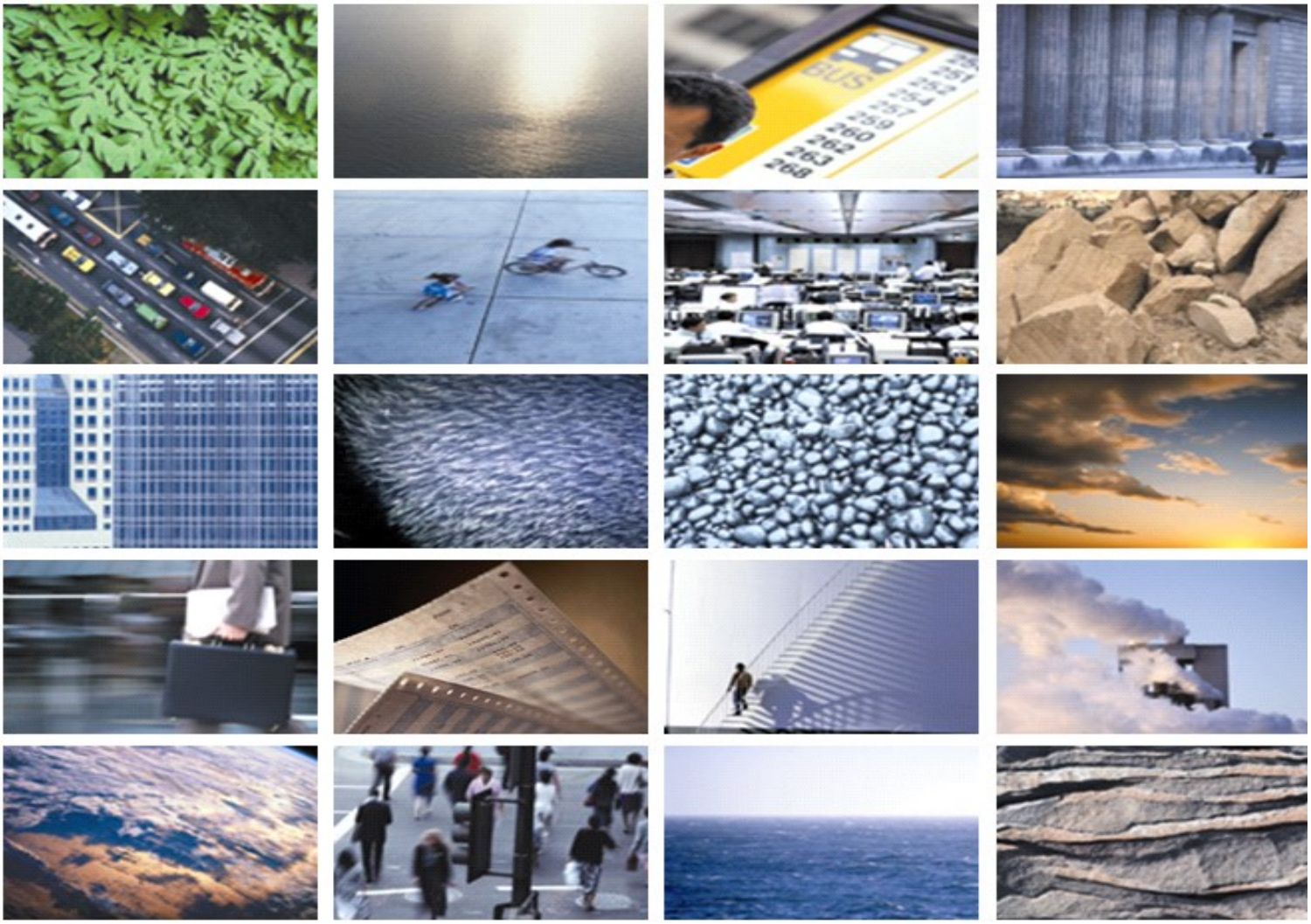

Eni Exploration Drilling in Block RSF-5

EIA Report

17 October 2019

Project No.: 0484028

Eni Myanmar B.V.

The business of sustainability

ERM

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Acronyms and Abbreviations

ADB	Asian Development Bank
ADB GMS-EOC	Asian Development Bank Greater Mekong Region – Environment Operations Centre
ADL	Asia Drilling Private Limited
ALARP	As Low As Reasonably Practicable
ALGAS	Asia Least Cost Greenhouse Gas Abatement Strategy
AOI	Area of Interest
API	American Petroleum Institute
AQS	Air Quality Standard
ASEAN	Association of Southeast Asian Nations
BEMS	Building Energy Management System
BES	Biodiversity and Ecosystem Services
BOD	Biological Oxygen Demand
BOP	Blowout Preventer
CAGS	Chinese Academy of Geological Sciences
CAIT	Climate Analysis Indicators Tool
CAT	Computerised Axial Tomography
CCS	Central Camp Site
CDZ	Central Dry Zone
CH_4	Methane
CIND	Climate Induced Natural Disaster
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
CR	Critically Endangered
CSR	Corporate Social Responsibility
DD	Data Deficit
DIHR	Danish Institute for Human Rights
DMP	Dust Management Plan
DO	Dissolved Oxygen
E&P	Exploration and Production

EAA	Ecologically Assessable Area
EC	Electrical Conductivity
ECC	Environmental Compliance Certificate
ECD	Environmental Conservation Department
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EN	Endangered
EOC	Environment Operations Centre
EPA	Environmental Protection Authority
EPA	Environmental Protection Agency
EPAS	Electronic Power Assisted Steering
ERM	Environmental Resource Management
ESE	Electricity Supply Enterprise
ESHIA	Environmental, Social and Health Impact Assessment
FERA	Fire and Explosion Risk Assessment
GAD	General Administration Department
GHG	Green House Gas
GIIP	Good International Industry Practice
GIS	Geographic Information Systems
GISD	Global Invasive Species Database
GMR	Greater Mekong Region
GPS	Global Positioning System
HAZID	Hazard Identification
HBV	High Biodiversity Value
HC	Hydrocarbons
HDPE	High Density Polyethylene
HPHT	High Pressure High Temperature
HSE	Health, Safety and Environment
IBAT	Integrated Biodiversity Assessment Tool
IEE	Initial Environmental Examination

IFC	International Finance Corporation
IMS	Integrated Management System
IOGP	International Association of Oil & Gas Producers
IPCC	Intergovernmental Panel on Climate Change
IPIECA	International Petroleum Industry Environmental Conservation Association
ISO	International Standards Organisation
IUCN	International Union for Conservation of Nature
LC	Least Concerned
LEL	Lower Explosive Limit
LOR	Limit Of Reporting
LR	Lower Risk
LTMO	Low Toxic Mineral Oil-Based
MCLG	Maximum Contaminant Level Goal
MFF	Myanmar Fisheries Federation
MIC	Myanmar Investment Commission
MIPL	Myanmar Integrated Port Limited
MITT	Myanmar International Terminal Thilawa
MJ	Megajoule
MMO	Marine Mammal Observer
MNREC	Ministry of Natural Recourses and Environmental Conservation
MOECAF	Ministry of Environmental Conservation and Forestry
MOEE	Ministry of Electricity and Energy
MOGE	Myanmar Oil and Gas Enterprise
MONREC	Ministry of Natural Resources and Environmental Conservation
MPA	Myanmar Port Authority
MPEP	Myanmar Petroleum Exploration and Production
MPN	Most Probable Number
MSDS	Material Safety Data Sheet
N_2O	Nitrous Oxide
NAF	Non-Aqueous Fluid
NCEA	National Certificate of Educational Achievement

NE	Not Evaluated
NEQEG	National Environmental Quality Emission Guideline
NGOs	Non-governmental Organisations
NO_x	Nitrogen-oxides
NT	Near Threatened
OBM	Oil-Based Mud
OGP	Oil & Gas Producers
OHS	Occupational Health and Safety
OSH	Safety and Health
PAM	Passive Acoustic Monitoring
PAPs	Project Affected Persons
PC	Project Contribution
PEC	Predicted Environmental Concentration
PF	Protected Forest
PFE	Permanent Forest Estate
PM	Particulate Matter
PPE	Personal Protective Equipment
PPF	Protected Public Forest
PPR	Project Proposal Report
PSC	Production Sharing Contract
PVEP	Petrovietnam Exploration Production
QRA	Quantitative Risk Analysis
RF	Reserved Forest
SA	Social Accountability
SAGD	Steam-Assisted Gravity Drainage
SCO	Synthetic Crude Oil
SEM	Sustainable Environment Myanmar
SOPEP	Shipboard Oil Pollution Emergency Plan
SPL	Sound Pressure Level
TBC	The Biodiversity Consultancy
TDS	Total Dissolved Solids

TENORM	Technologically Enhanced Naturally Occurring Radioactive Materials
ToR	Term of Reference
TPH	Total Petroleum Hydrocarbons
TSD	Total Dissolved Solids
TSP	Total Suspended Particulates
UNEP	United Nations Environment Program
UNFCC	United Nations Framework Convention on Climate Change
VOC	Volatile Organic Compound
WBM	Water-Based Mud
WCS	Wildlife Conservation Society
WHO	World Health Organization
WRI	World Resources Institute
WRUD	Water Resources Utilization Department
WTW	Well-to-wheels

၁ အကျဉ်းချုပ် အစီရင်ခံစာ

၁.၁ နိဒါန်း

၁.၁.၁ စီမံကိန်းအကျဉ်း

Eni Myanmar B.V. (Eni) သည် ၂၀၁၄ ဇူလိုင်လ ၃၀ ရက်နေ့တွင် ကုန်းပေါ် လုပ်ကွက်အမှတ် RSF-5 ကို လုပ်ကိုင်ခွင့်ရရှိခဲ့ပြီး ၂၀၁၄ ဇူလိုင်လ ၃၀ ရက်နေ့တွင် ထုတ်လုပ်မှုအပေါ် ခွဲဝေခံစားရေးစာချုပ် (PSC) ကို မြန်မာ့ရေနံနှင့်သဘာဝ ဓာတ်ငွေ့လုပ်ငန်း (MOGE) နှင့် လက်မှတ်ရေးထိုးခဲ့ကြပါသည်။ Eni Myanmar သည် ၉၀% W.I. ဖြင့် လုပ်ကွက်၏ လုပ်ငန်းဆောင်ရွက်သူဖြစ်ကာ၊ Myanmar Petroleum Exploration & Production Co., Ltd. သည် ၁၀% W.I. ဖြင့် အကျိုးတူလုပ်ငန်း (JV) မိတ်ဖက်အဖွဲ့ဖြစ်ပါသည်။

Eni သည် ၂၀၁၇-၂၀၁၈ တို့တွင် ဤလုပ်ကွက်၌ မြေပေါ်ဆိုက်စမစ်တိုင်းတာမှုကို ဆောင်ရွက်ခဲ့ပါသည်။ ၎င်းတိုင်းတာမှု အတွက် ပတ်ဝန်းကျင်၊ လူမှု နှင့် ကျန်းမာရေး ထိခိုက်မှု ဆန်းစစ်ခြင်း (ESHIA) အစီရင်ခံစာ[1] ကို ပြုစုရေးသားခဲ့ပြီး၊ ၎င်းအစီ ရင်ခံ စာကို သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန (MONREC) ၏ ပတ်ဝန်းကျင်ထိန်း သိမ်း ရေး ဦးစီးဌာန (ECD) က အတည်ပြုခဲ့ပါသည်။ Eni သည် ယခုအခါ လုပ်ကွက်အမှတ် RSF-5 တွင် ရှာဖွေတူး ဖော်မှု (“စီမံကိန်း”) ကို ဆောင်ရွက်ရန် စီစဉ်လျက်ရှိပြီး၊ ၂၀၁၉ နိဝင်ဘာလတွင် စတင်ရန် မျှော်မှန်းထားပါသည်။ ၎င်းနှင့်သက်ဆိုင်သော ပြင်ဆင်တည်ဆောက်ရေးစတင်ဆောင်ရွက်မှုသည် လိုအပ် သော ခွင့်ပြုချက်များထုတ်ပြန်ပေး မှုအပေါ် မူတည်ပါသည်။ လုပ်ကွက်အမှတ် RSF-5 သည် မြန်မာနိုင်ငံ အလယ်ပိုင်း တောင်ဘက် မကွေးတိုင်း ဒေသ ကြီး အတွင်း တည်ရှိပြီး၊ နယ်မြေဧရိယာ ၁၂၉၂ စတုရန်းကီလိုမီတာကျယ်ဝန်းပါသည်။

Eni သည် လုပ်ကွက်အမှတ် RSF-5 တွင် ONDWE DEEP-1 နှင့် ONDWE DEEP-2 ဟူ၍ အမည်အကြမ်းပေးထား သည့် ရှာဖွေရေးတွင်း (၂) ကို တူးသွားရန် အဆိုပြုပြီး၊ ၎င်းမှာ တွင်း တစ်တွင်းချင်းအတွက် ကျောက်ဖွဲ့စည်းမှု အချက်အလက်များမှတ်တမ်းယူခြင်း နှင့် ပိတ်သိမ်းခြင်းတို့ အပါအဝင် တူးဖော်ရန် ရက်ပေါင်း ၈၀ ခန့်ကြာမြင့်မည် ဖြစ်ပါသည် (ထို့ပြင်၊ နောက် စုစည်းတပ်ဆင်မှု နှင့် ပိတ်သိမ်းမှုတို့အတွက် နောက်ထပ် ရက်ပေါင်း ၂၀ ခန့် ကြာမြင့် မည်ဖြစ်ပါသည်)။ ရေနံတွင်းစမ်းသပ်တူးဖော်ခြင်းလုပ်ငန်းများ (ရက်ပေါင်း ၂၀ ခန့်) သည် ရေနံ သို့မဟုတ် သဘာဝ ဓာတ်ငွေ့သိုက်တို့သည် စီးပွားရေးအရတွက်ခြေကိုက်နိုင်သော ပမာဏရှိမရှိကို စစ်ဆေးရန် တူးဖော်သည့် ရှာဖွေ တူးဖော်မှုပြီးနောက် ဆောင်ရွက်နိုင်ပါသည်။ ဤအဆင့်၌၊ စီးပွားဖြစ်ဟိုက်ဒရိုကာဗွန်များထုတ်လုပ်ရန် Eni အနေဖြင့် အာမမခံနိုင်ပါ။

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံ၏ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ ပုဒ်မ ၇ နှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနည်း ဥပဒေ ပုဒ်မ ၅၂ နှင့် ၅၃ တို့အရ၊ Eni သည် အဆိုပြုတူးဖော်ရေးလုပ်ငန်းများအတွက် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဆိုင် ရာ လိုက်နာဆောင်ရွက်မှု သက်သေခံလက်မှတ် (ECC) ရရှိရန် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) ကို ဆောင် ရွက်ဖို့ လိုအပ်ပါသည်။

ယခု ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) အစီရင်ခံစာမှာ မြန်မာနိုင်ငံ၏ အမျိုးသား ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်း စစ်ခြင်း ဆိုင်ရာ လုပ်ထုံးလုပ်နည်း အရ စီမံကိန်းအဆိုပြုလွှာ နှင့် နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်းအစီရင်ခံစာ တို့ပြီးနောက်၊ သယံဇာတ နှင့် သဘာဝပတ်ဝန်းကျင် ထိန်းသိမ်းရေး ဝန်ကြီးဌာန (MONREC) ထံသို့ တင်သွင်းသည့် တတိယတင်သွင်းမှု ဖြစ်ပါသည်။ စီမံကိန်းအဆိုပြုလွှာ အစီရင်ခံစာကိုတင်သွင်းခဲ့ပြီး၊ ၂၀၁၉ ဇန်နဝါရီလ ၁၇ ရက်နေ့ တွင် အတည်ပြုခဲ့ပါသည်။ နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်း အစီရင်ခံစာကို ၂၀၁၉ ဖေဖြေလ ၁ ရက်တွင် တင်သွင်း ခဲ့ပြီး၊ ၂၀၁၉ မေလ ၁၃ ရက်တွင် အတည်ပြုပေးခဲ့ပါသည်။

[1] “ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA)” နှင့် “ပတ်ဝန်းကျင်၊ လူမှု နှင့် ကျန်းမာရေး ထိခိုက်မှုဆန်းစစ်ခြင်း (ESHIA)” အသုံးအနှုန်းတို့ကို အချင်းချင်းဖလှယ်အသုံးပြုထားကြောင်း မှတ်သားပါ။ ၂၀၁၅ တွင် ထုတ်ပြန်ခဲ့သော မြန်မာနိုင်ငံ၏ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းတွင် “EIA” သို့မဟုတ် “ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (IEE)” တို့ကို စီမံကိန်း၏ နယ်ပယ်အတိုင်းအတာသတ်မှတ်မှုအပေါ် ဆောင်ရွက်ရန် ရည်ညွှန်းပါရှိပါသည်။ ပုံမှန်အားဖြင့် မြန်မာနိုင်ငံတွင် ဆိုက်စမစ်လုပ်သည့် စီမံကိန်းသည် IEE ဆောင်ရွက်ရန် လိုအပ်ပါသည်။ သို့ရာတွင်၊ ဆိုက်စမစ်လုပ်ငန်းများအတွက် ယခင်ဆန်းစစ်မှုများပြင်ဆင်နေသည့်ကာလတွင်၊ EIA လုပ်ထုံးလုပ်နည်းမှာ ထွက်ရှိလာခြင်း မရှိသေးသဖြင့်၊ စကားလုံးအသုံးအနှုန်းကို တရားဝင် သတ်မှတ်ထားခြင်းမျိုးမရှိပါ။ ထို့ကြောင်း “ESHIA” ဟု သုံးနှုန်းခဲ့ပါသည်။

၁.၁.၂ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) အစီရင်ခံစာ အကျဉ်း

ဤ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) အစီရင်ခံစာသည် စီမံကိန်းနှင့် ဆက်နွယ်သော ဖြစ်ပေါ်လာနိုင်သော ပတ်ဝန်းကျင် နှင့် လူမှု ထိခိုက်မှုများကို တင်ပြထားပါသည်။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း၏ ရည်ရွယ်ချက်များမှာ အောက်ပါတို့ဖြစ်ကြပါသည် -

- ပတ်ဝန်းကျင် နှင့် လူမှုဆိုင်ရာ နေရာများ နှင့် အရင်းအမြစ်များနှင့် အပြန်အလှန်ချိတ်ဆက်မိမည့် ၎င်းတို့၏ အလားအလာများအရ အဆိုပြု စီမံကိန်း လုပ်ငန်းများကို ပြန်လည်သုံးသပ်ရန်၊
- သက်ရောက်နိုင်မည် နယ်မြေဇရိယာအတွင်းရှိ အခြေခံအချက်အလက်များနှင့်ပတ်သက်၍ ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်လွယ် ပတ်ဝန်းကျင် နှင့် လူမှု ဆိုင်ရာ အစိတ်အပိုင်းများကို ဖော်ထုတ်သတ်မှတ်ရန်[1]၊
- စီမံကိန်းမှ ဖြစ်ပေါ်လာနိုင်သည့် ပတ်ဝန်းကျင် နှင့် လူမှု ဆိုင်ရာ သက်ရောက်မှုများကို ဖော်ထုတ်သတ်မှတ် အကဲဖြတ်ရန်၊
- ဖြစ်ပေါ်လာနိုင်သော ဆိုးကျိုးသက်ရောက်မှုများကို ဖယ်ရှားရန်၊ လျော့ချရန် သို့မဟုတ် ရှောင်ကြဉ်ရန် လျော့ချ ရေး သို့မဟုတ် မြှင့်တင်ရေး အစီအမံများကို အကြံပြုရန်၊
- စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးမှု အပါအဝင် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP) ကို ပြဋ္ဌာန်းပေးရန် နှင့် နောက်ထပ်ကြည့်ရှုရန်၊ နှင့်
- စီမံကိန်းနှင့်ပတ်သက်သော အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးခြင်း နှင့် ထုတ်ဖော်တင်ပြခြင်းကို အကျဉ်းချုပ်တင် ပြရန်။

၁.၂ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းလေ့လာမှုကာလအတွင်း ဆောင်ရွက်ခဲ့သည့် လုပ်ငန်းများအကျဉ်း

၁.၂.၁ စီမံကိန်းအဆိုပြုလွှာ

ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း မစတင်မီ၊ Eni Myanmar သည် စိစစ်ခြင်းအတွက် MONREC ၏ ပတ်ဝန်းကျင် ထိန်းသိမ်းရေး ဦးစီးဌာန (ECD) ထံသို့ စီမံကိန်းအဆိုပြုလွှာ (PPR) ကို တင်သွင်းရန် လိုအပ်ခဲ့ပါသည်။ ၎င်း PPR ကို Eni Myanmar က ၂၀၁၉ ဇန်နဝါရီလ ၁၇ ရက်နေ့တွင် တင်သွင်းခဲ့ပါသည်။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၏ နောက်ဆက်တွဲ (က) အရ၊ စီမံကိန်းသည် နံပါတ် (၁၃) ဖြစ်သည့် "ကုန်းတွင်းရေနံ နှင့် သဘာဝ ဓာတ်ငွေ့ စမ်းသပ်တူးယူခြင်း" ဖြစ်သဖြင့်၊ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း ကို ဆောင်ရွက်ရန် လိုအပ် ပါသည်။

၁.၂.၂ နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်းအစီရင်ခံစာ

PPR ကို စိစစ်ခြင်း နှင့် တင်သွင်းခြင်းပြီးနောက်၊ စီမံကိန်း၏ ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ၊ ထိခိုက်ခံစားရ နိုင်သူများ / ရပ်ရွာများကို နောက်ထပ် ဖော်ထုတ်သတ်မှတ်ရန် နှင့် ဖြစ်ပေါ်လာနိုင်သော လျော့ချရေး အစီအမံများကို ဖော်ထုတ်သတ်မှတ်ရန် နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်း အဆင့်ကို ပြုလုပ်ဆောင်ရွက်ခဲ့ပါသည်။ ဤလုပ်ငန်းစဉ် ကာလအတွင်း အချက်အလက်များစုဆောင်းရန် နှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအဆင့်တွင် ထည့်သွင်းစဉ်းစား မည့် သက်ဆိုင်သူများ၏ အမြင်များ နှင့် စိုးရိမ်မှုများကို ဖော်ပြနိုင်ရန် သက်ဆိုင်သူများနှင့် ထိတွေ့တိုင်ပင်ဆွေးနွေး ခြင်း ကို ဆောင်ရွက်ခဲ့ပါသည်။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းအရ လိုအပ်သည့် ပတ် ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းအဆင့်၏ အစိတ်အပိုင်းတစ်ရပ်အဖြစ် လိုအပ်သော နယ်ပယ် နှင့် လေ့လာချက်များကို ရေးဆွဲထားသည့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာအတွက် လုပ်ငန်းတာဝန်များပါဝင်သည့် နယ်ပယ် အတိုင်းအတာသတ်မှတ်ခြင်း အစီရင် ခံစာ နှင့် လုပ်ငန်းတာဝန်များကို MOGE နှင့်

[1] သက်ရောက်နိုင်မည့်နယ်မြေဇရိယာသည် စီမံကိန်းမှ (တိုက်ရိုက် သို့မဟုတ် သွယ်ဝိုက်၍) ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ ဖြစ်ပေါ်နိုင်သည့် နယ်မြေဇရိယာဖြစ်ပါသည်။ သက်ရောက်နိုင်မည့်နယ်မြေဇရိယာကို ဤပတ်ဝန်းကျင်ထိခိုက်မှုအစီရင်ခံစာ၏ အခန်း (၅) တွင် သဘာဝ မြေမျက်နှာသွင်ပြင်၊ ဇီဝ နှင့် လူမှု-စီးပွား ပတ်ဝန်းကျင်တို့အရ ထပ်၍ အဓိပ္ပါယ်ဖွင့်ပြထားပါသည်။

MONREC တို့ထံသို့ တင်သွင်းခဲ့ပါသည်။ နယ်ပယ်အတိုင်းအတာ သတ် မှတ်ခြင်း အစီရင်ခံစာကို ၂၀၁၉ ဇူလိုင် ၁ ရက်နေ့တွင် တင်သွင်းခဲ့ပါသည်။

၁.၂.၃ ပတ်ဝန်းကျင် နှင့် လူမှုအခြေအနေများ တည်ဆောက်ရန် မူလ နှင့် တစ်ဆင့်ခံ အချက်အလက်များ ကောက်ယူစုဆောင်းခြင်း

လေ့လာမှုနယ်မြေဧရိယာ၌ ရှိနေသော ပတ်ဝန်းကျင်နှင့် လူမှု အခြေအနေများကို နားလည်သဘောပေါက်မှု တိုးတက်စေရန်၊ ရှေးကပင်ရှိနေသော သက်ဆိုင်ရာအချက် အလက်များ တွက်ချက်ပြုစုလေ့လာမှုများကို ဆောင်ရွက်ခဲ့ပါသည်။ နောက်ထပ်အသေးစိတ်အချက်အလက်များကို ဤအကျဉ်းချုပ် အစီရင်ခံစာ၏ ***အခန်း ၁.၅*** နှင့် ပတ်ဝန်းကျင် ထိခိုက်မှု ဆန်းစစ်ခြင်းအစီရင်ခံစာ၏ ***အခန်း ၅*** တို့တွင် ဖော်ပြထားပါသည်။

ERM၏ အနီးကပ် အထူးကြီးကြပ်မှုနှင့် လမ်းညွှန်မှုများဖြင့် SEM မှ အချက်လက်များတိုင်းတာခြင်း၊ ရူပပတ်ဝန်းကျင်ဆိုင်ရာ၊ သက်ရှိဇီဝဆိုင်ရာ၊ လူမှု-စီးပွားရေးဆိုင်ရာ နှင့် ကျန်းမာရေးဆိုင်ရာ အချက်အလက်များ ပါဝင်သော အခြေခံအချက်လက်များကောက်ယူခြင်း နှင့် စောင့်ကြည့်လေ့လာရေး အစီအစဉ်များအား ဆောင်ရွက်ခဲ့ပါသည်။

၂.၂.၃.၁ ပတ်ဝန်းကျင်ဆိုင်ရာ အရင်းအမြစ်များ

လေထုအရည်အသွေးနှင့် ဖန်လုံအိမ် ဓာတ်ငွေ့, ထုတ်လွှတ်မှုများ

လေထုအရည်အသွေး အတိုင်းအတာများအား စောင့်ကြည့်လေ့လာခြင်း (nitrogen dioxide, carbon monoxide, particulate matter 10, particulate matter 2.5, sulphur dioxide, temperature, relative humidity, wind speed, wind direction)အား SEM မှ ၂၀၁၉ မတ်လ ၂၁မှ ဇူလိုင် ၇ အတွင်း စောင့်ကြည့်လေ့လာရေးနေရာ တစ်နေရာတွင် ၇၂နာရီဆက်တိုက်ဖြင့် စုစုပေါင်းနေရာ ၅နေရာတွင် တိုင်းတာခဲ့ပါသည်။ လေထု အရည်အသွေး စောင့်ကြည့်လေ့လာခြင်းအား အလိုအလျောက်တိုင်းတာနိုင်သော Haz-Scanner Wireless Environmental Perimeter Air Station (EPAS) ဖြင့် ၇၂နာရီအကြာ ဆက်တိုက် တိုင်းတာခဲ့ပါသည်။ ထို့အပြင်၊ အိုဇုံး ပါဝင်မှုအား ozone meter Aeroqual 500 series စက်ဖြင့် တိုင်းတာခဲ့ပါသည်။

စောင့်ကြည့်လေ့လာရေး နေရာများအား စီမံကိန်း၏ လုပ်ဆောင်မှုကြောင့် အနီးအနား ပတ်ဝန်းကျင်ရှိ ထိခိုက်ခြင်းခံရနိုင်ခြေရှိသော သက်ရှိများ၏ နောက်ခံအခြေနေအမျိုးမျိုးပေါ် မူတည်၍ ရွေးချယ်ခဲ့ပါသည်။ ဥပမာအားဖြင့် လေထုအရည်အသွေး စောင့်ကြည့်လေ့လာရေးနေရာများအား စီမံကိန်း လုပ်ဆောင်ချက်များကြောင့် ဖြစ်နိုင်ခြေရှိသော ထိခိုက်လွယ်သော သက်ရှိများရှိရာနေရာများကို ရွေးချယ်ခဲ့ပါသည်။

ဆူညံသံ

ဆူညံသံ အခြေခံအချက်အလက်များအား စောင့်ကြည့်လေ့လာရေးအား SEMမှ နေရာတစ်နေရာတွင် ၄၈နာရီကြာ ဖြင့် စုစုပေါင်း နေရာ ငါးနေရာတွင် ၂၀၁၉ မတ်လ ၂၂ မှ ဇူလိုင် ၇ရက်အတွင်း ကောက်ယူခဲ့ပါသည်။ ဆူညံသံ အတိုင်းတာမှုများကို ISO 1996-1:2003 နှင့် ISO 1996:2:2007 တို့ပါဝင်သော International Organization for Standardization (ISO)၏ သက်ဆိုင်သော နည်းလမ်းများဖြင့် ကောက်ယူခဲ့ပါသည်။ Model SL-4023SD sound level meter ကို အသုံးပြုပြီး တိုင်းတာခြင်းများကို လုပ်ဆောင်ခဲ့ပါသည်။

မြေပေါ်ရေ

မြေပေါ်ရေ အရည်အသွေး အခြေခံအချက်အလက်များအား စုစုပေါင်း ၇နေရာတွင် ERM၏ ကြီးကြပ်မှုဖြင့် SEMမှ ၂၀၁၉ မတ်လ ၂၀နှင့် ၂၁ရက်နေ့ အတွင်း ကောက်ယူခဲ့ပါသည်။ ရေနမူနာကောက်ယူသော နေရာများအား ရွေးချယ်ရာတွင် စီမံကိန်းကြောင့် ထိခိုက်မှုဖြစ်နိုင်သော မြေပေါ်ရေ အရင်းအမြစ်နေရာများကို ရွေးချယ်ခဲ့ပါသည်။

နမူနာကောက်ယူသော နေရာများတွင် စီမံကိန်းမစမှီ လက်ရှိ အခြေခံအချက်အလက်များအား သိရှိနိုင်ရန် ကောက်ယူခဲ့ခြင်းဖြစ်သည်။ ဥပမာအားဖြင့် မြေပေါ်ရေ စောင့်ကြည့်လေ့လာရေးနေရာများအား စီမံကိန်း လုပ်ဆောင်ချက်များကြောင့် ဖြစ်နိုင်ခြေရှိသော ထိခိုက်မှုများရှိနိုင်သည့် နေရာများတွင် လုပ်ဆောင်ခဲ့ပါသည်။

မြေဆီလွှာ

မြေဆီလွှာ နမူနာများအား လေ့လာမှုနေရာအတွင်း နေရာ၈နေရာတွင် (အပေါ်ယံလွှာနှင့် အောက်ခံလွှာ မြေနမူနာများအား တစ်နေရာတွင် မြေနမူနာ နှစ်ခုစီဖြင့်) ၂၀၁၉ မတ်လ ၂၃ရက်နှင့် မတ်လ ၂၄ရက်တို့တွင် သက်ဆိုင်သော chemical အတိုင်းအတာများအား စစ်ဆေးခဲ့ပါသည်။

မြေဆီလွှာ နမူနာများအား လက်လှည့် အော်ဂါ ကိရိယာဖြင့် ကောက်ယူခဲ့ပြီး၊ မြေနမူနာများမှာ အပေါ်ယံမြေလွှာ (၃၀ စင်တီမီတာ - ၅၀ စင်တီမီတာ အနက်) နှင့် အောက်ခံမြေသား (၆၀စင်တီမီတာ - ၈၀စင်တီမီတာ အနက်)မှ ကောက်ယူခဲ့ပါသည်။

နမူနာကောက်ယူခဲ့သည့် နေရာများတွင် စီမံကိန်းမစမှီ လက်ရှိ အခြေခံအချက်အလက် အခြေအနေများအား သိရှိရန် ကောက်ယူခဲ့ခြင်းဖြစ်သည်။ ဥပမာအားဖြင့် မြေဆီလွှာ စောင့်ကြည့်လေ့လာရေးနေရာများအား စီမံကိန်း လုပ်ဆောင်ချက်များကြောင့် ဖြစ်နိုင်ခြေရှိသော ထိခိုက်မှုများရှိနိုင်သည့် နေရာများတွင် လုပ်ဆောင်ခဲ့ပါသည်။

မြေအောက်ရေ

လေ့လာမှုနေရာအတွင်း မြေအောက်ရေ အရည်အသွေး အခြေခံအချက်အလက်များ ကောက်ယူခြင်းကို EIAလေ့လာမှု အစီရင်အဝိုင်းတခုအနေဖြင့် လုပ်ဆောင်ခဲ့ပါသည်။ စုစုပေါင်း မြေအောက်ရေ နမူနာ ၆ခုအား လေ့လာမှုနေရာ အတွင်းတွင် ERMမှ ကြီးကြပ်မှုဖြင့် ၂၀၁၉ မတ်လ ၂၁ရက်နှင့် ၂၂ရက်နေ့တွင် SEMမှ ကောက်ယူခဲ့ပါသည်။

မြေအောက်ရေ နမူနာများအား ရေအရည်အသွေး အတိုင်းအတာများစွာအတွက် water checkerဖြင့် အချို့သော ရေတွင်းများမှ ကောက်ယူခဲ့ပြီး ပိုးသတ်ထားသော ပလတ်စတစ်နှင့် ဖန်ဖြင့် ပြုလုပ်ထားသော နမူနာသိမ်းဆည်းသည့်ဘူးများဖြင့် သိမ်းဆည်းကောက်ယူခဲ့ပါသည်။

၂.၂.၃ သက်ရှိဇီဝဆိုင်ရာ အရင်းအမြစ်များ

အပင်များ

A Global Positioning System (GPS) အား အသုံးပြုပြီး နမူနာကောက်ယူမည့် အကွက်များအား လမ်းညွှန်ပြီး coordinatesများအား အမှတ်အသားပြုပါသည်။ Plotless နှင့် transect နမူနာကောက်ယူမှုများအား ကျွမ်းကျင်သော ဒေသခံများ၏အကူအညီဖြင့် စီမံကိန်းလေ့လာမှုဇရိယာအတွင်း အပင်မျိုးစိတ်များအား ဆန်းစစ်မှုများပြုလုပ်ရန် ဆောင်ရွက်ခဲ့ပါသည်။ Plotless နမူနာကောက်ယူမှုနည်းစနစ်အား ကောက်ယူမှုပြုလုပ်မည့် နေရာအတွင်း ရွေးချယ်ထားသော အလျဉ်းသင့်သောနေရာများတွင် အသုံးပြုခဲ့ပြီး၊ transect နမူနာကောက်ယူမှုအတွက် တိကျသော နမူနာကောက်ယူမည့်နေရာများအား ဆုံးဖြတ်နိုင်ရန်အတွက် နမူနာကောက်ယူမည့် နေရာတခုလုံးတွင် ခြုံငုံကောက်ယူခဲ့ပါသည်။

ငှက်များ

Transect နှင့် opportunistic နည်းစနစ်များဖြင့် မျိုးစိတ်များ ကြွယ်ဝမှုအား စစ်တမ်းကောက်ယူခဲ့ပြီး၊ point counting ဖြင့် ငှက်မျိုးစိတ်များပေါများမှုပမာဏအား တိုင်းတာကောက်ယူခဲ့ပါသည်။

နို့တိုက်သတ္တဝါများ

လေ့လာသည့် နေရာအတွင်းနှင့် ဘေးပတ်ဝန်းကျင်တွင် နို့တိုက်သတ္တဝါမျိုးစိတ်အား နည်းလမ်းသုံးမျိုးဖြင့် လေ့လာခဲ့ပါသည်။

(၁) တိုက်ရိုက်လေ့လာခြင်း

(၂) တည်ရှိမှုအား အခြား လက္ခဏာများဖြင့် သတ်မှတ်ခြင်း (ဥပမာ။ ခြေရာများ၊ စားကျက်နေရာ လက္ခဏာများ)နှင့်

(၃) ဒေသခံများအား မေးမြန်းခြင်း

Point countနှင့် transect countနည်းလမ်းများအား နေ့အချိန်တွင် ဆောင်ရွက်ခဲ့ပြီး၊ တိုက်ရိုက်လေ့လာခြင်းအား သစ်ပင်နေ (သစ်ခေါင်းအောင်း) မျိုးစိတ်များအတွက် ဆောင်ရွက်ခဲ့ပါသည်။

ငါးမျိုးစိတ်များ

ငါးဖမ်းခြင်း လုပ်ငန်းဆိုင်ရာများဖြစ်သော အသုံးပြုသည့် ငါးဖမ်းကိရိယာ (ထောင်ချောက်၊ ချိတ်၊ လိုင်း၊ ပိုက်ကွန်)၊ တစ်နေ့ ငါးဖမ်းအကြိမ်အရေအတွက်နှင့် အဓိကထားဖမ်းသော ငါးမျိုးစိတ်တို့အား သိရှိနိုင်ရန် ဒေသခံ ငါးဖမ်းသမားများနှင့် တွေ့ဆုံမေးမြန်းခြင်းများ ပြုလုပ်ခဲ့ပါသည်။ မျိုးစုံသော ငါးမျိုးစိတ်များကို ဖမ်းယူပြီး ငါးမျိုးစိတ်နမူနာများအား ကောက်ယူခဲ့ပါသည်။

တွားသွားသတ္တဝါများ

တွားသွားသတ္တဝါများ လေ့လာကောက်ယူမှုအား တိုက်ရိုက်လေ့လာခြင်း point countနည်းလမ်းဖြင့် နေငြိးအချိန်တွင်ကောက်ယူခဲ့ပြီး၊ ၎င်းများအား လေ့လာကောက်ယူခဲ့သကဲ့သို့ အဓိကကျသော နေရင်းဒေသများအတွင်း အထူးရှာဖွေခြင်းနှင့် ဖြစ်နိုင်ခြေရှိသော ပုန်းခိုနေရာများ (ဥပမာ။ သစ်ရွက်များကြား၊ သစ်ခေါင်းပေါက်များကြား၊ ကျောက်တုံးနှင့် သစ်တုံးများ အောက်တွင်)တွင်ပါ ရှာဖွေ ကောက်ယူခဲ့ပါသည်။ ထိန်းသိမ်းစောင့်ရှောက်ရေး ရှုထောင့်အရ ဖမ်းဆီ နမူနာကောက်ယူခြင်းအား မပြုလုပ်ခဲ့ပဲ၊ မှတ်တမ်း ဓါတ်ပုံများရိုက်ကူးကာ ဒေသခံများဖြင့် အတည်ပြုချက်ယူရခြင်းကိုသာ ဆောင်ရွက်ခဲ့ပါသည်။ ထို့အပြင်၊ စက္ကူအာရုံဖြင့် လေ့လာမှတ်တမ်းတင်ခြင်းအ ပြင်ပရှုပဝံသဏ္ဌာန် ဂိသေသလက္ခဏာများ ဆန်းစစ်ရန် မှတ်တမ်းတင်ထားပါသည်။

၂.၂.၃.၂ လူမှုဘဝနှင့် ကျန်းမာရေးဆိုင်ရာ အရင်းအမြစ်များ

ယခုအခန်းတွင် တင်ပြထားသည့် အချက်အလက်များအား အများပြည်သူသိရှိနိုင်ရန် သတင်းထုတ်ပြန်ထားသည့် အရင်းအမြစ်များမှ ကနဦး သတင်းအချက်အလက်များရယူခဲ့ပါသည်။ ထို့အပြင်၊ စီမံကိန်းအတွင်းရှိ လူမှုဘဝ၊ လူမှု-စီးပွားရေး၊ ကျန်းမာရေးနှင့် ယဉ်ကျေးမှုအမွေအနှစ်ဆိုင်ရာ အခြေအနေများကို သိရှိ နားလည်စေရန် ၂၀၁၉ မတ်လ ၁၉ရက်နှင့် မတ်လ ၂၃ရက်အတွင်းပြုလုပ်ခဲ့သော အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးပွဲများအပြီးတွင် အဓိက အချက်အလက် ကောက်ယူခြင်းကိုပြုလုပ်ခဲ့ပါသည်။ အဓိကအချက်အလက်များ ကောက်ယူခဲ့ရာတွင် အိမ်ခြေများအား စစ်တမ်းကောင်ယူခြင်း၊ အဓိကကျသော လူထုအဖွဲ့များနှင့် မျက်နှာဆံစုံညီ ဆွေးနွေးမေးမြန်းမှုများနှင့် ဆွေးနွေးမှုများအား သတ်မှတ်ထားသော မေးခွန်းမေးသူများနှင့် ပြုလုပ်ခဲ့ပါသည်။ အဓိကကျသော ပါဂင်ပတ်သတ်သူများအဖွဲ့တွင် ရွာခေါင်းဆောင်၊ အမျိုးသမီးများ၊ ရေလုပ်သားများ၊ သူနာပြု/ကျန်းမာရေး ဝန်ထမ်း/ ဆေးမှူးများနှင့် ဒေသခံလယ်သမားများပါဂင်ပါသည်။ အိမ်ခြေစုစုပေါင်း၁၅၀အား မေးခွန်းများမေးခြင်း၊ အဓိကကျသော အဖွဲ့၁၃ခုနှင့် ဆွေးနွေးပွဲများပြုလုပ်ခြင်း နှင့် အဓိကသတင်းပေးမေးမြန်းမှုများအား မကွေး၊ မင်းလှနှင့် မင်းဘူးမြို့နယ်တို့တွင် ပြုလုပ်ခဲ့ပါသည်။

၁.၂.၄ အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးခြင်း နှင့် ဖော်ထုတ်တင်ပြခြင်း

မြန်မာနိုင်ငံ၏ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းပါ သတ်မှတ်ချက်များနှင့်အညီ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းလေ့လာချက်၏ အစိတ်အပိုင်းအဖြစ်၊ ဖော်ထုတ်သတ်မှတ်ထားသည့် အမျိုးမျိုးသော သက်ဆိုင်သူအုပ်စုများဘို့ဖြင့် အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးမှု နှင့် ဖော်ထုတ်တင်ပြမှုကို ဆောင်ရွက်ခဲ့ပါသည်။ ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်ခံစားရနိုင်သည့် ရပ်ရွာများနှင့်ပတ်သက်၍ နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်း အဆင့် ကာလအတွင်း ၂၀၁၉ မတ်လ နှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအဆင့်ကာလအတွင်း ၂၀၁၉ မေလတို့တွင် အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးမှုကို နှစ်ကြိမ်ဆောင်ရွက်ခဲ့ပါသည်။ တိုင်ပင်ဆွေးနွေးမှုများမှ ရလဒ်များကို ပတ်ဝန်း ကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအတွက် ထိခိုက်မှုဆန်းစစ်ခြင်း နှင့် လျော့ချရေးအစီအမံများတွင် ထည့်သွင်းရေးဆွဲရန် အသုံးပြုခဲ့ပါသည်။

ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းအရ သတ်မှတ်ထားချက်များအရ၊ ထုတ်ဖော်တင်ပြမှုလုပ်ငန်းများကို စီမံကိန်းသက်တမ်းတစ်လျှောက် အောက်ဖော်ပြပါ သီးသန့် သုံးနေရာတွင်၌ ဆောင်ရွက်သွားရန် လိုအပ်ပါသည် -

၁။ နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်း၏ အစိတ်အပိုင်းအနေဖြင့်၊ Eni သည် ဒေသသုံး မီဒီယာတွင် ကြော်ငြာမှုများဆောင်ရွက်လျက် အဆိုပြုစီမံကိန်းဆိုင်ရာ သတင်းအချက်အလက်များကို အများပြည်သူ နှင့် အရပ်ဖက်လူ့အဖွဲ့အစည်းတို့ထံသို့ ထုတ်ဖော်တင်ပြခဲ့ပါသည်။ Eni သည် စီမံကိန်းဆိုင်ရာ သတင်းအချက်အလက်များကို မီဒီယာနှစ်ခု (သတင်းစာ နှစ်စောင်) တွင် ထုတ်ဖော်တင်ပြခဲ့ပါသည်။ ကြော်ငြာ များကို The Global New Light of Myanmar (အင်္ဂလိပ်) နှင့် ကြေးမုံ (ဗမာ) သတင်းစာတို့တွင် ၂၀၁၉ ဖေဖော်ဝါရီလ ၁ ရက်နေ့တွင် ပုံနှိပ်ဖော်ပြခဲ့ပါသည်။ Eni သည် Eni ဝက်ဘ်ဆိုက်တွင်လည်း စီမံကိန်းဆိုင်ရာ အချက်အလက်များကို ထုတ်ပြန်ကြေညာခဲ့ပါသည်။

၂။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းလေ့လာမှု၏ အစိတ်အပိုင်းအဖြစ်၊ Eni သည် အဆိုပြု စီမံကိန်း ဆိုင် ရာ သက်ဆိုင်ရာအချက်အလက်များ နှင့် ၎င်း၏ ဖြစ်ပေါ်လာနိုင်သော ဆိုးကျိုးသက်ရောက်မှုများ အားလုံးကို ၂၀၁၉ မေလ ၂၀ ရက်တွင် ဒေသ နှင့် အမျိုးသား မီဒီယာမှ အများပြည်သူ နှင့် အရပ်ဖက်လူ့အဖွဲ့အစည်း ထံသို့ ထုတ်ပြန်ကြေညာခဲ့ပါသည်။

၃။ စီမံကိန်းအဆိုပြုသူသည် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာကို ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီး ဌာနသို့ တင်သွင်းပြီးနောက် ၁၅ ရက်ထက် နောက်မကျစေဘဲ၊ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံ စာကို လူမှုအဖွဲ့အစည်း၊ စီမံကိန်း ကြောင့် ထိခိုက်ခံစားရသူများ၊ ဒေသဆိုင်ရာလူ့အဖွဲ့အစည်း နှင့် အခြား အကျိုးသက်ဆိုင်သူများ သိရှိစေရန် စီမံကိန်း သို့မဟုတ် စီမံကိန်းအဆိုပြုသူ၏ ဝက်ဘ်ဆိုက်များ နှင့် သတင်း စာ စသည့် ပြည်တွင်းမီဒီယာများမှလည်း ကောင်း၊ စာကြည့်တိုက်၊ လူထုစုဝေးခန်းမ စသည့် အများပြည်သူ စုဝေးရာနေရာများတွင်လည်းကောင်း၊ စီမံကိန်း အဆိုပြုသူ၏ ရုံးများတွင်လည်းကောင်း ထုတ်ပြန်ကြေညာရ မည်။

