.

1.9. Associated Risk

Major environmental impacts from oil spills generally occur in near shore coastal regions where extensive marine biota exists. Although the risk of a large-scale accidental oil spill is extremely low at the Yetagun field, it is necessary to identify possible environmental impacts and required mitigation measures in the event of such an incident.

1.9.1 Sources of Spill

The most likely sources of spills are:

Fuel transfer and storage – Spills may occur during refueling activities as a result of hose rupture, coupling failure, or overfilling of tanks. Leaking and rupture (however remote) may also occur. The volume of fuel spillage in these situations is likely to be small and further minimized by continued monitoring, secondary containment, and prompt shutdown;

Well testing – Drill stem testing, although of limited duration, could result in small spills of oils. These will be contained on the bounded deck of the platform and will drain to drain – tanks for recovery;

Condensate transfer – Typical causes of accidental spills are pipeline rupture or connection failure. Continuous monitoring and the installation of automatic shut-off devices on pipelines will reduce the chance and the amount of this type of spill;

FSO related spills – Overfilling, bunkering (hose rupture, coupling failure), offloading (hose rupture, coupling failure), and in an extreme case, tank rupture. Continued monitoring and prompt shutdown will limit these spills to a minimum amount (except in the extreme case when a total failure of the tanker occurs);

Maintenance – The spillage of lubricant or fuel oils could occur during maintenance work on the platforms and the FSO;

Fire or explosion – Fire or explosion at the platforms or the FSO could result in a major oil spill. Strict regulations and high standards of safety equipment, servicing, maintenance, and training serve to ensure that fire and explosion are extremely rare events;

Shipping accidents – Failure of oil or fuel tanker during shipping or mooring may result the release of either part or all of the tanker contents. Implementation of standard operating procedures, continuous monitoring and strict personnel training will minimize the chance of a shipping accident.

1.9.2 Probability of Oil Spill

It is not possible to describe all oil spill scenarios; therefore, this OSRP sorts out the most important situations. Oil could be spilled or released from the Yetagun Field as a result of accidents, equipment failures or procedural irregularities with surface or subsurface equipment.

Oil spill scenarios were referenced to the Environmental Impact Assessment document. Potential oil spill scenarios for PCML operations in the Yetagun field include the following: **(see also Table 3.1)**

The most destructive accident and spill scenarios at Yetagun field are related to condensate spills from the FSO and the rupture of the fuel storage tanks. The greatest potential impact, but with very low probability, is for a severe accident causing a major condensate spill. A tanker collision, FSO capsizing, or similar event could cause a major spill of condensate. A worst case scenario would involve a full FSO or tanker containing 610,000 bbl of condensate.

Table 3.1 Potential Oil Spill Scenarios

Condensate Pipeline	FSO	Platform/Drilling Rig	Standby/Supply Vessel
Loss of condensate pipeline inventory to sea: Maximum loss: 6,440 bbl. 6,440 bbl = [(12 hrs night shift x 520 bbl/hr) + (200 bbl at 6" x 2 km condensate pipeline)] 520 bbl/hr = Train 1 (260 bbl/hr) + Train 2 (260 bbl/hr) Though highly unlikely, it may be caused by boat incidents, such as trawling, collisions, anchor drop etc.	*Loss of condensate to sea (four cases):* 1. Hose disconnection during offtake – 30 sec. to shutdown, maximum loss 200 bbl; 2. Ship collision – loss of one of the cargo tanks in the back (5P or 5S); maximum loss 40,000 bbl; 3. Ship sinks with full load – though highly unlikely (given the specific gravity of the cargo), it may result in the loss of 610,000 bbl; 4. Explosion/fire – in the extreme case, the entire cargo (full load 610,000 bbl) could be lost. *Spillage of fuel:* 1. Fuel loss during transfer – maximum 100 bbl 2. Storage tank failure – maximum loss not to exceed 5,000 bbl	*Spillage of fuel:* 1. Fuel loss during transfer – maximum 100 bbl 2. Storage tank failure – maximum loss not expected to exceed 3,000 bbl during drilling, 5,000 bbl during production. *Spillage of drilling mud:* 1. Mud tank rupture – maximum loss 2,500 bbl	*Spillage of fuel:* 1. Fuel loss during transfer – maximum 100 bbl 2. Storage tank failure – maximum loss not expected to exceed 3,600 bbl during operation 3. Ship collision – loss of the cargo tanks in the back; maximum loss 1200 - 3600 bbl 4. Ship sinks with full load – though highly unlikely (given the specific gravity of the cargo), it may result in the loss of 3,600 bbl;

Table of Contents

2. Oil Spill Response Organisation

2.1. General

This OSRP has been developed taking into account the PCML's organisational structure and how it interfaces with the company's Emergency Response Manual and Incident and Crisis Management Plans. A summary of the general organisational structure for PCML operation is shown below (**1**).

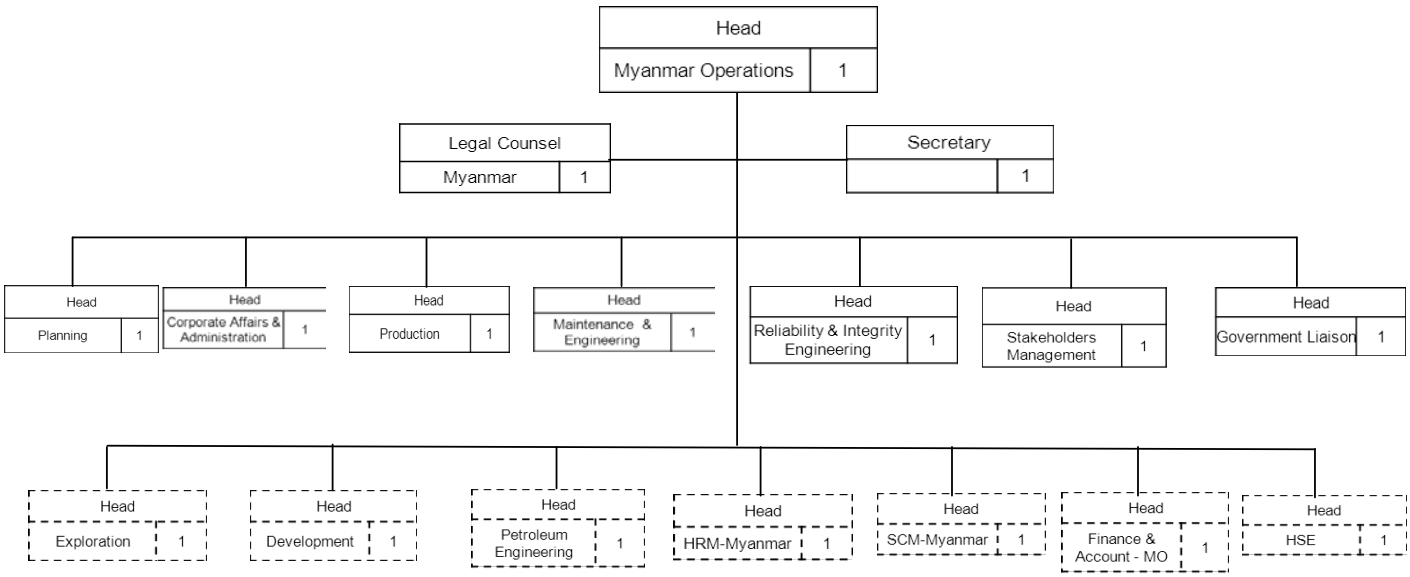

Figure 2.1: PCML Organisation Chart

2.3. PCML Emergency Organisation

PCML has limited resources but in the event of an emergency situation would adopt an organisational structure based on the Incident Command System (ICS) as shown below in **Figure 2.2**. The personnel listed above would together form the framework for the PCML Emergency Management Team (EMT) and site-based Emergency Response Team (ERT). The Emergency Coordination Centre (ECC) is located the PCML office in Yangon.

PCSB has established an ECC in the Head Office in Kuala Lumpur, Malaysia.

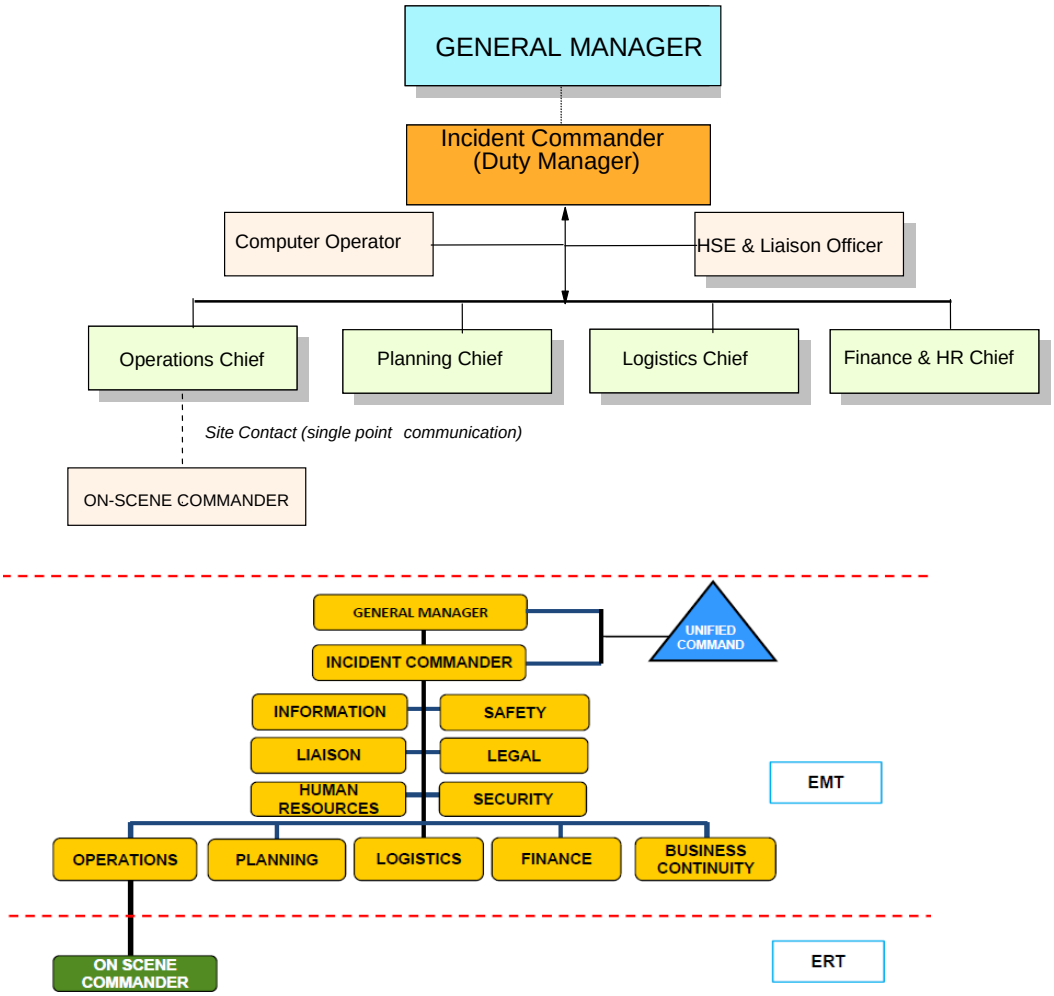

Figure 2.2: PCML Emergency Organisation

The Emergency Organisation will be manned based on the weekly duty roster.

The **OSC** would initially report the spill to the Incident Commander. Thereafter, when the ECC has been established, the **OSC** would report via the Operations Chief who would in turn keep the Incident Commander fully appraised. The

Incident Commander will provide the interface between the EMT in PCML and the CMT at PETRONAS Carigali Head Office, Kuala Lumpur.

The ICS structure is extremely flexible and can be partially activated in the case of minor spills (Tier 1) or expanded in the event of a full blown emergency (Tier 2 or Tier 3). The PETRONAS philosophy with regard to dealing with oil spills of different sizes/ severity is outlined in **Figure 2.3**.

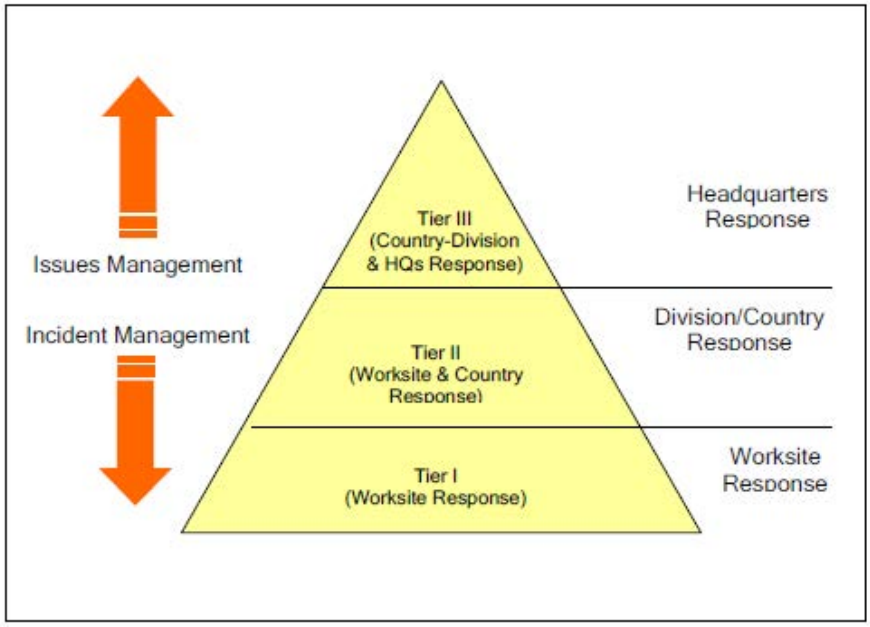

Figure 2.3: PETRONAS Response Levels

2.2.1 TECHNICAL SUPPORT TEAM

Technical Support Team may include PCML staff who are not occupied in the ECC and other personnel who are trained in the Oil Spill Response technique, especially in the beach cleaning etc.

In addition to other technical advisors, the Technical Support Team may include the On-site Commander, Beach Cleaning Advisor and Beach Cleaning Group Leader and Strike Team Leader.

2.2.2 PCSB HEADQUARTER

The PCSB HQ EMT will normally be mobilized in the event of a major emergency and will be responsible for technical and safety advice, and supply of resources beyond the capabilities of PCML EMT. The duties and responsibilities can be outlined as follows:

- Notify COMCEN PETRONAS
- Provide advice on safety and technical matter.
- Coordinate the approval of press release.
- Make corporate decisions.

2.4. Oil Spill Incident Management

2.4.1. Tier Assessment Criteria

The purpose of the three Tier levels (see **Table 2.1**) is to establish, as soon as possible, what is the correct level of response needed to combat the spill. The severity of the spill depends on the size and complexity of the response and the potential consequences for people, environment, assets and reputation.

Table 2.1: Tier Assessment Criteria

Tier 1	**Spills which can be dealt with using local, in-house resources.**	
❑ Spill can be easily managed using on-site oil spill response resources ❑ Source of spill has been stopped ❑ Spill contained ❑ Spill likely to naturally dissipate		❑ Day time release ❑ Oil is moving away from the coastline or not moving to sensitive areas ❑ <5 barrels
Tier 2	**Spills that require mobilisation of oil spill response resources from established service providers.**	
❑ Danger of fire or explosion ❑ Concentrated oil accumulating in close proximity to the drilling rig/vessel, onshore storage tank, etc. ❑ Possible continuous release ❑ Tier 1 resources overwhelmed, requiring additional resources ❑ Night time or poor visibility		❑ Heavy fuel or crude oil ❑ Oil spill is moving towards the coastline/inland waterway ❑ Oil predicted to impact sensitive areas (e.g. water intakes, fisheries, tourist areas) ❑ Local/National media attention ❑ 5-1000 barrels
Tier 3	**Spills which require the mobilisation of national resources.**	
❑ Actual or potentially serious threat to life, property, industry ❑ Tier 2 resources overwhelmed, requiring the mobilisation of government- owned and/or national resources international oil spill response contractor(s)		❑ Significant shoreline impact ❑ Potential to impact neighboring countries ❑ International media attention ❑ >1000 barrels

PCML tiered response system flowchart is shown in **Figure 2.4**.

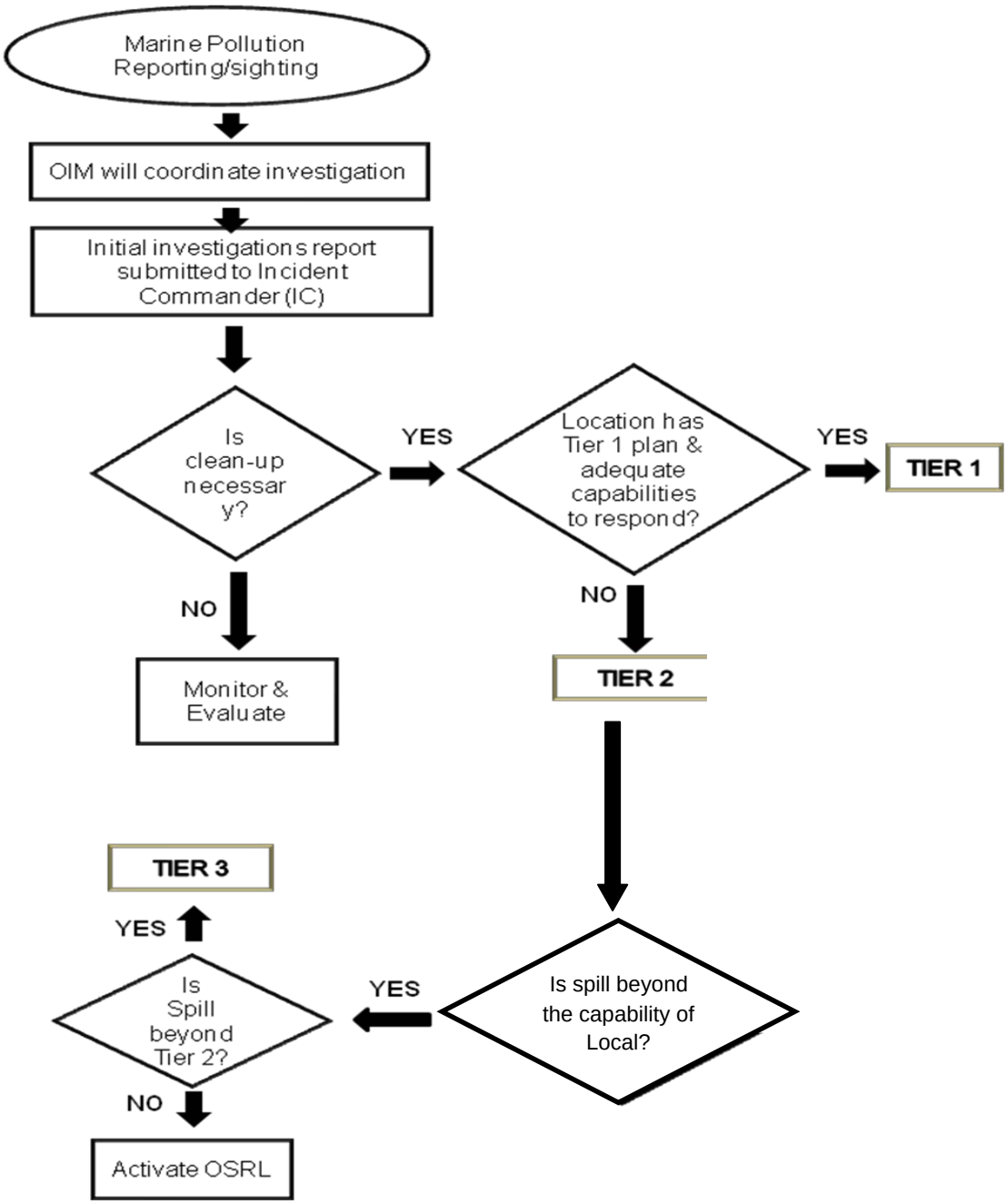

Figure 2.4: PCML Tiered Response System Flowchart

2.4.2. Tier 1 Spills

Spill that can be controlled in-house using PCML own resources (equipment and personnel) less than 5 ***barrels but not occurring at sensitive area****.*

2.4.3. Tier 2 Spills

The response capability will be provided primarily by the sources of equipment, materials and personnel in Yangon and sources from others operators, contractors and service providers. Incidents of this level would, in most cases, involve not only SERT but also all or parts of the Emergency Management Team (EMT), based in Yangon.

2.4.4. Tier 3 Spills

In addition to all the resources of PCML and PCSB HQ, the response equipment would be provided by OSRL.

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2.4.5. End of Emergency

The end of the emergency will be declared in a different way depending on the Tier:

- For Tier 1 oil spills, the On-Scene Commander will order the closure of oil spill response operations. The OSC will also be responsible for informing the Incident Commander and all personnel that had been involved or notified, that the emergency has terminated.
- For Tier 2 oil spills, the Incident Commander will order the termination of oil spill response operations. The Incident Commander will also be responsible for informing all personnel and organisations that had been involved or notified, that the emergency has terminated.
- For Tier 3 oil spills, the end of the emergency will be declared by the Head of Country.

The "End of Emergency" will be declared when any of the following circumstances occurs:

- All resources affected by the spill have reverted to the agreed status;
- It is not effective to continue pollution fighting or cleanup operations.

Table of Contents

3. Roles and Responsibilities

3.1. Incident Commander

The Incident Commander is overall in charge of the management of the oil spill response at PCML and is responsible for directing key personnel, for authorising, or obtaining authorisation of, any funds required for materials, equipment, contract services or specialist personnel necessary to bring the oil spill under control.

Among the other responsibilities of the IC are:

(1) Assess the situation and/or obtain a briefing from IC.

(2) Determine incident objectives and strategy.

(3) Establish the immediate priorities.

(4) Establish an appropriate organization.

(5) Ensure planning meetings are scheduled as required.

(6) Approve and authorize the implementation of an Incident Action Plan.

(7) Ensure that adequate safety measures are in place.

(8) Coordinate activity for all ECC Core Team members.

(9) Approve requests for additional resources or for the release of resources.

(10) Notify relevant authorities and PCSB management of the incident.

(11) Update PCSB management and authorities of the spill and cleanup activities.

(12) Authorize release of Holding Statement the news media.

(13) Order the termination/demobilization of the incident when appropriate.

(14) Prepare Cost Analysis Report and third party damage claims.

3.2. Operations Chief

The Operations Chief is responsible for managing all tactical operations of the oil spill incident. The tactical resources include:

(a) Ground or surface-based tactical resources

(b) Aviation (Air) resources (i.e. helicopters and fixed-wing aircraft)

(c) Staging Areas

The Operations Chief reports to the Incident Commander.

Among the other responsibilities of the Operations Chief are:

(1) Immediately establish direct contact with the On-Scene Commander at the installation/site.

(2) Obtain clear and concise details as to the nature and seriousness of the emergency and in particular details of any casualties.

(3) Verify total number of personnel on board the installation/site and their status/disposition.

(4) Determine what assistance is required by the On-Scene Commander at the installation/site e.g. additional manpower, Oil Spill Recovery Equipment, vessel, medical assistance, etc.

(5) Assign appropriate resources to activate the Ground tactical team, Aviation tactical team and establish Staging areas.

(6) Maintain open line communication with the On-Scene Commander at the installation/site throughout the duration of the emergency.

(7) Keep the Incident Commander fully informed of the developing situation and advice accordingly.

(8) Maintain an accurate log of all key events during oil spill emergency.

(9) Update Planning Chief and Logistic Chief of Operations activities.

3.3. Offshore On-Scene Commander

The Offshore On-Scene Commander is responsible for implementing and coordinating oil spill response activities at sea in collaboration with local authorities, boat captains, offshore production operations and contractors.

The Offshore On-Scene Commander reports to Operations Coordinator**.**

Among the other responsibilities of the Offshore On-Scene Commander are:

(1) Establish offshore command base for clean-up activities.

(2) Assess the marine and weather conditions and develop action plan accordingly.

(3) Mobilise mechanical recovery and boat spraying equipment and vessel, and initiate early response to protect sensitive areas.

(4) Supervise the offshore oil recovery and boat dispersant spraying operations.

(5) Assess and request for sea transportation facilities for manpower and equipment required during cleanup operation.

(6) Arrange for sampling of spilled oil and delivery of samples as per approved procedure.

(7) Work closely with local government authorities coordinating at site.

(8) Maintain incident log, update Operations Chief and prepare progress report.

3.4. Onshore On-Scene Commander

The Onshore On-Scene Commander is responsible for implementing and coordinating oil spill response activities on the shoreline in collaboration with local government authorities and contractors.

The Onshore On-Scene Commander reports to Operations Chief**.**

Among the other responsibilities of the Offshore On-Scene Commander are:

(1) Manning on-site Incident Command Post (ICP) / Staging Area for shore cleanup activities once established and activated by EMT.

(2) Assess the affected areas and collection of local information.

(3) Assess the shoreline / onshore situation and develop containment and cleanup plan in collaboration with Operations Chief.

(4) Quantify onshore cleanup equipment and manpower requirement and initiate an early response.

(5) Supervise the onshore oil recovery and beach cleanup operations.

(6) Supervise the transportation and disposal of recovered oil and wastes.

(7) Work closely with local authorities, technical specialist and Environmental Advisor to achieve effective cleanup operations.

(8) Maintain incident log, update Operations Chief and prepare progress report.

3.5. Planning Chief

The Planning Chief is responsible for managing all information relevant to the incident. He/She collects, evaluates, processes and disseminates the information.

The Planning Chief also supervises, organizes and coordinates technical specialist support.

The Planning Chief reports to the Incident Commander**.**

Among the other responsibilities of the Planning Chief are:

(1) Collecting, analyzing, and displaying situation information as the incident develops.

(2) Circulate regular information updates; every 1 - 2 hours initially.

(3) Prepare full chronological report including extent of oil contaminated areas, environmental damage, method used in containing and cleanup of the spill.

(4) Prepare daily and weekly reports to Management.

(5) Secretary to all oil spill coordination meetings.

(6) Provide general secretarial support to oil spill response team.

(7) Preparing and distributing the Incident Action Plan,

(8) Exercise overall responsibility for the coordination of technical supports requirement and activities.

(9) Keeps the Incident Commander informed of significant issues affecting the Planning Section and Log Keeping.

3.6. HSE & Liaison Officer

The HSE & Liaison Officer is responsible to develop and recommend measures for assuring personnel safety and to assess and/or anticipate hazardous and unsafe situations. And also responsible to liaise with related government agencies and other companies on behalf of Incident Commander and relevant local authorities as per Essential Notification Matrix.

The HSE & Liaison Officer reports to the Incident Commander**.**

Among the other responsibilities of the HSE & Liaison Officer are:

(1) Appoints Safety Officers at each worksite.

(2) Analyzes unsafe incidents and recommend corrective measures.

(3) Provide health, safety and environment advice as required.

(4) Notify PCSB HQ Incident Commander, relevant local authorities as per Essential Notification Matrix.

(5) Solicit additional equipment and supplies requirements from outside companies and associated as per Call-Out Procedure.

(6) Advise Incident Commander on impending issues e.g. public complaints, grievances, and notices from relevant authorities.

3.7. NOK & Media Officer

The NOK & Media Officer is responsible to develop and obtain approvals for releasing the information to the media, to response team, and other appropriate agencies and organizations.

The NOK & Media Officer reports to the Incident Commander**.**

Among the other responsibilities of the NOK & Media Officer are:

(1) Collect and screen information.

(2) Prepare draft holding statement and press releases for review by Incident Commander and forward approved releases to HQ ECC for approval by PCSB MD/CEO and President PETRONAS.

(3) Disseminate approved media statements to appropriate agencies and organizations.

(4) Organize Press Conference as necessary.

(5) Respond to enquiries from media and public.

3.8. Finance & HR Chief

The Finance & HR Chief is responsible for managing all financial and administrative aspects of the oil spill cleanup activities.

The Finance & HR Chief reports to the Incident Commander**.**

Among the other responsibilities of the Finance & Admin Chief are:

(1) Ensuring the accurate recording of daily personnel time and equipment time records.

(2) Maintain a file of injuries and illnesses associated with oil spill cleanup, including all written witness statements.

(3) Records all costs data, analyzes and prepares estimates of cleanup costs, and maintains accurate records.

(4) Manages all financial matters pertaining to vendor contracts, leases and fiscal arrangements.

(5) Establishes local sources for equipment and supplies; equipment rental agreements; and processes all billing invoices.

(6) Call out and activate relevant ECC support team members as appropriate

(7) Make adequate arrangements for catering, media receptions, land transport, accommodation for onshore and offshore clean-up personnel as required.

(8) Monitor and record expenses of all resources deployed for the clean-up operations; i.e. equipment, manpower, vehicles.

(9) Arrange immigration formalities for relevant personnel from outstation / overseas.

(10) Arrange for adequate facilities for local labour force (shelter, toilet, food / drink, hygiene, washing / cleaning).

(11) Facilitating accommodation and travel arrangement for affected personnel and government formalities and providing back-up facilities for the clean-up operations such as travel/accommodation, media reception area, catering and other sanitation facilities at the various locations.

3.9. Logistics Chief

The Logistics Chief is responsible on all matters related to logistics and resources, which include the following:

1. Facilities: setup, maintenance and demobilization of all incident support facilities i.e. Command Post, Incident Base, other facilities such as feeding, sleeping, sanitation.
2. Ground support: maintenance, servicing and fueling of all mobile equipment and vehicles. Transportation of personnel, supplies and equipment.
3. Communications: develop communication plans, installation and testing of communication equipment and facilities, distribution and maintenance of communication equipment.
4. Supplies: ordering, receiving, processing, disbursement, servicing and storing of all oil spill response related equipment and resources (including food).
5. Food services: supply of food throughout the entire incident duration, including to all remote locations.
6. Medical services: develop procedures for medical emergencies, provide medical aid.

The Logistics Chief reports to the Incident Commander**.**

Among the other responsibilities of the Logistics Chief are:

1. Assess the emergency situation and determine the adequacy of logistics response resources.
2. Establish communications with logistics service providers, when appropriate.
3. Identify available resources – aircraft, road transports, and materials and arrange for mobilization and movement of those resources as planned.
4. Obtain additional resources from other oil companies/operators, if necessary.
5. Activate equipment load-out and vessel mobilisation.
6. Monitor and record daily all resources deployed for the cleanup operations i.e. material handling equipments, vessels, manpower, land transportation, aircraft.
7. Update EMT regularly on all the resources deployed to site**.**

3.10. Computer Operator

The Computer Operator is responsible for maintaining an accurate written record of all the information and actions carried out by the EMT within the ECC. The Computer Operator reports to the Planning Chief.

Among the other responsibilities of the Computer Operator are:

(1) Update Event Log Sheet with the latest information (ensuring information is current, neat and legible)

(2) Maintain a dated and timed record of EMT information, actions and communications

(3) Commence a time record for key information about the incident including:

- Record the EMT members present
- Record the latest status on the Status Board
- Record actions to be taken

(4) Record Briefings and Time Outs

(5) Collate all personal logs ready for incident review and provide to Incident Commander.

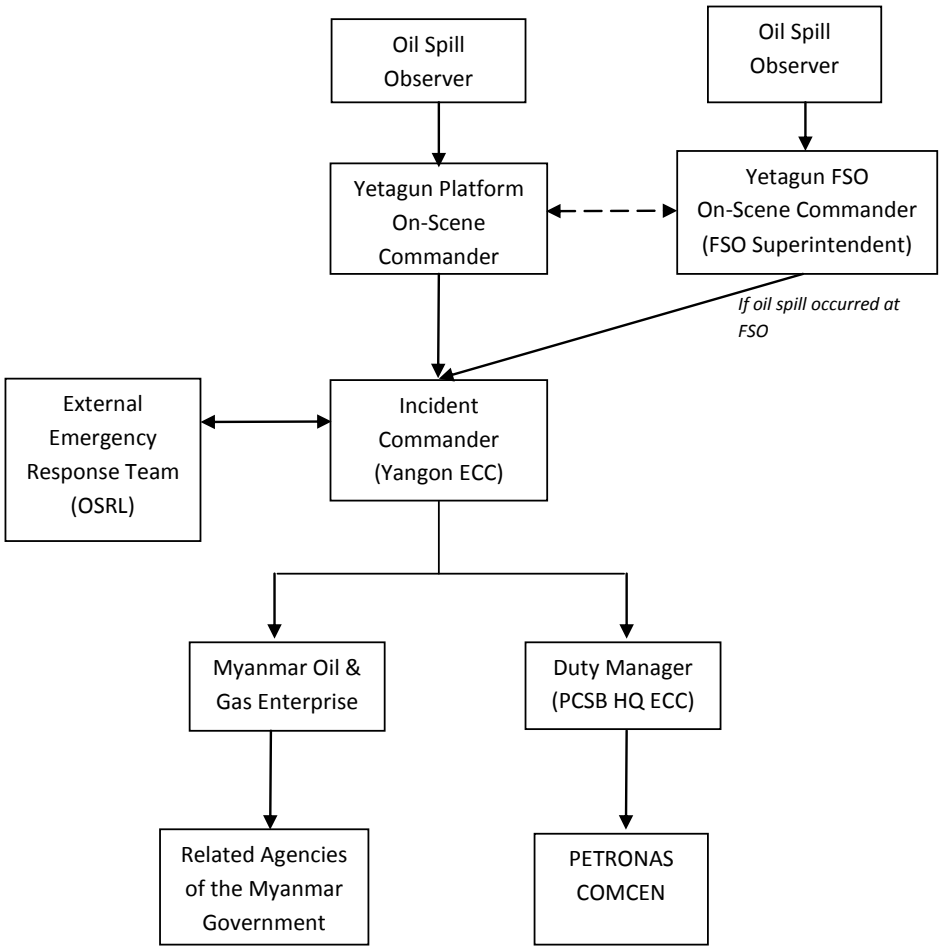
Table of Contents

4. Call-Out, Mobilization and Communication

4.1. Alert/Notification Procedure

For oil spills at offshore and onshore, **Figure 4.1** describes the initial notification, key actions and flow of information. Oil spills, irrespective of size or level (Tier 1 to Tier 3) will follow the same internal notification process to the Incident Commander in PCML and Kuala Lumpur.

Figure 3.4 Emergency Organization Structure



4.1.1. Authorisation of Oil Spill Incident Notification

Only the On-Scene Commander or a person appointed by him shall authorise transmission of oil spill incident notification. However, in a distress situation, the non-availability of these designated persons shall not prevent the Radio Operator, at his discretion, from sending any appropriate notification relating to an oil spill incident.

All oil spill incident notification shall use the Initial Notification Form (INF) (see **Appendix 4.0**).The Pollution Report (POLREP) Form (see **Appendix 4.1**) shall be used when more detail information will be required.

4.1.2. Oil Spill Incident Notification Routing

All oil spill incident notification from the installation, drilling rig or vessel shall be addressed to the PCML Incident Commander.

4.1.3. Notification to Authorities

The parties to be notified will depend on the magnitude and environmental sensitivity of affected area.

Every oil spill incident shall be reported as per PETRONAS Carigali Incident Notification Matrix as displayed in the ECC. Any oil spill onto inland waters, sensitive areas categorized as Tier 3 shall be reported (using the best available means) to MOGE.

The list and contact numbers of relevant authorities to be notified is as per **Appendix 4.2.**

4.2. Mobilization Procedure

The following mobilisation procedures will be followed for Tier 1, Tier 2 and Tier 3 oil spills.

4.2.1. Tier 1 Oil Spill Response Mobilisation Procedure

During Tier 1 incidents (**Figure 4.2**), the initial response will be dealt with by the OIM at offshore installations, who will activate the ERT (see list in **Appendix 4.3**) and mobilize Tier-1 oil spill response equipment on the installation stockpile (**Appendix 4.4**). The installations are equipped with spill kits which may include (as a minimum):

(a) oil spill dispersant at offshore installations,

(b) absorbent booms, absorbent pads, heavy duty oily waste bags and PVC gloves .

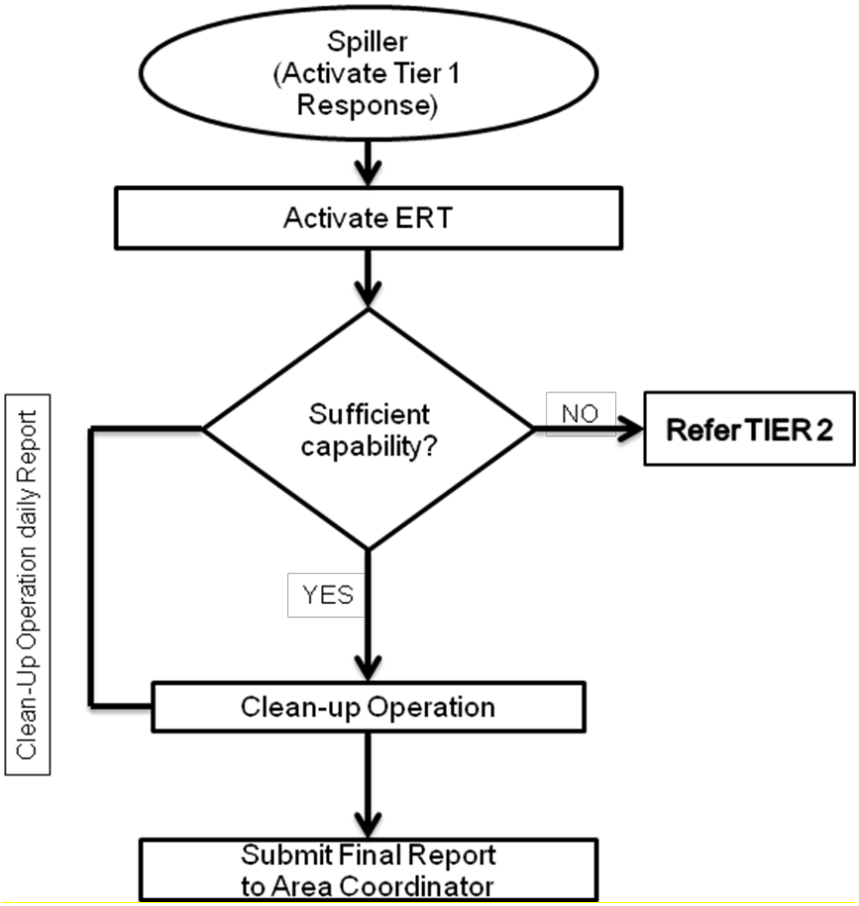


Figure 4.2: Tier 1 Oil Spill Response Mobilisation Procedure

4.2.2. Tier 2 Oil Spill Response Mobilisation Procedure

In the case of Tier 2 spills, ECC at PCML (i.e. EMT) will be mobilized (**Figure 4.3**). The **OSC** will contact the Incident Commander and request additional resources and agree on the appropriate level of response to the incident. The Incident Commander will liaise with the Operations Chief who will then arrange mobilisation of additional resources. A Staging Area will be established to provide front-line support in managing the Tier 2 response effort.