၁.၃ မူဝါဒ၊ ဥပဒေ နှင့် အဖွဲ့အစည်းဆိုင်ရာ မူဘောင်အကျဉ်း

ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း၏ အခန်း ၃ တွင် မြန်မာနိုင်ငံရှိ သက်ဆိုင်ရာ ဥပဒေ နှင့် မူဝါဒဆိုင်ရာ အနေအ ထားများ၊ နှင့် စီမံကိန်းက လိုက်နာဆောင်ရွက်မည့် နိုင်ငံတကာစံသတ်မှတ်ချက်များနှင့် လေးစားလိုက်နာမှုကို အောင် မြင်စေမည့် ပတ်ဝန်းကျင် နှင့် လူမှုဆိုင်ရာ စံသတ်မှတ်ချက် စာရွက်စာတမ်းများကို ဖော်ပြထားပါသည်။ ဤအပိုင်းတွင် အောက်ပါတို့ကို အကျဉ်းဖော်ပြထားပါသည် -

- Eni's ၏ ကျန်းမာရေး၊ ဘေးကင်းလုံခြုံရေး နှင့် ပတ်ဝန်းကျင် (HSE) ဆိုင်ရာ မူဝါဒများ၊
- စီမံကိန်းနှင့် စပ်လျဉ်းသည့် မြန်မာနိုင်ငံရှိ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း ဥပေဒ၊ သက်ဆိုင်ရာ မြန်မာနိုင်ငံ ဥပဒေ နှင့် နိုင်ငံတကာ ကွန်ဗင်းရှင်းများ၊ စံသတ်မှတ်ချက်များ နှင့် လမ်းညွှန်ချက်များအပါအဝင် မူဝါဒ နှင့် ဥပဒေ ရေးရာ မူဘောင်၊
- ထုတ်လုပ်မှုအပေါ် ခွဲဝေခံစားရေးစာချုပ် (PSC) ၏ သတ်မှတ်ချက်များအပါအဝင် စီမံကိန်းအဆိုပြုသူ နှင့် မြန်မာ နိုင်ငံ၏ အဖွဲ့အစည်းဆိုင်ရာ မူဘောင်၊ နှင့်
- စီမံကိန်းနှင့်စပ်လျဉ်းသည့် ပတ်ဝန်းကျင် နှင့်/သို့မဟုတ် ကျန်းမာရေး ဆိုင်ရာ စံချိန်စံညွှန်းများ။

၁.၄ စီမံကိန်းအကြောင်းအရာဖော်ပြချက် နှင့် အခြားဆောင်ရွက်နိုင်သော နည်းလမ်းများ

၁.၄.၁ စီမံကိန်းတည်နေရာ

မြန်မာနိုင်ငံ ကုန်းပေါ်ဒေရိယာတွင် ရေနံလုပ်ပိုင်ခွင့် လုပ်ကွက်ပေါင်း ၂၇ ခု ပါဝင်ပါသည်။ လုပ်ကွက်အမှတ် RSF-5 သည် စတု ရန်းကီလိုမီတာ ၁၂၉၂ ရှိပြီး၊ မြန်မာနိုင်ငံ အလယ်ပိုင်း ခြောက်သွေ့ဇုန် (CDZ) တွင် တည်ရှိပါသည်။ Eni Myanmar သည် လုပ်ကွက်အမှတ် RSF-5 တွင် ရေနံတွင်း နှစ် (၂) တွင်းတူးရန် စီစဉ် ထားပါသည်။ သို့ရာတွင်၊ Ondwe မြေအောက်ဖွဲ့စည်းမှုကို လေ့လာရန်နည် အခြားအစိတ်အပိုင်းတစ်ခုခုကို ရွေးချယ်မှုအတွက် ပထမရေနံတွင်း ကို တူးဖော်ပြီးနောက်၊ အလျော့အတင်းဖြစ်စေရန် တူးဖော်နိုင်သည့် ရေနံတွင်းနေရာ သုံး (၃) နေရာကို ထည့်သွင်းစဉ်း စားထားပါသည်။ အဆိုပြုရေနံတွင်း တည်နေရာများ (SEG#1၊ SEG#3_Dev၊ SEG#6K သို့မဟုတ် စီမံကိန်း လုပ်ငန်းခွင် သို့မဟုတ် စီမံကိန်းနယ်မြေဒေရိယာ) သည် လုပ်ကွက်အမှတ် RSF-5 (ပုံ ၁.၁) အလယ်ဗဟိုပိုင်း၌ တည်ရှိပါသည်။

၁.၄.၂ စီမံကိန်း၌ ပါဝင်သည့် အစိတ်အပိုင်းများ နှင့် လုပ်ငန်းများဆိုင်ရာ အကျဉ်းဖော်ပြချက်

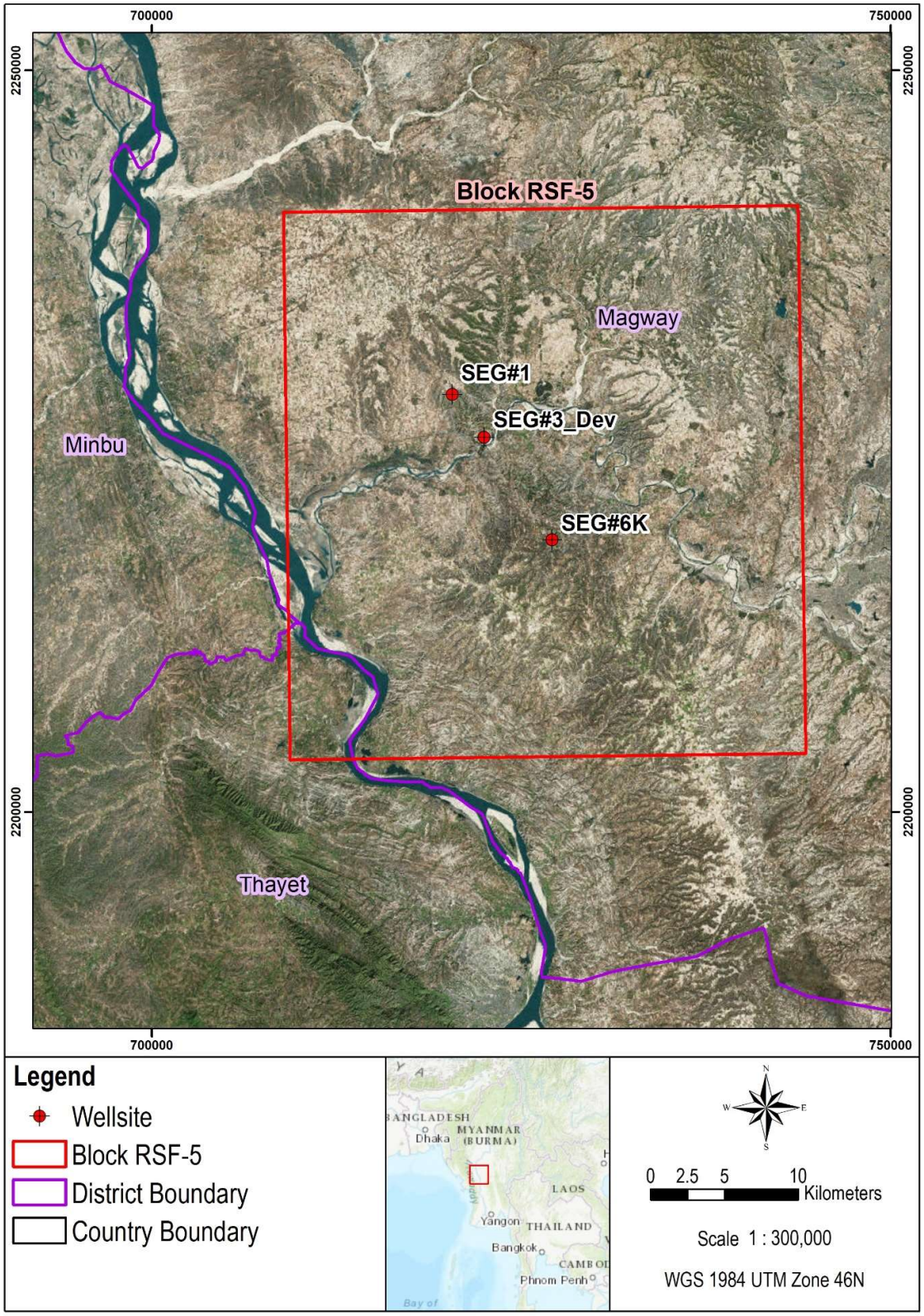
စီမံကိန်းတွင် အောက်ပါကဲ့သို့ (အသေးစိတ်ဖော်ပြချက်များကို ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း၏ ***အခန်း ၄*** တွင် တင်ပြထားပါသည်) သီးသန့်အဆင့်လေးဆင့် ပါဝင်သည် -

- **တည်ဆောက်ရေး နှင့် လုပ်ငန်းခွင်ပြင်ဆင်ရေး -** တူးဖော်လည်ပတ်ဆောင်ရွက်မှုမစတင်မီ၊ လမ်းချိတ်ဆက်မှု တည်ဆောက်ခြင်း/အဆင့်မြှင့်ခြင်း၊ ရေနံတွင်းအခုတည်ဆောက်ခြင်း၊ ရှိနေသောမြေကို အဆင့်မြှင့်ခြင်း၊ နှင့် ထောက်ပံ့ပို့ဆောင်ရေးစခန်း တည်ဆောက်ရေးတို့အပါအဝင် လုပ်ငန်းခွင်ပြင်ဆင်မှု လုပ်ငန်းများ ပါဝင်မည်။

- **တူးဖော်ရေးဆိုင်ရာ လည်ပတ်ဆောင်ရွက်မှုများ -** လုပ်ငန်းခွင်ပြင်ဆင်မှုလုပ်ငန်းများ ပြီးမြောက်ပြီးသည်နှင့် တစ်ပြိုင်နက်၊ တူးဖော်ရေးသုံးစင် နှင့် ၎င်းနှင့်ဆက်စပ်ကိရိယာတို့ကို လုပ်ငန်းခွင်သို့ သယ်ယူပို့ဆောင်မည်ဖြစ်ပြီး၊ ရေနံတွင်းအမာခံနေရာတွင် တင်ဆင်သွားမည် ဖြစ်ပါသည်။ ထို့နောက် ရေနံတွင်း တူးခြင်းကို စတင်ပါမည်။ တူးဖော်မှုလုပ်ငန်းစဉ်တွင် ယေဘုယျအားဖြင့် အဆင့်သုံးဆင့်ရှိပြီး၊ ***ပုံ ၁.၂*** တွင် ပုံဖြင့်ဖော်ပြထားကာ၊ အောက်ပါကဲ့သို့လည်း ဖော်ပြနိုင်ပါသည် -
  - တူးဖော်မှုအတွက် ပိုက် အကြိုတပ်ဆင်မှု - ဤအပိုင်းတွင် ပိုက်ကို တုန်ခါမှုသုံးစက်ဖြင့် မြေအောက်သို့ထိုးသွင်းပြီး၊ ၎င်းကို တူးဖော်မှုတွင် ကျန်ရှိသည့်အဆင့်များအတွက် လမ်းညွှန်အဖြစ် အသုံးပြုပါသည်။
  - ရေနံတွင်းအပေါ်လွှာအပိုင်းများတူးဖော်မှု - ဤသည်မှာ ရေနံတွင်း အပေါ်လွှာပိုင်းများတူးဖော်မှုကို ရည်ညွှန် းပါသည်။ ၎င်းအပိုင်းကို တူးဖော်သည်နှင့် အဖုံးအကာများကို ရေနံတွင်းခေါင်းတွင် နေရာတကျ အင်္ကတေ ကိုင်ရပါသည်။
  - ရေနံတွင်းအောက်လွှာအပိုင်းများတူးဖော်မှု - ရေနံတွင်းအောက်လွှာအပိုင်းများကို TD 3,800 m TVD GL သို့ 12 ¼″ နှင့် 8 ½″ အပိုင်းအထိတူးရန် ရည်မှန်းထားပါသည်။

  စီစဉ်ထားသောတူးဖော်ရှာဖွေရေး ရေနံတွင်းများနှင့်ပတ်သက်၍၊ တွင်းအပေါ်ပိုင်းများအတွက် ရေအခြေပြုရွံ့များ (WBM) နှင့် တွင်းအောက်အပိုင်းများအတွက် ရေတွင်မပျော်ဝင်နိုင်သောအရည် (NAF) တို့ကို အသုံးပြုသွားမည် ဖြစ်ပါသည်။ ရေတွင်မပျော်ဝင်နိုင်သောအရည်များမှာ ပြုလုပ်ထားသည့် တူးဖော်မှုသုံးအရည် သို့မဟုတ် အဆိပ်ဖြစ်စေမှုနည်းသည့် တွင်းထွက်ဆီ (LTMO) တစ်မျိုးမျိုး ဖြစ်ပါမည်။ မတော်တဆဖြစ်ရပ်များကြောင်း ညစ်ညမ်းမှုဖြစ်စေခြင်းအခြေအနေများတွင် NAF အရည်များသည် ဆီအခြေပြုအရည်များတွက် သဘာဝပတ်ဝန်းကျင်အပေါ် ထိခိုက်မှုနည်းပါးကြောင်း ထည့်သွင်းသတ်မှတ်ထားကြပါသည်။ ထို့ကြောင့်၊ NAF အရည်များကိုအသုံးပြုသွားမည် ဖြစ်ပါသည်။
- **ပိတ်သိမ်းခြင်း** - တူးဖော်ရှာဖွေမှုပြီးမြောက်ပြီးသည်နှင့်တစ်ပြိုင်နက်၊ တူးဖော်ရေးသုံးကိရိယာများအားလုံးကို တူးဖော်ရှာဖွေသည့်နယ်မြေဇရိယာများမှ ပြန်သိမ်းယူသွားမည် ဖြစ်ပါသည်။ ရေနံတွင်းတစ်တွင်းကို ရေနံတွင်းရလဒ်များ နှင့် စီစဉ်ထားသည့် အနာဂတ်အသုံးပြုမှုအပေါ်မူတည်၍ စမ်းသမ်းတူးဖော်မှု သို့မဟုတ် တွင်းယာယီပိတ်သိမ်းမှုအတွက် ဆိုင်းငံ့ထားနိုင်သည်။ တူးဖော်ရေးနယ်မြေဇရိယာ၌ သယ်ယူပို့ဆောင်မှု နှင့် စိုက်ပျိုးရေးလုပ်ငန်းများကို တွင်းပိတ်သိမ်းမှုပြီးနောက် ပြန်လည်၍ ပုံမှန်စတင်ဆောင်ရွက်သွားနိုင်မည် ဖြစ်ပါသည်။
- **လုပ်ငန်းခွန် ပြည်လည် ပြင်ဆင်မွမ်းမံခြင်း** - ပိတ်သိမ်းပြီးနောက်၊ ရပ်ရွာ သို့မဟုတ် အစိုးရက အခြားနည်း တောင်းဆိုမှု မရှိလျှင်၊ ရေနံတွင်းအမာခံနေရာများအတွက်အသုံးပြုခဲ့သည့် လုပ်ငန်းခွင်နေရာများကို ၎င်းတို့၏ စီမံကိန်းမလုပ်မီအခြေအနေမူလအတိုင်းပြန်လည်ပြင်ဆင်မွမ်းမံသွားမည် ဖြစ်ပါသည်။

ပုံ ၁.၁ - လုပ်ကွက်အမှတ် RSF-5 ရှိ ရှာဖွေတူးဖော်ရေးတွင်းများ



ကိုးကား - ERM, 2019

၁.၄.၃ ထောက်ပံ့ပို့ဆောင်ရေး နှင့် အလုပ်သမားများ

Eni Myanmar သည် မြန်မာနိုင်ငံ၊ မကွေးတိုင်းဒေသကြီး၊ မကွေးမြို့မှ ၁၅.၅ ကီလိုမီတာအကွာတွင် တည်ရှိမည့် ထောက်ပံ့ပို့ဆောင်ရေးစခန်းအသစ်တစ်ခုကို ပြင်ဆင်တည်ဆောက်သွားမည် ဖြစ်ပါသည်။ ထောက်ပံ့ပို့ဆောင်ရေး စခန်းသည် ကိရိယာသိုလှောင်မှု၊ ဓာတုပစ္စည်းအကာအရံ၊ အန္တရာယ်ရှိသောပစ္စည်း ဖုံးအုပ်မည့် ဇရိယာ၊ ကုန်ပစ္စည်း နေရာ၊ တည်းခိုဆောင်နေရာ နှင့် ရုံးခန်းများ ပေါင်းစပ်ပါဝင်မည် ဖြစ်ပါသည်။ ထောက်ပံ့ပို့ဆောင်ရေးစခန်းအတွက် လိုအပ်သည့် အနည်းဆုံးနယ်မြေဧရိယာမှာ မီတာ ၁၅၀ x မီတာ ၁၃၀ = စတုရန်းမီတာ ၁၉၅၀၀ ခန့် လိုအပ်မည် ဖြစ်ပါသည်။

စီမံကိန်းတွင် လုပ်ငန်းခွင်ပြင်ဆင်မှု နှင့် တည်ဆောက်ရေးအဆင့်အတွက် ပျမ်းမျှ လုပ်သားဦးရေ ၄၀ - ၆၀ ဦး ခန့် (အလုပ်များချိန်တွင် လုပ်သားဦးရေ ၁၀၀ ဦးခန့်) နှင့် တူးဖော်လည်ပတ်မှု အဆင့်အတွက် လုပ်သားဦးရေ ၁၂၀ - ၁၄၀ ဦးခန့် ပါဝင်မည် ဖြစ်ပါသည်။ လုပ်ငန်းခွင်ပြင်ဆင်မှု နှင့် တည်ဆောက်မှုကာလအတွင်း၊ ထောက်ပံ့ပို့ဆောင်ရေး စခန်းကို တည်ဆောက်သေးမည်မဟုတ်ဘဲ၊ လုပ်သားများအချို့မှာ အနီးအနားရှိ ဟိုတယ်နေရာတို့တွင် တည်းခိုရန် စီစဉ်ထား ပါသည်။ ထောက်ပံ့ပို့ဆောင်ရေစခန်း နှင့် စီမံကိန်း အတွက် တည်းခိုဆောင်များကို တည်ဆောက်ပြီးသည် နှင့် တစ်ပြိုင်နက်၊ လုပ်သားများသည် စီစဉ်ထားသည့် တည်းခို ဆောင်သို့ ရွှေ့သွားမည်ဖြစ်သည်။ ၎င်းမှာ လုပ်ငန်းခွင်ပြင်ဆင်မှု နှင့် တည်ဆောက်ရေးကာလအဆင့်အကုန်နီးခန့်တွင် ဖြစ်ပါမည်။

၁.၄.၄ ထုတ်လွှတ်မှုများ၊ စွန့်ထုတ်မှုများ နှင့် စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု

အစိုင်အခဲ နှင့် အရည်စွန့်ပစ်မှုတို့ကို စနစ်ကျသောနည်းလမ်းဖြင့် အစိုးရခွင့်ပြုပေးထားသည့် ကန်ထရိုက်တာများက စွန့်ပစ်ပစ္စည်းစက်ရုံသို့ သယ်ယူသွားမည်ဖြစ်ကာ၊ ၎င်းနေရာတွင် ဒေသပတ်ဝန်းကျင် စည်းမျဉ်းများနှင့်အညီ သန့်စင်စွန့်ထုတ်သွားမည် ဖြစ်ပါသည်။ Eni Myanmar သည် တိုင်းတာတူးဖော်ထုတ်လုပ်ရာတွင် နည်းပညာလမ်းညွှန် - စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲခြင်းလမ်းညွှန် (စာတမ်းကုဒ် - နောက်ဆက်တွဲ (၈) – AMTE-TG-010) ကို ယခု RSF-5 တူးဖော်ရှာဖွေရေးလုပ်ငန်းဆောင်ရွက်မှု၏ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအတွက် အဓိက လုပ်ထုံးလုပ်နည်းအဖြစ် အသုံး ပြုဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

တူးဖော်ရေး အရည်များ နှင့် ကျစ်စာများကို ပတ်ဝန်းကျင်ထိခိုက်မှု လျော့နည်းစေလျက် မြန်မာနိုင်ငံ ဥပဒေများနှင့်အ ညီ သင့်လျော်သလို စီမံခန့်ခွဲစွန့်ထုတ်သွားမည် ဖြစ်ပါသည်။ ရွှံ့နှင့် ကျစ်စာ စွန့်ပစ်ပစ္စည်းများကို စီမံခန့်ခွဲရာတွင် အဓိက အဆင့်များမှာ အောက်ပါတို့ဖြစ်ကြပါသည် -

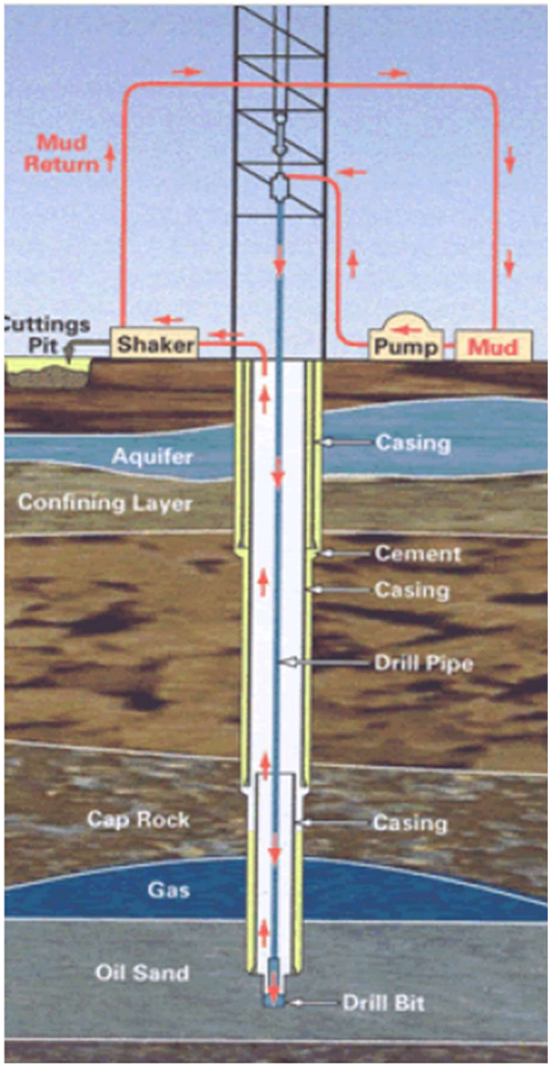
- ရေနံတွင်းရွှံ့မှ ကျစ်စာဖယ်ရှားမှု/ခွဲခြားမှုပြီးနောက်၊ ကျစ်စာများကို တူးဖော်ရေနံတွင်းအမာခံနေရာရှိ စွန့်ပစ် ပစ္စည်းများတွင် စုဆောင်းသွားမည် ဖြစ်ပါသည်၊
- ကျစ်စာများ နှင့် စွန့်ပစ်ရွှံ့များကို အစိုင်အခဲ စွန့်ပစ်ပစ္စည်း နှင့် အရည် စွန့်ပစ်ပစ္စည်းအဖြစ် ခွဲခြား၍ ကောက်ယူ စုဆောင်းကာ၊ DOWA စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲရေးစက်ရုံသို့ ထရပ်ကားများဖြင့် သယ်ယူမည် ဖြစ်ပါသည်။ ဤ လုပ်ငန်းစဉ်ကို WBM နှင့် NAF ရွှံ့စနစ်များအတွက် အောက်တွင် ပြထားသည့်အတိုင်း သီးသန့်ခွဲ၍ ဆောင်ရွက်ပါသည်။ ထို့ပြင်၊
- ကျန်ရှိသောရွှံ့ကို ပြန်လည်အသုံးပြုပြီး၊ တူးဖော်ရေးသုံးကြိုးမှတစ်ဆင့် ရေနံတွင်းသို့ ထိုးသွင်းရာ နေရာမှ ရွှံ့တိုင်ကီများသို့ သယ်ယူမည်။

၁.၄.၅ စီမံကိန်းအချိန်ဇယား

စီမံကိန်းလုပ်ငန်းဆောင်ရွက်မှုကို တာဝန်ခန့်အပ်သည့်အစီအစဉ် နှင့် လုပ်ငန်းအချိန်စာရင်းတို့အပေါ် မူတည်၍ ၂၀၁၉ နိုင်ဝင်ဘာလ - ဒီဇင်ဘာလတွင် စတင်ဆောင်ရွက်သွားရန် အကြမ်းစီစဉ်ထားပါသည်။ ပထမ ရေနံတွင်း တူးဖော်မှု၊ ရပ်စဲမှု/ပြန်လည်ပြုပြင်မှုတို့ကို ၂၀၂၀ ဖွန်အလအတွင်း ပြီးမြောက်ရန် စီစဉ်ထားပါသည်။

Ondwe Deep-1 တွင် ဟိုက်ဒရိုကာဗွန်ရှာဖွေ မတွေ့ရှိလျှင်၊ ပထမရေနံတွင်းနှင့်ပတ်သက်သော တွင်း စမ်းသပ်မှုလုပ် ငန်းများဆိုင်ရာ တိကျသော အစီအစဉ်ကို အထောက်အကူပြုရန် ရေနံတွင်းဆောင်ရွက်မှုအလွန် လေ့လာချက်များကို ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ စမ်းသပ်ရှာဖွေတူးဖော်မှုအောင်မြင်လျှင်၊ ရေနံသိုက်များထုတ်လုပ်နိုင်မှုကို ဆောင် ရွက်လျက်၊ ဒုတိယရေနံတွင်း (Ondwe Deep-2) အတွက် ဖွဲ့စည်းမှု၏ အခြားအပိုင်းကို ရှာဖွေရန် ပြင်ဆင်တူးဖော် သွားမည် ဖြစ်ပါသည်။

ပုံ ၁.၂ - မြေတစ်ဝက်မြုပ် တူးဖော်မှုပြုပုံ (နမူနာ)



ကိုးကား - Eni, 2019

၁.၅ အနီးပတ်ဝန်းကျင်အကြောင်းအရာ ဖော်ပြချက်

လုပ်ကွက်အမှတ် RSF-5 နှင့် စီမံကိန်းလေ့လာမှုနယ်မြေဧရိယာအတွင်းရှိ စီမံကိန်းလုပ်ငန်းများက သက်ရောက်နိုင်သည့် ပတ်ဝန်းကျင်၊ လူမှု နှင့် ကျန်းမာရေးဆိုင်ရာ အခြေအနေများကို ***အခန်း ၅*** တွင် ဖော်ပြထားပါသည်။

၁.၅.၁ လေ့လာခြင်းကန့်သတ်မှုများချမှတ်ခြင်း

ယခုစီမံကိန်းအတွက်၊ လေ့လာမှုနယ်မြေဧရိယာနယ်နိမိတ်သည် ယေဘုယျအားဖြင့် ရေနံတွင်းလုပ်ငန်းနေရာ၏ အချင်း၀က် ၅ ကီလိုမီတာအတွင်း ကန့်သတ်ထားပါသည်။ ဤသည်မှာ ရေနံ နှင့် သဘာဝဓာတ်ငွေ့ စမ်းသပ်ရှာဖွေတူးယူမှု စီမံကိန်းများအတွက် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းတို့အတွက် အလေ့အကျင့်ကောင်းအပေါ် အခြေပြုထားသည့် ပုံမှန်လေ့လာမှုနယ်မြေဧရိယာဖြစ်ပါသည်။

၁.၅.၂ အချက်အလက်ကောက်ယူခြင်း နှင့် ပိုင်းခြားစိတ်ဖြာခြင်းတို့နှင့်ပတ်သက်သည့် နည်းလမ်း

ယခုအစီရင်ခံစာပါ ပတ်ဝန်းကျင်၊ လူမှု နှင့် ကျန်းမာရေး အခြေခံအချက်အလက်များနှင့်ပတ်သက်သော သတင်းအချက်အလက်များကို အခြေခံအချက်အလက်စစ်တမ်း နှင့် သဘာပတ်ဝန်းကျင်ဆိုင်ရာ ရှိနေသော သတင်းအချက်အ

လက်များပြန်လည်သုံးသပ်မှုတို့ အပေါ် အဓိက အခြေခံထားပါသည်။ တစ်ဆင့်ခံအချက်အလက်များနှင့်ပတ်သက်၍၊ အောက်ပါအရင်းအမြစ်များကို အသုံးပြုခဲ့ပြီး၊ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာတစ်လျှောက် သင့်လျော် သလို ကိုးကားခဲ့ပါသည်။

- ရှိနေပြီးသော အစီရင်ခံစာများ နှင့် လေ့လာချက်များ၊
- လုပ်ကွက်အမှတ် RSF-5 ၏ ယခင် ESHIA (၂၀၁၆)[1]၊
- အစိုးရ/ အာဏာပိုင်အဖွဲ့အစည်း အချက်အလက်များ၊
- အင်တာနက်ပေါ် သုတေသနပြုလုပ်မှု၊ နှင့်
- ရုံးတွင်၌ရှိနေသော အချက်အလက်များမော်ကွန်းတိုက်များ၏ စုစည်းမှု။

စီမံကိန်းလေ့လာမှုနယ်မြေဧရိယာ၏ ရှိရင်းစွဲအခြေအနေများနှင့်ပတ်သက်၍ မူလအချက်အလက်များကို အဆိုပြု လုပ်ကွက်အမှတ် RSF-5၊ နှင့် ရေနံတွင်းတည်နေရာများအနီးတို့တွင် ၂၀၁၉ မတ်လ ၂၁ ရက်နေ့ နှင့် ဇူလိုင် ၇ ရက်နေ့ တို့အကြား ERM က ကြီးကြပ်ပြီး SEM က ဆောင်ရွက်ခဲ့သည့် အခြေခံနမူနာစစ်တမ်းများကာလအတွင်း ကောက်ယူ စုဆောင်းခဲ့ပါသည်။ အခြေခံစစ်တမ်းနည်းလမ်း နှင့် ရလဒ်တို့နှင့်ပတ်သော နောက်ထပ် အသေးစိတ် အချက်အလက်များကို ဤပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာ၏ ***အခန်း ၅*** တွင် တင်ပြထားပါသည်။

၁.၅.၃ တွေ့ရှိမှုများအကျဉ်းဖော်ပြချက်

အဓိက ပတ်ဝန်းကျင်၊ လူမှု နှင့် ကျန်းမာရေး အရင်းအမြစ်များ၏ အရေးပါသော သွင်ပြင်လက္ခဏာများအကျဉ်းကို အောက်တွင် ဖော်ပြထားပါသည်။ အနီးပတ်ဝန်းကျင်နှင့်ပတ်သက်သော အပြည့်အစုံဆွေးနွေးတင်ပြချက်ကို ***အခန်း ၅*** တွင် ဖော်ပြထားပါသည်။

- **ဥတုရာသီ နှင့် မိုးလေဝသ** - စီမံကိန်းနယ်မြေဧရိယာသည် လုပ်ကွက်အမှတ် RSF-5 တွင် တည်ရှိပြီး၊ ၎င်းမှာ မြန်မာနိုင်ငံ၏ အလယ်ပိုင်းသို့ကျရောက်ပြီး၊ အပူပိုင်းမြက်ခင်းလွင်ပြင် နှင့် အပူပိုင်း ဆဗားနား မြက်ခင်းပြင်တို့ဖြစ်ကြသည့် ဥတုရာသီဇုန်နှစ်ခုတွင် ကျရောက်ပါသည်။ ၎င်းဥတုရာသီနှစ်ခုလုံးကို မိုးခေါင်သောဇုန်အဖြစ် ပိုင်းခြားသတ်မှတ်ထားပါသည်။ မကွေးတိုင်းဒေသကြီးတွင် နေ့စဉ် အမြင့်ဆုံး နှင့် အနိမ့်ဆုံး အပူချိန်မှာ 39°C (ဇူလိုင်) နှင့် 14°C (ဇန်နဝါရီလ) တို့အကြား အသီးသီးရှိကြပါသည်။ ထို့ပြင်၊ မိုးရာသီမှာ မေလမှ စက်တင်ဘာလအကုန် အထိဖြစ်ပြီး၊ ဩဂုတ်လတွင် မိုးရေအချိန်အများဆုံး (၁၂၅ မီလီမီတာခန့်) ရှိပါသည်။

- **လေထုအရည်အသွေး** - ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့အစည်း (WHO) က ဆောင်ရွက်ခဲ့သည့် လေ့လာချက်တစ်ရပ် အရ မြန်မာနိုင်ငံသည် ပါတီကူလိတ်မက်တာ (particulate matter) မြင့်သည့်အဆင့်ရှိသည့် နိုင်ငံတစ်နိုင်ငံ အဖြစ် အဆင့်သတ်မှတ်ခဲ့ပါသည်[2]။ စီမံကိန်းလေ့လာမှုနယ်မြေဧရိယာ အနီးတစ်ဝိုက်ရှိ လေထုသို့ ထုတ် လွှတ် မှုများ၏ အဓိကရင်းမြစ်များမှာ အိမ်သုံး ထင်းမီးများ (ဥပမာ၊ ချက်ပြုတ်ခြင်း၊ အပူပေးခြင်း နှင့် အလင်း အဖြစ် သုံးခြင်း)၊ နှင့် လမ်းတွင် သယ်ယူပို့ဆောင်မှုမှ အိပ်ဇော်ထုတ်လွှတ်မင်များ နှင့် အမှိုက်များကို မီးရှို့ ခြင်းလောင် ကျွမ်းခြင်းတို့မှ ဖြစ်နိုင်ပါသည်[3]။ လေထုအရည်အသွေး စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးမှုစစ်တမ်း၏ အခြေခံအချက်အ လက်များမှ လေထုအရည်အသွေးပါရာမီတာအများစုမှာ အချို့နေရာများရှိ $PM_{2.5}$၊ PM_{10} နှင့် SO_2 တို့မှလွဲ၍ စံနှုန်းနှင့် ကိုက်ညီမှုရှိပါသည်။

[1] Eni အတွက် ဆိုက်စမစ်တိုင်းတာမှုနှင့်ပတ်သက်သော ESHIA လေ့လာချက်ကို ERM က ၂၀၁၆ တွင် ဆောင်ရွက်ခဲ့ပါသည်။ As part of the ESHIA လေ့လာချက်၏ အစိတ်အပိုင်းနေဖြင့်၊ အခြေခံအချက်အလက်များနှင့်ပတ်သက်သည့် ကွာဟချက်ကို ထည့်ဖြည့်ရန် အခြေခံနမူနာများကို ကောက်ယူခဲ့ပြီး အစီရင်ခံစာတွင် တင်ပြခဲ့ပါသည်။

[2] World Health Organisation, 2016. Ambient Air Pollution: A Global Assessment of Exposure and Burden of Disease, http://apps.who.int/iris/bitstream/10665/250141/1/9789241511353-eng.pdf?ua=1, accessed on November 8, 2018.

[3] MyanmarTimes, 30 SEP 2016, Myanmar's air pollution among the worst in the world: WHO. http://www.mmtimes.com/index.php/national-news/22840-myanmar-s-air-pollution-among-the-worst-in-the-world-who.html

- **ဖန်လုံအိမ်ဓာတ်ငွေ့ ထုတ်လွှတ်မှုများ** - World Resources Institute (၂၀၁၄) ၏ အချက်အလက်များအရ၊ ၂၀၁၃ တွင် မြန်မာနိုင်ငံ၏ စုစုပေါင်း GHG ထုတ်လွှတ်မှုများ (မြေယာအသုံးပြုမှု အပြောင်းအလဲ နှင့် သစ်တော တို့ကို ပယ်၍) CO2 အီကွေးဗင့်လန့် ($MtCO_2$)[1] ၉၈.၇၅ တန် ရှိပါသည်။ CO_2 ထုတ်လွှတ်သည့် အဓိက ကဏ္ဍများ မှာ စိုက်ပျိုးရေး (65%) နှင့် စွမ်းအင် (22%) တို့ဖြစ်ကြပါသည်။
- **မြေမျက်နှာသွင်ပြင်** - အဆိုပြုစီမံကိန်းသည် မြန်မာနိုင်ငံအလယ်ပိုင်းဒေသရှိ မကွေးတိုင်းဒေသကြီး၏ မြေနိမ့်ပိုင်း မြေမျက်နှာသွင်ပြင်ပေါ်တွင် တည်ရှိပါသည်။ လုပ်ကွက်အမှတ် RSF-5 ၏ ပင်လယ်ရေမျက်နှာပြင်ထက်အမြင့်မှာ ၃၂ မီတာခန့် မှ ၁၉၆ မီတာ ရှိပါသည်။
- **ဆူညံသံ** - ဆူညံသံနှင့်ပတ်သက်သည့် စောင့်ကြပ်ကြည့်ရှုမှု ငါး (၅) ခု (၄၈ နာရီကြာ မှတ်တမ်းယူခဲ့ပါသည်) မှ သက်ဆိုင်ရာ မြန်မာနိုင်ငံ၏ NEQG (အမျိုးသား ထုတ်လွှတ်မှုအရည်အသွေးလမ်းညွှန်) စံနှုန်းများကို ကျော်လွန်သွားသည်မှာ ဆူညံသံအဆင့်တစ်ခုသာ ရှိပါသည်။ ၎င်းကျော်လွန်သွားမှုမှာ ညအချိန်ဖြစ်ပြီး၊ L_{aeq} မှာ ၅၀ ဖြစ်ပါသည် (NEQG ၏ ညအချိန်အတွက်သတ်မှတ်စံနှုန်းမှာ ၄၅ dB(A) ဖြစ်ပါသည်)။
- **မြေပေါ်ရေ** - လုပ်ကွက်အမှတ် RSF-5 လုပ်ပိုင်ခွင့်နေရာမှာ ဧရာဝတီချိုင့်ဝှမ်းရှိသောနေရာတွင် တည်ရှိပါသည်။ ဧရာဝတီမြစ်သည် မြန်မာနိုင်ငံနိုင်မြောက်ဘက် ကချင်ပြည်နယ်တွင် စတင်ဖြစ်ပေါ်သည်။ ဤမြစ်သည် မြောက်ဘက်မှ လုပ်ကွက်အမှတ် RSF-5 ကို ဖြတ်စီးပြီး၊ တောင်ဘက်သို့ဆက်မစီးမီ လုပ်ကွက်အမှတ်၏ အနောက်ဘက်ခြမ်းသို့ ကွေးသွားကာ၊ လုပ်ကွက်နေရာ တောင်ဘက်သို့ စီးဆင်းသွားပါသည်။ ဧရာဝတီအောက်ပိုင်း၏ စုစုပေါင်းဆီးဆင်းသည့်ဧရိယာမှာ ၉၅၆၀၀ စတုရန်းကီလိုမီတာခန့်၊ နှင့် နွေရာသီကာလအတွင်း ကုဗမီတာ ၂၃၀၀ နှင့် မိုးရာသီကာလအတွင်း ကုဗမီတာ ၃၂၆၀၀ ခန့် အပိုင်းအခြားနှုန်းရှိပါသည် [2] ။ နမူနာရလဒ်များအရ၊ အစိုင်အခဲပါဝင်မှုမှလွဲ၍ ရေပါရာမီတာအများစုမှာ မြန်မာနိုင်ငံ၏ NEQG၊ IFC နှင့် EPA စံနှုန်းများစသည့် စံသတ်မှတ်ချက်သုံးမျိုးနှိုင်းယှဉ်မှုအတွင်းရှိကြောင်း တွေ့ရှိခဲ့ရပါသည်။ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးသည့်နေရာ ခုနှစ်နေရာထဲမှ ငါးနေရာတွင် အစိုင်အခဲပါဝင်မှုမှာ (မြန်မာနိုင်ငံ၏ NEQG အရ) စံနှုန်း 50 mg/L ထက် ကျော်လွန်ကြောင်း တွေ့ရှိခဲ့ရပါသည်။
- **ဘူမိဗေဒ -** မြန်မာနိုင်ငံကို တက်တိုးနစ်နယ်မြေ ခြောက်ခုဖြင့် ခွဲနိုင်ပါသည်။ ၎င်းတို့မှာ (က) ရခိုင်ကမ်းမြောင် ဒေသ၊ (ခ) အင်ဒို-ဗရမန် တောင်တန်း၊ (ဂ) အနောက်ဗမာနယ်နိမိတ်ချိုင့်ဝှမ်း၊ (ဃ) ဗဟိုမီးတောင်ရပ်ဝန်း၊ (င) အရှေ့ဗမာနယ်နိမိတ်ချိုင့်ဝှမ်း၊ နှင့် (စ) ဆိုင်နိုဗမာတောင်တန်းတို့ဖြစ်ကြပါသည် [3] ။ စီမံကိန်းလေ့လာမှုနယ်မြေ ဧရိယာသည် အနောက်ဗမာနယ်နိမိတ်ချိုင့်ဝှမ်းပေါ်တွင် တည်ရှိပါသည်။ လုပ်ကွက်အမှတ် RSF-5 သည် အုန်းတွဲဖွဲ့စည်းမှုရှိပြီး၊ စမ်းသပ်တူးဖော်ရှာဖွေမှုမှု၏ ရည်ရွယ်ချက်ပါသည်။ ၎င်းမှာ ရေနံချိပ်-ချောက်-ရေနံချောင်းကွင်းတို့၏ တူညီသော ဟိုက်ဒရိကာဗွန်ဖွဲ့စည်းမှုလမ်းကြောင်းတစ်လျှောက် တောင်ဘက်သို့ဦးတည်သွားပါသည်[4]။
- **မြေဆီလွှာ** - မြန်မာနိုင်ငံ၌ မြေဆီလွှာများကို အဓိက (၁၀) မျိုးဖြင့် ခွဲခြားထားပါသည် - ခွဲခြားထားမှုကို မြန်မာ နိုင်ငံမြေဆီလွှာအနေအထားမြေပုံတွင် ချမှတ်ထားသည့် စီမံကိန်းတည်နေရာဖြင့် မြင်တွေ့နိုင်ပါသည်။ လုပ်ကွက်အမှတ် RSF-5 သည် Luvisol၊ Nitisol နှင့် Lixisol အဖြစ်သတ်မှတ်ထားခွဲခြားထားသည့် မြေဆီလွှာ

[1] CAIT Climate Data Explorer – Myanmar. [Online] Available at: http://cait.wri.org/profile/Myanmar [Accessed 15 May 2017].
[2] Ministry of Electric Power, 2013, Initial Environment Examination – Proposed Loan Republic of the Union of Myanmar: Power Distribution Improvement Project. https://www.adb.org/sites/default/files/linked-documents/46390-003-ieeab.pdf, accessed on November 8, 2018.
[3] Gadjah Mada University, Department of Geological Engineering, 2010, Report on Regional Geology of Myanmar. http://myanmar-preview.iwmi.org/sites/default/files/Documents/regional_geology_of_myanmar.pdf, accessed on November 8, 2018.
[4] Nyi Nyi Soe, 2017. Stratigraphic Control of Upper Pondaung Sandstone, Letpando Oil Field, Central Myanmar Basin, Search and Discovery Article no. 20408. http://www.searchanddiscovery.com/documents/2017/20408soe/ndx_soe.pdf accessed on November 2018.