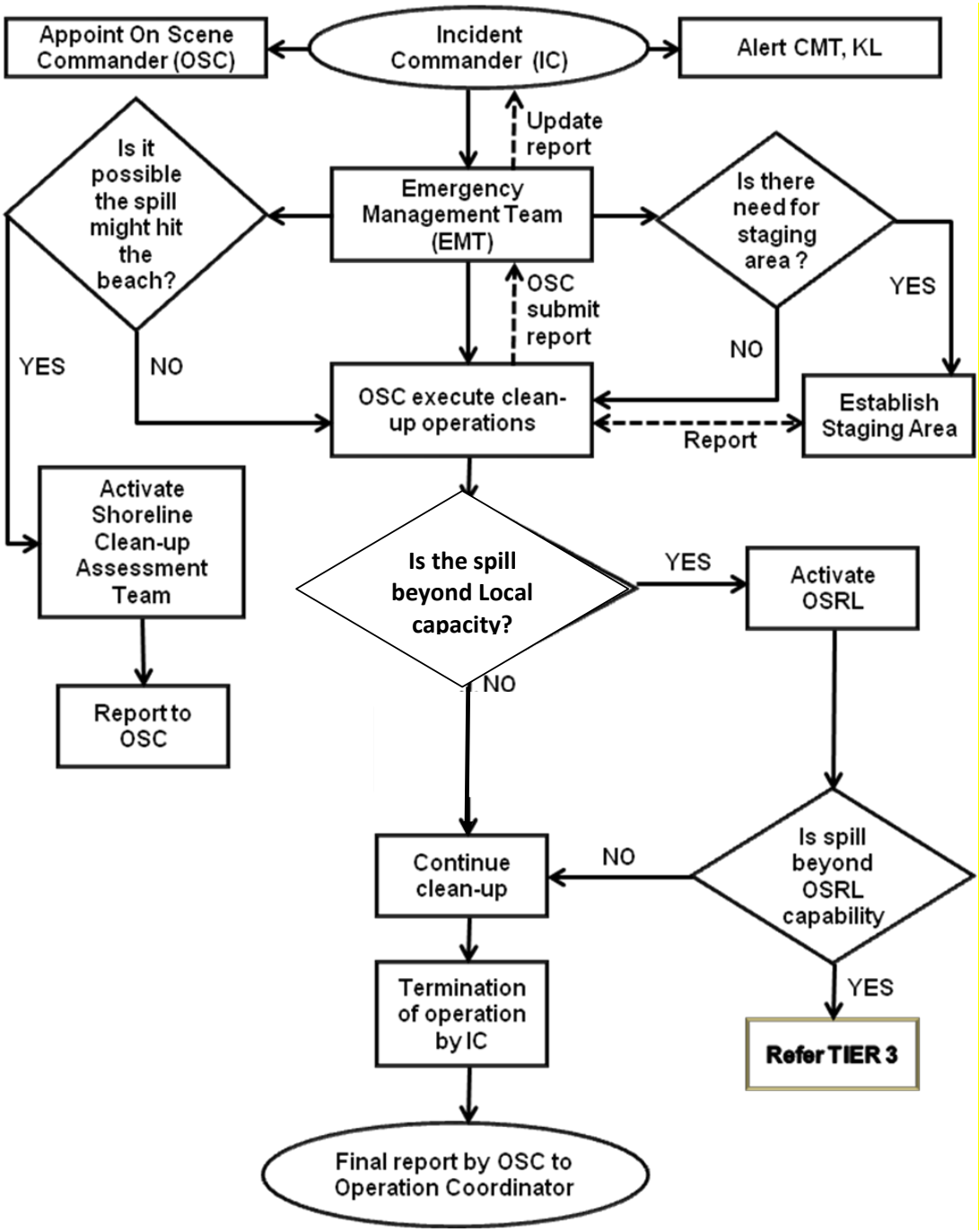


Figure 4.3: Tier-2 Response Flowchart

As a minimum the **OSC** should provide SITREPs to the Incident Commander on a daily basis.

For all spills, the OSC must notify the Incident Commander immediately. The Incident Commander will continue to provide regular updates and liaise with the CMT /EMT in Kuala Lumpur regarding the extent or further escalation of the emergency.

4.2.3. Tier 3 Oil Spill Response Mobilisation Procedure

Alert PCSB HQ ECC, PETRONAS COMCEN and Myanmar Government via MOGE.
Call in additional resources to protect far field environmentally sensitive areas, other vessels and installations.
Consider environmental survey if coastal resources threatened.
Government may call in own resources depending on size and behavior of spill.

OSRL can be notified by the authorised persons using:

a) Form OSRL 025: Mobilization Authorisation Form (**Appendix 4.6**)

b) Form OSRL 027: Notification Form (**Appendix 4.7**).

The list of other agencies that can be contacted for assistance during an oil spill is listed in **Appendix 4.5**.

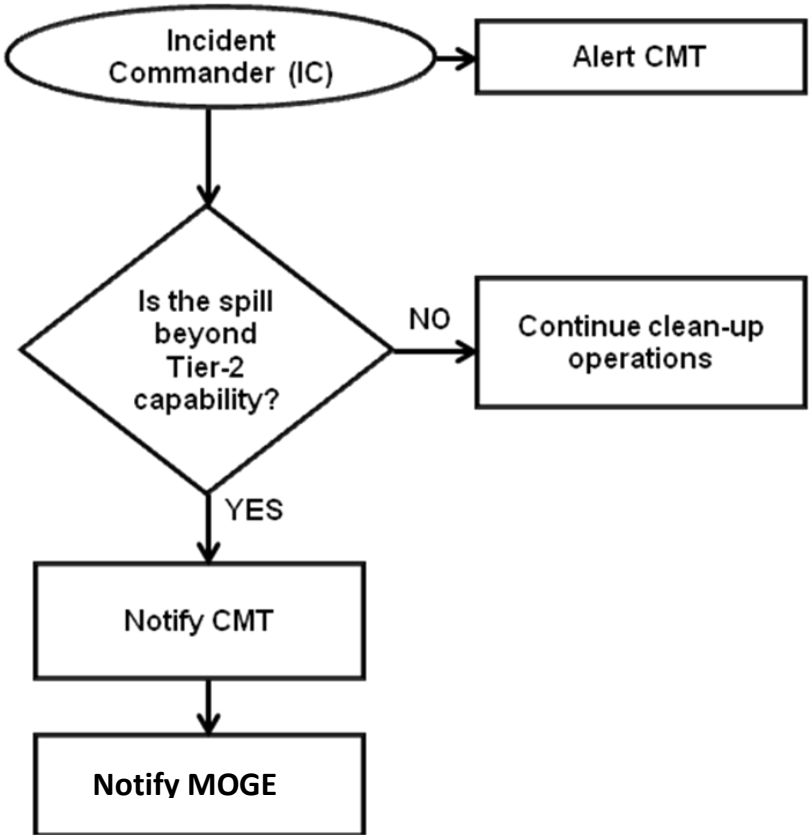


Figure 4.4: Tier 3 Response Flowchart

The Incident Commander will ensure that the authorities (i.e. MOGE) have received a Pollution Report (POLREP) form (**Appendix 4.1**), who will also subsequently send Situation Report (SITREP) (**Appendix 4.8**) to provide updates on a regular basis.

4.2.4. Assistance to OSRL

In the event of a Tier 3 mobilisation, PCML would be required to provide assistance with some aspects of logistical support, customs documentation, transportation (the types of vehicles and boats required), and the number of manpower needed, will rely on PCML to ensure that the requirements are met. **Table 4.1** below shows the typical assistance required during Tier-3 mobilization.

Table 4.1: Typical assistance requirements in Tier-3 mobilization

Action	Assistance Required
Flight	• Liaise directly with the Local Authority to obtain over-flight clearances and landing rights • Liaise with Department of Civil Aviation (DCA) to obtain trans-boundary over-flight flight clearance and landing rights. • Meet the flight (equipment will normally be accompanied by a Response Specialist). Aviation Logistics Executive to arrange for airport clearance, ground support services e.g. dispersant loading point, re-fueling, post- & pre-flight checks/maintenance, waste management, etc.
Customs and Immigration	• Liaise directly with the Customs to obtain emergency clearance on the importation and re-exportation of the oil spill response equipment. • Arrange emergency clearance for immigration / visas for personnel
Unloading	• At the airport, PCML to provide: ○ Ground handling equipment ○ Hi-loader ○ Forklifts (low mast for unloading from aircraft) ○ Local agents to carry out aircraft unloading • Transport to Site • PCML will be expected to arrange and to assist with: ○ Trucks for transport ○ Loading of equipment onto transport ○ Provision of secure storage ○ Control and tracking of equipment

Action	Assistance Required
On Site Operations	• PCML to pre defined equipment lay-down points, identify a pool of vessels of opportunity to draw from and obtaining the necessary approvals for dispersant application. • *Oil Spill Response Limited* will provide: ○ Technical expertise and services ○ Daily reports on activities and costs ○ Management of own personnel and decisions on duration of duty periods • PCML will arrange: ○ Food, accommodation and transport for *Oil Spill Response Limited* personnel.
De-mobilisation	• *Prepare demobilization plan:* ○ In use / standby decision ○ Onsite cleaning ○ Return freight by air or sea

4.3. Government Agencies for Spill Response

In the event of any oil spill it is necessary to notify the Myanmar Government. Unless specifically advised otherwise, the only government agency to be notified will be the Myanma Oil & Gas Enterprise (MOGE) who is the official operator of each PSC (Production Sharing Contract).

MOGE require to be notified immediately of any incident. Initial contact should be by telephone or radio. This should be followed up by fax as soon as possible. When cleared by the PCML General Manager, the EMT's HSE & Liaison Officer on duty who has the necessary contact numbers will initiate contact with MOGE.

MOGE will then contact any other government agencies required i.e. police, medical, military, customs, immigration etc. Where required, MOGE should be asked to assist in dealing with other government agencies for issues such as arranging clearance for emergency flights, immigration matters and liaison with the Armed Forces if required.

NB: It is important that MOGE are the first external party to be contacted in an emergency situation.

4.4. Termination / Demobilization Procedure

When the end of emergency has been declared, the following actions should be taken:

- Withdrawal of personnel and material.
- Evaluation of the emergency incident and creation of reports and statistics.
- Design and implementation of a Recovery Plan for the affected area, if necessary
- Post-spill environmental monitoring to verify that the spill did not have long-term effect on any sensitive natural or social areas.

Table of Contents

5. Pre-Incident Action Plan

5.1. Generic Response Guidelines

This section contains operational guidance for various oil spill response strategies that may be deployed to mitigate a potential oil spill. Please refer to **Appendix 5.1 – Oil Spill Response Guide** for further information. **Table 5.1** below summarises the generic response guide for the different spill types. .

Table 5.1: Generic Response Guidelines

Response Strategy	Spill Type				Level of Response
	Crude	Diesel/ Condensate	Water Based Drilling Mud	Utility Oils, i.e. hydraulic, lubricating or base oil	
Evaluate and Monitor	✓	✓	✓	✓	Tier 1
Allow to Evaporate		✓			Tier 1
Offshore Containment and Recovery	✓	Diesel likely to evaporate readily both off and near shore*	WBM likely to disperse and dilute through water column	✓	Tier 1/ Tier 2
Chemical Dispersion	✓	✘	✘	✓	Tier 2/ Tier 3
Shoreline Protection	✓ If oil threatens shoreline	Diesel likely to evaporate readily both off and onshore. A shoreline response is unlikely	WBM likely to disperse and dilute through water column. Monitor and evaluate is the only probable strategy.	✓ If oil threatens shoreline	Tier 2/ Tier 3
Shoreline Clean-up	✓ If impacts shoreline			✓ If oil impacts shoreline	Tier 2/ Tier 3
In-situ Combustion	✓	✘	✘	✘	Tier 3

Key

✓ = Recommended **✘ = Not Recommended**

* = If oil does persist then containment and recovery will become the response strategy.

5.2. Response Guide Flowchart

Following any oil spill scenario, **Figure 5.1** provides a guide in initiating the appropriate response strategy.

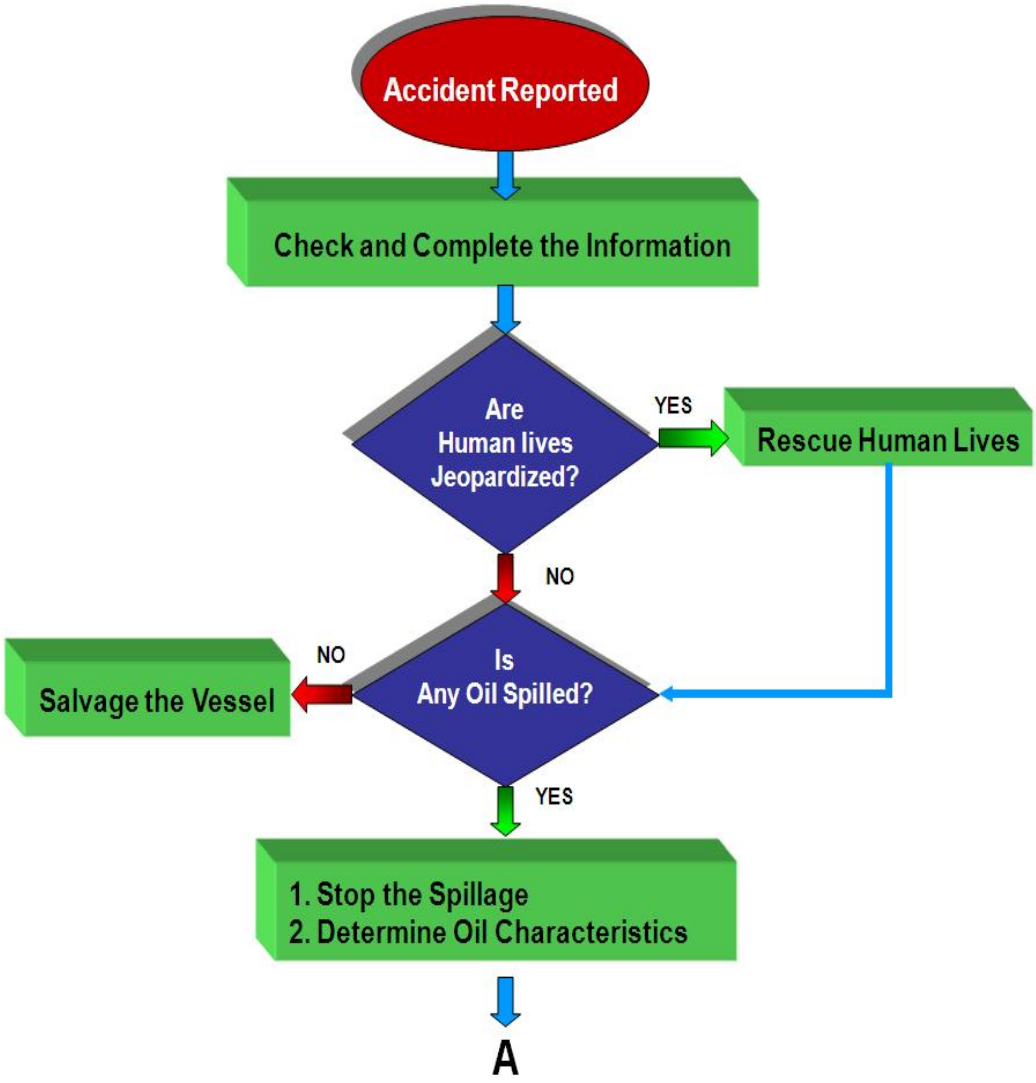


Figure 5.1A: Response Guide Flowchart

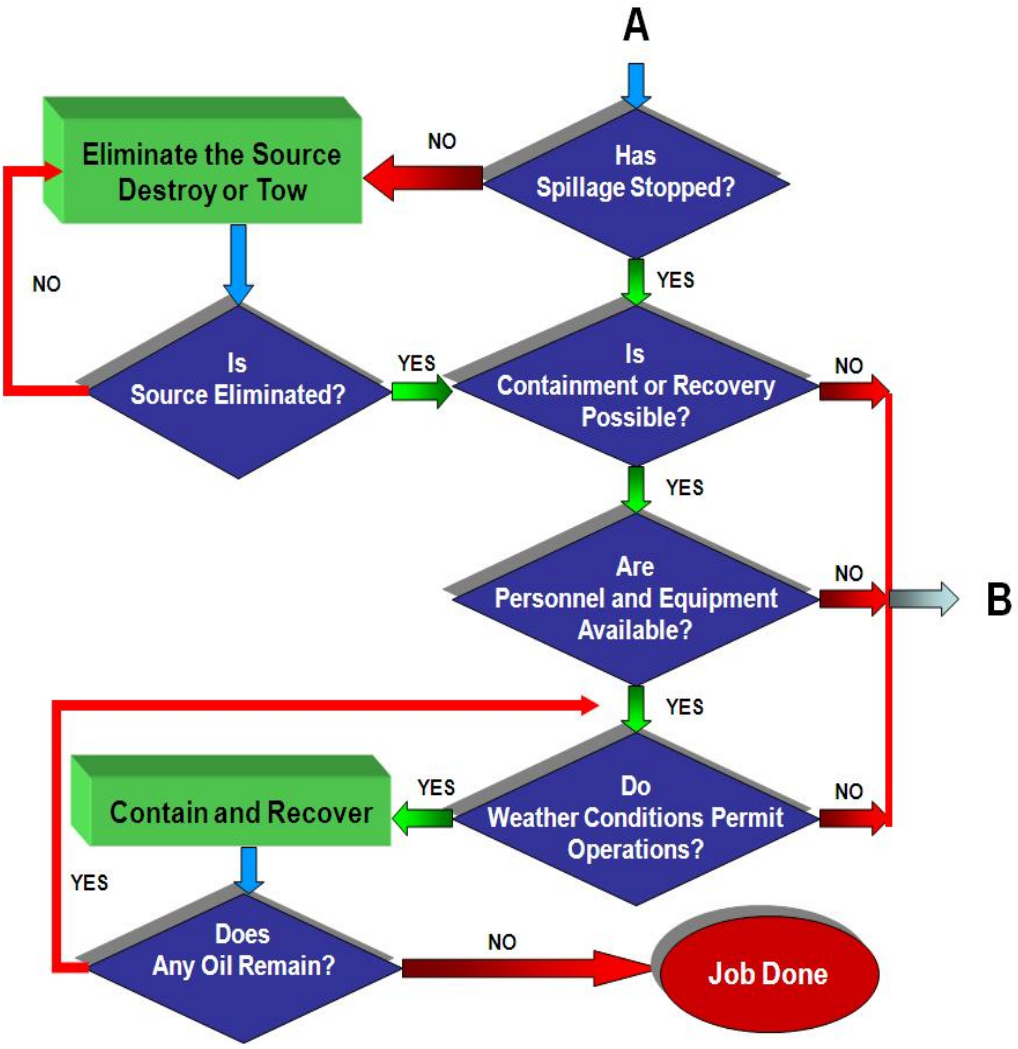


Figure 5.1B: Response Guide Flowchart

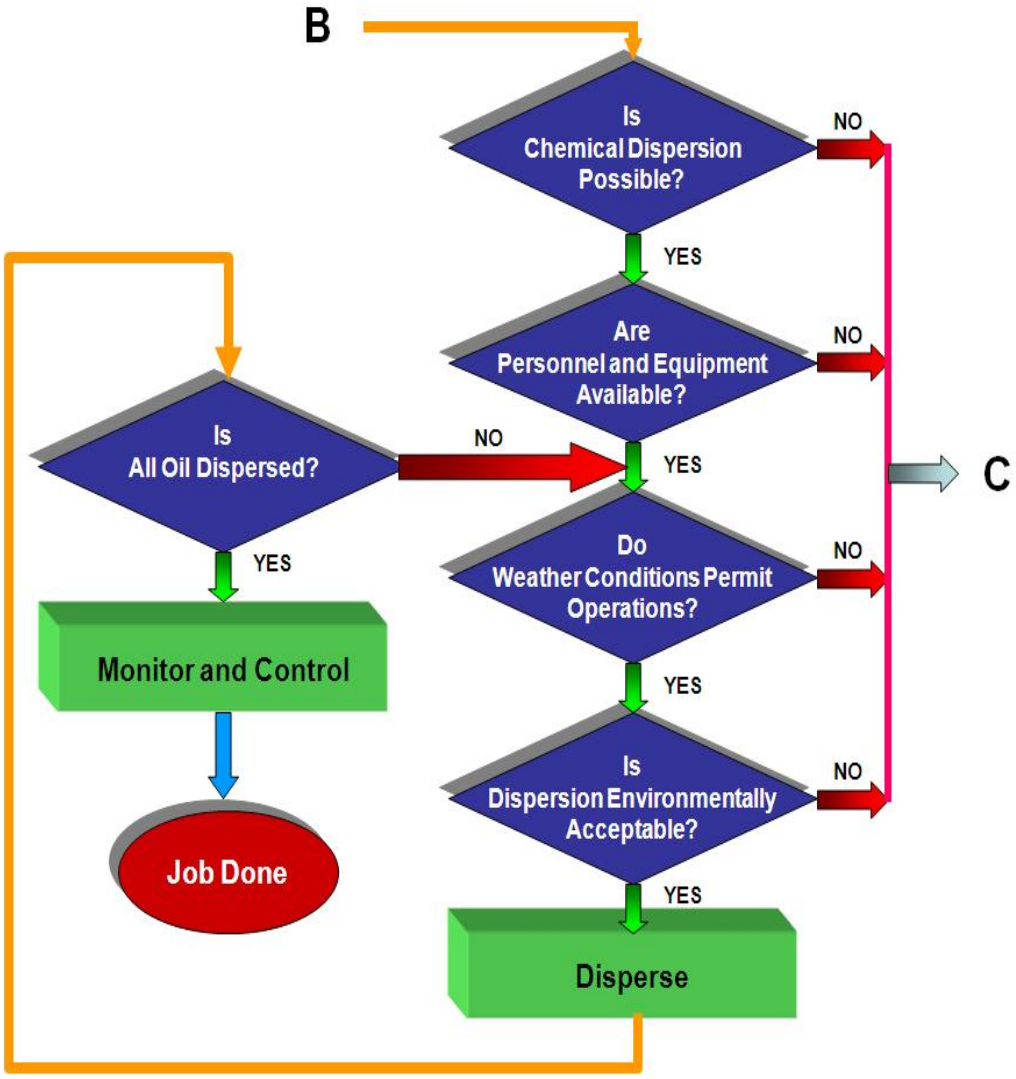


Figure 5.1C: Response Guide Flowchart

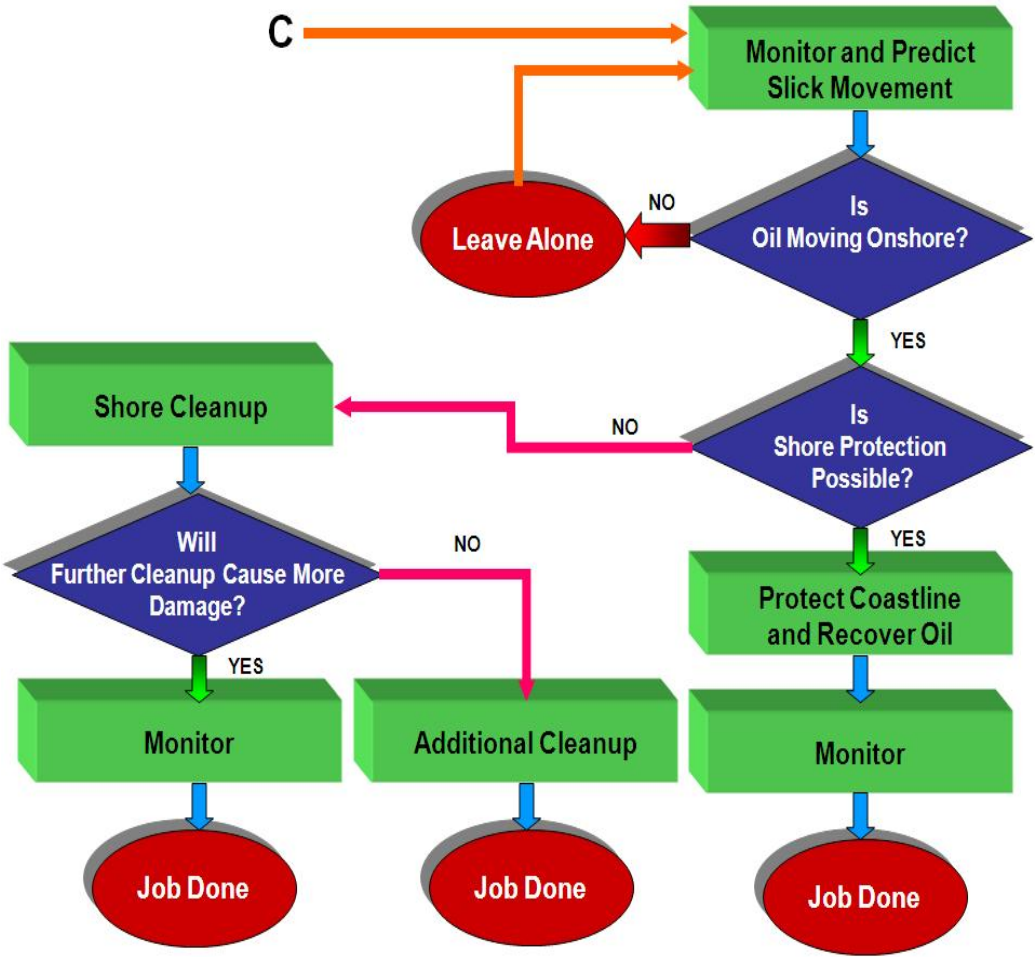


Figure 5.1D: Response Guide Flowchart

5.3. Action Checklists

Action Checklists have been compiled for key individual's in the EMT. These action checklists act as a quick reference for the key actions that should be taken by these key individuals during the initial stage of a response.

5.3.1. Spill Observer

SPILL OBSERVER	
Reports to: Dependent upon location of spill observer: **Onboard installation - Control Room and PIC** **Onboard Vessel – Vessel Master**	
Step	**Actions**

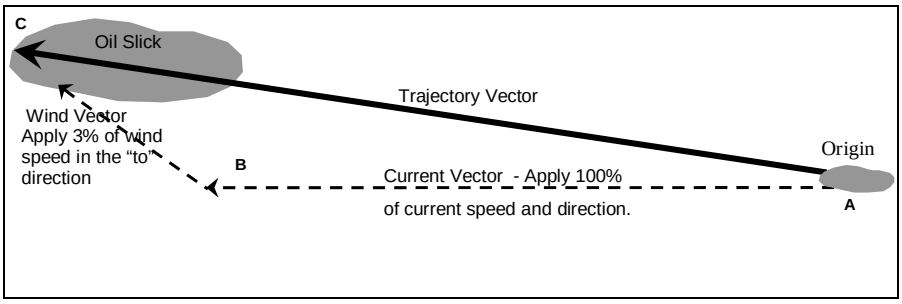
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY**
	❑ Raise the alarm as soon as possible by verbal means e.g. radio or in person
	❑ Inform the installation Control Room / OIM / Vessel Master of the incident and provide as much information as possible:
	  ❑ Location of pollution incident.
	  ❑ Source of spill.
	  ❑ Extent of spill.
	  ❑ Time of incident.
	  ❑ Potentially hazardous situations/equipment.
	❑ If trained and safe to do so, take reasonable actions to stop the source of the spill until relieved by suitable/ competent individual.
	❑ If unsafe to remain at spill site, leave and instruct other personnel to evacuate the hazardous area.
	❑ Start a **Personal Log** and record time and details of own actions and own decisions.

Further Actions	❑ If safe to do so, continue monitoring the spill, keeping the **OSC** informed until the Damage Control Team arrives. ❑ Be prepared to direct the Damage Control Team to the spill. ❑ If trained and if required, assist the Damage Control Team.
Final Actions	❑ After the incident, take part in the debriefing ❑ Provide recommendations based on observations made during the response.

5.3.2. Offshore On-Scene Commander (OSC)

OFFSHORE ON-SCENE COMMANDER (OSC)	
Coordinates the tactical offshore oil spill response activities. **OIM/ Vessel Master assumes OSC position for spills in water.** **Reports to: Operations Chief.**	
Step	**Actions**

Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY**
	❑ OIM assumes role of **OSC** if spill enters water, regardless of size.
	❑ Make an initial assessment of the incident.
	  ❑ Spill source and cause
	  ❑ Type of hydrocarbon
	  ❑ Size and location
	  ❑ Injuries
	  ❑ Hazards
	❑ If the volume of condensate/ diesel/oil spilt is unknown, estimate the maximum volume which may have spilt and assume 'worst case scenario'
	❑ Mobilise the Damage Control Team, brief the team of the situation.
	❑ Start a Personal Log and record time and details of own actions and own decisions
	❑ Arrange for offshore oil samples to be collected and sent for analysis
	❑ Authenticate the reported emergency details by speaking with the original Observer and obtain full details of the incident
	❑ If the spill or leak is from a vessel, provide guidance to the Vessel Master on taking action to stop operations and move the vessel to safety
	❑ If the spill leak is from an onshore operation, cordon off the area (i.e. Port operations)
	❑ Decide on whether to discontinue or cease operations
	❑ Decide if there is a need to evacuate an area
	❑ For all spills immediately notify Incident Commander (verbally).
	  ❑ For Tier 1 spills send Initial Notification Form (**Appendix 4.0**, INF) within 1 hour.
	  ❑ For Tier 2/3 spills send INF followed by **POLREP** as soon as practicable.
	❑ For Tier 2/3 spills liaise with Operations Chief on additional actions and/or resources required, and the practical deployment of resources.

OFFSHORE ON-SCENE COMMANDER (OSC)	
Coordinates the tactical offshore oil spill response activities. **OIM/ Vessel Master assumes OSC position for spills in water.** **Reports to: Operations Chief.**	
Step	**Actions**
Initial Actions	❑ Identify tasks that must be performed to implement the initial strategy and identify task leaders for tactical response ❑ Agree a danger zone for the spill (i.e. a safe distance from the spill which the Damage Control Team must enforce). ❑ If necessary request a helicopter through the Operations Chief to provide aerial observation. Aerial surveillance will allow you to observe and record the size and location of the slick. ❑ The colour of the oil on water will indicate its thickness. Using the Bonn Agreement Oil Appearance Code (BAOAC, **Appendix 5.2 – Aerial Surveillance Form**) colour chart, calculate the volume of oil based on the area and colour of oil visible from the aerial observation. ❑ Once the scale and movement of the spill are known, and if required, request assistance from the field support vessels.  **Figure 5.2: Predicting movement of oil on water** ❑ Obtain information on tides & direction/speed of current and wind. ❑ Using the information on current and wind, predict the trajectory and speed of movement of the spill as illustrated in **Figure 5.2** above. ❑ Draw the slick on a chart (map) with co-ordinates, showing position and predicted movement of the oil. ❑ Notify Operations Chief via Situation Report (SITREP, **Appendix 4.9**).
Further Actions	❑ Request support/additional procurement of equipment, manpower and services via the Operations Chief. ❑ Maintain real time knowledge of the situation and continue to evaluate the spill. ❑ Keep the Operations Chief updated with the **SITREP** form. ❑ Prepare to meet and brief specialist response personnel if these have been mobilised.

OFFSHORE ON-SCENE COMMANDER (OSC)	
Coordinates the tactical offshore oil spill response activities. OIM/ Vessel Master assumes OSC position for spills in water. Reports to: Operations Chief.	
Step	**Actions**
Final Actions	❑ When safe to restart, approve restart of normal site operations ❑ Hold debrief for onsite personnel who were involved in the response ❑ Collate all information received and personal logs of actions taken ❑ Send logs of the incident and other relevant records to the Planning Chief.

5.3.3. Onshore On-Scene Commander (OSC)

ONSHORE ON-SCENE COMMANDER (OSC)	
Coordinates the tactical onshore oil spill response activities. **Pipeline Site Manager assumes OSC position for spills onshore and inland.** **Implementing and coordinating oil spill response activities on the shoreline in collaboration with local government authorities** **Reports to: Operations Chief.**	
Step	**Actions**

Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY**
	❑ Pipeline Site Manager assumes role of **OSC** if spill occurs at onshore and/or inland, regardless of size.
	❑ Make an initial assessment of the incident.
	  ❑ Spill source and cause
	  ❑ Type of hydrocarbon
	  ❑ Size and location
	  ❑ Injuries
	  ❑ Hazards
	❑ If the volume of oil spilt is unknown, estimate the maximum volume which may have spilt and assume 'worst case scenario'
	❑ Mobilise the Damage Control Team, brief the team of the situation.
	❑ Start a Personal Log and record time and details of own actions and own decisions
	❑ Arrange for onshore oil samples to be collected and sent for analysis
	❑ Authenticate the reported emergency details by speaking with the original Observer and obtain full details of the incident
	❑ If the spill leak is from an onshore operation, cordon off the area (i.e. POC)
	❑ Decide on whether to discontinue or cease operations
	❑ Decide if there is a need to evacuate an area
	❑ For all spills, immediately notify Incident Commander (verbally).
	  ❑ For Tier 1 spills send Initial Notification Form (**Appendix 4.0**, INF) within 1 hour.
	  ❑ For Tier 2/3 spills send INF followed by **POLREP** as soon as practicable.
	❑ For Tier 2/3 spills liaise with Operations Chief on additional actions and/or resources required, and the practical deployment of resources.
	❑ Identify tasks that must be performed to implement the initial strategy and identify task leaders for tactical response

ONSHORE ON-SCENE COMMANDER (OSC)	
Coordinates the tactical onshore oil spill response activities. **Pipeline Site Manager assumes OSC position for spills onshore and inland.** **Implementing and coordinating oil spill response activities on the shoreline in collaboration with local government authorities** **Reports to: Operations Chief.**	
Step	**Actions**
Initial Actions	❑ Agree a danger zone for the spill (i.e. a safe distance from the spill which the Damage Control Team must enforce). ❑ If necessary request a helicopter through the Operations Chief to provide aerial observation. Aerial surveillance will allow you to observe and record the size and location of the spill. ❑ Notify Operations Chief via Situation Report (SITREP, **Appendix 4.9**).
Further Actions	❑ Request support/additional procurement of equipment, manpower and services via the Operations Chief. ❑ Maintain real time knowledge of the situation and continue to evaluate the spill. ❑ Keep the Operations Chief updated with the **SITREP** form. ❑ Prepare to meet and brief specialist response personnel if these have been mobilised.
Final Actions	❑ When safe to restart, approve restart of normal site operations ❑ Hold debrief for onsite personnel who were involved in the response ❑ Collate all information received and personal logs of actions taken ❑ Send logs of the incident and other relevant records to the Planning Chief.

5.3.4. Incident Commander

INCIDENT COMMANDER	
Responsible for the overall management of the incident. **Establish response priorities (People, Environment, Asset & Reputation).** **Establish Incident Objectives, Strategy, and Tactical Direction.** **Establish the Termination Criteria in consultation with relevant authorities.** **Monitor scene safety.** **Establish and monitor incident organization adequacy.** **Conduct planning meetings and briefings, as required.** **Approve and authorize the implementation of an Incident Action Plan.** **Approve requests for additional resources or for the release of resources.** **Authorise the release of Holding Statement and draft Press Release.** **Reports to: Incident Commander (Kuala Lumpur)**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ Following notification from **OSC**, discuss incident details and make an assessment of incident severity and collate all information received. ❑ For Tier 2/3 spills liaise with Operations Chief over requirement for additional resources to ensure optimal response. ❑ For all spills > 5bbls notify the Incident Commander in Kuala Lumpur verbally within 1 hour. ❑ Once a **POLREP** is received from the OSC and/ or sufficient information is available, ensure that appropriate Authorities are notified. ❑ Start a Personal Log and record time and details of own actions and decisions. ❑ Establish Incident Objectives, Strategy, and Tactical Direction. ❑ Establish the Termination Criteria in consultation with relevant authorities.
Further Actions	❑ Maintain close contact with the **OSC** via the Operations Chief and obtain regular updates regarding the situation at the spill site. Ensure adequate resources are available. ❑ In the event of Tier 2/ 3 spills, brief Head – MO for external communication with the relevant Authorities and receive regular briefings on same. ❑ Mobilise EMT and support groups as required (ensure roles adequately filled).

INCIDENT COMMANDER	
Responsible for the overall management of the incident. **Establish response priorities (People, Environment, Asset & Reputation).** **Establish Incident Objectives, Strategy, and Tactical Direction.** **Establish the Termination Criteria in consultation with relevant authorities.** **Monitor scene safety.** **Establish and monitor incident organization adequacy.** **Conduct planning meetings and briefings, as required.** **Approve and authorize the implementation of an Incident Action Plan.** **Approve requests for additional resources or for the release of resources.** **Authorise the release of Holding Statement and draft Press Release.** **Reports to: Incident Commander (Kuala Lumpur)**	
Step	**Actions**
Further Actions	❑ Provide initial briefing giving details of actions taken. ❑ Receive regular briefings from Chiefs in EMT. ❑ Provide Incident Commander in Kuala Lumpur with regular updates verbally and using **SITREP** forms. ❑ Discuss feedback/ guidance received to brief Chiefs in the EMT. ❑ In the event that Tier 3 resources are required, authorize procurement of OSRL services (refer to **Appendix 4.6 and 4.7**). ❑ In the event of a well blow-out, ensure regular updates received on capping/ relief well progress.
Final Actions	❑ Obtain approval from relevant authorities on incident close-out/termination. ❑ Conduct debrief session for EMT members who were involved in the response. ❑ Complete and hand-in Log to Planning Chief. ❑ Authorise final close-out report.

5.3.5. Operations Chief

OPERATIONS CHIEF	
Focal point for communications with OSC. **Responsible for managing all tactical operations and resources of the oil spill incident, which include:** • **Ground or surface-based tactical resources;** • **Aviation (Air) resources (i.e. helicopters and fixed-wing aircraft);** • **Staging Areas** **Reports to: Incident Commander**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ After being notified of the incident, establish direct contact with the OSC to establish details. ❑ Collate all information received from the OSC. ❑ Liaise with the Incident Commander over the requirement for additional resources. ❑ Attend initial briefing. ❑ For Tier 2/3 spills, notify Logistics Chief and ensure that requirements for Staging Areas are made ready. ❑ Start a Personal Log and record time and details of own actions and decisions. ❑ If Tier 2 resources are required, coordinate with OSC, HSE & Liaison Officer and Logistics Chief to arrange mobilisation of own resources and request available external resources. ❑ In the event that Tier 3 resources may be required, coordinate with Logistics Chief to arrange resources from OSRL and for receiving the resources and transportation to the site.
Further Actions	❑ Maintain close contact with the OSC and obtain regular updates regarding the situation. ❑ Attend briefings and maintain regular contact with EMT (e.g. Planning and Logistics functions to ensure adequate provision of resources in line with Action Plan). ❑ Provide Incident Commander with regular updates (e.g. **SITREP**s). ❑ For Tier 2 incidents, continue to liaise with OSC, HSE & Liaison Officer and Logistics Chief and ensure that additional resources have been mobilised for Tier 2 support.

OPERATIONS CHIEF	
Focal point for communications with OSC. **Responsible for managing all tactical operations and resources of the oil spill incident, which include:** • **Ground or surface-based tactical resources;** • **Aviation (Air) resources (i.e. helicopters and fixed-wing aircraft);** • **Staging Areas** **Reports to: Incident Commander**	
Step	**Actions**
Further Actions	❑ Liaise with OSRL in the event that Tier 3 resources are required. ❑ Act as operational focal point to ensure that that all response resources (internal and external) are coordinated to provide an effective and efficient response in line with operational action plans.
Final Actions	❑ Attend debrief for onsite personnel who were involved in the response. ❑ Complete and hand-in Log to Planning Chief. ❑ Be prepared to provide input to the after action report.

5.3.6. Logistics Chief

LOGISTICS CHIEF	
Responsible for obtaining personnel, equipment, materials and supplies needed to mount and sustain emergency response operations and for providing services necessary to ensure that emergency response operations are carried out in a safe and efficient manner. **Reports to: Incident Commander**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ On notification of the incident, report to the ECC ❑ Obtain briefing by Incident Commander ❑ Check Status Boards for the latest information, log arrival on the White Board in the ECC ❑ Start a Personal Log and record time and details of own actions and decisions and all own incoming/ outgoing calls. ❑ Confirm the initial incident severity classification, with the Incident Commander and Operations Chief. ❑ Place aerial surveillance helicopters and support vessels on standby ❑ Advise on the response equipment available ❑ Ensure early availability of MSDS Sheets ❑ Advise and coordinate the EMT on all logistical requirements ❑ Liaise with the Finance & HR Chief to coordinate actions and requirements for Oil Spill Responders i.e. accommodation and transportation, catering and medical services, and sanitation facilities.
Further Actions	❑ Establish a system for recording and tracking all equipment ❑ Establish a refuelling and maintenance schedule for equipment being used ❑ Establish necessary backup systems that can be used to support personnel affected by the incident and those in the response teams ❑ Coordinate Search and Rescue activities ❑ Request aircraft and observer for aerial surveillance activities or equipment transportation ❑ Assist the Planning Chief with the development of the site clean up and waste disposal plan
Further Actions	❑ Ensure all logistical support is provided, e.g. transport and support facilities for all response activities. ❑ Prepare for the potential arrival of Tier 3 equipment and personnel. ❑ Obtain data related with weather, wind, tide, current information, relay information to Planning Chief for oil spill modelling.