ပေါ်တွင် တည်ရှိပါသည်။ စီမံကိန်းတည်နေရာရှိ မြေဆီလွှာအနေအထားမှာ ယေဘုယျအားဖြင့် နန်းမြေမှ ရွှံ့စေးထူသည်အနေအထားတွင်ရှိပြီး၊ အထူးသဖြင့် Lixisol မြေဆီလွှာနေရာတွင် ဖြစ်ပါသည်။ ဤမြေဆီလွှာအနေအထားသည် စိုက်ပျိုးရေးလုပ်ငန်းများအတွက် ကောင်းမွန်ကာ၊ ရေများကိုထိန်းပေးနိုင်သည်။ မြေဆီလွှာနမူနာဓာတ်ခွဲတွက်ချက်မှုအရ၊ စံနှုန်းကို ကျော်လွန်သည့် ပါရာမီတာနှစ်ခုမှာ နီကယ် နှင့် ဗနေဒီယံ တို့ဖြစ်ကြပါသည်။ အခြားပါရာမီတာများမှာ စံနှုန်းအတွင်းကျရောက်ကြောင်း တွေ့ရှိခဲ့ရပါသည်။

- **မြေအောက်ရေ** - မြန်မာနိုင်ငံ၏ ရေအသုံးချမှုဦးစီးဌာနအရ၊ မြန်မာနိုင်ငံ၏ မြေအောက်ရေဖွဲ့အစည်းမှုကို အဓိက ရေအောင်းလွှာ ၁၃ မျိုးခွဲခြားထားပါသည်။ ၎င်းတို့မှာ Alluvian, Irrawaddian, Peguan, Ecoene, Flysch, Cretaceous, Kalaw, Plateau Limestone, Lebyin, Cambrian, ChaungMaGyi, Metamorphic နှင့် Igneous တို့ဖြစ်ကြ ပါသည်။ လုပ်ကွက်အမှတ် RSF-5 သည် Irrwaddian နှင့် Peguan ရေအောင်းလွှာ နှစ်မျိုး ပေါ်တွင် တည်ရှိပါသည်။ နမူနာရလဒ်များအရ၊ နိုက်ထရိုဂျင်၊ သံ နှင့် ကော်လီဖောင် (coliform) ပါဝင်မှုတို့မှ လွဲ၍ ရလဒ်များအားလုံးနီးပါးမှာ စံနှုန်းများအောက်ကျရောက်ကြောင်း တွေ့ရှိခဲ့ရပါသည်။
- **ဇီဝအရင်းအမြစ်များ** - စီမံကိန်းလေ့လာမှုဧရိယာရှိ ဒေသရင်းအပင်အများစုမှာ မြန်မာနိုင်ငံအလယ်ပိုင်းရှိ ပိုးချည်ဖြူဝါပင် ဟု သိကြသည့် ရှားပါးမျိုးစိတ်ရှိနေနိုင်သည့် အလားအလာရှိကာ၊ ခြောက်သွေ့သစ်တောအတွက် ပုံမှန်အပင်များဖြင့် ပေါင်းစပ်ပေါက်ရောက်ပါသည်။ လုပ်ကွက်အတွင်းရှိ ဖော်ထုတ်သတ်မှတ်ထားသော သက်ရှိများမှာ ခြောက်သွေ့သစ်တောတွင် ပုံမှန်တွေ့ရသည့် သက်ရှိသတ္တဝါများဖြစ်ကြပါသည်။ လေ့လာမှုနယ်မြေဧရိယာအတွင်းရှိ ကြီးစိုးထားသော နေရင်းဒေသမှာ မြစ်ကမ်းဘေးနားရှိ အရည်အသွေးနိမ့် ဒီရေတောများရှိပြီး၊ စိုက်ပျိုးရေးနယ်မြေဧရိယာ (ပြုပြင်ထားသည့်နေရင်းဒေသ) ဖြစ်ပါသည်။ ဇီဝမျိုးစုံမျိုးကွဲစစ်တမ်းများမှ အဓိကတွေ့ရှိချက်များထဲမှ တစ်ခုမှာ မျိုးစိတ် ၅ မျိုးကို သတ်မှတ်နိုင်ခြင်းဖြစ်ပြီး၊ ၎င်းတို့မှာ လေ့လာမှုနယ်မြေဧရိယာ တွင် တွေ့ရလေ့ရှိသော မျိုးစိတ်များဖြစ်ကြပါသည်။ ၎င်းတို့မှာ vinous-breasted သာလိကာ မျိုး (*Acridotheres burmannicus*), streak-eared bulbul ဗွတ်ဖင်နီမျိုး (*Pycnonotus blanfordi*), white-throated babbler စွေငှက်မျိုး (*Chatarrhaea gularis*), Burmese bush lark ဘီလူးငှက်မျိုး (*Mirafra microptera*), and hooded treepie ငှက်မျိုး (*Crypsirina cucullata*) တို့ ဖြစ်ကြပါသည်။ စီမံကိန်းဧရိယာနှင့် ထပ်ကျနေသော ထိန်းသိမ်းကာကွယ်ထားသည့် နယ်မြေဧရိယာ သို့မဟုတ် ဘေးမဲ့တောများမရှိပါ။
- **လူမှု အရင်းအမြစ်များ** - လူမှုအရင်းအမြစ်များအတွက် သက်ရောက်မှုရှိနိုင်သည့်နယ်မြေဧရိယာများတွင် မကွေး၊ မင်းလှ နှင့် မင်းဘူးမြို့နယ်တို့ပါဝင်ကြပြီး၊ ရပ်ကွက်ပေါင်း ၂၅ ရပ်ကွက် နှင့် ကျေးရွာအုပ်စု ၁၉၁ အုပ်စုတို့ပါ ဝင်ကြပါသည်။ ၎င်းတို့အားလုံးမှာ မကွေးတိုင်းဒေသကြီးအတွင်း၌ တည်ရှိပါသည်။ နောက်ဆုံးရ သန်းခေါင်စာရင်းအရ၊ မကွေးတိုင်းဒေသကြီးအတွင်း (၂၀၁၄ စာရင်းအရ) နေထိုင်သည့်လူဦးရေမှာ ၃၉၁၇၊၅၅၅ ဦးဖြစ်ပြီး၊ လူဦးရေအထူထပ်ဆုံးတွင် အဆင့်၃နှစ်တွင်ရှိသည့် ဒေသဖြစ်ပါသည်။ ဤဒေသရှိ လူများစုမှာ စီးပွားရေးလုပ်ငန်းပိုင်ရှင်၊ လယ်သမား သို့မဟုတ် နေ့စား နှင့် အလုပ်လက်မဲ့ နှုန်း ၂၈.၇% ရှိပါသည်။ အများပြည်သူဝန်ဆောင်မှုများနှင့်ပတ်သက်၍၊ ဒေသတွင် (၂၀၁၆ စာရင်းအရ) ဆေးရုံပေါင်း ၁၀၀ ရှိပြီး၊ စုစုပေါင်းလူဦးရေ၏ ၂၂.၇% မှာ အမျိုးသားမဟာဓာတ်အားလိုင်းမှ လျှပ်စစ်မီးရရှိကြပါသည်။ မကွေး၊ မင်းလှ နှင့် မင်းဘူးတို့ရှိ တွေ့ရများသော သယ်ယူပို့ဆောင်မှုနည်းလမ်းများမှာ မော်တော်ဆိုင်ကယ်၊ စက်ဘီး နှင့် နွားလှည်းတို့ဖြစ်ကြပါသည်။ မကွေးတွင် အင်တာဗျူး မေးမြန်းခံခဲ့ရသူများမှာ အဓိကအားဖြင့် မော်တော်ဆိုင်ကယ် နှင့် ခြေကျင် တို့ဖြင့် သွားလာကြပါသည်။ စီမံကိန်း SA၀I ရှိ လမ်းများတွင် ယာဉ်အသွားအလာအလွန်နည်းပါသည်။ အဓိကအရေးပါသော ယဉ်ကျေးမှုအထင်ကရနေရာ နှစ်ခုရှိပြီး၊ မြသလွန်ဘုရား နှင့် မင်းလှ ခံတပ် နေရာတို့ဖြစ်ကြပါသည်။
- **ကျန်းမာရေး အရင်းအမြစ်များ** - မကွေးတိုင်းဒေသကြီးရှိ တွေ့ရများသော ရောဂါများမှာ သွေးတိုးခြင်း၊ ဗျားနာ ခြင်း၊ နှလုံးရောဂါ၊ ဆီးချို နှင့် အဆစ်အမျက်ရောင် ရောဂါ တို့ဖြစ်ကြပါသည်။ ကျေးရွာအများစုတွင် လမ်းလျှောက်သွား၍ရသောအကွာအဝေးအတွင်း ကျန်းမာရေးဌာနများရှိပါသည်။ သို့ရာတွင် ဒေသတွင်း လူဦးရေ အရလုံ လောက်မှုမရှိပါ။ ပြင်းထန်သောရောဂါအခြေအနေ သို့မဟုတ် အရေးပေါ်အခြေအနေတို့တွင်၊ ကျေးရွာသူ/သားများသည် စီမံကိန်းနေရာများမှ ၁၉ ကီလိုမီတာခန့် ဝေးသည့် မကွေးဆေးရုံသို့ သွားရောက်ရပါသည်။ ၂၀၁၆ တွင်၊ မကွေးတိုင်းဒေသကြီး၌၊ ဆေးရုံ ၁၀၀ နှင့် ခွင့်ပြု ကုတင် ၃၁၂၉ လုံး၊ ရှိနေသောကုတင် ၃၇၃၆ လုံး နှင့် ဝင်ခွင့်ပြုသူ

၂၁၆၉၉၈ ဦး၊ ဆင်းခွင့်ပြုသူ နှင့် သေဆုံးသူ ၂၁၅၆၉၀ ဦး၊ ဆေးရုံတက်ခွင့်ပြုသူ ၉၆၅၀၉၉ ဦး၊ သေဆုံးသူ ၂၁၄၈ ဦး၊ ဆေးရုံတွင် သေဆုံးမှုနှုန်း ၁%၊ နှင့် ဆေးရုံအပြင်ကလာပြသည့်လူနာ ၅၁၃၉၄၈ ဦး ရှိခဲ့ပါသည်။

၁.၆ အဓိကသက်ရောက်မှုများ နှင့် လျော့ချရေးအစီအမံများ ဖော်ပြခြင်း

စီမံကိန်းမှ အဓိက သက်ရောက်မှုအကျဉ်း နှင့် သက်ရောက်မှု ဆန်းစစ်ခြင်းရလဒ်များ၊ နှင့် အဓိက လျော့ချရေးအစီအမံများကို ***ဇယား ၁.၁*** မှ ***ဇယား ၁.၃*** အထိ စာရင်းတင်ပြထားပါသည်။ ဤသည်မှာ အရေးအကြီးဆုံးသက်ရောက်မှုများ (မပြောပလောက်သောအဆင့်မဟုတ်သော ကြွင်းကျန်သက်ရောက်မှု၏ အရေးပါမှုများ) နှင့် ၎င်းနှင့်ဆက်နွယ်သော အဓိကအကျဆုံး လျော့ချရေး အစီအမံများသာ ဖြစ်ပါသည်။ လုပ်ငန်းတစ်ခုချင်းမှ ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အားလုံးနှင့်ပတ်သက်သော အသေးစိတ်များကို ***အခန်း ၆*** တွင်တင်ပြထားပြီး၊ သက်ရောက်မှုတစ်ခုချင်းအတွက် လျော့ချရေးအစီအမံများစာရင်းကို ***အခန်း ၈*** ပါ EMP တွင် တင်ပြထားပါသည်။

လျော့ချရေးအစီအမံများကို ဖော်ထုတ်ထားသည့် သက်ရောက်မှုများဖြစ်ပေါ်လာနိုင်မှုကို လျော့ချရန် အသုံးပြုပါသည်။ ထို့ပြင်/သို့မဟုတ် သက်ရောက်မှုတစ်ခုခုဖြစ်ပေါ်လာပါက၊ ၎င်း၏ ပမာဏ သို့မဟုတ် ပြင်းထန်မှုကို ကန့်သတ်ရန် အသုံးပြုပါသည်။ အဆိုပြု လျော့ချရေးအစီအမံများ၏ ရည်ရွယ်ချက်မှာ စီမံကိန်းလုပ်ငန်းများအားလုံးဆောင်ရွက်သည့် ကာလ အတွင်း ဖော်ထုတ်ထားသော သက်ရောက်မှုများကို စီမံခန့်ခွဲရန်၊ စည်းမျဉ်းများနှင့်ကိုက်ညီရန် နှင့် နိုင်ငံတကာ လုပ်ငန်းအလေ့အကျင့်စံနှုန်းများကို သေချာစွာ အသုံးပြုရန် ဖြစ်ပါသည်။ ဖော်ထုတ်ထားသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများအားလုံးကို ဤလျော့ချရေးအစီအမံများအကောင်အထည်ဖော်မှုကို သင့်လျော်စွာ စီမံသွားနိုင်ဖြစ်ပြီး၊ စီမံကိန်းလုပ်ငန်းများမှ ကြီးမားသော ကြွင်းကျန်သက်ရောက်မှုများရှိမည် မဟုတ်ပါ။

ဇယား ၁.၁ - တည်ဆောက်ရေးနှင့် လုပ်ငန်းခွင်ပြင်ဆင်ရေးအဆင့်ကာလအတွင်း စီမံကိန်းအတွက် လျော့ချရေးအစီအမံများ

အရင်းအမြစ်/ နေရာ	အဓိကအရေးပါသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အကျဉ်း	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု ၏ အရေးပါမှု	အဓိကအရေးပါသော လျော့ချရေး အစီအမံများအကျဉ်း	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု ၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
လေထု အရည်အသွေး နှင့် GHG ထုတ်လွှတ်မှုများ	■ နေရာရွှေ့ပြောင်းသော နှင့် နေရာမရွှေ့ပြောင်းသော တည်ဆောက်ရေးနှင့် ပတ်သက်သော လုပ်ငန်းများမှ နိုင်ထရိုဂျင်အောက်ဆိုက် (NOx)၊ ဆာလဖာ ဒိုင်အောက်ဆိုက် (SO_2)၊ ဖုန်မှုန့် နှင့် ပါတီကူလိတ်များ (PM_{10} နှင့် $PM_{2.5}$) လက်ရှိ ထုတ်လွှတ်နေမှုများ။	အတော်အသင့် ဖြစ်သော	■ ယာဉ်များ၊ စက်များ နှင့် ဂျင်နရေတာများ ကို အကောင်းဆုံးလည်ပတ်နိုင်မှု အနေ အထားရှိရန် ပုံမှန် စစ်ဆေး ထိန်းသိမ်းခြင်း။ ■ အသုံးမပြုသောအခါတွင်၊ ဂျင်နရေတာများ၊ ကွန်ပရက်ဆာများ နှင့် အခြား ကိရိယာစက်များကို ပိတ်ထားခြင်း။ ■ (အကွာအဝေးကို လျှော့ရန် အသင့်လျော်ဆုံး သယ်ယူပို့ဆောင်မှုလမ်းကြောင်းများကို အသုံးပြုခြင်း။ ■ ယာဉ်များတွင် မနိုင်ဝန်မတင်ခြင်း။	သာမညဖြစ်သော
	■ အောက်ပါတို့မှ ဖုန်မှုန့်များ နှုံ့မှုကို မျှော်လင့်ထားသည် – မြေတူးခြင်း၊ ညှိခြင်း နှင့် အပင်များခုတ်ထွင် ရှင်းလင်းခြင်း ကဲ့သို့သော မြေပြင်ဆင်ရေး လုပ်ငန်းများ။ – လမ်းများ ဖောက်လုပ်တည်ဆောက်သည့် ကာလအတွင် ပစ္စည်းများ ယာယီ ပုံထားခြင်းများ။	အတော်အသင့် ဖြစ်သော	■ ရပ်ရွာများအနီး အလုပ်များမှ ထွက်ရှိသည့် ဖုန်မှုန့်များသက်ရောက်သည့် နေရာများတွင် ဖုန်မှုန့်များမထွက်ရန် ရေဖြန်းဆောင်ရွက်ခြင်း။ ■ စီစဉ်ထားသော စီမံကိန်းလုပ်ငန်းများအတွက် လိုအပ်သည့် ကျဉ်းမြောင်းပြီး ရှင်းလင်းသော လမ်းဖရိယာများ ပြုလုပ်ခြင်း။ ■ အနီးအနား ရပ်ရွာများ ဘေးမှ ဖြတ်မောင်းသော အခါ ယာဉ်မြန်နှုန်းကို လျှော့ခြင်း။ ■ ပစ္စည်းများ သယ်ယူပို့ဆောင်သည့် ကာလ အတွင်း ထရပ်ကားပေါ်တင် ပစ္စည်းများကို အပြည့် ဖုံးအုပ်ထားခြင်း။	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	အဓိကအရေးပါသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အကျဉ်း	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု ၏ အရေးပါမှု	အဓိကအရေးပါသော လျော့ချရေး အစီအမံများအကျဉ်း	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု ၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
ဆူညံသံ နှင့် တုန်ခါမှု	■ အောက်ပါတို့မှ ဆူညံသံ နှင့် တုန်ခါမှုများတိုးလာနိုင် သည်ဟု မျှော်လင့်ထားသည် - – တည်ဆောက်ရေး လုပ်ငန်းခွင်သုံး ယာဉ်များ နှင့် စက်ကိရိယာများ။ – လုပ်ငန်းခွင့်သို့ နှင့် လုပ်ငန်းခွင်မှ အလုပ်သမားများ၊ ပစ္စည်းများ နှင့် စွန့်ပစ်ပစ္စည်းများ သယ်ယူဆောင်ရွက်ခြင်း။ – ဂျင်နရေတာများ လည်ပတ်ဆောင်ရွက်ခြင်း။	သာမညဖြစ်သော	■ ကိရိယာများကို ထုတ်လုပ်မှုပါ အသေးစိတ် အချက်အလက်များနှင့် အညီ လည်ပတ် ထိန်းသိမ်းဆောင်ရွက်ခြင်း။ ■ ဖြစ်နိုင်လျှင်၊ ကျယ်လောင်သော[1] သို့မဟုတ် တုန်ခါမှုဖြစ်စေ သော တည်ဆောက်ရေး လုပ်ငန်းများကို နေ့ အခါမှသာ ဆောင်ရွက်ခြင်း။ ■ လုပ်ငန်းခွင်ပြင်ပ ဆူညံသံသက်ရောက်မှုများကို လျော့ချရန် ဆူညံသံထွက်သော ကိရိယာများကို နေရာပြောင်းရွှေ့ဆောင်ရွက်ခြင်း။	သာမညဖြစ်သော
ဇီဝမျိုးစုံမျိုးကွဲ နှင့် ဂေဟစနစ်ဆိုင်ရာ ဝန်ဆောင်မှုများ	■ ရေမြောင်းများ (ဥပမာ၊ ရေဆိုးနှတ်စနစ်များ) နှင့် တည် ဆောက်ရေးသုံးကိရိယာများ နှင့် ယာဉ်များအသုံးပြုမှုသည် စမ်းချောင်းများ နှင့် မြစ်များတွင် နန်းများတိုးလာသဖြင့် ဒေသရင်းအပင်များ နှင့် သက်ရှိသတ္တဝါများအပေါ် သွယ်ဝိုက် သက်ရောက်နိုင်ခြင်း။ ■ မြစ်ထဲရှိနုန်းများကို အနှောင့်အယှက်ဖြစ်စေနိုင်ပြီး၊ မြစ် ကမ်းနေရာများတွင် ဒေသရင်းနေရာများ ဆုံးရှုံးနိုင်ခြင်း။ ဤသည်မှာ တိုက်ရိုက်ရှင်းလင်းမှု၊ ဒေသရင်းနေရာများ ဆုံးရှုံးမှု နှင့် ဒေသရင်းနေရာများ အစိတ်စိတ်ခွဲမှု နှင့် ဥ/အကောင် ပေါက်သည့် နေရာများကို	သာမညဖြစ်သော	■ ရေနုံတွင်း အမာခံနေရာ၊ သိုလှောင်ရေး/ လူနေဆောင် နေရာများ နှင့် လမ်းနေရာများ အတွက်သာ ကန့်သတ် တည်ဆောက် ဆောင်ရွက်ခြင်း။ ■ အဆိုပြု နေရာအဆောက်အအုံများ တပ်ဆင် ရန် လိုအပ်မှသာ အပင်များကို ရှင်းလင်းခြင်း။ ■ ဇရိယာအတွက် ရာသီဥတုကို နေ့စဉ် စစ်ဆေး ခြင်း။ မိုးအလွန်အကျွံရွာပါက မြေညှိ ဆောင် ရွက်မှုလုပ်ငန်းများကို ရပ်တန့်ခြင်း။ ■ မိုးအလွန်အကျွံရွာသည့် ကာလအတွင်း တိုက် စားမှုကို ကာကွယ်ရန် ဟင်းလင်းပေါ် နေသော	သာမညဖြစ်သော

[1] နေ့ဘက်တွင် 55dB(A) နှင့် ညနေဘက်တွင် 45dB(A) တို့ထက် ပိုမြင့်သော ဆူညံသံ ထွက်ရှိသည့် လည်ပတ်သော လုပ်ငန်း။ နေ့ဘက်တွင် 55dB(A) နှင့် ညနေဘက်တွင် 45dB(A) တို့ထက် ပိုမြင့်သော ဆူညံသံ အခြေခံအဆင့် နှင့် 3dB(A) မှ ဤ အခြေခံအဆင့်ထက် တိုးမြင့်မှုကို ကျယ်လောင်ခြင်းအဖြစ် ထည့်သွင်းစဉ်းစားပါသည်။ လည်ပတ်ရေးလုပ်ငန်း

အရင်းအမြစ်/ နေရာ	အဓိကအရေးပါသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အကျဉ်း	လျှော့ချမှု မတိုင်မီ သက်ရောက်မှု ၏ အရေးပါမှု	အဓိကအရေးပါသော လျှော့ချရေး အစီအမံများအကျဉ်း	လျှော့ချမှု ပြီးနောက် သက်ရောက်မှု ၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
	အနောင့်အယှက် ဖြစ်စေခြင်းတို့မှ ဒေသရင်း အပင်များ နှင့် သက်ရှိသတ္တဝါများ ကို သက်ရောက်နိုင်ခြင်း။		ဆည်များရှိသည့်နေရာတွင် တိုက်စားခြင်းကို ထိန်းချုပ်မှုများ တပ်ဆင်ခြင်း။ ■ မြစ်ကမ်းများတွင် တည်ဆောက်/တပ်ဆင်မှု ပြုလုပ်သောအခါ မြစ်ထဲရှိ နန်းများသို့ အနောင့် အယှက်ဖြစ်မှုကို လျှော့ချခြင်း။	
	■ နေရင်းဒေသမျက်နှာပြင်များပျက်စီးမှုကြောင့် ဒေသရင်း အပင်များ နှင့် သက်ရှိသတ္တဝါများအပေါ် ထိခိုက်နိုင်မှုများ။	သာမည်ဖြစ်သော	■ အပင်များရှင်းလင်းခြင်း နှင့် အခြား ရှိနေနိုင် သော ဒေသရင်းနေရာများရှင်းလင်းရာတွင် တည်ဆောက်ရေးလုပ်ငန်းများအတွက် လိုအပ်သည့် ပမာဏကိုအထိ ကန့်သတ်ခြင်း။ ■ ရှင်းလင်းမည့် နေရာပမာဏကို ရှင်းလင်းစွာ အမှတ်အသားလုပ်ခြင်း။	သာမည်ဖြစ်သော
	■ အကယ်၍ ဖို့သည့် ပစ္စည်းများကို တင်သွင်းရလျှင်၊ နေရင်းဒေသပျက်စီးမှုမှ ဇီဝမျိုးစုံမျိုးကွဲအပေါ် သက်ရောက် နိုင်ခြင်း။	သာမည်ဖြစ်သော	■ ဖို့သည့် ပစ္စည်း နမူနာများကို အတည်ပြု ဆောင်ရွက်ခြင်း။ ■ ဖို့သည့်ပစ္စည်းများကို ခွင့်ပြုသည့် သို့မဟုတ် ဒီဇိုင်းပြုလုပ်ထားသည့် တည်နေရာ/ဓရိယာများမှ ရရှိစေခြင်း။	သာမည်ဖြစ်သော
	■ ယာဉ်နှင့်တိုက်မိခြင်းမှ ကုန်းနေသက်ရှိသတ္တဝါများကို သက်ရောက်နိုင်ခြင်း။ ■ စီမံကိန်းသုံးယာဉ်များ နှင့် ကိရိယာစက်များ မောင်းနှင်သွား လာမှုကြောင့် သဘာဝ နေရင်းဒေသများ သို့မဟုတ် ကုန်းပေါ်ရှိ သက်ရှိသတ္တဝါများ၏ စားကျက်မြေများ ကို ထိခိုက်နိုင်ခြင်း သို့မဟုတ် ပျက်စီးစေနိုင်ခြင်း။	သာမည်ဖြစ်သော	■ ယာဉ်များကို အနီးအနား နေရာရှိ လုပ်ငန်းခွင် မဟုတ်သည်နေရာများ သို့မဟုတ် သတ်မှတ် ထားခြင်း မဟုတ်သည့် သယ်ယူပို့ဆောင်ရေး လမ်းကြောင်းများ အပေါ် သွားလာခြင်း မပြုခြင်း။ ■ ဝန်ထမ်းနှင့်ပတ်သက်သော အသိအမြင်များ တိုးမြင့်စေခြင်း နှင့် ယာဉ်မောင်းများကို လုံလောက်စွာ လေ့ကျင့်သင်ကြားပေးခြင်း။	သာမည်ဖြစ်သော

အရင်းအမြစ်/ နေရာ	အဓိကအရေးပါသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အကျဉ်း	လျှော့ချမှု မတိုင်မီ သက်ရောက်မှု ၏ အရေးပါမှု	အဓိကအရေးပါသော လျှော့ချရေး အစီအမံများအကျဉ်း	လျှော့ချမှု ပြီးနောက် သက်ရောက်မှု ၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
	■ အလုပ်သမားများအနေဖြင့် ခွင့်မပြုထားသော/ တရားမဝင်သော ငါးဖမ်းခြင်း နှင့် အမဲလိုက်ခြင်းတို့သည် ဇီဝမျိုးစုံမျိုးကွဲအပေး သက်ရောက်မှု ရှိနိုင်ခြင်း။ ■ အလုပ်သမားများက အပင်များ နှင့် သက်ရှိသတ္တဝါများကို ရိတ်သိမ်းဖမ်းယူ စားသုံးခြင်း။	သာမညဖြစ်သော	■ လိုက်ရှာခြင်း ဖမ်းဆီးခြင်း၊ ငါးဖမ်းခြင်း၊ အမဲလိုက်ခြင်းတို့ကို အလုပ်သမားများအား တားမြစ်ခြင်း။	သာမညဖြစ်သော
မြေ/မြစ် အသုံးပြုမှု နှင့် အသက်မွေးဝမ်းကျောင်း (စီးပွားရေးအရ ရွှေ့ပြောင်းခံရမှု)	■ မြေယာများရယူမှုကြောင့် ရှိရင်းစွဲမြေအသုံးပြုမှု အပေး အနောင့်အယှက်ဖြစ်ပေါ်နိုင်ခြင်း။ ■ ရုပ်ဝတ္ထု နှင့် စီးပွားရေးအရ ရွှေ့ပြောင်းရခြင်းကြောင့် နယ်မြေဧရိယာအတွင်း ရှိနေသော ဒေသခံရပ်ရွာလူထုအပေါ် စီမံကိန်းကိန်း လုပ်ငန်း ဆောင်ရွက်မှုမှ သက်ရောက်မှုရှိနိုင်သည်။ ၎င်းမှာ အသက်မွေးဝမ်းကျောင်းလုပ်ငန်းများပါ ထိခိုက်နိုင်သဖြင့် လျော်ကြေးပေးရန် လိုအပ်နိုင်သည်။	အတော်အသင့် ဖြစ်သော	■ ဒေသ ဥပဒေများ နှင့် နိုင်ငံတကာ အလေ့အကျင့်ကောင်းများ (ဥပမာ၊ အပြည် ပြည်ဆိုင်ရာ ဘဏ္ဍာရေး ကော်ပရေး ရှင်း လုပ်ဆောင်မှု စံနှုန်းများ) နှင့်အညီ မြေရယူမှု ကို ဆောင်ရွက်ခြင်း။ ■ ထောက်ပံ့ပို့ဆောင်ရေးစခန်းအတွက် ၎င်းတို့ မူလ အနေအထားသို့ မြေများကို ပြန်လည်ပြုပြင်ရန် နှင့် ပြောင်းလဲရန်အတွက် လျော်ကြေးပေးခြင်းနှင့် စပ်လျဉ်း၍ တည်ဆောက်ရေး နှင့် လည်ပတ်ရေး ကာလအတွင်း ယာယီ သို့မဟုတ် ထာဝရ ထိခိုက်ခံရသည့် မြေယာပိုင်ဆိုင်သော သက်ဆိုင်သူများကို ဈေးကွက်ပေါက်ဈေးဖြင့် လျော်ကြေးပေးခြင်း။	သာမညဖြစ်သော
	■ ရေနံတွင်းနေရာတည်ဆောက်ခြင်းကြောင့် မြေပေါ်ရှိ လူနေ သည် မြေ နှင့် အဆောက်အအုံများ ဆုံးရှုံးခြင်း၊ အထွက်နှုန်းကောင်းသော မြေ နှင့် သီးနှံများ ဆုံးရှုံးခြင်း၊ နှင့် အခြား ယခင်က မြေအသုံးပြုမှုကို ဆုံးရှုံးခြင်း၊ နှင့် သီးနှံများအရည်အသွေး ကျဆင်းခြင်း သို့မဟုတ်	အတော်အသင့် ဖြစ်သော	■ လုပ်ငန်းခွင်ပြင်ဆင်ခြင်း နှင့် တည်ဆောက်ခြင်း ကာလတို့အတွင်း ထိခိုက်ခံရသည့် သီးနှံများအတွက် သက်ဆိုင်သူများအား (ကျေးရွာ ခေါင်းဆောင်အပါအဝင်) ကော်မတီက ဦးဆောင်သော အစိုးရက သတ်မှတ်သော ဈေးကွက်ပေါက်ဈေးဖြင့် လျော်ဇ	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	အဓိကအရေးပါသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အကျဉ်း	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု ၏ အရေးပါမှု	အဓိကအရေးပါသော လျော့ချရေး အစီအမံများအကျဉ်း	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု ၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
	စိုက်ပျိုးရေး အတွက် အသုံးပြုသည် ပတ်ဝန်းကျင် မြေများ ဆုံးရှုံခြင်းတို့ အပါအဝင် ရှိနေသော မြေယာအသုံးပြုမှု အပြောင်းအလဲ ဖြစ်နိုင်ခြင်း။ ■ ငါးဖမ်းခြင်း သို့မဟုတ် ရေသုံး စိုက်ပျိုးခြင်း အတွက် အသုံးပြုသည့် အနီးပတ်ဝန်းကျင် ရေနေရာများတွင် အရည်အသွေး ကျခြင်းနိုင်ခြင်း။		ကြားပေးခြင်း။ မြေယာကို ၎င်း၏ ကနဦး ထုတ်လုပ်နိုင်သော အနေအထားအထိ ပြန်လည်ပြုပြင်ပြီးသည်အထိ လျော်ကြေးပေးခြင်း။ ■ စိုက်ပျိုးထားသော အပင်များရှိနေသည့် နယ်မြေဇရိယာများ ခုတ်ထွင်ရှင်းလင်းမှုကို ကန့်သတ်၍၊ စီမံကိန်းအတွက် လိုအပ်သည့် ပမာဏအတွက်သာ ရှင်းလင်းခြင်း။	
	■ အရင်းမြစ်ပစ္စည်းများရှိသည့်နေရာများ၌ မြေအသုံးပြုခြင်းမှာ ထိခိုက်မှုရှိနိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ ဖို့သည့်ပစ္စည်းများကို ခွင့်ပြုသည့် သို့မဟုတ် ဒီဇိုင်းပြုလုပ်ထားသည့် တည်နေရာ/ဇရိယာများမှ ရရှိစေခြင်း။	သာမညဖြစ်သော
	■ တည်ဆောက်ရေးလုပ်ငန်းများကြောင့် လယ်ယာလုပ်ငန်းအပေါ် အနှောင့်အယှက်ဖြစ်ပေါ်နိုင်ခြင်း။ ■ တည်ဆောက်ရေး လုပ်ငန်းများမှ သိပ်သည်းလာမှုကြောင့် မြေဆီလွှာ နှင့် စိုက်ပျိုးမြေအပေါ် သက်ရောက်နိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ အနီးအနားရှိမြေအပေါ် အနှောင့်အယှက်ဖြစ်မှု ကို ရှောင်ကြဉ်ရန် ရေနံတွင်း အမာခံနေရာ၊ သိုလှောင်သည့် နေရာ / လူနေဆောင်နေရာ နှင့် လမ်းပေါ် သွားလာမှုတို့နှင့်ပတ်သော သယ်ယူပို့ဆောင်မှုများကို ကန့်သတ်ခြင်း။	သာမညဖြစ်သော
အများပြည်သူသုံး အခြေခံ အဆောက်အအုံ နှင့် အသုံးပြုမှုများ	■ လေးလံကြီးမားသော ကိရိယာများသည် ရှိနေသော လမ်းများ ကို ထိခိုက်နိုင်စေခြင်း။ ■ လမ်းများအဆင့်မြှင့်တင်ခြင်း နှင့် တည်ဆောက်ခြင်းသည် နေထိုင်သူများ နှင့် စီးပွားရေးလုပ်ငန်းများအတွက် လမ်းအသုံး ပြုမှု ကို အနှောင့်အယှက်ဖြစ်နိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ လမ်းမဟုတ်သည့်နေရာများ သွားလာခြင်း နှင့် အမြန်နှုန်းကန့်သတ်မှုကို ဖြစ်စေရန် တည်ဆောက်ရေးကိရိယာများကို သတ်မှတ်ထားသောလမ်းများ နှင့် စီမံကိန်း နယ်မြေဇရိယာအတွင်း၌သာ အသုံးပြုခြင်း။ ■ လမ်းအသစ်ပေါ်တွင် ယာဉ်အသွားအလာဘေး ကင်းမှု ရှိစေရန် လမ်းသွားလမ်းလာ စနစ်ကျသော အမှတ်သင်္ကေတများ နှင့် ကိရိယာများကို တပ်ဆင်ခြင်း။	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	အဓိကအရေးပါသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အကျဉ်း	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု ၏ အရေးပါမှု	အဓိကအရေးပါသော လျော့ချရေး အစီအမံများအကျဉ်း	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု ၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
			■ စီမံကိန်းရလဒ်အနေဖြင့် လမ်းအသုံးပြုသူများ ကကြုံတွေ့ရသည့် ထိခိုက်မှုကို လျော့ချရန် ယာဉ်အသွားလာ စီမံခန့်ခွဲမှု အစီအစဉ်ကို ရေးဆွဲအကောင်အထည်ဖော်ခြင်း။	
	■ စီမံကိန်းယာဉ်များရှိနေမှုကြောင်း လမ်းတွင်ယာဉ်အ သွားအလာ တိုးလာခြင်း။ ■ တည်ဆောက်ရေးလုပ်ငန်းကာလအတွင်း လေးလံကြီးများ သော စက်များ နှင့် ယာဉ်များ အသုံးပြုမှုကြောင့် ရှိနေသော လမ်းများကို ထိခိုက်ပျက်စီးနိုင်ခြင်း။ ■ စီမံကိန်းသုံး ယာဉ်များ (စီစဉ်မထားသည့် ဖြစ်ရပ်များကဏ္ဍ တွင် ထည့်သွင်းထားပါသည်) ကြောင့် လမ်းတွင် အသွားအလာတိုးလာမှု ကြောင့် ဘေးကင်းရေးဆိုင်ရာ အန္တရာယ်များတိုးလာနိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ ယာဉ်အသွားအလာများသည့် လမ်းများ အတွက်၊ မြေများ၊ ကျောက်စရစ်များ၊ ကွန်ကရစ် သို့မဟုတ် အလားတူအရာများကို တည်ငြိမ်အောင် ပြုလုပ်ခြင်း။ ■ လမ်းမဟုတ်သည့်နေရာများတွင် သွားလာမှုကို ရှောင်ကြဉ်ရန် စီမံကိန်းသုံး ယာဉ်များ အားလုံးသည် သတ်မှတ်ထားသည့် လမ်းများတွင်သာ အသုံးပြုခြင်း။ ■ မြန်နှုန်းလျော့ချခြင်းအပါအဝင်၊ ယာဉ်အသွား အလာ စီမံခန့်ခွဲမှု အစီအစဉ်၏ အစိတ်အပိုင်း အနေဖြင့် ယာဉ်မောင်းမှု ဘေးကင်းရေး စံနှုန်းများကို အကောင်အထည် ဖော်ခြင်း။ ■ အသုံးပြုသွားလာမှုအမြင့်ဆုံးအချိန်များ ကို ရှောင်ကြဉ်ရန်၊ နှင့် ကျောင်းစချိန် - ဆင်းချိန် သို့မဟုတ် ဒေသတွင်း လုပ်ငန်းများ (ဥပမာ၊ ဘာသာရေးပွဲများ) အစ နှင့် အဆုံး အချိန်များ ကို ရှောင်ကြဉ်ရန် ယာဉ်အသွားအလာ များပြားမှုကို စီစဉ်ခြင်း။	သာမညဖြစ်သော
	■ စီမံကိန်း၏ ရေအသုံးပြုမှုဆိုင်ရာ သတ်မှတ်ချက်များသည် ဒေသတွင်း ရေရရှိမှုကို လျော့ကျစေနိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ ခွင့်ပြုချက်ရထားသော ရေထောက်ပံ့ပေးသူများ ကိုသာ အသုံးပြုခြင်း နှင့် လုံလောက်သော ခွင့်ပြုချက်ဖြင့် ရေနံတွင်းများကို ဆောင်ရွက်ခြင်း။	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	အဓိကအရေးပါသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အကျဉ်း	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု ၏ အရေးပါမှု	အဓိကအရေးပါသော လျော့ချရေး အစီအမံများအကျဉ်း	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု ၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
			■ စီမံကိန်းနယ်မြေဇရိယာများ၏ အနီးအနား နေရာများတွင် ရေများမလုံလောက်မှု ကြုံတွေ့ရလျှင်၊ အခြားကွာဝေးသည့်နေရာများ နှင့် ရေအရင်းအမြစ်များတို့မှ သုံးရန် ထည့်သွင်းစဉ်းစားခြင်း။	
လူမှု-စီးပွား	■ အနီးပတ်ဝန်းကျင်ရှိ လူများ၊ လုပ်ငန်းများ နှင့် ဝန်ဆောင်မှုများ အတွက် အလုပ်အကိုင် အခွင့်အလမ်း/ဝင်ငွေ နှင့် ရောင်းဝယ်မှု တိုးပွားလာခြင်း (အပြုသဘောဆောင်သော သက်ရောက်မှု)။	အပြုသဘော ဆောင်သော	■ ဒေသခံ အလုပ်သမားကို ဖြစ်နိုင်သမျှ ခန့် အပ်ခြင်း။ ကျွမ်းကျင်မှုများအလိုအပ်သည့် အလုပ်များအတွက် ဒေသခံများကို ဦးစားပေးခြင်း။ ■ မျှတသင့်လျော်သော ခန့်အပ်ရေး လုပ်ငန်းစဉ် ဖြစ်စေခြင်း။ ■ ဒေသခံ စီးပွားရေးလုပ်ငန်းများမှ ဖြစ်နိုင်သမျှ သော ပစ္စည်းများကို ဝယ်ယူအသုံးပြုခြင်း။ ■ ခွင့်ပြုချက်ရထားသော သို့မဟုတ် သတ်မှတ် ထားသော တည်နေရာများ/ဇရိယာများက ရရှိသော ဖို့သည့် ပစ္စည်းများ၏ အနီးအနားနေရာအရင်းအမြစ်များကို အသုံးပြုခြင်း။	အပြုသဘော ဆောင်သော
မြင်ကွင်းရှုကွက်	■ လုပ်ငန်းခွင်ပြင်ဆင်မှုကာလအတွင်း၊ မြေယာပုံစံပြောင်း လဲခြင်း နှင့် တည်ဆောက်ရေးသုံး ယာဉ်များရှိနေခြင်း တို့ကြောင့် ရှိနေသော မြင်ကွင်းရှုကွက်များ ပြောင်းလဲခြင်း။	သာမည်ဖြစ်သော	■ စီမံကိန်းဇရိယာရှိ သစ်ပင်များ နှင့် အခြား သဘာဝ အဂါရုပ်များ ဖယ်ရှားမှုကို လိုအပ်သလောက် အနည်းဆုံးဖြစ်အောင် ကန့်သတ်ခြင်း။ ■ ဖယ်ရှားရမည့် အထူးမျိုးစိတ်များ နှင့် ၎င်းတို့၏ ထိန်းသိမ်းကာကွယ်ရေးဆိုင်ရာ အနေအထားကို တွက်ထုတ်ခြင်း။	သာမည်ဖြစ်သော

အရင်းအမြစ်/ နေရာ	အဓိကအရေးပါသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အကျဉ်း	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု ၏ အရေးပါမှု	အဓိကအရေးပါသော လျော့ချရေး အစီအမံများအကျဉ်း	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု ၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
ရပ်ရွာလူထုကျန်းမာရေး နှင့် ဘေးကင်းလုံခြုံရေး	■ တည်ဆောက်ရေး လုပ်ငန်းများမှ ထွက်ရှိလာသည့် ဖုန်မှုန့်၊ စွန့်ပစ်ပစ္စည်းတို့ကြောင့် ကျန်းမာရေးအပေါ် ထိခိုက်နိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုနှင့်ဆက်နွယ်သော သက်ရောက်မှုများ၊ လေထုအရည်အသွေးအပေါ် သက်ရောက်မှုများကို လျော့ချရန်အသုံးပြုသည့် အလားတူ အစီအမံများကို အကောင်အထည်ဖော်ခြင်း။ ■ စီမံကိန်းလုပ်သားအပေါ် သက်ရောက်မှုရှိနိုင် သော ကိစ္စရပ်များကို စီမံခန့်ခွဲမှုကို အလေးပေးသည့် ထပ်ဖြည့်ထားသော လုပ်ငန်းခွင်ကျန်းမာရေး နှင့် ဘေးကင်းရေး အစီအစဉ်ကို ရေးဆွဲသင့်ပါသည်။	သာမညဖြစ်သော
	■ အခြားနေရာများမှ လုပ်သားများ ရောက်ရှိလာခြင်းသည် လိင်မှတစ်ဆင့် ကူးစက်တတ်သော ရောဂါများအပါအဝင် ကူးစက်ရောဂါများတိုးပွားလာမှုကို ဦးတည်စေနိုင်ခြင်း။ ■ ယာဉ်အသွားအလာ မတော်တဆဖြစ်မှု တိုးလာနိုင်ခြင်း။ ■ တည်နေရာနှင့် ရပ်ရွာဆက်ဆံရေးတို့အပေါ် မူတည်၍၊ လုပ်သားများ ရှိနေခြင်းကြောင့် ရပ်ရွာအတွင်း အနှောင့် အယှက်ဖြစ်မှု နှင့် တင်းမာမှုများ ဖြစ်ပေါ်လာနိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ လုပ်သားများ တည်းခိုဆောင်စခန်းတွင် သင့်လျော် သော အဆင်ပြေမှုများကို ဆောင်ရွက်ပေးခြင်း (ဥပမာ၊ အပန်းဖြေစရာ အခွင့်အလမ်းများ) ■ စီမံကိန်းနှင့်ပတ်သက်သော လုပ်သားများ၊ ကန်ထရိုက်တာများ နှင့် လာရောက်လည်ပတ်သူများအားလုံးအတွက် အလုပ်သမား ကျင့်ဝတ်ကို ရေးဆွဲအကောင်အ ထည်ဖော်ခြင်း။	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	အဓိကအရေးပါသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အကျဉ်း	လျှော့ချမှု မတိုင်မီ သက်ရောက်မှု ၏ အရေးပါမှု	အဓိကအရေးပါသော လျှော့ချရေး အစီအမံများအကျဉ်း	လျှော့ချမှု ပြီးနောက် သက်ရောက်မှု ၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
လုပ်ငန်းခွင် ကျန်းမာရေး၊ ဘေးကင်း လုံခြုံရေး နှင့် အလုပ် အခြေအနေများ	■ စီမံကိန်း၏ တည်ဆောက်ခြင်း နှင့် လည်ပတ်ခြင်းသည့် အလုပ်သမားများအတွက် ကျန်းမာရေး နှင့် ဘေးကင်း ရေးဆိုင်ရာ အန္တရာယ်များကို ဖြစ်ပေါ် စေနိုင်ခြင်း။ ဤအန္တရာယ်များမှာ လုပ်ငန်းခွင်ပြင်ဆင်ခြင်း၊ တည်ဆောက် ခြင်း နှင့် ရေနံတူးဖော်ခြင်း အဆင့်များအားလုံးတွင် ရှိနိုင်ပါသည်။	အတော်အသင့် ဖြစ်သော	■ လုပ်ငန်းခွင်ကျန်းမာရေး နှင့် ဘေးကင်းရေးတို့နှင့် ပတ်သက်သော Eni ၏ စီမံခန့်ခွဲမှုအစီအစဉ်များ ကို အကောင်အထည်ဖော်ခြင်း။ ■ စီမံကိန်းသည် တည်ဆောက်ရေးဆိုင်ရာ လုပ်ငန်း ခွင် ကျန်းမာရေး နှင့် ဘေးကင်းရေး စီမံခန့်ခွဲမှု အစီအစဉ် (OHSMP) ကို လုပ်ငန်း အလေ့အ ကျင့် ကောင်းအနှင့် ရေးဆွဲ အကောင်အထည် ဖော်ခြင်း နှင့် စီမံကိန်း AoI နှင့် စီမံကိန်းလုပ်ငန်း များ တွင် မူဝါဒများ ထည့်သွင်းအသုံးပြုခြင်း။ ■ ကန်ထရိုက်တာသည် ကျန်းမာရေး၊ ဘေးကင်းရေး နှင့် ပတ်ဝန်းကျင်ဆိုင်ရာ အစီအစဉ်ကို လုပ်ငန်း မစတင်မီ ရေးဆွဲ ကောင်အထည်ဖော်ခြင်း (ကုမ္ပဏီမှ အတည်ပြုခြင်း)။	သာမညဖြစ်သော
	■ အလုပ်သမားများအတွက် သတ်မှတ်ချက်များနှင့် စနစ်တကျ မစီမံပါက၊ စီမံကိန်း ပမာဏကြီးမားခြင်းသည် ကလေးလုပ် သားများ အသုံးပြုခြင်း သို့မဟုတ် အားပေးခြင်းနှင့်ပတ် သက်သော အန္တရာယ်များကို ဖြစ်ပေါ် စေနိုင်ခြင်း။ ■ အလုပ်သမားများအတွက် သတ်မှတ်ချက်များနှင့် စနစ်တကျ မစီမံပါက၊ စီမံကိန်း ပမာဏကြီးမားခြင်းသည် ဘေးကင်း လုံခြုံမှု ကင်းမဲ့ခြင်း သို့မဟုတ် မသင့်လျော်သော လုပ်ငန်းအ နေအ ထားများ နှင့် ပတ်သက်သော အန္တရာယ်များကို ဖြစ်ပေါ် စေနိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ လုပ်ငန်းခွင် ကျန်းမာရေး နှင့် ဘေးကင်းရေး နှင့် အလုပ်လုပ်သည့် အခြေအနေများနှင့် ပတ် သက်သော Eni ၏ စီမံခန့်ခွဲမှု အစီအစဉ် များကို အကောင်အထည်ဖော်ခြင်း။ ■ ကလေးသူငယ်များ နှင့် / သို့မဟုတ် အတင်းအဓမ လုပ်အားစေခိုင်းမှုများကို EPC ကန်ထရိုက်တာ နှင့် ၎င်း၏ တစ်ဆင့်ခံ ကန်ထရိုက်တာများက မလုပ်ဆောင်စေရန် လုပ်အားကျင့်သုံးမှုများကို လမ်းညွှန်ခြင်း နှင့် ရှာဖွေချိတ်ဆက်မှုကို အသုံးပြုခြင်းတို့ဖြင့် အတွင်းရှိ	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	အဓိကအရေးပါသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အကျဉ်း	လျှော့ချမှု မတိုင်မီ သက်ရောက်မှု ၏ အရေးပါမှု	အဓိကအရေးပါသော လျှော့ချရေး အစီအမံများအကျဉ်း	လျှော့ချမှု ပြီးနောက် သက်ရောက်မှု ၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
			စံနှုန်းများ သွေဖည်ခြင်းကို စောင့်ကြပ်ကြည့်ရှု စစ်ဆေးခြင်း။ ■ ရေးဆွဲ အကောင်အထည်ဖော်သော ကာကွယ်မှု နှင့် ထိန်းချုပ်မှု မဟာဗျူဟာများ နှင့် လုပ်သားများ၏ မကျေနပ်ချက်များ ဒေါင်းကြား ရေး ယန္တရားတို့၏ ထိရောက်မှုကို အတည်ပြုရန် လုပ်ငန်းခွင်၊ ကျန်းမာရေး နှင့် ဘေးကင်းရေး (OHS) ဆိုင်ရာ စောင့်ကြပ်ကြည့်ရှု စစ်ဆေးမှုကို နေရာတကျ ထားရှိ ဆောင်ရွက်ခြင်း။	
စွန့်ပစ်ပစ္စည်း၊ စွန့်ပစ်ရေ နှင့် အန္တရာယ်ရှိသော ပစ္စည်းများ စီမံခန့်ခွဲခြင်းမှ အမျိုးမျိုးသော အရင်းအမြစ်များ နှင့် လူများ အပေါ် သက်ရောက်ခြင်း	■ စနစ်မကျသော စီမံခန့်ခွဲမှု နှင့် အန္တရာယ်ရှိသော သို့မဟုတ် အန္တရာယ်မရှိသော စွန့်ပစ်ပစ္စည်းတို့သည် မြေပေါ် ရေ အရည်အသွေး၊ မြေဆီလွှာ နှင့် မြေအောက်ရေ တို့အပေါ် ထိခိုက်နိုင်ခြင်း။ စီမံကိန်းတည်နေရာ အပေါ် မူတည်၍ ဇီဝမျိုးစုံမျိုးကွဲ နှင့် လူများအပေါ် တစ်ဆင့် ထိခိုက်မှု ဖြစ်ပေါ်နိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ စွန့်ပစ်ပစ္စည်း အမျိုးအစားများ အားလုံးကို သက်ဆိုင်ရာ စည်းမျဉ်းများနှင့်အညီ ကိုင်တွယ်ခြင်း၊ သိုလှောင်ခြင်း၊ စွန့်ထုတ်ခြင်း။ ■ စွန့်ပစ်ရေ (လိုအပ်သလို) စုဆောင်းခြင်း နှင့် သန့်စင်ခြင်း၊ အထွေထွေ စွန့်ပစ်ပစ္စည်းများ၊ အစိုင်အခဲစွန့်ပစ်ပစ္စည်း၊ ဓာတုပစ္စည်း စသည် တို့ သိုလှောင်ခြင်း နှင့် တရားဝင်စွန့်ထုတ်ခြင်း တို့အတွက် လုံလောက်သော နေရာအဆောက် အအုံများပေးထားခြင်း နှင့် ထုတ်ပြန်သွားမည့် စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအစီအစဉ်ကို ပြဋ္ဌာန်းပေးခြင်း။ ■ ယိုဖိတ်မှုများကို ချက်ချင်း သန့်ရှင်းခြင်း၊ စု ဆောင်းမှုအတွက် သင့်လျော်သော အမှိုက်ပုံး သို့ စွန့်ထည့်ခြင်း။ ■ စွန့်ပစ္စည်းများကို Eni ၏ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု အစီအစဉ် နှင့် အညီ စီမံခန့်ခွဲခြင်း။	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	အဓိကအရေးပါသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အကျဉ်း	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု ၏ အရေးပါမှု	အဓိကအရေးပါသော လျော့ချရေး အစီအမံများအကျဉ်း	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု ၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
			■ ခွင့်ပြုချက်ရထားသော စွန့်ပစ်ပစ္စည်း နေရာအ ဆောက်အအုံများ နှင့် ဝန်ဆောင်မှုများကို အသုံးပြုခြင်း နှင့် လုံလောက်သော စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုဆိုင်ရာ ဝါစဉ်အဆင့်ကို လေးစား လိုက်နာစေခြင်း။ ■ စီစဉ်မထားသည့် ဖြစ်ရပ်များတွင် မတော်တဆ ထုတ်လွှတ်မှုများနှင့်ပတ်သက်၍ စီမံခန့်ခွဲမှုကို ကိုးကားခြင်း။	
	■ စနစ်တကျမစီမံပါက၊ စွန့်ပစ်ရေ စွန့်ထုတ်မှု နှင့် လုပ်ငန်းခွင် အတွင်း စီးကျမှု တို့သည် မြေပေါ်ရေ အရည်အသွေး၊ မြေဆီလွှာ နှင့် မြေအောက်ရေတို့အပေါ် တိုက်ရိုက် သက်ရောက်နိုင်ခြင်း။ စီမံကိန်းတည်နေရာ အပေါ်မူတည်၍ ဇီဝမျိုးစုံမျိုးကွဲ နှင့် လူများအပေါ် တစ်ဆင့် ထိခိုက်မှု ဖြစ်ပေါ်နိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ စွန့်ပစ်ရေ (လိုအပ်သလို) စုဆောင်းခြင်း နှင့် သန့်စင်ခြင်း၊ အထွေထွေ စွန့်ပစ်ပစ္စည်းများ၊ အစိုင်အခဲစွန့်ပစ်ပစ္စည်း၊ ဓာတုပစ္စည်း စသည် တို့ သိုလှောင်ခြင်း နှင့် တရားဝင်စွန့်ထုတ်ခြင်း တို့အတွက် လုံလောက်သော နေရာအဆောက် အအုံများပေးထားခြင်း။ ■ စွန့်ထုတ်မှုများကို ပြုလုပ်ရန်လိုအပ်ပါက၊ မြန်မာနိုင်ငံ၏ NEQG အရ၊ ရေအရည်အသွေး စံနှုန်းများနှင့်ကိုက်ဖေရန် စွန့်ပစ်ရေများကို သန့်စင်ခြင်း။ ■ ခွင့်ပြုချက်ရထားသော စွန့်ပစ်ပစ္စည်း နေရာ အဆောက်အအုံများ နှင့် ဝန်ဆောင်မှုများကို အသုံးပြုခြင်း။ ■ စီစဉ်မထားသည့် ဖြစ်ရပ်များတွင် မတော်တဆ ထုတ်လွှတ်မှုများနှင့်ပတ်သက်၍ စီမံခန့်ခွဲမှုကို ကိုးကားခြင်း။	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	အဓိကအရေးပါသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အကျဉ်း	လျှော့ချမှု မတိုင်မီ သက်ရောက်မှု ၏ အရေးပါမှု	အဓိကအရေးပါသော လျှော့ချရေး အစီအမံများအကျဉ်း	လျှော့ချမှု ပြီးနောက် သက်ရောက်မှု ၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
	■ အန္တရာယ်ရှိသော ပစ္စည်းများ (ဥပမာ၊ လောင်စာများ၊ ဆီများ၊ ချောဆီများ သို့မဟုတ် ပျော်ဝင်နိုင်သော အရည်များ) ကို စနစ်တကျ မစီမံပါက မတော်တဆ ယိုဖိတ်နိုင်ခြင်း သို့မဟုတ် ယိုစိမ့်နိုင်ခြင်း နှင့် မြေပေါ်ရေ အရည်အသွေး၊ မြေဆီလွှာ၊ နှင့် မြေအောက်ရေ တို့အပေါ် ထိခိုက်နိုင်ခြင်း။ စီမံကိန်းတည်နေရာ အပေါ်မူတည်၍ ဇီဝမျိုးစုံမျိုးကွဲ နှင့် လူများအပေါ် တစ်ဆင့် ထိခိုက်မှု ဖြစ်ပေါ်နိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ စွန့်ပစ်ရေ (လိုအပ်သလို) စုဆောင်းခြင်း နှင့် သန့်စင်ခြင်း၊ အထွေထွေ စွန့်ပစ်ပစ္စည်းများ၊ အစိုင်အခဲစွန့်ပစ်ပစ္စည်း၊ ဓာတုပစ္စည်း စသည် တို့ သိုလှောင်ခြင်း နှင့် တရားဝင်စွန့်ထုတ်ခြင်း တို့အတွက် လုံလောက်သော နေရာအဆောက် အအုံများပေးထားခြင်း။ ■ လုပ်ငန်းခွင် နှင့် စီမံလုပ်ငန်းနှင့်ဆက်နွယ်သော အလုပ်များအတွက် ယိုဖိတ်မှုသုံး အသင့် ဆောင်ပစ္စည်း/ကိရိယာများ နှင့် ယိုဖိတ်မှုပြီး နောက် ဆောင်ရွက်ရမည့် လုပ်ထုံးလုပ်နည်း များ ထားရှိခြင်း။ ■ လောင်စာ နှင့် အန္တရာယ်ရှိသော ပစ္စည်းသို့ လှောင်သည့် ဧရိယာများကို ရေကြီးနိုင်သည့် အမြင့်ထက် ပိုမြင့်သည့် နေရာများတွင် တည်ရှိခြင်း။ ■ လောင်းစာ တိုင်ကီများ နှင့် အခြား အန္တရာယ် ရှိသော ပစ္စည်းများကို သိုလှောင်မှုပမာဏ အနည်းဆုံး ၁၁၀% သိုလှောင်နိုင်စွမ်းရှိပြီး၊ အပြည့် ဆည်ထားသည့် နေရာ၌သာ ထည့်သွင်းသိုလှောင်ခြင်း။ ■ SDS နှင့်အညီ ဓာတုပစ္စည်းများအားလုံးကို သိုလှောင် ကိုင်တွယ် ဆောင်ရွက်ခြင်း။ ■ လောင်စာဖြည့်ခြင်း နှင့် စက်များထိန်း သိမ်းပြုပြင်ခြင်းကို သတ်မှတ်ထားသည့်နေ့ရာ၊	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	အဓိကအရေးပါသော ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ အကျဉ်း	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု ၏ အရေးပါမှု	အဓိကအရေးပါသော လျော့ချရေး အစီအမံများအကျဉ်း	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု ၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
			အကာအရံများရှိသည့် နေရာ၊ တာဆည်ထားသည့် နေရာတို့တွင်သာ ဆောင်ရွက်ခြင်း။ ■ စီစဉ်မထားသည့် ဖြစ်ရပ်များတွင် မတော်တဆ ထုတ်လွှတ်မှုများနှင့်ပတ်သက်၍ စီမံခန့်ခွဲမှုကို ကိုးကားခြင်း။	