LOGISTICS CHIEF	
Responsible for obtaining personnel, equipment, materials and supplies needed to mount and sustain emergency response operations and for providing services necessary to ensure that emergency response operations are carried out in a safe and efficient manner. **Reports to: Incident Commander**	
Step	**Actions**
Final Actions	❑ Attend debrief for onsite personnel who were involved in the response. ❑ Complete and hand-in Log to Planning Chief. ❑ Be prepared to provide input to the after action report

5.3.7. HSE & Liaison Officer

HSE & LIAISON OFFICER	
Responsible to develop and recommend measures for ensuring that all activities in the response to the oil spill are carried out in a safe manner, minimising risk to personnel, the public and environment. **Assess and/or anticipate hazardous and unsafe situations.** **Reports to: Incident Commander**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ Once notified by Incident Commander, report to ECC ❑ Obtain briefing by Incident Commander ❑ Check Status Boards for the latest information, log arrival on the White Board in the ECC ❑ Start a Personal Log and record time and details of own actions and decisions and all own incoming/outgoing calls. ❑ Obtain situation status information and response activities from Operations Chief, and collate all information received from the OSC.
Further Actions	❑ Attend Briefings and maintain contact with Chiefs in the EMT. ❑ Develop the site safety, first aid and medical evacuation plans. ❑ Coordinate medical support and provide advice on personnel safety and fire prevention. ❑ Coordinate regular site inspection of all operational sites for compliance with Health & Safety requirements. ❑ Liaise with OSC, Logistics Chief and Operations Chief to ensure that all operations are undertaken safely and within the requirements of applicable legislation.
Final Actions	❑ Attend debrief for onsite personnel who were involved in the response. ❑ Complete and hand-in Log to Planning Chief. ❑ Be prepared to provide input to the after action report

5.3.8. NOK & Media Officer

NOK & MEDIA Officer	
Responsible to develop and obtain approvals for releasing information to the media, to response teams and other appropriate agencies and organizations. **Assess and/or anticipate hazardous and unsafe situations.** **Reports to: Incident Commander**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ Once notified by Incident Commander, report to ECC ❑ Obtain briefing by Incident Commander ❑ Check Status Boards for the latest information, log arrival on the White Board in the ECC ❑ Start a Personal Log and record time and details of own actions and decisions and all own incoming/outgoing calls. ❑ Obtain situation status information and response activities from Chiefs in the EMT, and collate all information received from the OSC. ❑ Monitor media coverage of the incident and develop press strategy accordingly with assistance from ECC HQ. ❑ Notify PCSB HQ Incident Commander upon approval by the IC. ❑ **THE POLREP MUST BE SENT WITHOUT DELAY EVEN IF INCOMPLETE** ❑ Missing information can be transferred in a Situation Report Form at a later stage.
Further Actions	❑ Maintain close dialogue with local communities and authorities to disseminate and gather information. ❑ Engage with local communities to seek their involvement and assistance in cleanup activities. ❑ Keep Incident Commander updated of developments and media reports. ❑ Prepares draft press statements for endorsement by IC and approval by HQ. ❑ Set up a Media Centre to respond to media enquiries. ❑ Maintain close contact with the PETRONAS Regional Office and provide updates in status on a regular basis. ❑ Attend briefings and maintain contact with Coordinators
Final Actions	❑ Attend debrief for onsite personnel who were involved in the response. ❑ Complete and hand-in Log to Planning Chief. ❑ Be prepared to provide input to the after action report

5.3.9. Planning Chief

PLANNING CHIEF	
Responsible for all matters related to technical and information support. Coordinates, supervise and organize technical specialist supports. **Maintains an accurate timed log of events, instructions and communications.** **Reports to: Incident Commander**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ Attend initial briefing by Incident Commander. ❑ Ensure that the ECC is set up properly and that appropriate equipment and supplies are in place. ❑ Start to collect, analyse information and ensure that information regarding the emergency situation and location of critical resources is displayed at the event boards ❑ Start a Personal Log or equivalent and record time and details of own actions and decisions.
Further Actions	❑ Ensure proper and effective log keeping is maintained by members of the EMT ❑ Ensure that status boards are kept current, neat and legible. ❑ Support Incident Commander in delivery of regular incident briefings. ❑ Maintain contact with EMT Coordinators to ensure that all significant events and issues are recorded. ❑ Provide Incident Commander and members of the EMT regular updates ❑ Recommend (as required) the activation of support teams in anticipation of or immediately following an incident or emergency. (e.g. environmental team, medical team, shoreline assessment team, dispersant application team). ❑ Prepare and disseminate Oil Spill Response Strategy, Objectives and Action Plan ❑ Ensure that worksites activities are integrated into the overall planning process.
Final Actions	❑ Attend debrief and provide support for incident investigation ❑ Complete and hand-in Log to Computer Operator ❑ Be prepared to provide input to the after action report

5.3.10. Finance and HR Chief

FINANCE AND HR CHIEF	
Manages all financial aspects of an incident. **Ensures accurate recording of daily personnel time.** **Managing all financial matters pertaining to vendor contracts, leases, and fiscal agreements.** **Establishes local sources for equipment and supplies, rental agreements, and document billing invoices.** **Maintains an accurate time log of events, instructions and communications.** **Administers all claims for compensation and injuries, including medical claims.** **Provides cost analysis and maintains accurate records of incident cost.** **Reports to: Incident Commander**	
Step	**Actions**
Initial Actions	❑ **ENSURE SAFETY IS FIRST PRIORITY** ❑ Attend initial briefing by Incident Commander. ❑ Ensure that the ECC is set up properly and that appropriate equipment and supplies are in place. ❑ Start to collect, analyse information and ensure that information regarding the emergency situation and location of critical resources is displayed at the event boards ❑ Start a Personal Log or equivalent and record time and details of own actions and decisions.
Further Actions	❑ Ensure proper and effective log keeping is maintained by members of the EMT ❑ Ensure that status boards are kept current, neat and legible. ❑ Support Incident Commander in delivery of regular incident briefings. ❑ Maintain contact with EMT Chiefs to ensure that all significant events and issues are recorded. ❑ Provide Incident Commander and members of the EMT regular updates. ❑ Monitor and records all expenses of all resources deployed for the cleanup operations and prepares expense reports ❑ Monitor timeliness and accuracy of personnel documentation and financial records. ❑ Arrange adequate facilities for labor force (shelter, toilet, catering) ❑ Establish sources for equipment supplies and rentals and maintain agreements.

FINANCE AND HR CHIEF	
Manages all financial aspects of an incident. **Ensures accurate recording of daily personnel time.** **Managing all financial matters pertaining to vendor contracts, leases, and fiscal agreements.** **Establishes local sources for equipment and supplies, rental agreements, and document billing invoices.** **Maintains an accurate time log of events, instructions and communications.** **Administers all claims for compensation and injuries, including medical claims.** **Provides cost analysis and maintains accurate records of incident cost.** **Reports to: Incident Commander**	
Final Actions	❑ Attend debrief and provide support for incident investigation ❑ Complete and hand-in Log to Planning Chief. ❑ Be prepared to provide input to the after action report

5.3.11. Computer Operator

COMPUTER OPERATOR	
Responsible for maintaining an accurate written record of all the information and actions carried out by the EMT within the ECC. Planning Chief to assign this role from available resources. **Reports to: Planning Chief**	
Step	**Actions**
Initial Actions	❑ On notification of the incident report to the ECC and log arrival ❑ Obtain briefing by Incident Commander ❑ Switch on computer and start Event Log Sheet Excel file. ❑ Update Event Log Sheet with the latest information (ensuring information is current, neat and legible) ❑ Maintain a dated and timed record of EMT information, actions and communications
Further Actions	❑ Liaise with Planning Chief and other Section Chiefs and update Status Boards ❑ Commence a time record for key information about the incident including: • Record the EMT members present • Record the latest status on the Status Board • Record actions to be taken ❑ Record Briefings and Time Outs
Final Actions	❑ Attend debrief and provide support for incident investigation ❑ Collate all personal logs ready for incident review and provide to Incident Commander.

Table of Contents

6. Training, Exercises and Review

6.1. Training

PCML personnel will receive training relating to the current OSRP through a Plan Roll-Out Workshop. Specific operator training in the use of oil spill response equipment will be provided.

The International Maritime Organisation (IMO) and PIMMAG provide details of recommended training courses (**Appendix 6.1)**.

PCML shall ensure that the key individuals identified in this OSRP are trained appropriately. An overview of the training required is summarised below in **Table 6.1**.

Table 6.1: Level of Training Required for PCML personnel

Emergency Response Role / Job Title	Course Standard		
	IMO Level 3	IMO Level 2	IMO Level 1
Senior Manager & All PCML EMT	✓		
HSE Staff	✓	✓	
Managers including OIMs, PSM and Drilling Supervisor		✓	✓
Damage Control Team (DCT)			✓

A database will be maintained containing a record, for all company personnel who have attended oil spill response training (or participated in oil spill response exercises) – refer to **Appendix 6.2**.

In addition, volunteers and contractors' workers shall be provided with appropriate briefing/training prior to undertaking designated activities as part of the overall spill response that they are suitably trained. For example, sufficient volunteers and contractors' workers should be trained in dispersant spraying, and the deployment of booms and skimmers from vessels.

6.2. Exercises

The purpose of exercises is to improve responder's skills and maintaining their awareness. Exercises will also provide management with an opportunity to assess equipment, familiarise personnel with their roles and responsibilities, measure performance, obtain feedback from participants and give a clear message about the company's commitment to oil spill preparedness and response. Any feedback or lessons learnt from oil spill exercises are compiled and analysed by the HSE Department for the response plan improvement.

Table 6.2 provides an overview of the different types of exercises recommended.

A record of training and exercises undertaken will be maintained (**Appendix 6.2**). The training database will be updated with the most current information and relevant personnel will be notified of their training requirements. Any feedback or lessons learnt from oil spill exercises are compiled and analysed by the HSE Department for the response plan improvement.

Table 6.2: Overview of Exercises

Exercise	Description	Frequency
Oil Spill Contingency Plan Workshop	• Familiarisation of staff with roles, procedures and responsibilities; • Review of each section of the plan by encouraging discussion to make useful and practical improvements to the plan.	Yearly
Notification	• Practice of the procedures to alert and call out the emergency management teams; • Conducted telephone or radio test, depending on the source of initial oil spill report; • Test communications systems, availability of personnel, travel options and ability to transmit information quickly and accurately. Duration: 1-2 hours, held at any time of the day or night.	Weekly Weekly Communications test once a month.
Tabletop	• Simulated oil spill incident to test teamwork, decision-making and procedures; • Planning of a realistic scenario, clearly defined objectives for participants, exercise inputs, and a well briefed team in control of the running and debriefing of the exercise. Duration: 2-8 hours.	Yearly
Equipment Deployment **Offshore and Shoreline Oil Recovery Equipment**	• Designed to give personnel a chance to become familiar with equipment, or part of a detailed and specific emergency response scenario, where maps, messages, real-time weather and other factors can be included; • Test / evaluation of the capability of equipment, personnel or functional teams within the wider oil spill response; • Verification of availability of oil spill response equipment and its working order; • Level of difficulty can be varied by increasing the pace of the simulation or by increasing the complexity of the decision-making and co-ordination needs. Duration: 1 day.	As and when required

6.3. Review

A full review shall be conducted every three years. The recommendation arising from the review shall be submitted to PCML Management for approval.

In line with PCSB HSEMS, the review will cover wholly or any parts of the PCML Oil Spill Response Plan.

6.3.1. Annual Preparedness Review (APR)

The purpose of this review is to assess the level of preparedness in responding to oil spill incident. The review shall be carried out at least once every year.

6.3.2. Management Review

The purpose of the review is to assess the overall effectiveness and adequacy of the PCML Oil Spill Response Plan. The management review shall be carried out yearly by the MO – HSE Committee (MOHSEC). Findings and recommendations shall be presented to the MO Management Committee (MOMC) for approval.

Appendix 3
Emergency Management Plan

MYANMAR OPERATION
EMERGENCY MANAGEMENT PLAN

TABLE OF CONTENTS

AUTHORITY FOR ISSUE

Authority for Original Issue

Issue Approval
Issue of this document has been formally approved by:

Signature:	
Name:	Ahmad Lutpi B Haron
Reference Indicator:	Myanmar Operation
Position:	Head of Myanmar Operation
Date:	15/11/2013

Document Custodian
The following person has been assigned as the document custodian:

Signature:	
Name:	Linn Thura Htun
Reference Indicator:	Myanmar Operation
Position:	Health, Safety & Environment Manager
Date:	15/11/2013

This document has been prepared by the following person:

Signature:	
Name:	Myo Min Htike / Saw Sydney Awgyi
Position:	Exe.HSE Management System
Date:	November 2013

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13	Finance Manager	MO
14	Project Manager	MO
15	MO ECC Room	MO
16	Offshore Installation Manager (OIM) Yetagun Platform	MO
17	Pipeline Site Manager (PSM) Pipeline Operating Centre (POC)	MO
18	Metering Station (MS)	MO
19	Dawei Base	MO
20	Library / Live link	MO
21	PCSB MD/CEO	PCSB – Kuala Lumpur
22	Head HSE, PI	PI-Kuala Lumpur
23	Head Crisis Management, RAC	EP-HSE – Kuala Lumpur
24	EP ECC Room	PCSB - Kuala Lumpur
25	PETRONAS COMCEN	PETRONAS - Kuala Lumpur

Amendment Summary

This sheet must be completed in detail at each revision once this document has been approved.

Details must include revision number, description and indication of which pages and paragraphs have been revised, date of revision approval, approvers' title and signature.

Rev	Description	Date	Approver Title	Signature
0	Original Issue	June 2004	GM	
1	Conversion to Incident Command System	January 2006	GM	
2	Changed the title of the document from Yangon Office Emergency Coordination Plan to MO Emergency Management Plan Added Mercury Incident Emergency Response Plan Updated MO Emergency Contact Numbers	October 2007	GM	
3	Updated as per PTS 60.0112 GCPS and PCSB Emergency Response Plan Development Guideline	November 2013	GM	

Notes:

(1) Revision updates are required annually, or earlier if dictated by significant operational change, project change, major audit finding, exercise lessons or due to domestic regulation

(2) Document Holders to update Amendment Record as and when amendments/new revisions are received.

(3) For description of amendment the Document Holder should indicate correction, modification, and update or deletion issue.

(4) Document Holder to enter their company reference number, sign and date the record of entry.

(5) Where part amendments are issued, the relevant page(s) will be identified with a lower case letter in the revision status line in the header.

Any proposed changes are to be submitted to the HSE Department, MO Yangon Office as per the revision procedure contained in this document.

PREFACE

This Emergency Management Plan has been developed to ensure that MO reacts quickly and effectively in the event of an emergency in its operations. The document is formulated to meet all Company and legislative requirement and to satisfy all moral obligations in the event of any such emergency.

This document addresses the actions to be taken before, during, and after an emergency or disaster. The ability to contain and respond effectively to an emergency is one of the most challenging priorities facing our operations. The Company regards all hazards and risks can be managed and mitigate, if appropriate efforts were made. In doing so, MO vigorously pursues efforts to deter and preempt these risks and manage through good HSE practice.

This plan was built upon previous experiences for managing risks and further elaborated as emergency management strategies, a mechanism and management structure undertaken by the country office to mitigate all possible emergency situations. The management strategies include implementing measures to reduce our vulnerabilities, responding rapidly and effectively to incidents or actual emergency, and giving the highest priority to developing sufficient capabilities to mitigate and manage the consequences.

To ensure this management strategy is implemented in a coordinated manner, this Emergency Management Plan, hereafter referred to as the EMP, is designed to provide overall guidance to the Emergency Management Team concerning how they would respond to an incident or emergency that occurs in the Company jurisdictional areas. This plan outlines an organized and unified capability for a timely, coordinated response by the Emergency Response Teams and the assistance that will be rendered by other emergency support agencies and government authorities.

It establishes conceptual guidance for assessing and responding, notifying appropriate service providers and government agencies, and deploying the requisite resources to assist the emergency management team in facilitating inter-agency coordination for mitigation and controls. Lastly, it defines the relationships between structures under which the Company will marshal consequence management resources (including supports from HQ Office) to respond to an emergency or crisis situation.

ABBREVIATIONS AND ACRONYMS

The abbreviations and acronyms used in this document shall have the following meaning:

CASEVAC	Casualty Evacuation
CMP	Crisis Management Plan
CMT	Crisis Management Team
CMERT	CMERT Crisis Management and Emergency Response Training
COMCEN	Communications Centre at PETRONAS Head Quarters, Kuala Lumpur
DCT	Damage Control Team
DM	Duty Manager (same as Incident Commander and ERM)
ECC	Emergency Control Centre
EMP	Emergency Management Plan
EMT	Emergency Management Team
EOC	Emergency Operation Centre
ERP	Emergency Response Plan
ERT	Emergency Response Team
FSO	Floating Storage & Offloading
IAP	Incident Action Plan
IC	Incident Commander
ICS	Incident Command System
IMS	Incident Management System
KLCC	Kuala Lumpur City Centre
MEDEVAC	Medical Evacuation
MO	Myanmar Operation
MOGE	Myanmar Oil & Gas Enterprise
MS	Metering Station
NOK	Next of Kin
OIM	Offshore Installation Manager
OPU	Operating Unit
OSC	On Scene Commander
PCSB	PETRONAS Carigali Snd Bhd
PETTs	PETRONAS Twin Towers
PIC	Person-in-Charge
PICS	PICS PETRONAS Incident Command System
POC	Pipeline Operating Centre
UC Unified Command	UC Unified Command

GLOSSARY

Activation	The implementation of emergency response capabilities, procedures, activities and plans in response to an emergency or emergency declaration.
Alert	Notification that a potential emergency situation exists or has occurred; direction for recipient to standby for possible activation of emergency response plan.
Area Command	An organization established to: 1) Oversee the management of multiple incidents that are each being handled by an Incident Command System organization; or 2) To oversee the management of a very large incident that has multiple Incident Management Teams assigned to it. Area Command has the responsibility to set overall strategy and priorities, allocate critical resources based on priorities, ensure that incidents are properly managed, and ensure that objectives are met and strategies followed.
Assessment Meetings	Two-way meetings held in the ECC and scheduled by the IC for the purpose of checking response progress and reviewing objectives, problems and task allocation.
Assignments	Tasks given to resources to perform within a given operational period, based upon tactical objectives in the Incident Action Plan.
CASEVAC	Casualty Evacuation. The urgent evacuation of a sick or injured person because there is a risk of serious injury or death if more comprehensive medical treatment is not available quickly. A Casevac may involve special transport arrangements (i.e. ad-hoc charters, air ambulance, etc.) and will almost certainly require medical staff to accompany the patient.
Cold Zone	This area contains the command post and such other support functions as are deemed necessary to control the incident. This is also referred to as the clean zone or support zone.
Common Emergency Management System (CEMS)	Combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure with responsibility for management of assigned resources to effectively direct and control the response to an incident; PETRONAS ICS.
Command Network	Direct communication link established between the EMT Operations Section Chief and the ERT On-Scene Commander
Control Zone	The designation of areas at an incident based upon safety and the degree of hazard. Many terms are used to describe the zones involved in a hazardous materials incident.

Emergency	Unexpected condition resulting in fire, explosion, oil and/or chemical spill, gas escape, serious injury or fatality, structure damage, total evacuation, severe electrical storm, aircraft or vehicle crash, vessel collision or sinking, deliberate act of arson or sabotage etc., all of which require prompt action.
Crisis Network	The direct communication link established between the EMT Incident Commander and the EP BU Crisis Manager or Head of Country if CSP activated.
Emergency Control Centre (ECC)	A site from which management-appointed response personnel exercise direction and control in an emergency.
Emergency Operations Centre (EOC)	The physical location at which the coordination of information and resources to support incident management (on−scene operations) activities normally takes place. An EOC may be a temporary facility or may be located in a more central or permanently established facility.
Emergency Response Team	A team of personnel, trained to manage and respond to an emergency. These are the Site Emergency Response Team, Regional Emergency Response Team and Corporate Emergency Response Team.
Hot Zone	The area immediately surrounding an incident, which extends far enough to prevent adverse effects from hazardous materials releases to personnel outside the zone. This zone is also referred to as the exclusion zone or restricted zone.
Incident Commander	He is normally the first person to be contacted in case of emergency. He is responsible, in conjunction with the Person-In-Charge of the installation on which the emergency occurred, for assessing the scale of the emergency and initiating the appropriate response actions, including, if deemed necessary, calling out the Regional Emergency Response Team. He shall also notify all relevant parties of the emergency. During the emergency, the Regional Incident commander shall normally remain in overall charge of and is responsible for directing the Regional Emergency Response Team, for authorizing, or obtaining authorization for, any funds required for materials, equipment, contract services or specialist personnel necessary to resolve the emergency.
Incident Action Plan (IAP)	The IAP, which is initially prepared at the first meeting, contains general control objectives reflecting the overall incident strategy and specific action plans for the next operational period. When complete, the IAP will have a number of attachments. The IAP is used to manage change from one operational period to another in support of the OSC. It is prepared by Planning for review by Operations. The IC is the issue authority.

Initial Briefing	Delivered by the EMT IC at the beginning of the emergency in the ECC which is one way (no questions) and which is designed to push information in front of the EMT.
Incident Command System (ICS)	An organized system of roles, responsibilities, and standard operating procedures used to manage and direct emergency operations.
Incident Management System	The process used by the EMT to navigate the emergency phase, and which consists of; briefings (initial and subsequent), objectives (based on core values, aligned with PEAR priorities, and aligned in support of the ERT objectives), tactical response operations (supporting the field tasks), information management (situation status display), response thought process (solving problems), incident potential (informal and formal assessment of the implications), meetings (scheduled assessment meetings), and action plans (incident action planning cycle managing change from one operational period to another)
Incident Objectives	Statements of guidance and direction necessary for the selection of appropriate strategies, and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed. Incident objectives must be achievable and measurable, yet flexible enough to allow for strategic and tactical alternatives.
International Direct Dialing (IDD)	With an IDD telephone line, you can make a direct overseas call by using the international access code. With non-IDD telephones, overseas calls must be made via a Myanmar Telecomm Authority operator.
Installation	Offshore - Yetagun A & B Platforms, FSO, Drilling Rig, Vessels etc. Onshore - POC, MS, Dawei Base, Thaketa Base and Yangon Office
Jurisdiction	The range or sphere of authority. The teams and agencies have jurisdiction at an incident related to their legal responsibilities and authority for incident mitigation. Jurisdictional authority at an incident can be political/geographical (e.g., site, facility, state or federal boundary lines), or functional (e.g., police department, home ministry, etc.). (See Multi-Jurisdiction Incident.)
Major Emergency	An emergency that, on assessment by the PIC, cannot immediately be brought under control with the first line response team and available equipment onsite without outside assistance.

MEDEVAC	Medical Evacuation. The routine evacuation of a sick or injured person to a location where they can receive more appropriate medical treatment than is possible at the work site. A MEDEVAC will typically involve normal transport arrangements, although timetables may be accelerated and medical staff may accompany the patient during travel.
Minor Emergency	An emergency which when assessed by the PIC, can immediately be brought under control with the first-line response team and available equipment located onsite without any outside assistance. However, if there is any uncertainty regarding the scale of the emergency, it should initially be treated as a major emergency.
Mitigate	Any action to contain, reduces, or eliminates the harmful effects of a spill or release of a hazardous substance/material.
Person-In-Charge (PIC)	PIC of the site/installation/drilling rig or vessel at the time of the emergency. He is the person who coordinates all emergency response activities carried out by his own personnel and any additional assistance from outside the installation.
Personnel On Board (POB)	POB is used in this document to mean the number of people at a certain location, not necessarily on a vessel or aircraft. For example "POB at the Pipeline Operating Centre" means the total number of people located at the POC near Kanbauk.
Personal Protective Equipment	The equipment provided to shield or equipment to isolate a person from the chemical, physical, and thermal hazards that may be encountered at a hazardous materials incident. Adequate personal protective equipment should protect the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing. Personal protective equipment includes both personal protective clothing and respiratory protection.
Resources	All personnel and major items of equipment available, or potentially available, for assignment to incident tasks on which status is maintained.
Situation Status Display	The display managed by Planning which provides the entire EOC staff a ready view of what has happened, where it has happened, and what is being done about it. It should include the following boards; incident facts, casualty status, organization, contacts, map, response objectives, problems/ solutions, action tracking, resource tracking, and a schedule of assessment meetings.
Span of Control	A Command and Control term that means how many organizational elements may be directly managed by one person. Span of Control may vary from three to seven, and a ratio of one-to-five reporting elements is recommended.
Staging Area	That location where incident personnel and equipment are assigned awaiting tactical assignment.

Stakeholders	Any person, group, or organization affected by and having a vested interest in the incident and/or the response operation.
Strategy	The general plan or direction selected to accomplish incident objectives.
Supply Network	Direct communication network established between the EMT Logistics Section Chief and the ERT Staging Area Manager
Tactics	Deploying and directing resources during an incident to accomplish the objectives designated by strategy.
Tactical Direction	Directions given by the IC that includes: the tactics appropriate for the selected strategy, the selection and assignment of resources, tactics implementation, and performance monitoring for each operational period.
Task Force	A group of resources with common communications and a leader assembled for a specific mission.
Triage	The classification of casualties according to the severity of their injuries in order to set priorities for treatment in a multiple casualty situation.
Unified Command (UC)	A unified team that manages an incident by establishing a common set of incident objectives and strategies. This is accomplished without loss or abdication of agency or organizational authority, responsibility or accountability.
Warm Zone	The area where personnel and equipment decontamination and hot zone support takes place. It includes control points for the access corridor and thus assists in reducing the spread of contamination. This is also referred to as the decontamination, contamination reduction, or limited access zone/corridor.

REFERENCED DOCUMENTS

095/020/002	MO Initial Incident Notification Guideline EP Incident Notification Flowchart
095/020/006	Medical Evacuation and Reception Procedures
095/020/007	Media Response Procedure
095/020/010	Guide on Return of Remains of Deceased
WW ALL S 07 001	PCSB Health, Safety and Environment Management System Manual
MY ALL S 07 003	PCSB HSEM 2.1 - Supervisory Safety Procedure Manual Section 4: Incident Investigation & Reporting
095/009/001/032	Safe Handling of Mercury and Mercury Compound
PTS 18.0510	Group Contingency Planning Standards (GCPS)
PTS 18.0509	Emergency Drills & Exercise Guidelines
PTS 60.0112	Group Contingency Planning Standards (GCPS)

MY ALL PCSB Emergency Management Plan Development Guideline HSE MCF

Section 1
INTRODUCTION
Contents

1. INTRODUCTION

This Emergency Management Plan has been developed to provide guidelines to the on-duty emergency management team, who are directly or indirectly involved, when responding to emergencies occurring at MO operational areas.

The document has been developed to complement the existing Site Emergency Response Plan, which cover in detail the required response to specific emergencies. The document provides details of the management philosophy utilized by MO when defining the organization and resources used in the response to an emergency and details the overall responsibilities required to handle effectively any emergency, which may arise.

All personnel with emergency roles and responsibilities must ensure that they become familiar with the requirements and procedures contained in this manual.

1.1 Purpose

This Plan establishes procedures to manage and coordinate the mitigation and control measures following an emergency or disaster situation. The following objectives have been established for this plan:

- This EMP is designed to support the MO ERPs
- Attend to the primary priorities of:
  - People
  - Environment
  - Assets
  - Reputation
- Sets forth fundamental policies, planning assumptions, a concept of operations, the emergency management team responsibilities, and response and mitigation actions.
- Addresses linkages to other existing emergency management plan developed for specific incidents.
- Maximize the effectiveness of counter-measures through an established plan that consists of the following phases:
- Over-reaction; applying all emergency resources as soon as possible
- Assessment; anticipating problems before they become a reality
- Response; the application of resources to contain, isolate & stabilize the emergency
- De-Escalation; the scaling down of the response towards agreed termination criteria which marks the end of the emergency phase. Assign responsibilities to designated EMT members and provide guidance for emergency support groups during prolonged periods of mitigation.
- Serves as the foundation for the development of detailed supplemental procedures to complement this plan for response activities, rapidly and efficiently.
- Ensure compliance with applicable regulatory requirements and industry standards for emergency management.

The plan is organized in sections for easy reference. Each major section deals with a component of the plan beginning with governing policies, plan activation through emergency counter-measures and restoration of normal operations. The appendices contain information such as forms which may be required during the emergency response process; partners contact lists, vendor lists, etc.

1.2 Scope

All activities that are managed by MO are covered by this Emergency Management Plan. All EMT members are required to understand and be familiar with their duties as they pertain to this Plan.

When there is an actual emergency or potential for an emergency, the procedures written in this Plan will be carried out immediately.

This document covers the response of MO to emergencies affecting Myanmar Operations, specifically the following area operations:

- Yetagun A, B & C Platforms
- Pipeline Operating Centre (POC)
- Metering Station (MS)
- Floating Storage and Offloading (FSO)
- Yangon Office
- Drilling Rig
- Onshore Blocks
- Vessels
- Etc.

This document should be used in conjunction with the following according to the nature of the emergency.

(a) Oil Spill Contingency Plan
(b) Mobile drilling rig emergency procedures (contractors)
(c) MEDEVAC / CASEVAC Procedures
(d) Accident Reporting Procedures
(e) Diving Emergency Procedures (Contractors)
(f) General Procedures for Simultaneous Operations.

This plan shall be used by the on-duty EMT members that are tasked to provide emergency assistance. This plan will be reviewed annually and updated when any of the following occurs:

- Applicable regulations are introduced or revised.
- The plan fails in an exercise or real emergency.
- Changes to the configuration of the facility.
- New hazards are introduced into or near the facility.
- Existing hazards are eliminated.
- There are changes to personnel who have a role in the plan.
    - Applicable regulations are introduced or revised.
    - The plan fails in an exercise or real emergency.
    - Changes to the configuration of the facility.
    - New hazards are introduced into or near the facility.
    - Existing hazards are eliminated.
    - There are changes to personnel who have a role in the plan.

All changes shall be approved by MOMC. The complete Plan shall be distributed to all relevant parties.

1.3 Overview

During an emergency situation, the centre of operation is known as the Emergency Control Centre (ECC). All information and coordination, regarding emergency management operations, shall flow through the ECC. The centre is staffed by the Emergency Management Team (EMT) and shall include one Incident Commander and members of the appointed representatives.

Within this framework, the EMT can provide, equipment, supplies, facilities, managerial and technical services in support of site ERT mitigation and control efforts. The Incident Commander and the other team members shall be involved in providing all required supports.

Under PETRONAS Incident Command System, the HSE Department has been delegated with primary responsibility for coordinating MO emergency preparedness, planning, management, and emergency assistance functions. The department also has been delegated with responsibility for establishing emergency assistance policy. In this stewardship role, the department has the lead in developing this plan.

1.4 Document Structure

This Plan applies and shall be used by the emergency management team to coordinate emergency management operations occurring at MO operations. The plan presented here is based on the following planning assumptions:

1 The plan is current, having been reviewed, maintained and updated on an annual basis. Plan training exercises have been performed.
2 Emergency mitigation is performed in accordance with the procedures that have been set forth within this plan and appendices.
3 The EMT has current strategies in place and any weaknesses have been identified and addressed.
4 Appropriate emergency response equipment is available and accessible.
5 The plan is to be a document that reflects a changing environment. Therefore, part of the plan is to implement on-going practices, in order to sustain the state of readiness.

This Plan utilizes the Common Emergency Management System (PETRONAS ICS) in organizing manpower and equipment during response and recovery operations.

The plan is organized in sections for easy reference. Each Section deals with a component of the Plan beginning with response concept, plan activation through restoration of normal operations. The appendices contain information such as incident notification flow chart, dedicated contact numbers, vendor lists, etc.

1.5 Ownership and Maintenance

This plan shall be reviewed annually by the Custodian, HSE Manager. All EMT members shall be responsible for reviewing their team responsibilities and making any recommendations for change. The plan will also be updated as a result of all post-incident review processes, as a result of information gained from plan training exercises and as a result of new Group Contingency Planning Standard.

Recommendations arising from the annual review will be submitted to MO management for discussion and approval each year. Minor updates may be made by the Custodian at any time during the year. The Custodian holds ownership to this Manual.

The proper maintenance of this Plan will be the responsibility of ALL copy holders. It will be their responsibility to incorporate all approved revisions into their assigned copy to ensure that the plan is maintained. All removed pages are to be properly disposed or shredded.

Section 2

AUTHORITIES AND POLICIES

Contents

2. AUTHORITIES AND POLICIES

This section describes the authorities and policies associated with emergency and crisis management. Authorities and policies will govern the response concepts and what directs the planning and development of an operational emergency management systems.

2.1 Authorities

The on-duty Emergency Management Team shall give their total response to effectively minimise the harmful effect of an emergency and overcome such emergency as quickly as possible.

The Incident Commander is in overall charge of the response and is responsible for directing key personnel, for authorising, or obtaining authorisation of, any funds required for materials, equipment, contract services or specialist personnel necessary to bring the emergency under control.

Under the common emergency management system, the Person-in-Charge may declare a major emergency or crisis situation. The declaration is based upon the findings by the ERT Leader(s) and personnel at the incident scene, indicating the emergency is of sufficient severity to warrant a declaration. The PIC will alert (emergency declaration) the IC and be advised to mobilize the EMT.

The IC shall respond to all requests for assistance from the PIC without delay. It is the sole responsibility of the PIC to identify such requirements and of the IC and EMT to implement them.

Response by EMTs under this plan has precedence over other activities, except for GROUP security implications (deemed to be of a higher priority). If an emergency or emergency affects the security of the GROUP, appropriate security authorities, plans, and procedures will be used.

Following a declaration, the IC will authorise use of resources in support of on-scene assistance efforts to the extent that provision of the support does not conflict with other agency emergency missions. For good understanding, the ERT will manage the life-saving and other emergency mitigation efforts while the EMT will coordinate the overall mitigation and recovery efforts.

The IC is responsible for notifying all relevant authorities and PCSB-HQ management in Kuala Lumpur with the Incident Notification Form template, as necessary; brief them on the emergency and advising them of the actions being taken to bring the emergency under control.

If outside assistance is required from other agencies, e.g. for the use of equipment, transports, etc, all requests will be channelled through HQ EMTIC. The requirements should subsequently be confirmed by fax in writing wherever possible.

The General Manager shall be informed of the emergency by the IC. They shall consider strategic issues, such as the impact of the emergency on the country operations as a whole in terms of operability and continuity of supply to customers, public relations (including reviewing draft press releases prior to sending these to PCSB HQ in KL for approval), setting policies for welfare and support to be provided to employees and relatives/next of kin, high level contacts with local authorities and other organisations and representation of the company in dealing with the media.

The E & P Health, Safety and Environment Department shall be notified of all emergencies, will provide whatever assistance lies within its capability and will call out HQ-EMT, as deemed necessary.

2.2 Response Policy

MO policy on contingency planning and response to emergencies take cognizance of both existing Company and statutory requirements as they relate to the handling of emergencies relevant to the Company operations, as well as to satisfy all moral obligations of the Company.

It is the policy of MO that:

(a) In the event of any emergency occurring in any of its operations, the respective Site Emergency Response Team shall be immediately mobilised to deal with the emergency.

(b) Additionally, the respective Regional Emergency Management Team as well as Corporate Emergency Management Team (both headed by management), shall also be mobilized, as necessary, to provide whatever support required by the site Emergency Response Team.

(c) Both Teams shall give their total support to the site Emergency Response Team with a view to effectively minimizing the harmful effect and to overcome the emergency as quickly as possible. When managing the emergency, the following priorities shall prevail:

1. Saving of lives and safety of personnel;
2. Preserving public health and safety;
3. Preserving the environment;
4. Protecting the property and investment; and
5. Maintaining the company reputation;

(d) Consistent with the overall policy, it is also a requirement that the Emergency Response Procedures of Contractors working for, and on behalf of MO, shall conform to the contractual requirement and policy on emergency response.

(e) Additionally, regular training of all personnel, both Company and Contractors personnel, shall be conducted to ensure an effective emergency response preparedness exist throughout the Company's operations.

2.3 Terms of Reference EMT Members

The appointed emergency management team members are responsible for the co-ordination of response efforts during any emergency. The team is led by a Duty Manager. When on emergency duty, EMT members activities take precedence over any other duties/or off-site visits. The terms of reference for these EMT members are as listed below.

(a) A company executive and management-appointed person (in writing by General Manager or Managing Director)

(b) Good working knowledge in operations, engineering or management-related activities

(c) Familiar with hazards and risks associated with various phases of E&P operations

(d) High level of maturity, analytical ability, good leadership qualities, with effective communication and interpersonal skills

(e) Responds to all emergency call-for-assistance when on-duty

(f) Vested with the department and management authority in the discharge of duty

(g) Co-ordinate all emergency supports and counter-measures

(h) Attend emergency management training and oil spill management course

(i) Participate in at least one (1) full-scale emergency response exercise

(j) Attend emergency induction training and department briefing before taking up duty

(k) Only delegate emergency duty to another trained team member

(l) Listed in the Weekly Duty Roster when on emergency duty for the week

(m) Duty Roster is coordinated by HSE, with changes require management approval.

Note: Appointment to Duty Manager designate must be E3 and above at Operating Division. While for Headquarters the individual must be E4 and above. Appointment of other EMT members must be E2 (or equivalent) and above.

2.4 Terms of Reference ERT Members

The appointed emergency response team members are responsible for the mitigation efforts at worksite or facility during any emergency. The team is led by the On-scene Commander. When on emergency mitigation, ERT members' activities take precedence over any other duties at worksite. The terms of reference for these ERT members are as listed below.

(a) A full-time employees of worksite or facility operations team

(b) Good working experience associated with maintenance and operations

(c) Good appreciation of hazards and risks associated with the worksite operations

(d) Able to respond to all emergency call-for-assistance

(e) Vested with the management authority in the discharge of duty

(f) Attend site emergency response team and oil spill operator training

(g) Management-appointed person (in writing by Business Head)

(h) Delegation of emergency duty is only to another trained team member

(i) Listed in the worksite emergency response Duty Roster when on emergency duty

(j) Duty Roster is managed by On-scene Commander; with changes require facility management approval.

Note: Appointment to On-scene Commander designate must be an Executive, while for smaller facility i.e. satellite platform, the individual must be a Supervisor-appointed person.

2.5 Emergency Classifications

Classification of an incident is subjective and may change after additional facts are gathered.
After the Duty Managers have been notified, the incident may be re-classified as deemed appropriate.

PETRONAS three-tiered response definitions provide the following classification.

Tier 1- Minor

A situation where there is no danger to life and where risk of damage to property and environment is minimal. The emergency is within the control of the Facility/ vessel, Operation and OPU.

Tier 2 - Major

A situation where there is danger to life and risk of damage to property and environment. The emergency is within the control of the Facility / vessel, Operation and OPU with limited external assistance.

Tier 3 - Crisis

A situation where there is a potential for multiple fatalities and severe damage to property and the environment involving neighboring sites and surrounding communities. The emergency is clearly beyond the capacity of the Facility/ vessel, Operation, OPU and Business to control and consequently requires action from PETRONAS corporate, government or other external parties.

2.6 On-duty Assignments-EMT Members

In the absence of the Duty Incident Commander for any reason, the replacement will be proposed by HSE Department and agreed by GM to act as IC.

Personnel appointed for emergency duty shall be available 24 hours and 7 days active coverage and ready for possible call out. The common rules while on emergency duty are:

- Available for handover or takeover session inside the ECC.
- Ensure telephone contact(s) remain current and advise on changes in writing to HSE Unit.
- Understand emergency responsibilities and be familiar with those of other members.
- Make available a copy of the weekly duty roster and other support documents.
- Keep Duty Manager informed of own whereabouts and means of contacting at all times.
- If, due to circumstances a team member cannot be available;
  1. Arrange for replacement and transfer of duty phone
  2. Advise HSE Unit of the change so that an update made to the Duty Roster.
- Duty can only be transferred to a team member that is trained as EMT member.
- Always carry emergency duty mobile phone and remain within the response times.
- Acknowledge receipt of messages by informing Duty Manager, otherwise proceed immediately.

Once MO EMT is exhausted, back up EMT will be notified by HSE Department and agreed by General Manager. Back up EMT team will keep on handling the emergency situation.

2.7 Resources Management

Resource management involves coordinating and overseeing the use of tools, processes, and systems that provide ERT and EMT members with timely and appropriate resources during an emergency. Resources include manpower, teams, facilities, equipment, and supplies. Resource management is divided into four primary tasks:

1. Establishing systems for qualifying, inventorying, requesting, and tracking resources;
2. Activating these systems prior to and during an emergency;
3. Dispatching resources prior to and during an emergency; and
4. Deactivating or recalling resources during or after emergencies.

2.8 Multi-Agency Coordination System

A multi-agency coordination system is a combination of facilities, equipment, personnel, procedures, and communications integrated into a common system with responsibility for coordinating and supporting domestic incident management activities. The primary functions of multi-agency coordination systems are to support incident management policies and priorities, facilitate logistics support and resource tracking, inform resource allocation decisions using incident management priorities, coordinate emergency-related information, and coordinate interagency and intergovernmental issues regarding emergency or crisis management policies, priorities, and

strategies. Direct tactical and operational responsibility for conducting emergency management activities rests with the Incident Command.

2.9 Coordination and Issues Management

To the maximum extent possible, internal local resources at site shall be used as the first line of support for emergency recovery operations. Arrangements and working collaboration should be made with other agencies as an additional option for resource support after an emergency declaration.

Once MO resources and capabilities are exhausted, HQ EMT assistance may be provided to support operational requirements and priorities. Utilization can be requested from the EMT.

Resources are acquired using the standard company procurement vehicle such as a purchase order, blanket purchase agreement, or contract. Additionally, the IC may authorise purchase under the emergency provision power directing completion of a specific task.

2.10 Exclusions and Exemptions

When implementing emergency management programs, consideration on translating and use of this guide is required. Implication and applicability on exclusions and exemptions are:

(a) The facilities and activities of Joint Operating Companies are exempted from the requirements.

(b) All service contractors' facilities subject to license requirements are specifically exempted from the requirements.

(c) If a PETRONAS Carigali-contracted activity can demonstrate that it is subjected to emergency management program requirements under the authority of other regulatory agencies and those requirements are at least as stringent, then an exemption may be requested.

(d) Requests for exemptions from the requirements shall document the basis for each exemption and shall establish and justify alternatives equivalent to, or exceeding. Requests for exemptions shall be submitted for approval by PETRONAS Carigali-CHSE.

Section 3

EMERGENCY RESPONSE ORGANISATIONS

Contents

3 EMERGENCY RESPONSE ORGANISATIONS

3.1 General

All operational activities (such as site survey, seismic acquisition survey, drilling, construction and hook-up) are controlled by PCSB Office in Kuala Lumpur, Malaysia The Yangon Office shall always in direct contact with the site location on a day to day basis on operational matters.

3.2 Site Facility

The response to an emergency occurring at the site or facility is undertaken by the facility Emergency Response Team, under the direct supervision of the PIC. The site emergency response team comprises of personnel that are assigned to carry out specific emergency duties. (refer to site Emergency Response Plan for details).

At minimum, the composition of the site ERT are as follow:

For manned facilities, two (2) complete DCTs shall be in place consisting of the following:

(a) 1 x OSC
(b) 1 x Emergency Operation Centre (EOC) Support (e.g. RO)
(c) 1 x DCT Commander
(d) 2 x DCT Team, each comprising 1 x DCT Leader,
2 x Fire Fighter,
2 x Fire Fighter with Breathing Apparatus (BA) and
1 BA Coordinator
(e) 4 x engine driver (Coxswains) – only applicable for offshore facilities

The team shall be involved, when responding to emergency situation(s) and carry out mitigation and control (first responder), pending arrival of emergency assistance and supports.

3.3 MO Emergency Control Centre (ECC)

The MO Emergency Control Centre (ECC) is located at ECC Building, Yangon Office. The ECC is utilized by the MO Emergency Management Team (EMT) when managing emergencies occurring in Myanmar Operations.

The EMT comprises of core group and support personnel. These personnel are assisted (when mobilized) by the PCSB HQ-EMT, based at Head Office, Kuala Lumpur. The core team members are as follows and shown in Figure 3.1 which is supposed to be Tier 1 & 2 Emergency:

(a) Incident Commander
(b) Operations Section Chief
(c) Planning Section Chief
(d) Logistics Section Chief
(e) Finance and HR Section Chief.
(f) HSE & Liaison Officer
(g) Computer Operator

The core group is supported by the following group but not limited to as IC can call out other subject matter experts upon agreed by GM;

(a) Administration Support Team.
(b) Next-Of-Kin Response Team.

(c) Media Response Team (Information).
(d) IT/Telecommunication Team.
(e) Technical/Specialist Group.
(f) Contractor Representative

The declaration of Tier 3 shall be the responsibility of IC. Based on the severity of the incident, MO EMT functional structure is shown in Figure 3.2. The additional roles and responsibilities will be in Appendix X.

Figure 3.1 – MO Emergency Management Team (Core Group)

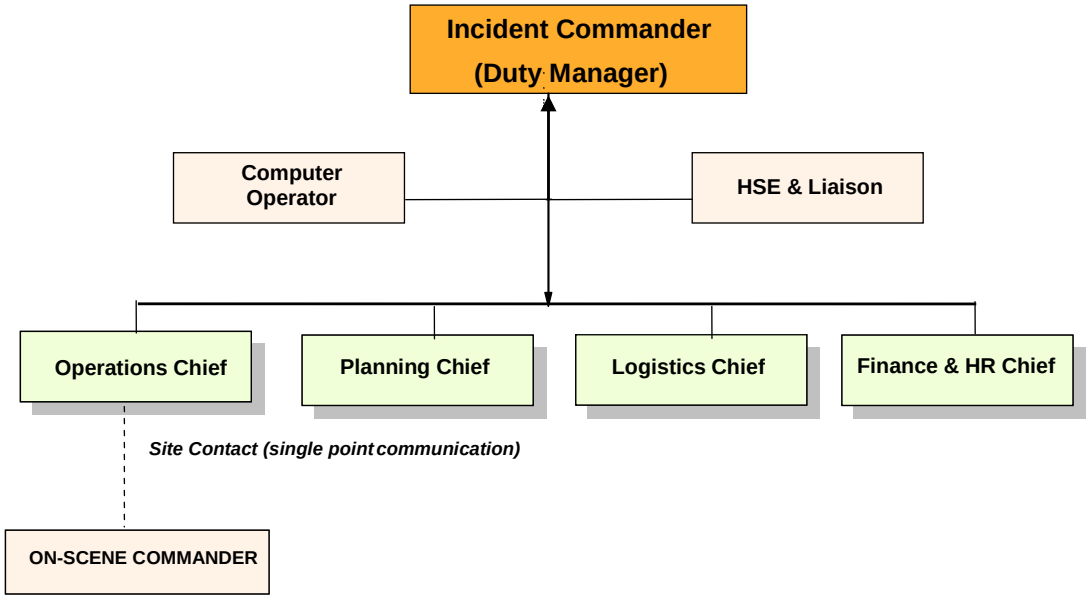
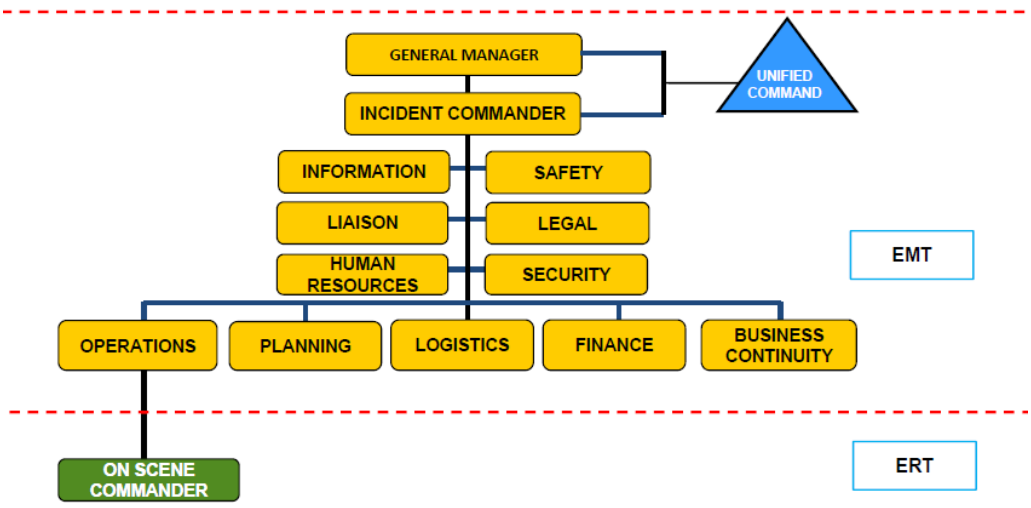


Figure 3.2 – MO Emergency Management Team (Tier - 3)



3.4 PCSB HQ Office, Kuala Lumpur

The PCSB Emergency Control Centre (ECC) is at PCSB Head Office, Kuala Lumpur. The ECC is used by Head Office EMT, when coordinating emergency activities and providing supports to PCSB-OPU (local and International).

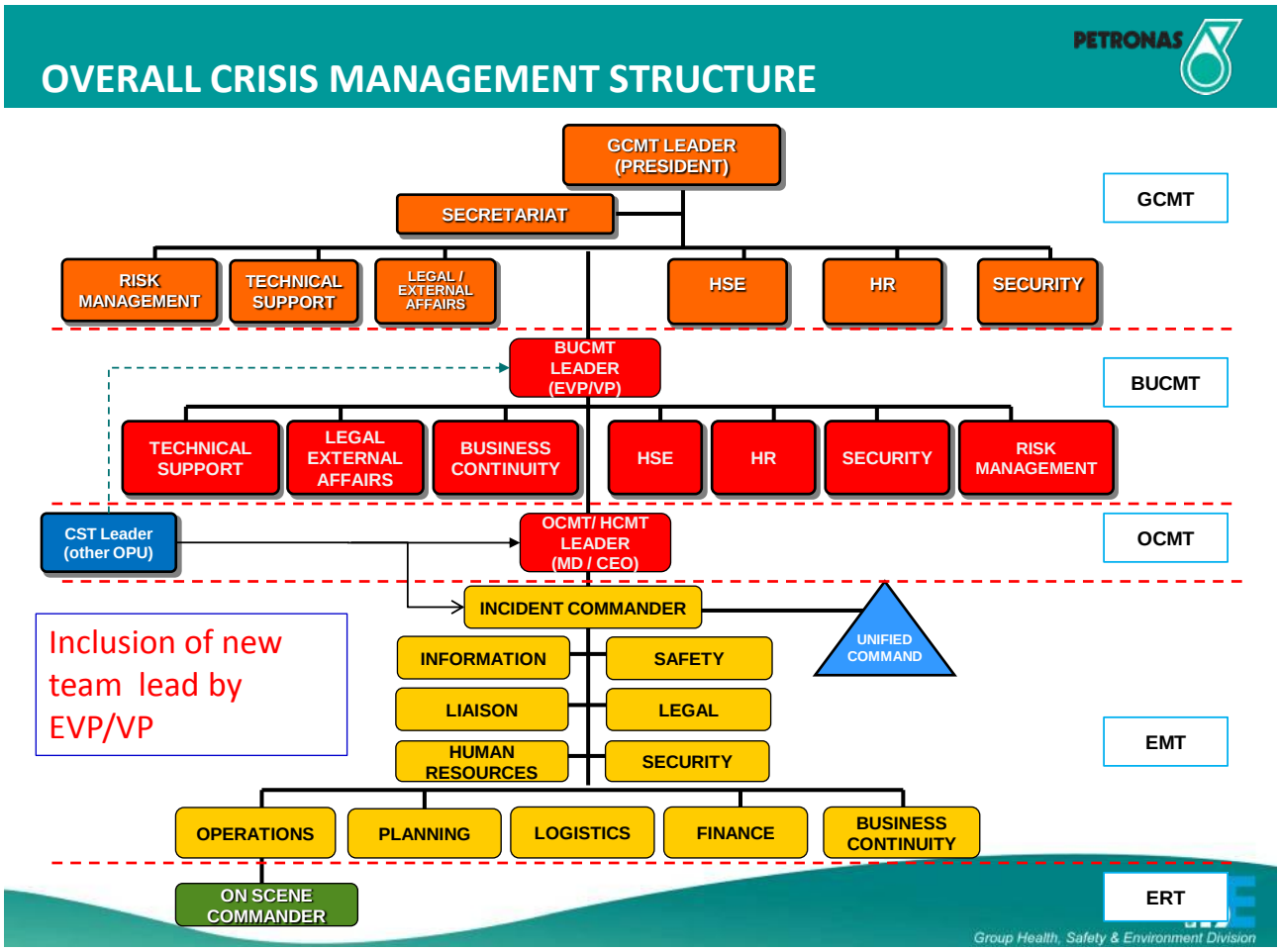
The corporate EMT is supported by appointed emergency support team members. The Corporate EMT will also organise supports from other OPUs to the affected OPU at the request of the Incident Commander.

3.5 PETRONAS Headquarters, Kuala Lumpur

The OPU Crisis Management Team (OCMT) at PETRONAS Headquarters is involved in an emergency, when it escalates into a crisis situation. The team primary roles are to address strategic / tactical group issues and policy guidance to PCSB and OPU team members, when necessary.

PETRONAS Head Office is notified of emergencies by PCSB-HQ IC. Press releases (beside the Holding Statement) must be approved by the President office before the official release.

The overall crisis management structure is as per below.



Section 4

Activation, Notification and Communication

Contents

4 ACTIVATION, NOTIFICATION AND COMMUNICATION

4.1 General

The EMT shall take necessary actions to assist affected site or employees. These actions ranging from initial notification of an emergency to preparation of a final disaster post emergency response report are summarized below. They are not necessarily in sequential order; some may be undertaken concurrently. An overview of the entire emergency management operation, indicating key operational components and the typical sequence of actions appear in Section 6 and 7 of this plan.

4.2 Call-out Assignments

All members of the EMT or their alternates must:

- Be able to reach the Yangon ECC within 1 hour
- Be available 24 hours per day, 7 days per week for call out
- Ensure their contact details remain current; make changes in writing to the HSE Manager
- Understand their responsibilities and be familiar with those of the other members
- Ensure that their alternates are appropriately informed and prepared for any call out.

4.3 Activation and Notification

The responsibility of activating an emergency rests solely with the Person-In-Charge of the site, installation, drilling rig or vessel as defined below:

LOCATION	PERSON-IN-CHARGE
Yetagun Complex Platforms	- Offshore Installation Manager (OIM)
Drilling Rig	- PCSB Drilling Supervisor
Drilling Rig (Others, e.g. Exploratory Semi or Jack-up)	- Rig Superintendent - Contractor
Construction Barge	- Barge Master
Pipeline Operating Centre (POC)	- Pipeline Site Manager (PSM)
Metering Station (MS)	- Pipeline Site Manager (PSM)
Yangon Office	- General Manager
Yetagun FSO	- FSO Superintendent
Vessel	- Master
Onshore Blocks	- Company Site Representative(CSR)

The PIC shall immediately notify the IC of any emergency that exceeds or has the potential to exceed the capability of the facility by calling the dedicated mobile phone number and follow up by fax or mail of INF (Initial Incident Notification Form) as provided in Appendix III.PIC must notify the IC in Yangon office within notification time as provided in Appendix VII (Incident Notification Flow Chart for Myanmar Operation).The IC then immediately mobilize the EMT members.

The EMT supports the site Emergency Response Team. Following an emergency-declared situation, the IC and EMT members will proceed to the designated ECC. All EMT members shall try to reach the ECC within 30 minutes of the activation time.

Activation Phase

(a) Proceed to the ECC at Yangon Office.
(b) Report to the IC or other assigned EMT members.
(c) Set up your workstation and review your position responsibilities.
(d) Establish and maintain an event/or position log, which chronologically describes your actions taken.

(e) Determine your resource needs, such as a computer, phone, plan copies, and other reference documents.

The IC will alert the General Manager and PCSB-HQ IC according to the incident notification matrix (Table 4.1).

4.4 Emergency Communication

Efficient communication is essential during any emergency. The importance of keeping the Emergency Management Team fully informed of the development of the emergency situation cannot be emphasized too highly. The IC requires such information to enable him to plan his response to the emergency and pass accurate information to PCSB HQ IC.

4.5 Emergency Messages

All emergency messages from the site or facility shall be addressed to the IC at Yangon Office(via MO Switchboard Operator, contact no. +95 1 515011 / 526411). The IC is the designated emergency contact point for the receipt of notification of an emergency and any request for assistance and shall remain contactable at all times during the period when on duty. Overall routing can be referred to **Appendix I.**

Upon notification of an emergency:

(a) The IC will inform the General Manager and call out the on-duty EMT members.
(b) The IC will inform EP-HQ IC and follow up by fax or mail of NF (Notification Form) as provided in Appendix III and refer to the MO notification flow chart (Appendix VII) and Table 4.1 for detail.
(c) The IC will inform the relevant government authorities (MOGE) within 24 hours.
(d) PETRONAS COMCEN shall cascade information to other GROUP Management.

4.6 Emergency Mitigation Operations

The EMT will assist in identifying appropriate counter-measures to meet emergency mission-critical needs, synchronizing support, and encouraging incorporation of mitigation measures, where possible. Additionally, they track overall progress of response effort, particularly noting program deficiencies and problem areas.

Upon arrival at the ECC, every member shall review the followings with the IC:

- What had happened?
- When did it happen?
- Where exactly it happens?
- How did it happen?
- What action had been taken?
- Are there people involved?
- What effect it has on operations or productions?
- Has contact been made with other agencies?
- What support is required?

The EMT members are the focal persons for delivering emergency recovery assistance programs. The members ensure that third party agencies that might have appropriate emergency assistance programs are notified in support of mitigation efforts.

4.7 Joint Response Arrangement

In the event of a joint response operation, the On-Scene Commander, in conjunction with the IC, will confer with each other regarding the coordination of the joint response efforts including:

1. Joint response actions to be undertaken;
2. Status of damages and response efforts;
3. Personnel, equipment and financial resources available;
4. Information to be provided to the personnel; and
5. Health and safety issues.

Any issues that cannot be settled by the OSC will be brought to the EMT IC for resolution. If need be, the PCSB HQ IC will be consulted.

4.8 Emergency Notification Protocol

PETRONAS Carigali Emergency Notification protocol is illustrated by Figure 4.1:

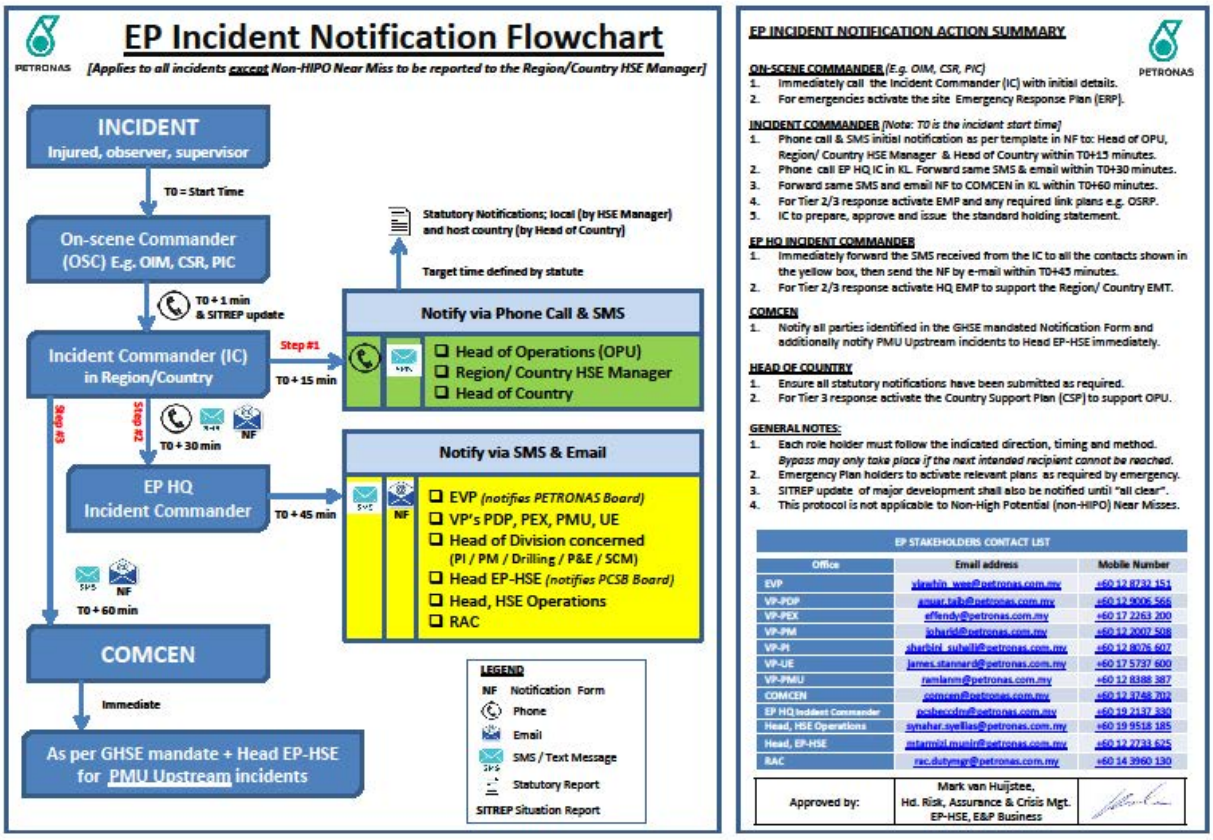


Figure 4.1: Emergency Notification Protocol

MO IC establishes communication with MO Management and PCSB HQ IC notifications are also made to higher management and other parties as per notification flow chart in Fig 4.1 and Table 4.1.

Initial Incident Notification Matrix

TYPE OF INCIDENT	LINE OF NOTIFICATION/TIMING		
Fatality/Multiple Fatalities	OSC to IC	IC to MO Head	MO IC to HQ IC
Permanent Total/Partial Disability	Immediate	30 minutes	30 minutes
Lost Workday Case	Immediate	30 minutes	12 hours
Restricted Workday Case	Immediate	30 minutes	12 hours
Medical Treatment Case	Immediate	30 minutes	12 hours
First Aid Case	12 hours	12 hours	24 hours
Detection of Contagious Disease	immediate	30 minutes	30 minutes
Process Fire Rating 4 & 5 (Major)	Immediate	30 minutes	30 minutes
Process Fire Rating 3 (Major)	Immediate	30 minutes	12 hours
Process Fire R 1 & 2 (Minor)	12 hours	12 hours	24 hours
Non-Process Fire/Explosion Rating 4 & 5 (Major)	Immediate	30 minutes	30 minutes
Non-Process Fire/Explosion Rating 3 (Major)	Immediate	30 minutes	12 hours
Non-Process Fire/Explosion Rating 1 & 2 (Minor)	12 hours	12 hours	24 hours
Property Damage Rating 4 & 5 (Major)	Immediate	30 minutes	30 minutes
Property Damage Rating 3 (Major)	Immediate	30 minutes	12 hours
Property Damage Rating 1 & 2 (Minor)	12 hours	12 hours	24 hours
Oil/Chemical Spill ≥ 5 bbl	Immediate	30 minutes	30 minutes
Oil/Chemical Spill < 5 bbl	Immediate	30 minutes	12 hours
Hydrocarbon Gas Release Rating 4 & 5 (Major)	Immediate	30 minutes	30 minutes
Hydrocarbon Gas Release Rating 3 (Major)	Immediate	30 minutes	12 hours
Hydrocarbon Gas Release Rating 1 (Minor)	12 hours	12 hours	24 hours
Near Miss	24 hours	24 hours	*
Aviation Accidents	Immediate	30 minutes	30 minutes
Security Threat (hijacking, encroachment)	Immediate	30 minutes	30 minutes
Dangerous Occurrence (M)	Immediate	30 minutes	12 hours
Radiation Exposure (M)	Immediate	30 minutes	12 hours

Table 4.1 Initial Incident Notification Matrix

4.9 External Communication

In the event of any emergency it is necessary to notify the Myanmar Government. Unless specifically advised otherwise, the only government agency to be notified will be the Myanma Oil & Gas Enterprise (MOGE) who is the official operator of each PSC (Production Sharing Contract).

MOGE require to be notified immediately of any incident. Initial contact should be by telephone or radio. This should be followed up by fax as soon as possible. When cleared by the MO General Manager, the EMT's IC on duty who has the necessary contact numbers will initiate contact with MOGE.

MOGE will then contact any other government agencies required i.e. police, medical, military, customs, immigration etc. Where required, MOGE should be asked to assist in dealing with other government agencies for issues such as arranging clearance for emergency flights, immigration matters and liaison with the Armed Forces if required. For example, the Armed Forces may be involved in assisting in maritime or land based search and rescue operations or in dealing with terrorist threat or other security issues.

Contact with Malaysian or other embassies in Myanmar may be necessary in connection with notification of Next of Kin, repatriation of casualties or fatalities, evacuation of personnel due to socio-political developments and other issues. The General Manager will decide whether or not and when such contact will be initiated.

NB: It is important that MOGE are the first external party to be contacted in an emergency situation.

4.10 Partners

MO's partners in the Yetagun Gas Project, which covers Blocks M-12, M-13 and M-14 are:

- MOGE
- PETRONAS Carigali Myanmar Incorporated (PCMI)
- Nippon Oil
- PTTEPI

The MO General Manager, who has all the necessary contact information, will normally perform liaison with Partners. In the absence of the General Manager, any other member of the MO Management Team is responsible to liaise with Partners.

NB: It is important that Partners are advised of any emergency situation before the media.

4.11 Managing the Media

The MO EMT's HSE & Liaison Officer is responsible for all issues related to the media (press, television, radio) both locally and internationally. Two broad categories of emergency event are recognised:

A minor event

For minor events, local or national media contact will be handled by MOGE using the approved press releases and statements by MO. For example, no serious injuries or fatalities minor property damage, little or no environmental impact, no significant fire, explosion or hydrocarbon release that would be expected to generate local or national interest.

A major event

For major events, local and national media contact will once again be handled by MOGE using the approved press releases and statements by MO. However, PETRONAS Headquarters, Kuala Lumpur, will handle international media contact. For example serious injuries or fatalities, serious property damages significant environmental impact, significant fire, significant explosion or a hydrocarbon release that would generate international interest.

4.12 Next of Kin and Relatives

If there are any injuries or fatalities as a result of an emergency situation, then there is a duty to inform and assist the NOK and relatives of such injured or deceased personnel. It is the responsibility of MO to inform and assist relatives in the case of any MO personnel so affected (which includes staff and direct-hire consultants and contractors). Generally, if MO provides travel, accommodation, transport etc for a person then that person may be regarded as one of "MO's personnel".

It is the responsibility of each Contractor Representative to inform and assist relatives in the event of any contractor personnel who are injured or deceased. MO will always provide whatever services it can to facilitate such assistance.

Notification of NOK of injuries and fatalities is a sensitive issue and shall be handled with care and compassion. The NOK & Media Liaison Officer is responsible for such notification where MO personnel are affected.

4.13 Public Information

The notification to the public through relevant Government Agencies (MOGE) on potential and actual impacts of an emergency shall be made as soon as possible. This will increase public awareness of the hazards by providing information to advise the public on appropriate actions to be taken before, during and after emergencies.

MO EMT IC shall decide to inform the public through communication with the authorities (MOGE) if required.

Section 5

POST INCIDENT MANAGEMENT

Contents

5 POST INCIDENT MANAGEMENT

5.1 Purpose

This section describes the authorities, procedures to be followed and actions to be taken post emergency response activation at MO.

5.2 Post Incident Procedures

All teams responding to emergency shall ensure that the emergency is managed to completion, including executing post incident procedures. These include the authority to declare termination of the emergency and preparing report on incident management to extract lessons learnt and institute continual improvement to MO Emergency Management process.

5.3 Ending the Emergency (Stand-Down)

It is essential to ensure all potential hazards have been identified and that the emergency is under control before a decision is made to terminate the emergency.

As response operations begin to diminish, the IC shall demobilize the EMT and support groups. The all clear stand down announcement is made by the IC.

Demobilization Phase

(a) Deactivate your assigned position and close out logs when authorized by the IC.
(b) Complete all required forms and reports. All forms should be submitted to the IC, prior to your departure.
(c) Be prepared to provide input to the post emergency response report.
(d) If another person is relieving you, ensure they are thoroughly briefed before you leave your workstation.
(e) Clean up your work station before you leave.
(f) Leave a forwarding phone number where you can be reached.

The HSE & Liaison officer shall assume responsibility for the closeout of any other activities left unaccomplished following demobilization of other EMT. Once this is accomplished, the HSE & Liaison person will close out emergency response activities by:

(a) Coordinating with affected site and the IC on the disposal, refurbishment, and retrograde of affected assets;
(b) Maintaining proper property accountability processes; and
(c) Conducting post-action meetings and participate in others after-action meetings.

The Custodian (HSE Department) shall revise documents, collect and file paperwork, and develop and assign tasks to improve capabilities. The team may meet with service providers to develop a corrective action plan to improve overall cost-effectiveness and efficiency.

5.4 Management of Evidence

The HSE & Liaison officer shall assume responsibility for keeping evidences of all emergency logs, forms and reports that have been used during emergency in ECC in order to improve MO EMT response capability.

The affected area should be secured and evidence preserved for further examination and investigation by the investigation team

5.5 Recovery and Restoration

The process of recovery and restoration of MO to pre-emergency condition will include managing the affected personnel and implementation of BCP shall be implemented as deemed appropriate.

5.6 Emergency Post Mortem

Following any emergency response activities, the IC will submit Post Emergency Response report, detailing problems encountered and key issues affecting overall performance. The IC may convene an interagency forum to identify lessons learned. Each EMT member involved is expected to keep records of its activity to assist in preparing its own post emergency response report.

The Emergency Response Report is at Appendix VIII.

Section 6

EMERGENCY ROLES AND RESPONSIBILITIES

Contents

6 EMERGENCY ROLES AND RESPONSIBILITIES

6.1 General

The command and control of an incident or emergency demands a unified framework for the preparation and execution of plans and orders. Emergency Response Teams at all levels may manage command and control activities somewhat differently depending on the complexity, their capabilities and resources.

6.2 Incident Commander

The authority to manage any emergency is delegated to MO appointed Incident Commander.

Roles

- ☐ Serve as management representative during an emergency.
- ☐ Exercise overall management responsibility for the coordination between emergency response agencies.
- ☐ Establish appropriate staffing level for the ECC and continuously monitor organizational effectiveness and made appropriate modifications, as required.
- ☐ In conjunction with other EMT members, set priorities for response efforts. Ensure that all actions are accomplished within the priorities established.
- ☐ Lead the determination of strategic and tactical issues and actions on a local basis.
- ☐ Ensure that PCSB-HQ EMT is activated in the event of a major incident.
- ☐ Ensure that Inter-Agency Coordination is accomplished effectively.

Responsibilities

- ☐ Activate the EMT and support groups as required.
- ☐ Provide status updates of the conditions and situations at the emergency scene to Head Office and authorities.
- ☐ Ensure that the appropriate tactics and resources are in place at the emergency scene.
- ☐ Ensure that all necessary resources are available for optimal response.
- ☐ Ensure that there is a continuous dialogue with PIC, contractor and other involved parties.
- ☐ Ensure EMT roles (e.g., operations, safety, liaison with external agencies, media liaison, and documentation) are satisfactorily being fulfilled.
- ☐ Inform contractors of MO expectation and regularly update the PCSB-HQIC via briefings.
- ☐ Keep a personal log of events, communications, and decisions.
- ☐ Co-ordinate response with external response resources.
- ☐ Co-ordinate with local authorities and consulate office, as appropriate.

Activation Phase

- On being notified of an emergency, shall return the call within 5 minutes and proceed immediately to the ECC.
- Establish direct contact with the PIC and obtain clear and concise details on the nature, seriousness and in particular details of casualties.
- Assessing the emergency situation and determine the adequacy of emergency response capability and resources.
- Verify total number of personnel on site and their status/disposition.
- Determine appropriate level of activation based on situation as known.
- Start and maintain an incident status log until relieved by the Planning Section Chief.

- Maintain open communication with the PIC throughout the emergency and keep as brief as possible; provide advice and assistance as is possible.
- Alerting the General Manager, PCSB-HQIC and mobilize appropriate EMT members for the initial activation.
- On the arrival of EMT brief them fully on the status of the Emergency giving details of any action taken.
- Ensure that the ECC is properly set up and ready for operations.
- Ensure that telephone and/or radio communications with partners/operators are established and functioning.
- Conduct initial briefing and schedule the initial Action Planning meeting.

Operational Phase

- Monitor EMT member activities to ensure that all appropriate actions are being taken.
- Coordinating the overall company efforts to collect, analyze, process, synthesize, report, mitigate and facilitate the supports for effective emergency operations on-scene.
- Providing staffing support for emergency management activities, if deemed necessary.
- Establishing general liaisons with business partner(s), contractor and the relevant government agencies.
- Keep PCSB-HQ IC updated on progress of mitigation and controls.
- If partial or total evacuation of personnel is deemed necessary, ensure that numbers and movements are accurately documented.
- In conjunction with the PCSB or GROUP management, conduct news conferences and review media releases for final approval, following the established procedure for information releases and media briefings.
- Ensure that the HSE & Liaison Officer is providing for and maintaining effective inter agencies coordination.
- Based on current status reports, establish initial strategic objectives to support partners efforts.
- Identify requirements for specific expertise (e.g. Exploration, Drilling, Structural, Aviation etc) depending on nature of the emergency.
- If there are casualties, ensure that appropriate CASEVAC arrangements have been made.
- In coordination with EMT members, prepare management function objectives for the initial Action Planning Meeting.
- Convene the initial Action Planning meeting. Ensure that all EMT members and other key agency representatives are in attendance.
- Once the Action Plan is completed by the Planning Chief, review**,** approve and authorize its implementation.
- Request Finance & HR Chief to set up a separate cost centre/account number for the emergency and ensure that all related expenditure and costs are recorded against this account.
- Establish a separate technical support team outside the ECC to consider detailed technical aspects of the emergency and response if required and staff with appropriate specialists.
- Conduct periodic briefings with EMT members to ensure strategic objectives are current and appropriate.
- Conduct regular updates for PCSB- HQ IC, PCSB and GROUP Management or their representatives.
- Ensure that HSE & Liaison Officer has accurate information regarding the emergency to enable him to co-ordinate the preparation of draft Press Statements.
- Brief your relief (during prolonged response) at shift change, ensuring that ongoing activities are identified and follow-up requirements are known.

Demobilization Phase

- Authorize deactivation of EMT and Support Teams when they are no longer required.
- Notify the PCSB-HQ IC and other appropriate organizations of the expected planned deactivation time.
- Ensure that any open actions not yet completed will be handled after deactivation.
- Ensure that all required forms or reports are completed prior to deactivation.
- Be prepared to provide input to the after action report.
- Deactivate the ECC at the designated time, as appropriate.
- Proclaim termination of the emergency and proceed with recovery operations.

6.3 Operations Section Chief

A member of EMT responsible to the IC on all matters related to operations and emergency communication.

Roles

☐ Assess the emergency situation and determine the adequacy of emergency response resources.
☐ Provide on-scene tactical operations support to the site ERT.
☐ Serve as the single focal point of situation assessment operations and overall management of response efforts for team members.
☐ Establish direct contact with PIC and obtain clear and concise details on the nature and seriousness.
☐ Interpret information from the PIC and use them to support the different planning needs of EMT members.
☐ Monitor the actions of ERT and other response agencies (if involved).

Responsibilities

☐ Ensure operational objectives and assignments identified in the agreed Action Plan are carried out effectively.
☐ Establish the appropriate level of operations supports, continuously monitoring the effectiveness and modifying accordingly.
☐ Exercise overall responsibility for the management of emergency operational activities within the Operations Section.
☐ Ensure that the Planning Chief is provided with updated reports (for log keeping) utilizing the Emergency Response Log Sheet.
☐ Conduct periodic Operations briefings to EMT members as required or requested.
☐ Overall supervision and control of the operations Unit activities; including technical supports.

Activation Phase

- Follow the generic Activation Phase Checklist (see para 4.3).
- Confer with IC to ensure that EMT positions are staffed at levels necessary to provide adequate information and support for emergency operations.
- Ensure that the Operations Section support is set up properly and that appropriate personnel, equipment, and supplies are in place, including maps and status boards.
- Based on the situation, activate appropriate supports within the section. Designate a Leader as necessary.
- Establish communications with the site PIC.
- Based on the situation known or forecasted, determine likely future needs of the operations supports.

- Identify key issues currently affecting the emergency site and affected personnel or secondees; discuss with EMT members and determine appropriate counter-measures for the first operational period.
- Review responsibilities; develop an operations plan detailing strategies for carrying out operations objectives.
- Adopt a proactive attitude. Think ahead and anticipate situations and problems before they occur.

Operational Phase

- Analyze the escalation trends and assists with the development of subsequent action plans.
- Discuss with the IC; obtain a preliminary situation briefing on:
    - Type of emergency
    - Number of personnel on-location
    - Status of mustering and head count
    - Number and conditions of casualties
    - Actions that has been taken on-scene
    - Weather condition (strong wind, sand storms, etc)
    - Resources on site – vehicles, aircraft
    - Assistance requested from others.
- Identify critical issues and provides general planning support to the PIC.
- Maintain open communication with the PIC.
- Ensure that situation and resources information is provided to the Planning Chief on a regular basis or as the situation requires.
- Ensure that all media contacts are referred to the IC or HSE& Liaison Officer.
- Conduct periodic updates and works to reach consensus among EMT members.
- Work closely with PIC to ensure that the MO objectives, as defined in the current action plan, are being addressed.
- Brief the IC periodically on any updated information you may have received.

Demobilization Phase

- Follow the generic Demobilization Phase Checklist (see para 5.3)

6.4 Planning Section Chief

A member of EMT responsible to the IC on all matters that are related to technical and secretarial supports. The job includes maintaining an accurate timed log of events, instructions and communications during the emergency period.

Roles

- ☐ Serve as the information focal point for the overall compilation of situation assessment.
- ☐ Collect, analyze, and display information regarding the emergency situation and the location of critical resources at the Event Boards.
- ☐ Process information that is common to team members that can contributes to the overall perspective of the emergency.
- ☐ Recommend (as needed) the activation of support teams in anticipation of, or immediately following, an incident or emergency.

☐ Maintain the completeness of information displayed, collects and analyzes information to be used for subsequent reporting to Corporate Offices, the status briefings by Incident Commander and by other team members.

☐ Contact other support expertise to provide information updates for reporting and analysis requirements. Other members are responsible for inputs to information processing and information displays unique to their functional discipline.

☐ Disseminate emergency response summary for the EMT members.

Responsibilities

☐ Ensure that the responsibilities of Planning Section are carried out, to include:

- Collecting, analyzing, and displaying situation information,
- Preparing periodic Situation Reports,
- Preparing and distributing the EMC Action Plan,
- Providing technical support services to EMT, and
- Documenting and maintaining log and files on EMC activities.

☐ Exercise overall responsibility for the coordination of technical supports requirement and activities.

☐ Keeps the IC informed of significant issues affecting the Planning Section and Log Keeping.

☐ In coordination with other EMT members, ensure that consistent log keeping is made, complete Situation Status Reports, and to develop the ECC Action Plan.

☐ Ensure all status boards and other displays contain accurate information.

Activation Phase

- Follow the generic Activation Phase Checklist (see para 4.3).
- Ensure that ECC is set up properly and that appropriate equipment, and supplies are in place.
- Prepare Situation Analysis objectives for the Initial Action Planning meeting.
- Discuss with the IC and EMT members to obtain and review any major incident reports.
- Make a list of key issues to be addressed; in consultation with EMT members, identify objectives to be accomplished during the initial Operational Period.
- Keep the IC and EMT members informed of significant events.

Operational Phase

- Ensure proper and effective log keeping is maintained and keep current information for the situation status report.
- Ensure that major information are compiled by EMT members and are available for recording.
- Ensure that all status boards and other displays are kept current and that posted information is neat and legible.
- Produce situation status report and distribute to EMT members.
- Assist the IC's action planning meetings and during a quick update session after the end of each operational period.
- Work closely with EMT members to ensure the objectives, as defined in the current EMC Action Plan, are being addressed.
- Ensure that fiscal and administrative requirements are coordinated through the Finance & HR Chief.

Demobilization Phase

- Follow the generic Demobilization Phase Checklist (see para 5.3).

6.5 Logistics Section Chief

A member of EMT responsible to the IC on all matters related to logistics and resources.

Roles

- ☐ Assess the emergency situation and determine the adequacy of logistics response resources.
- ☐ Establish communications with logistics service providers, when appropriate.
- ☐ Identify available resources – aircraft, road transports, and materials and arrange for mobilization and movement of those resources as planned.
- ☐ Validate requests and managed the procurement process with Vendors assistance.
- ☐ Coordinate resource requests with Service Providers and other suppliers.
- ☐ Obtain additional resources from other oil companies/operators, if necessary.
- ☐ Provide status reports on logistics activities to the IC and EMT members.