ဇယား ၁.၂ - တူးဖော်လည်ပတ်ဆောင်ရွက်မှုအဆင့်ကာလအတွင်း စီမံကိန်းအတွက် လျော့ချရေးအစီအမံများ

အရင်းအမြစ်/ နေရာ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု မတိုင်မီ	လျော့ချရေးအစီအမှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု ပြီးနောက် (ကြွင်းကျန် သက်ရောက်မှုများ)
ဆူညံသံ နှင့် တုန်ခါမှု	■ တူးစင်သယ်ယူရန်အသုံးပြုသည့် စက် နှင့် ယာဉ်များမှ ဆူညံသံနှင့် တုန်ခါမှု တိုးလာခြင်း။ ■ အနီးရှိ နေထိုင်သူများအား သက်ရောက်နိုင်သည့် တူးဖော်ရေးဆိုင်ရာ ၂၄ နာရီ လည်ပတ်မှုလုပ်ငန်းများ အတွင်း၊ တူးစင်အတွက် စက်များ၊ ကိရိယာများ အသုံးပြုခြင်း။ ■ တူးဖော်လည်ပတ်မှုများနှင့် ဆက်နွယ်သော ဆူညံသံ သည် ဒေသရှိ ညမှကျက်စားတတ်သော မျိုးစိတ်များ ကို အနှောင့်အယှက်ဖြစ်နိုင်ခြင်း။	အရေးပါသော	■ လုပ်ငန်းခွင်ပြင်ဆင်ခြင်း နှင့် တည်ဆောက်ရေး အဆင့် တွင် ဆူညံသံ နှင့် တုန်ခါမှုဆိုင်ရာ သက်ရောက်မှု အတွက် အလားတူ အစီအမံများကို အကောင်အ ထည်ဖော်ခြင်း။ ■ အသံထွက်မှုကို လျော့ချရန် တူးစင် စက်များကို ခြံဝင်းအတွင်း ထိန်းသိမ်းဆောင်ရွက်စေခြင်း။	အတော်အသင့် ဖြစ်သော
မြေအောက်ရေ	■ တူးဖော်ရေးအတံမှ အရည်များ မတော်တဆထုတ် လွှတ်မှုမှ မြေအောက်ရေအပေါ် သက်ရောက်မှုများ။	အတော်အသင့် ဖြစ်သော	■ ရေနံတွင်းတူးမှုမှ ရေအောင်းလွှာ နှင့် တိမ်သည့် အပိုင်းမှ ဓာတ်ငွေ့များ ခွဲခြားမှုအတွက် ရေနံတွင်းဒီဇိုင်းကို သေချာဆောင်ရွက်ခြင်း။	သာမညဖြစ်သော
	■ တူးဖော်လည်ပတ်မှုကာလအတွင်း လိုအပ်သော ရေအရင်းအမြစ် နှင့် ရေထုတ်ယူသည့် ပမာဏအပေါ် မူတည်၍ မြေအောက်ရေ ရရှိနိုင်မှုကို သက်ရောက်စေနိုင်သည့် စီမံကိန်းဆိုင်ရာ လိုအပ်ချက်များ အတွက် ရေအသုံးပြုမှုမှ မြေအောက်ရေကို ပေါ် သက်ရောက်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ မြေအောက်ရေ တွင်းများကို သင့်လျော်သော အနက် (အနည်းဆုံး ၅ မီတာ) တါင် တင်ဆင်ခြင်း။ ■ ခွင့်ပြုချက်ရထားသော မြေအောက်ရေတွင်းများ ကိုသာ အသုံးပြုခြင်း နှင့် ရေပါရာမီတာများ နှင့် ထုတ်ယူမှုကို မှတ်တမ်းယူထားခြင်း။	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု မတိုင်မီ	လျော့ချရေးအစီအမှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု ပြီးနောက် (ကြွင်းကျန် သက်ရောက်မှုများ)
ဇီဝမျိုးစုံမျိုးကွဲ နှင့် ဂေဟစနစ် ဝန်ဆောင်မှုများ	■ တူးဖော်ရေးလုပ်ငန်းများသည် ဆူညံသံ နှင့် တုန်ခါမှု နှင့် အလင်းရောင်များမှ သက်ရောက်မှုရှိနိုင်ပြီး၊ ၎င်းသည် ဒေသရင်းသို့မဟုတ် မျိုးသုန်းပျောက်ဆုံးတော့မည့် သက်ရှိ သတ္တဝါများ အထူးသဖြင့် ငှက်မျိုးစိတ် (avifauna) များ ၏ ပျံ့နှံ့မှု နှင့် နေရင်းဒေသများအပေါ် ဆိုးကျိုးသက်ရောက်နိုင်ကာ၊ အနောင့်အယှက်ဖြစ်မှုကြောင့် ၎င်းတို့မှာ အစာရှာစားသည့် နေရာများ နှင့် အခြို့ စက်ံလမ်းများကိုအသုံးပြုမှုတို့ကို ရှောင်ကြဉ်ခြင်း။	သာမညဖြစ်သော	■ ဆူညံသံ နှင့် တုန်ခါမှု (အထက်တွင်ဖော်ပြခဲ့သည့် တိုင်း) တို့ကြောင့် သက်ရောက်မှုများကို လျော့ချရန် အစီအမံများကို အကောင်အထည်ဖော်ခြင်း။ ■ မျိုးစိတ်များအပေါ် အလင်းရောင် တိုက်ရိုက်ကျ ရောက်မှု ကို လျော့ချရန် အလင်းရောင် ဦးတည်ရာဘက်ကို အကောင်အထည်ဖော်ခြင်း နှင့် အလင်းပြင်းအားကို တတ်နိုင်သမျှ လျော့ချခြင်း။	သာမညဖြစ်သော
	■ လမ်းသစ်များ ဖောက်လုပ်ခြင်း နှင့် ရှိနေသော လမ်းများ ပေါ်တွင် ယာဉ်အသွားအလာတိုးပွားခြင်းသည် ယာဉ်များ ရွေ့လျားခြင့်ဖြင့် တိုက်မိမှုရလဒ်ကြောင့် သက်ရှိသတ္တဝါများ အပေါ် မတော်တဆ သေဆုံးစေခြင်း သို့မဟုတ် ဒဏ်ရာရ စေခြင်းဆိုင်ရာ အန္တရာယ်များကို ဖြစ်ပေါ်စေခြင်း။	သာမညဖြစ်သော	■ အလုပ်သမားများနေရာကို ရှင်းလင်းစွာ ပိုင်ခြားသတ်မှတ်ထားခြင်း နှင့် ဇရိယာများအပြင်ဘက်ရှိ လုပ်ငန်းများကို တားမြစ်ထားခြင်း။ ■ ယာဉ်များကို အနီးအနား နေရာရှိ လုပ်ငန်းခွင် မဟုတ်သည်နေရာများ သို့မဟုတ် သတ်မှတ်ထားခြင်း မဟုတ်သည့် သယ်ယူပို့ဆောင်ရေး လမ်းကြောင်းများ အပေါ် သွားလာခြင်း မပြုခြင်း။	သာမညဖြစ်သော
	■ ဥပမာ၊ လုပ်ငန်းစခန်းများ၌ အလုပ်သမားများ စုပြုံရောက်ရှိလာခြင်း နှင့် အလုပ်သများအဆောင်များ သည် ဇီဝမျိုးစုံမျိုးကွဲအပေါ် သက်ရောက်စေနိုင်သော အလုပ်သမားများမှ အပင်များ နှင့်	သာမညဖြစ်သော	■ လိုက်ရှာခြင်း ဖမ်းဆီးခြင်း၊ ငါးဖမ်းခြင်း၊ အမဲလိုက်ခြင်း တို့ကို အလုပ်သမားများအား တားမြစ်ခြင်း။	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု မတိုင်မီ	လျော့ချရေးအစီအမှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု ပြီးနောက် (ကြွင်းကျန် သက်ရောက်မှုများ)
	သက်ရှိသတ္တဝါများကို တရားမဝင် ရိတ်သိမ်းခြင်း နှင့် အမဲလိုက်ခြင်းတို့ ဖြစ်ပေါ်နိုင်ခြင်း။			
	■ ဂေဟစနစ်ဝန်ဆောင်မှုများတွင် စီမံကိန်း လုပ်ငန်းများမှ ယာယီထိခိုက်နိုင်သော ရေအသုံးပြုမှုကဲ့သို့သော ဝန်ဆောင်မှုများ ဆောင်ရွက်ပေးခြင်းတို့ပါဝင်သည်။	သာမညဖြစ်သော	■ လိုက်ရှာခြင်း ဖမ်းဆီးခြင်း၊ ငါးဖမ်းခြင်း၊ အမဲလိုက်ခြင်း တို့ကို အလုပ်သမားများအား တားမြစ်ခြင်း။ ■ သဘာဝရေမြောင်းများစီးဆင်းမှုအပေါ် အနှောင့်အယှက် ဖြစ်မှု ကို ကန့်သတ်ခြင်း။ ■ တိုက်စားမှု နှင့် နန်းထိန်းချုပ်မှု အစီအစဉ်ကို အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း။ ■ မှတ်တမ်းယူထားသော IUCN စာရင်းပါ မျိုးစိတ်များ အတွက် ဇရိယာများ၌ ပေါက်ဖွားသည့် ရာသီများ ကာလအတွင်း အလုပ်သမားများ ရှောင်ကြဉ်ရန် စာချုပ်သတ်မှတ်ချက်များတွင် ထည့်သွင်းခြင်း။	သာမညဖြစ်သော
အများပြည်သူပိုင် အခြေခံအဆောက် အအုံ နှင့် အသုံးပြုမှုများ	■ တူးစင်စုဆောင်းသယ်ယူမှုကာလအတွင်း ကြီးမားလေးလံသော ယာဉ်များအသုံးပြုမှုသည် လမ်းများ နှင့် တံတားများ ကဲ့သို့သော ဒေသတွင်း အခြေခံအဆောက်အအုံများကို သက်ရောက်နိုင်သည့် တုန်ခါမှုကို ဖြစ်ပေါ်စေခြင်း။	အတော်အသင့် ဖြစ်သော	■ စီမံကိန်းကြောင်း လမ်းအသုံးပြုသူများက တွေ့ကြုံသည့် သက်ရောက်မှုများကို လျော့ချရန် ယာဉ်အသွားအလာ စီမံခန့်ခွဲမှု အစီအစဉ်ကို ရေးဆွဲအကောင်အထည်ဖော်ခြင်း။	သာမညဖြစ်သော
	■ အကယ်၍ စီမံကိန်းမှ အသုံးပြုသော မြေအောက်ရေဇယားများ သည် ဒေသခံကျေးရွာများမှ အသုံးပြုသော အရာများနှင့် တူညီနေလျှင်၊ ဒေသခံ သက်ဆိုင်သူများအတွက် ရေရရှိနိုင်မှုအပေါ်	အတော်အသင့် ဖြစ်သော	■ စီမံကိန်း၏ တစ်စိတ်တစ်ပိုင်းအနေဖြင့် တည် ဆောက်ရေး အဆင့်အတွက် ဆောင်ရွက်ထားသော သက်ဆိုင်သူများနှင့်ထိတွေ့တိုင်ပင်မှု အစီအစဉ် နှင့်	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု မတိုင်မီ	လျော့ချရေးအစီအမှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု ပြီးနောက် (ကြွင်းကျန် သက်ရောက်မှုများ)
	သက်ရောက်နိုင်သည့် အလားအလာများ ရှိကာ၊ တည်ဆောက်ရေးလုပ်ငန်းအဆင့်အတွင်း တူးဖော်ထားသော ရေတွင်းများမှ ရေများကို ထုတ်ယူခြင်း။		မကျေနပ်ချက်များတိုင်ကြားရေး ယန္တရားကို ဆက်လက်အကောင်အထည်ဖော်ခြင်း။ ■ မြေအောက်ရေအပေါ် သက်ရောက်မှုအတွက် အသုံးပြုသည့် အလားတူ အစီအမံများကို အကောင်အထည်ဖော်ခြင်း။	
	■ အလုပ်သမားများ စုပြုံရောက်ရှိလာမှုတိုးပွားလာခြင်း နှင့် အလုပ်သမားများနေရာအဆောင်များသည် ရှိနေသော အခြေခံအဆောက်အအုံများ နှင့် အသုံးပြုမှုများအပေါ် ကြီးမားသော ဖိအားများဖြစ်စေခြင်း။	အတော်အသင့် ဖြစ်သော	■ ဆေးဝါးဆိုင်ရာ ဝန်ဆောင်မှုပေးသည့် ကုမ္ပဏီသည် တစ်ချိန်တည်းတွင် အလုပ်သမားများ အားလုံးအား ကုသနိုင်ရန် လုံလောက်သော စွမ်းရည် နှင့် လုပ်နိုင်စွမ်းရှိစေခြင်း။ ■ အလုပ်သမားများ လွှဲပြောင်းမှုအရေအတွက်ကို လျော့ချရန် ကျွမ်းကျင်မှုမလိုအပ်သော အလုပ်များခန့်အပ်ရာတွင် ဦးစားပေးခြင်း။ တည်ဆောက်ရေးအဆင့်များအတွင်း ခန့်အပ်ထားသည့် အလုပ်သမားများကို ဖြစ်နိုင်သောအနေအထားတွင် လုပ်အားနေရာများတွင် ဆက်လက် ထားရှိခြင်း။	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု မတိုင်မီ	လျော့ချရေးအစီအမှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု ပြီးနောက် (ကြွင်းကျန် သက်ရောက်မှုများ)
လူမှု-စီးပွား	■ အောက်ပါတို့အပါအဝင် အပြုသဘောဆောင်သော သက်ရောက်မှုများ ရှိလာနိုင်ခြင်း - – လေ့ကျင့်သင်ကြားမှုအခွင့် အလမ်းများ ထောက်ပံ့ပေးခြင်း။ – အလုပ်အကိုင်အခွင့်အလမ်းများ ထောက်ပံ့ပေးခြင်း။ – ဝန်ဆောင်မှုများ နှင့် ထောက်ပံ့ပို့ဆောင်ရေး များအတွက် ဝယ်လိုအား တိုးမြင့်လာခြင်း။ – ဒေသရှိ လူ့အရင်းအမြစ်စွမ်းရည်များ (သင်တန်းများ စသည်) တိုးလာခြင်း။ – ဒေသရှိ စီးပွားရေးဖွံ့စည်းမှုတွင် တိုးတက်လာခြင်း။	အပြုသဘော ဆောင်သော	■ N/A - အပြုသဘောဆောင်သော အစီအမံ	အပြုသဘော ဆောင်သော
မြေယာ ရှုခင်းရှုကွက်	■ ညပိုင်းအချိန်၌ တူးစင်ရှိနေမှု နှင့် မီးအလင်းတို့ကြောင့် မြေယာရှုခင်းရှုကွက်များအပေါ် သက် ရောက်နိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ တတ်နိုင်သမျှ အလင်းပြင်းအားကို လျော့၍ လိုအပ်သလို မီးအလင်းရောင်ပေးခြင်း နှင့် ရေနံတွင်း အမာခံနေရာများ၌သာလျှင် မီးအလင်းရောင်ကို ဦးတည်ခြင်း/ မီးအလင်းထိုးခြင်း။	အတော်အသင့် ဖြစ်သော
ရပ်ရွာလူထု ကျန်းမာရေး နှင့် ဘေးကင်းလုံခြုံရေး	■ သယ်ယူရေးလမ်းကြောင်းတစ်လျှောက် အနီးပတ် ဝန်းကျင်ရပ်ရွာနှင့် ပတ်သက်၍ လုပ်ငန်းခွင် သို့ တူးစင်စုဆောင်းခြင်း ကာလအတွင်း သယ်ယူရေး ယာဉ်များ လည်ပတ်ခြင်းမှ သက်ရောက်နိုင်ခြင်း။	သာမညဖြစ်သော	■ ကျူးကျော်ဝင်ရောက်မှုနှင့်ဆက်နွယ်သော ဘေးအန္တရာယ်များကို လူများအား အကြံပေးလျက် လုပ်ငန်းခွင်တစ်ဝိုက် ဆိုင်းဘုတ်များ တပ်ဆင်ခြင်း။ စာတတ်မြောက်နားလည်မှု အားနည်းသည့် သူများပါ ဆိုင်းဘုတ်များကို နားလည်စေရန် ဆိုင်းဘုတ်များ အားလုံးမှာ ပုံဖြင့်ပြထားခြင်းများ ဖြစ်သင့်သည်။	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု မတိုင်မီ	လျော့ချရေးအစီအမှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု ပြီးနောက် (ကြွင်းကျန် သက်ရောက်မှုများ)
			■ ဝင်ပေါက်ဆိုင်ရာ သင်္ကေတများကို ကြည့်ရှုရန် နှင့် ကောင်းမွန်သောအခြေအနေရှိစေရန် ခြံစည်းရိုးများကို နေ့စဉ် စစ်ဆေးခြင်း။ ■ စီမံကိန်းလုပ်ငန်းများကြောင့် ထိခိုက်ခံရသည့် ဒေသရှိ သက်ဆိုင်သူများမှ မကျေနပ်ချက်များကို ကောက်ယူရန် မကျေနပ်ချက်များ တိုင်ကြားရေး ယန္တရား နှင့် သက်ဆိုင်သူများနှင့် ထိတွေ့ တိုင်ပင် ဆွေးနွေးမှု အစီအစဉ်ကို ဆက်လက်ဆောင် ရွက်ခြင်း။	
	■ အခြားနေရာများမှ လုပ်သားများ ရောက်ရှိလာခြင်း သည် လိင်မှုတစ်ဆင့် ကူးစက်တတ်သော ရောဂါများအပါအဝင် ကူးစက်ရောဂါများတိုးပွား လာမှုကို ဦးတည်စေနိုင်ခြင်း။	သာမညဖြစ်သော	■ ကူးစက်တတ်သောလမ်းကြောင်းများနှင့် ကူးစက်တတ် သော ရောဂါများ၏ လက္ခဏာများနှင့် ပတ်သက်၍ အလုပ်သမားများအား လုံးအတွက် သင်တန်းပေးခြင်း။ ■ အလုပ်လုပ်ရန် ကြံ့ခိုင်မှုရှိမရှိ သေချာရန် အလုပ် အကြို စိစစ်မှုကို ဆောင်ရွက်ခြင်း။ ■ စီးပွားဖြစ်လိင်အလုပ်သမားနှင့် ပါဝင်ပတ်သက် လာခြင်း ကဲ့သို့သော လူမှုအပြုအမူမသင့်လျော်မှုကို ဦးတည်သည့် အသေးစိတ်အစီအမံများပါသည့် လုပ်သား ကျင့်ဝတ် များကို ရေးဆွဲအကောင်အထည် ဖော်ခြင်း။	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု မတိုင်မီ	လျော့ချရေးအစီအမှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု ပြီးနောက် (ကြွင်းကျန် သက်ရောက်မှုများ)
လုပ်ငန်းခွင် ကျန်းမာရေး၊ ဘေးကင်း လုံခြုံရေး နှင့် အလုပ် အခြေအနေများ	■ အော်ပရေတာများ ဘေးကင်းရေးနှင့်ပ တ်သက်၍ လုပ်ငန်းခွင်နေရာသို့ တူးစင်စုဆောင်းမှုကာလ အတွင်း သယ်ယူပို့ဆောင်ရေးလည်ပတ်မှုတို့မှ သက် ရောက် နိုင်ခြင်း။ ■ အော်ပရေတာများ ဘေးကင်းရေးနှင့်ပ တ်သက်၍ တူးဖော်ရေး လည်ပတ်မှုကြောင့် သက်ရောက်နိုင်ခြင်း။ ■ နေ့ရက်တစ်လျှောက် တည်နေရာမှ ဘတ်စ်ကားငယ် များ နှင့် ဗင်ကားများဖြင့် ကိုယ်ရေးကိုယ်တာ (လုပ်သားများပြောင်းလဲခြင်း စသည်ဖြင့်) သွားလာ ခြင်း တိုးပွားလာသဖြင့် မတော်တဆဖြစ်နိုင်ခြေ တိုးပွားလာခြင်း။ ■ ပါဝင် ဂျင်နရေတာများမှ လေထုအရည်အသွေး အပေါ် ဆိုးရွားစေခြင်းကြောင့် ရပ်ရွာလူထုကျန်းမာ ရေး နှင့် ဘေးကင်းရေးအပေါ် အန္တရာယ်ဖြစ်စေ နိုင်ခြင်း။	သာမညဖြစ်သော	■ လုပ်ငန်းခွင် ပြင်ဆင်ခြင်း နှင့် တည်ဆောက်ရေး အဆင့်တို့မှ လျော့ချရေးအစီအမံများကို ဆက်တိုက် အကောင်အထည်ဖော်ခြင်း။ ■ လုပ်ငန်းခွင်ကျန်းမာရေး နှင့် ဘေးကင်းလုံခြုံမှု စီမံခန့်ခွဲ ခြင်း အစီအစဉ် (OHSMP) ကို တူးဖော်လည်ပတ် ဆောင်ရွက်မှု ၏ အန္တရာယ်ရှိနိုင်မှုများကို ပေါင်းထည့်ပြီး၊ စီစဉ်မထားသည့် ဖြစ်ရပ်အတွက် အရေးပေါ်တုံ့ပြန်မှု အစီအစဉ်နှင့် ချိတ်ဆက်သွားမည်။ ■ အလုပ်သမားများအတွက် မကျေနပ်ချက်များ တိုင်ကြား ရေး ယန္တရားစနစ်ကို ထားရှိခြင်း။	သာမညဖြစ်သော

အရင်းအမြစ်/ နေရာ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု မတိုင်မီ	လျော့ချရေးအစီအမှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု ပြီးနောက် (ကြွင်းကျန် သက်ရောက်မှုများ)
စွန့်ပစ်ပစ္စည်း၊ စွန့်ပစ်ရေ နှင့် အန္တရာယ်ရှိသော ပစ္စည်းများ စီမံခန့်ခွဲခြင်းမှ အမျိုးမျိုးသော အရင်းအမြစ်များ နှင့် လူများ အပေါ် သက်ရောက်ခြင်း	■ စွန့်ပစ်ပစ္စည်း၊ စွန့်ပစ်ရေ၊ သို့မဟုတ် အန္တရာယ်ရှိသော ပစ္စည်းများ သည် မြေမျက်နှာသွင်ပြင်ဆိုင်ရာ၊ ဇီဝဆိုင်ရာ နှင့် လူမှုဆိုင်ရာ အရင်းအမြစ် များ နှင့် ဇီဝပတ်ဝန်းကျင်တို့ထံသို့ သက်ရောက်နိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ စွန့်ပစ်ပစ္စည်း၊ စွန့်ပစ်ရေ နှင့် အန္တရာယ်ရှိသော ပစ္စည်းများမှ သိသာထင်ရှားသော သက်ရောက်မှုများကို လျော့ချရန် လုပ်ငန်းခွင်ပြင်ဆင်ခြင်း နှင့် တည်ဆောက် ရေး အဆင့်မှ သက်ဆိုင်ရာ အစီအမံများကို အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း။ ■ စီစဉ်မထားသည့် ဖြစ်ရပ်များတွင် မတော်တဆ ထုတ်လွှတ်မှု များနှင့်ပတ်သက်၍ စီမံခန့်ခွဲမှုကို ကိုးကားခြင်း။	သာမညဖြစ်သော
	■ တူးဖော်လည်ပတ်ရေးလုပ်ငန်း များဆောင်ရွက်ရာတွင် စနစ်တကျမစီမံပါက၊ အစိုင်အခဲစွန့်ပစ်ပစ္စည်း၊ စွန့်ပစ်ရေ နှင့် အန္တရာယ်ရှိသော ပစ္စည်း စီမံခန့်ခွဲမှု နှင့် ကိုင်တွယ်မှုတို့သည် မြေဆီလွှာအပေါ် တိုက်ရိုက်သက်ရောက် နိုင်ပြီး၊ ထိခိုက်ခံရသည့် မြေဆီလွှာနှင့် ထိတွေ့သော ဇီဝမျိုးစုံမျိုးကွဲ နှင့် လူတို့အပေါ် တစ်ဆင့်ခံ သက်ရောက် နိုင်ခြင်း။	အတော်အသင့် ဖြစ်သော	■ လုပ်ငန်းခွင်တွင် တူးဖော်မှုသုံးအရည်များရောနှော ပေါင်းစပ်မှုကို ကန့်သတ်ခြင်း - ဖြစ်နိုင်လျှင် ကြိုး၍ ရောနှောပေါင်းစပ်ခြင်း။ ■ လုပ်ငန်းခွင်ပြင်ပ မစွန့်ထုတ်မီ တူးဖော်လည်ပတ်မှုကာလ အတွင်း အသုံပြုသည့် ရေကို သန့်စင်ခြင်း။ စွန့်ထုတ် ရန်လိုအပ်ပါက၊ စွန့်ပစ်ရေကို မြန်မာနိုင်ငံ NEQG အရ ရေအရည်အသွေးစံနှုန်းများနှင့် ကိုက်ညီစေရန် သန့်စင်ခြင်း။ ■ တွင်းငယ်များတွင် ၌်များ နှင့် ကျစ်စာများကို သိုလှောင် ခြင်း နှင့် သင့်လျော်သော လုပ်ငန်းခွင်ပြင်ပ၌ သန့်စင် စွန့်ထုတ်ခြင်း။ ■ ညစ်ညမ်းမှုများ ပျံဖိတ်ဆုံးရှုံးနိုင်မှုကို စစ်ဆေးရန် ကျစ်စာထားသည် တွင်းငယ်များကို ပုံမှန် စောင့်ကြပ် ကြည့်ရှုစစ်ဆေးခြင်း။	

အရင်းအမြစ်/ နေရာ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျှော့ချမှု မတိုင်မီ	လျှော့ချရေးအစီအမှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျှော့ချမှု ပြီးနောက် (ကြွင်းကျန် သက်ရောက်မှုများ)
			■ စွန့်ထုတ်ရန်လိုအပ်နေသော တူးဖော်ရေးကျစ်စာများ နှင့် ရွှံ့များကို ခွင့်ပြုချက်ရထားသော သယ်ယူရေး ဝန် ဆောင်မှုကုမ္ပဏီ နှင့် စွန့်ပစ်ပစ္စည်းနေရာအဆောက် အအုံဖြင့် အပြည့်အဝထိန်းသိမ်း၍ သယ်ယူစေခြင်း။ ■ ညစ်ညမ်းနေသော စီးကျနိုင်မှုကို ရေငွေ့ပြန်သည့် တွင်းငယ်များသို့ လမ်းကြောင်းချပေးခြင်း၊ အနီးဝန်းကျင်သို့ စွန့်ထုတ်မှုများမပြုလုပ်မီ သန့်စင်ခြင်း။ ■ စွန့်ထုတ်ရန်လိုအပ်ပါက၊ မြန်မာနိုင်ငံ၏ NEQG အရ ရေအရည်အသွေးစံနှုန်းများ နှင့် ကိုက်ညီရန် စွန့်ပစ်ရေ များကို သန့်စင်ခြင်း။ ■ နန်းများ နှင့် ဆီများ ပိတ်ဆို့မှုတို့မှ ရေများ စုဆောင်းရန် အင်္ဂတေခင်းရေတွင်းငယ် သို့မဟုတ် သင့်လျော်သော အရွယ်အစားရှိလိုင်းများမှ စီးကျမှုကို ကောက်ယူရန် ရေနုတ်တူးမြောင်းမ ျားပါသည့် အင်္ဂတေခင်း တူးစင် အမာခံနေရာ ဖြစ်စေခြင်း။ စွန့်ထုတ်မှုများမပြုလုပ်မီ ရေကို စမ်းသပ်ခြင်း၊ နှင့် သန့်စင်ခြင်း သို့မဟုတ် သင့်လျော်သလို စွန့်ထုတ်ခြင်း။ ■ ယိုဖိတ်မှုများ နှင့် မတော်တဆမှုများကို ကာကွယ်ရန် အန္တရာယ်ရှိသော ပစ္စည်းများအသုံးပြုမှုအတွက် ထိန်းချုပ်မှုများ နှင့် စံနှုန်းလည်ပတ်ရေး လုပ်ထုံး လုပ်နည်းများကို ရေးဆွဲ အကောင်အထည်ဖော်ခြင်း။	

အရင်းအမြစ်/ နေရာ	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု မတိုင်မီ	လျော့ချရေးအစီအမှုများ	သက်ရောက်မှု ၏ အရေးပါမှု လျော့ချမှု ပြီးနောက် (ကြွင်းကျန် သက်ရောက်မှုများ)
			■ SDS အရ၊ အန္တရာယ်ရှိသော ပစ္စည်းများ အားလုံးကို သယ်ယူပို့ဆောင်ခြင်း၊ သိုလှောင်ခြင်း နှင့် စီမံခန့်ခွဲခြင်း။ ■ သင်လျော်သော ယူဖိတ်မှုမှုဆိုင်ရာ ညစ်ညမ်းမှုတွင် အသုံးပြုရန် အသင့်ဆောင်ကိရိယာများကို လုပ်ငန်းခွင်တွင် ရရှိစေခြင်း။ ■ ညစ်ညမ်းစေမှု မဖြစ်ကြောင်း ဆန်းစစ်ရန် ရေ နှင့် မြေဆီလွှာ အရည်အသွေးစောင့်ကြပ်ကြည့်ရှု စစ်ဆေးခြင်းကို ဆောင်ရွက်ခြင်း။	

ဇယား ၁.၃ - မစီစဉ်ထားသော ဖြစ်ရပ်များကြောင့် သက်ရောက်မှုများအတွက် လျော့ချရေးအစီအမံများ

ဖြစ်ရပ်	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု၏ အရေးပါမှု	လျော့ချရေး အစီအမံများ	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
ယာဉ်တိုက်မိမှု	■ စီမံကိန်းနယ်မြေ ဇရိယာရှိ ယာဉ်အသွားအလာပမာဏ တိုးလာမှုသည် ဒေသရပ်ရွာနှင့် မတော် တဆမှု အန္တရာယ်များကို တိုးလာနိုင်သည်။ ■ ယာဉ်များမှ ဆီယိုဖိတ်မှု သို့မဟုတ် အန္တရာယ်ရှိသော ပစ္စည်းများသည် ရေလမ်းကြောင်းများသို့ ရောက်ရှိလာခြင်း သို့မဟုတ် နေရင်း ဒေသအပေါ် ထိတွေ့ကျရောက်ခြင်းမှ တစ်ဆင့်ခံ သက်ရောက်မှုများ။ ■ စီမံကိန်းအတွက် သယ်ယူမှုအတွက် များလာ သော ယာဉ်အသွားအလာပမာဏ ကြောင့် ယာဉ်မတော်တဆမှုများ တိုးပွား လာနိုင်ခြင်း။ ■ တိုက်မိမှုများ သို့မဟုတ် မတော်တဆမှုများ ကြောင့် ယာဉ်အသွားအလာအပေါ် ပိတ်ဆို့မှုများ ရှိလာနိုင်ခြင်း။ ■ ယာဉ်တိုက်မှုသည် ရပ်ရွာလူထုကျန်းမာရေး နှင့် ဘေးကင်းလုံခြုံမှုအပေါ် သက်ရောက်နိုင်သည်။ ■ စီမံကိန်းအတွက် မတော်တဆမှုများ အားလုံး သည် အလုပ်သမားများအတွက် ကျန်းမာရေး	အတော် အသင့် ဖြစ်သော	■ ယာဉ်မောင်းများကို လေ့ကျင့်သင်ကြားပေးခြင်း။ ■ လိုင်စင်ရ ယာဉ်မောင်းများ နှင့် သယ်ယူပို့ဆောင်ရေး ကုမ္ပဏီများ ကိုသာ အသုံးပြုခြင်း။ ■ "ညဖက်မမောင်းရမူဝါဒ" ကို အကောင်အထည်ဖော်ခြင်း နှင့် ခရီးဝေးမောင်းနှင်သွားလာမှုအတွက် ခေတ္တနားချိန်များကို ကြို တင် သိထားခြင်း။ ■ စီမံကိန်းသုံးယာဉ်များအားလုံး သည် သတ်မှတ်ထားသည့် လမ်းများ ကို အသုံးပြုရမည် ဖြစ်ပြီး၊ လမ်းမရှိသည့်နေရာတွင် သွားလာခြင်းကို ရှောင်ကြဉ်ခြင်း။ ■ မြန်နှုန်းကန့်သတ်မှုများအပါအဝင် ယာဉ်အသွားအလာ စီမံခန့်ခွဲမှု အစီအစဉ်၏ အစိတ်အပိုင်းအနေဖြင့် မောင်းနှင်ရာတွင် ဘေးကင်းရေး စံနှုန်းများကို အကောင်အထည်ဖော်ဆောင်ခြင်း။ ■ အရေးကြီးယာဉ်အသွားအလာ နေရာများ ဥပမာ၊ ကျောင်း၊ နတ်စင်များ၊ ပုထိုးများ၊ ဗလီများ၊ ကျန်းမာရေးဆေးပေးခန်းများ စသည်တို့ တည်ရှိသည့်နေရာများကို စီမံကိန်းယာဉ်မောင်းများအား အသိပေးခြင်း။ ဤနေရာများအတွက် မြန်နှုန်းများကို လျော့ချခြင်း။ ■ ယဉ်ကြေးပိတ်ချိန်များ နှင့် ကျောင်းကြို ကျောင်းဆင်း အချိန်များကာလအတွင်း သယ်ယူပို့ဆောင်ခြင်းလုပ်ငန်းများကို ရှောင်ကြဉ်ခြင်း။ ■ လူနေထိုင်ရာနေရာများ နှင့် အခြားနေရာအဆောက်အဦများကို သွားလာမှုအပါအဝင်၊ ဖြစ်နိုင်လျှင်၊ လူသွားလမ်းကို ပေးခြင်း။	သာမညဖြစ်သော

ဖြစ်ရပ်	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု၏ အရေးပါမှု	လျော့ချရေး အစီအမံများ	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
	နှင့် ဘေးကင်းလုံခြုံမှုဆိုင်ရာ အန္တရာယ်များကို ဖြစ်ပေါ်စေနိုင်သည်။		■ ယာဉ်လမ်းကြောင်းပြောင်းအခြေအနေများ ကို ရှင်းလင်းသည့် သင်္ကေတများဖြင့်၊ တည်ဆောက်ရေးလုပ်ငန်းများကြောင့် ဒေသ ယာဉ်အသွားအလာလမ်းအနေအထားနှင့် ပတ်သက်သော အဆိုပြု အပြောင်းအလဲများအကြောင်းကို ဒေသ ရပ်ရွာလူထုသို့ သတိပေးခြင်း။ ■ အောက်ပါတို့အပါအဝင် Eni ၏ သက်ဆိုင်ရာ မူဝါဒများ နှင့် လုပ်ထုံးလုပ်နည်းများကို အကောင်အထည်ဖော်ခြင်း - - အရေးပေါ်တုံ့ပြန်ရေး အစီအစဉ် နှင့် မဟာဗျူဟာ၊ - pol HSE 001 Eni Myanmar 02 – HSE မူဝါဒ၊ - pol HSE 001 Eni Myanmar 02 - ယာဉ်မောင်းခြင်း မူဝါဒ၊ - pol HSE 003 Eni Myanmar r02 – အရက်၊ ဆေးလိပ် နှင့် မူယစ်ဆေး မူဝါဒ၊ - နောက်ဆက်တွဲ (၃၂) - pro HSE 017 2016 r00 - မြေသယ်ယူပို့ဆောင်ခြင်း၊ နှင့် ■ လုပ်ငန်းခွင် ကျန်းမာရေး နှင့် ဘေးကင်းလုံခြုံရေး၊ နှင့် လုပ်ငန်း ဆောင်ရွက်မှု အခြေအနေများနှင့် သက်ဆိုင်သည့် စီမံခန့်ခွဲရေး အစီအစဉ်ကို ကောင်အထည်ဖော်ခြင်း။	
မတော်တဆ ထုတ်လွှတ်မှုများ	■ ဆီ၊ လောင်စာ၊ သို့မဟုတ် အခြား အန္တရာယ်ရှိသော ပစ္စည်းများ မတော်တဆ ယိုဖိတ်မှု များသို့မဟုတ် ယိုစိမ့်မှုများသည် မျက်နှာ ပြင်ရေကို ညစ်ညမ်းစေနိုင်ခြင်း။ ■ လောင်စာ၊ ဆီ နှင့် အခြား အန္တရာယ်ရှိသော ပစ္စည်းများ ယိုဖိတ်မှုများ သို့မဟုတ် ယိုစိမ့်မှု	အတော် အသင့် ဖြစ်သော	■ SDS အရ၊ ဓာတုပစ္စည်းများ၊ လောင်စာများ၊ ချောဆီများကို စိမ့်မဝင်နိုင်သော (ဘိလပ်မြေ သို့မဟုတ် ပလတ်စတစ်အချပ်ပြား) ကြမ်းပြင် နှင့် တာဆည်ထားသော နံရံ ရှိသည့် လုံခြုံသော နေရာများတွင် သိုလှောင်ခြင်း၊ ■ ၎င်း၏ SDS အရ၊ ဓာတုပစ္စည်းများအားလုံးကို ကိုင်တွယ်ခြင်း။ ■ လေ့ကျင့်သင်ကြားပေးခြင်း နှင့် ယိုဖိတ်မှုဆိုင်ရာ လေ့ကျင့်မှုများ ဆောင်ရွက်ခြင်း။	သာမညဖြစ်သော

ဖြစ်ရပ်	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု၏ အရေးပါမှု	လျော့ချရေး အစီအမံများ	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
	များမှ ညစ်ညမ်းခြင်းကြောင်း မြေဆီလွှာကို ညစ်ညမ်းစေနိုင်ခြင်း။ ■ ညစ်ညမ်းနေသော မြေဆီလွှာသည် ရေတွင် ပျော်ဝင်ပါသွားသဖြင့် နောက်ဆက်တွဲ မြေအောက်ရေ ညစ်ညမ်းမှုကို ဦးတည်သွားနိုင်ခြင်း။ ■ ဆီ၊ လောင်စာ၊ ဘိလပ်မြေ သို့မဟုတ် အခြား အန္တရာယ်ရှိသော ပစ္စည်းများသည် ရေလမ်းကြောင်းသို့ ဝင်ရောက်ခြင်း သို့မဟုတ် နေရင်းဒေသကို ထိတွေ့လာခြင်းကြောင်း ရေပေါ် နှင့် ရေထဲရှိ နေရင်းဒေသအပင်များ နှင့် သက်ရှိသတ္တဝါများအပေါ် ထိခိုက် နိုင်ခြင်း။ ■ မြစ်များညစ်ညမ်းခြင်းမှ ငါးကောင်ရေ လျော့ကျခြင်းကြောင့် ငါးဖမ်းလုပ်ငန်းများအပေါ် တစ်ဆင့်ခံ သက်ရောက်နိုင်မှုများ။ ■ စီမံကိန်းမှ အန္တရာယ်ရှိသော ပစ္စည်းများ မ တော်တဆ ယိုဖိတ်မှုများ သို့မဟုတ် ယိုစိမ့်မှုများသည် သောက်ရေ နှင့် အစားအစာကို ညစ်ညမ်းစေနိုင်သဖြင့် ရပ်ရွာလူထု ကျန်းမာ ရေးကို တစ်ဆင့်ခံ ထိခိုက်နိုင်ခြင်း။		■ သင့်လျော်သော ဆေးဝါးကုသမှု ဆောင်ရွက်ပေးခြင်း၊ ဖြစ်ရပ်များ အတွက် သန့်ရှင်းခြင်း နှင့် သို့မဟုတ် ဖြစ်ပျက်ပုံအစီရင်ခံခြင်း။ ■ လုပ်ငန်းခွင်တွင် ယိုဖိတ်မှုဆိုင်ရာ အသင့်ဆောင် ကိရိယာများထားရှိခြင်း နှင့် အသေးစားယိုဖိတ်မှုများအတွက် အလုပ်သမားများအတွက် လုံလောက်သော PPEs များ ထားရှိခြင်း။ ■ လုပ်ငန်းခွင် ကျန်းမာရေး နှင့် ဘေးကင်းလုံခြုံရေး၊ နှင့် လုပ်ငန်း ဆောင်ရွက်မှု အခြေအနေများနှင့် သက်ဆိုင်သည့် စီမံခန့်ခွဲရေး အစီအစဉ်ကို ကောင်အထည်ဖော်ခြင်း။ ■ Eni ၏ အရေးပေါ် တုံ့ပြန်ရေး အစီအစဉ်ကို အကောင်အထည် ဖော်ခြင်း။ ■ Eni ၏ စံနှုန်းများ နှင့် လမ်းညွှန်းချက်များကို အကောင်အထည် ဖော်ခြင်း။ ■ စီမံကိန်းလုပ်ငန်းများတွင် ပါဝင်သည့် ဝမ်းပြားရေယာဉ်များ / ယာဉ်များအတွက် သဘော်ပေါ် ဆီညစ်ညမ်းမှု အရေးအပေါ် အစီအစဉ် (SOPEP) နှင့် / သို့မဟုတ် ဆီယိုဖိတ်မှု တုံ့ပြန်ရေး အစီအစဉ် ကို နေရာတကျထားရှိအသုံးပြုခြင်း။	

ဖြစ်ရပ်	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု၏ အရေးပါမှု	လျော့ချရေး အစီအမံများ	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
	■ စီမံကိန်းအတွက် မတော်တဆမှုများ အား လုံးသည် အလုပ်သမားများအပေး ကျန်းမာ ရေး နှင့် ဘေးကင်းလုံခြုံရေးအပေါ် ထိခိုက် နိုင်ခြင်း။ ■ မတော်တဆမှုများ၊ လေထုညစ်ညမ်းမှုမျာ၊ ဖုန်မှုန့်၊ သို့မဟုတ် ဆူညံသံ၊ မတော်တဆ ပိုဖိတ်မှုမှ ရေကို ညစ်ညမ်းစေခြင်း။ ■ ဒေသကျန်းမာရေး နေရာအဆောက် အဒုံများ အပေါ် ဝန်ပိမှုများလာခြင်း။			
တွင်းပွင့်ထွက်မှု	■ မထိန်းချုပ်နိုင်သော ရေနံတွင်း ဖြစ်ရပ်သည် အပူ၊ မီး သို့မဟုတ် ပေါက်ကွဲမှု ဖြစ်ပေါ် စေနိုင်ပြီး စီမံကိန်း အနီးရှိ ဒေသရင်းအပင်များ နှင့် သက်ရှိသတ္တဝါများကို သက်ရောက်နိုင်ခြင်း နှင့် အများပြည်သူ ကျန်းမာရေး၊ အလုပ်သမား ကျန်းမာရေး နှင့် ဘေးကင်းရေး တို့အပေါ် အန္တရာယ်များ ဖြစ်ပေါ်နိုင်ခြင်း။	အရေးပါသော	■ ရေနံတွင်းတည်ဆောက်မှုအတွက် အရည်အသွေးမြင့် ပစ္စည်းများ အသုံးပြုခြင်း၊ တူးဖော်မှုစံနှုန်း နှင့် ရေနံတွင်း ထိန်းချုပ်မှု စနှုန်းလည်ပတ်ရေး လုပ်ထုံးလုပ်နည်းများ အသုံးပြုခြင်း၊ နှင့် လိုအပ်လျှင် အဖြည့်ပစ္စည်းများဖြင့် တူးဖော်ရေး ရှုံ့ဆောင်ရွက်မှု ကို အသုံးပြုခြင်းတို့ဖြင့် ဓာတ်ငွေ့များဆိုင်ရာ အန္တရာယ်များဖော် ထုတ်ကာ တူးဖော်လည်ပတ်မှုကို ဂရုတစိုက် စီစဉ်ခြင်း။ ■ ပွင့်ထွက်မှုကာကွယ်သည့်ကိရိယာ (BOP) တိုင် နှင့် ရှီးယာရမ် (shear ram) တပ်ဆင်ခြင်း။ ■ လည်ပတ်ဆောင်ရွက်မှု နှင့် ပူးတွဲတပ်ဆင်မှုများ မစတင်မီ ဘေးကင်းရေး ကိရိယာများကို စမ်းသပ်ခြင်း။ ■ တူးဖော်နေစဉ် ရေနံတွင်းရှိ ဖိအား နှင့် ပြန်လည်သုံးနေသော ရှုံ့များကို ဆက်တိုက် စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးခြင်း။ ■ တူးစင်ပေါ်တွင် ဖိအားဖြင့် ရေဖြန်းသည့်စနစ်ကို တပ်ဆင်ခြင်း။	သာမညဖြစ်သော

ဖြစ်ရပ်	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု၏ အရေးပါမှု	လျော့ချရေး အစီအမံများ	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
			■ တွင်းပွင့်ထွက်မှု တုံ့ပြန်ရေး လုပ်ထုံးလုပ်နည်းအစီအစဉ် ထား ရှိခြင်း နှင့် နောက်ထပ်အလုပ်သမားများအား တူးဖော်ရေး လုပ်ငန်းများမစတင်မှ ဤအစီအစဉ်ကို လေ့ကျင့်သင်ကြား ပေးခြင်း။ ■ တူးဖော်လည်ပတ်နေစဉ် သတိပေးသင်္ကေတများ နှင့်မီးသတ် ကိရိယာများကို ထောက်ပံ့ပေးထားခြင်း။ ■ တူးဖော်ရေးအစီအစဉ် ကို သတိပေးဆောင်ရွက်ခြင်း နှင့် ပုံမှန် တူးဖော်မှုများကို ဆောင်ရွက်ခြင်း။ ■ Eni ၏ အရေးပေါ် တုံ့ပြန်ရေး အစီအစဉ်ကို အကောင်အထည် ဖော်ခြင်း။ ■ နောက်ဆက်တွဲ (၂၅) - opi_sg_hse_040-ups-r01-HSE မလုံခြုံသည့် အခြေအနေ နှင့် မလုံခြုံသည့် အက်ဥပဒေနှင့်အညီ ဆောင်ရွက်ခြင်း။ ■ API နှင့် သက်ဆိုင်ရာ Eni ၏ မူဝါဒများ၊ စံနှုန်းများအားလုံး နှင့် အညီ နိုင်ငံတကာ အကောင်းဆုံး ဘေးကင်းရေးလုပ်ထုံးလုပ် နည်းများဖြင့် တူးဖော်မှုကို ဆောင်ရွက်ခြင်း။ ■ သင့်လျော်သော အဆင့်၌ ရေနံတွင်း၏ ဖိအား ရေနံဖိအားကို ထိန်းသိမ်းရန် ရေနံတွင်းအထိုင်တစ်ဝိုက်တွင် ဘားခလုတ်စနစ် (Christmas Tree) တပ်ဆင်ခြင်း။ ■ အရေးပေါ် လုပ်ထုံးလုပ်နည်းများနှင့်ပတ်သက်၍ အလုပ်သမား များအား လေ့ကျင့်သင်ကြားပေးခြင်း နှင့် လုပ်ငန်းခွင့်သို့ လာရောက်သူ မည်သူမဆိုအား သင်ကြားပေးခြင်း။ ■ (လုပ်ငန်းခွင် တစ်ခုလုံးမှ ကြားနိုင်မြင်နိုင်သော) သတိပေးချက် များ နှင့် လေညွှန်ပြန်များ တင်ဆင်ခြင်း။	

ဖြစ်ရပ်	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု၏ အရေးပါမှု	လျော့ချရေး အစီအမံများ	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
			■ ရေနံတွင်းရှိ ဖိအား နှင့် ပြန်လည်အသုံးနေသော ရွှံ့များကို အမြဲတမ်း စစ်ဆေးခြင်း။ ■ Eni ၏ စံနှုန်းများ နှင့် လမ်းညွှန်းချက်များကို အကောင်အ ထည် ဖော်ခြင်း။	
မီးလောင်ခြင်း နှင့် ပေါက်ကွဲခြင်း (တွင်းပွင့်ထွက်မှု မဟုတ်သည့် အခြားအရာများ)	■ ဓာတ်ငွေ့ထုတ်လွှတ်နိုင်မှု နှင့်/သို့မဟုတ် မီးစ လောင်နိုင်မှုသည် မီးလောင်ခြင်း သို့မဟုတ် ပေါက်ကွဲခြင်းကို ဖြစ်စေနိုင်ပြီး၊ စီမံကိန်း အနီးပတ်ဝန်းကျင်ရှိ ဒေသရင်း အပင်များ နှင့် သက်ရှိသတ္တဝါများပေါ် ထိခိုက်နိုင်ကာ အများပြည်သူ ကျန်းမာရေး နှင့် လုပ်သားများ ကျန်းမာရေး နှင့် ဘေးကင်းရေးတို့အပေါ် အန္တရာယ် ဖြစ်စေနိုင်ခြင်း။ ■ မီးလောင်ခြင်း သို့မဟုတ် ပေါက်ကွဲခြင်း သည် ရေနံတွင်းမှ ဓာတ်ငွေ့ထုတ်လွှတ်မှုကို မထိန်း ချုပ်နိုင်ခြင်းကို ဖြစ်ပေါ်စေနိုင်ပြီး၊ လေထု အရည်အသွေးအပေါ် သက်ရောက်နိုင်ခြင်း။ ■ မီးလောင်ခြင်း သို့မဟုတ် ပေါက်ကွဲခြင်း သည် ရေနံတွင်းမှ ဖန်လုံအိမ် ဓာတ်ငွေ့ထုတ်လွှတ်မှုကို မထိန်း ချုပ်နိုင်ခြင်းကို ဖြစ်ပေါ်စေနိုင်ခြင်း။ ■ မီးလောင်ခြင်း သို့မဟုတ် ပေါက်ကွဲခြင်း သည် ကျယ်လောင်သော ဆူညံသံ၊ တုန်ခါမှု နှင့်	အတော် အသင့် ဖြစ်သော	■ သတိပေးသင်္ကေတအမှတ်အသားများ ဆောင်ရွက်ပေးခြင်း။ ■ ရေနံတွင်းလုပ်ငန်းခွင်၌ အရေးပေါ် ကုသခြင်း၊ ရှေးဦးသူနာပြု အသင့်ဆောင်ကိရိယာ နှင့် ရှေးဦးသူနာပြု ဆောင်ရွက်ခြင်း။ ■ ဒေသရှိ မီးသတ်အဖွဲ့/စခန်းနှင့် ကြိုတင် ဆက်သွယ် ညှိနှိုင်း ဆောင်ရွက်ခြင်း။ ■ Eni ၏ အရေးပေါ် တုံ့ပြန်ရေး အစီအစဉ်ကို အကောင်အထည် ဖော်ခြင်း။ ■ Eni ၏ စံနှုန်းများ နှင့် လမ်းညွှန်းချက်များကို အကောင်အ ထည်ဖော်ခြင်း။ ■ သက်ဆိုင်ရာ API နိုင်ငံတကာ စံနှုန်းများ နှင့် အညီ လုပ်ငန်းများ စွန့်လွှတ်ခြင်း နှင့် စမ်းသပ်မှုများ နှင့် လုပ်ငန်းဆောင်ရွက်မှုများကို ပြုလုပ်ခြင်း။ ■ ရေနံတွင်းပွင့်ထွက်ခြင်းအတွက် အကြံပြုထားသော လျော့ချရေး အစီအမံများကို အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း။ ■ ထိန်းချုပ်ထားသော နေရာ၌သာ ဆေးလိပ်သောက်ခွင့်ပြုခြင်း။ ■ မီးလောင်မှုနှင့်ပတ်သက်သော လေ့ကျင့်သင်ကြားမှု နှင့် တုံ့ပြန်မှု လုပ်ငန်းများကို ဆောင်ရွက်ခြင်း။ ■ (ဖြစ်နိုင်လျှင်) အဆိုပြုထားသော လမ်းကြောင်းများတစ်လျှောက် ရှိနေပြီးသော ဓာတ်ငွေ့ပိုက်လိုင်းလမ်းကြောင်း နှင့် မြေပုံကို ရရှိထားခြင်း။ ■ ပိတ်သိမ်းထားခဲ့သော ရေနံတွင်းသို့ မျိုးစုံသော စက်ပစ္စည်း ဆိုင်ရာ အတားအဆီးများ နှင့် အချိတ်အဆက်ပလတ်များ ထားရှိခြင်း။ ■ အရည်ဖိအားသုံးအတားအဆီး(များ)ကို ပိတ်သိမ်းမှုဒီဇိုင်းတွင်ပူး ပေါင်းထည့်သွင်းခြင်း။	သာမညဖြစ်သော

ဖြစ်ရပ်	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု၏ အရေးပါမှု	လျော့ချရေး အစီအမံများ	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
	အလင်းရောင်ထွက်သည့် အရင်းအမြစ်နေရာ ဖြစ်နိုင်ပြီး၊ ရေနံတွင်းနေရာရှိ အဆောက်အအုံ နေရာများ ပျက်စီးခြင်းမှတစ်ဆင့် တစ်ဆင့်ခံ သက်ရောက်မှုများ ရှိနိုင်ခြင်း။ ■ ရေလမ်းကြောင်းများသို့ အန္တရာယ်ရှိသော စွန့်ပစ် ပစ္စည်းများ စွန့်ထုတ်ခြင်း ကြောင့် အခြေခံ အဆောက်အအုံများ ထိခိုက်မှု သဖြင့် မြေပေါ် ရေ အရည်အသွေးအပေါ် တစ်ဆင့်ခံ ထိခိုက်နိုင်ခြင်း။ ■ မြေဆီလွှာပေါ်သို့ အန္တရာယ်ရှိသော စွန့်ပစ် ပစ္စည်းများ စွန့်ထုတ်ခြင်း၊ (ထိုမှတစ်ဆင့် မြေအောက်ရေကို ထိခိုက်ခြင်း) ကြောင့် အခြေခံ အဆောက်အအုံများ ထိခိုက်သဖြင့် မြေဆီလွှာ သို့မဟုတ် မြေအောက် ရေအပေါ် တစ်ဆင့်ခံ ထိခိုက်နိုင်ခြင်း။ ■ မီးလောင်ခြင်း သို့မဟုတ် ပေါက်ကွဲခြင်းသည် ပြင်းထန်သော အပူ၊ မီးခိုး၊ နှင့် မထိန်းသိမ်းနိုင် သော ဓာတ်ငွေ့ ထုတ်လွှတ်မှု နှင့် စီမံကိန်းအနီးရှိ ဒေသရင်း အပင်များ နှင့် သက်ရှိသတ္တဝါများပေါ် သက်ရောက်နိုင်ခြင်း။		■ ရေနံတွင်းကို ပိတ်ထားပြီး မြေပေါ်တွင် ဖုံးအုပ်ထားခြင်း။	

ဖြစ်ရပ်	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု၏ အရေးပါမှု	လျော့ချရေး အစီအမံများ	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
	■ မြစ်ရေညစ်ညမ်းမှုကြောင့် ငါးကောင်ရေ လျော့သဖြင့်၊ ငါးဖမ်းလုပ်ငန်းအပေး တစ်ဆင့်ခံသက်ရောက်နိုင်ခြင်း။ ■ မီးလောင်ခြင်း သို့မဟုတ် ပေါက်ကွဲခြင်းသည် ပြင်းထန်သော အပူ၊ မီးခိုး၊ နှင့် မထိန်းသိမ်းနိုင် သော ဓာတ်ငွေ့ ထုတ်လွှတ်မှု နှင့် ရပ်ရွာ လူထု ကျန်းမာရေး နှင့် ဘေးကင်းရေးအပေါ် သက်ရောက်နိုင်ခြင်း။			
သဘာဝ ဘေးအန္တရာယ်များ	■ နွေရာသီ မိုးသက်မုန်တိုင်းသည် စီမံကိန်း ဇရိယာရှိ အလုပ်သမားများအပေါ် သက်ရောက်မှုရှိနိုင်ခြင်း နှင့် ဖွဲ့စည်းမှု နှင့် / သို့မဟုတ် စီမံကိန်း အဆောက်အအုံများကို ထိခိုက်နိုင်ခြင်း ။ ■ ရေကြီးမှုသည် မြေအကောင်အထည်ဖော်မှုကို အနှောင့်အယှက် ဖြစ်နိုင်ပြီး၊ နောက်ဆုံးတွင် တည်ဆောက်ရေးလုပ်ငန်းများကို ရပ်တန့်သွားစေနိုင်ခြင်း။ ■ မြန်မာနိုင်ငံ၏ အချို့နေရာများတွင် ငလျင်ဖြစ်နိုင်သော အန္တရာယ်ရှိခြင်း။	အရေးပါသော	■ နွေရာသီ ပြင်းထန်သည့် မိုးသက်မုန်တိုင်းဒဏ်ကို ခံနိုင်သည့် တူးဖော်ရေး အမာခံနေရာဖွဲ့စည်းမှု နှင့် ကိရိယာများ။ ■ ရေကြီးသည့်နေရာတွင် ရေနုံတွင်း နေရာ နှင့် လမ်းသွားသည့် နေရာများ တည်ဆောက်ခြင်းကို ရှောင်ကြဉ်ခြင်း။ ■ ရေကြီးနိုင်သည့် အမြင့်ထက် ပိုမြင့်သည့် ရေနုံတွင်း အမာခံနေရာ နှင့် လမ်းနေရာများကို တည်ဆောက်ခြင်း။ ■ စီမံကိန်းလုပ်ငန်းများ၏ ဘေးကင်းလုံခြုံမှုကို သက်ရောက်နိုင် သည့် ကြိုမြင်နိုင်သော မိုးလေဝသအကြောင်းများ သို့မဟုတ် အကြီးစားမဟုတ်သော မုန်တိုင်းများကို သေချာစေရန် နေ့စဉ် မိုးလေဝသခန့်မှန်းချက်များကို စစ်ဆေးခြင်း။ ■ Eni ၏ အရေးပေါ် တုံ့ပြန်ရေး အစီအစဉ်ကို အကောင်အထည် ဖော်ခြင်း။	သာမညဖြစ်သော

ဖြစ်ရပ်	ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ	လျော့ချမှု မတိုင်မီ သက်ရောက်မှု၏ အရေးပါမှု	လျော့ချရေး အစီအမံများ	လျော့ချမှု ပြီးနောက် သက်ရောက်မှု၏ အရေးပါမှု (ကြွင်းကျန် သက်ရောက်မှုများ)
			■ သက်ဆိုင်ရာ မိုးလေဝသ အစီစဉ်များ အပါအဝင် Eni ၏ စံနှုန်းများ နှင့် လမ်းညွှန်းချက်များကို အကောင်အထည်ဖော်ခြင်း။	

၁.၇ အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးခြင်း နှင့် ဖော်ထုတ်တင်ပြခြင်း

အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးခြင်းသည် ထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ငန်းစဉ်၏ အရေးကြီးသော အခန်းကဏ္ဍတစ်ရပ် ဖြစ်ပါသည်။ *ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းလေ့လာချက်၏ အစိတ်အပိုင်းအဖြစ်၊* Eni Myanmar *သည် မြန်မာနိုင်ငံ၏ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းအရ တိုင်ပင်ဆွေးနွေးမှုများကာလအတွင်း ပြည်နယ်၊ တိုင်းဒေသကြီး၊ မြို့နယ် နှင့် ကျေးရွာအဆင့်တို့၌ သက်ဆိုင်သူများကို ချိတ်ဆက်ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။* Eni Myanmar သည် မြန်မာနိုင်ငံ၏ ဥပဒေများနှင့်အညီ ဖြစ်သော ထိတွေ့တိုင်ပင်ဆွေးနွေးမှုလုပ်ငန်းစဉ်ကို ဆောင် ရွက်ရန် ကတိကဝတ်ပြုထားပြီး၊ စီမံကိန်းနှင့် သက်ဆိုင်သူများနှင့် ပူးပေါင်းပါဝင်ပြီး အစဉ်အမြဲဖြစ်စေ သော စကားဝိုင်း ဖြင့် ဆောင်ရွက်မည် ဖြစ်ပါသည်။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း၏ ***အခန်း ၉*** သည် ပတ်ဝန်း ကျင်ထိ ခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ ဆောင်ရွက်မှုကာလအတွင်း ဆောင်ရွက်ခဲ့သည့် သက်ဆိုင်သူများနှင့် တိုင်ပင် ဆွေးနွေးမှု လုပ်ငန်း များကို ဖော်ပြထားပါသည်။ ၎င်းတွင် သက်ဆိုင်သူများမေးမြန်းခဲ့သော အဓိကအရေးပါသော အကြောင်းအရာ ကိစ္စရပ်များကို ထည့်သွင်းထားပြီး၊ အကြောင်းအရာကိစ္စရပ်များကို ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်း စစ်ခြင်းတွင် ထည့်သွင်း ဆောင်ရွက်ထားပါသည်။ လုပ်ထုံးလုပ်နည်းအရ၊ Eni သည် အများပြည်သူနှင့်တိုင်ပင် ဆွေးနွေးမှုကို နှစ်ကြိမ်ဆောင် ရွက်ထားပြီး အောက်တွင် အကျဉ်းချုပ်ဖော်ပြထားပါသည် -

- **နယ်ပယ်အတိုင်းအတာသတ်မှတ်ခြင်းအဆင့် တိုင်ပင်ဆွေးနွေးမှု (ပထမအကြိမ်)** - စီမံကိန်းသတင်းအချက်အလက်ကို အများပြည်သူထံ ချပြပေးရန် နှင့် စီမံကိန်း နှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအချိန်ဇယားတို့အပေါ် သူတို့ထံမှ သဘောထားမှတ်ချက်ကို ကောက်ယူရန် ပထမအကြိမ် ထိတွေ့တိုင်ပင်ဆွေးနွေးမှုကို ၂၀၁၉ မတ်လ ၁၉ မှ ၂၃ ရက်နေ့တို့အကြား ဆောင်ရွက်ခဲ့ပါသည်။ ဤ အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးမှုအစည်းအဝေးများကို မကွေးတိုင်းဒေသကြီးရှိ ဒေသအဆင့် ပါဝင်ပတ်သက်သည့် အမျိုးမျိုးသော သက်ဆိုင်သူများနှင့် ကျင်းပခဲ့ပါသည်။ တိုင်ပင်ဆွေးနွေးမှုသည် ထိခိုက်ခံစားရနိုင်သောသူများ၊ ဖြစ်ပေါ်လာနိုင်သော အချက်အလက်ကွာဟချက်များ နှင့် ၎င်းတို့ကို ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာတွင် မည်သို့ ထည့်သွင်းဆောင်ရွက်သွားမည်တို့နှင့် ပတ်သက်သည့် သတင်းအချက်အလက်များကို ကောက်ယူမှုတွင် အထောက်အကူဖြစ်စေခဲ့ပါသည်။ ယခုစီမံကိန်းနှင့် ပတ်သက်၍ ဒေသအဆင့်၌ စီမံကိန်းဆိုင်ရာ သတင်းအချက်အလက်များကို ဖော်ထုတ်တင်ပြရန် နှင့် လေ့လာမှုနယ်မြေဇရိယာနှင့်ပတ်သက်သည့် ကျွန်ုပ်တို့၏ အခြေခံအချက်အလက်ဆိုင်ရာ နားလည်သဘော ပေါက်မှု ကို အတည်ပြုရန် အစည်းအဝေးများကို ကျင်းပဆောင်ရွက်ခဲ့ခြင်း ဖြစ်ပါသည်။ သက်ဆိုင်သူများက မေးခွန်းများတွင် အဓိကအရေးပါသောစိုးရိမ်မှုများ မပါဝင်ခဲ့ကြပါ။ မျှော်လင့်ထားသော ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများ၊ ထုတ်ဝေမှုအပေါ် ခွဲဝေခံစားမှုစာချုပ်များ၊ အလုပ်အကိုင်အခွင့်အလမ်းများ၊ လျော်ကြေးဆိုင် ရာများ၊ လမ်းတည်ဆောက်မှုများ၊ ကော်ပိုရိတ်လူမှုတာဝန်များ နှင့်

  စီမံကိန်းဆိုင်ရာ နောက်ထပ်အချက်အလက် တောင်းခံမှုများတို့နှင့်ပတ်သက်သော မေးခွန်းအချို့ကို မေးမြန်းခဲ့ကြပါသည်။ အကြောင်းအရာကိစ္စရပ်များ အား လုံးကို အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးမှုအစည်းအဝေးများတွင် Eni၊ MOGE နှင့် ERM/SEM တို့က သင့်လျော် သလို တုံ့ပြန်ဖြေကြားခဲ့ကြပါသည်။

- **ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအဆင့် တိုင်ပင်ဆွေးနွေးမှု (ဒုတိယအကြိမ်)** - စီမံကိန်းဆိုင်ရာ အချက်အလက်များ၊ သက်ရောက်မှုများ၊ နှင့် လျော့ချရေးအစီအမံများကို အများပြည်သူထံ တင်ပြပေးရန် နှင့် စီမံကိန်း၊ သက် ရောက်မှုများ၊ လျော့ချရေး အစီအမံများ နှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအချိန်ဇယားတင်သွင်းမှုတို့အပေါ် သူတို့၏ သဘောထားမှတ်ချက်များကို စုဆောင်းရန် ၂၀၁၉ မေလ ၂၇ နှင့် ၃၁ ရက်နေ့တို့အကြား ဒုတိယအကြိမ် ထိတွေ့တိုင်ပင်ဆွေးနွေးမှုကို ဆောင်ရွက်ခဲ့ပါသည်။ ဤအများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးမှုများကို မကွေးတိုင်းဒေသကြီးရှိ တိုင်းဒေသကြီးအဆင့် နှင့် ဒေသအဆင့်တို့၌ ပါဝင်ပတ်သက်သည့် အမျိုးမျိုးသော သက်ဆိုင်သူများ နှင့် ကျင်းပဆောင်ရွက်ခဲ့ပါသည်။ သက်ဆိုင်သူများက မေးခွန်းများတွင် အဓိကအရေးပါသောစိုးရိမ်မှုများ မပါဝင်ခဲ့ကြပါ။ စီမံကိန်းဒီဇိုင်း နှင့် သတင်းအချက်အလက်များ၊ စီမံကိန်းလုပ်ငန်းများ (တုန်ခါမှု၊ အလင်းရောင်း၊ ဆူညံသံ၊ စွန့်ပစ်ပစ္စည်းတို့မှ သက်ရောက်မှုများ၊ အခြေခံအဆောက်အအုံ၊ ယဉ်ကျေးမှုအမွေအနှစ်နေရာများ၊ သီးနှံများ နှင့် ခြံမွေးတိရိစ္ဆာန်များတို့အပေါ် ထိခိုက်မှုများ) မှ ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ၊ နှင့် လျော်ကြေး၊ နှင့် CSR အစီအစဉ်တို့နှင့်ပတ်သက်သော မေးခွန်းအချို့အချို့ကို မေးမြန်းခဲ့ကြပါသည်။

အကြောင်း အရာကိစ္စရပ်များ အား လုံးကို အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးမှုအစည်းအဝေးများတွင် Eni၊ MOGE နှင့် ERM/SEM တို့က သင့်လျော် သလို တုံ့ပြန်ဖြေကြားခဲ့ကြပါသည်။ အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးမှုအစီအစဉ် ကို အကောင်အထည်ဖော်ဆောင်ရွက်မှုသည် စီမံကိန်းနှင့်ပတ်သက်သော အမြင်များ နှင့် အကြံပြုချက်များကို ပေးရန် သက်ဆိုင်သူများအတွက် အခွင့်အလမ်းများကို ပေးရာတွင် ၎င်း၏ ပန်းတိုင်များကို အောင်မြင်ခဲ့ပါသည်။ ပတ်ဝန်းကျင် နှင့် လူမှုဆိုင်ရာ သက်ရောက်မှုများနှင့်ပတ်သက်သော လျော့ချရေးအစီအမံများ နှင့် စောင့်ကြပ် ကြည့်ရှု စစ်ဆေးရေးအစီအစဉ်များကို ရေးဆွဲရာတွင် အထောက်အကူဖြစ်စေရန် ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း လေ့လာချက်တွင် အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးမှုမှ ရရှိသော အမြင်များ နှင့် အကြံပြုချက်များ ကို အသုံးပြုခဲ့ပါသည်။ အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးမှုလုပ်ငန်းများ၏ ပြီးမြောက်ခဲ့သောနည်းလမ်း နှင့် ရလဒ်များကို ယခု ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာ၏ ***အခန်း ၉*** တွင် တင်ပြထားပါသည်။

- ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း လုပ်ထုံးလုပ်နည်း လိုအပ်ချက်အရ အများပြည်သူအား သတင်းအချက်လက်များထုတ်ဖော်တင်ပြခြင်း သုံးကြိမ် ပြုလုပ်ခဲ့ပါသည်။ (နယ်ပယ်အတိုင်းအတာ သတ်မှတ်ခြင်းအစီရင်ခံစာအဆင့်၊ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း လေ့လာမှု ပြုလုပ်နေစဉ်အချိန်နှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာအား ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနသို့ တင်သွင်းပြီးအချိန်)

၁.၈ ကတိကဝတ်များဖော်ပြချက်

Eni Myanmar သည် ယခု ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာတွင် တင်ပြထားသော ကတိကဝတ်များ၊ လျော့ချရေးအစီအမံများ နှင့် အစီအစဉ်များကို အစဉ်အမြဲ အပြည့်အဝ လိုက်နာသွားမည် ဖြစ်သည်။ Eni Myanmar သည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲအစီအစဉ်၊ စီမံကိန်း၏ ကတိကဝတ်များ နှင့် သတ်မှတ်ချက်များအားလုံး ကို အပြည့်အဝ အကောင်အထည်ဖော်ဆောင်ရွက်သွားမည်ဖြစ်ပြီး၊ စီမံကိန်း၏ ကန်ထရိုက်တာများ နှင့် တစ်ဆင့်ခံ ကန်ထရိုက်တာများ အားလုံးသည် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဥပဒေ (၂၀၁၂)၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး နည်း ဥပဒေများ နှင့် ပတ်ဝန်း ကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းများ (၂၀၁၅) အပါအဝင် သက်ဆိုင်ရာ ဥပဒေများအားလုံး၊ အပြင် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်၊ စီမံကိန်း၏ ကတိကဝတ်များ နှင့် သတ်မှတ်ချက်များ အားလုံးကို သေချာစေရန် တာဝန်ရှိပါသည်။

Eni Myanmar နှင့် ERM သည် အောက်ပါတို့ကို အတည်ပြုပါသည် -

၁။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာသည် တိကျမှန်ကန်ခိုင်မာမှု နှင့် ပြည့်စုံမှုရှိသည်။

၂။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာကို ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း (၂၀၁၅) အပါအဝင် သက်ဆိုင်ရာ ဥပဒေများနှင့်အညီ ဆောင်ရွက်ခဲ့သည်။

၃။ စီမံကိန်းသည် ယခု ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာတွင် ချမှတ်ထားသော ကတိကဝတ်များ၊ လျော့ချရေးအစီအမံများ နှင့် အစီအစဉ်များကို အပြည့်အဝ လိုက်နာသွားမည် ဖြစ်သည်။

2. EXECUTIVE SUMMARY

2.1 Introduction

2.1.1 Project Overview

Eni Myanmar B.V. (Eni) was awarded the onshore Block RSF-5 and signed with MOGE a PSC on 30 July 2014. Eni Myanmar is the operator of the block with 90% W.I. while Myanmar Petroleum Exploration & Production Co. is the JV Partner with 10% W.I

Eni previously conducted land seismic survey activities in this block in 2017-18, for which an Environmental, Social and Health Impact Assessment (ESHIA) Report[1] was prepared and approved by the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC). Eni is now planning to conduct exploration drilling in Block RSF-5 ("the Project"), expected to commence in December 2019. Associated preparatory civil works commencement is subject to the release of necessary authorizations. Block RSF-5 is located in southern central Myanmar, within Magway Region, covering an area of 1,292 km^2.

Eni propose to drill two (2) exploration wells in Block RSF-5, tentatively named ONDWE DEEP-1 and ONDWE DEEP-2, with each well taking approximately 80 days to be drilled including logging and abandoning the wells (plus an additional 20 days of mobilization and demobilization). Well testing activities (about 20 days) could also take place after Exploration drilling in case of discovery to check if oil or gas reservoirs are producible in commercial quantity. There is no commitment from Eni to produce hydrocarbons at this stage.

Under Section 7 of the Environmental Conservation Law and Articles 52 and 53 of the Environmental Conservation Rules of the Republic of the Union of Myanmar, Eni is required to undertake an Environmental Impact Assessment (EIA) to obtain an Environmental Compliance Certificate (ECC) for the proposed drilling activities.

This EIA Report is the third submission under Myanmar's Environmental Impact Assessment Procedure (EIA Procedure) to be made to the Ministry of Natural Resources and Environmental Conservation (MONREC), following the earlier submission of the Project Proposal Report and the Scoping Report. The Project Proposal Report was submitted and approved on January 17, 2019. The Scoping Report was submitted on April 1, 2019 and approved on May 13, 2019.

2.1.2 Overview of Environmental Impact Assessment (EIA) Report

This Environmental Impact Assessment (EIA) report presents an assessment of the potential environmental, social and health impacts associated with the Project. The objectives of this EIA are:

- To review the proposed Project activities with respect to their potential to interact with environmental, social and health receptors and resources;
- To identify the potentially vulnerable environmental, social and health components of the baseline within the Area of Interest[2];
- To identify and evaluate potential environmental, social and health impacts from the Project;

[1] Note that the terms "Environmental Impact Assessment (EIA)" and "Environmental, Social and Health Impact Assessment (ESHIA)" are often used interchangeably. Myanmar's EIA Procedure, promulgated in 2015, contains reference and requirements to conduct either "EIA" or, alternatively, "Initial Environmental Examination (IEE)", depending on the scope of the project. Typically seismic projects in Myanmar are required to conduct an IEE. However, at the time of preparation of the previous assessment for the seismic activities, the EIA Procedure was not yet enacted, so the terminology was not legally defined and the report was referred to as an "ESHIA".

[2] The Area of Interest is the area in which any potential impacts from the Project (direct or indirect) could occur. The Area of Interest is further defined under Chapter 5 of this EIA Report in terms of the physical, biological and socio-economic environment.

- To recommend mitigation or enhancement measures to remove, reduce or avoid potential adverse impacts;
- To provide an environmental management plan (EMP) including an approach for monitoring and follow up; and
- To summarise public consultation and disclosure of the Project.

2.2 Summary of Activities Undertaken during EIA Study

2.2.1 Project Proposal Report

Prior to commencing the EIA study, Eni Myanmar was required to submit a Project Proposal Report (PPR) to the Environmental Conservation Department (ECD) of MONREC for screening. This PPR was submitted by Eni Myanmar and approved on January 17, 2019. As per *Annex I* of the *EIA Procedure*, the Project requires an EIA i.e. categorised as Item 13, "Onshore Oil and Gas Exploration Drillings".

2.2.2 Scoping Report

After screening and submission of the PPR, a scoping phase was conducted to further identify the potential impacts of the Project, and likely Project Affected Peoples / Communities and to identify potential mitigation measures. Stakeholder engagement was undertaken during this process to collect baseline data and allow stakeholders to express views and concerns which would be considered during the EIA Phase. A Scoping Report was prepared, as required by the EIA Procedure, and contained the Terms of reference for the EIA Report, which outlined the scope and studies necessary as part of the EIA Phase. This Scoping Report and Terms of Reference were also submitted to the MOGE and MONREC. The Scoping Report was submitted on April 1, 2019.

2.2.3 Collection of Primary and Secondary Data to Establish the Environmental and Social Setting

To develop an understanding of the existing environmental and social conditions in the (Project) Study Area, desktop studies and primary baseline surveys were carried out. Further details are described in ***Section 1.5*** of this Executive Summary, and in ***Section 5*** of the EIA Report.

The primary data collection comprised survey, baseline sampling, including physical, biological, social and health resources and monitoring were conducted by SEM with ERM's strict supervision and guidance.

2.2.3.1 Environmental Resources

Air Quality and Greenhouse Gas Emissions

Monitoring of air quality parameters (nitrogen dioxide, carbon monoxide, particulate matter 10, particulate matter 2.5, sulphur dioxide, temperature, relative humidity, wind speed, wind direction) was conducted by SEM at 5 monitoring locations continuously for 72 hours per site, between 21st March and 7th April 2019. The air monitoring was conducted with an automatic Haz-Scanner Wireless Environmental Perimeter Air Station (EPAS) which monitor air quality continuously for 72 hours period. Moreover, the ozone concentration measurement was conducted using ozone meter Aeroqual 500 series.

Monitoring locations were selected to determine the general background concentration in close proximity to human receptors that may be affected by the project activities. For example, air quality monitoring identified closeby locations to determine potential air sensitive receptors (ASRs) within the study area.

Noise

Noise baseline monitoring was conducted at five (5) locations, over 48 hours per location, between 22nd March and 7th April 2019 by SEM. Noise level measurements were conducted according to the relevant methods of the International Organization for Standardization (ISO), which include ISO 1996-1:2003, and ISO 1996:2:2007. The equipment used for measurement is a Model SL-4023SD sound level meter.

Surface Water

A total of seven (7) baseline surface water quality locations were sampled by SEM under ERM's supervision on the 20th and 21st March 2019. Sampling locations were selected based on potential Project interactions that may result or impact the surface water resources.

Sampling locations were selected to determine the current baseline condition prior to project commencement. For example, surface water monitoring locations surveyed were those potentially to be impacted by project activities.

Soil

Soil samples were collected from eight (8) sampling locations (with 2 samples per location – top soil and sub soil samples) in the Study Area between 23 March 2019 and 24 March 2019 and were tested for relevant chemical parameters.

The soil samples were collected using a manual hand auger tool, and the samples were collected from top soil (30 cm – 50 cm depth) and sub soil (60 cm – 80 cm depth).

Sampling locations were selected to determine the current baseline condition prior to project commencement. For example, soil monitoring locations surveyed were those potentially to be impacted by project activities.

Groundwater

Baseline groundwater quality sampling surveys in the Study Area have been conducted, as part of this ESIA Study. A total of six (6) groundwater samples were taken around and within the Study Area by SEM under ERM's supervision on 21st and 22nd March 2019.

Groundwater samples were taken by multi parameters (i.e. water checker) for water quality for some wells and collected in plastic and sterilized glass sample containers.

2.2.3.2 Biological Resources

Flora

A Global Positioning System (GPS) was used to navigate and mark coordinates between sample plots. Techniques such as plotless sampling and transect sampling were implemented with assistance of skilled local residents to record flora species observed within the Project Study Area. Plotless sampling technique was conducted at random selected points within the survey area, whereas transect sampling was conducted across the sample site to determine specific sampling points.

Birds

Transects and opportunistic methods were used to census the species richness while point counting was used to obtain the relative measure of bird abundance.

Mammals

Three types of observational methods were carried out to survey mammal species found in and around the Study Area:

(1) direct observation,

(2) identification of signs (e.g. footprints, scat, feeding signs), and

(3) interviews with local community

Point count and transect count techniques were conducted during daytime, by which direct observation was used to survey arboreal species.

Fish

Interviews with local fishermen were conducted to obtain information on the fishery process such as types of gears used (e.g. traps, hooks, lines, gill nets), number of fishing time per day, and target species. As part of the fish survey, fish specimens were collected by using traps to catch various types of fish species.

Herpetofauna

Reptile surveys were conducted during daytime through point count method by directly observing and active searching in all major habitat types that were surveyed for birds as well as in potential hiding places (e.g. among leaf litter, inside holes, under stones and logs). In the event that captured specimens could not be collected for preservation, photographs were taken and further consulted with local residents. In addition, all visual observations were also documented to examine the morphometric characters (e.g. sizes, shapes, patterns, spots, stripes, body length, and colour) of each specimen.

2.2.3.3 Social and Health Resources

The information presented in this Section was gathered initially through a desktop review of publicly available sources. In addition, to provide a more precise understanding of the social, socio-economic, health and cultural heritage conditions in the Project area, primary data have been collected just after the first Public Consultation session between March 19th and March 23th 2019. The methods for gathering primary data included household questionnaires, face-to-face interview with key informants and focus group discussions with designated interviewees. Key stakeholder groups includes village leader, women, fisherman, nurse/ medical/ health officers and famers within the local villages. A total of 150 household questionnaires as well as 13 Focus Group Discussions and 16 Key Informant Interviews have been administered in Magway, Minhla and Minbu Townships.

2.2.4 Public Consultation and Disclosure

Public consultation and disclosure was undertaken across various identified stakeholder groups as part of the EIA study, in line with the requirements in Myanmar's EIA Procedure. For the potentially affected communities, two rounds of public consultation were undertaken in March 2019 during the Scoping Phase and in May 2019 during the EIA Phase. Results from the consultations were used to inform the impact assessment and mitigation measures for the EIA.

As per the requirements of the EIA Procedure, disclosure activities are required at three separate places throughout the Project, as follows:

1. As part of Scoping, Eni has disclosed information about the proposed Project to the public and civil society through placing advertisements in two local media (Newspapers). The advertisements were published in The Global New Light of Myanmar (English) and The Mirror (Burmese) on February 1, 2019. Eni has also disclosed information on the Project on Eni website.
2. As part of the EIA study, Eni has disclosed all relevant information about the proposed Project and its likely adverse impacts to the public and civil society through local and national media on May 20, 2019.
3. Not later than fifteen (15) days after submission of the EIA Report to ECD, the Project Proponent shall disclose the EIA Report to civil society, PAPs, local communities and other concerned stakeholders: (i) by means of national media (i.e. newspapers); (ii) the website(s) of the Project

or Project Proponent; (iii) at public meeting places (e.g. libraries, community halls); and (iv) at the offices of the Project Proponent.

2.3 Policy, Legal and Institutional Framework

Section 3 of the EIA sets out the relevant legal and policy context in Myanmar and documents the environmental and social standards with which the Project will achieve compliance as well as the international standards that the Project will follow. Specifically, this section summarises the following:

- Eni's Health, Safety and Environment (HSE) Policies;
- Policy and Legal Framework, including EIA Legislation in Myanmar, relevant Myanmar legislation and international conventions, standards and guidelines relevant to the Project;
- Institutional Framework of the Project Proponent and Myanmar, including the requirements of the Production Sharing Contract (PSC); and
- Environmental and/or health standards related to the Project.

2.4 Project Description and Alternatives

2.4.1 Project Location

The Myanmar Onshore area consists of 27 petroleum concession blocks. Block RSF-5 is located in the central dry zone (CDZ) of Myanmar with a block area of 1,292 km2. Eni Myanmar plans to drill two (2) exploration wells in Block RSF-5 but is considering three (3) potential well locations in order to provide flexibility, after the drilling of the first well, for the selection of which other segment of the Ondwe sub-surface structure to investigate. The proposed exploration wells locations (SEG#1, SEG#3_Dev, SEG#6K or Project Site or Project Area) are located within the center section of Block RSF-5 (***Figure 2.1***).

2.4.2 Summary of Project Components and Activities

The Project consists of four separate phases, as follows (detailed descriptions are presented in ***Section 4*** of the EIA):

- **Construction and Site Preparation** - Before drilling operations commence, site preparation activities will take place, including construction/upgrading of access roads, well pad construction, grading of existing land, and establishment of logistics base.
- **Drilling Operations** - Once the site preparation works are complete, the drilling rig and associated equipment will be transported to the site and assembled at the well pad. Drilling of the wells then commences. In general there are three distinct stages of the drilling process, as illustrated in ***Figure 2.2*** and described below:

  - Installation of Pre-Drill Drive Pipe: This section of pipe is hammered into the ground by a vibrator machine and is used as a guide for the remaining drilling stages.