Responsibilities

- ☐ Ensure the Logistics function is carried out in support of EMT and ERT operations. This function includes resource tracking; acquiring equipment, supplies, and transportation services.
- ☐ Establish the appropriate level of staffing and continuously monitoring the effectiveness and modifying as required.
- ☐ Coordinate closely with all EMT members to establish priorities for resource allocation to support emergency management operations.
- ☐ Keep the IC informed of all significant issues relating to the logistics operations.
- ☐ Ensure that the Planning Chief is provided with updated reports (for log keeping) utilizing the Emergency Response Log Sheet.
- ☐ Supervise all logistics related activities.

Activation Phase

- Follow the generic Activation Phase Checklist (see para 4.3).
- Ensure the logistics support is set up properly and that appropriate personnel, equipment, and supplies are in place, contact directories, vendor references, and other resource directories.
- Establish communications with logistics support department.
- Advise logistics support units to deliver and coordinate requirement.
- Discuss with the IC and EMT members and identify immediate resource needs.
- Meet with Finance &HR Chief and determine level of purchasing authority for the Logistics Section.
- Provide periodic updates to the IC and EMT members, if required.
- Adopt a proactive attitude, thinking ahead and anticipating situations and problems before they occur.

- **Operational Phase**

- Ensure that logistics position logs and other necessary files are maintained.
- Attend and participate in EMT Action Planning meetings.
- Ensure that transportation requirements, in support of response operations, are met.
- Ensure that all requests for facilities and facility support are addressed.
- Ensure that all resources are tracked and accounted for, as well as resources ordered through Mutual Aid.
- Ensure that the Planning Unit is provided with updated reports (for log keeping) utilizing the Emergency Response Log Sheet.
- Provide section staff with information updates as required.

Demobilization Phase

- Follow the generic Demobilization Phase Checklist (see para 5.3)

6.6 Finance & HR Section Chief

A member of EMT responsible to the IC on all matters related to finance and administration.
But as per the requirement of emergency situation the Finance & HR Section Chief will split into Finance Section Chief and HR officer. The additional man power will take over from Finance & HR Section Chief to concentrate more on either Finance part or HR part. HR officer responsibility is in Appendix X.

Roles

☐ Ensure that all financial records are maintained throughout the event or disaster.
☐ Ensure NOK and Media Response Teams are given only approved information, which they can release.
☐ Allocate personnel to render appropriate assistance to Next of Kin, providing representatives with an initial briefing and copies of press releases.
☐ Identify and arrange specific need for transport, accommodation, catering, clothing, money etc. for evacuated personnel and NOK.
☐ Collate and make copies of all approved press reports and provide to EMT members.

Responsibilities

☐ Determine purchase order limits for the procurement function in Logistics.
☐ Discuss requirement and support with medical service provider, if necessary.
☐ Ensure that compensation claims, resulting from the response to the incident are processed within a reasonable time, given the nature of the situation.
☐ Ensure that all travel and expense claims are processed within a reasonable time, given the nature of the situation.
☐ Provide administrative support to EMT members as required.
☐ Activate support teams as required; monitor activities continuously and modify the organization as needed.
☐ Coordinate with HSE &Liaison Officer on local meetings and security supports.
☐ Keep current on general status of resources and activity associated with your position.
☐ Ensure that the Planning Unit is provided with updated reports (for log keeping) utilizing the Emergency Response Log Sheet.

Activation Phase

- Follow the generic Activation Phase Checklist (see para 4.3).

- Ensure that the supports are set up properly and that appropriate personnel, equipment, and supplies are in place.
- Maintain accurate details of all POB movements.
- Co-ordinate response to Relatives/Next-of-Kin enquiries.
- Ensure coordination with all EMT members for the purposes of gathering and consolidating response cost estimates and other related information.
- Discuss with the IC and Logistics Chief and review financial and administrative support requirements and procedures; determine the level of purchasing authority to be delegated.
- Notify and coordinate requirement with medical service provider, if necessary.
- Communicate with contractors/or partners and relevant agencies to address welfare needs.
- Adopt a proactive attitude, thinking ahead and anticipating situations and problems before they occur.

Operational Phase

- Ensure that position logs and other necessary files are maintained.
- Ensure all data (NOK address, contact numbers, etc) are current, and that information is posted in a legible and concise manner.
- Provide NOK and support teams with an initial briefing and copies of press releases.
- Notify the medical service providers.
- Co-ordinate response to media and spouse enquiries.
- Co-ordinate office security, particularly regarding access of media personnel to MO office.
- Ensure adequate support personnel e.g. telephonist, driver etc. have been called out and transported to the office in a timely manner.
- Participate in all Action Planning meetings.
- Brief all support team leaders and ensure they are aware of EMT objectives as defined in the Action Plan.
- Keep the IC and EMT members aware of the current fiscal situation and other related matters, on an on-going basis.
- In coordination with the Logistics Section, ensure that the purchasing unit processes purchase orders and develops contracts in a timely manner.
- Notify and coordinate requirement with medical service provider, including doctors, ambulances etc.
- Ensure Support teams are given only approved information, which they can release.
- Allocate personnel to render appropriate assistance to Next of Kin, providing representatives with an initial briefing and copies of press releases.
- Identify and arrange specific need for transport, accommodation, catering, clothing, money etc. for evacuated personnel and spouse.
- Collate and make copies of all approved press reports and provide to EMT members.
- Coordinate reception of evacuated personnel, sending representatives to landing places, hospitals etc. as required.
- Ensure that the Planning Chief is provided with updated reports (for log keeping) utilizing the Emergency Response Log Sheet.

Demobilization Phase

- Follow the generic Demobilization Phase Checklist (see para 5.3).

6.7 HSE & Liaison Officer

A member of EMT responsible to the IC on all matters that are related to HSE, Security and Liaison with relevant external agencies. But as per the requirement of emergency situation the HSE & Liaison Officer will split into Safety officer, Liaison officer and Security officer. The additional man power will take over from HSE & Liaison to concentrate more on either Security , Safety part or Liaison part in order to response effectively. Each responsibility is in Appendix X.

Roles

- ☐ Develops and recommends measures for assuring personnel safety and security, assessing and/or anticipating hazardous and unsafe situations, and taking corrective measures.
- ☐ Acting as liaison with partners and facilitate requests, but normally do not directly act on or process resource requests.
- ☐ Obtain situation status information and response activities from EMT Operations Chief.
- ☐ Identify or act as the spokesperson (seek prior authorisation) for public, media, or special interest stakeholders during the emergency.
- ☐ Coordinate MO's participation with regulatory agencies at the incident scene, if necessary.
- ☐ Resolve any conflicts with agencies having jurisdiction over MO's response efforts.
- ☐ Prepare press releases and coordinate public briefings.

Responsibilities

- ☐ Provides a point of reference for identifying and addressing the safety and health hazards that may threaten personnel.
- ☐ Delineates responsibilities for protecting personnel from these hazards and for providing prompt and effective remedial actions if and when an emergency-related injury or illness takes place.
- ☐ Establishes a Joint Information Centre (if necessary) to collect, review, and disseminate information to the public media and stakeholders.
- ☐ Ensures that all parties take reasonable steps to protect deployed personnel from emergency-related hazards, including, but not limited to, compliance with established safety and health standards.
- ☐ Develops and implements a standard reporting system to centrally document the occurrence of emergency-related injury or illnesses.
- ☐ Resolve any conflicts between MO response activities and agencies participating in the response.
- ☐ Ensure that the Planning Chief is provided with updated reports (for log keeping) utilizing the Emergency Response Log Sheet.
- ☐ Implement a system to report, investigate, and recommend remediation for accidents, injuries, and illnesses related to the emergency.
- ☐ Provide written evaluations and after-action reports on the emergency safety and health activities.

Activation Phase

- Follow the generic Activation Phase Checklist (see para 4.3).
- Confide with the IC, as and when appropriate to implement the followings:

  - ❖ Integrate HSE and security requirement structure;
  - ❖ Ensure a safe and healthful working environment is maintained for staff; and
  - ❖ Establish and maintain liaison among emergency services and local officials concerned with safety, health and security.

Establish communications with PCSB HQ Office (upon advise by IC) and government agencies; notify the IC of any communications problems.

- Contact other jurisdictional agency public information officers to coordinate public information activities.

Operational Phase

- Communicate with partners and relevant government authorities.
- Prepare an initial press release regarding MO's involvement in the response and monitor approval.
- Identify, investigate, and coordinate abatement of safety and health or security problems.
- Provide teams with approved press releases, updates on significant developments pending next press release and other background information.
- Attend briefings and press conferences and respond to requests for information about MO's involvement in the incident.
- Establish a system for accomplishing required follow-up activity after the emergency.
- Release information to the media and public (if cleared) through press briefings and press releases.
- Represent MO at planning meetings, as appropriate, providing update briefings about your agency's activities and priorities.
- Keep the IC informed and ensure that you can provide HSE policy guidance and clarification, as required.
- On a regular basis, inform EMT members of priorities and actions that may be of interest.
- Maintain logs and files associated with your position.

Demobilization Phase

- Follow the generic Demobilization Phase Checklist (see para 5.3).
- When deactivation is approved by the IC, contact relevant parties and advise them of expected time of deactivation and points of contact for the completion of ongoing actions or new requirements.
- During the stand-down phase, ensure that the emergency safety operation has a smooth closeout by: concluding the emergency recovery functions and activities with the IC; providing follow-up information to deployed personnel; evaluate and document the effectiveness of emergency safety and health effort; and debrief deployed personnel on safety and health issues, if applicable.
- Ensure that you complete all final reports, close out your activity log, and transfer any ongoing missions and/or actions to the IC or other appropriate individual.
- Ensure copies of all documentation generated during the operation are submitted to the Planning Chief.

6.8 Computer Operator

- Record all incoming and outgoing messages from the main log of events and emergency response messages forms and incorporate into the computer log in related order.
- Assist in accessing any other information held on the computer such as Emergency Contacts.
- Type and print reports, draft press releases and any other material required by the EMT members.

6.9 General Manager

The General Manager is the legitimate Corporate Management representative, responsible for all business activities and as such retains overall control of all response efforts to incidents or emergencies occurring in jurisdictional areas. On being notified of an emergency the General Manager will:

- Confide with the IC and obtain clear and concise details on the nature, seriousness and in particular details of casualties.
- Ensure adequacy of emergency response capability and resources to mitigate and facilitate the supports for effective emergency management operations.
- Communicate with PCSB Management and establish general liaisons with business partners and the relevant government agencies.
- Analyze possible long-term trends and assists the IC with the development of strategic plans and critical planning issues.
- Request progress updates on contingency action plans, special planning meetings, and long-range management plans concerning personnel or operational priorities.
- Produce and disseminate emergency response summary for the Corporate Management teams and the relevant authorities.

6.10 Emergency Support Teams

A) Next-of-Kin Response Team

On being notified of an emergency, the team shall proceed to the allocated Next-of-Kin Room as soon as possible and will receive calls from Next-of-Kin or relatives. Such calls will be transferred to them by telephonist in the first instance, then come direct once these numbers have been disclosed. The team members shall only give information as authorised by the Finance &HR Chief. The team members roles and responsibilities are as follows:

- All calls should be answered by stating the Company name. Do not divulge their real names to callers.
- Establish full name of the caller.
- Establish the identity or relationship of the caller, their contact number and address.
- If the mentioned name by the caller is NOT in the list, advise the caller that the person is not involved in the incident.
- If the name is on the list, reply "No definite information as yet, please give me your name, address and telephone number" and promise to " Call back as soon as details are obtained". The information will only be released after the HR Chief has received confirmation of names and details of injuries and after the next-of-kin has been informed.
- If uncertain of the answer, always reply "We have no information as yet, please leave your telephone number, we will ring you back".
- Any enquiries from Media (Press, TV or Radio) and general public should be referred to Media Support Team.
- Record all messages on the "Next of Kin - Relative Enquiry Form".
- All calls must be handled sympathetically and if the team members cannot satisfy a caller they should have a senior member of HR Representative or other Senior Management to call the individual as soon as it is practicable.

B) Media Response Team (Information Officer)

- On being notified of an emergency, the team shall proceed to allocated Media Room as soon as possible and will received calls from Media (Press, TV or Radio). Such calls will be transferred to them by telephonist.
- The team members shall only provide information as authorized by the Finance &HR Chief in the ECC and previously approved by the Company.
- All calls must be handled firmly but politely. The media will employ various methods, some undoubtedly devious, in an attempt to obtain the fullest information possible about the emergency. Any team members facing difficulty in communicating with a Media Representative, obtain the Representative telephone number and have the Finance &HR Chief or Senior Management in ECC return the call.
- The team shall record media queries in "Media Inquiry Form".

C) Radio Operator on duty

The responsibilities of the duty Radio Operator on being notified of an emergency are:

- Inform the IC immediately.
- Commence and maintain a log of all emergency related communications.
- On instruction from the IC, call out or locate other EMT members.
- On instruction from the IC, screen all non-emergency communications.
- If the emergency has occurred outside normal office hours, handle all emergency related calls until such time as the Switchboard Operator is at the switchboard, including taking details of incoming enquiries from Next of Kin/ Relatives, Media, etc.
- Send and receive hard copy messages to ECC.

E) Medical Coordinator

- Assist Operations Chief as required.
- Ensure appropriate hospital facilities are available including doctors, ambulances etc if required.
- Liaise with site Doctor and ensure patient information form is received.
- Liaise with SOS/AEA Doctor on duty in Yangon.
- Liaise with local hospitals
- Liaise with internal medical support organisations.

F) ISOS Doctor

- Receive and acknowledge any request for medical advice regarding casualties.
- Liaise with site Doctor regarding need for Casevac.
- Advise helicopter requirements e.g. seat to be removed for stretches, Doctor to accompany casualty, etc.
- Arrange appropriate medical assistance, hospital facilities etc
- If required to proceed to site, proceed immediately to Helibase.
- If not required proceeding to site, standby and waiting further instructions.

G) Driver (Duty)

- On instructions from the IC standby at Yangon office.
- Assist survivors and relatives of company personnel and catering team investigation/ support teams with travel arrangements, accommodation, passports, clothing etc.

H) Security Guards on Duty

- On being informed of an emergency situation, the Security Guards shall be informed of any additional requirements regarding the Security of Yangon office through the IC.
- Proceed to their designated areas and maintain security.
- Keep people under control.

- Do not allow unauthorised persons to enter the office area unless permission is granted by the IC.
- Escort visitors, e.g. Next of Kin/Relatives of the personnel involved of the emergency and media personnel to designated areas.

6.11 Legal Officer

The legal officer is responsible for all business activities and as such retains overall control of all response efforts to incidents or emergencies occurring in legal areas.

Section 7

EMERGENCY EVENTS REGISTER

Contents

7 EMERGENCY EVENT REGISTER

7.1 Purpose

This section lists the risk events and consequences which have been described and assessed in HSE CASE. It is intended to determine the critical scenarios which provide the basis for the development of Pre Incident Plan.

7.2 Hazard Assessment

HSE Case

The HSE Case indentifies the risk to personnel arising from process hydrocarbon release (topsides, risers and well blowouts), ship-platform collisions, helicopter accidents, structural failure and occupational accidents. Detail of Hazard Assessment can be referred to Yetagun HSE Case and POC HSE Case.

The assessment also makes reference to previous incidents within the company and the industry, security incident and natural disaster.

The Risk Matrix used in the hazards assessment is provided as Figure 7.1 below.

IMPACT		Severity	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
		People	Slight Injury	Minor Injury	Major Injury	Single Fatality	Multiple Fatalities
		Environment	Slight Impact	Minor Impact	Localized Impact	Major Impact	Massive Impact
		Asset	Slight Damage	Minor Damage	Local Damage	Major Damage	Extensive Damage
		Reputation	Slight Impact	Limited Impact	Considerable Impact	Major National Impact	Major International Impact
LIKELIHOOD	E Almost Certain	Happens several times per year at location	E1	E2	E3	E4	E5
	D Likely	Happens several times per year in company	D1	D2	D3	D4	D5
	C Possible	Incident has occurred in our company	C1	C2	C3	C4	C5
	B Unlikely	Heard of incident in industry	B1	B2	B3	B4	B5
	A Remotely likely to happen	Never heard of in industry	A1	A2	A3	A4	A5

Definition	
Severity	**Definition**
Serious	A life threatening situation or serious weakness exposes the company to a major extent in terms of achievement of the corporate HSE objectives or results.
High	A high weakness is one, which, though not serious, is essential to be brought to the attention of the senior management team. This include any legal non-compliance and any otherwise medium weakness, which is a repeat finding from a previous report.
Medium	A medium weakness could result in a perceptible and undesirable effect on achievement of HSE objectives.
Low	A low weakness has no major HSE impact at the process level but its correction will assure greater effectiveness/efficiency in the process concerned.

Figure 7.1: Risk Matrix

7.3 List of scenarios

Pre Incident Plan (PIPs) for the following scenarios was developed.

1. Fire and Explosion
2. Hydrocarbon Spill
3. Toxic Gas Release
4. Threat of Marine Collision
5. Helicopter Emergency
6. Radioactive Emergency
7. Contagious Disease
8. Severe Weather Condition
9. Vessel Encroachment
10. Bomb Threat
11. Workplace violence
12. Man Overboard
13. Diving Emergency
14. Emergency on Export Tanker
15. FSO Mooring System failure
16. Pipeline Emergency
17. Road Transport Accident
18. Fire at Main office
19. MEDEVAC (Out Country)
20. Terrorist Threat

It is important that the type of emergency is identified as early as possible, so that the appropriate emergency response action plans can be taken.

By their nature, emergency situations are usually unique and unpredictable. Nevertheless, “Pre-incident action plans (PIAP) for each of emergency sub-categories listed above can be utilized for effective and fast response. The PIAP is located at Appendix x.

Section 8

Support Plans

8 SUPPORT PLANS

8.1 Purpose

This section describes the external support that can be readily accessible by MO during emergency situation.

8.2 Specialised Emergency Support

The list of specialised emergency support is provided in Table 8.1 below.

No.	Agency	Scope
1	International SOS (ISOS)	Medical Services
2	Yangon General Hospital	Medical Services
3	Heli union	Helicopter Services
4	Heavi Lift	Twin Otter Fixed Wing service
5	PTTEPI	Helicopter Services
6	Tidewater (Supply Vessel)	Fire Fighting, Search and Rescue, Oil Spill, etc

Table 8.1 Specialised Emergency Support

8.3 Business Continuity Plan (BCP)

MO Business Continuity Plan has been developed by MO BCP Strategy Team. The IC shall immediately notify the Head of Myanmar Operation to initiate MO Business Continuity Strategy when any emergency escalates into a crisis situation or any disruptions could threaten MO business survival. Please refer to MO BCP. As per requirement of emergency response, The Business Continuity Chief will be mobilized to give advise for MO EMT. The responsibility is in Appendix X.

Section 9

Training and Exercises

9.0 Training & Exercises

9.1 Introduction

It is MO policy to ensure the emergency preparedness of all their emergency organisations. Regular training of all personnel involved in Emergency Response activities shall take place to ensure that the highest standard of emergency response preparedness exists throughout MO Operations. It is mandatory for those personnel selected for emergency duties to undertake the required courses in the Crisis Management and Emergency Response Training Programme (CMERT) in order for them to be effective in their role.

Three (3) levels of training have been identified:

CMERT Level 1
CMERT Level 2
CMERT Level 3

9.2 CMERT Level 1 Training Programmed for Emergency Response Team

This is for Emergency response training for the Worksite ERT. The training is to be taken twice a year for each crew change or shift. The objective of the training is to provide an opportunity for the Worksite ERT as a whole to practice all elements of their response from the PIC in his appraisal of the situation, the deployment of resources and command and control aspects, to DCTs in intervention actions, fire fighting and casualty retrieval.

NB: This training is in addition to the routine musters and drills carried out at worksite and should follow approved scenarios.

The minimum requirements for Emergency and Crisis Training Programme are illustrated in Table 9.1 below:

Personnel/Team	Training Programmes	Frequency
DCT	• DCT Training	Every three years
ERT	• Emergency Response Training	Monthly Exercise and drill conducted weekly basis
OIM, PS, MS	• Managing Major Emergency	Every three years
Personnel at Onshore Plant	• Basic Fire Fighting	Every four years
Coxswain	• Coxswain & Lifeboat Training	Every three years
First Responder	• First Responder Training	Once off

HLO	• HLO Training	Every three years
OSR Operator	• Oil Spill Response Operator Training (Tier 1)	Once off
OSC	• OSC Strategy and Tactics	Once off
Medic	• Advance Trauma Life Support Training • Advance Cardiac Life Support Training	Every three years
New Staff	• Fire Safety and Evacuation Orientation Programme	As and when necessary

Table 9.1: Emergency and Training Programme for ERT

9.3 CMERT Level 2 Training Programme for Emergency Management Team

Emergency response training for the Yangon Office EMT. The training is to be taken once a year. The objective of the training is to provide Yangon Office EMT members and Support Team members an opportunity to practice their respective roles in a simulated emergency situation.

9.4 CMERT Level 3Training Programme for Emergency Management Team

Emergency response training for all levels of the Emergency Response Organisations i.e. Worksite ERT, Yangon Office EMT and Support Teams and PCSB HQ EMT and Support Teams. There will be one training a year. The objective of the training is to provide an opportunity for all levels of the MO and PCSB emergency response organizations to work together to deal with a major emergency.

9.5 Drills and Exercises

Emergency Drills and exercises shall be conducted to allow responders (ERT's) and all ERT personnel to become familiar with the procedures, facilities and systems incorporated during an actual emergency. The interactions within multiple and external response teams allow the responders to enhance decision-making capabilities and demonstrate individual and group skill abilities to response operations. The frequency of exercise is as follows:

TYPE OF EXERCISES/DRILLS	LEVEL	FREQUENCY
Emergency Drill (Including Notification / Communication)	CMERT Level 1	Once in a month for each shift

Table 9.2: Exercise Type and Frequency for ERT

9.6 Training and Exercise Evaluation

EMT / ERT shall conduct exercise evaluation to identify lessons learnt and to improve the procedures, competency and training programme. Evaluation form is provided in Appendix IX: Form 2: Emergency Drill Report.

All training programme documents and post mortem reports shall be made available at site and maintained for continual improvement and audit purposes.

Section 10

Assurance Review

Paragraph **Page**

10 ASSURANCE REVIEW

10.1 Purpose

This section describes the requirements for Assurance Review to ensure Emergency response capability and preparedness of the facilities and the competency of the Emergency Response Team.

10.2 Compliance Assessment Review

The technical assessment and review of emergency and crisis preparedness programme is conducted periodically. The objective of this assessment and review is to identify gaps and incorporate feedback for continual improvement.
The technical assessment review shall be based on the following:

1. ERP and other related plans
2. Training Records
3. Exercise Post Mortem reports and Gap Closure
4. List of emergency contact
5. Records of Past Incidents/Emergency Calls.
6. Emergency Response Adequacy Audit Checklist

All Emergency Response Documentation must be made available at all times.

10.3 Frequency and Team Composition

The technical assessment shall be conducted at intervals.

Yearly adequacy assessment is conducted by MO HSE Dept/CHSE. Tier 3 Technical Assessment is conducted by Group HSE Division on a sampling basis.

10.4 Action Tracking and Record Keeping

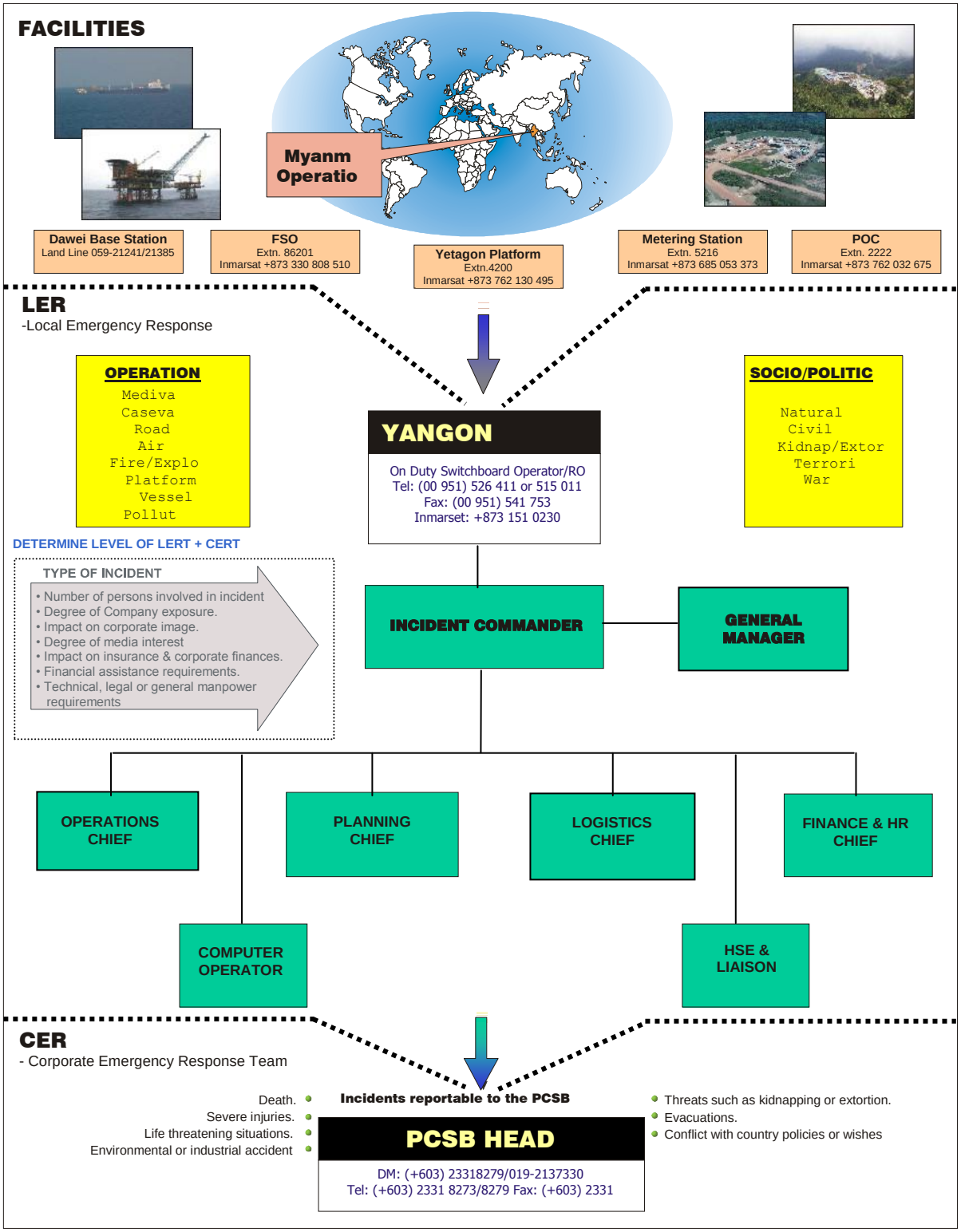
All audit findings shall be communicated to field management and the agreed action item/recommendation shall be tracked to completion. An audit database shall be established and kept at sites for reference and should be captured in HSERAI to follow up.

APPENDIXES

Contents

APPENDIX I

EMERGENCY RESPONSE FLOWCHART



APPENDIX II
EMERGENCY CONTACT DATABASE

PARTIES	CONTACT NUMBERS	
	TELEPHONE	FAX
PETRONAS HQ , KUALA LUMPUR		
PETRONAS COMCEN	+6 03 23312141/42/43	+6 03 2161 1696
PCSB HQ, KUALA LUMPUR		
DATUK MOHD ANUAR TAIB VP & CEO PETRONAS Development & Production and President PCSB	+6 01 2900 6566 (h/p)	
PCSB HQ DUTY MANAGER	+6 03 2331 8279 (ECC) +6 01 9213 7330 (Duty)	+6 03 2331 8280
M Tarmizi Munir Head EP HSE	+012 2733625 (hp)	
Acting Head HSE	+6012 8786520 (hp)	
PETRONAS & MO, YANGON		
AHMAD LUTPI HARON GENERAL MANAGER (MO) PETRONAS COUNTRY MANAGER	515011 ext:3002 (off) 09 518 9317 (h/p)	515092
JAYANG UNDUM PRODUCTION MANAGER	515011 ext: 3096 (off) 09 503 5337 (h/p)	525698
ANNIE NILAR SEIN HR MANAGER	515011 ext: 3039 (off) 09 519 7056 (h/p)	525698
KHIN MOE KYU FINANCE MANAGER	515011 ext: 3048 (off) 09 510 1454 (h/p)	525698
DR.EDWARD ZAN CAA MANAGER	515011 ext:3004 (off) 09 511 4216 (h/p)	525698
SUNNY LINN THURA HTUN HSE MANAGER	515011 ext: 3038 (off) 09 516 5876 (h/p)	525698
YAN NAING WIN SENIOR MANAGER(RIE)	515011 ext: 3086 (off) 09 519 4985 (h/p)	525698

SHAHRIL B KAMARUDIN ME MANAGER	515011 ext: 3207 (off) 09 515 1692 (h/p)	525698
JAFRI RAHIM SCM MANAGER	515011 ext:3166 (off) 09 519 8343 (h/p)	535763
AZLAN SHAH MOHAMAD PLANNING MANAGER	515011 ext:3167 (off) 09 512 4304 (h/p)	525698
JAZMIE OSMAN PROJECT MANAGER	515011 ext: 3152 (off) 09 513 1805 (h/p)	525698
MOHD SHAUFI BIN DAHLAN DRILLING MANAGER	515011 ext: 3231 (off) 09 502 8785 (h/p)	525698
AZLAN BIN MOHD SABIRIN EXPLORATION SENIOR MANAGER	515011 ext: 3198 (off) 09 535 1123 (h/p)	525698
MO EMERGENCY MANAGEMENT TEAM		
MO Emergency Management #16 Shwetaung Kyar (Golden Valley Road) Bahan Township Yangon Fax:	Switchboard Tel: Switchboard Tel: Inmarsat:	515011 (11 lines) 526411 (4 lines) 525698, 525684 +873 151 0230
MO Yetagun FSO/Yetagun Platform/Yetagun POC/Yetagun Metering Station For telephone connection to the MO Yetagun facilities from outside the MO Yangon office, dial the MO Yangon Switchboard (see above) and ask to be connected to the required facility.		
INCIDENT COMMANDER	Ext: 3170 (ECC) DL: 662538(ECC) H/P (09 5193367)	525698
OPERATIONS CHIEF	Ext: 3143 (ECC) OPS - 09 519 3872 FSO/SBM - 09 50 85070	525698
PLANNING CHIEF	Ext: 3172 (ECC) 09 519 4187 (h/p)	525698
LOGISTICS CHIEF	Ext: 3173 (ECC) 09 519 4253 (h/p)	525698

FINANCE & HR CHIEF	Ext: 3142 (ECC) 09 519 4513 (h/p)	525698
HSE & LIAISON OFFICER	Ext: 3171 (ECC) 09 519 4569 (h/p)	525698
MEDICAL COORDINATOR	Ext: 3010 (ECC) 09 519 4573 (h/p)	525698
COMPUTER OPERATOR	Ext: 3141 (ECC) 09 519 4571 (h/p)	525698
MAY MAY SHAR LOCAL & TRAVEL COORDINATOR	515011 ext: 3203 09-513 8204 (h/p)	525698
CHARLES ZAW NAING SEIN AVIATION COORDINATOR	515011 ext: 3042 09 519 1018 (h/p)	525698
AUNG HTON MARINE COORDINATOR	515011 ext: 3121 09 513 4736 (h/p)	525698
IT ENGINEER	09 519 4984 (h/p)	525698
TELECOMM ENGINEER	09 519 4670 (h/p)	525698
MO DRIVER	515011 ext: 3271	
CONTRACTORS REPRESENTATIVE	09 50 85070 (SBM) 09-450 044484 (TideWater) 09 205 1415(Heliunion) 09 513 0398(Hevilift)	
YETAGUN FSO		
SUPERINTENDENT	+873 330-808-510	+873 330-808-512
RAYNALDO TIDE		
MASTER	00 881 631 852 178	
ROMIC TIDE		
MASTER	00 881 631 852 428	

DAWEI		
DAWEI BASE STATION MO AIRPORT OFFICE	(059) 23831 (059) 21992	(059) 21041
TOTAL MYANMAR E&P		
YANGON HEAD OFFICE	650977/ 650989/ 660466	650478/ 650479
JOINT VENTURE PARTNERS		
MOGE MD's OFFICE	657667/657668 (Yangon)	95-1-657678
U MYO MYINT OO MOGE MD	542728 (Residence)	067 403088 (Res:) 067- 411056 (Off;) 067- 411055 (Off:) 067- 411125 (Fax)
U THAN TUN MOGE DIRECTOR (OFFSHORE)	067 420701 (Res:)	067 411009 (Off:) 067 411331(Off) 067- 411330 (Fax)
MR. KAZUNORI TANUMA / Mr. Masahide Shimada / NIPPON OIL	+81-3-6275-5246	+81-3-3276-1359
KHUN KANOK INTHARAWIJITR / PTTEPI	667782 , 652700, 01, 02,03, 04	kanok@pttep.com
MS NATRUEDEE KHOSITAPHAI / PTTEPI	+662 5375784 natrudeek@pttep.com	+6625374909 (Fax)
EMBASSIES		
MALAYSIAN EMBASSY	220248 / 220249	221840
BRITISH EMBASSY	370863 / 370864	370866
US EMBASSY	536 509 / 535 756	511 069
THAI EMBASSY	226 721 / 226728	221713
SINGAPORE EMBASSY	559 001	559 002
SOUTH AFRICA	(66-2) 659 2900	(66-2) 250 1064

INDONESIA EMBASSY	254465 / 254469	254 468
AUSTRALIAN EMBASSY	251810 / 251797	246159
HOTELS IN YANGON		
GOLDEN HILL TOWERS	558556, 558558	558557
SEDONA HOTEL	666900	666911, 666833
MICASA APARTMENT	650933	650950
SAKURA APARTMENT	525001	525002
MARINA APARTMENT	650651	650630
DUSIT INYA LAKE RESORT	662857	665964
TRADERS HOTEL	242828	242800
HOTEL NIKKO ROYAL LAKE	544500	544400
OTHERS		
ISOS CLINIC	09 42011 4536	657922,
YANGON INTERNATION EDUCATION CENTER (YIEC)	530 082 / 530 083	530 083
HORIZON INTERNATIONAL EDUCATION CENTER (Horizon)	541 085 / 537 739 / 548 452	543 926
INTERNATIONAL SCHOOL (ISY)	512793 / 512795	525020
FIRE EMERGENCY	191	
POLICE	199	

MO INMARSAT NUMBERS		
MO	**Phone**	**Fax**
Yangon (Radio Room)	00870 772 529 170	
Platform Radio Room	00870 772 520 445	00870 782 441 513
Platform (LV Control room)	00870 772 520 444	
FSO	00873 330 808 510	00873 330 808 512
POC Radio Room	00870 772 520 443	
POC Accommodation	00870 772 520 812	
MS	00870 772 520 810	
Tidewater Marine International		
Reynaldo Tide	00 881 631 852 178	
Romic Tide	00 881 631 852 428	

Inmarsat Calling from Yangon (From Office Extension Phone)	Dial "7" + Full International Number + "#"
N.B. In MO Emergency Management Centre Inmarsat Access is restricted to Nominated Extensions	
Inmarsat Calling from MO Sites	Dial: - Full International Number + "#"

MO IRIDIUM NUMBERS		
MO	**Phone**	**Fax**
POC (Security Advisor)	00881 6315 52350	
Tidewater Marine International		
Reynaldo Tide	00 881 631 852 178	
Romic Tide	00 881 631 852 428	
IRIDIAM CALLING - ENTER PIN "1111+OK"	Find Signal, Dial: - Full International Number 00. + "OK"	

APPENDIX III

SAMPLES OF EMERGENCY MANAGEMENT FORM

1. Incident Notification and Reporting Form

From:

OSC, _____
To: MO Incident Commander

Subject: Notification of Incident or Emergency on_____

Exact Location	
Date and Time	
Nature of Incident/Brief Description	
Number and Condition of Casualties	
Extent of Damage	
Actions Taken	
Assistance Required	
Aircraft Location	
Weather Conditions	Wind Condition: Wind Speed & Direction: Temperature:
Any Other Information	

_____
(On-Scene Commander)

1. Initial Incident Notification Form

COMCEN:	**FR0M:**
Tel: +603-2331 2141/42/43 Fax: +603-2161 1696 SMS: +6012-374 8702 / +6012-316 8496 Email: comcen@petronas.com.my	BU: OPU: Tel: Fax: Sequence No:

NOTIFICATION LIST

OPU to tick:	**COMCEN** to notify the following:	**OPU** to notify internally as follows:
☐ Tier 1	☐**With IMPACT / HIGH POTENTIAL (HI-PO) - see list below*** • **PETRONAS Management Committee** • **VP Supply Chain and Risk Management** • **Head GHSED** • **GM CSD** • **GM HSE PMU (for Upstream Emergency only)** ☐**No IMPACT*** • **GM HSE PMU (for Upstream Emergency only)**	• **Notification list to be established by OPU / BU**
☐ Tier 2	☐**With IMPACT / HI-PO - see list below*** • **PETRONAS Management Committee** • **VP Supply Chain and Risk Management** • **Head GHSED** • **GM CSD** • **GM HSE PMU (for Upstream Emergency only)** ☐**No IMPACT*** • **Head GHSED** • **GM CSD** • **GM HSE PMU (for Upstream Emergency only)**	• **Notification list to be established by OPU / BU**
☐ Tier 3	• **PETRONAS Management Committee** • **VP Supply Chain and Risk Management** • **Head GHSED** • **GM CSD** • **GM HSE PMU (for Upstream Emergency only)**	• **Notification list to be established by OPU / BU**

*** IMPACT / HI-PO (tick where relevant)**

Impact:	Hi-Po:
☐ Fatality ☐Major injury (e.g. Permanent Partial Disability, Lost Workday Case more than 4 days) ☐ Significant environmental impact (e.g. groundwater contamination, vegetation damage, fish kill) or release above Tier 1 threshold quantity** ☐ Asset damage exceeding USD 25,000 ☐ Local media / public concerns ☐ Security incident (e.g. arson, kidnapping, bomb threat, piracy, hijack)	☐Incident with potential consequences leading to fatality or impact to organisational reputation

** Note
i. **Natural gas, Methane, Ethane, Propane, Butane, LPG, LNG = 500 kg**
ii. **Petrol, Gasoline, Methanol, above 15 API Gravity Crude oil = 1000 kg or 7 bbl**
iii. **Diesel, below 15 API Gravity Crude oil = 2000 kg or 14 bbl**
iv. **For other material, please refer to API 754 Standard**

PETRONAS	NOTIFICATION FORM	BU / OPU:	
		Tel:	
		Fax:	

****** Mandatory to be filled up for initial notification***

Type of Notification ***	☐ Initial ☐ Update ☐ Stand Down / All Clear		
Response Tier ***	☐ Tier 1 ☐ Tier 2 ☐ Tier 3		

SECTION A: BASIC INFORMATION ***

Department Responsible:		Date Prepared:	
		Time Prepared:	
Emergency Location:	☐ Onshore:	Emergency Date:	
	☐ Offshore:	Emergency Time:	

SECTION B: NATURE OF EMERGENCY / TYPE OF EMERGENCY ***

HSE	☐ Fatality	☐ Environment	☐ Fire / Explosion	☐ High Potential Incident (Hi-Po) ( )	
	☐ Loss of Containment / Gas Leak	Spillage / Release Volume:			
		Recovered Volume:			
Security	☐ Arson	☐ Kidnapping Hostage	☐ Bomb Threat	☐ Community Disturbance	☐ Hijack / Piracy
	☐ Others: Please specify				
Transportation	☐ Land	☐ Water	☐ Air	Please specify:	

SECTION C: CASUALTY / FATALITY / MISSING ***

Number of Injured Person	**Number of Fatality**	**Number of Missing**
☐ PETRONAS: ( )	☐ PETRONAS: ( )	☐ PETRONAS: ( )
☐ Contractor: ( )	☐ Contractor: ( )	☐ Contractor: ( )
☐ 3rd Party: ( )	☐ 3rd Party: ( )	☐ 3rd Party: ( )

SECTION D: EMERGENCY POTENTIAL ***

☐ Under control with available resources. No potential of escalation	☐ May require additional resources (e.g. authorities, contractors, mutual aid)
☐ Authorities may take over command and control	☐ May trigger significant authorities / public / community / media interest

SECTION E: AUTHORITIES INFORMED

Authorities / Date Informed:	☐ Police ( )	☐ Fire Dept. ( )	☐ Medical ( )	☐ HSE Regulator ( )	☐ Others: e.g. Coast Guard, Marine Dept, Municipality, etc. ( )

SECTION F: BRIEF DESCRIPTION OF EMERGENCY (Who, What, Where, When& Consequence)

SECTION G: RESPONSE ACTION TAKEN

SECTION H: COMMENT / ADDITIONAL INFORMATION

SECTION I: STAND DOWN / ALL CLEAR	**Date:**		**Time:**
Prepared / Reported by * **	**Name:**		**Signature:**
	Designation:		
Approved and Submitted by * **	**Name:**		**Signature:**
	Designation:		

SMS Template:

SAMPLE SMS Notification The following are the mandatory information for SMS notification: (1) Type of incident i.e. fire, injuries/casualty/fatality; (2) Basic Information: Incident location, date and time; (3) Incident Potential: Incident under control or potential to escalate; (4) Impact & Consequence: Fire/Injury/Environment/Security (No. of Casualty/Fatality); (5) Sender:	Sample of SMS notification showing all the information above is shown as below: Initial Notification: Fire Incident @ Platform ABC, OPU XYZ on 31/12/2010 @0030 hrs. Tier 2 declared & incident under control. 5 staff injured @ Medevac ongoing. Sender: Incident Commander, ECC – OPU XYZ

2. Proforma Sheet

This Proforma Sheet will be used by the Incident Commander to record initial reporting by the Person-in Charge on essential details and to prompt responses required.