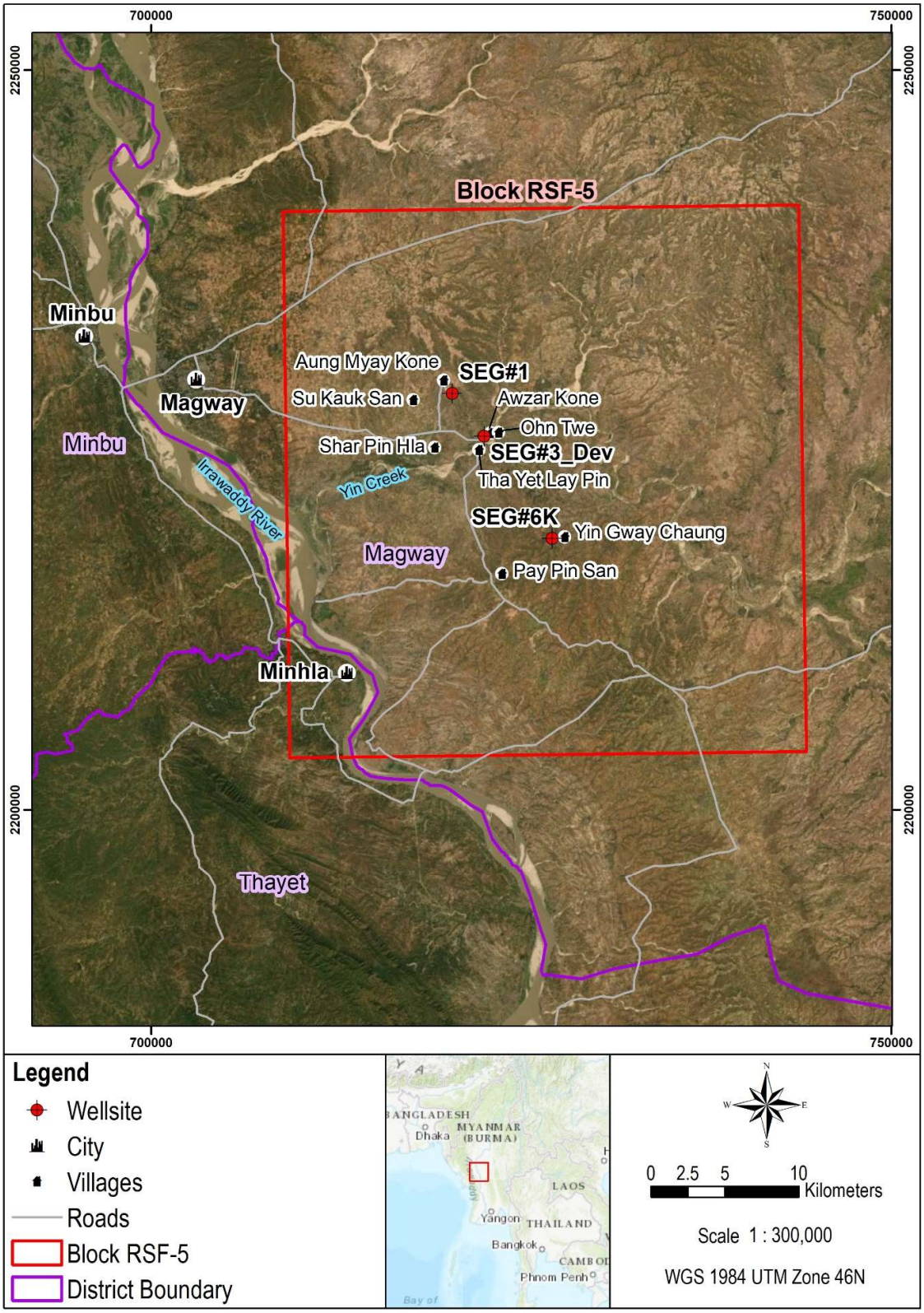
  - Drilling the Top Well Sections: This refers to the drilling of the upper sections of the well. Once each section is drilled, casing is run onto the well shaft and cemented into position.

  - Drilling the Lower Well Sections: The lower well sections will be drilled with 12 ¼" and 8 ½" section to TD 3,800 m TVD GL.

  The planned exploration wells will be drilled with Water Based Mud (WBM) for the top sections and Non-Aqueous Fluid (NAF) for the lower well sections. NAF-based fluids can be either synthetic or low toxic mineral oil-based (LTMO). NAF fluids are considered to have fewer potential impacts to the environment than oil-based fluids in the case of an accidental loss of containment. Therefore, NAF will be used for this Project.

- **Demobilization** - Upon completion of the drilling exploration, all drilling equipment will be demobilized from the exploration areas. Each well is likely to be suspended for testing or plugged and abandoned (P&A), depending on well results and planned future use. Transportation and agricultural activities in the exploration area are expected to resume to normal after demobilization.
- **Site Restoration** - After demobilizing, the sites used for well pads will be returned to their original, pre-Project state, unless otherwise requested by community or government.

Figure 2.1: Exploration Wells in Block RSF-5



Source: ERM, 2019

2.4.3 Logistics and Work Force

Eni Myanmar will establish and construct a new logistic base located 15.5 km from Magway Town, Magway region, Myanmar. The logistic base will comprise of location for equipment storage, chemical shelter, hazardous material covered area, warehouse, accommodation area and offices. The minimum area required for the logistics base will be 150 m x 130 m = ~19,500 m^2.

The Project will involve an average of 40 - 60 workers for the Site Preparation and Construction phase (with peak of 100 workers), and 120 - 140 workers for the Drilling Operation Phase. During the Site Preparation and Construction, when the logistic base would not be yet established, a portion of the workers are planned to stay in a nearby hotel accommodation. Once the logistic and Project accommodation base is set up, workers will then move into the arranged accommodation, which will most likely be towards the end of the Site Preparation and Construction phase.

2.4.4 Emissions, Discharges and Waste Management

All solid and liquid wastes will be transported by government authorized Contractors, with proper means, to a dedicated waste plant, where the waste will be treated and finally disposed according to local environmental regulations. Eni Myanmar will adopt the Technical Guideline – Waste Management in Upstream Oil&Gas Activities (Document Code: AMTE-TG-010) as the main procedure for waste management of this RSF-5 Exploration Drilling campaign.

Drilling fluids and cuttings will be managed and disposed of appropriately according to Myanmar law, minimizing environmental impacts. The main steps involved in the management of mud and cuttings waste are as follows:

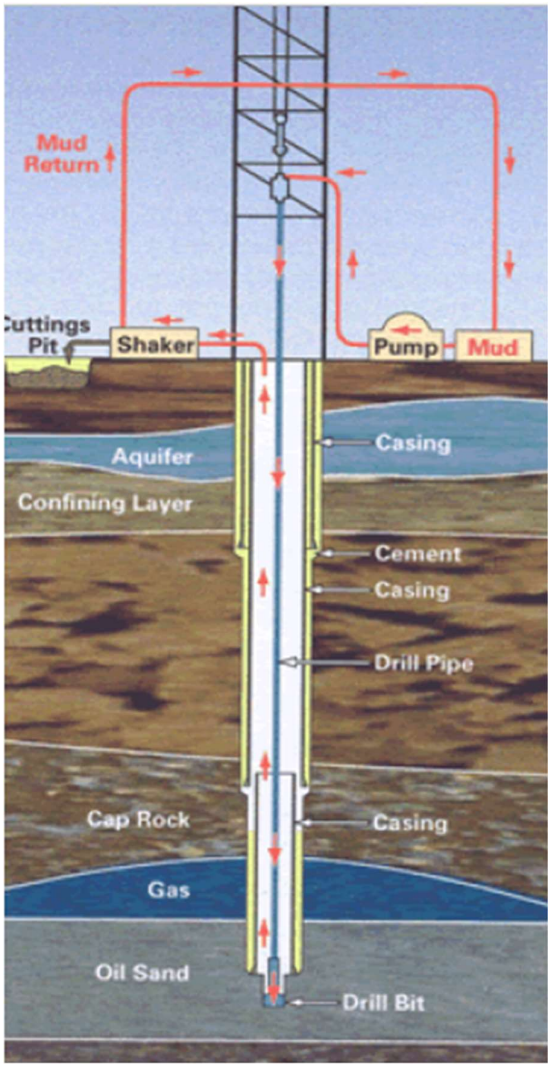
- After cutting removal/separation from well mud, cutting will be collected in the waste pits at the drilling well pad;
- The cuttings and the waste mud will be then collected and transported, separately as solid waste and liquid waste, to the DOWA authorized waste management plant by dedicated trucks. This process is done separately for WBM and NAF mud systems, as described below; and
- Leftover mud, after passing the solid control treatment (shale shakers), is then transferred to the mud tanks from where it will be reused and pumped again in to the well through the drilling string.

2.4.5 Project Schedule

Drilling exploration activities are expected to begin tentatively in November-December 2019, subject to commissioning program and work schedule. The drilling, abandonment and demob/restoration of the first well is planned to be completed within June 2020.

In case of hydrocarbon discovery in Ondwe Deep-1, post-well studies will follow to support proper planning of well testing activities on the first well. In case of successful well testing, hence proving reservoir deliverability, the second well (Ondwe Deep-2) will be prepared and drilled to explore another segment of the structure.

Figure 2.2: Sub-Surface Drilling Diagram (Example)



Source: Eni, 2019

2.5 Description of the Surrounding Environment

Section 5 describes the environmental, social and health conditions which could be affected by Project activities within Block RSF-5 and the Project Study Area.

2.5.1 Setting the Study Limits

For this Project, the Study Area boundary is generally limited to within a 5 km radius of the well sites. This is a typical study area based on best practice for EIAs for oil and gas exploration projects, and is based on examination of the project activities and their potential impact extent.

2.5.2 Methodology for Data Collection and Analysis

Information on environmental, social and health baseline conditions in this report are based primarily on a combination of baseline survey and desktop review of existing information on the natural environment. For secondary data, the following sources were utilized, and are referenced as appropriate throughout the EIA Report.

- Existing reports and studies;
- Previous ESHIA 2016 of Block RSF-5[1];
- Government/ authority data;
- Internet research; and
- Collation of in-house existing data archives.

Primary data pertaining to the existing conditions of the Project Study Area was collected during a number of baseline sampling surveys, conducted by SEM and supervised by ERM, in the proposed block RSF-5 and near the well locations, between 21st March and 7th April 2019. Additional details on the baseline survey methodology and results are presented ***Section 5*** of this EIA Report.

2.5.3 Summary of Findings

A summary of key characterizations of key environmental, social and health resources is provided below. Complete discussion on the surrounding environment is presented in ***Section 5***.

- **Climate and Meteorology** - The Project Area is located in Block RSF-5, which is located in the central region of Myanmar falling into two climatic zone, which are, tropical steppe and tropical savannah climate. Both of these climates a categorized as arid zone. Magway Region has a mean daily maximum and minimum temperature is between 39°C (April) and 14°C (January), respectively. Moreover, rainy season starts from May and end in September with August having the highest amount of precipitation (approximately 125 mm).
- **Air Quality** - Myanmar was ranked by a study conducted by World Health Organisation (WHO) as a country with high levels of particulate matter[2]. The principle sources of emissions to the atmosphere in the immediate vicinity of the Project Study Area are likely to be from household fires from domestic purposes (e.g. cooking, heating and lighting) as well, as from exhaust emissions from road transportation and combustion from waste burning[3]. From the baseline of air quality monitoring survey, most air quality parameters met the compared standards, with the exception $PM_{2.5}$, PM_{10} and SO_2 in some locations.
- **Greenhouse Gas Emissions** - According to data from the World Resources Institute (2014), Myanmar's total GHG emissions (excluding land use change and forestry) in 2013 were 98.75 million tons of CO2 equivalent ($MtCO_2$)[4]. The major sectors producing CO_2 emissions are agriculture (65%) and energy (22%).
- **Topography** - The proposed Project is located on predominantly low-lying topography in Magway Region, which is in the central area of Myanmar. The elevation of Block RSF-5 and its surroundings varies from approximately 32 m to 196 m a.m.s.l. (above mean sea level).
- **Noise** - From five (5) noise monitoring (recorded over 48 hours) only one average noise level was recorded to be above the respective Myanmar NEQG (National Emission Quality Guideline) standard. This exceedance was found at night time, where the L_{aeq} was recorded to be 50 (where the NEQG standard at night time is 45 dB(A).

[1] An ESHIA study was conducted in 2016 by IEM for Eni for a seismic survey. As part of the ESHIA study, a combination of baseline sampling were conducted to compliment the gap of the baseline data and were presented in the report.

[2] World Health Organisation, 2016. Ambient Air Pollution: A Global Assessment of Exposure and Burden of Disease, http://apps.who.int/iris/bitstream/10665/250141/1/9789241511353-eng.pdf?ua=1, accessed on November 8, 2018.

[3] MyanmarTimes, 30 SEP 2016, Myanmar's air pollution among the worst in the world: WHO. http://www.mmtimes.com/index.php/national-news/22840-myanmar-s-air-pollution-among-the-worst-in-the-world-who.html

[4] CAIT Climate Data Explorer – Myanmar. [Online] Available at: http://cait.wri.org/profile/Myanmar [Accessed 15 May 2017].

- **Surface Water** - Concession Block RSF-5 is located on the Irrawaddy Sub-Basins. The Irrawaddy River originates in the northern region of Myanmar in Kachin. This river flows through Block RSF-5 from the north, and curving towards the western section of the block before continuing south and leaving through the south of the concession block. The total drainage area of lower Irrawaddy is approximately 95,600 km^2, with an estimated flow rate varying from 2,300 m^3/s during the summer to 32,600 m^3/s in the monsoon season[1]. According to the sampling results, most water parameters were found to be within all three compared standards; Myanmar NEQG, IFC and EPA standards except for suspended solids. Suspended solids at five out of seven monitoring location was measured to be above the standard of 50 mg/L (as per the Myanmar NEQG).
- **Geology -** Myanmar can be subdivided into six trending tectonic domains: (a) the Arakan (Rakhine) Coastal Strip; (b) the Indo-Buraman Ranges; (c) the Western Inner-Burma Tertiary Basin; (d) the Central Volcanic Belt; (e) the Eastern Inner-Burma Tertiary Basin; and (f) the Sino-Burma Ranges[2]. The Project Study Area is located on the Western Inner-Burma Tertiary Basin. Block RSF-5 hosts the Ohn Twe structure which is the objective of the exploration drilling. It is located towards the south along the same hydrocarbon structural trend of Yenangyat-Chauk-Yenangyaung fields[3].
- **Soil** - Myanmar has been classified into ten (10) main soil types; the categorization can be seen by the project location plotted on the Myanmar soil profile map. Block RSF-5 is situated on soil classified as Luvisol, Nitisol and Lixisol. The soil texture in the Project location is generally loamy to clayey, especially in Lixisol soil area. This soil texture is capable of holding water which is favorable for agricultural purposes. From the soil baseline sampling laboratory analysis, the two parameters that exceeded the standard were Nickel and Vanadium. Other parameters were found to be within the standards.
- **Groundwater** - Based on Water Utilization Department of Myanmar, they have divided Myanmar's groundwater bodies into 13 major aquifers, namely: Alluvian, Irrawaddian, Peguan, Ecoene, Flysch, Cretaceous, Kalaw, Plateau Limestone, Lebyin, Cambrian, ChaungMaGyi, Metamorphic and Igneous. Block RSF-5 is situated on two different aquifer types, that is, Irrwaddian and Peguan aquifer. According to the sampling results, almost all results were found to be below the compared standards, with the exception of nitrogen, iron, and total coliform.
- **Biological Resources** - Majority of the flora located in the Project Study Area comprise of typical flora for a dry dipterocarp forest in central Myanmar with a potentially rare species known as white silk cotton. Fauna identified in the block are of those found in a general dry dipterocarp forest. It was found that the dominating habitat inside the Study Area is agricultural area (modified habitat) with a small portion of degraded mangroves nearby the riverbanks. One of the key findings from the biodiversity surveys was the identification of 5 species that are endemic to the Study Area, namely vinous-breasted myna (Acridotheres burmannicus), streak-eared bulbul (Pycnonotus blanfordi), white-throated babbler (Chatarrhaea gularis), Burmese bush lark (Mirafra microptera), and hooded treepie (Crypsirina cucullata). No protected area or sanctuary were found overlapping with Project Area.
- **Social Resources** - The area of interest for social resources includes Magway, Minhla and Minbu township, with a combination total of 25 wards and 191 village tracts, all of which are located in

[1] Ministry of Electric Power, 2013, Initial Environment Examination – Proposed Loan Republic of the Union of Myanmar: Power Distribution Improvement Project. https://www.adb.org/sites/default/files/linked-documents/46390-003-ieeab.pdf, accessed on November 8, 2018.

[2] Gadjah Mada University, Department of Geological Engineering, 2010, Report on Regional Geology of Myanmar. http://myanmar-preview.iwmi.org/sites/default/files/Documents/regional_geology_of_myanmar.pdf, accessed on November 8, 2018.

[3] Nyi Nyi Soe, 2017. Stratigraphic Control of Upper Pondaung Sandstone, Letpando Oil Field, Central Myanmar Basin, Search and Discovery Article no. 20408. http://www.searchanddiscovery.com/documents/2017/20408soe/ndx_soe.pdf accessed on November 2018.

Magway region. The latest census report stated that there was a total of 3,917,055 people living in Magway region (as of 2014), ranking as the seventh most populated region. Majority of the people in this region are business owner, farmer or day labor with a 28.7% unemployment rate. With regards to public services, there were a total of 100 hospital within the region (as of 2016) and 22.7% of total population have access to electricity from the national grid. The common mode of transportation in Magway, Minhla and Minbu are motorcycle, bicycle and bullock-cart. Magway interviewees mainly use motorcycle but also travel by foot. Traffic is very light on the roads in the Project SAoI. There are two significant cultural landmarks; the Myathalun Pagoda and Minhla Fortress.

- **Health Resources** - In Magway region, the most common disease are common fever, heart disease, diabetes, and gout. There are health centres within walking distances available in most villages but these are considered inadequate and insufficient by the local population. In case of serious medical issue or emergency, the villagers will have to travel to Magway hospital which is about 19 km away from the project sites. In 2016, in Magway region, there were 100 hospitals, 3,129 sanctioned beds, 3,736 available beds, 216,998 admissions, 215,690 discharges and deaths, 965,099 patient days, 2,148 numbers of death, hospital death rate at 1%, and 513,948 out-patient attendance.

2.6 Highlights of Key Impacts and Mitigation Measures

A summary of key impacts from the Project, as well as the results of impact assessment, and key mitigation measures, are listed in ***Table 2.1*** through ***Table 2.3***. This is only a brief summary of the most important impacts (those with non-negligible residual impact significance) and the key associated mitigation measures. Full details on all potential impacts from each activity are presented in ***Section 6,*** and a list of mitigation measures for each impact is presented in the EMP in ***Section 8***.

The mitigation measures are employed to reduce the likelihood of the impacts identified, and/or to limit the extent or severity of impact if one does occur. The purpose of the proposed mitigation measures is to manage identified impacts, comply with regulations and ensure that standards of international industry practice are adopted during the execution of all Project activities. It should be noted that all identified potential impacts can be appropriately managed with the implementation of these mitigation measures, and there are no major residual impacts from Project activities.

Table 2.1: Mitigation Measures for Project during Construction and Site Preparation Phase

Resource/Receptor	Summary of Key Potential Impacts	Impact Significance Pre-Mitigation	Summary of Key Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
Air Quality and GHG Emissions	■ Temporary emissions of nitrogen oxides (NOx), sulphur dioxide (SO_2), dust and particulates (PM_{10} and $PM_{2.5}$) from mobile and non-mobile construction-related activities.	Moderate	■ Regularly inspect and maintain vehicles, engines and generators operating at optimal efficiency. ■ Shut down generators, compressors, and other equipment when not in use. ■ Use optimal transport routes (to reduce distance). ■ Do not overload vehicles.	Minor
	■ Dust dispersion is expected from: - land preparation activities such as excavating, grading and clearing existing vegetation. - temporary stockpiles during construction access of roads	Moderate	■ Use of water sprinkling for dust suppression where dust is being created from works impacting nearby community. ■ Only strip and clear areas specifically required for planned Project works. ■ Reduce vehicle speed when passing nearby communities. ■ Fully cover truck loads during material transportation.	Minor
Noise and Vibration	■ Increased noise and vibration from: - construction site vehicles and equipment - transportation of workers, material and waste from and to site - operation of generators	Minor	■ Equipment to be operated and maintained in accordance with manufacturer specifications. ■ Where possible, carry out loud[1] or vibration-intensive construction activities during the daytime. ■ Reposition noisy equipment to reduce offsite noise impacts.	Minor

[1] Any operation that generate noise level greater than 55 dB(A) during day and 45 dB(A) during night. Where the noise baseline level is above 55 dB(A) during the day or 45 dB(A) during the night, operation that increases this baseline by 3 dB(A) is considered as loud.

Resource/Receptor	Summary of Key Potential Impacts	Impact Significance Pre-Mitigation	Summary of Key Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
Biodiversity and Ecosystem Services	■ Drainage works (e.g. stormwater drainage systems) and use of construction equipment and vehicles may have a negative indirect impact on flora and fauna due to increased sediment loading of streams and rivers. ■ River sediments may be disturbed, resulting in loss of habitat at and around the riverbank landings. This may impact the native flora and fauna through direct clearing and habitat loss, as well as fragmentation of habitat and breeding area disturbance (should these be present).	Minor	■ Limit construction works only to well pad, storage/accommodation areas, and access roads. ■ Clear vegetation only as required to install the proposed facilities. ■ Check weather daily for the area. Stop earthworks during heavy rain. ■ Installation of erosion controls where embankments are exposed to prevent erosion during heavy rains. ■ Minimize disturbance to river sediments when constructing/installing riverbank landings.	Minor
	■ Potential harm to flora and fauna by physical destruction of habitats.	Minor	■ Limit clearing of established vegetation and other potential habitat areas to only the extent required for construction works. ■ Clearly mark the extent of areas to be cleared.	Minor
	■ Biodiversity could be impacted by deterioration of habitat if contaminated material is imported.	Minor	■ Consider validation sampling of imported fill material. ■ Make sure that fill materials are obtained from approved or designated locations/areas.	Minor
	■ Terrestrial fauna could be impacted from vehicle strikes. ■ Natural habitat or feeding ground of terrestrial animals has the potential to be damaged or destroyed due to the movement of project vehicles and equipment.	Minor	■ Prohibit vehicles from moving offsite or off designated transportation routes onto surrounding land. ■ Raise awareness in the personnel and adequately train the drivers.	Minor
	■ Unauthorized/illegal fishing and hunting by workers could impact biodiversity. ■ Harvesting of plants and animals by workers.	Minor	■ Prohibit workers from foraging, fishing and hunting.	Minor

Resource/Receptor	Summary of Key Potential Impacts	Impact Significance Pre-Mitigation	Summary of Key Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
Land/River Use and Livelihood (incl. Economic Displacement)	■ Potential disruption to existing land use due to land acquisition. ■ Project development could impact the existing local communities within the area through physical and economical displacement. This could lead to the need for economic compensation as livelihood could also be affected.	Moderate	■ Undertake land acquisition in accordance with local laws and international best practice (such as International Finance Corporation Performance Standards). ■ Compensate stakeholders whose land is temporarily or permanently impacted during construction and operation using market price with a premium to compensate for the change and allow for restoration of the land to its original state for the logistic base area.	Minor
	■ Construction of well sites has the potential to change existing land use, including loss of residential land and structures on land, loss of productive land and crops, and loss of other previous land uses, and potential degradation of crops or surrounding land used for agriculture. ■ Potential degradation of surrounding water bodies used for fishing or aquaculture.	Moderate	■ Compensate stakeholders whose crops is being impacted during site preparation and construction using market price identify by government led committee (including village heads). Compensation should be paid until land has been restored to its initial productive state; ■ Limit clearing of established vegetation areas to only the extent required for the Project.	Minor
	■ Land use at source material site could be affected.	Moderate	■ Make sure that fill materials are obtained from approved or designated locations/areas.	Minor
	■ Potential disruption to farming due to construction activities. ■ Potential impact to soils and agricultural land through compaction from construction activities	Moderate	■ Limit transportation only to well pad, storage/accommodation area, and access roads, to avoid disturbance to surrounding land.	Minor
Public Infrastructure and Utilities	■ Heavy equipment may damage existing roads. ■ Upgrade and construction of access road may disrupt local access for resident and business.	Moderate	■ Construction equipment to use designated roads and Project area only, avoid traveling off roads and enforce speed limit. ■ Set up proper traffic signs and equipment to ensure traffic safety on the new road. ■ Develop and implement a traffic management plan to minimize the impact experienced by road users as a result of the Project.	Minor

Resource/Receptor	Summary of Key Potential Impacts	Impact Significance Pre-Mitigation	Summary of Key Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
	■ Increase in local road traffic due to presence of Project vehicles. ■ Potential damage to existing roadways due to use of heavy machinery and vehicles during construction. ■ Potential for increased safety risk from increase in traffic due to Project related vehicles (covered under Unplanned Events).	Moderate	■ For access roads where there is increased traffic, stabilize with compact laterite, gravel, concrete or similar. ■ All Project vehicles shall use designated roads only, and avoid traveling off roads. ■ Implement driving safety standards as part of a Traffic Management Plan, including enforced speed limits. ■ Plan heavy traffic activities with local stakeholders to avoid peak hours, start or end of school hours or specific local activities (such as religious festival).	Minor
	■ Project's water use requirements could potentially reduce the local water supply.	Moderate	■ Only use approved and permitted water supplier and exploit wells with adequate permit. ■ Consider using multiple water sources and at further distance if close proximities of project areas might experience water scarcity.	Minor
Socio-Economy	■ Increased employment/income and procurement opportunities for people, business and services in surrounding area (positive impact).	Positive	■ Hire local labour as much as possible. Unskilled job for local people as a priority. ■ Ensure a fair hiring process. ■ Procurement of goods using local businesses whenever possible. ■ Use nearby sources of fill material that are obtained from approved or designated locations/areas.	Positive
Visual Landscape	■ Existing visual landscape will be altered due to the changed landforms during site preparation, as well as presence of numerous construction vehicles.	Minor	■ Limit the removal of trees and other natural features in the project areas to the strict minimum necessary evaluating the particular species to be removed and their protection status.	Minor

Resource/Receptor	Summary of Key Potential Impacts	Impact Significance Pre-Mitigation	Summary of Key Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
Community Health and Safety	■ Potential health impacts due to dust, waste generated from construction activities.	Moderate	■ Implement same measures to mitigate impacts to air quality and impacts associated with waste management. ■ A complementary occupational health and safety plan should be developed – to focus on managing potential issues that may affect the Project workforce.	Minor
	■ Presence of workers from other areas may lead to increased risk of infectious diseases including sexual transmitted diseases. ■ Increase in risk of traffic accident. ■ Depending on location and community relationships, general disturbance and tension within the community due to worker presence.	Moderate	■ Provide appropriate amenities at the workforce accommodation camp – e.g. recreational opportunities. ■ Develop and implement a Worker Code of Conduct for all employees, contractors and visitors directly related to the Project.	Minor
Occupational Health, Safety and Working Conditions	■ Construction and operation of any large Project poses health and safety risks to workers. These risks are present at almost every stage of site preparation, construction and drilling.	Moderate	■ Implement Eni's management plans relevant to occupational health and safety. ■ The Project will develop and implement a Construction Occupational Health and Safety Management Plan (OHSMP) in line with good industry practice and corporate policies and specific to the Project AoI and Project activities. ■ The Contractor will prepare and implement a Health, Safety and Environmental Plan prior to commencing work (and to be approved by Company).	Minor
	■ Any large scale Project with a requirement for a large workforce, if not managed properly, has a risk of inadvertently supporting or utilizing child labor. ■ Any large scale Project with a requirement for a large workforce, if not managed properly, has a risk of causing unsafe or unfair working conditions.	Moderate	■ Implement Eni's management plans relevant to occupational health and safety and working conditions. ■ Monitor deviation to the internal standard guiding labour practices and applying to the supply chain to ensure that no child and/or forced labour will be employed by the EPC contractor and its sub-contractors.	Minor

Resource/Receptor	Summary of Key Potential Impacts	Impact Significance Pre-Mitigation	Summary of Key Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
			■ An Occupational, Health, and Safety (OHS) monitoring programme should be put in place to verify the effectiveness of prevention and control strategies and a workers grievance mechanism developed and implemented.	
Various Resources and Receptors – Impacts from Management of Waste, Wastewater, and Hazardous Materials	■ Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to biodiversity and social receptors.	Moderate	■ All type of waste must be handled, stored, and disposed in accordance with relevant regulations and provision of waste management plan that will be issued. ■ Provide adequate facilities for collection and treatment of wastewater (as required), storage and legal disposal of general waste, solid waste, chemicals etc. ■ Clean up spills immediately and dispose into appropriate bin for collection. ■ Waste materials will be managed under Eni's Waste Management Plan. ■ Use authorized and permitted waste facilities and services and ensure an adequate waste management hierarchy to be respected. ■ Also refer to management of Accidental Releases in Unplanned Events.	Minor
	■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to biodiversity and social receptors.	Moderate	■ Provide adequate facilities for collection and treatment of wastewater (as required), storage and legal disposal of general waste, solid waste, chemicals etc. ■ Where discharge is required, effluent shall be treated to meet water quality standards as per Myanmar's NEQG. ■ Use authorized and permitted waste facilities and services ■ Also refer to management of Accidental Releases in Unplanned Events.	Minor

Resource/Receptor	Summary of Key Potential Impacts	Impact Significance Pre-Mitigation	Summary of Key Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
	■ Hazardous materials (such as fuels, oils, lubricants or solvents), if not managed appropriately, could accidentally spill or leak, directly impacting surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to biodiversity and social receptors.	Moderate	■ Provide adequate facilities for collection and treatment of wastewater (as required), storage and legal disposal of general waste, solid waste, chemicals etc. ■ Maintain spill kits/equipment, and posted spill procedures, on site and with any Project related works. ■ All fuel and hazardous substance storage areas to be located above historical flood level. ■ Contain all fuel tanks and other hazardous substances in a fully bunded area with a storage capacity of at least 110% of the total potential storage volume. ■ Store and handle all hazardous substances in accordance with their SDS. ■ Refueling and machinery maintenance is to be undertaken in a designated, sealed, bunded area. ■ Also refer to management of Accidental Releases in Unplanned Events.	Minor

Table 2.2: Mitigation Measures for Project during Drilling Operation Phase

Resource/Receptor	Potential Impacts	Impact Significance Pre-Mitigation	Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
Noise and Vibration	■ Increased noise and vibration from machinery and vehicles used to transport rig. ■ The use of equipment and machinery, particularly generators for the drilling rig, during 24 hour drilling activities will generate noise that may impact nearby residents. ■ Noise associated with the Drilling Operations has the potential to disturb local nocturnal species.	Major	■ Implement same measures as for impacts to noise and vibration in Site Preparation and Construction Phase. ■ Ensure that generators of drilling rig are kept in enclosures to reduce sound output.	Moderate
Groundwater	■ Impacts to groundwater from accidental releases of fluids from drill sleeve.	Moderate	■ Make sure well design allows for isolation of aquifers and shallow gas from well bore.	Minor
	■ Impacts to groundwater may be from water use for the project needs impacting groundwater availability depending on source and quantity of water required during Drilling Operation.	Moderate	■ Make sure that groundwater wells are installed to a suitable depth (at least 5 m). ■ Only use approved and permitted groundwater wells and keep track of abstraction and of water parameters.	Minor
Biodiversity and Ecosystem Services	■ Drilling activities will cause impacts from noise and vibration, as well as light contamination, which may negatively influence the distribution and habits of endemic or endangered fauna, in particular avifauna, which may avoid feeding grounds and usage of certain corridors due to disturbance.	Minor	■ Implement measures to reduce impacts due to noise and vibration (as stated above). ■ Implement directional lighting to reduce light spill to species and keep light intensity as low as possible.	Minor
	■ The development of new access roads, as well as increased traffic on existing roads, presents a risk of accidental mortality or injury to fauna as a result of collision with moving vehicles.	Minor	■ Work areas will be clearly demarcated and any activities outside these areas will be prohibited. ■ Prohibit vehicles from moving offsite or off the designated transportation routes onto surrounding land.	Minor

Resource/Receptor	Potential Impacts	Impact Significance Pre-Mitigation	Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
	■ Labour influx and worker accommodation in work camps may lead to unauthorized hunting and harvesting of plants and animals by workers which could impact biodiversity.	Minor	■ Prohibit workers from foraging, fishing and hunting.	Minor
	■ Ecosystem services include provisioning services such as use of water, which may be temporarily affected by the project activities.	Minor	■ Prohibit workers from foraging, fishing and hunting. ■ Limit interference with natural drainage flows. ■ Implement an Erosion and Sediment Control Plan. ■ Include in the contract requirement to avoid works during breeding seasons in areas for which IUCN listed species have been recorded.	Minor
Public Infrastructure and Utilities	■ The use of heavy vehicles during rig mobilization will cause vibration which might affect local infrastructure such as roads and bridges.	Moderate	■ Develop and implement a traffic management plan to minimize the impact experienced by road users as a result of the Project.	Minor
	■ The water will be extracted from the water wells drilled during construction phase with a potential risk to impact water availability for local stakeholders if the groundwater tables used by the Project are the same as the ones used by local villages.	Moderate	■ Continue to implement the Stakeholder Engagement Plan and Grievance Mechanism developed for the construction phase as part of the Project. ■ Implement same measures as for impacts to groundwater.	Minor
	■ Increase of labour influx and worker accommodation will put a greater pressure on the existing public infrastructures and utilities.	Moderate	■ Ensure that company medical services have sufficient capacity and capability to treat a reasonable amount of workers at the same time. ■ Prioritize the recruitment of unskilled position to reduce number of transferring workers. Workers recruited during construction phase should be retained in the work force when possible.	Minor
Socio-Economy	■ A number of potential positive impacts, including: - Provides training opportunities. - Provides job opportunities. - Increased demand for services and logistics.	Positive	■ N/A – positive measure	Positive

Resource/Receptor	Potential Impacts	Impact Significance Pre-Mitigation	Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
	- Improved capacity of local human resources (training etc.). - Improvement in local economic structure.			
Visual Landscape	■ Potential impacts to visual envelope and landscape due to the presence of the rig and lighting at night time.	Moderate	■ Illuminate the area as necessary, keeping the intensity as low as possible and direct/focus lighting on well pad areas only.	Moderate
Community Health and Safety	■ Potential impacts from operation of transportation vehicles during rig mobilization to site concerning safety of the surrounding community along the transport route.	Minor	■ Ensure that signs are put up around the site advising people of the risks associated with trespass. All signs should be in diagram form to ensure those with low levels of literacy understand the signs. ■ Fencing will be checked daily to ensure that it is in good condition and to look for any signs of entry. ■ Continue the Stakeholder Engagement Plan and the Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities.	Minor
	■ Presence of workers from other areas may lead to increased risk of infectious diseases including sexual transmitted diseases.	Minor	■ Training for all workers on the transmission routes and common symptoms of communicable diseases. ■ Undertake pre-employment screening to ensure fitness for work. ■ Develop and implement a Workforce Code of Conduct with specific measures that target anti-social behaviour, such as becoming involved with commercial sex workers.	Minor
Occupational Health, Safety and Working Conditions	■ Potential impacts from the operations of transportation vehicles during rig mobilization to site concerning safety of the operators. ■ Potential impacts from operation from drilling operations concerning safety of the operators. ■ Personnel movements to and from location (crew changes, etc.) throughout the day will	Minor	■ Keep implementing the mitigation measure from the Site Preparation and Construction Phase. ■ The Occupational Health and Safety Management Plan (OHSMP) will be updated to integrate the new potential risks of the drilling operation and be linked to the Emergency Response Plan for unplanned event.	Minor

Resource/Receptor	Potential Impacts	Impact Significance Pre-Mitigation	Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
	require multiple trips by minibuses or vans which may increase the likelihood of accidents. ■ Potential risks to community health and safety due to deterioration of air quality from power generators.		■ Maintain the grievance mechanism for workers.	
Various Resources and Receptors – Impacts from Management of Waste, Wastewater, and Hazardous Materials	■ Inappropriate management of waste, wastewater, or hazardous materials could lead to impacts to multiple physical, biological, and social resources and receptors.	Moderate	■ Implement relevant measures from Site Preparation and Construction Phase to reduce significance of impacts from management of waste, wastewater and hazardous materials. ■ Also refer to management of Accidental Releases in Unplanned Events.	Minor
	■ Solid waste, wastewater and hazardous material management and handling, if not managed appropriately during drilling activities, could directly impact soil as well as secondary receptors such as biodiversity and human that interact with the impacted soil.	Moderate	■ Limit mixing of drilling fluids on site – pre-mix wherever possible. ■ Treat water used during Drilling Operations prior to any discharge off-site. Where discharge is required, effluent shall be treated to meet water quality standards as per Myanmar NEQG. ■ Store mud and cuttings in adequate containers and ensure appropriate offsite treatment and disposal. ■ Regularly monitor cuttings pits to detect any potential loss of containment. ■ Drill cuttings and mud requiring disposal are to be fully contained and transported by authorized and permitted transport Service Company and permitted waste facility; ■ Potentially contaminated run-off should be directed to sumps or evaporation pits, and treated prior to any discharge to surroundings. ■ Where discharge is required, effluent should be treated to meet water quality standards as per Myanmar's NEQG.	Minor

Resource/Receptor	Potential Impacts	Impact Significance Pre-Mitigation	Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
			■ Provide concrete rig pad with drainage gutters to collect runoff to a suitably sized lined or concrete dirty water pit to collect water from rig pad with sediment and oil trap. Test water before discharge and treat or dispose as appropriate. ■ Develop and implement controls and standard operating procedures for the use of hazardous substances to prevent spills and accidents. ■ All hazardous materials to be transported, stored and managed according to their SDS. ■ Appropriate spill contaminant kits are to be made available on-site. ■ Conduct monitoring of water and soil quality in order to assess no contamination has occurred.	

Table 2.3: Mitigation Measures for Impacts due to Unplanned Events

Event	Potential Impacts	Impact Significance Pre-Mitigation	Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
Vehicle Collision	■ Increased traffic volume in Project area may potentially increase risk of accidents with local community. ■ Secondary impact from the spill of oil or hazardous materials from vessel entering to watercourses or coming into contact with habitat. ■ Potential increase in incidence of traffic accidents due to higher traffic volume from transportation for Project. ■ Potential obstructions to traffic due to collisions or accidents. ■ Vehicle collision could affect the community health and safety. ■ All accidents for the Project pose health and safety risks to workers.	Moderate	■ Provide training to drivers. ■ Use only properly licensed drivers and transport companies. ■ Implement “No Night Driving Policy” and foresee breaks for long travels. ■ All Project vehicles shall use designated roads only, and avoid traveling off roads. ■ Implement driving safety standards as part of a Traffic Management Plan, including enforced speed limits. ■ Inform Project drivers of sensitive traffic areas, e.g. location of schools, shrines, temples, mosques, health clinics, hospitals etc. Reduce speed limits for these areas. ■ Avoid haulage tasks during peak traffic periods and school drop-off and pick-up times. ■ Maintain pedestrian access wherever possible, including access to any settlements and other facilities. ■ Notify the local communities about proposed changes to local traffic access due to construction activities and providing clear signage of changed traffic conditions. ■ Implement Eni’s relevant policies and procedures, including: - Emergency Response Plan and Strategy; - pol HSE 001 Eni Myanmar r02 - HSE Policy; - pol HSE 002 Eni Myanmar r02 - Driving Policy; - pol HSE 003 Eni Myanmar r02 - Alcohol, Smoking and Drugs Policy - pro HSE 017 2016 r00 - Land Transportation; and - Management plans relevant to occupational health and safety and working conditions.	Minor
Accidental Releases	■ Accidental leaks or spills of oil, fuel, or other hazardous materials could potentially pollute surface waters.	Moderate	■ Store chemicals, fuels, and lubricating oil in a secured storage area with impervious (cement or plastic sheet) floor and bund wall and according to SDS.	Minor

Event	Potential Impacts	Impact Significance Pre-Mitigation	Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
	■ Soil may be contaminated by pollution from spills or leaks of fuel, oil and other hazardous materials. ■ Leaching of contaminated soil may lead to subsequent groundwater pollution. ■ Potential harm to aquatic and terrestrial flora and fauna due to spills of oil, fuel, cement or other hazardous substances entering watercourses or coming into contact with habitat. ■ Potential secondary impacts to fisheries due to reduction in fish population from pollution of rivers. ■ Accidental spills or leaks of hazardous materials from the Project could result in indirect impacts to community health and safety due to contamination of drinking water or food. ■ All accidents for the Project pose health and safety risks to workers. ■ Accidents, exposure to air pollutants, dust, or noise, water contaminated by accidental spills. ■ Increased stress on local health care facilities.		■ Handle all chemicals according to their SDS. ■ Provide training and conduct spill exercises. ■ Provide appropriate medical care, clean-up, and file incident or accident reports. ■ Provide spill kits onsite and adequate PPEs to workforce for minor spills ■ Implement Eni's management plans relevant to occupational health and safety and working conditions. ■ Implement Eni's Emergency Response Plan. ■ Implement applicable Eni Standards and Guidelines. ■ Use a Shipboard Oil Pollution Emergency Plan (SOPEP) and/ or Oil Spill Response Plan in place for all barges/vessels involved in the project activities.	
Wellhead Blowout	■ An uncontrolled well event could result in heat, fire or explosion, potentially impacting flora and fauna surrounding the Project site, as well as posing risks to public health and worker health and safety.	Major	■ Carefully plan Drilling Operation by identifying shallow gas hazards, using high quality materials for well construction, using standard drilling and well control standard operating procedures, and using proper drilling mud formulation with additives if necessary (well kill fluids, loss control and weighting agents). ■ Install blowout preventer (BOP) stacks and shear rams; ■ Test safety devices prior to start-up for function and integrity.	Minor

Event	Potential Impacts	Impact Significance Pre-Mitigation	Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
			■ Continuously monitor pressure in the well and recycled mud during drilling. ■ Provide high-pressure water-spray dousing system on drilling rig. ■ Provide blow out response procedure plan in addition workers will be trained about this plan before start Drilling Operation. ■ Provide warning sign and firefighting equipment during Drilling Operation. ■ Provide fire/muster drill plan and conduct regular drills. ■ Implement Eni's Emergency Response Plan and Strategy. ■ Comply with opi_sg_hse_040-ups-r01-HSE Unsafe Condition and Unsafe Act. ■ Undertake drilling with international best practice safety procedures as per API and all applicable ENIs policies and standards. ■ Install a valve system (Christmas Tree) around the mount of the well in order to maintain petroleum pressure of the well at a suitable level. ■ Train employees on emergency procedures and induct whoever accessing to the site. ■ Install alarms and windsocks (to be audible and visible from whole site). ■ Always check the pressure in the well and recycled mud. ■ Implement applicable Eni Standards and Guidelines.	
Fire and Explosion (other than wellhead blowout)	■ Potential gas release and/or ignition could result in fire or explosion, potentially impacting flora and fauna surrounding the Project site, as well as posing risks to public health and worker health and safety. ■ A fire or explosion could result in the unplanned or uncontrolled release of	Moderate	■ Provide warning signage. ■ Provide medic, first aid kit and first aid room at well site. ■ Pre-communicate and coordinate with local firefighting brigade/station. ■ Implement Eni's Emergency Response Plan and Strategy. ■ Implement applicable Eni Standards and Guidelines. ■ Undertake all testing and commissioning, as well as abandonment works as required to applicable API international standards.	Minor

Event	Potential Impacts	Impact Significance Pre-Mitigation	Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
	gases from the wells, potentially impacting air quality. ■ A fire or explosion could result in the unplanned or uncontrolled release of greenhouse gases from the wells. ■ A fire or explosion could be a source of significant noise, vibration and light, and may also cause secondary impacts through destruction or damage to facilities at the well site. ■ Potential for secondary impacts to surface water quality due to damage of infrastructure, resulting in releases of hazardous substances to waterways. ■ Potential for secondary impacts to soil or groundwater due to damage of infrastructure, resulting in releases of hazardous substances to soil (and subsequent leaching to groundwater). ■ A fire or explosion could result in intense heat, smoke, and unplanned or uncontrolled release of gases, potentially impacting flora and fauna surrounding the Project site. ■ Potential secondary impacts to fisheries due to reduction in fish population from pollution of rivers. ■ A fire or explosion could result in intense heat, smoke, and unplanned or uncontrolled release of gases, potentially impacting community health and safety.		■ Implement the recommended mitigation measures for Well Blowouts. ■ Restrict smoking to controlled areas only. ■ Conduct fire training and response drills. ■ Obtain map and route of existing gas pipelines along proposed access routes (if applicable). ■ Multiple mechanical barriers and bridge plugs shall be set into the abandoned well. ■ Hydraulic barrier(s) should be incorporated into the design of the abandonment. ■ The well should be sealed and capped at the surface.	
Natural Disasters	■ Summer thunderstorm may impact to worker in project area, damage structure and/or project's property	Major	■ Drilling pad structure and equipment design must be durable for heavy summer thunderstorm.	Minor

Event	Potential Impacts	Impact Significance Pre-Mitigation	Mitigation Measures	Impact Significance Post-Mitigation (Residual Impacts)
	■ Flooding has potential to disrupt land translation and ultimately stop construction activities ■ Potential risk of earthquakes throughout certain areas of Myanmar.		■ Avoid construction of well site and access roads in areas that may flood. ■ Build up well pad and access roads higher than historical flood. ■ Check weather forecast daily to ensure there are no major storms or weather events foreseen which could affect the safety of Project activities. ■ Implement Eni's Emergency Response Plan. ■ Implement applicable Eni Standards and Guidelines, including any relevant to sever weather plans.	

2.7 Public Consultation and Disclosure

Public consultation is an important aspect of the impact assessment process. As part of the EIA study, Eni has engaged with a number of stakeholders at the state/region, township and village level during consultations as per Myanmar's EIA Procedure. Eni Myanmar is committed to undertaking an engagement process that is in line with Myanmar regulation and delivers an inclusive and continuous dialogue with the Project stakeholders. ***Section 9*** of the EIA describes the stakeholder engagement activities undertaken during the development of the EIA. These include key issues raised by stakeholders and how each of these issues has been addressed in the EIA. As per the Procedure, Eni has conducted two rounds of Public Consultation, summarized as follows:

- **Scoping Phase Consultation (1st Round):** The first round of engagement was conducted between the 19th and the 23rd of March 2019 to provide the public with Project information and gather their feedback on the Project and the EIA schedule. These public consultation meetings were held with various relevant stakeholders at the regional level in Magway Region. The consultation helped the Project to gather information on potentially affected people, and on potential data gaps and how these can be closed out in the EIA Report. For this Project, the meetings were undertaken to disclose information on the Project at the regional level and to confirm our baseline understanding of the Study Area. There were no major concerns raised by any stakeholders. Some minor questions regarding anticipated environmental impacts, Product Sharing Contracts, job opportunities, compensations, road construction, Corporate Social Responsibility and requests for additional project details were raised. All of the issues were responded to appropriately by Eni, MOGE and ERM/SEM at the public meetings.
- **EIA Phase Consultation (2nd Round):** The second round of engagement have been conducted between the 27th and the 31st of May 2019 to provide the public with Project information, impacts, and mitigation measures, and gather their feedback on the Project, impacts, mitigation measures, and the EIA schedule to submission. These public consultation meetings were held with various relevant stakeholders at the regional and domestic level in Magway Region. There were no major concerns raised by any stakeholders. Some minor questions regarding details of the Project design and information, potential impacts from Project activities (such as impact from vibration, light, noise, waste, damages to infrastructure, cultural heritage sites, crops and livestock) and compensation and CSR Program were raised. All of the issues were responded to appropriately by Eni, MOGE and ERM/SEM at the public meetings. The implementation of the public consultation program achieved its goals in providing an opportunity for stakeholders to give opinions and recommendations on the Project. Opinions and recommendations obtained through public consultation have been used in the EIA study to help develop mitigation measures and monitoring programs on environmental and social impacts. Complete methodology and results of the Public Consultation activities are presented in ***Section 9*** of this EIA Report.

As per the requirements of the EIA Procedure, three (3) public disclosures were submitted (during the scoping phase, during the EIA study and after submission of EIA to ECD).

2.8 Statement of Commitments

Eni Myanmar will at all times comply fully with the commitments, mitigation measures, and plans that have been presented in this EIA Report. Eni Myanmar 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, including the Environmental Conservation Law (2012), Environmental Conservation Rules and Environmental Impact Assessment Procedure (2015), as well as the EMP, Project commitments and conditions.

Eni Myanmar and ERM hereby confirm that:

1. The EIA Report is accurate, consolidated and complete;
2. The EIA has been conducted in accordance with relevant laws, including the EIA Procedure (2015).

3. The Project will fully follow the commitments, mitigation measures and plans set out in this EIA Report.

3. INTRODUCTION

3.1 Project Overview

Eni Myanmar B.V. (Eni) was awarded the onshore Block RSF-5 and signed with MOGE a PSC on 30 July 2014. Eni Myanmar is the operator of the block with 90% W.I. while Myanmar Petroleum Exploration & Production Co. is the JV Partner with 10% W.I.

Eni previously conducted land seismic survey activities in this block in 2017-18, for which an Environmental, Social and Health Impact Assessment (ESHIA) Report[1] was prepared and approved by the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC). Eni is now planning to conduct exploration drilling in Block RSF-5 ("the Project"), expected to commence in December 2019. Associated preparatory civil works commencement is subject to the release of necessary authorizations. Block RSF-5 is located in southern central Myanmar, within Magway Region, covering an area of 1,292 km^2.

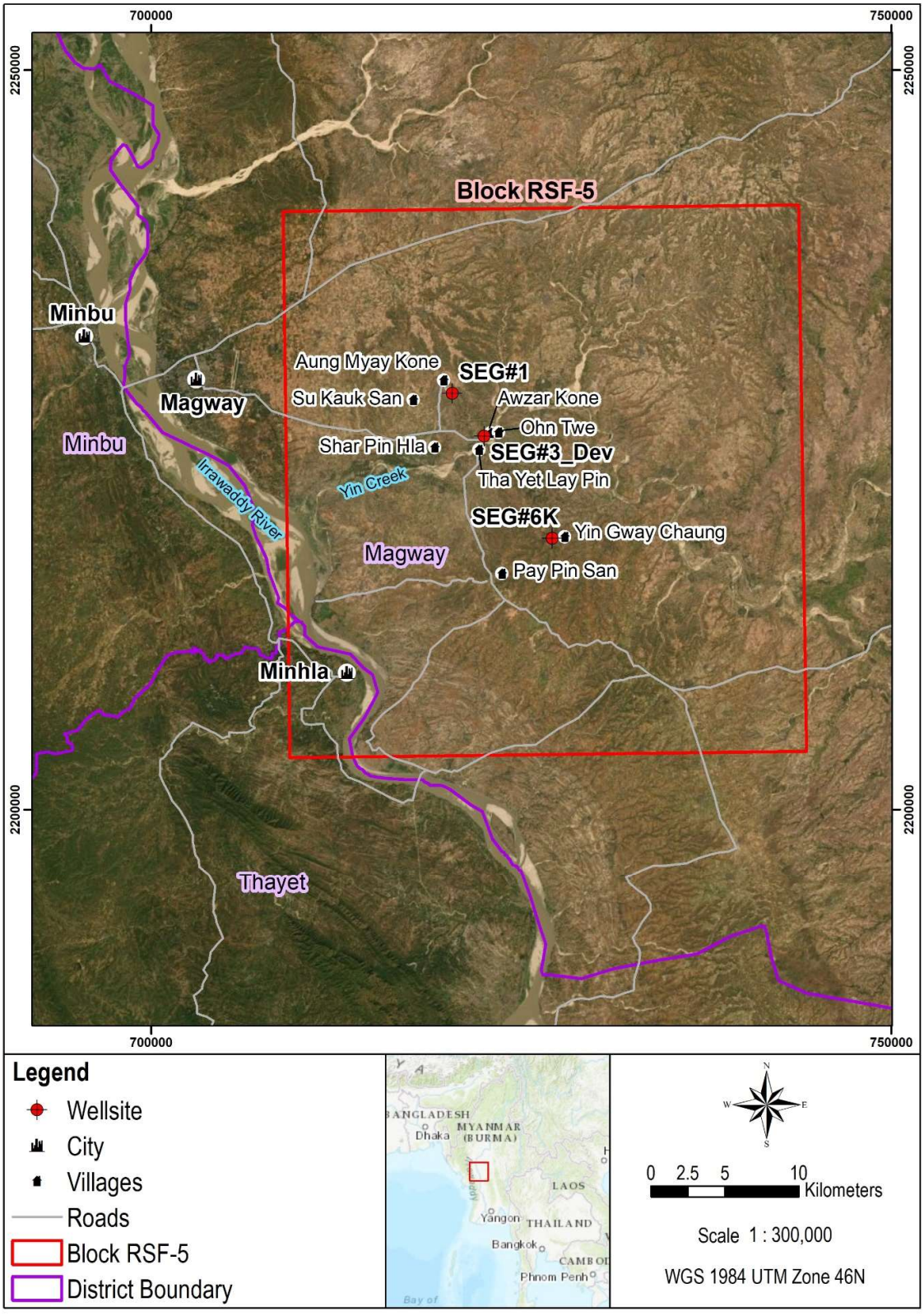
Eni propose to drill two (2) back-to-back exploration wells in Block RSF-5, which will take approximately 160 days to complete in total with each well taking approximately 80 days to drill including logging, testing and abandoning the wells.

Under Section 7 of the Environmental Conservation Law and Articles 52 and 53 of the Environmental Conservation Rules of the Republic of the Union of Myanmar, Eni is required to undertake an Environmental Impact Assessment (EIA) to obtain an Environmental Compliance Certificate (ECC) for the proposed drilling activities.

This EIA Report is the third submission under Myanmar's Environmental Impact Assessment Procedure (EIA Procedure) to be made to the Ministry of Natural Resources and Environmental Conservation (MONREC), following the earlier submission of the Project Proposal Report and the Scoping Report. The Project Proposal Report was submitted and approved on January 17, 2019. The Scoping Report was submitted on April 1, 2019 and approved on May 13, 2019.

[1] Note that the terms "Environmental Impact Assessment (EIA)" and "Environmental, Social and Health Impact Assessment (ESHIA)" are often used interchangeably. Myanmar's EIA Procedure, promulgated in 2015, contains reference and requirements to conduct either "EIA" or, alternatively, "Initial Environmental Examination (IEE)", depending on the scope of the project. Typically seismic projects in Myanmar are required to conduct an IEE. However, at the time of preparation of the previous assessment for the seismic activities, the EIA Procedure was not yet enacted, so the terminology was not legally defined and the report was referred to as an "ESHIA".

Figure 3.1: Approximate Location of Drilling Area within Block RSF-5



Source: Eni, 2018

3.2 Purpose of the EIA Report

This Environmental Impact Assessment (EIA) report presents an assessment of the potential environmental, social and health impacts associated with the Project.

According to the definition from the EIA Procedure, an EIA Report is *"a report on an EIA Type economic activity prepared in accordance with the requirements stipulated in Article 63 and having a focus on: systematic identification and assessment of potential Adverse Impacts including cumulative impacts of the proposed Project, business, service or activity; systematic assessment of feasible Project alternatives; and determination of appropriate measures to mitigate potential Adverse Impacts. EIA Report shall include an EMP."*

The objectives of this EIA are to:

- To review the proposed Project activities with respect to their potential to interact with environmental, social and health receptors and resources;
- To identify the potentially vulnerable environmental, social and health components of the baseline within the Area of Interest;
- To identify and evaluate potential environmental, social and health impacts from the Project;
- To recommend mitigation or enhancement measures to remove, reduce or avoid potential adverse impacts;
- To provide an environmental management plan (EMP) including an approach for monitoring and follow up; and
- To summarise public consultation and disclosure of the Project.

3.3 Presentation of the Project Proponent

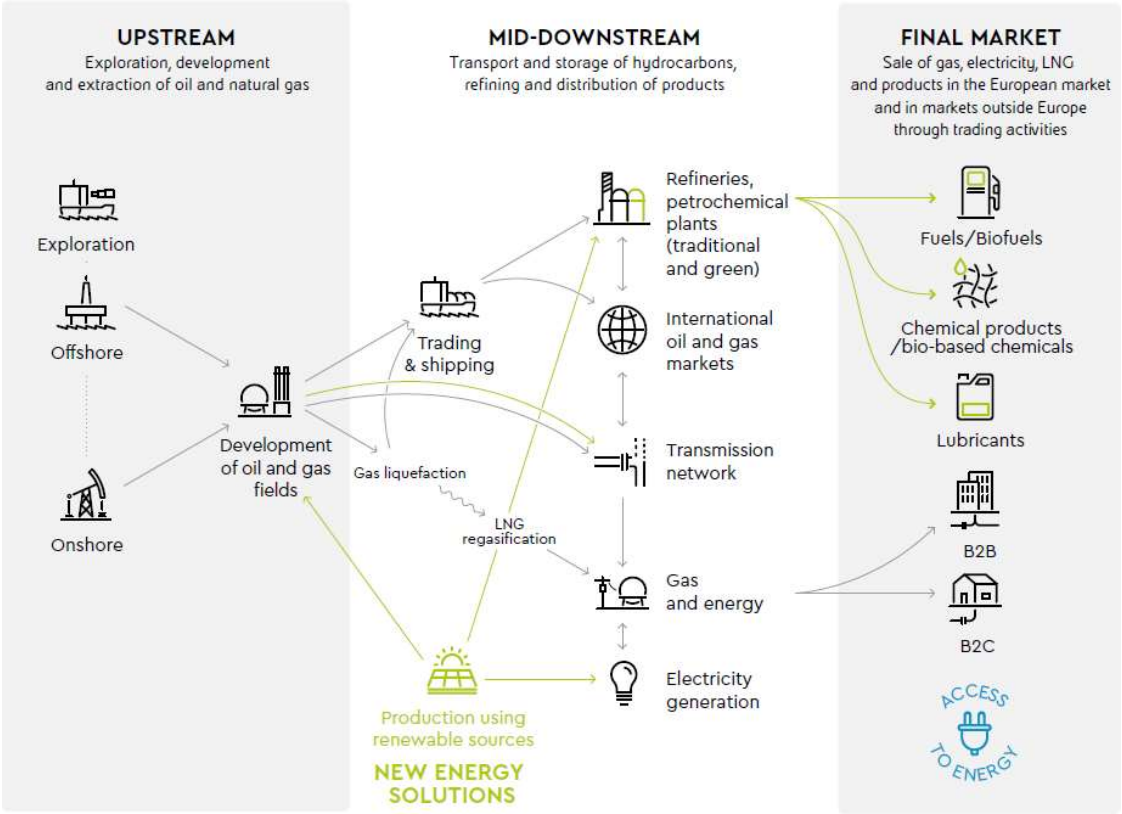
3.3.1 Overview

Eni S.p.A is an integrated energy company, active in 71 countries in the world, and the sixth largest oil & gas company worldwide.

Eni is divided into Upstream and Mid-Downstream divisions: Eni Upstream services include oil & gas exploration, field development and production as shown in ***Figure 3.2***. Eni operates on a global scale, while Eni Upstream division operates in the countries shown in ***Figure 3.3***.

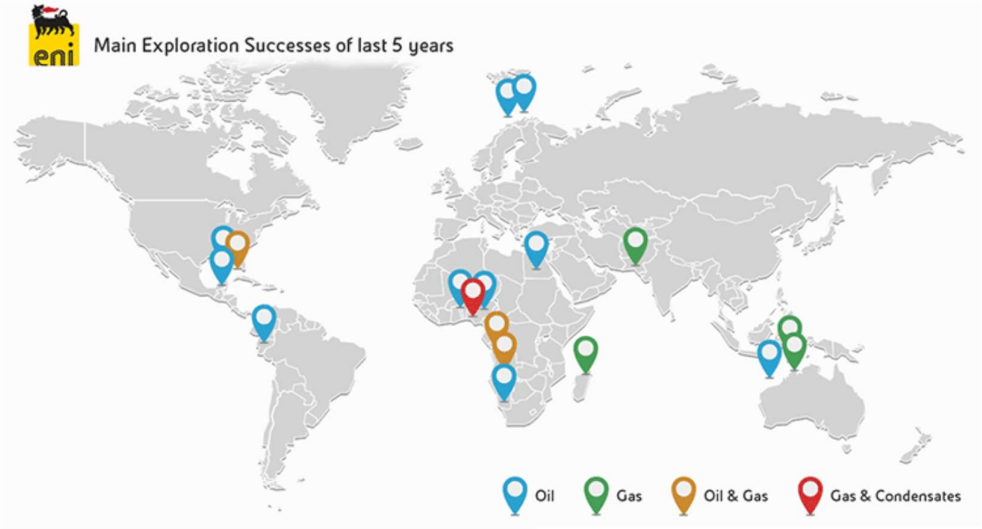
Eni is a socially responsible actor and contributes to the economic development of the countries where it operates. Sustainability is an integral part of Eni's governance model and represents the motor of a continuous improvement process that contributes to the achievement of the business targets. In the deployment of its activities, Eni has built important relations with the external world in order to maintain a constructive confrontation aimed at the diffusion and development of best practices. This approach is based on the respect of universal principles such as the protection of human rights, the adoption of the highest standards of work, the respect of the environment and communities. The respect for universal principles incorporated in Eni's business model is expressed mainly in responsibility towards applicable laws and the adoption of best international standards, the inclusion of all its people through fair and non-discriminating policies, excellence in operations with the adoption of quality systems and advanced technologies. Integration, innovation and cooperation are the competitive drivers allowing Eni to stand out in the oil & gas industry.

Figure 3.2: Eni S.p.A Operations in the World



Source: Eni.com

Figure 3.3: Eni Upstream Main Exploration & Production Activities in the World



Source: Eni, 2015

3.3.2 HSE Management System

Eni Upstream division has adopted, implemented and constantly updates its own Health, Safety, Environment Public Safety, Quality and Radiation Protection Integrated management system (HSE IMS), since 1998. The HSE Integrated Management System is the portion of eni Management System that includes the organisation, the planning activities, the responsibilities, practices, procedures and processes, and the resources for elaborating, putting into action, achieving and maintaining the company's HSE Policy. The HSE policies are main drivers to identify the company HSE commitments and engagements and to guide the organization through continuous improvement of the HSE matters in the overall.

The Eni Upstream division's HSE IMS has been developed to comply with the international standards concerning environmental management (ISO 14001:2015), health and safety (OHSAS 18001), quality (ISO 9001), social accountability (SA 8000) and social responsibility (ISO 26000); the HSE IMS of Eni's daughter companies or subsidiaries (such as Eni Myanmar B.V.) is also developed following the same international standards, in fact Eni Myanmar is also certified in both Occupational Health and Safety (OHSAS 18001) and Environmental Standards (ISO 14001:2015).

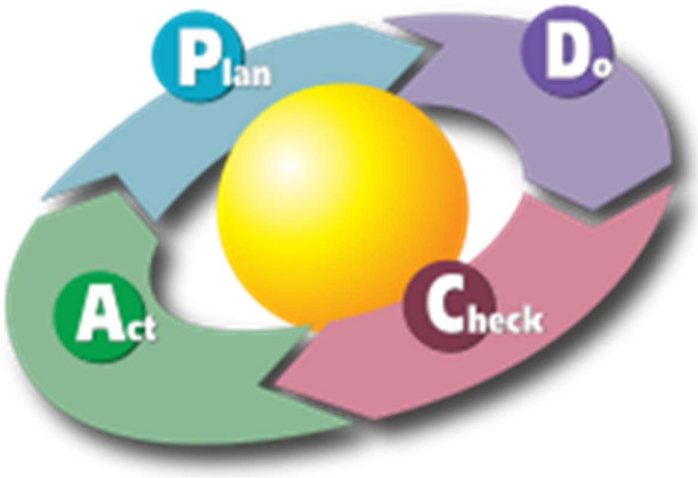
Eni Upstream is also involved in all the major initiatives in the HSE area being an active participant of international organizations as IOGP and IPIECA.

Eni is committed to share information and experience for the continuous development and improvement of industry standards and improved practices for health, safety and environmental protection. This has allowed Eni Upstream to develop a strong culture on HSE issues.

The Eni Upstream division's HSE IMS operates according to the Deming cycle method, in order to guarantee a continuous improvement of the associated activities; in particular, the HSE process is composed of four sub-processes, which is summarized in :

- Planning;
- Implementation and operation;
- Checking and corrective actions; and
- Management review.

Figure 3.4: Deming Cycle Method



Source: Eni, 2019

For each of the above mentioned sub-processes, the HSE IMS identifies and describes their inherent phases with their characteristics and the main operating modalities, as well as the associated roles and responsibilities.

At present, Eni Upstream division headquarters holds the following certificates:

- ISO 14001:2015 for "Strategic and operational planning and projects development in hydrocarbon exploration and production", starting from 2005 and renewed on a yearly basis;
- OHSAS 18001:2007 for "*Direction And Control, Technical Support, Monitoring And Control Of Upstream Activities, In Italy And Abroad. Strategic/Operational Planning Of Project Of Hydrocarbon Exploration And Production Activities.*" issued in 2010 and renewed on a yearly basis;
- ISO 9001:2015 for "Survey Design, Acquisition and Processing of Geophysical Data" starting from 2002; and
- ISO 9001:2015 for "Planning and Development of Radiation Protection Services, Radioecological Surveying, NORM Surveying, Dosimetry, Radiometric Analyses, Training, Electromagnetic Field Evaluation" starting from 1999.

Further information on Eni's activities is available on Eni's website[1].

3.3.3 Eni Myanmar

Eni was one of the first international oil and gas companies to enter Myanmar after the opening of the market to foreign investment following the removal of international sanctions in 2012.

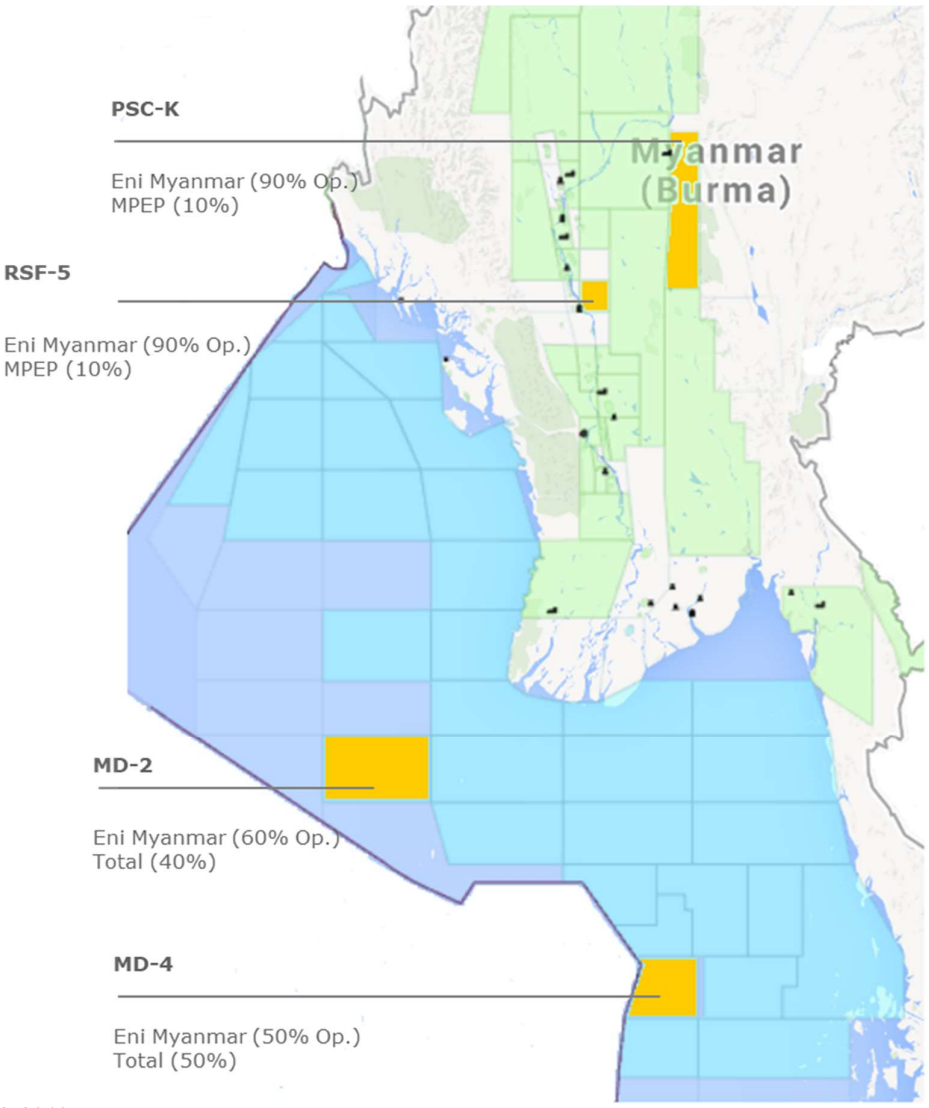
Since then, the country has embarked on a process of economic growth that has also involved the energy sector.

In 2013 the Ministry of Energy issued international tenders for the award of exploration licenses of still potentially largely untapped oil and gas resources.

Eni was subsequently awarded two onshore (Blocks RSF-5 and PSC-K) and two offshore (Blocks MD-4 and MD-2) exploration licenses. With four operated exploration licenses, Eni is one of the largest international investors in the country and a major player in the energy sector.

[1] https://www.eni.com/en_IT/media/focus-on/eni-myanmar.page

Figure 3.5: Overview of Eni's Blocks in Myanmar



Source: Eni, 2019

3.3.3.1 Onshore Activities

In October 2013 two onshore exploration licenses for the RSF-5 and PSC-K blocks were awarded to Eni and the Production Sharing Contract (PSC) were signed in July 2014.

The joint venture is composed by Eni (operator with 90%) through Eni Myanmar, and the local partner Myanmar Production and Exploration Company Ltd (10%). In both PSCs the exploration period lasts six years and is divided into three phases: Initial Exploration Period (3 Years), First Extension Period (2 Years) and Second Extension Period (1 Year).

Block RSF-5 covers an area of 1,292 square kilometres and is located in the prolific Salin Basin, about 500 kilometres north of Yangon, while Block PSC-K covers an area of 6,558 square kilometres and is located in the unexplored Pegu Yoma-Sittaung Basin, in the central area of Myanmar.

In the Initial Exploration Phase, the activities that have already been conducted are, in RSF-5 the seismic reprocessing of pre-existing 2D Seismic data and a new 3D seismic acquisition and processing while in Block PSC-K, Eni concluded in July 2016 the acquisition and interpretation of an aerial gravimetric and magnetometric survey across the entire block.

3.3.3.2 Offshore Activities

In March 2015, Eni signed a PSC for the exploration of two offshore blocks, MD-2 and MD-4. These exploration blocks were awarded to Eni as a result of participation in an international tender called by the Republic of the Union of Myanmar.

The Joint Venture, following the withdrawal of Petrovietnam Exploration Production Corporation Limited (PVEP) is now composed, in MD-2, by Eni, operator with 60%, through Eni Myanmar BV and Total Myanmar E&P (40%) while, in MD-4 Joint Venture, Eni is the operator with 50% and Total Myanmar E&P holds the remaining 50%.

The Block MD-2 is located in the southern part of the Bay of Bengal, in the Rakhine Basin, around 135 kilometres from the coast. The block covers 10,330 square kilometres in water depths ranging from 500 to 2,400 metres.

The Block MD-4 is located in the Moattama South Andaman Basin, around 230 kilometres from the coast. The block covers 5,900 square kilometres in water depths ranging from 1,500 to 2,200 metres. During the initial two-year study period, a 2D seismic survey was conducted in MD-2 completed in June 2016. In MD-4, after a 2D seismic reprocessing of legacy seismic, a 3D seismic acquisition was conducted between January-May 2018.

These activities will be followed by exploration drilling in case JV partners will elect to enter into the next exploration phases (six years and divided into three phases).

3.3.3.3 Stakeholder Engagement

Eni Myanmar has adopted a systematic approach for the efficient management and engagement of stakeholders. The process has also been tailored to fit the reality of the Project Areas. In this regard, Eni Myanmar undertook pre-emptive actions through prompt engagement with the stakeholders involved at an early stage of the project. The main actions implemented in this approach are to (a) inform stakeholders of project activities; (b) take into consideration stakeholder expectations and guide public perceptions setting a positive tone; (c) timely predict potential issues and risks that might affect the project throughout its lifecycle since the beginning of the project; and, (d) enable a proactive cultivation of relationships that can serve as “capital” during project life.

In particular, Eni Myanmar has so far delivered three key components of the stakeholder engagement:

1. Stakeholder identification and analysis: the project’s geographic domain of influence was delineated by mapping the sphere of influence of different types of environmental and social impacts, and distinct groups were identified by impact area. A prioritisation of key stakeholders was then conducted, followed by the production of the Stakeholder Register;
2. Information Disclosure: project related information was communicated early in the process through Scoping/Project Screening presentation meetings; and
3. Stakeholder consultation: official public consultations have been conducted in the interested Townships and Regional Divisions.

3.3.3.4 Human Rights Impact Assessment

Eni has always embraced a sustainable and locally oriented approach, accompanying countries in a grow path that aims at their development.

Respect for human rights is a cornerstone for the comprehensive development of societies, territories and consequently of the companies that work in them.

In 2015, a human rights impact assessment related to the Myanmar activities was launched in the exploration phase of the onshore Block RSF-5.

To this end, Eni Myanmar commissioned the support of an independent and well established institute, the Danish Institute for Human Rights (DIHR), which carried out an initial assessment of the social

characteristics of the country (Preliminary Human Rights Impact Mapping) and an analytical identification of the most representative stakeholders on human rights (Stakeholder Mapping and Analysis).

In March 2016, in view of the 3D Seismic acquisition planned in block RSF-5, Eni Myanmar and the DIHR collected information about the socio-economic and environmental context and carried out field activities including of consultations at major villages envisaged by exploration activities, through which major areas for improvement and appropriate actions to prevent and mitigate the identified risks were defined.

The consultations involved more than five hundred people, selected to be representative of the community's social structure of the Magway region interested by the Exploration Activity, through both focus groups and individual interviews.

During these field activities meetings were also held with a number of local associations, active in the area with development programmes and advocacy initiatives for the rights of farmers.

3.3.3.5 Contact Details

The contact details of Eni are presented in ***Table 3.1***.

Table 3.1: Contact Details of Eni

Company Name	Eni Myanmar B.V. (Eni)
Address **Phone Number**	Sakura Tower, 6th floor, 339 Bogyoke Aung San Rd. Kyauktada Township, Yangon, Myanmar (+95.1) 255 364
Contact Person 1 **Mobile Number**	Juan Deffis Manuel +95 9971679164
Contact Person 2 **Mobile Number**	Aung Phone Myat +95 95098909
Email Address	info.enimyanmar@eni.com

Source: Eni, 2018

3.4 Presentation of Environmental, Social and Health Experts

3.4.1 Environmental Resources Management (ERM)

Environmental Resource Management (ERM) has been contracted by Eni to prepare this EIA for the Project. This report presents the objectives, methodology and expected outcomes of the EIA.

ERM is a leading global provider of environmental, health, safety, risk, social consulting, and sustainability-related services. ERM has more than 160 offices in 40 countries and territories and employ more than 5,000 people. ERM has a 40-year track record of excellence on complex and challenging projects.

ERM has recently registered as a separate ERM Myanmar entity and has opened an office in Yangon with full-time staff.

An overview of the environmental, social and health experts involved with the preparation of this EIA report are presented in ***Table 3.2.***

Table 3.2: ERM Key Personnel Involved in Preparation of this Study

Organization/ Company	Name	Qualifications	Position/ Specialization
ERM	Kamonthip Ma-oon	■ Executive Study: General Management Programme, Judge Business School, University of Cambridge, UK ■ MSc. (DIC) in Environmental Engineering and Business Management, Imperial College, London ■ BEng. in Environmental Engineering, Chulalongkorn University, Thailand	Partner-In-Charge
	Craig Reid	■ BSc (Hons), Marine Biology, University of Stirling, Scotland, United Kingdom, 1997	Technical Advisor
	Chris Brown	■ MSc (Environmental Engineering) ■ BSc (Manufacturing Engineering)	Principal Consultant, Project Manager
	Syliva Jagerroos	■ MSc Biological Sciences with Environmental Science, University of Complutense, Madrid Spain (2000- 2002) ■ BSc Biological Sciences, University of Complutense Biological Science, Madrid, Spain (1997-2000)	Environmental Lead
	David Nicholson	■ Bachelor of Applied Science (Environmental Assessment and Management) 1992: University of Newcastle - Water Resource Management; Plant Systematics and Ecology ■ Executive Masters in Public Administration (With Merit) 2007: Australian and New Zealand School of Government - International Politics and Development; Government and Business Ethics; and Financial Management	Biodiversity Specialist
	Vincent Lecat	■ Mastère spécialisé Management du Développement Durable, HEC Paris Business School, France ■ Maitrise en Ecologie et Environnement (Msc in Ecology and Environment), Université Pierre et Marie Curie, France ■ Licence en Biologie et Ecologie (Bsc in Biology and Ecology), Université Pierre et Marie Curie, France	Social Lead

Organization/ Company	Name	Qualifications	Position/ Specialization
	Kanokphorn Chaivoraphorn	■ M.A. (Social Development – Social Organization and Development) ■ B.Sc. (Industrial Chemistry) B.P.H. Major in Occupational Health and Safety	Principal Consultant, Health Specialist
	Monthat Suwannakarn	■ MSc (Environmental Science, Major in Land and Water Management) ■ BSc (Environmental Engineering)	Associate Consultant
	Khin Su Su Naing	■ Master in International and Community Development, Deakin University, Australia, 2009 ■ Bachelor of Science (Zoology), Yangon Distant University, Myanmar, 2001 ■ Graduate Diploma in Politics and Government, Open University, United Kingdom, 2007 ■ Graduate Diploma in Business Administration, Association of Business Executive, United Kingdom,	Senior Consultant
	Thapye Myo Oo	■ Master of Science in Engineering, Environmental Planning and Management, Yangon Technological University, 2017 ■ Master of Science in Engineering, Renewable Energy Engineering, Yangon Technological University, 2014 ■ Graduate Diploma in Business Law, Yangon University, 2012 ■ Graduate Diploma in Management and Administration, Yangon Institute of Economics, 2009 ■ Bachelor of Engineering in Electronics, Yangon Technical University, 2004	Senior Consultant, Environmental and Social Specialist
	Daw Myat Mon Swe	■ Diploma of GIS and RS, Yangon University, Myanmar, ■ MSc, Energy and Environmental Management, University of Flensburg, Germany, ■ B.Agri.Sc., Yezin Agricultural University Myanmar	Social Consultant
	Aung Soe Min	■ Bachelor of Civil Engineering, Technological University in Hmawbi, Yangon, Myanmar, 2016	Consultant

Organization/ Company	Name	Qualifications	Position/ Specialization
Sustainable Environment Myanmar (SEM)	Dr. Sandar Hlaing	■ B.A. (Hons.) MA (Geog :) ■ PhD (Environmental Geography)	Senior Social Expert
	Myat Thitsar Naing	■ B.A. (Hons) English in 2011, Dagon University ■ M.A. English in 2014, Dagon University ■ Diploma in Human Resource Management by IQN, UK ■ Certificate in Environmental Studies by Myanmar Environmental Institute	Social Expert
	Nan Cherry Thein	■ B.A. (Hons) English 2012, Dagon University ■ M.A. English 2014, Dagon University ■ Certificate in General English (British Council) ■ Certificate in Business Studies (Yangon University) ■ Certificate in Involuntary Resettlement (AIT Vietnam) ■ Certificate in Environmental Studies (Myanmar Environment Institute MEI)	Social Expert, Logistic and Administration

Source: Eni, 2018

3.4.2 Local Myanmar Consultants

ERM regularly works with local organizations and individual consultants on projects to ensure there is strong local knowledge of the regulatory environment and good domestic experience. Our model for this is to create a fully integrated project team to ensure effective communication and joint working.

In this Project, we are partnering with ***Sustainable Environment Myanmar (SEM)*** to provide local expertise and to convey an EIA that is appropriate and relevant for the planned project activities in Myanmar. The overview of the EIA experts involved are presented in below.

3.5 Report Structure

This EIA Report has been structured according to the Environmental Impact Assessment Procedure (2015), as well as the Administrative Instruction of Environmental Impact Assessment Procedure (2015), which are described further in Chapter 3. The structure of the EIA Report is provided in ***Table 3.3***.

Table 3.3: Proposed EIA Report Structure

Chapter Number	Chapter Title	Contents
1	Executive Summary	■ Summary of the EIA Report
2	Introduction	■ Project Overview ■ Purpose of EIA Report ■ Presentation of the Project Proponent / Project developer ■ Presentation of the Environmental, Social and Health Experts
3	Policy, Legal and Institutional Framework	■ Corporate Environmental Policy of the project proponent (e.g. CSR policy) ■ Policy and Legal Framework should include such as existing environment-related laws and rules, international conventions, treaties and agreements, and ■ International standards and guidelines ■ Institutional framework of the project proponent and Myanmar government responsible for EIA e.g. organizational structures and responsible sections; and ■ Environmental and/or Health Standards related to the Project e.g. international and/or domestic standards.
4	Project Description and Alternatives	■ Project Background, Objectives and Descriptions ■ Project Location, Overview map and Site Layout Maps ■ Comparison and Selection of Alternatives ■ Description of the Selected Alternative
5	Description of the Surrounding Environment	■ Setting the Study Limits ■ Methodology for Data Collection and Analysis ■ Physical Components/Resources ■ Biological Components/Resources ■ Socio-Economic Components/Resources ■ Public Health Components/Resources ■ Cultural Components/Resources ■ Visual Components/Resources
6	Impact and Risk Assessment and Mitigation Measures	■ Impact and Risk Assessment Methodology ■ Identification of Impacts ■ Determination of Impact Significance ■ Mitigation Measures ■ Determination of Residual Impacts ■ Risk Assessment (Unplanned Events)
7	Cumulative Impact Assessment	■ Methodology and Approach ■ Cumulative Impact Assessment
8	Environmental Management Plan	■ Summary of Impacts ■ Description of Proposed Mitigation Measures ■ Monitoring Program ■ Reporting Requirements ■ Emergency Plan ■ Capacity Development and Training ■ Public Consultation and Information Disclosure ■ Work Plan and Implementation Schedule
9	Public Consultation and Disclosure	■ Purpose of the Consultation ■ Methodology and Approach, ■ Summary of Consultation Activities ■ Summary of main comments received and how comments taken into account during EIA process ■ Minutes of Each Consultation Meeting ■ Information Disclosure ■ Recommendations for Future Consultations
10	Conclusions and Recommendations	■ Presents the main conclusions of the EIA report, and recommendations for future actions (if any) to be taken.

3.6 Statement of Commitments

Eni will at all times comply fully with the commitments, mitigation measures, and plans that have been presented in this EIA Report.

Eni 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, including the Environmental Conservation Law (2012), Environmental Conservation Rules and Environmental Impact Assessment Procedure (2015), as well as the EMP, Project commitments and conditions.

Eni and ERM hereby confirm that:

(1) The EIA Report is accurate, consolidated and complete;

(2) The EIA has been conducted in accordance with relevant laws, including the EIA Procedure (2015); and

(3) The Project will fully follow the commitments, mitigation measures and plans set out in this EIA Report.

4. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

This section presents a summary of the regulatory requirements that will be applicable to the Project. These include local and international regulations, conventions and guidelines. Eni has undertaken this EIA Report in line with the EIA Procedure[1] Specifically, this section summarises the following:

- Eni's Environmental and Social Policies
- Policy and Legal Framework
- Contractual and Other Commitments
- Project's Environmental, Social and Health Standards

4.1 Eni's Environmental and Social Policies

Eni has developed specific guidelines and standards for its operations that will be met during project activities. A summary of these guidelines are included below:

- Eni Policies (e.g. Sustainability, Our People, The Integrity in our Operations etc.);
- Eni E&P Division – Quality Requirements: this document defines the contractor's Management System requirements to be applied to the Contract Scope of Work during the bid stage and during the execution of works;
- Eni E&P Division - Contract HSE Requirements for abroad services (Rev 01, Aug 2010): Sets out the minimum requirements, as well as recommendations for everything relevant to the Health, Safety & Environment aspects of the project;
- Eni Upstream Technical Guideline – AMTE-TG-002 "Environmental, Social and Health Impact Assessment in Exploration" (11/03/2016). This Technical Guideline provides guidance for carrying-out the Environmental, Social and Health Impacts Assessment (ESHIA) process in oil and gas projects during the exploration phase. It describes the purpose, basic steps, approach and timing to identify environmental, social and health aspects and timely mitigate project-related impacts through the preparation and the implementation of an ESHIA for exploration activities.
- Eni Upstream Technical Guideline – AMTE TG 002 annex C r00 "Environmental, Social and Health Impact Assessment in Exploration – Environmental Baseline Data". The annex to the technical guidelines describe the environmental components that should be investigated while conducting ESHIA process (unless different requirements by host Country legislation) in order to define the baseline context in which the exploration activity is going to be developed and against which to assess changes;
- Eni Upstream Technical Guideline - AMTE-TG-013 "Biodiversity and Ecosystem Services Impact Assessment and Management". This Technical Guideline (TG) provides guidance for managing Biodiversity and Ecosystem Services (BES) issues in onshore and offshore oil and gas projects during all project phases, from exploration to decommissioning;
- Eni Upstream Technical Guideline – AMTE-TG-014 "Technical Guideline – HSE Aspect on Decommissioning Activities". This Technical Guideline provides guidance for managing HSE aspect related to the decommissioning activities, including information on the main HSE items for each step necessary to plan and implement a Decommissioning Project;
- Eni Upstream Professional Operating Instruction: Local Stakeholder Engagement (opi ssc 001 eni spa); Social Context Analysis (opi ssc 002 eni spa); Community Investment Management (opi ssc 003 eni spa); Monitoring, reporting and audit activities (opi ssc 004 eni spa); Local Content (opi ssc 005 eni spa); Land Acquisition and Management (opi ssc 006 eni spa) – all issued in July 2015.

[1] Required under Section 7 of the Environmental Conservation Law (2012) and Articles 52 and 53 of the Environmental Conservation Rules (2014) of the Republic of the Union of Myanmar.

These guidelines area aimed to ensure that eni Upstream activities are carried out and developed in a sustainable way;

- Eni Upstream Technical Operating Instruction – opi sg hse 012 e&p r01 "Professional Operating Instruction – Noise and Vibration Management". This Technical Operating Instruction sets out the requirements for noise and vibration management which shall be applied during all Eni Upstream activities;
- Eni Upstream Technical Operating Instruction – opi sg hse 028 ups (1/03/2016) "Identification of significant environmental aspects" This document establishes a methodology for the identification and evaluation of the environmental aspects deriving from activities, products and services of the Subsidiaries and Affiliates, in Italy and abroad, belonging to eni Upstream Business Area. ;
- Eni Upstream Technical Guideline N° SLT TG 005 r01 "Health Risk Assessment" The HRA is the process by which health risks are identified, assessed and managed. It should cover and be applied to, all employees, contractors and third parties at work within company premises.;
- Eni Upstream Technical Operating Instruction- AMTE-TG-010 "Waste Management in Upstream Oil&Gas Activities". This Technical Guideline provides a set of recommendations and treatment options that shall be considered for a correct management of wastes produced during Upstream activities.
- Eni Upstream Operating Technical Guideline – "Air Quality Monitoring in Upstream Oil&Gas Activities" (AMTE-TG-006). It provides a guide or the design, installation and management of Air Quality Monitoring Systems;
- Eni Upstream Operating Technical Guideline – "Sustainable Water Management for the Upstream Sector" (AMTE-TG-012). It defines the procedure for proper and sustainable water management, thus resulting in a usable instrument both for design and operational phases. Moreover it is conceived to be a guideline to develop a Water Management Plan;
- Eni Minimum HSE Requirements in Geophysical Operations (opi sg hse 002 e&p r01). It defines the minimum HSE requirements to apply in geophysical operations (including land seismic acquisition and processing, gravity and magnetic survey) in order to ensure compliance with the commitments of eni spa Policies as well as the requirements of internationally recognized best practices;
- Professional Operating Instruction (opi sg hse 009 e&p r01) – Hazard Identification (HAZID) Methodology. This document provides an overall understanding of Hazard Identification (HAZID) process and its effective application within Eni activities (including design and modifications of projects and plants);
- Eni HSE Policy (pol HSE 001, 2016);
- Eni Driving Policy (pol HSE 002, 2016);
- Eni Alcohol, Smoking & Drugs Policy (pol HSE 003, 2016);
- Eni Code of Ethics (Mar 2008): Lays out eni's Code of Ethics for its operations; and
- Eni Guidelines on the Protection and Promotion of Human Rights (Apr 2007).

Moreover, *Eni Myanmar* refers to some international policies, principles, and standards for its activities; the main of them are listed below:

- OGP/IPIECA – Ecosystem services guidance, 2011;
- International Union for Conservation of Nature (IUCN) Red List;
- International Finance Corporation (IFC) – Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources, 2012;
- International Finance Corporation (IFC) – Performance Standard 7 Indigenous People, 2012;

- International Finance Corporation (IFC) – Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets, 2007;
- WHO – World Health Organization;
- OGP/IPIECA - A Guide to Health Impact Assessment for oil and gas industry, 2007; and
- International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978.

4.2 Policy and Legal Framework

4.2.1 Myanmar EIA Procedure

The EIA Procedure for Myanmar was promulgated on 29th December 2015. The procedure was prepared by the Ministry of Natural Recourses and Environmental Conservation (MONREC), formerly called the Ministry of Environmental Conservation and Forestry (MOECAF), along with the support of an EIA Review Team Committee comprising the members of relevant union ministries, union attorney general's office, three city development committees and Non-governmental Organisations (NGOs) and technical support by experts from the Asian Development Bank Greater Mekong Region – Environment Operations Centre (ADB GMS-EOC).

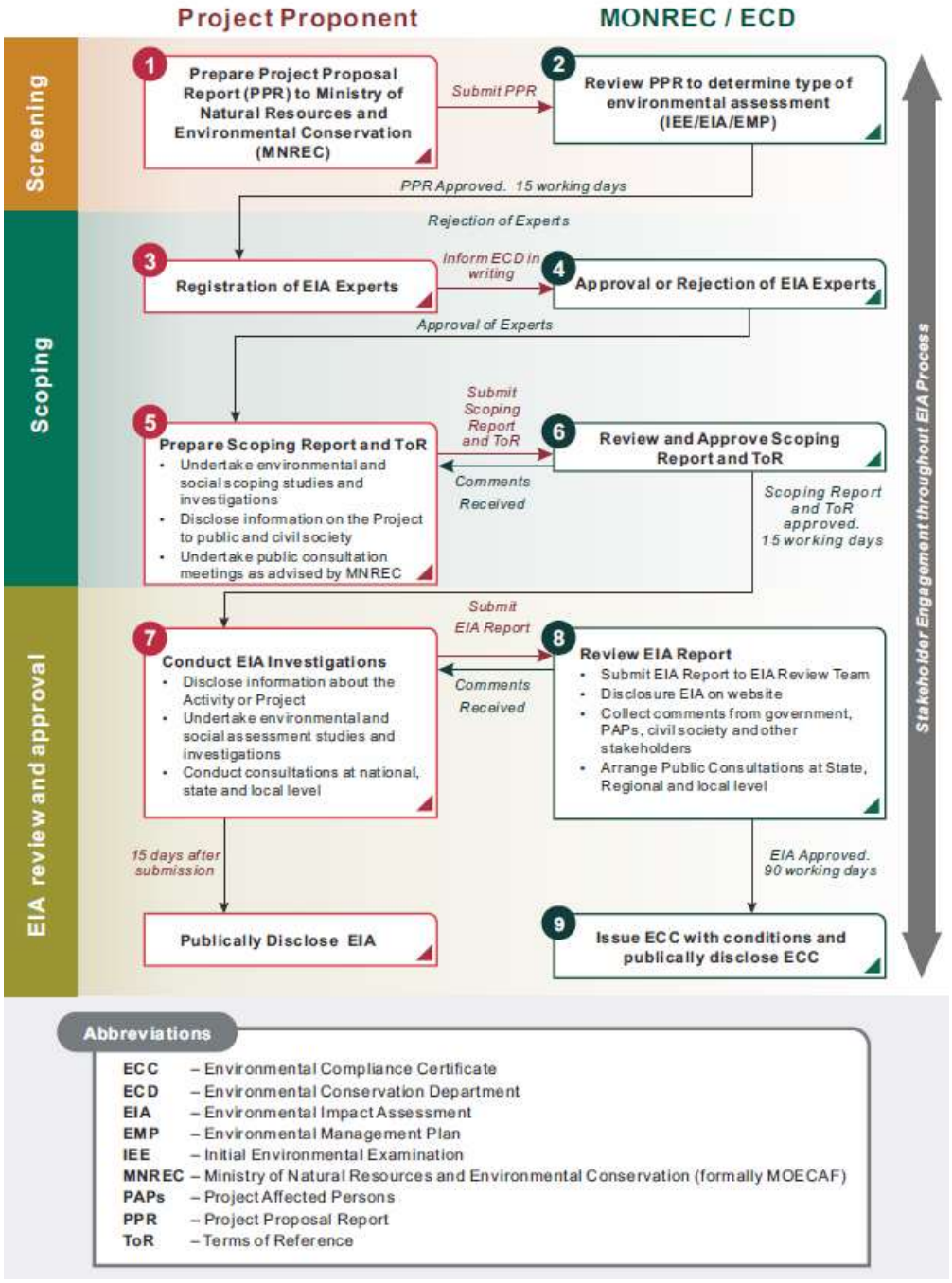
The EIA Procedure sets out the requirements for development, assessment and subsequent monitoring of an EIA. The requirements to conduct an EIA are outlined in the Environment Conservation Law (2012) and Environment Conservation Rules (2014). In addition; the EIA Procedures are supported by the draft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

An overview of the review and approval process for an EIA according to the EIA Procedure is shown in ***Figure 4.1***.