ITEM	COMMENT
Date and Time of notification.	
What has happened?	
Where and when did it happened?	
What is the emergency description (blowout, fire etc.)?	
Immediate actions taken e.g. muster, fire teams, evacuation etc.	
Number and severity of casualties?	
POB/PAX numbers and lists. All personnel accounted for?	
Road Ambulance on-locations.	
Aircraft locations.	
Facility Emergency Response Team informed/mobilized.	
Additional resources required? (Aircraft, equipment, materials etc)	
Long-term actions required?	
External notifications made? (Government agencies, other authorities)	
Emergency Assessment?	Minor Serious Crisis
Weather conditions?	Wind Condition: Wind Speed & Direction: Temperature:

This form shall be filled by the Person-in-Charge (at the site immediately after the initial reporting of emergency situation and then faxed or e-Mail to the Incident Commander.

3. **MEDEVAC Form**

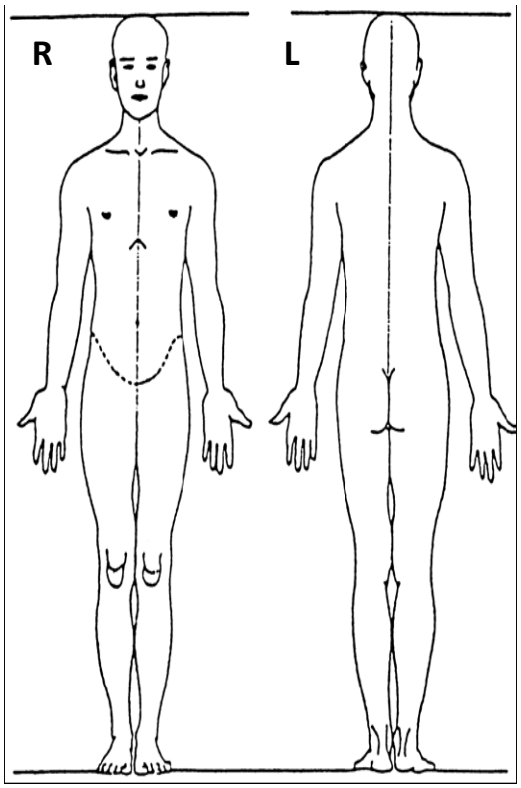
From: On-Scene Commander		
To:		
Subject: Medical Evacuation of		
1.	Patient Name	
2.	Nationality	
3.	Passport Number	
4.	Employer	
5.	Nature of Illness/Injury	
6.	Treatment Given	
7.	Medical Evaluation - Detailed Diagnosis and Prognosis	
8.	Patient's Present Location - Provide full address and telephone number	
9.	Physician - Name of attending physician, and telephone number if available	
10.	Travel Date and Time - Approximate date and time patient will be able to travel	
11.	Hospitalization Requirement - Indicate hospitalization is required upon arrival	
12.	Medical Records - Indicate whether medical records will accompany the applicant	
13.	Escort Requirement - Indicate escort is accompanying per recommended	
14.	Escort's Final Destination - Will accompany the subject to the final destination	
15.	Special Requirements - Special reception requirement (wheelchair, ambulance)	
16.	Other Medical Information - Provide other information not covered above.	

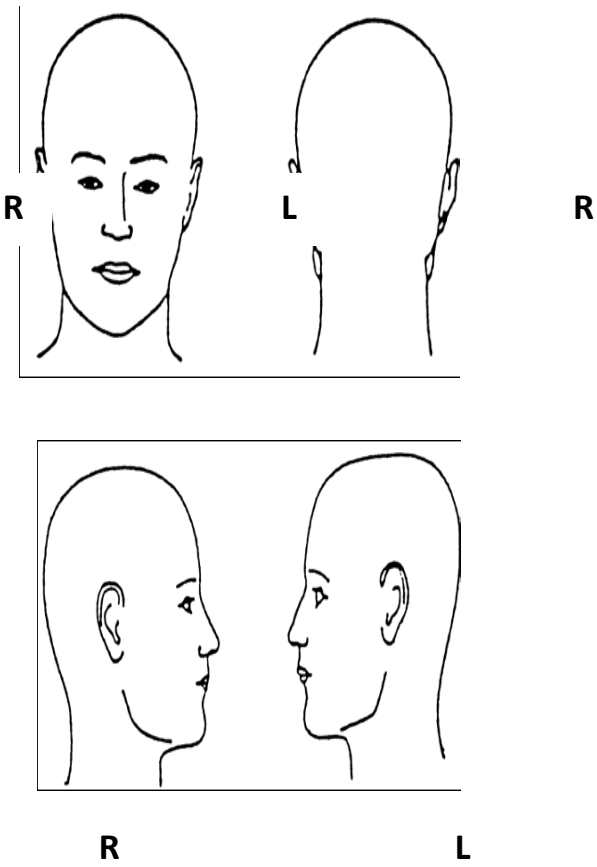
4. Bodily Injury Form

BODILY INJURY CHART

Injured person's name :	**Date :**
Preparer's name :	**Time :**

Indicate location of abrasions, lacerations, bruises, suspicious marks, etc., on the charts below. Number each location, and describe the injury in the space provided. If more space is needed for descriptions, use the back of this page. Attach available photographs.





Description of Injuries :

1.	
2.	
3.	
4.	
5.	

APPENDIX IV

LIST OF EMT ASSIGNEES

PRIORITY CALL-OUT TEAM MEMBERS			
Name	**Home**	**Mobile**	**Address**
Incident Commander (Duty Mobile No: 09 519 3367)			
YAN NAING WIN	527290	09 519 4985	Bldg 9, Room 302, Kabaung Housing, Kabaung Road,
KHIN MOE KYU	581039/572626	09 510 1454	34/1356, Bo Min Yaung Road, North Dagon
M AZLAN SHAH BIN MOHAMAD	*01 558556*	09 512 4304	#1811, Golden Hill Tower
SHAHRIL B KAMARUDIN	650651	095151692	Room 314, Marina Residence
LINN THURA HTUN	*01 518066*	09 516 5876	#3, 5th Floor, Sann Chaung road,, Sann Chaung Township, Yangon
ANNIE NILAR SEIN	708314 500187	09 519 7056	7, 2nd Floor, Awaiyar St., Hledan, Kamayut
DR EDWARD ZAN	01 652827	09 511 4216	Building E, # 525,Thiri Condominium, North Point Shopping Center, Mayangone Township
JAFRI B A RAHIM	N/A	09 519 8343	#305 Golden Hill Tower
JAYANG UNDUM	N/A	09 503 5337	#19-08, Golden Hill Tower
Operations Chief (Duty Mobile No: 09 519 3872)			
BOB THOMAS	NA	09 503 8557	30B Aung Min Khaung St., Kamaryut Township
ADRIANO ANONUEVO	NA	09 5401980	Room 6C Race Course Condo, No.24/26 South Race Course Road, TamweTownship
KYAW ZEYA	NA	09-5107478	No.62/12 Posein Road, TamweTownship, Yangon,
TI KYI	c/o -651389/ 663139	09 430 30199	2/473, Thumarlar 2nd St. North Okkala.
AUNG SOE MIN	N/A	09 501 1917	131, 32nd St., Pabedan
WIN MYINT	NA	09 505 1960	111, first floor, 156 St, Tarmwe, Yangon.
AUNG MYINT THEIN	NA	09 421 116079	No. 127, Nant Thar Myaing Street, 50 Qtr, North Dagon
SANDAR AUNG	N/A	09 515 8581	277/12, East Yankin, Yankin TSP
MYAT TUN MIN NYO	NA	09 505 1288	601, Nyaung Ta Pin St., Aung San, Insein
KHUN MIN SWE	514081	09 516 1050	17, 6th Fl, Thukamyaing St, Sanchaung
Planning Chief (Duty Mobile No: 09 519 4187)			
HAN ZAW OO	N/A	09- 730 56297	No. 6, Anawyahtar Road, Pazudaung
ZAW MIN TUN	01 221153	09 730 22648	158, 8th floor, Sanchaung Street, Saunchaung Tsp.
NANDA HLAING	547386	09 5086 168	159, Yadanar Road, Yadanar Housing Project 1, Thaketa
WIN THU	NA	09 511 2523	1260, Room 205,Thiri Street, Myittar- Nyunt, Tamwe,
WIN MYINT	NA	09 505 1960	111, first floor, 156 St, Tarmwe, Yangon.
YIN THIDA HTET	N/A	09 540 3402	No. (528), Shwe Yin Mar Street, 41-Quarter, North Dagon.
AUNG MYAT KYAW	NA	09 4500 25718	No. 266, Nat Maut St. 39 Qtr, North Dagon Myo Thit

THAN OO	N/A	09 430 68757	No. 6, Parami Housing, Room #102, U Thin Pe' Street, 16 Qtr, HlaingTownship.
***Logistics Chief* (Duty Mobile No: 09 519 4253)**			
TONY COLE	*01 665534*	*09 504 4273*	*No.5, Ady Road. West 2*
AUNG HTOON	01 573048		*98, 6th Street, Ngwe Kyar Yan , South Oakkalapa.*
MYAT ZAW AYE	*9 666 238*	*09 513 4361*	*14 (B) May Kha Road,Mayangone*
THAN NAING MYINT		09 863 0771	1091 Sarga road, Qr 4, South Okkalar
HAN THU		09 423 689239	No.19, 6-flat, Phyar Pon Street, San Chaung Township, Yangon
WIN ZAW	01 526726	*09 8632676*	*6(B) , Bld (4) , Yan Aung St, Sanchaung.*
NAY LIN KHINE	*N/A*	*09 510 8988*	*87, Kyaung Gyi Street, Kyee Myin Daing T/S*
CHAW SU WIN –SU SU	*01-548 929*	*09 431 84855*	*21, 1st Fl, Atesarthaya St, Kyauk Myaung Tsp*
Finance & HR Chief (Duty Mobile No: 09 519 4513)			
THAN THAN SHEIN	01 660796	09 501 9796	6, Aung Thuka St., 9 Mile, Mayangone
MYAT SANDAR	541005	09 540 7957	213, Bodg 6, Kyaik Ka San Housing , Tamwe
SAN SAN WIN	09-513 0362	09-730 84241	No. 125, 4th Floor, 46th Street, Botahtaung Township, Yangon, Myanmar
YIN YIN AYE	610467	611106	31/94 Shwe Pyi Thar Housing Bogyoke Road Shwe Pyi Thar TSp, Yangon
MARY ANTHONY	562891	0943202613	23 (B), Yadanar Road, Yankin
TIN MAUNG MYINT	N/A	09 732 41572 09 515 4969	No.71, Level 6,Hledan Street, LanmadawTownship, Yangon, Myanmar
AUNG MYINT OO	N/A	09 492 13180 09 519 1151	No. 30, 3rd Floor (Left), Thiri Street, Thiri Khemar Qr, Sanchaung
YAMIN KHA	555 828	09 430 43316	No.90, Min Street, BahanTownship, Yangon
Name	**Home**	**Mobile**	**Address**
HSE and Liaison Officer (Duty Mobile No: 09 519 4569)			
KHIN MG MYOE	584198	09 519 4569	34/217 , Tabinshwehtee Road, North Dagon.
TIN NAING	682926	09 519 4573	7C, Yuzana Road, Aye Yeik Mon Housing , Hlaing.
WIN AUNG ZAW	525537	09 518 8137	12 B, Shwe Taungkyar, Bahan Yangon
SAW TUN	N/A	09 519 7170	K-21, Mingalar 1st street. FMI City Hlaing Thayar
KHIN OHNMAR SOE AUNG	667045	09 519 4569	231, Shwe Hinin Si Lane 6, 9th Mile , Mayangone.
MYO THET NAING	N/A	09 4480 11581	18 B-6 ,Chanthar St, Near Fire station, Sanchaung TSP
SAW SYDNEY AWGYI	09 4200 25 330	09 730 30 947	54-B, Nanthagone Road, Insein.
MIN MIN	09 519 4569	09 501 2787	
THARAPHI HTAY		0943202845	No.101, Room No.(27), Kan Road, Hlaing Township, Yangon
Computer Operator (Duty Mobile No: 09 519 4571)			
KATHY KHINE	N/A	09-5171615	No.165, Hin Thar Street, 14/2 Qtr,

		09-5111077	S/Okkalar
THIDA KO	N/A	09 4500 67854	No. 125, 4th Floor, 46th Street, Botahtaung Township, Yangon, Myanmar
PHYU HNIN AUNG	*N/A*	09 4211 74731	Room-B6, No.14, Minn Road,
EI CHO CHO MAUNG	N/A	09 4480 12903 01 586 509	16/10, Taw Win Housing, 41 Quarter, North Dagon Township.
HNIN HNIN SOE	N/A	01 252670 09 500 3226	No. 155 , 1st Floor Latha Street , Latha Township , Yangon
PWINT HLAING ZAR	N/A	0950 46476	No. 40A, Myita St., Mikyaungkan Part(2), Thingangyun Tsp., Yangon
MAY AYE OO @ MARY	389416	09-7303 9878	Bldg 405,7 D, Bogyoke Streeet, Pabedan Tsp, Yangon
MAY HNIN MAUNG	700678	N/A	No 865,Kyaw Thu (20) Steet,9 Quarter, SouthOkalarTownship,Yangon, Myanmar.
WAI MON	N/A	09-4200 16043	No.478, Baho St., Kyauk Ye Dwin, 5th Ward, Mayangone Towinship, Yangon

Back-Up Call-Out Team Members			
Name	**Home**	**Mobile**	**Address**
OPERATIONS			
NOK and Media Liaison Officer (Duty Mobile No: 09 519 4607)			
AYE MYA THIDA	01 559251	09 519 7936	25 (D), Room 1008, Condo (B), University Housing, New University Avenue Road, Bahan Township
PHONE KHINE WIN	*580625*	09 503 7049	34/649, Yamanay Road, North Dagon
THANDAR AUNG		09 730 22783	No. 16/1271, Room C-6, 6th Floor, Sabe Street, Myitta Nyunt Quarter, TamweTownship
HAN ME KO	*524241*	09 502 0292	217, Dhamazedi Road, Bahan
MYA SANDI TUN		09 512 7318 09 519 4607	Bldg 8A, Room E1, Aye Yeik Mon 3rd St, Hlaing
KAY NWE KHIN	C/O 01-516545	09 731 40512	No. 18, 2nd Floor,Yadana Street,Myaynigone (South Qtr),San Chaung Township,Yangon.
NAW GAY NAY PAW	N/A	09 732 28205	No.15, Julibee road, Taung Thu Gone Qtr, Insein Tsp.
Telecom Engineers (Duty Mobile No: 09 519 4670)			
DEREK BOYLE	525001	09 510 0961	Room (513) , Sakura Residence
THAN ZAW	291748		105, 1st Floor ,51st Street, Pazundaung.
SAW MYINT AUNG	221154		23, U Lu Nee Street, Kyi myin daing.
ZAW WIN MAW	N/A	09 519 4049	No. 81/82, Room 2, Hanthar Yeik Mon, Kamayut.
YADANA HANDI	N/A	N/A	No. (1), Aung Thiri Lane, Aung Mingalar Ward, Thanlyin
Contractor Representative			
Schlumberger (IT) (Duty Mobile No : 09 519 4984)			
NAY WIN MIN	660 796	660 796	6, Aung Thuka St, 9 Mile, Mayangone.

AUNG THU THU	N/A	09 515 4631	25/4 Tha Bawa Yeik Nyein, Aung Dama Yeik Tha Street, Hlaing, Yangon.
THUTA HTAY	687 026	N/A	No. B-31, Padaukwar 3 Street, FMI City, Hlaing Tharyar Township
THEIN ZAW	N/A	N/A	No.154/6B,Sanchaung St, Shinsawpu Ward, Sanchaung Tsp, Yangon
MIN THEIN	N/A	09 535 1584	No. 123, 1st floor (L), Bo Ywal Street, Latha Township, Yangon.
AUNG LAN WINT HTIKE	N/A	09 519 1475	No. 27, 90th Street, Kandawkalay, Mingalar Taung Nyunt Township
SES, SBM (FSO) (Duty Mobile 09 50 85070)			
KYAW THURA		959 43025257	No-16,5/A , Bahan 1st Street, Bahan Township , Yangon .
YIN MIN MIN HTET	C/O 552163 09 421 112 677	09 50 85070	34, 2nd Floor , Damawihara St, Kyauk Myaung.
Carimin (Duty Mobile No: 09 7321 2269)			
MYA MOE THU (Carimin)	09-5069653	370852 09-73212269	#406, 4th Floor, La Pyayt Wun Plaza, No.37, Alan Pya Pagoda Road, Dagon Township, Yangon, Myanmar(OFFICE)
Tidewater (Shipping)			
Capt: YE LIN HTUT (Tide Water)		01 – 556780 09-450 044484	No.15, Inya Myaing Road, Bahan Township, Yangon Room-601, Bldg-A, Shwe Than Lwin Condominium, New University Avenue Road, Bahan (OFFICE)
MS HAY MAR THET (Tide Water)		01 – 556780 09 4210 25849	#862, Net Ya Kan (3)St; 35th Quarter, Dagon (North) Township, Yangon, Myanmar.
ISOS (Medical)(Duty Mobile No: 09 514 4997)			
Duty Doctor	667877/667879	09 514 4997 + 66 2205 7777	1) Bangkok Alarm Centre Dusit Inya Lake Hotel (Yangon Office)
Heliunion(Aviation)			
Base ManagerFRANCIS ECHE(Heli union)	650 933	09 205 1415	Base Manager Room (418), Micasa Hotel
Hevilift(Aviation)			
U MAUNG MAUNG LAY(IPSC, HeviLift)	647050 Fax - 647060	09 513 0398	105 A, Zion Hill St, Nanthar kone, Insein ipsc@myanmar.com.mm
M&A (Catering)			
WIN PHYO(Myint Associates) MYAT MIN U MYO THI HA	09 7303 4715	507 100/ 521 003/ 516 201/ 505 077 09 500 1609 09 7321 7329	84-85 Hlaing Myint Moh Lane # 1, 10th Quarter, Hlaing Tsp, Yangon
TNS			
KHINE THI TUN (TNS)	09 510 1453	09 862 4137	Room (0301), Sedona Hotel (Residence) 11(A) (GFL) South Race Rd,Tamwe.
Asia Guiding Star			
DR. KAUNG MYAT LIN (Asia Guiding Star)	662133, 522 587	09 515 0178	5, Shwesabei Street, Aungtheikdi Avenue, Mayangone, Yangon
PCMI Project Team Representative			
Mr. Syahrul (CSR)	095028537	095028537	Gway Cho Camp, Bagan

			lauengchuan82@gmail.com
ENG BOON KEONG		09 43081019	611, Golden Hill Tower
MO Drilling Representative			
PLANNING			
Technical Specialists			
Yan Naing Win (Mechanical)	527290	09 519 4985	Bldg 9, Room 302, Kabaung Housing, Hlaing Township,
Khun Min Swe (Mechanical)	514081	09 516 1050	17, 6th floor, Thukamein Street, Sanchaung
Thura Htun (Electrical)			
Vacant (Electrical)			
Aung Soe Min (Instrument)	N/A	09 501 1917	131, 32 nd Street, Pabedan Township
Nanda Hlaing (Process)	547386		#159, Yadanar Road, Yadanar Housing Project 1, Tharketa Township, Yangon
Bob Thomas	221224	09 503 8557	236, Ahlone Road, Ahlone
Myat Tun Min Nyo		09 505 1288	601, Nyaung Ta Pin Street, Aung Sun Insein Township
Documentation			
Moe Ma Ma Myo	663594	09 510 0151	24/5 Housing Project, Ward 6, Mayangone
Myo Paing	536046 / 505301		313/C, Pyay Road, Sanchaung Township, Yangon
Land Transport			
Myint Han	650520	09 510 1670	358 A/2 Zeyar Khay Mar Street, No.6 Quarter, Mayangone
Zaw Nyi Nyi	09 514 3422	09 863 9100	9/D, Nawarat Road, Mayang Gone, 8th mile
Marine and Custom			
Aung Htoon	573048	09 513 4736	98, 6th Street, Ngwe Kyar Yan, South Okkalarpa
Myat Zaw Aye	666238	09 541 7751	14 (B) May Kha Road, Mayangone
Aviation			
Zaw Naing Sein (Charles)	500374	09 519 1018	Bldg 1, Room 44, 7th Floor, Pyi Yeik Mon Housing, Narnataw Road
Security			
Min Min		09 501 2787	
Rehabilitation, Accommodation and Food			
Soe Naing	721109	09 80 33421	241/1, Phokhoung Street, 14/3 Ward, Myin Thar, South Okkalarpa
Myint Han	650520	09 510 1670	358 A/2 Zeyar Khay Mar Street, No.6 Quarter, Mayangone
General Manager			
Ahmad Lutpi Haron	558556	09 518 9317 +6 019 235 8897	Room (806), Golden Hill Tower 1

APPENDIX V

LIST OF ECC EQUIPMENT

1 EQUIPMENT

As a minimum, the following equipment will be maintained within the EMC at all times:

1. At least 4 large tables
2. Comfortable chairs for at least 12 persons
3. 2 wall clocks (set for Yangon and Kuala Lumpur time)
4. A desktop computer and local laser printer (with access to the Yangon office network and the PCSB global e-mail system)
5. At least 8 standard office telephones (connected to the MO switchboard)
6. An Inmarsat mini M-telephone
7. Wall boards for information logging
8. At least 3 four-way extension socket outlets (UK 3-pin 13 Amp style)
9. Various socket outlet adapters (USA and Continental)
10. 8 nos of mobile cellular phones for all EMT Core Members
11. 3 nos of hotline phones connected to each site

Note that the Yangon office Radio Room is adjacent to the ECC and this is where the HF radio set is located.

2 CONSUMABLES

As a minimum, the following consumables will be maintained within or adjacent to the EMC at all times:

1. At least 12 whiteboard non-permanent marker pens (various colors)
2. At least 4 flip-chart pads
3. At least 12 A4 pads of lined paper
4. At least 2 reams of A4 plain paper
5. At least 12 pens
6. At least 12 pencils
7. At least 4 erasers
8. A calculator (with spare batteries)
9. At least 4 12-inches rulers
10. At least 4 rolls of masking tape
11. At least 1 clear-tape dispenser with a roll of tape
12. At least 1 pair of scissors

3 LOCATION AND COMMUNICATION INFORMATION

Additionally, the folio cases should contain up-to-date location and communication information for:

1. The PCSB Headquarters Office in Kuala Lumpur
2. The MO Yangon Office
3. The TOTAL Yangon Office
4. The MO Pipeline Operating Centre (POC) in Kanbauk
5. The MO Metering Station (MS) in Ban I Tong
6. The TOTAL Pipeline Centre (PLC) in Kanbauk
7. The Yetagun A & B Platforms
8. The Yetagun FSO
9. SOS Clinic (Medical Services Provider)
10. Heliunion Helicopters Limited (Aviation Services Provider)
11. Any MO Supply Boats or other Marine Vessels
12. Any MO Mobile Drilling Units

13. Any MO Survey Spreads
14. Any MO Construction Spreads
15. Any MO onshore design offices and fabrication yards

4 MAPS

The folio cases should also contain up-to-date maps as follows:

1. The Yetagun field (showing the Yetagun A & B platforms, the Yetagun FSO and the field no-entry zone.
2. The onshore pipeline right-of-way and service track.
3. The offshore gas and condensate pipelines.
4. Aviation navigation map (showing Yangon, Kanbauk, Dawei, Myeik and Yetagun as a minimum)
5. Marine navigation map (showing Yangon, Heinze Chaung, dawei, Myeik, Yetagun and Singapore as minimum)
6. Yangon City street map.
7. Myanmar national road map.
8. Onshore pipeline area regional map (showing villages and other main features in the pipeline area.

Note: Maps 1 through 5 above **must** include latitude/longitude grid

5 DRAWINGS

There should be up to date plans and elevations (or general arrangements / layouts) for the following facilities within Myanmar:

Permanent onshore and offshore facilities:

1. The Pipeline Operations Centre (POC)
2. The Metering Station (MS)
3. The Yetagun-A wellhead platform
4. The Yetagun-B production platform
5. The Yetagun FSO
6. Any Yetagun field supply vessel

Temporary onshore and offshore facilities

1. Drilling rigs
2. Survey spreads
3. Diving Spreads
4. Construction spreads

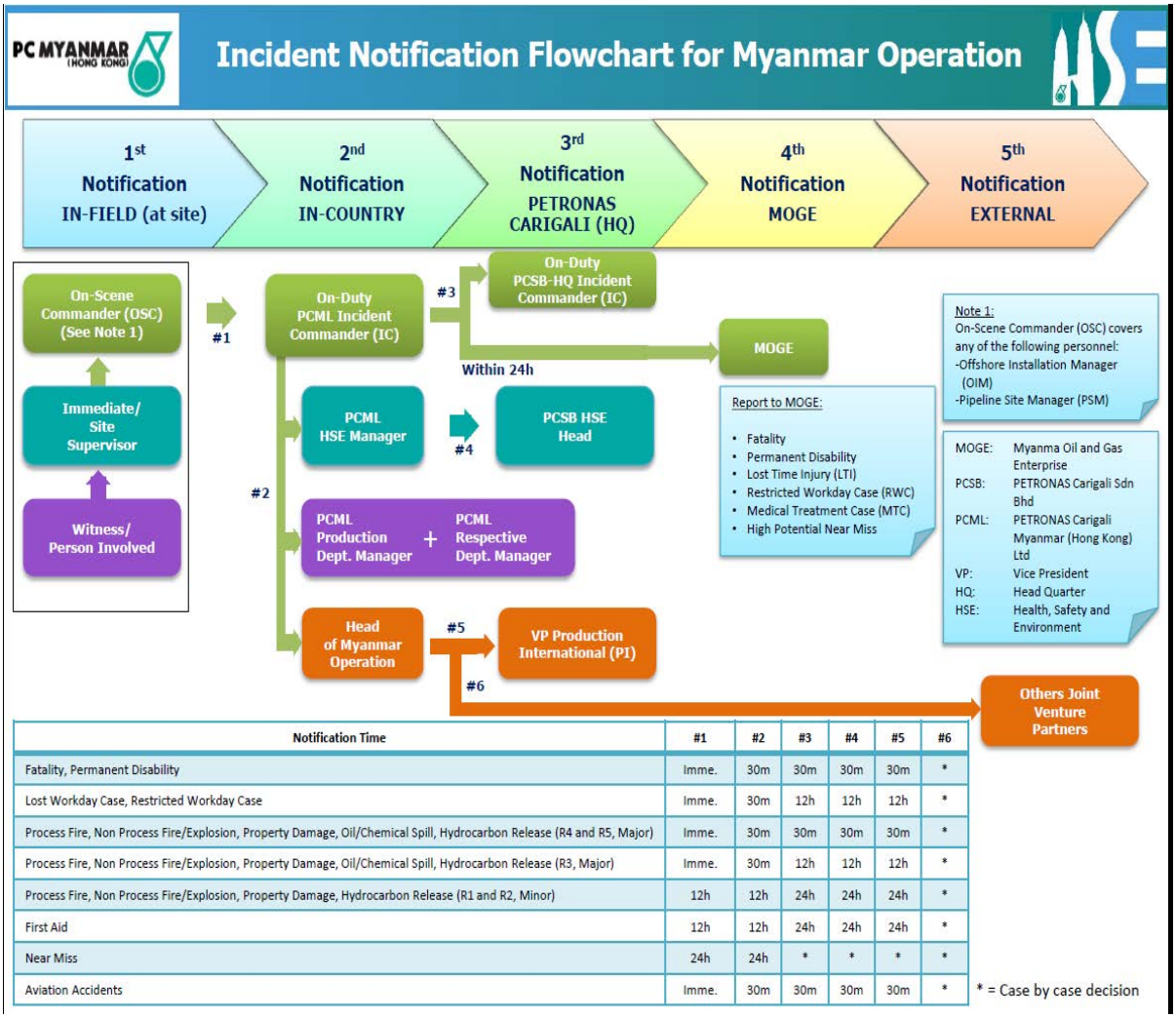
Note: Preferred drawing size is A3 and A4. A2 sized drawings can be accommodated if A3 and A4 sized drawings are not available. However, A0 and A1 sized drawings should be avoided.

6 OTHERS

The cupboards/shelves in the EMC should also contain comprehensive A3 drawings of all gas/condensate production facilities (i.e platforms, pipelines, FSO)

APPENDIX VI

INCIDENT NOTIFICATION FLOWCHART FOR MYANMAR OPERATION



Notification Time	#1	#2	#3	#4	#5	#6
Fatality, Permanent Disability	Imme.	30m	30m	30m	30m	*
Lost Workday Case, Restricted Workday Case	Imme.	30m	12h	12h	12h	*
Process Fire, Non Process Fire/Explosion, Property Damage, Oil/Chemical Spill, Hydrocarbon Release (R4 and R5, Major)	Imme.	30m	30m	30m	30m	*
Process Fire, Non Process Fire/Explosion, Property Damage, Oil/Chemical Spill, Hydrocarbon Release (R3, Major)	Imme.	30m	12h	12h	12h	*
Process Fire, Non Process Fire/Explosion, Property Damage, Hydrocarbon Release (R1 and R2, Minor)	12h	12h	24h	24h	24h	*
First Aid	12h	12h	24h	24h	24h	*
Near Miss	24h	24h	*	*	*	*
Aviation Accidents	Imme.	30m	30m	30m	30m	*

* = Case by case decision

APPENDIX VII

EMERGENCY RESPONSE REPORT

1. Emergency Response Report

Location:		**Shift:**
Date:	**Time:**	**POB:**
ERT Organization		
OSC	DCT Commander	Medical Team Leader
Recorder/Communications	Process Control	Mustering/Lifeboat Commander
Incident Description		
Sequence of Events		

Time	Event

Findings

No.	Element	Findings
1	Mustering	
2	Communications	
3	Tactical Response (DCT)	
4	Process	
5	Competency	

6	Equipment		
7	Staging		
8	Others		
Recommendation for Improvement			
No.	Item	Recommended Action	Action party
1			
2			
3			
4			
5			
6			

Prepared By:

_____
Name:
Position:

Approved By:

_____
Name:
Position:

APPENDIX VIII

EMERGENCY DRILL REPORT

Emergency Drill Report

Location:		**Shift:**
Date:	**Time:**	**POB:**
ERT Organization		
OSC	DCT Commander	Medical Team Leader
Logger/Communications	**Process Control**	**Mustering/Lifeboat Commander**
Exercise Scenario:		
Reference PIP(s): 1. 2. 3.		
Sequence of Events		

Time	Event

Findings:	
Element	Findings
Mustering	
Communications	
Tactical Response (DCT)	
Process	
Competency/Training	
Equipment	
Others	

Recommendation for Improvement	
Item	Recommended Action

Prepared By:

_____
Name:
Position:

Approved By:

_____
Name:
Position:

APPENDIX IX

ADDITIONAL ROLES & RESPONSIBILITIES FOR MOEMT

Information Officer		Responsible for organizing and managing all public affairs activities associated with incident response operations.
HSE & Liaison Officer	**Safety Officer**	Responsible for supporting the EMT and Site Safety Officer and to provide expertise on safety issues that may arise during the conduct of incident response operations.
	Liaison Officer	Responsible for organizing and managing all government and community affairs activities associated with incident response operations.
	Security Officer	Responsible for providing advice on security issues associated with incident response operations.
Legal Officer		Responsible for providing advice on legal issues associated with incident response operations.
Finance & HR Chief	**Human Resource Officer**	Responsible for addressing human resources issues that arise for response personnel and for arranging humanitarian assistance to the NOKs of individuals injured or killed by the incident or during response operations.
	Finance Section Chief	Responsible for managing and supervising all financial and administrative aspects of incident response operations, including accounting, invoice processing, contracts, cost control, insurance coordination, and financial reporting.
Business Continuity Chief		Responsible to ensure the team is activated to provide response related to Business Continuity Management.

Appendix 4
Scoping Phase Meeting Minutes

Record of Meeting Minute

Basic Details	
Project Title	EIA Study of Exploration Drilling Campaign in Onshore Block M-12, M-13, M-14
Date	[14.6.2018] Thursday
Time	[2:00 pm]
Venue	[Dawei]
Number of Participants	46
Agenda	1. Opening of Public Consultation meeting 2. Introductory speech by MOGE representative U Nay Aung 3. Presentation about Project information by U Phore Kyaw (PCML) 4. Presentation about Ye Takon CSR by Daw Tin New Nyo (PCML) 5. Presentation about Environmental Impact Assessment (EIA) by U Khun Setthar (EQM) and Mr. Dylan Jenkins(IEM) 6. Question and Answer 7. Closing of Public Consultation meeting

Question & Answer Session

No.	Questions, Concerns and Recommendation	Clarification
1	**U Tint Lwin, Hin Thar media** I would like to know the local name of block M12, M13 and M14 and the locations of the blocks. I would like to know clearly about that there are 3 blocks (M12, M13 and M14) in which four well will be drilled. I have already talk about area and block M 13 is very close to Dawei. In Dawei, there are one project site of NAG and it is closed with M 13. I also worry about that there are local fishery in that place. How much millions of cubic feet of oil and gas produced from Ye Ta Gon?	**U Khun Sat Thar, EQM** I would like to explain that you asked about fishery zone and drilling zone. Blocks M12, M13 and M14 are located in the west of Dawei and four black points on this map are points which aim to drill. If you see this map, I think you will know where the blocks are located on the fishing ground. Total area of these blocks is about 29987 sq km. And then, 500m from the drilling rig is regarded as the safety zone. Dilling period is 75 days long for each well and it will take six months for all wells. I would like to say that we don't prohibit the whole block and we will regard only 500 m around the drilling rig as the exclusion zone.
	U Tint Lwin, Hinthar Media Are there another wells to drill, besides block M12, M13 and M14? Local people don't know the name of the blocks such as M12, M13 and M14. Please explain again clearly the local name of the blocks and the locations of the blocks. For example, these blocks are located which distance from the Kan Pauk. What does 180 MMSCAF mean? **U Tint Lwin, Hin Thar Media** How many wells are there?	**U Phoe Kyaw** These three points on the map are located 110 nm far from Dawei. 180 MMSCAF means the production amount of gas from all the wells. **U Phoe Kyaw, PCML** There are about 12 wells totally.
	U Hlawn Moe, Daweil Research Association Block M13 shown on the map is very close to the onshore fishing areas. How do you collect the data? There are many local fishermen from Maungmakan, Thabouseik and Kanpauk in that place. 500 m exclusion zone is equal to 1600 ft.	**U Khun Set Thar, EQM** Blocks M12, M13 and M14 are located 110 nm far from Dawei. There are located on offshore, not onshore area. It is 120 nm far from Myeik. The well sites are located 100 miles from Dawei, 80 miles from Mosco Kyun Wildlife Sanctuary, 65 miles from

	The area of the block (over 29000 sq km) is very wide. There are over 1000 of fishery family dependent on that area.	Myeik Archipelago and 45 miles from the Shark Protected Area. The area of the block (about 29000 sq km) is very wide. But 500 m for the exclusion zone is small.
	U Hlawn Moe, Daweil Research Association I would like to know the time duration of offshore blocks?	**U Nay Aung, MOGE** PCML contracted Production Sharing Contract with MOGE for the blocks M12, M13 and M14 in 1990-1992. It takes 30 years. The gases were produced from Yetagun Project since 2000. From 2000 up to 2030, the gas will be produced from 3 blocks of Yetagun project. The project's duration is 30 years.
	U Hlawn Moe, Daweil Research Association I think that the oil and gas will be drilled from the block D28 and E5. How is it related with M13?	**U Nay Aung, MOGE** These are not related with the blocks M12, M13 and M14 that are drilled by PCML. I think E5 will be seismic phase conducted by the other companies. This will be MD2 and MD4.
	U Tin Aung Moe I think there will be experts for the project. I am aware of CSR activities for the education and health. I would like to know the export amount of gas to Thai and the budget from the export. And, could it support the availability of electricity for the local people?	**U Nay Aung, MOGE** There are four projects in Myanmar and they are creating foreign income. They are Yadanar, Yetagun, Zawtiga and Shwe projects. As I do not remember the income amount and the amount of export, I will contact and answer for these. The 2013-2014 report had been disclosure and posted on the relevant website. In this report, we prepared the detail plans such as the income from the production of oil and gas and the export amount. 2014-2015 and 2015-2016 reports will also be disclosure, from these reports there will be detail facts that MOGE operated with which companies. There may be weak points to announce these reports widely for the public. I have a little difficulty to answer the question of which profits can get for Tanintharyee Region. Companies are doing CSR activities related with health and education. But, it is difficult to help for the support of the local electricity. Mainly, the drilling of oil and gas is for the first priority of local electric availability.
	U Nay Min Yazar, NDF We had heard that voice and our speeches are also repeated as I am experienced with lots of consultation meetings. I would like to discuss for nation. Minister said that it will be constructed to generate electricity for Kyauk phyu, Thilawa, Dawei and Kan-Pauk with the $ 5 billion in 2019. I am glad to hear that there will not be impacts on aquatic flora species.Near Kanbauk, about 10 species out of 120 fish species are vanishing. I would like to know that this issue is related to the oil and gas offshore projects. As the presentation, the company constructed the concrete road from Thaninthari reserved area to 'SetThoneWa'. The length of road is about 10 miles from 'KanPauk'. The road from 'KaungMhu' to 'KabPauk' is 10 miles long and	**Dylan Jekin (IEM) & Khun Set Thar (EQM)** I would like to give answer to your question about fishes. This EIA study is prepared for exploration drilling. We have experienced and conducted the similar projects since 30 years ago. The drilling takes about 75 days and it is just temporary to drill the seabed. Due to the noise, vibration and sedimentation caused by drilling operations, the fish and marine animals might avoid the well-area and migrate to other places temporarily. The drilling will take only 75 days. Considering above reasons, it is not reliable that the marine species would be affected by the project. In EIA study, fish vanishing issue you mentioned would be considered. **U Nay Aung, MOGE**

	this road is a concrete road? I am so glad that PETRONAS is conducting CSR programs in Health and Education aspects. I would like to know what kind of development program the government have undertaken spending income from natural resources. Even if development plans are mentioned, finance would be allowed by World Bank / EIDI. In next meeting, I would like to request to answer the detailed information about governmental development programs for our region using natural resources.	The company will answer the question relating CSR programs after checking the number. Concerning the survey, the socio-economic and health survey would be conducted in the village that would potentially be affected. In this morning, the 60 questionnaire are finessed in certain village after permission from township administrator. EIA scoping report based on the collected data would be submitted to ECD. Socio-economic and health survey data, comments, attitudes and perception relating to the project would be added to the report. Third party will assess the potential impacts and develop mitigation measures. **U Khun Set Thar, EQM** This phase is the Scoping phase. Now we are here is that to get your concerns, suggestions and local data. In addition, we will also write about your recommendations- the extinction of fish species in the report. We accept your suggestion. We conducted public consultation meeting like that in Myeik with the participation of local NGO and all organizations. We will consider your concerns, suggestions and comments. **Daw Tin New Nyo, PCML** We constructed road from Phaung Taw to Thabouseik by TNRP project. Road type is commonly coal tar. Some roads were constructed with another technology as they are no convenient to use the coal tar.
	U Hlawn Moe, Daweil Research Association Do you collect the data from San Hlan village, does it include for Palaw? I would like to know the assessment from the baseline data collection.	**U Khun Set Thar, EQM** We collected your concerns, suggestions and livelihood conditions. We will do the second consultation meeting about the environmental impacts, mitigation measures and baseline survey assessment. This is the first consultation meeting for the Scoping phase. We will collect the socio economic data and suggestions from tomorrow meeting of San Hlan village. We do not make the assessment yet. We will disclose the assessment results in the next meeting.
	Questioned by U Zaw Tun (Future Light) I would like to know the role of health sector in the CSR program of Yetagon Project.	**Answered by Daw Tin Nwe Nyo,** Our main focus for health sector is student health care. We conducted awareness program of health care and free medical treatment programs by hiring staff at the clinic and hospitals.
	Suggested by U Zaw Tun, I would like to suggest to conduct CSR program where medical treatment, costs of medicine are necessary for poor people who could not afford the cost of medicine. I would like to assist for emergency case, for the patient who could not afford the cost of medicine (e.g. transportation of patient by ambulance to Yangon General Hospital). I would like to request Yetagon to consider for life saving sector.	**Answered by Daw Tin Nwe Nyo,** We will consider your suggestion.

	U Tint Lwin (Hinthar media) CSR programs are used to conduct in each sector including health, socio-economic, economy etc). At the end of the year, only the numbers of how many percentages for this sector, how many for those sector were come out. Actually, local people would like to participate in the Management role of CSR programs. We don't want to implement the CSR program by listening the voices of local people. We would like to manage the program by ourselves. In your previous CSR project, please consider about that did the older people and disable people include in CSR program? We want to three parties management team for CSR including company, local community and government.	**Answered by Daw Tin Nwe Nyo,** In terms of your first part of question for the role of local community in CSR program, company couldn't make decide for CSR plan. We listened the comments from local community and identified the local needs. Like you said in the earlier, the role of older people and disable people are included. This is the first stage. As a second stage, we plan to implement the sectors that are identified by local community. And we discussed with regional and local authorities and regarded the estimated budget for the implementation. Then, we implement our programs. As we implement the CSR program in this region, participation of many local community are included. And there are some parts that are responsible by local community. Later, we will explain in detail how we implemented our programs in each sector and each project.
	U Nay Min Yazar, NDF I heard that Yadana gas Company offered minor operation equipment. There is still no Cancer Treatment Radiation Machine. I would like to request the company to fund for this machine.	**Daw Tin Nwe Nyo, PCML** I am glad to know the local communities' needs through this meeting. The suggestions would be recorded for taking account into CSR plans.
	U Khaing Tun, Assistant Director, ECD Although the main purpose of conducting public consultation meeting is for scoping report, 'Scoping Report' word could not been seen in very first power-point slide. This word should be written obviously. Concerning EQ and EG aspect, there is a little difference between your translation and official term in translating 'National Environmental Quality (Emission) Guidelines" term to Myanmar Version. As the drilling rig will anchor to the seabed such as coral reefs, officers from Department of Marine Science would discuss about this issue if they will attend this meeting. As the natural gas could come out of the well with other gases, these gases are treated by flaring method. Could CO2 be emitted by the treatment? Third party should assess this issue. As the project is located near this region, CSR programs in this region should be declared particularly but not in Yangon because some might think that CSR programs are conducted only in Yangon although natural sources in this region are taken away. In which part did the company conduct 10% Environment in CSR program circle? Planting? What activities are conducted? Is there any possibility that the drilling mud generated from 4 wells will reach to the Mawsco reserved area due to sea-water flow. This issue should be assessed and added to the report.	**Dylan Jekin (IEM)** **T**hanks for your suggestions and comments. We try to make next PC meeting better. In this assessment, we would definitely conduct impacts on coral reef and sea grass, impacts of sediments on multiple resources from drilling operations and others else.

	Hlwan Moe, Dawei Research Association Concerning the coral reef mentioned by ECD officer, is there any secret in that area? Are there the important things in anchoring area and near drilling rigs?	**Dylan Jekin (IEM)** There are no coral reef because the water is very deep and over 100m deep. Sub-contractor would conduct sediment samplings collection there. Based on their experiences, there is nothing special in this area.

Photo Session

 U Nay Aung, Opening Remark	 U Phore Kyaw, Explain about the project
 Daw Tin Nwe Nyo, Explain about the Ye Takon CSR	 Mr.Dylan Jenkin and U khun Set Thar, Explain about the EIA
 Question by U Tint Lwin	 Question by U Hlwan Moe
 Question by U Tin Aung Moe	 Question by U Nay Min Yar Zar

	
Question by U Zaw Tun	Suggestion by U Khaing Tun , ECD

Record of Meeting Minute

Basic Details	
Project Title	EIA Study of Exploration Drilling Campaign in Onshore Block M-12, M-13, M-14
Date	[12.6.2018] Tuesday
Time	[2:30 pm]
Venue	[Kywe Ku village head office]
Number of Participants	37
Agenda	1. Opening of Public Consultation meeting 2. Introductory speech by MOGE representative U Nay Aung 3. Presentation about Project information by U Phore Kyaw (PCML) 4. Presentation about Environmental Impact Assessment (EIA) by U Khun Setthar (EQM) and Mr. Dylan Jenkins(IEM) 5. Question and Answer 6. Closing of Public Consultation meeting

Question & Answer Session

No.	Questions, Concerns and Recommendation	Clarification
1	**Villager Question** **U Maung Maung Htay, the village administrator of KyweKu Village** Every villager could ask whatever you want to know about the project. As this project is operated in offshore blocks, it is so far from our village. Data collection in our village is not as interesting as data collection in Kyun Su Township nearby the project. I think Kyun Su Township is more relevant. What kind of difficulty/problems have the other country faced through the oil and gas projects? **U Maung Maung Htay, the village administrator of KyweKu Village** Yes, I mean the problems about EIA in other countries.	Discussion by IEM/EQM **U Khun Set Thar, EQM** Which field do you want to know about, EIA or Drilling? Do you mean EIA? **U Nay Aung, MOGE** I would explain generally. In Dawei and Myeik near the project, we have to conduct public consultation meetings with relevant government department, political parties, NGOs and media. The reasons why the meeting and data collection are conducted in this village are that it is near the project area and some villagers are offshore-fishermen. We would like know how many nautical mile from the shore fishermen go for offshore-fishing and whether they go to the project area. What are they worried about? What plans will the committee provide? Oil and gas drilling projects are operated in both other countries and our country. The common concerns are about dangers on marine animals, scarcity of fish resources, damage on coastal reef and explosion accidents. To minimize these concerns of local communities, the company will explain about the activities which will reduce the potential impacts caused by the project till no danger and damage. Based on the different locations and

		conditions, the concerns and comments of the resident are variable. For example, if the fishing area of this villagers are nearby the project area, they will have so much concern about their profession. The things i discussed are general but the detailed information would be presented by the company. **Dylan Jenkins (IEM) & Khun Set Thar (EQM)** I am from International Environmental Management Company, consulting international environmental projects. The company is established since 30 years ago and based in Thailand. Concerning this oil and gas project, IEM is a third party conducting environmental consultation and assessment. IEM undertakes environmental consultation for oil and gas project in a South East Asia such as Thailand, Vietnam and Cambodia. In Myanmar, the consultation projects have been performed since 10 years ago. **Dylan Jenkins (IEM) & Khun Set Thar (EQM)** The current stage is scoping stage and its main purpose is to take assessment on significance of impacts. This stage could not be conducted only by the third party and must include the perception and attitude of local communities relating the project. Your suggestion and perception is necessary in this stage. You could ask and tell anything that you want to know and advise. Thanks.
	U Aung Soe Could the smell of oil and gas cause the air pollution?	**Khun Set Thar (EQM)** This smell is not bad like the industrial air emission. As I presented previously, thus project area is over 100 miles far from the shore. This target of the project is to drill an exploration well. It will take about 75 days for drilling one exploration well and about 6 months for two wells. For above reasons, there will be no odor disturbance. **U Nay Aung (MOGE)** As the oil and gas is transmitted from the underground pipeline to the relevant station, this project cannot emit the smoke and bad smell like the industry.
	U Maung Htay Where is the Block M12, M13 and M14 located from the place that people lived? **U Maung Htay** As this project is not implemented, we do not suffer any side effects from this project activity during current condition. Which company will operate the drilling of oil and gas with which plans?	**U Khun Set Thar** It is far 100 miles from Myeik. **U Phoe Kyaw (PCML)** There are two parts for drilling. If we do not explore gas reservoir, we will cement the well. If we found the gas, we will transport the gas with pipeline to the Yetagun production rig.
	U Aung Soe Can there be the blowout when drilling the blocks?	**U Phoe Kyaw (PCML)** When we drill the well, the well will be blowout due to the large pressure. But we will install the machines which are resistant to the pressure as

		the cost of borrowing drilling rig is high. So we will do with careful attention.
	U Maung Htay I heard the project of drilling oil and gas in Motta Sea when I was young. The President U Thein Sein announced that we found the gas reservoir and large amount of gas were produced. But in a few moment, it was blow out and damaged. I would like to know the difference between the current drilling and the previous one.	**U Nay Aung (MOGE)** In our country, there are four oil and gas projects. The country have got foreign income from Yetagun, Zawtika, Yadanar and Shwe projects. Technologies are changed and developed. The basic concepts for drilling is the same.
	U Maung Win How many benefits can the country get as this project is operated with other country? And which benefits can Tanatharyee region get from this project? The price of electricity is very high in our region. So, we would like to use the electricity with the cheap price.	**U Nay Aung (MOGE)** Since the project is implemented, companies invested on the whole cost of the project operation. If the gas is not found, their investment are lost. If the gas is found to the production level, the government invested on this for the profit sharing. The government include 20% on behalf of the public. 20% investment is not the acceptance of 20 from the profits of 100. The government collect taxes from the profits 100%. For example, if the profit is 100 % from the project, the government have got 60% and the company is 40% profit. If we calculated the total income of the whole project, the government got at least 60- 80% profits out of 100%. The project site is near Tanintharyee coast and Motta Sea. It is inconvenience to say how many profits can get for Tanintharyee Region from this project. It is managed by the Central Government. Now there are Regional Government in each Region/ State. These projects are managed by the Central Government last years. It is difficult to say how much profits can get for Tanintharyee Region. We are discussing with company how to make to go profits for the regions and how to do benefits for social, health, education and fishery industry.

Photo Session

 U Nay Aung, MOGE Rep, Opening Remark	 U Phore Kyaw, PCML Explain about the project
 Mr. Dylan Jenkins (IEM) and U Khun Set Thar (EQM) Explain about the EIA	 Question by U Maung Maung Htay
 Question by U Aung Soe	 Question by U Maung Win
 Question by U Aung Soe	 U Khun Set Thar (EQM), Explain about EIA

Record of Meeting Minute

Basic Details	
Project Title	Environmental, Social and Health Impact Assessment (ESHIA) for Offshore Blocks M12, M13 and M14
Date	12.6.2018 (Tuesday)
Time	9:00a.m-11:00a.m
Venue	Grand Jade Hotel
Number of Participants	32
Agenda	1. Opening of Public Consultation meeting 2. Introductory speech by MOGE representative U Nay Aung 3. Presentation about project by U Phoe Kyaw (PCML) 4. Presentation about Environmental Impact Assessment (EIA) by Mr. Dylan Jenkins (ERM) and U Khun Set thar (EQM) 5. Showing PTTEP Myanmar Asset Video 6. Question and Answer 7. Closing of Public Consultation meeting

Question & Answer Session

No.	Questions, Concerns and Recommendation	Clarification
1	• **U San Maung, President of Myeik Fishery Federation** The 500 meters is regarded as the exclusion zone during the drilling stage. How many meters will be regarded during the production phase?	• **Dylan Jekins, IEM** This EIA is for the exploration drilling. Exploration drilling is 500m for the safety zone. If we will find any oil and gas, we will prepare the separate EIA phase and we will come back with the additional information. But for the existing platforms and future platforms they will have the exclusion zone for the safety of PCML. We will prepare the separate EIA in the future for the production.
2	• **U San Maung, President of Myeik Fishery Federation** How you regard the exclusion zone for the production phase in Yetagun project?	• **U Nay Aung, MOGE** The exclusion zone is regarded 5 miles from the drilling rig and 500 m from the pipeline.
	• **U San Maung, President of Myeik Fishery Federation** Is it sure as the exclusion zone is 5 mile? If so, can we catch fishes from 7 miles?	• **U Nay Aung, MOGE** I cannot exactly say that you can fish or not as it is regarded in accordance with the project.
	• **U San Maung, President of Myeik Fishery Federation** Only block M13 is on the map. It is far from 100 miles from Dawei. The fishing block is 30 miles. It is a little missed as you said. 100 miles is from the Dawei Township or from the coast? According to the map, it is impossible that the block is located from 100 miles as the fishing block is 30 miles.	• **Dylan Jekins, IEM** We measured from the coast to the proposed with GIS. We got this map from Department of Fishery.
	• **U San Maung, President of Myeik Fishery Federation** When did you perform the seismic survey?	• **U Khun Set Thar, EQM** The seismic survey was conducted in 2016.

	• **U San Maung, President of Myeik Fishery Federation** Did you perform EIA study for the seismic activities?	• **U Khun Set Thar, EQM** We did not study EIA for the seismic survey.
	• **U San Maung, President of Myeik Fishery Federation** Most of the companies conducted Consultation meetings and explained about the projects since 2015. There was no transparency during the seismic survey. There are no calculations based on the consideration of our impacts. If the exclusion zone is regarded, we cannot catch from these area. Is there any negative impacts on the fishermen? Although PCML can be safe, this can affect our economic conditions.	• **U Khun Set Thar, EQM** This is the Scoping phase. We will consider impacts during the EIA study. We will conduct Second Consultation Meeting. • **U Nay Aung, MOGE** Yetagun Project was implemented since 1990. We met with Regional Government and explained about the project. During the scoping stage, we consider which organizations should be invited and met. We have second consultation meeting and we will meet with the organizations which are necessary during the scoping phase. After preparation of the Scoping study, we have to submit this report to ECD to get the comments. This is prepared in accordance with Environmental Conservation Law, Environmental Conservation Rule and EIA procedure (2015). We performed EIA study for the projects beyond 2013. We did not perform for the projects in front of 2013. But the relevant monitoring team studied environmental impacts.
	• **U San Maung, President of Myeik Fishery Federation** Most of the companies conducted consultation meetings beyond 2016. But your organizations did not conduct. The video clip is not exploration drilling stage. It is the drilling stage. Our speeches in this meeting room will be disappeared outside of the room. I think the records will be rubbishes. Our speeches and comments are repeated. The explanation with the video clip is interested but we are not interested. The reasons why we are not interested is that there is no benefits for us. Now, it is saying that it is the national benefits than local. The production of oil from the previous well is little so you are planning to dig the new one. If these new wells are depleted, you will dig another wells. There is no considerations upon the resource depletion. We said only our feelings. The responsible persons should do for that. As blocks are existed within the fishing blocks, I said on behalf of fishermen. There are no fishermen in this meeting. You should disclose about this to the fishermen. You did not consider the impacts on fishermen and fishing blocks and mitigation measures. The exclusion zone for 500 m is just for the safety of PCML while drilling. Although there will be	• **U Nay Aung, MOGE** This project is Oil and Gas Exploration drilling project for our nation. I don't know how many benefits will be on the fishing industry. We will discuss with the company for the benefits of local people. We will report the comments and your concerns to the relevant levels in order to perform development activities. There are also CSR activities for education, health and local development.

	impacts upon us, we accept for that if the Tanintharye Region will be developed. There is also no benefits for our region. We would like to be M12, M13 and M14 blocks should be on the map, now there is only block M13 on the map. Myeik Township is dependent upon the fishing industry. The development of this township is also dependent upon fishing industry. We cannot please if our fishing industry will be affected. This area on the map is 60% of fishing area in Tanintharyee region. If this area is regarded as the exclusion zone, we cannot catch fishes on this area. If so, the responsible persons should consider for this condition. If offshore fishermen are prohibited to catch on this area, they will reach onshore fishing blocks. I think about 15 fishing blocks are within the Block M12, M13 and M14. Third party should consider not only company's impacts but also local impacts.	
	• **Comment by local people** In this situation, as far as I know, the main point is Union Government. Now the project had already permitted by union government. Nevertheless, they will proceed their project. Actually regional government should be included in this process. Therefore, I think we should consider this situation in preparing new constitution.	•
	• **U Khin Maung Than** EIA Consultant Company should consider not only environmental impact, social impact, health impact but also mental pain. We do not get any benefits. This effects on our fishing activities and transportation of the goods. About 15,000,000 of people in Tanintharyee region did not get any benefits, only Kan-pauk Township.	• U **Khun Set Thar, IEM** We will consider in the assessment.
	• **U Aung Than** How many impacts are occurred from the drilling of Yetagun project? How many impacts are there on the local people? How do company take responsibilities as 60 % cannot catch fishes? I would like to request to discuss with DOF for the good condition. Which mitigation measures are conducted in the Yetagunprorject?	
	• **U Myat Zaw Moe (FFI)** Most of EIA Consultant companies are conducted for the company. 60% of fishing boats will be invasive in the areas that are established by FFI (Flora and Fauna International).	• **U Khun Set Thar** We are third party, not for company.
	• **U Aung Than**	• **U Nay Aung, MOGE**

	60% of fishing boats will be invasive in the Adman Sea. Did the previous government allow these blocks or the current government?	These blocks are allowed to drill oil and gas since 1992. It will take 30 years. The project duration is from the announcement of oil and gas land to the production stage.
	• **U San Maung** In the presentation slides, it is shown that the exploration drilling will be conducted from 2018 Oct to 2019 Oct. Is this Consultation Meeting conducted for the exploration drilling? How many consultation meetings will be conducted before the drilling starts?	• **U Khun Set Thar, EQM** This is for the Scoping phase. We will come back for the next consultation meeting.
	• **U San Maung, President of Myeik Fishery Federation** I would like to request more NGOs and CSOs should be invited for the next consultation meeting. When will the second consultation meeting begin?	• **U Nay Aung, MOGE** We have to submit the Scoping report to ECD. ECD will review this report if there will be comments, we have to prepare and submit again. After review from ECD, EIA study will be conducted.
	• **U San Maung, President of Myeik Fishery Federation** But in the presentation slides, the exploration drilling will be started from Oct 2018. So, when will the second consultation meeting begin?	• **U Khun Set Thar, EQM** The second consultation meeting will be around August.
	• **U San Maung, President of Myeik Fishery Federation** Why do you exactly definite the date for the drilling?	• **Dylan Jekins, IEM** This is the first public consultation to introduce the project and get your concerns. PCML plans the drilling and we start EIA study. Then we will do assessments dependent upon impacts and mitigation measures for coming project. Then we will submit to ECD in Nay Pyi Taw for the review and approved the project. After that, we will plan to conduct the second public consultation before the inclusion of mitigation measures and impacts for the upcoming project.
	• **U Khin Maung Than** About 90 % of business in Taninthari region is fishery and local communities are relying on marine resources. Would the project be stopped if complaints occur against the project? I am sorry that I object the project due to our fishery**.**	• **ECD Officer** The purpose of scoping report is to assess and collect complaints, perception and attitude about the project. And then, this scoping report would be submitted to EIA review team in Nay Pyi Taw.
	• **U San Maung, President of Myeik Fishery Federation** In next/second stakeholder consultation meeting, I would like to request the company to bring more EIA experts and authorities who could make important and specific decision. I would like to ask so many questions in next meeting. • **U Khin Maung Than**	• **U Nay Aung, MOGE** There are some reason and limitation that we couldn't answer and decide at once. When public consultation meeting are held, the company and third party are enforced to conduct it widely in conformity with EIA procedure and they do so. Based on different conditions, it is founded that it doesn't goes well and things are not matched with original targets. Whatever it is, the comments and concerns of local communities, relevant organizations and experts are absolutely recorded,

	I agree with him. It must need authorities who are transparent and could make decision. The company officers who could make decision about the project must be taken by the company. As MOGE, authorities who could make urgent decision must attend the meeting. I don't want the people who could not make decision.	submitted and progressed in accordance with laws and regulations. Regarding the certain cases, the answer and decisions couldn't be made urgently. As a point, the project is at national level and the national government handles the project. So, as governmental personnel, I have limitations urgently to tell and make decision how many proportion of the profit of the project would be shared to Taninthari region. This is an on-going project and 30-years project. It is not to drill in new blocks and just to drill new wells within the current project area in conformity with EIA procedure. Before seismic survey, public consultation must be conducted according to the procedure. Whenever new wells are proposed to drill within the project, the similar meeting has to be conducted before drilling. The original purpose of the meeting is to collect comments, attitudes and concerns of the local communities. Access to electricity is not included in the purpose but is recorded in the report. Concerning Taninthari region, the decisions about electricity fee could not be made at once by me because this case is relevant to national level, regional level and more levels. Please understand me that I have limitations to give answer and decision. Thank you.
	• **ECD Officer** As I said previously, this scoping report and public consultation record would be submitted to EIA review team in Nay Pyi Taw. The report would be developed by EIA team after assessing CSR program as well as compensation, considering potential impacts on fishermen and their loss. • **ECD Officer** I mean that compensation and replacement would be provided if there is loss and damage on fishery. These plans would also be submitted to EIA review team and EIA review team would assess and develop the report.	• **U San Maung, President of Myeik Fishery Federation** I didn't say about compensation. The others may think that the Myeik Fishery Federation is asking compensation. I didn't say a word like 'compensation'. I said the project would definitely effect on fishery. The fishing area will become narrower due to the blocks. If fishing areas are compared with numbers of fishing boats, overfishing occurs in Taninthari region. The narrower the fishing areas are, the lesser the fishery's income. We are not asking compensation for the income-fall. Although we (fishermen) can sacrifice losing the income, I would like to know what kind of plans would be provided by the company for development and benefits of our Taninthari region. We are not asking to pay us. The earnings of individual and Taninthari region would drop. What types of benefits would be achieved for our region if there is an economic production of oil and gas? We are not asking compensation. You shouldn't use 'compensation' word as media are recoding and voice-recorders are switched on. Some people may think that Myeik District Fishing Association is asking for compensation.
	• **U San Hmwe** How many months are included in the Yetagun well contract? The proposed wells are new or old? There are difficulties in area. Could the contract of new wells be started even after the contract of old wells are completed?	• **U Nay Aung, MOGE** The contractual basis is related to block area for example Block M12, M13, M14 and not well-contract. Within the block area, the potential area has to be drilled. Prior to drilling, the company has to submit project plans to MOGE and then discuss about the oil and gas potential and cost with their

		contractors. After access to permission of MOGE, the new wells are drilled within the specified areas. The contract covers drillings in Block M12, M13 and M14. The proposed wells are new exploration wells in these blocks.
	• **U Soe Tint Aung, FFI** As the first, Tidal survey has been conducted. What is the water level of sea-light? It is to figure out what are the differences between surface of the sea-light and our surface. About 60% of fishing ground represents not only Taninthari region but also the whole nation. Now marine protective areas and alumni have been conducting. If the blocks are within 60% of fishing ground and prohibited to fish, the fishery will come to our reserved areas which consist of marine protective areas and alumni. With permission of Department of Fishery, Department of Forestry and Environmental Conservation Department, fishing is prohibited within 3 mile far from the shore. With rules and regulations of these departments, fish species are conserved for populace but not for FFI. I know that blocks are established since 1990. It needs to show MIC permit to the local populace with transparency. The other thing is about exclusive economic zone. Concerning the exclusive economic zone, it needs to conduct public announcement for local communities to declare different authority for fishing within 200 miles and within 10 miles in the territorial waters and illegal fishery issues. For conservation of marine animals and habitats, we have been undertaking consultation meeting and presenting baseline scientific data in Department of Fishery, Department of Forestry and Environmental Conservation Department, Ministry of Hotel and Tourism and Ministry of Home Affairs. Now, Conservation Laws of Biodiversity and Natural Reserved Area has been established. Without blaming each other, it needs to figure out the reasons why the wales die. In next/ second consultation meeting, the avenue should be city hall to be joined by the people in lower class. The comments and voices of the lower-class people should be prioritized.	• **U Nay Aung, MOGE** Thank for your advice. As you mentioned, MIC has been accessed. The contractual basis is 'Production Sharing Contract'. The nation receives the contractual profit as well as tax fee. The government sometimes has shares as the project proponent and then the profit would base on the contract. The life-span of the project is fished in 2030.The current project is valid according to the project life-span. As you advised previously, the consultation meeting would be conducted more widely by MOGE, the company and the third party. The earlier meetings have ever been conducted in Central Fishing Federation. The stakeholder meetings have ever been held with significant number of local communities. As personnel of the country, it is the biggest prize for me to have chance for collecting the comments and listening voice of the lower-class communities.
	• **U Too, Department of Fishery** Would new contracts be made for the blocks? Is there any plan to extend the current contract? Where are the other projects?	• **U Nay Aung, MOGE** Currently, there are no more contracts and extensions concerned with these blocks as it is the long-term contract and within the lifespan. Regarding new contracts, there is no exact information whether the government make tender for blocks which has no operation, or not. This YeTaGun project is situated within Block M12, M13 and M14. There is Yadana project in Block M5 and M6 , Shwe project in Block A-1 and A-3 in Rakhine region and ZawTiKa project in M-9 and M-11 operated by PTTEP. Briefly, domestic use and export are supplied through four projects and nine

		blocks.
	• **U Myat Zaw Moe, FFI** Are you from the Ministry of Energy?	• **U Nay Aung, MOGE** I am from Ministry of Electricity and Energy?
	• **U Myat Zaw Moe, FFI** If so, electricity is relevant to you. Electricity fee is expensive in Myeik. Local communities have no benefits of natural resources in Taninthari region. Electricity is directly connected to Energy. Although natural resources of our region have been taken out and used, one unit of electricity is still about 450 kyats in Myeik and about 700 kyats in some places, basing on diesel-to- electricity. In Rakhine, the oil and gas pipelines are constructed from KyaukPhyu to China after production. As local communities in Rakhine protested for access to electricity, electricity is accessed in Rakhine now. I heard that Chin will have access to electricity recently. Do local communities in Taninthari region need to make demonstrations for access to electricity?	• **U Nay Aung, MOGE** When I conduct public consultation meetings Taninthari region (Dawei, Myeik, Ye), I always hear the electricity issues. I have limitations to say the words as a commitment when I represent MOGE, the ministry and the nation. I couldn't claim when there is access to electricity in Taninthari region because this access depends on master plans, long-term and short-term plans of electricity and it is the whole national level. As my words may become the commitment, the national government might seems break the commitment if it does not happen as I said. As I am from the department creating foreign income through oil and gas, I am also interested in electricity issue under the same ministry. When I went out last night, I investigated that one unit of electricity is about 405 kyats in Dawei. You don't think that I am not interested in electricity cases. The comments you said would be recorded and submitted to the relevant authorities who could do management. Please understand me.
	• **U Khin Maung Than** EIA report must include our negative feelings about oil and gas project and the beliefs that we would have no benefits from these projects.	
	• **U Soe Tint Aung , FFI** I would like to inform something. Near our reserved area, BuZar, sand production company is proposed to operate. Consultation was held in YayNanAung but objected by YayNanAung. Public consultation meeting was conducted and then change the title. Why does the company want to consider the benefits of villagers? Now, wales die. How many EZ (economic zone) and fishing blocks are there in territorial waters? What kind of benefits would be provided for biodiversity? How many impacts are caused on local communities? To find out the above questions, public consultation meeting needs the participation of relevant government departments, elder peoples, local communities and other organizations. I just suggest succeeding the meeting. The project will complete if the company and the third party conduct the project in compliance with national and international standards and regulations.	• **U Nay Aung, MOGE** **Thanks for your advice.**
	• **U Khin Maung Than** In next meeting prior to drilling, the authorities in both sides of the company and MOGE must be included. The company officers who could make decision about the project must be brought. As	• **U Nay Aung, MOGE** According to the contract, contractual commitments must be complied by the government and project proponent. Although the profit of the project would

	MOGE, authorities who could make urgent decision must attend the meeting. Invite Union minister, Deputy Minister or the permanent secretary to the meeting. I don't want the people who could not make decision. We don't want to waste our time and air	be achieved directly by Taninthari region, this profit creates national revenue. I request the local communities to cooperate with projects creating national incomes. In another way, there is still a valid life-span of the contract which is signed by the international oil and gas companies and the government and the project is just operated within the authorized area with permission of the government. I understand the voices of the local communities. In later times, I request all of you to cooperate like this for projects creating foreign income.
	• **U Myat Zaw Moe, FFI** We would not resist the projects if impacts on profession of local communities are not caused by them. Need to consider about the local communities. There is also no disclosure about environmental impacts on the local communities. I think that our next generation would not have fishes to eat. • **U San Maung, President of Myeik Fishery Federation** We are not cooperating for this project. I found that whatever the local communities agree or disagree, this project would be absolutely continued due to the contractual basis. If so, this meeting is just a waste and our comments are also just wastes. We are just saying about development of our region. Could the fishery create foreign and domestic income? If the contract is kept going without considering our comments and concern, there will be no more chance to conduct second or third meeting with us. There is an example that the contract could be cancelled. It is Myit Sone project. If the company and the authorities care our comments and negotiate with us managing the issue as they can, the next meetings are welcomed.	• **U Nay Aung, MOGE** We are willing to listen to the voices of local communities and so the main purpose of this meeting is to record and listen to your comments and concerns presenting the project information as the best. Individual comments are reported. According to my position and my assigned authority, I could make the decision on profit for Taninthari region at once. In e each contractual description, there are wider things that we could not understand easily and relevant indirectly to us. I am so grateful to all of you for your participation in this meeting because your participation is just the cooperation with us. I did not say that the contract would be kept continued whatever the local communities say. It means that the government might face some difficult conditions in aspects if the project does not go well. For example, as Zawtika project produced 60 Btu, the president had to negotiate Oil and Gas Company about the contract in order to address demand of oil and gas, holding the summit meeting. I am dutiful personnel and stand for the benefits of our people and country without personal profit.
	• **U Myat Zaw Moe, FFI** As the project create national income, this national income is not related to the profits if the whole nation. National is like a mom. Regions are like brothers and sisters. If the elder brothers and sisters have benefits, the little ones who achieve no profits would not be satisfied and shout (protest). Would the coutry provide the benefits to the Taninthari if we protest holding the candles like Rakhine. Our region stands on itself. There are no governmental support in this Taninthari region and just loss of local communities.	• **U Khun Set Thar, EQM** As the third party, we are so glad to conduct the meeting like this. The comments you said would not be wasted and included in EIA procedures. In final EIA report, your comments will be taken into account. As we would like to listen to the voices of the local communities like this, we estimated participation of 100 attendees and I am sorry for the decreased number. We will try best to be able to conduct the next meeting better than this meeting. EIA procedures enact to conduct the public consultation meeting in order to collect the comments and concerns of local communities. In every project, there will be more or less impacts on environment. EIA report is to minimize the impacts at least. We are third party and not biased as this is our profession. I would like to explain about this to all of you.

Photo Session

 U Nay Aung, MOGE Rep	 U Phore Kyaw, PCML
 Mr. Dylan (IEM) and Khun Set Thar (EQM)	 U San Maung, President of MFF
 U Khin Mg Than, Myeik Fishermen	 comment by Local people

	
Ko Myat Zaw Moe (FFI)	Question by local people
	
Answered by Dylan (IEM)	Questions and answers
	
comment by ECD officer	Question by local people

 Comment by Ko Soe Tint Aung (FFI)	 Question by Local People

Record of Meeting Minute

Basic Details	
Project Title	EIA Study of Exploration Drilling Campaign in Onshore Block M-12, M-13, M-14
Date	[15.6.2018] Friday
Time	[9:30 Am]
Venue	[San Hlan Monastery]
Number of Participants	107
Agenda	1. Opening of Public Consultation meeting 2. Introductory speech by MOGE representative U Nay Aung 3. Presentation about Project information by Daw Ei Mon Swe (PCML) 4. Presentation about Ye Takon CSR by Daw Tin New Nyo (PCML) 5. Presentation about Environmental Impact Assessment (EIA) by U Khun Setthar (EQM) and Mr. Dylan Jenkins(IEM) 6. Question and Answer 7. Closing of Public Consultation meeting

Question & Answer Session

No.	Questions, Concerns and Recommendation	Clarification
1	**MOGE representative, U Nay Aung** Please feel free to ask me for any questions or unclear points of project information. We will answer your question as much as we can. **Villager Question** One villager from San Hlan village asked about the exact location of proposed area. (e.g. how many miles far from our places?)	**Discussion by U Khun Set Thar (EQM)** As I explained in the earlier slides, the proposed areas (well sites) are located: 100 miles from Dawei and 120 miles from Myeik, 80 miles from Moscos Kyun Wildlife Sanctuary, 65 miles from Myeik Archipelago and 45 miles from the Shark Protected Area. Here is the proposed location that are marked on the map.

Photo Session

 U Nay Aung, MOGE Rep,Opening Remark	 Daw Ei Mon Swe, Explain about project information (PCML)
 Daw Tin Nwe Nyo, Explain about Yetagon CSR (PCML)	 Mr. Dylan Jenkins (IEM) and U Khun Set Thar (EQM), Explain about EIA
 U Khun Set Thar, Explain bout EIA	 Question by one villager from Sanhlan

Appendix 5
EIA Phase Meeting Minutes

Meeting Minutes

Detail			
Project	ESHIA for Offshore Block M12, M13 and M14 Project		
Venue	ZayarHtetSan Hotel	**Region**	Thanintharyi
District	Dawei	**Township**	Dawei
Objective	Second Public Consultation Meeting		
Date	24/07/2018		
Time	3:00 – 6:00 pm		

Presentation

- **Dr. Soe Moe Aung (MOGE)** started the consultation process with the introduction to the meeting, explaining the objectives of the meeting
- **U Phyoe Paing Soe (PCML Co., Ltd)** explained about seismic survey.
- **U Phoe Kyaw (PCML Co., Ltd)** presented about exploration drilling with video.
- **Daw Khin Su Su Naing (Senior Consultant_ ERM)** giving an overview of environmental impacts assessment and potential impacts from infill drilling and 3D seismic survey processes.
- **Dylan Jenkins (IEM) and U Khun Set Thar (EQM Co., Ltd)** presented about environmental potential impacts from exploration drilling.
- **Daw Tin Nwee Nyo (Yetagun)** explained about Corporate Social Responsibility (CSR) program of Yetagun Project.
- **Question and Answer (Discussion)**

Discussion

(1) Questioned by U Min Yazar, National Democratic Force (NDF)

Thanks, for the construction of road between KaLainAung and DaMinSeik. And I request to construct the road between Zarti and Fat Wa. I think that this project will support the local development. We should consider not only physical effects but also mental damage. You should estimate local people feelings and concerns and listen to the public voice. We study the atmosphere and water body but we should study the soil. Finally, can earthquake occur due to production of Oil and Gases?

Answered by Daw Khin Su Su Naing, ERM

We would consider the construction of these roads as co-operate social responsibility (CSR).

Answered by U Phyo Paing Soe, PCML

In the gas production, the gap of the soil is refilled with oil and water. The formation of earthquake is not concerned with exchange of the soil layers. In Myanmar, Bago earthquake occurs one times in 100 years. Earthquake in Myanmar can't occur due to production of oil and gas but due to subduction and collision of Indian plate and Burmese plate.

Discussion

(2) Questioned by U Tin Soe, fisherman in ThaBawSeik

Can production of gas affect fishes we eat? The project is related to local people or government. If the project is successful, Dawei will get chance for electricity. How many impacts can local people be affected?

Answered by U Phoe Kyaw, PCML

The wastes from Yetagun project are discharged in compliance with National Emission Quality Guideline (NEQG). If the waste is over the NEQG, we carry it to the land. Kitchen wastes are discharged regularly. Waste impacts are reduced as much as possible.

Answered by Dr. Soe Moe Aung, MOGE

In Myanmar, there are three phases for access to electricity (generation, transmission and distribution). Now, MOGE proposes to build the transmission line (Mawlamyine-Yae-Dawei transmission line) for access to electricity. We sell the gas for local used with reasonable price. Using electricity is high at morning and night but electricity is wasted in day-time. If the national grid connects with local region, charge of electricity is lower than the current price.

(3) Questioned by U Win Htein (tourism)

Is the Yetagun project operated?

The project is 90 miles far from Loung Lon, 96 miles from Dawei, 105 miles from Myeik and 85 miles from island. How many advantages and disadvantages can the project affect the tourism industry? How much impacts can the project affect marine tourism and fishing area?

Can the protected area near Laung Lon be affected by the project later?

Answered by U Phoe Kyaw, PCML

Two parts of drilling are permanent drilling and infill drilling. We have already gas pipelines for the existing drilling. If we discover the new one, we will conduct small oil extraction process.

Answered by U Zaw Zaw Aung, PCML

Water depth of the project is about 300 ft and these are no suitable for coral reef and scuba-driving. Scuba-diving is suitable at about 30 ft and so may not affect the tourism industry. We have waste management plan for the project. So, the tourism sector may improve in the future.

(4) Questioned by U Soe Tint, Staff Officer, Taninthari Department of Fishery

During operation, the exclusion zone is about 500m. I would like to talk about a problem that happened last years. I think the project name is “Shwe Tabawa Yay Nan Myay”. I am not sure about it but the project area is about 10 miles from the Rakhine shore. In Rakhine, the company hada problem with inshore fishermen during seismic operations. Most of fishermen were from Taninthari. As soon as the problem occurred, the environmental company like IEM came to the area where the problem occurred, negotiated with fishermen in sea, took relevant photos and discussed with the regional departments of fishery. When they took on-site survey in the villages, the fishermen/villagers mentioned that they cannot pull up their fishing nets when the seismic vessel came because the length of net is about one mile. For this case, the radio channel used by fishermen should be used in seismic vessel in order to notice in advance the seismic vessel path.

Discussion

As the company took response and responsibilities immediately, both sides (company and local communities) became convenient. Now, this current project on blocks (M12, M13, and M14) is offshore as well as very important fishing areas. I know that drilling operations would take about 75 days per well and exclusion zone is 500m. Fishermen have experienced that drilling duration was more than 75 days and exclusion zone was wider than 500m.The reliable information about drilling duration and exclusion area should be totally provided. As fishing days are about 20 days per month, fishermen would have many difficulties in their livelihood if they could not fish in these days. What is the exclusion zone of drilling rig? I would wonder about locations surveyed in the IEE. I found out that all data resulted in survey had been explained in this meeting. I am the one who started to establish regional conservation. This presentation included information about "Lake Zaung Lyar (turtle)". According to my knowledge, there is no data about "Lake Zaung Lyar" in Thaninthari. How did the environmental company collect data about "LakeZaungLyar"? or from which reference? Where did the company undertake sea-bed micro-organism survey?

Answered by U Phoe Kyaw, PCML

Prior to seismic survey, "Mariner Notice" has to be announced in newspaper. In mariner notice, the boundaries/edges of the seismic vessel path are included only. Seismic vessel with 10 km streamer equipment would go back and forth within the blocks and two miles in front of seismic vessel is safety zone. If fishing boats are in the seismic vessel path, we used to negotiate with them using Marine Channel-16 without forcing them. If gas reservoir is found, drilling rig would be mobilized and safety zone is 500m around it. The Law-protected area is assigned by five nautical miles radius from safety zone. We have no allowance to enter and operate in this area.

Answered by Daw Khin Su Su Naing, ERM

Concerning sea water, sediment, benthos and sea-bed organisms, samplings are conducted in four directions (East, West, South, and North) of the project area. If you want detailed sampling locations and information, I could ask this information for you from baseline surveyors. I am not a marine scientist. In this morning, we collected survey data showing photos of turtle in Laung Lon. The most common turtle in this region is "Orlitia". Concerning source of information, all reliable references such as website, research and study would be provided to you later.

(5) Questioned by U Than Win

The presentation is so good. People might think that onshore would not be affected as this project is offshore. The corrosion caused by gas pipelines in DaMinSeik is not still fixed yet. The respective project company said that this corrosion is not caused by their project. That cliff in DaMinSeik never collapsed before gas pipelines which were not covered with sand bags. After covering them with sand bags, the cliff becomes collapsed from 2011 till now. I would like to share my experience. Last years, local people had a problem with a project company. Concerning this case, the residents complained the government and then the government warned the company. Complaint process was like a Volleyball game. The affected ones are just local communities. As I would like to learn complaint process, share with us if the government took actions seriously on this company for certain problems. For example, who complained the company? How did the government take actions on the company? Go to see at the DaMinSeik. The cliff collapse continues in places where are not covered with sand bags. About 100 households were ruined by this collapse. As the village has to move back due to collapse, the pond in backyard is on beach now. I have strong evidences including photos and videos. This village was not supported by any compensation. Another thing is to inform you that people in

Discussion
DaMinSeik and KanPauk don't know about this meeting. **Answered by U Phoe Kyaw, PCML** We appreciate your suggestion. As gas pipelines became emergent in 2010, these pipelines were covered with geo-membrane by our company (PCML) and with stone by TOTAL Company. I never heard of the problems that you said. Thanks for your suggestion. **Discussed by U Than Win** As TOTAL just covered only the relevant places, eddies has risen around stone line and took down houses and coconut trees. If TOTAL company has kindness to the village, DaMinSeik would have no cliff collapse like that.

Photo Session

Presentation by U Phoe Kyaw, PCML

Presentation by Daw Kin Su Su Naing, ERM

Presentation by Dylan Jekin, IEM and
U Khun Set Thar, EQM

Presentation by Daw Tin Nwe Nyo, PCML

Questioned by U Nay Min YarZar

Questioned by U Tin Soe

Questioned by U Htein Win, Dawei Tourism

Discussed by U Phyo Paing Soe, PCML

Discussed by U Zaw Zaw Aung, PCML

Questioned by U Soe Tint, Taninthari Fishery Department

Questioned by U Than Win, HRW Dawei

Discussed by Dr. Soe Moe Aung, MOGE

Meeting Minutes

Detail			
Project	ESHIA for Offshore Block M12, M13 and M14 Project		
Venue	LaungLon GAD office	**Region**	Thanintharyi
District	Dawei	**Township**	LaungLon
Objective	Second Public Consultation Meeting		
Date	24/07/2018		
Time	9:00 – 12:00 am		

Presentation

- **Dr. Soe Moe Aung (MOGE)** started the consultation process with the introduction to the meeting, explaining the objectives of the meeting
- **U Phyoe Paing Soe (PCML Co., Ltd)** explained about seismic survey.
- **U Phoe Kyaw (PCML Co., Ltd)** presented about exploration drilling with video.
- **Daw Khin Su Su Naing (Senior Consultant_ ERM)** giving an overview of environmental impacts assessment and potential impacts from infill drilling and 3D seismic survey processes.
- **Dylan Jenkins (IEM) and U Khun Set Thar (EQM Co., Ltd)** presented about environmental potential impacts from exploration drilling.
- **Daw Tin Nwee Nyo (Yetagun)** explained about Corporate Social Responsibility (CSR) program of Yetagun Project.
- **Question and Answer (Discussion)**

Discussion

(1) Questioned by U Min Aung Thu

I would like to know the Contract sharing between MOGE and PCML. From this sharing how much will be used for this region. Survey should be carried out widely, especially on the affected local areas as most of the areas in this region are dependent on fishing industry.

How do you protect the impacts on fishermen? The vessels for the project site reached on the fishing ground so the fishing boats are prohibited to enter around the project site.. Therefore, we have many difficulties for fishing. Coral reefs are the main areas for breeding of fishes. So, third party should disclose EIA report to the local community. I would like to know where coral reefs exist and how to maintain coral reefs from the impact of exploration drilling.

We are afraid of waste disposal although company will be conducting the monitoring program. Another concern about this project is Mercury. If there is leakage of Mercury, it will effect on fishes and marine animals in the water. So, I want to know how to manage mercury and I didn't find the management of mercury in this presentation. PCML will be cooperated with whom to conduct laboratory analysis. Why I want to know is that the results will be good if laboratory analysis is conducted by PCML.

If we enter to the exclusion zone during the night, there will be dangerous for both sides. I want to know the safety program for the fishermen. I found that the EIA study is conducted only for the drilling areas, not for the immediate areas around the blocks. The EIA study should be conducted not only for three blocks but also for other blocks around the project site. These

Discussion
drilling areas are located around our main fishing zone so PCML should conduct carefully during the drilling activities. Third party should directly disclose the EIA reports to the local community, other than after getting permission from PCML. The CSR activities should be conducted in the undeveloped villages with lack of accessible areas located in Dawei and Laung Lone. **Answered by Dr. Soe Moe Aung, MOGE** The contract's name is production sharing contract between PCML and MOGE. Although it is contracted by MOGE, all the profits are under the management of Union Government. According to our procedures, the resources within 25 nautical miles of the coastal areas can be managed under the regional government. As the current drilling project is outside of 25nautical miles of the coastal areas, the profits from this project are under the management of Union Government. The Union Government will share the profits equally for the development of States and Regions. MOGE's role is to take responsibilities in technology for exploration, drilling and production as the governmental department. **Answered by Daw Khin Su Su Naing, ERM** I would like to explain about Environmental Impact Assessment (EIA). We collected not only marine species but also plankton and zooplankton species that can only be seen by microscope. We emphasized mangrove species and coral reefs in this presentation slide as these are main breeding areas of marine species. There are two main sections in the EIA report, one is the summary of the EIA report and the other is described as chapter by chapter of findings, analysis, management plans and mitigation measures. We will disclose on the websites after the EIA report is finished. We said to receive this EIA report from the Project Proponent as some wants to get EIA report as a document. We also studied the cumulative impacts of surrounding areas around the project site. We also studied the monitoring programs along with the mitigation measures and will submit this to ECD. If you want to know the progress of monitoring plans, you can ask to the project proponents. This stage is only the assessment stage, we will describe your comments, suggestions and recommendations in the EIA report. **Answered by U Phoe Kyaw, PCML** We have to submit Environmental Monitoring Plan to ECD as the requirements of EIA report. We will use modeling to know where the drilling cuttings are existed and the amount of drilling cuttings as well. According to National Environmental Quality (Emission) Guidelines, we are going to analyze the content amount from the drilling cuttings. We will dispose these drilling cuttings only after treatment until achieving the acceptable levels. An acceptable level for mercury is 1 mg/kg and for oil and gas is 6.9 ppm according to the guideline.
(2) Questioned by U Maung Maung Aye Tanintharyi region is the main oil and gas production area, but we purchased diesel, gas and electricity with high price. I would like to know how much benefits will get from the future blocks.

Discussion

Answered by Dr. Soe Moe Aung, MOGE

We are not producing oil and gas from the new blocks. We are planning to produce oil and gas from the infilling as the amount of oil and gas become decreased. According to our procedures, the resources within 25 nautical miles of the coastal areas can be managed under the regional government. As the current drilling project is outside of 25 nautical miles of the coastal areas, the profits from this project are under the management of Union Government. We need power generation system in order to generate electricity. And we also need transmission line and distribution line to distribute electricity to the areas. At the current condition, there are no transmission lines in the Tanintharyee region. So, we only distribute to the areas where the transmission line are existing.

The current condition is only the infilling phase due to decreased amount of oil and gas from the current blocks. The other is the exploration drilling stage. In this stage, we are not sure if the reservoir is still existing or not. If we found the reservoir, we will conduct management for the National Development.

(3) Questioned by U Kyaw Thu Soe

Is it not fair if we do not get benefits even though the oil and gas projects are performed in our regional areas? All of our people are dependent upon the fishing industry. We would like to know how to manage mercury leakage and how to mitigate that kind of leakage. I would like to recommend if you give EIA reports as our people are not educated persons, these reports should be given in Myanmar version. We want to accept this project as the country development. But the resources are taken from our region and we only receive the negative impacts. Moreover, if we cannot accept this project, you cannot generate electricity for our region.

Answered by Dr. Soe Moe Aung, MOGE

It is the production sharing contract. Technology used for oil and gas production is high and the investment cost is also high. We included only 20.5% shares in Yetagun project. We get profits only upon the sharing amount. All profits that we got are under the management of the Union Government. Union Government will allocate the profits for the development of States and Regions. The CSR activities are also planning for the local development.

(4) Questioned by U Tin Soe, Laung Lone

We are facing many difficulties due to the drilling of oil and gas projects.

Answered U Phyoe Paing Soe, PCML

We have mariner notices for the drilling of oil and gas. Ships are rotating within 500m exclusion zone in order to be safe for fishing boats and fishermen.

Questioned by U Tin Soe, fisherman in ThaBawSeik Village

Fishermen are needed to be informed about project operations using pamphlets. The point is that pamphlets should be sent to every house.

Discussion

Answered by U Phoe Kyaw, PCML

These exploration blocks are so far from the shore. Some of fishing boats may go to fish around the blocks. If seismic survey vessel is going to operate within blocks, fishing boats would be informed for the pathway and noticed in advance by supporting vessels not to fish there. Local communities need to know that seismic vessel would go back and forth during seismic operations. Concerning this issue, we would discuss and cooperate with seismic survey company.

Questioned by U Tin Soe, fisherman in ThaBawSeik Village

If environment and marine animals within blocks are affected negatively and fishing in the blocks is prohibited, fishery and our livelihood would be seriously disturbed. How will the company handle these problems?

Answered by U Phoe Kyaw, PCML

Total duration of seismic survey and exploration drilling is about 7 months and these operations are temporary. If gas reservoir is found economic, gas pipelines will be connected from this place to the bottom of the station built in the first phase. Maximally, seismic survey takes about 50 or 70 days and it takes about 75 days to drill one exploration well. The actual duration may be shorter. To prevent the traffic problems, I would like to urge local communities to do fishing using 'Mariner Notice'.

Answered by Daw Khin Su Su Naing, ERM

Especially, I would like to request fishing villagers to stay for 10 or 15 minutes after meeting and to answer our questionnaires about fishing activities including fishing area, fishing mile and horse power of fishing boats. The purpose of data collection is to assess impacts on livelihood and fishery of local communities and to prepare mitigation measures. I would like to inform that these assessments will be taken into consideration of EIA.

Questioned by U Tin Soe, fisherman in ThaBawSeik Village

I am not resisting the project. Although I know that this project will support for national development, I just mentioned loss of local people according to the current situations. How would the company address socio-economic problems?

Answered by Daw Khin Su Su Naing, ERM

Concerning your question, two things would be conducted. Firstly, assessment on fishery would be undertaken. The second thing is 'Mariner Notice'. The current project area is situated about 100m far from the shore. Data survey would be undertaken not only with fishermen in this meeting but also the relevant organizations including the Dawei fishing associations and the fishing departments. Notice would also be conducted, for example, fishery would be informed about the operation area one month in advance prior to the project operations. Both assessment and preventive measures would be issued.

Questioned by U Tin Soe

According to the geology, our fishery is also relying on this project. I know that this project area is related to our fishing areas.

Answered by Daw Khin Su Su Naing, ERM

I would like to collect fishery data from you. I would like to request you to explain us about offshore fishing activities after the meeting.

Discussion

Questioned by U Tin Soe

Concerning environmental damage, fish might eat wastes generated from drilling operations. May we have negative impacts if we eat these fishes?

Answered by Daw Khin Su Su Naing, ERM

Waste management is the most important part in this case and thank you for your question. Waste generated from human and operational activities must be categorized and some wastes have to be sent to the disposable area. Food waste such as banana peel would be disposed into the sea even after crashing them to millimeter size although food could be solvent in sea water.

Regarding waste disposal, any waste must not be disposed carelessly without compliance with the relevant standards. Waste management must be undertaken in compliance with national and international standards. If so, the operations could be sustainable.

(5) Discussed by U Tun Kyi

As U Kyaw Thu (township administrator) said, our comments will disappear soon after the meeting and your hearing. We don't like this situation. Is it possible not to extend and progress the project? Although there are forest productions, jade mining and oil and gas production in our country, our country is still undeveloped. If this project is progressed, it is just to burden on local communities, especially, fishermen. Moreover, in every project, only a handful of people become prosperous and the whole country becomes poorer and poorer. The experts would know this better than me. I would like to urge the experts to do right things. MOGE representative said that the union government is responsible for this project as this project is operated outside 45 nautical miles from the shore. The nautical mile assigned for fishermen is just about 12 miles from the shore. It makes fishermen face difficulties. I would like to request to give equality to both sides.

(6) Questioned by Daw Ye Ye Htwe

I know that these offshore blocks are established and operated in the previous government's term and progressed in the current government's term. I would like to know the contracts signed in the previous government's term. There are also no strong laws and regulations in Myanmar that would include provisions for local communities if they have loss of their property and livelihood due to these projects. I would like to know for what the union government sold natural resources in our region. Although our country is a federal one, we have no federation. Due to conditions that might make local people jobless, I would like to tell to stop this project that contracted with union government without agreement of local people. I have ever experienced with CSR programs conducted by Yetagun project. I found dispute among local communities as Yetagun project did not support enough amount of money. For example, in a village, Yetagun project provided budget for building preschool. In rural area, the land ownership issue is quite complex with various sorts of ownership rule, and because of the lack of solid evidence, there have already been a lot of arguments between villagers and land owner. That preschool was built on the disputed land, but Yetagun took no responsibility, just asking how much those villagers and owner needed as compensation and never paying the promised money. So it is necessary for all village administrators to know the real meaning of Yetagun CSR programs and that we would get nothing free from Yetagun. But most of them already accepted Yetagun's support, and hence it's difficult for us to bring up this matter. What I would like to point out is that Yetagun is executing these tasks, in coordination with the central government and we don't have the right to discuss about these matters. So I request to stop this project.

Discussion
Answered by Dr.Soe Moe Aung, MOGE Our project is not a new one, but an established one. This contract includes the contract duration in which the specified amount of oil production must be produced. But due to the current crisis of decrease in production, the government is about to fall into the condition of compensating the loss. To prevent this situation, infilling wells and exploration wells have to be drilled. The probability of successful production for an infilling well is from 80% to 90%, whereas that of exploration well is from 10% to 15%. The compensation of government for the loss means implicitly the disadvantage of the citizens. Moreover, the current project is not a new one; instead it is just continued because of the decreased production. In the process of drilling wells, gas reservoirs will be explored only in Block M12, M13 and M14. The production process will be carried out just in the area of gas reservoirs and before that, environmental impact assessments will be executed. We already guaranteed to try our best for the minimum side effect. We would like the locals to discuss the better ideas and to provide a good cooperation. To say again, this project is not a new one, and it is continued due to the decreased production of oil.
(7) Questioned by U Tun Kyi We got your point, sir. As you said before, this project is continued because of decreased production and consequently to save the government from compensating the loss. You said the compensation of government somehow affected the citizens. Well! This company was once a very successful one and already got enormous profit. But we, the local, have to pay from 200 kyats to 600 kyats per 1 unit of electricity till now, while the nationwide price is 35 kyats. I'd like you to report this matter to the government since you are government agent. Please ask the current government if they are afraid of project owner, ignoring us, the sons and fathers of country. Sir, you are afraid of compensating the loss. Right! But we, the local, can't get access to use 25% of the produced gas. Where does this 25% go? We just heard about it. At that time the price of 1 unit electricity was from 400 kyats to 700 kyats. Now the price is still 200 kyats in Dawei. We want the government equally treat both sides. If not, we will protest. Call it objection or fighting anyway. We will not keep quiet. If my words are impolite, please tolerate them because I was trying to speak clearly. **Answered by Dr.Soe Moe Aung, MOGE** In this contract, share of the nation is 20.5%. Concerning the profit sharing, 20.5 % profit has to be allocated for covering the whole nation. Regarding access to electricity, MOGE has been supporting for domestic use after installing domestic gas pipelines. Just like other regions/states, natural gas has been sold to Taninthari region by 7.5 USD per 1MMbtu. Using natural gas, power plantation would be built. After that, power lines need to be constructed for access to transmission. National government and regional governments also prioritize this case. **Answered by Daw Khin Su Su Naing, ERM** Our assessment is not outward and easy-going as you said. The main purpose of this meeting is not only to listen to your comments but also record them for assessment. Suggestion and consultation of local communities must be included in a particular session of EIA report. I guarantee that your comments and suggestions would include in the report.
(8) Discussed by U Kyaw Myint Soe Although it is said that the drilling rig cause no impacts on environment, the real truth is that the environment is affected negatively. I found dead fishes in my fishing-net near the drilling rig. Other fishing boats near the rig experienced just like me. I think this death is related to the waste

Discussion
generated from drilling rig. Although I am not an expert, please appreciate our experience and take it into consideration of assessment.
(9) Questioned by U Tin Htwe I would like to discuss about CSR programs. As the project area is about 30 miles far from LaungLon, it seems closer to our ethnic regions. Usually, Yetagun conducted many CSR programs in the towns/villages which have accessible roads but a few programs in coastal areas. There are 18 ethnic villages in LaungLon Township. As CSR have been conducted only in 2 or 3 villages among these villages, CSR programs should be reviewed. I found that the meeting was held together by the MOGE, project proponent,and EIA Company. I wonder why the meeting was held like this. Although local communities want to have open-talk only with EIA Company, we daren't to say openly as we have to look back MOGE. In next meetings, we want to discuss with EIA Company. **Answered by Daw Khin Su Su Naing, ERM** Even if the meeting is held together like this, all information related to the project could be explained at the same time. If the EIA Company come to held presentation separately and the project company come to present the relevant project information in another meeting, local communities could also face inconvenience to attend the various meetings. Concerning the meeting, all presentations could be conducted together by MOGE, Project Company and EIA Company. If local communities want to talk openly just with EIA Company, EIA Company would stay to listen and record your comments after this meeting but the Project Company and MOGE would go back. I would like to request the fishermen not to go back after meeting and to explain us about fishing activities. Moreover, your comments and discussion wanted to be listened and recorded if you want to talk openly EIA Company only. Please understand us that the meetings are held together like this for many reasons.

Photo Session

Introductory Speech by Dr. Soe Moe Aung, MOGE

Presentation by U Phyo Paing Soe, PCML

Presentation by U Phoe Kyaw, PCML

Presentation by Daw Kin Su Su Naing, ERM

Presentation by Dylan Jekin, IEM and
U Khun Set Thar, EQM

Questioned by U Min Aung Thu

Questioned by U Kyaw Thu Soe

Questioned by U Maung Maung Aye

Questioned by U Tin Soe

Questioned by U Tun Kyi

Questioned by Daw Ye Ye Htwe

Questioned by U Kyaw Myint Soe

Meeting of Minutes: ESHIA for Offshore Block M12, M13 and M14 Project – Consultation Meeting at Myeik Township

Detail			
Project	ESHIA for Offshore Block M12, M13 and M14 Project		
Venue	Grand Jade Ballroom	**Region**	Thanintharyi
District	Myeik	**Township**	Myeik
Objective	Second Public Consultation Meeting		
Date	26/07/2018		
Time	9:00 – 12:00 am		

Presentation

- **Dr. Soe Moe Aung (MOGE)** started the consultation process with the introduction to the meeting, explaining the objectives of the meeting
- **U Phyoe Paing Soe (PCML Co., Ltd)** explained about seismic survey.
- **U Phoe Kyaw (PCML Co., Ltd)** presented about exploration drilling with video.
- **Daw Khin Su Su Naing (Senior Consultant_ ERM)** giving an overview of environmental impacts assessment and potential impacts from infill drilling and 3D seismic survey processes.
- **Dylan Jenkins (IEM) and U Khun Set Thar (EQM Co., Ltd)** presented about environmental potential impacts from exploration drilling.
- **Daw Tin Nwee Nyo (Yetagun)** explained about Corporate Social Responsibility (CSR) program of Yetagun Project.
- **Question and Answer (Discussion)**

Discussion

Question – U Zaw Naing

Presentation for the SIA is very interesting. There are impacts of the project. I have 3 questions to ask you. One is the potential short term impact on fishery and do you have any plan to give compensation for grievance. Another one is the potential long term impact. Yetagun project has been operating for 20 years extracting non-renewable resources. Local people suffered from spiritual wounds. Electricity fee is very expensive in our area and do you have any plan to distribute electricity generated from oil and gas of the project. The last one is that sharing resources is included in 21 Century Pinlong Peace Conference. I have known about the contact will last 20-30 years. I would like to know how would be changed if the regional government will have authority for management.

Answer – U Phoe Kyaw (PCML Co., Ltd)

The project contract is not a new one. The production of the existing well is degrading and therefore infilling will be carried out in order to fulfill the expected production. The project activities including exploration, drilling and infilling will be done near the existing Yetagun platform. The project is to extract oil and gas and these are sold with the fixed prices by sending

Discussion
with national oil and gas pipe line to other cities. There are three steps to get electricity; generation, transmission and distribution. Although oil and gas will be sold with the fixed price for generation, transmission line is still required. If the electricity for this area will be connected with national grid, it will be better for electricity. **Answer - U Zaw Zaw Aung (PCML Co., Ltd)** PCML has a mechanism. If the project will pass through on the land, there is Form (7) for land acquisition. Government has to fix the compensation amount for damaged crops. The project proponent has to comply with the laws and regulation. If there were laws and regulation to give compensation for the project located in the sea, we will comply the government instruction. **Question – U San Maung** I would like to say for all of fishery association. This group had been discussed again and again in our area. I would like to know that did you submit our voices and comments to the higher level. Although we had disclosed our attitude, there was no response for them. Oil and gas is abundant in our region, but we have to pay 400 Kyats per unit for electricity. We are like the people outside of the population of Burmese. Company told about the CSR program, but there is no CSR activity in Myeik Township. Fishery is the key business in Myeik. Being M-12, M-13 and M-14 blocks located within the fishing ground the 20 fishing plots out of 52 plots cannot be used for fishing.. Previous project, such as TOTAL, operated their project activities at the place where the water depth is about 500- 1000 meter. The project is progressively near to the shore. Technicians said that there are so many fishing boats and overfishing is currently taking place in the area. During this situation, the project came into this area and therefore fishing boats have to back away from current location. If fishing boats enter the project restricted area, they will be taken action. I know that oil and gas is very important for the government income. I would like to know when the expiry date of the contract will be. Will the infill drilling fulfil the amount included in the contract? Will the project take extension for years if oil and gas can be extracted to continue? I would like to know that what our region can get positive impacts from this project. If there were many advantages for our country (or) for our region from the project, we will agree the project whether it can have negative impacts on fishery. Someone told that there is form (7) for land, but not for sea. There is fishing licence in the sea. We have to pay taxes according to government regulation. They said only for the company, but not consider about local people. The project will determine the area for 3D seismic survey and restricted area for not passing through. The company will have no negative impacts, but there will have grievance on seasonal fishermen. We said about our difficulties and suggestions. There is no reply for our comments. If the public consultation meeting is hold just for one of the requirements, no more meeting is needed in our township. We want the meeting which seriously consider our voice, suggestions and comments. Catching red crab which is main business of Thanintharyi region, is steadily deteriorating. I would like to know the impacts of seismic survey. We are not interested in shark and whales because we don't catch them. Therefore, please present about the impacts of seismic survey on fishes and crabs. Currently, drilling is now starting. I would like to know how much will be extracted and the amount of oil and gas sending through the pipe line. How much can be produced by the potential wells? I would like you to disclose the amount because seismic survey had already been done.

Discussion

Question – U San Mhwe

Someone told about form (7) on land. Form (7) is for individual land ownership. It cannot be the same in nature for the sea. The 52 fishing plots determined by Department of Fishery are located in Thanintharyi Region. Therefore, I would say that there may have specified ownership for sea because fishing plots are determined by Department of Fishery.

Answer - Daw Khin Su Su Naing (Senior Consultant_ ERM)

The project proponent has to hire third party. Third party has to record the main points and subscribed in the report. This report has to be submitted to Environmental Conservation Department (ECD) and reviewing has to be done. Relevant departments including Ministry of Labour, Immigration and Population, Ministry of Health and Sports, Forest Department, Department of Meteorology and Hydrology, GMA, Port Authority, Professor from Technological University are also included in the review team. After viewing the report, relevant technicians give comments and suggestions. If there are no comments and suggestions by local people, they direct to hold public consultation meeting again. I would like to say and prove that the voices and comments of local people are surely reached to the relevant departments.

We have to analyse the reaction of young fishes, fishes with eggs and organisms on the sea bed. Impact on young fishes by the project is less than the naturally occurring damage. We have not seen the evidence that 3D seismic survey has impact on the environment. I share this information from documents and research paper.

Answer –Dr. Soe Moe Aung (MOGE)

Oil and gas projects, like Yadana, Yetagun, Zaw Ti Ka, are doing the CSR programs. They have to negotiate with the Regional Government before starting project activities. They have to disclose the proposed project information. Then, government manages the projects not to overlap with their planned project. The current production of oil and gas become decreases. We assume that the proposed oil and gas well will have some percentage of success. According to technology, drilling on the existing well has only 30% for success. Required infrastructures have to be built for drilling and production of oil and gas. If the production covers the economic benefit, the production activities will be proceeded.

Question- U Tin Than

Offshore fishing is around 160 miles distance from the shore. The project area is 60 square miles. There are around 2,000 members in fishery association. We cannot catch fishes in these 60 square miles and we have to fight for the fishing ground in the remaining area.

Question – U Win Naing

We welcome environmental and social impact assessment processes and we want transparency. I would like you to hold responsible and accountable public consultation meeting. I don't like that the grievance mechanism will be done only if the government gives instruction. One presented that fishermen catch fishes within 10 miles from the shore. However, we usually go 20-100 miles for fishing. There are some requirements in EIA and SIA processes. I would like you to be transparency and assurance for local people. Electricity is very expensive in our township. I would like to request to the third party and company to get electricity in our area.

Question –

One presented that the company spend 750,000 USD for the CSR program. I would like to

Discussion
suggest that to disclose in the contract how much % of the profit will be used for the CSR program. **Answer – Daw Tin Nwee Nyo (PCML Co., Ltd)** I presented about the amount of USD for the CSR program by Yetagun Project. We give taxes to the government according to the contract. We have to share profit with proportion to government and MOGE by complying the contract. The CSR program is not included in the contract. Yetagun perform CSR program specifically for local development. **Question – Myat Zaw Moe (Biogeography Student, Myeik University)** I like the word "profit sharing with proportion". Please explain how to share the profit. One presented that contact information is disclosed in presentation. We don't want these numbers. We just want the number that we can complain effectively for project negative impacts. I would like to know how to plan for relocation for fishermen. Relocation process is very important and costly. I would like you to consider for relocation. **Answer – Dr. Soe Moe Aung (MOGE)** Sharing profit with proportion means that all proponents have to invest sharing amount for hiring ships, drilling cost and constructing platform when exploration drilling starts. The amount of profit depends on the investment amount and therefore it is called as sharing profit with proportion. **Question – U Aung Than** My name is U Aung Than. I would like to know that third party stand by company or Petronas or local people. Locals cannot get any benefits from oil and gas project. We don't agree the project that has no benefits on local area. **Question – U Yan Kin (Staff Officer, Department of Fishery, Myeik)** If there are damages on crops by the project on land, there is farmland form for giving compensation. When drilling starts, there may have noise and vibration. I would like to know that do you have plan to consider grievance for fishery like the way you did for grievance on land. We all are trying to conserve for marine resources by reducing 10 % for catching fishes and restricting for breeding season 3 months. I would like you to consider for marine resources and local fishery. **Answer – Daw Khin Su Su Naing (Senior Consultant_ ERM)** I would like to explain about third party. Third party is a freedom organization and has to analyse the environmental and social condition depending on the project. The information "fishing within 10 miles" got from the previous observation, but now we have known that offshore fishery goes over 100 miles distance from the shore. In the report, we will inscribe the information from local people comments, suggestions and conducting surveys as well. We would like to ask fishery survey at the end of this meeting. We will describe all the information in the report. If comments and suggestion of local people do not include, the report will not be a complete report. Third party has to assess the potential impacts and the environment, describe the mitigation measures for the impacts and consulting for management mechanism. **Question - U Kyaw Naing** Last 20 years ago, there is only 230 KV transmission line, but now 500 KV is available, in Myanmar. In Kanbauk Township, there is a LNG plant. The electricity will be sent to Bago,

Discussion
however, Thanintharyi region is not included. Although projects are located in our region, they do not share any benefits for local people. Therefore, peace is so hard to find. **Answer – Dr. Soe Moe Aung (MOGE)** LNG plant is now being constructed in Kangbauk Township. Department of Electricity (DOE) and Myanma Oil and Gas (MOGE) is not the same. Oil and gas processes are being run under the MOGE. Generation and transmission of electricity is being performed by Department of Electricity. According to the DOE plan, I would like to share the information about they have a plan to implement Mawlamyaing- Yay- Dawei transmission line and Dawei- Myeik- Bokepyin transmission line. **Question-** When will this project start? **Answer- Dr. Soe Moe Aung (MOGE)** The implementation is scheduled as Dawei- Myeik transmission line in 2021-2022, Myeik- Bokepyin in 2021- 2022 and Bokepyin- Kawthaung in 2022- 2023. **Question – Ko Chit Htwe** Local people attitude and perception on the project is the key point in international oil and gas projects. The project cannot get licence without local people agreement. In the Union Government, there is no fisherman and they do not know about the fishery. The Regional government has no authority on this project and local people have no power as well. And, I would like you to suggest that to extend the schedule for more discussion and comments. **Question – U Htay Hlaing** The current project, M-12, M-13 and M-14 blocks, have been contracted with the previous government and process to continue by the current government. These blocks are located near the fishing grounds. I would like to know how many years remain according to the contract. And, can these blocks be managed by local when the contract date ends? As a local people, I would like you to stop the project because these 3 blocks are the most dangerous and nearest to the shore. **Answer- Dr. Soe Moe Aung (MOGE)** The project had already contracted. The production of the existing well is degrading and therefore infilling is done to fulfill the expected production. If the production amount is less than the amount in the contract, the government has to compensate according to regulation of the contract. The project activities such as exploration drilling and infilling will be done near the existing platform. The project timeline is 30 years contract and it started in 2000. The time remaining for the project is 12 years from now. **Question – Unknown** Do you make recording for the comments and suggestion of local people in this meeting? The workshop I had attended gave us agenda for meeting. I didn't see agenda in this meeting and we have difficulties when we note down the points. I think third party will get more comments and suggestion if you will plan group discussion. I think this meeting is a little different and I would like you to suggest that to plan for giving comments and suggestion more widely by local people. **Question- U San Maung** Most of the members in fishery association are now in this meeting room and we would like to know the restricted area for fishing and drilling rag.

Discussion
Answer – U Phoe Kyaw (PCML Co., Ltd) The restricted area is radius 5 miles from the drilling rig. **Question – U San Maung** Is that sure "the restricted area is 5 miles radius from the drilling rig"? Because we wanted to confirm this distance. We cannot enter this restricted area. When the fishing boat is 6 miles away from drilling rig, and if drilling rig security will catch that boat, how would you solve for this case? **Answer – U Zaw Zaw Aung (PCML Co., Ltd)** This restricted area is also marked on the nautical map. We have not seen that fishing boats are entering the restricted area. **Question- U San Maung** The fishery association have known that fishing boats cannot enter the radius 10 miles. The navy guards usually stay 10 miles away from the restricted border. Therefore, the restricted area is totally 20 miles distance from the drilling rig. We would like to suggest that to disclose the restricted distance in newspaper and magazines. **Answer – U Zaw Zaw Aung (PCML Co., Ltd)** It will be disclosed in the nautical map. **Question –** We know that it is disclosed in the nautical map. We would like you to disclose this information in newspaper and magazines because we would like to have a cover when there will be a problem relating to the restricted area. **Question- U San Maung** I would like to know how to assess the result of this public consultation meeting. I would like to suggest you to consider the comments and suggestion of fishermen who functionally working in the sea. How would you assess the result of this meeting according to recent comments and suggestion of ship owners, local people and association? **Question- U Ye Htwe** I would like to know how to submit the report to Environmental Conservation Department. We don't believe that our comments and suggestion will be inscribed in that report. **Answer- Daw Khin Su Su Naing (Senior Consultant_ ERM)** When we do the EIA process, the report has to be disclosed to the public. This report has to be sent to Department of Fishery and relevant administrative offices. It will be also disclosed on the internet website. If you have questions and comments, you can contact to the address stated. The aim of this meeting is to disclose about the project information to local people and to collect comments and suggestion of local people. We record your voices with recorder and then note down as meeting minutes. And then we have to inscribe this meeting minutes in the report and assessment will be based on this information. Therefore, the assessment for the whole project is impossible during this meeting (within three hours). **Question- U Too Hlaing Myint** If we disagree with this project, would you stop? Is this meeting holding after the project starts? If the project will be processed to continue, although local people disagree with the project, the

Discussion
public consultation meetings are nonsense. We have no fishes to catch because of the project impacts. **Answer – U Phyoe Paing Soe (PCML Co., Ltd)** There is a contract with the Government for sharing the profit with the proportion based on the production. The production of the existing well is degrading and therefore infilling is done to fulfill the expected production. If the production amount is less than the amount in the contract, the government has to compensate according to regulation of the contract. The project is not the new one. The project activities will be operated within the limited duration. We came and disclose that how to do project activities with the least impacts by the project and to listen local people comments and suggestion. **Question – U Aung Than** It is hurt on our mind. We are very upset. The projects come and hold public consultation meeting in our area and finally they do as they want to do. Don't care for us. Don't invite us for public consultation meeting because it leads to time and money waste. However we protest the project, the project will continue to process. This meeting is just for show. **Question – Unknown** Infill drilling well is the one that was performed seismic survey in 2016, right? We have known that infill drilling has to be done because of decreasing production. Is the block that will be done seismic survey for infill drilling or new contract? **Answer- U Phoe Kyaw (PCML Co., Ltd)** This block will be processed for infilling when necessary. The contract is the old one. **Question/ Suggestion – Anonymous** If so, the project will last for long life. Local people were affected by the project, but there is no positive impact for local area. We all do not agree with the project. **Answer – U Phoe Kyaw (PCML Co., Ltd)** Thank you for your suggestion and comments. Third party will inscribe these comments and suggestions in the report.

Photos	
	
Presentation by Dr. Soe Moe Aung, MOGE	Presentation by Daw Khin Su Su Naing, ERM

Presentation by Daw Tin Nwee Nyo, PCML

Presentation by U Phyoe Paing Soe, PCML

Presentation by Dylan Jenkins (IEM) and U Khun Set Thar (EQM Co., Ltd)

Question by Ko Myat Zaw Moe, FFI

Question by U Zaw Naing

Question by U San Maung, Myeik Fishery Association

Meeting of Minutes: ESHIA for Offshore Block M12, M13 and M14 Project – Consultation Meeting at Thayet Chaung Township

Detail			
Project	ESHIA for Offshore Block M12, M13 and M14 Project		
Venue	Thayet Chaung GAD office	**Region**	Thanintharyi
District	Dawei	**Township**	Thayet Chaung
Objective	Second Public Consultation Meeting		
Date	23/07/2018		
Time	3:00 – 6:00 pm		

Presentation

- **Dr. Soe Moe Aung (MOGE)** started the consultation process with the introduction to the meeting, explaining the objectives of the meeting
- **U Phyoe Paing Soe (PCML Co., Ltd)** explained about seismic survey.
- **U Phoe Kyaw (PCML Co., Ltd)** presented about exploration drilling with video.
- **Daw Khin Su Su Naing (Senior Consultant_ ERM)** giving an overview of environmental impacts assessment and potential impacts from infill drilling and 3D seismic survey processes.
- **Dylan Jenkins (IEM) and U Khun Set Thar (EQM Co., Ltd)** presented about environmental potential impacts from exploration drilling.
- **Daw Tin Nwee Nyo (Yetagun)** explained about Corporate Social Responsibility (CSR) program of Yetagun Project.
- **Question and Answer (Discussion)**

Discussion

Questioned by U Kyaw Kyaw Thet (Chairman, Dawei fishery federation)

I attended public consultation as the first time and I'd like to ask the question as well The main problem is electricity in Tanintharyi Region. Currently, the electricity bill may be increased to two hundred and sixty kyats per unit from two hundred as the increased USD price and even gas price. Although people of all regions are the same, people at Tanintharyi region have the burthen on electricity.

Are these three wells news?
Have the former agreement accomplished?
Did MOGE and PCML contract the new form of agreement on oil and gas from the wells?
Is there any allocation for the Tanintharyi region?
The next fact I want to say about fishery is that the fishery zones of Tanintharyi are facing overfishing. The fishery resources are also declining till 60%. Although the law had determined 10 miles from sea board for onshore, onshore fisherman are extending away from sea board. And

Discussion
also they are expending the depth of fishnet till the sea bed due to the declination of fishery resources. Local people of Long Lon Township will also ask something like that. They won't ask about EIA and I think the profession may do the best. I would like to request to MOGE to explain benefit sharing between PCML and MOGE. **Answered by Dr.Soe Moe Aung (MOGE)** This current project is not a new agreement and continues along with the existing agreement. Being declining of gas production, the agreement will be the long term. Therefore, new wells were needed to be expended to as an existing field so as to accelerate recovery. The government has been distributing domestic uses from Yadanar and Zawtika gas fields. The agreement was contracted not only PCML and MOGE but also with the government. The economic benefit from the oil industry goes directly to the government. And then government allocates accordingly back to the country. The benefit cannot be used as the department own budget. The main contract is with the Union Government. MOGE is the one which performs and participates with technical support. **Questioned by U Kyaw Kyaw Thet (Chairman, Dawei fishery federation)** Will we continue to buy and use the gas? **Answered by Dr.Soe Moe Aung (MOGE)** Regarding electricity accessibility, currently, there are two departments namely. Department of Electricity which is serving for electricity transmission and distribution and we, MOGE are working on exploration and drilling. According to the Department of Electricity, Liquefied natural gas project begins for the electric feasibility of Dawei along with the two sectors including transmission and distribution. The LHG project will co-operate both Dawei region and electric needs of national grid. The Liquefied natural gas project can be decrease the bill of electricity approximately in 2021. The main reason for high electricity bill is the absence of linkage with national grid. Department of Electricity is also performing to link with national grid. **Questioned by U Kyaw Kyaw Thet (Chairman, Dawei fishery federation)** The achievement for national grid is not important for us. If we buy and use gas, we won't be ok. **Answered by Dr.Soe Moe Aung (MOGE)** This fact what you say is correct but the electricity for national grid is more important. . In home use of electricity, it is more used in the morning and evening. Although electricity is not use in afternoon, the concept is the paying for surplus electricity. Later the payment of electricity will correspond with other regions if the surplus of home use share to places which need more like commercial industrial zones after linking main transmission line.

Discussion

Questioned by U Soe Tint (local people)

I think company continues the respective works according to the contract. I know that the exploration wells are in Tanintharyi offshore. Will the agreement contract again be M12, 13, 14 in Tanintharyi region?

Answered by Dr.Soe Moe Aung (MOGE)

According to the formulary law of resources for both international and Myanmar, if the zone is far from 25 miles of one region, it is under management of that region. This block is located over 60 miles so it will be under the management of Union government. According to the contract, the current agreement will accomplish in 2025.

Questioned by U Kyaw Kyaw Thet (Chairman, Dawei fishery federation)

Will the agreement for new block encompass under the current contract?

Answered by Dr. Soe Moe Aung(MOGE)

This exploration wells are not in new block and already contracted. Annual selling amounts were also included in the first contract. We have been drilled for 20 years in these three blocks since the first contract, thus the underground soil condition was changed and also the production was reduced. So we need to drill new well to cover the production rate that include in the contract. The new wells have only 50 percent to success because of both technical principle and natural resources principle. And also we invested the exploration drilling base on 20 percent to success. If the exploration drilling can produce gas, we must plan to produce sufficiently. If the natural gas were not discovered, the exploration company and also the shareholder company may compensate because these projects have long term contract with government.

Questioned by U Shu Tun(Local People)

Although Tanintharyi region can produce natural gas, we are still purchasing for it. Thus we need appropriate privilege for our region.

Answered by Dr. Soe Moe Aung (MOGE)

If we think about the contract, it has been for t 10 to15 years as a long term contract based on the National business. Nowadays, natural resources become declining. Thus the exploration drilling was needed to be carried out in order to complete the needs according to the contract. According to the government plan, if the natural gas production become increased, the government will supply for the regions who need electricity.

Photos

Presentation by Dr.Soe Moe Aung(MOGE)

Introductory speech by U Than Htun(Township Administartor)

Presentation by U Phore Kyaw (PCML Co., Ltd)

Presentation by U Phyoe Paing Soe (PCML Co., Ltd)

Presentation by Daw Khin Su Su Naing(ERM Co.,Ltd)

Presentation by U Khun Set Thar(EQM Co.,Ltd)

Question by U Kyaw Kyaw Lwin(Chairman, Dawei fishery federation)

Question by U Soe Tint (local people)

Question by U Shu Tun(Local People)

Socio-economic survey in Thayet Chaung Township