4.2.2 Myanmar Legislation Relevant to the Project

The key laws related to environmental, social and health issues and hence relevant to the Project are listed below in ***Table 4.1***.

Figure 4.1: EIA Review and Approval Process



Source: ERM, 2018

Table 4.1: Myanmar Legislation Relevant to Project

Sources of Related Laws, Rules and Regulations	Commitments
The Constitution of the Republic of the Union of Myanmar, 2008	The Constitution of the Union of Myanmar is the supreme law of the country and has provisions regarding the protection of the environment in Myanmar. The Project Proponent commits to comply the relevant articles (37(a)(b), 45, 390) as these three Articles in the Constitution provide a basis for legalizing and institutionalizing environmental health impact assessment and social impact assessment. There stipulates that ■ The Union 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; The Union shall enact necessary law to supervise extraction and utilization of State owned natural resources by economics forces; ■ The Union shall protect and conserve natural environment. ■ Every citizen has the duty to assist the Union in carrying out the following matters: (a) preservation and safeguarding of cultural heritage; (b) environmental conservation; (c) striving for development of human resources; (d) protection and preservation of public property.
Myanmar Agenda 21 (1997)	The Myanmar Agenda 21 makes recommendations for the drafting and promulgation of a framework law which can further promote the integration of environmental and developmental concerns in the decision-making processes of the country. The Project Proponent commits to comply as per this Myanmar Agenda 21's guidelines to address the following issues: ■ Increasing energy and material efficiency in production processes; ■ Reducing wastes from production and promoting recycling; ■ Promoting use of new and renewable sources of energy; ■ Using environmentally sound technologies for sustainable production; ■ Reducing wasteful consumption; ■ Increasing awareness for sustainable consumption.
National Sustainable Development Strategy (2009)	Sustainable management of natural resources in Myanmar, from environmental perspective comprises 11 areas, in which oil and gas sector development concerned are as follow: ■ Sustainable forest resources management; ■ Biodiversity conservation; ■ Sustainable fresh water resources management ; ■ Environmental quality management and enhancement; ■ Sustainable management of land resources; ■ Sustainable management for mineral resources utilization; ■ Sustainable energy production and consumption; and

	■ Sustainable industrial, transport and communication development. The Project Proponent acknowledges and commits to implement the project as per this strategy guideline.
National Environmental Policy, 1994	Under this policy, the main environmental body was the NCEA. Prior to the establishment of MONREC, environmental conservation was undertaken by various ministries and departments. In 1990, the NCEA was established to advise the government on environmental policy, to act as a focal point and as a coordinating body for environmental affairs and to promote environmentally sound and sustainable development. The NCEA's main mission is to ensure sustainable use of environmental resources and to promote environmentally sound practices in industry and other economic activities, objectives and mandates. The Project Proponent commits to comply and implement the project as per this policy requirement.
Myanmar Climate Change Policy, 2019	This is established with the vision to be a climate-resilient, low carbon society that is sustainable, prosperous and inclusive, for the wellbeing of present and future generations. There clearly set-up a guiding principles for ■ Sustainable development ■ Precaution ■ Prevention ■ Environmental integrity ■ Shared responsibility and cooperation ■ Inclusiveness ■ Good governance ■ Climate justice and equity ■ Gender equality and women's empowerment The project proponent commits to support the Government in order to meet the above-mentioned principles (Clause 12)
Environmental Conservation Law (2012)	The Project Proponent commits: ■ To provide compensation for environmental impact and contribute funds for obtaining benefit from the natural environmental service system, contribute a part of the benefit from the business by exploring, trading and using the natural resources in environmental conservation works.(section 7(o)) ■ To treat, emit, discharge and deposit the substances which cause pollution in the environment in accord with stipulated environmental quality standards for causing a point source of pollution (section.14). ■ To install or use an on-site facility or controlling equipment in order to monitor, control, manage, reduce or eliminate environmental pollution for causing a point source of pollution. If it is impracticable, the project proponent commits to arrange to dispose the wastes in accord with environmentally sound methods (section 15). ■ Not to violate any prohibition contained in the rules, notifications, orders, directives and procedures issued under the Environmental Conservation Law (section 29).

Environmental Conservation Rules, (notification no. 50/2014)	The Project Proponent commits: ■ Not to emit, cause to emit, dispose, and 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 (section 69(a)). ■ Not to 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 (section 69(b)).
Environmental Impact Assessment Procedure, (notification no 616/2015)	The EIA Procedure sets out the procedures for completing an IEE, EIA and/or EMP in Myanmar. This includes information on project categorization, responsibilities of project developers and ministries, EIA review, monitoring and auditing, among other issues. The Project Proponent (Project Proponent) commits to comply the relevant section (102(a)(b),103, 104, 105, 106, 107, 108, 110, 113, 115, 117) prescribing: ***To bear full legal and financial responsibility***: ■ For his 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 ■ To 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 until PAPs have achieved socio-economic stability at a level not lower than that in effect prior to the commencement of the Project ***For undertaking EMP,*** ■ To implement the EMP, all Project commitments, and conditions, and ■ For liability 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. ■ For his responsibility, and to fully and effectively implement the requirements set forth in ECC, applicable Laws, Rules, EIA Procedure and standards. ■ Project commitments and conditions when providing services to the Project and inform the Ministry with detailed information as to the propose project's potential adverse impacts. ***For monitoring and reporting,*** ■ To notify and identify in writing to the Ministry, providing detailed information as to the proposed Project's potential Adverse Impacts. ■ To 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 EIA Procedure, standards, the ECC, and the EMP during all phases of the Project (pre-construction, construction, operation, decommissioning, closure and post-closure). ■ To notify and identify in writing to the Ministry for any breaches of his obligations or other performance failures or violations of the ECC and 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, to undertake 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. ■ To 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. ■ To submit the monitoring report within ten (10) days of completing a monitoring report and the information to be included. ■ To make a monitoring report as contemplated in Article 108 and Article 109 in accordance with the EMP schedule, (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 within ten (10) days of completing ■ To submit a digital copy of a monitoring report within ten (10) days of receiving such request via email or as may otherwise be agreed upon with the requestor for the request of any organization or person. ***For the purposes of monitoring and inspection, the event of emergency,*** ■ To grant 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; ■ To grant, from time to time as and when the Ministry may reasonably require, 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. ■ To grant full and immediate access to the Ministry at any time as may be required by the Ministry 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. ■ To ensure that the Ministry's rights of access can extend to access by the Ministry to the Project's contractors and subcontractors. ***For the Conditions and Revisions to Conditions prescribed in Environmental Compliance Certificate,*** ■ To commence the 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 upon receipt of the written approval from the relevant authority.
National Environmental Quality (Emissions) Guidelines, (notification no. 615/2015)	The Project Proponent commits to comply the NEQ guidelines and its setting out for emission standards for air, noise and effluent discharges for Onshore Oil and Gas operations. The Project Proponent acknowledge this emissions standards and commits to comply and consider the prescription in all phases of the projects.
The Petroleum and Petroleum Product Law (2017)	There empowers- ■ The Ministry of Commerce to function relating to: (a)issuing licenses relating to import and export (c) determining procedures and conditions related to import and export (section 7(a,c)); ■ The Ministry of Transport and Communications to carry out the following functions relating to any petroleum and petroleum product for issuing licenses for motor vehicles, watercraft and barges for the carriage of petroleum and any types of petroleum products(section 9(a));

	■ The Ministry of Natural Resources and Environmental Conservation to perform the following functions relating to any petroleum and petroleum product for issuing storage license for the warehouses and storage tanks; transport permit for the vehicles, vessels and barges that shall carry any petroleum and petroleum product (section 10(a,b)); The Project Proponent acknowledges above these requirements and commits to state warning sign of danger or if not possible writing to be displayed on all receptacles containing any dangerous petroleum and petroleum product.
Petroleum exploration, drilling, appraisal and production law (2019)	The Project Proponent commits to comply the prescriptions for the responsibilities of the Petroleum license holders as per section 29(a-y), ■ To abide as per prescribed laws, rules, regulations, notifications, directives, orders, procedures, terms and conditions being specified in agreement ■ To care occupational safety, health, environmental conservation, guidelines relating to waste disposal and to implement international petroleum good practices
The Oilfields Act (1918) (amended in 2010)	This act 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 Project Proponent commits to comply guidance and issues prescribed such as for preventing oil and gas wastes, reporting of fires, accidents and other occurrences and regulating the collection and disposal of both oil and gas.
Oilfields (Labor & Welfare) Act (1951) (amended in 1953)	This act provides for the prevention of waste of oil or gas and also the prevention of environmental pollution by petroleum operations. There mentions 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. The Project Proponent commits to comply the stipulations ■ For the labors' working hours: Higher physical danger risk establishment (e.g. an oil rig): 8 hours/day or 40 hours/week, Medium physical danger risk establishment (e.g. factory, oilfield, open mine): 8 hours/day or 44 hours/week. If factory work is part of a continuous process (i.e. technical reasons): admissible 48 hours/week, 10 hours a day Max. 6 days/week (i.e. Sunday = weekly holiday). For Overtime: 2x normal pay rate. Work on weekly holiday = alternative day off within a period of 2 months. In Practice: No specific rules for offshore workers except in old law—oilfields act. Workers in industrial zones work around 11 hours a day, 6 days a week. Many in oilfields the same, but more dangerous jobs, 40/ week.
Law protecting Ethnic Right, 2015	There it is enacted that if an ethnic loose the right, he can complain to the Regional or State Government to get the equal chance and find the equal right. The Project Proponent commits to arrange: ■ To have the Equal right between the Ethnics living in Myanmar (section 5). ■ To informed all the project matters, coordinated and undertaken in consultation with ethnic groups if projects are in areas with ethnic groups. The Project Proponent also commits to comply the Succeeding laws to protect the right of Myanmar national:

	Monogamy Law (2015): Concerning all those who are living in Myanmar, Myanmar Citizens who live outside of Myanmar, and foreigners who marry Myanmar citizens while living in Myanmar for preventing misconducting marriages. ***Buddhist Women Special Marriage Law (2015):*** Concerning the marriage between Buddhist Woman and other religious man. There prescribed the legal procedure, the conditions to be complied by non-Buddhist husband, the customs for dividing property when divorcing. ***Religious Conversion Law (2015):*** This is enacted for the freedom to convert from one religion to another, or a person without a religion has the freedom to convert to a religion. There prohibited to apply for a religious conversion with an intent to insult, disrespect, destroy, or abuse a religion. **The Health Care in the Adjustment of Population Increase Law (2015);** This is for alleviate poverty, provide adequate quality healthcare, and ensure that family planning improves maternal and child health in the country. This Empowers region or state government that concerned with the special zone for healthcare to form region or state population control healthcare group to implementing the task as per the directives of the Ministry and region or state government and the Union Territory Governing body.
The Protection and Prevention of Communicable Disease Law, 1995	As per this law the Department of Health has to carry out immunizations and health education activities related to communicable diseases. (section 3(a)): The Project Proponent commits: ■ To prepare report for an outbreak of a communicable disease to the nearest Health Officer (section 9). ■ To support Health Officer to undertake investigations and medical examinations to prevent the control the spread of Principal Epidemic Disease (section 11).
The Public Health Law, 1972	The Project Proponent commits to cooperate with the authorized person or organization in line with the stipulations (section 3,5) ■ To abide by any instruction or stipulation for public health. ■ To accept any inspection, anytime, anywhere if it is needed.
The Control of Smoking and Consumption of Tobacco Product Law, 2006	The Project Proponent commits: (a) To keep the caption and mark referring that it is a non-smoking area, (b) To arrange the specific place (c) To supervise and carry out measures so that no one shall smoke at the non-smoking area (d) To accept the inspection when the supervisory body comes to the place for which he is responsible. (section 9(a-d))
The Protection and Preservation of Antique Objects Law (43/2015)	The Project Proponent commits: ■ To inform the relevant Ward or village-tract administrator if he knows or it seems reasonable to assume that the said object is an antique object for finding any object which has no owner or custodian (section 12).

The Protection and Preservation of Ancient Monuments Law (51/2015)	The Project Proponent commits: ■ To promptly inform the relevant Ward or Village-Tract Administrative Office for finding 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 (section 12). ■ To apply prior permission from the Department before searching for and extracting oil and gas or constructing pipelines within the specified area of an ancient monument (section 15(c)). ■ Not to damage ancient monuments including using machinery which causes vibration and discharging chemical substance (section 20).
Conservation of Water Resources and Rivers Law (2006)	The Project Proponent commits: ■ Not to 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 (section 11(a)). ■ Not to dispose of any substance into the river creek that may cause damage to waterway or change of watercourse from the bank or vessel (section 19) The empowerment of this Law is provided to the Ministry of Transport for controlling navigation of vessels in the rivers and creeks as well as communicating with local and foreign government and organizations for conservation of water resources, rivers and creeks. Also, to carry out conservation works for water resources, rivers and creeks, in accordance with the relevant international conventions, regional agreements and bilateral agreements for environmental conservation.
The Forest Law (2018)	The Forest Law is enacted by Pyihtaungsu Hluttaw in September, 2018. It empowers, to declare for the reserved forest for the maintaining a sustained yield of the forest produce, to manage the forest land. The Project Proponent commits (section 12): (a) To apply approval from the Ministry if desirous to implement the development work or economic project within a forest land and forest covered land. (b) To comply the Environmental Conservation Law and the stipulations from respective Laws for whoever desirous to undertake as in sub-section (a).
The Protection of Biodiversity and Conservation Areas Law 2018	The Project Proponent acknowledges that there may be charged with fine or imprisonment or both if finds guilty of ■ Using dynamite or explosive chemicals, electrolyzing, destroying water flow or poisoning water, intentionally pollutes the soil, water, air in the conservation area (section 39(d)); ■ Disposing or handling chemical waste and poisoning materials in the conservation area (section 39(e)).
Law on Protecting New Species of Plants (2016)	The Project Proponent commits to comply the stipulation for the right and protect the right of the new species growers for causing any impact to environment and biodiversity.
Myanmar Investment Law, 2016	The Project Proponent commits: (section 50(d), 51, 65) ■ To register the land lease contract at the office of Registry of Deeds in accordance with the Registration Act. ■ To comply the guideline for appointment, replacement, providing for the employment of staff and workers, ensuring to meet the entitlements and rights prescribed in the labor laws and rules in settling dispute regarding HR issues. ■ To comply stipulation:

	(a). To respect and comply with the customs, traditions and traditional culture of the ethnic groups in the Union; (e). To inform to the Commission if it is found that natural mineral resources or antique objects and treasure trove are not related to the investment permitted; (f). Not to make any significant alteration of topography or elevation of the land on which is entitled to lease or to use, without the approval of the Commission; (g). To abide by 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; (h). To list and keep proper records of books of account and financial statement and necessary financial matters relating to the investments performed by permit or endorsement in accordance with internationally and locally recognized accounting standards; (j). To pay wages and salaries to employees in accordance with applicable laws, rules, procedures, directive and so forth during the period of suspension of investment for a credible reason; (k). To pay compensation and indemnification in accordance with applicable laws to the relevant employee or his successor for injury, disability, disease or death due to the work; (l). To supervise foreign experts, supervisors and their families, who employ in their investment, to abide by the applicable laws, rules, orders and directives, and the culture and traditions of Myanmar; (m). To respect and comply with the labor laws; (n). To have the right to sue and to be sued in accordance with the laws; (o). To pay effective compensation for loss incurred to the victim, if there are 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). To allow the Commission to inspect in any places, when the Commission informs the prior notice to inspect the investment; (q). To take in advance permit or 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, and shall submit the situation of environmental and social impact assessment to the Commission along the period of activities of the investments which obtained permit or endorsement of the Commission.
Myanmar Investment Rules, 2017	The Project Proponent commits: ■ To comply with all terms and conditions in the permit and other applicable laws when the investment is carried out (section 202). ■ To fully assist while negotiating with the Authority for settling the grievances of the local community that have been effected due to Investments (section 203). ■ To appoint expert foreigner as senior manager, technical and operational expert or advisor according to subsection (a) of the section 51 of the Law (section 206). ■ To obtain the permit or tax exemption or relief to insure the relevant insurance out of the following types of the insurance at any insurance business entitled to carry out insurance business within the Union based on the nature of the business: Property and Business Interruption Insurance; Engineering Insurance; Professional Liability Insurance;

	Bodily Injury Insurance; Marine Insurance; or Workmen Compensation Insurance; Life Insurance; Fire Insurance (section 212).
The Import and Export Law, 2012	The Project Proponent, as a license holder, commits to comply as per stipulations in section 7, for not to violate the conditions contained in the license.
The Factories Act (1951) (Amended 1953, 1954, 1962, 2016)	The Project Proponent commits to comply the relevant stipulations: ■ For Health (Chapter 3): to arrange clean and free from any odors, solid waste and any seepage, to provide temperate and good ventilations, to well manage the particulate matters and emissions, to set up a moisture level that may be comfortable, not to populate in the factory, to get enough light, to provide clean drinking water, to provide toilets, ■ For Safety (Chapter 4): to arrange protection for machinery, to care and assign duty to operate the running machines, to obey the direction for appointing youth in high risk machines, to arrange precautionary measure relating to emission that may harm, to prepare plan for fire, to maintain, re-build, re-assemble the factory and machine for the safety. For worker accommodation (Chapter 5), to support first aid kids, to create a better environment for living, shops for worker, rest rooms, and nursery.
Labor Organization Law, 2011	This Law was 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 labor organizations systematically and independently. The Project Proponent acknowledges that Labour Organizations: ■ Are free to organise and negotiate workers rights if not meeting labour laws (section 17). ■ May demand re-appointment of worker if cause of dismissal is related to labour organisation membership or activities or not conform with labour laws (section 18).. ■ Have the right to send representatives to conciliation tribunals (section 19). ■ Have the right to participate and discuss workers rights and interests with government and employers (section 20) ■ Have the right to participate in collective bargaining in accordance with labour laws (section 21). ■ May take collective actions in accordance with the relevant procedures, regulations and law (section 22).
The Settlement of Labor Dispute Law, 2012	The Pyidaungsu Hluttaw hereby had enacted this Law for safeguarding the right of workers or having good relationship between employer and workers and making peaceful workplace or obtaining the rights fairly, rightfully and quickly by settling the dispute of employer and worker justly. The Project Proponent commits: ■ Not to fail to negotiate and coordinate in respect of a complaint within the prescribed period without sufficient cause (section 38) ■ Not to alter the conditions of service of workers involved in disputes prior to investigation by tribunals (section 39) ■ To be liable to pay full compensation to workers as determined by Arbitration Body or Tribunal if commits acts without sufficient cause (section 51).
Minimum Wages Law, 2013	This Law was enacted to meet with the essential needs of the workers, and their families, who are working at the commercial, production and service, agricultural and livestock breeding businesses and with the purpose of increasing the capacity of the workers and for the development of competitiveness. The Project Proponent commits:

	■ Not to pay wage less than the minimum wage stipulated, do not have the right to deduct any other wage (section 12 (a-e); ■ To inform rates of minimum wage relating to the business, allow the entry and inspection of the inspection officer, give the sick worker holiday for medical treatment in accord with stipulation and give holiday for the matter of funeral of the family of worker without deducting from the minimum wage (section 13(a-g)).
Leaves and Holidays Act, 1951	The Project Proponent commits to comply the relevant stipulations(4): ■ For employee to be granted to pay public holidays as announced by the Government in the Myanmar Gazette. On average, Myanmar has 26 public holidays per year, depending on the date of the variable holidays. ■ For additional rules to apply in accordance with other laws, such as the Social Security Law (2012) for employees contributing to the Social Security Fund. ■ To grant 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 to every employee who has completed a period of twelve months continuous service.
Payment of Wages Law, 2016	The Project Proponent commits: ■ That salaries are to be paid at the end of the month or, depending on the size of the employing enterprise, between 5-10 days before the end of the month. The employer is permitted and required to withhold income tax and social security payments. Other deductions, e.g. for absence, may only be withheld in accordance with the law (section 3). ■ That salaries are to be paid either in 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). ■ 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 (section 5). ■ To report to the Department with evidence of payment at later date agreed with the employee if the employer has difficulties to pay wages on time because of significant events (e.g. natural disaster) (section 9), ■ Not to cut the total salary more than 50% of his salary for any deducting from the salary due to the employees' absence (section 10). ■ To comply the stipulation for overtime work, to allow the presiding overtime rate as set by the Law (section 14).
Employment and Skill Development Law, 2013	The Project Proponent commits: ■ To conclude an employment agreement within thirty days after appointing worker to do any work as per section 5 (a)(i, ii) ■ To carry out training programmes for increasing employment skill of the workers who are intended to appoint or who are working presently in his work in accord with the policy of the Skill Development Body according to the requirement of the work (section 14). ■ To carry out to cause to train each or group of workers, according to each or combination of works, in opening on-job trainings, training in workplace systematically, sending to external trainings and training by the system applying information technology in managing and carrying out training programmes for increasing employment skill of the workers (section 15(a)).

	■ To carry out to cause to train persons who have attained 16 years of age, by appointing them as apprentices, the technologies relating to the employment in accord with regulations and by laws stipulated by the Skill Development Body (section 15(b)).
Social Security Law, 2012	The Project Proponent commits: ■ To include the social security funds (section 15(a)). ■ To deduct contributions to be paid by worker from his wages together with contribution to be paid by him and pay to the social security fund and in such case he can incur the expense (section 18(b)). ■ To 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 (section 48 (a)) ■ To 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 (section 51(a)); ■ To pay defaulting fee stipulated under section 88, in addition to the contribution if fails to contribute after effecting insurance for employment injury benefit (section 51(b)). ■ To incur the costs of medical treatment for employment injury occurring from criminal action or omission of the employer, or occurring from employer's failure to keep occupational safety plans and protections, and other benefits entitled to enjoy under this Law in accord with the stipulations without fail (section 53(b)). ■ To 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 (section 54(a)). ■ To keep records of work and lists as per prescription in section 75.
The Workmen's Compensation Act, 1923 (amended in 1955, 1957, 2005)	The Workmen's compensation act had been promulgated in 1923, amended in 1955, 1957, 2005, The Project Proponent commits to comply the stipulations relevant to the project (section 3): ■ For the payment by certain classes of employers to their workmen of compensation for injury by accident. ■ For the liability for compensation of employer's, amount of compensation, compensation to be paid when due and penalty for default, method of calculating wages, review, commutation of half-monthly payments, payment of a lump sum amount, distribution of compensation, compensation not to be assigned, attached or charged, notice and claim, power to require from employers statements regarding fatal accidents, reports of fatal accidents and serious bodily injuries, medical examination, contracting, remedies of employer against stranger, compensation to be first charge on assets transferred by employer, special provisions relating to masters and seamen. ■ For any updating for revising the monetary amount as per the amendment law.
Occupational Safety and Health Law, 2019	The Project Proponent commits: ■ To appoint the occupational safety and health responsible person in order to closely inspect for the safe and health of workers as per types of business defined by Ministry of Labour, Immigration and Population (section 12(a)). ■ To organize the Safety and Health Committee in accordance with the stipulations of the Ministry including the equal numbers of representative from employees and employers for the purposes to implementing the working environment, which is in safe and healthy for the business where the number of workers are not less than the number stipulated by the Ministry. In this case, the committee will be formed for the considerations (section 12(b)).

Myanmar Fire Brigade Law, 2015	■ The Project Proponent commits to abide by the directives of fire safety issued under section 16 by the head of the relevant Township Department of Fire Services (section 24). ■ As a work-site or business exposed to fire hazard, the Project Proponent as a owner or manager being assigned by Project Proponent commits to form the reserve fire brigade and to provide materials and apparatuses for fire safety; in conformity with the directive of the Fire Services Department (section 25).
Myanmar Insurance Law (1993)	Myanmar Insurance is established under this Law as a legal entity having perpetual succession, capable of suing and being sued in its own name. The Project Proponent commits: ■ To arrange Third Party Liability Insurance with Myanma Insurance (section 15) ■ To have General Liability Insurance with the Myanma Insurance as a compulsory requirement for organizations operating as an enterprise which may cause damage to life and property of the public or may pollute the environment (section 16).
Third-Party Liability insurance Rules (notification no.64/2003)	For the motor vehicles to be used in project, the Project Proponent commits: ■ To compulsorily insured with the Myanma Insurance against third-party liability for having his vehicle (section 3(a)). ■ To pay the premium charged by the Myanma Insurance to it or the organization authorized thereby on registration of his motor vehicle or renewal of the registration (section 3(b)).
Explosives Substances Act (1908)	The Project Proponent commits to comply and acknowledges the stipulations (section 4): ■ For 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, whether any injury to person or property has been actually caused or not, to be punished with transportation for life or any shorter term, to which a fine may be added, or with imprisonment for a term which may extend ten years, to which a fine may be added.
Industrial Use Explosive Substance Law (Law no.17/2018)	The Project Proponent commits not to import, transport, store, make, use, hold, and transfer the industrial explosive substances without any approval in accordance with this law as per section 19(a).
Prevention from Danger of Hazardous Chemical and Associated Material Law (Pyidaungsu Hluttaw Law No 28/2013)	The Project Proponent commits: ■ Not to produce, treat and formulate, use, possess, store, distribute, sell, transport, import or export the chemical or related substances prohibited by the Central Leading Board (section 33). ■ Not to operate the chemical and related substances business without license (section 34). ■ Not to use the chemical or the related substances which are unregistered or annulled from the registered list or not met to the quality and norm in the chemical and related substance business (section 35). ■ Not to restrict or disturb the inspecting of the Central Supervisory Board, the Supervisory Board and the Boards of Inspection in respect of the chemical and related substances business (section 36).
Motor Vehicle Law (2015)	The Project Proponent commits to reduce environmental impacts arising from a motor vehicle (section 3 (e)).
Freshwater Fisheries Law, 1991,	The Project Proponent commits: ■ Not to erect, construct place, maintain or arrange any obstruction such as a dam, bank or weir in a freshwater fisheries waters without the permission of the Department (section 36).

	■ Not to cause harassment of fish and other aquatic organisms or pollution of the water in a freshwater fisheries water (section 40). ■ Not to alter the quality of water, volume of water or the water -course in a leasable fishery, reserved fishery and creeks contiguous thereto or in water-courses (section 41).
Underground Water Act, 1930	The underground water act is enacted on the date of 21st June in 1930 whereas it is expedient to conserve and protect underground sources of water supply in the Union of Myanmar. The Project Proponent commits to comply the stipulations: ■ For prohibition from sinking of a tube for the purpose of obtaining underground water except under and in accordance with the terms of a license granted by the water officer. ■ For the powers of Township Officer or sub-divisional officer to close a license tube after exercising jurisdiction over the local area concerned and the expense of such closure shall be recoverable from the owner of the tube as if it were an arrear of land-revenue.
Vacant, Fallow and Virgin Land Management Act 2012, (Pyidaungsu Hluttaw Law No.10 of 2012)	The Project Proponent commits to comply the conditions for Person who is granted the right to use the vacant, fallow and virgin lands (section 16): (a). To use for the purpose granted and in relation to economic enterprise; (b). To carry out to be completed within four years from the date of grant according to the purpose granted (can revise by the Central Committee for losing time due to natural disaster and unstable security conditions; (c). Not to mortgaged, giving, sold, leasing or otherwise transferred or divided without the permission of the Cabinet of the Union Government; (d). To fully pay the land revenue; (e). To comply the conditions prescribed by the Central Committee (f). Not to explore other natural resources below and above ground except the purpose granted; (g). To surrender the natural resources found in the authorized land and the Government being desirous of extracting the same on a commercial resumes the area required therefrom.
The Farmland Act 2012	For utilizing the farmland for other purposes in the interest of the public in respect of the application:- There empowers: ■ The Central Farmland Management Body to give permission to utilize the paddy land for other purposes, with the recommendation of the Region or State Farmland Management Body (section 30(a)); ■ 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 (section 30(b)); The Project Proponent acknowledges these and commits to comply the directions being issued.

Sources of Related Laws, Rules and Regulations	Commitments
The Constitution of the Republic of the Union of Myanmar, 2008	The Constitution of the Union of Myanmar is the supreme law of the country and has provisions regarding the protection of the environment in Myanmar. The Project Proponent commits to comply the relevant articles (37(a)(b), 45, 390) as these three Articles in the Constitution provide a basis for legalizing and institutionalizing environmental health impact assessment and social impact assessment. There stipulates that ■ The Union 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; The Union shall enact necessary law to supervise extraction and utilization of State owned natural resources by economics forces; ■ The Union shall protect and conserve natural environment. ■ Every citizen has the duty to assist the Union in carrying out the following matters: (a) preservation and safeguarding of cultural heritage; (b) environmental conservation; (c) striving for development of human resources; (d) protection and preservation of public property.
Myanmar Agenda 21 (1997)	The Myanmar Agenda 21 makes recommendations for the drafting and promulgation of a framework law which can further promote the integration of environmental and developmental concerns in the decision-making processes of the country. The Project Proponent commits to comply as per this Myanmar Agenda 21's guidelines to address the following issues: ■ Increasing energy and material efficiency in production processes; ■ Reducing wastes from production and promoting recycling; ■ Promoting use of new and renewable sources of energy; ■ Using environmentally sound technologies for sustainable production; ■ Reducing wasteful consumption; ■ Increasing awareness for sustainable consumption.
National Sustainable Development Strategy (2009)	Sustainable management of natural resources in Myanmar, from environmental perspective comprises 11 areas, in which oil and gas sector development concerned are as follow: ■ Sustainable forest resources management; ■ Biodiversity conservation; ■ Sustainable fresh water resources management ; ■ Environmental quality management and enhancement; ■ Sustainable management of land resources; ■ Sustainable management for mineral resources utilization; ■ Sustainable energy production and consumption; and ■ Sustainable industrial, transport and communication development. The Project Proponent acknowledges and commits to implement the project as per this strategy guideline.

National Environmental Policy, 1994	Under this policy, the main environmental body was the NCEA. Prior to the establishment of MONREC, environmental conservation was undertaken by various ministries and departments. In 1990, the NCEA was established to advise the government on environmental policy, to act as a focal point and as a coordinating body for environmental affairs and to promote environmentally sound and sustainable development. The NCEA's main mission is to ensure sustainable use of environmental resources and to promote environmentally sound practices in industry and other economic activities, objectives and mandates. The Project Proponent commits to comply and implement the project as per this policy requirement.
Myanmar Climate Change Policy, 2019	This is established with the vision to be a climate-resilient, low carbon society that is sustainable, prosperous and inclusive, for the wellbeing of present and future generations. There clearly set-up a guiding principles for ■ Sustainable development ■ Precaution ■ Prevention ■ Environmental integrity ■ Shared responsibility and cooperation ■ Inclusiveness ■ Good governance ■ Climate justice and equity ■ Gender equality and women's empowerment The project proponent commits to support the Government in order to meet the above-mentioned principles (Clause 12)
Environmental Conservation Law (2012)	The Project Proponent commits: ■ To provide compensation for environmental impact and contribute funds for obtaining benefit from the natural environmental service system, contribute a part of the benefit from the business by exploring, trading and using the natural resources in environmental conservation works.(section 7(o)) ■ To treat, emit, discharge and deposit the substances which cause pollution in the environment in accord with stipulated environmental quality standards for causing a point source of pollution (section.14). ■ To install or use an on-site facility or controlling equipment in order to monitor, control, manage, reduce or eliminate environmental pollution for causing a point source of pollution. If it is impracticable, the project proponent commits to arrange to dispose the wastes in accord with environmentally sound methods (section 15). ■ Not to violate any prohibition contained in the rules, notifications, orders, directives and procedures issued under the Environmental Conservation Law (section 29).
Environmental Conservation Rules, (notification no. 50/2014)	The Project Proponent commits: ■ Not to emit, cause to emit, dispose, and 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 (section 69(a)). ■ Not to 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 (section 69(b)).

Environmental Impact Assessment Procedure, (notification no 616/2015)	The EIA Procedure sets out the procedures for completing an IEE, EIA and/or EMP in Myanmar. This includes information on project categorization, responsibilities of project developers and ministries, EIA review, monitoring and auditing, among other issues. The Project Proponent (Project Proponent) commits to comply the relevant section (102(a)(b),103, 104, 105, 106, 107, 108, 110, 113, 115, 117) prescribing: ***To bear full legal and financial responsibility***: ■ For his 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 ■ To 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 until PAPs have achieved socio-economic stability at a level not lower than that in effect prior to the commencement of the Project ***For undertaking EMP,*** ■ To implement the EMP, all Project commitments, and conditions, and ■ For liability 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. ■ For his responsibility, and to fully and effectively implement the requirements set forth in ECC, applicable Laws, Rules, EIA Procedure and standards. ■ Project commitments and conditions when providing services to the Project and inform the Ministry with detailed information as to the propose project's potential adverse impacts. ***For monitoring and reporting,*** ■ To notify and identify in writing to the Ministry, providing detailed information as to the proposed Project's potential Adverse Impacts. ■ To 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 EIA Procedure, standards, the ECC, and the EMP during all phases of the Project (pre-construction, construction, operation, decommissioning, closure and post-closure). ■ To notify and identify in writing to the Ministry for any breaches of his obligations or other performance failures or violations of the ECC and 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, to undertake 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. ■ To 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. ■ To submit the monitoring report within ten (10) days of completing a monitoring report and the information to be included.

	■ To make a monitoring report as contemplated in Article 108 and Article 109 in accordance with the EMP schedule, (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 within ten (10) days of completing ■ To submit a digital copy of a monitoring report within ten (10) days of receiving such request via email or as may otherwise be agreed upon with the requestor for the request of any organization or person. ***For the purposes of monitoring and inspection, the event of emergency,*** ■ To grant 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; ■ To grant, from time to time as and when the Ministry may reasonably require, 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. ■ To grant full and immediate access to the Ministry at any time as may be required by the Ministry 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. ■ To ensure that the Ministry's rights of access can extend to access by the Ministry to the Project's contractors and subcontractors. ***For the Conditions and Revisions to Conditions prescribed in Environmental Compliance Certificate,*** ■ To commence the 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 upon receipt of the written approval from the relevant authority.
National Environmental Quality (Emissions) Guidelines, (notification no. 615/2015)	The Project Proponent commits to comply the NEQ guidelines and its setting out for emission standards for air, noise and effluent discharges for Onshore Oil and Gas operations. The Project Proponent acknowledge this emissions standards and commits to comply and consider the prescription in all phases of the projects.
The Petroleum and Petroleum Product Law (2017)	There empowers- ■ The Ministry of Commerce to function relating to: (a)issuing licenses relating to import and export (c) determining procedures and conditions related to import and export (section 7(a,c)); ■ The Ministry of Transport and Communications to carry out the following functions relating to any petroleum and petroleum product for issuing licenses for motor vehicles, watercraft and barges for the carriage of petroleum and any types of petroleum products(section 9(a)); ■ The Ministry of Natural Resources and Environmental Conservation to perform the following functions relating to any petroleum and petroleum product for issuing storage license for the warehouses and storage tanks; transport permit for the vehicles, vessels and barges that shall carry any petroleum and petroleum product (section 10(a,b)); The Project Proponent acknowledges above these requirements and commits to state warning sign of danger or if not possible writing to be displayed on all receptacles containing any dangerous petroleum and petroleum product.

Petroleum exploration, drilling, appraisal and production law (2019)	The Project Proponent commits to comply the prescriptions for the responsibilities of the Petroleum license holders as per section 29(a-y), ■ To abide as per prescribed laws, rules, regulations, notifications, directives, orders, procedures, terms and conditions being specified in agreement ■ To care occupational safety, health, environmental conservation, guidelines relating to waste disposal and to implement international petroleum good practices
The Oilfields Act (1918) (amended in 2010)	This act 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 Project Proponent commits to comply guidance and issues prescribed such as for preventing oil and gas wastes, reporting of fires, accidents and other occurrences and regulating the collection and disposal of both oil and gas.
Oilfields (Labor & Welfare) Act (1951) (amended in 1953)	This act provides for the prevention of waste of oil or gas and also the prevention of environmental pollution by petroleum operations. There mentions 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. The Project Proponent commits to comply the stipulations ■ For the labors' working hours: Higher physical danger risk establishment (e.g. an oil rig): 8 hours/day or 40 hours/week, Medium physical danger risk establishment (e.g. factory, oilfield, open mine): 8 hours/day or 44 hours/week. If factory work is part of a continuous process (i.e. technical reasons): admissible 48 hours/week, 10 hours a day Max. 6 days/week (i.e. Sunday = weekly holiday). For Overtime: 2x normal pay rate. Work on weekly holiday = alternative day off within a period of 2 months. In Practice: No specific rules for offshore workers except in old law—oilfields act. Workers in industrial zones work around 11 hours a day, 6 days a week. Many in oilfields the same, but more dangerous jobs, 40/ week.
Law protecting Ethnic Right, 2015	There it is enacted that if an ethnic loose the right, he can complain to the Regional or State Government to get the equal chance and find the equal right. The Project Proponent commits to arrange: ■ To have the Equal right between the Ethnics living in Myanmar (section 5). ■ To informed all the project matters, coordinated and undertaken in consultation with ethnic groups if projects are in areas with ethnic groups. The Project Proponent also commits to comply the Succeeding laws to protect the right of Myanmar national: ***Monogamy Law (2015):*** Concerning all those who are living in Myanmar, Myanmar Citizens who live outside of Myanmar, and foreigners who marry Myanmar citizens while living in Myanmar for preventing misconducting marriages.

	Buddhist Women Special Marriage Law (2015): Concerning the marriage between Buddhist Woman and other religious man. There prescribed the legal procedure, the conditions to be complied by non-Buddhist husband, the customs for dividing property when divorcing. ***Religious Conversion Law (2015):*** This is enacted for the freedom to convert from one religion to another, or a person without a religion has the freedom to convert to a religion. There prohibited to apply for a religious conversion with an intent to insult, disrespect, destroy, or abuse a religion. **The Health Care in the Adjustment of Population Increase Law (2015);** This is for alleviate poverty, provide adequate quality healthcare, and ensure that family planning improves maternal and child health in the country. This Empowers region or state government that concerned with the special zone for healthcare to form region or state population control healthcare group to implementing the task as per the directives of the Ministry and region or state government and the Union Territory Governing body.
The Protection and Prevention of Communicable Disease Law, 1995	As per this law the Department of Health has to carry out immunizations and health education activities related to communicable diseases. (section 3(a)): The Project Proponent commits: ■ To prepare report for an outbreak of a communicable disease to the nearest Health Officer (section 9). ■ To support Health Officer to undertake investigations and medical examinations to prevent the control the spread of Principal Epidemic Disease (section 11).
The Public Health Law, 1972	The Project Proponent commits to cooperate with the authorized person or organization in line with the stipulations (section 3,5) ■ To abide by any instruction or stipulation for public health. ■ To accept any inspection, anytime, anywhere if it is needed.
The Control of Smoking and Consumption of Tobacco Product Law, 2006	The Project Proponent commits: (a) To keep the caption and mark referring that it is a non-smoking area, (b) To arrange the specific place (c) To supervise and carry out measures so that no one shall smoke at the non-smoking area (d) To accept the inspection when the supervisory body comes to the place for which he is responsible. (section 9(a-d))
The Protection and Preservation of Antique Objects Law (43/2015)	The Project Proponent commits: ■ To inform the relevant Ward or village-tract administrator if he knows or it seems reasonable to assume that the said object is an antique object for finding any object which has no owner or custodian (section 12).

The Protection and Preservation of Ancient Monuments Law (51/2015)	The Project Proponent commits: ■ To promptly inform the relevant Ward or Village-Tract Administrative Office for finding 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 (section 12). ■ To apply prior permission from the Department before searching for and extracting oil and gas or constructing pipelines within the specified area of an ancient monument (section 15(c)). ■ Not to damage ancient monuments including using machinery which causes vibration and discharging chemical substance (section 20).
Conservation of Water Resources and Rivers Law (2006)	The Project Proponent commits: ■ Not to 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 (section 11(a)). ■ Not to dispose of any substance into the river creek that may cause damage to waterway or change of watercourse from the bank or vessel (section 19) The empowerment of this Law is provided to the Ministry of Transport for controlling navigation of vessels in the rivers and creeks as well as communicating with local and foreign government and organizations for conservation of water resources, rivers and creeks. Also, to carry out conservation works for water resources, rivers and creeks, in accordance with the relevant international conventions, regional agreements and bilateral agreements for environmental conservation.
The Forest Law (2018)	The Forest Law is enacted by Pyihtaungsu Hluttaw in September, 2018. It empowers, to declare for the reserved forest for the maintaining a sustained yield of the forest produce, to manage the forest land. The Project Proponent commits (section 12): (a) To apply approval from the Ministry if desirous to implement the development work or economic project within a forest land and forest covered land. (b) To comply the Environmental Conservation Law and the stipulations from respective Laws for whoever desirous to undertake as in sub-section (a).
The Protection of Biodiversity and Conservation Areas Law 2018	The Project Proponent acknowledges that there may be charged with fine or imprisonment or both if finds guilty of ■ Using dynamite or explosive chemicals, electrolyzing, destroying water flow or poisoning water, intentionally pollutes the soil, water, air in the conservation area (section 39(d)); ■ Disposing or handling chemical waste and poisoning materials in the conservation area (section 39(e)).
Law on Protecting New Species of Plants (2016)	The Project Proponent commits to comply the stipulation for the right and protect the right of the new species growers for causing any impact to environment and biodiversity.
Myanmar Investment Law, 2016	The Project Proponent commits: (section 50(d), 51, 65) ■ To register the land lease contract at the office of Registry of Deeds in accordance with the Registration Act. ■ To comply the guideline for appointment, replacement, providing for the employment of staff and workers, ensuring to meet the entitlements and rights prescribed in the labor laws and rules in settling dispute regarding HR issues. ■ To comply stipulation:

	(a). To respect and comply with the customs, traditions and traditional culture of the ethnic groups in the Union; (e). To inform to the Commission if it is found that natural mineral resources or antique objects and treasure trove are not related to the investment permitted; (f). Not to make any significant alteration of topography or elevation of the land on which is entitled to lease or to use, without the approval of the Commission; (g). To abide by 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; (h). To list and keep proper records of books of account and financial statement and necessary financial matters relating to the investments performed by permit or endorsement in accordance with internationally and locally recognized accounting standards; (j). To pay wages and salaries to employees in accordance with applicable laws, rules, procedures, directive and so forth during the period of suspension of investment for a credible reason; (k). To pay compensation and indemnification in accordance with applicable laws to the relevant employee or his successor for injury, disability, disease or death due to the work; (l). To supervise foreign experts, supervisors and their families, who employ in their investment, to abide by the applicable laws, rules, orders and directives, and the culture and traditions of Myanmar; (m). To respect and comply with the labor laws; (n). To have the right to sue and to be sued in accordance with the laws; (o). To pay effective compensation for loss incurred to the victim, if there are 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). To allow the Commission to inspect in any places, when the Commission informs the prior notice to inspect the investment; (q). To take in advance permit or 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, and shall submit the situation of environmental and social impact assessment to the Commission along the period of activities of the investments which obtained permit or endorsement of the Commission.
Myanmar Investment Rules, 2017	The Project Proponent commits: ■ To comply with all terms and conditions in the permit and other applicable laws when the investment is carried out (section 202). ■ To fully assist while negotiating with the Authority for settling the grievances of the local community that have been effected due to Investments (section 203). ■ To appoint expert foreigner as senior manager, technical and operational expert or advisor according to subsection (a) of the section 51 of the Law (section 206). ■ To obtain the permit or tax exemption or relief to insure the relevant insurance out of the following types of the insurance at any insurance business entitled to carry out insurance business within the Union based on the nature of the business: Property and Business Interruption Insurance; Engineering Insurance; Professional Liability Insurance;

	Bodily Injury Insurance; Marine Insurance; or Workmen Compensation Insurance; Life Insurance; Fire Insurance (section 212).
The Import and Export Law, 2012	The Project Proponent, as a license holder, commits to comply as per stipulations in section 7, for not to violate the conditions contained in the license.
The Factories Act (1951) (Amended 1953, 1954, 1962, 2016)	The Project Proponent commits to comply the relevant stipulations: ■ For Health (Chapter 3): to arrange clean and free from any odors, solid waste and any seepage, to provide temperate and good ventilations, to well manage the particulate matters and emissions, to set up a moisture level that may be comfortable, not to populate in the factory, to get enough light, to provide clean drinking water, to provide toilets, ■ For Safety (Chapter 4): to arrange protection for machinery, to care and assign duty to operate the running machines, to obey the direction for appointing youth in high risk machines, to arrange precautionary measure relating to emission that may harm, to prepare plan for fire, to maintain, re-build, re-assemble the factory and machine for the safety. For worker accommodation (Chapter 5), to support first aid kids, to create a better environment for living, shops for worker, rest rooms, and nursery.
Labor Organization Law, 2011	This Law was 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 labor organizations systematically and independently. The Project Proponent acknowledges that Labour Organizations: ■ Are free to organise and negotiate workers rights if not meeting labour laws (section 17). ■ May demand re-appointment of worker if cause of dismissal is related to labour organisation membership or activities or not conform with labour laws (section 18).. ■ Have the right to send representatives to conciliation tribunals (section 19). ■ Have the right to participate and discuss workers rights and interests with government and employers (section 20) ■ Have the right to participate in collective bargaining in accordance with labour laws (section 21). ■ May take collective actions in accordance with the relevant procedures, regulations and law (section 22).
The Settlement of Labor Dispute Law, 2012	The Pyidaungsu Hluttaw hereby had enacted this Law for safeguarding the right of workers or having good relationship between employer and workers and making peaceful workplace or obtaining the rights fairly, rightfully and quickly by settling the dispute of employer and worker justly. The Project Proponent commits: ■ Not to fail to negotiate and coordinate in respect of a complaint within the prescribed period without sufficient cause (section 38) ■ Not to alter the conditions of service of workers involved in disputes prior to investigation by tribunals (section 39) ■ To be liable to pay full compensation to workers as determined by Arbitration Body or Tribunal if commits acts without sufficient cause (section 51).
Minimum Wages Law, 2013	This Law was enacted to meet with the essential needs of the workers, and their families, who are working at the commercial, production and service, agricultural and livestock breeding businesses and with the purpose of increasing the capacity of the workers and for the development of competitiveness. The Project Proponent commits:

	■ Not to pay wage less than the minimum wage stipulated, do not have the right to deduct any other wage (section 12 (a-e); ■ To inform rates of minimum wage relating to the business, allow the entry and inspection of the inspection officer, give the sick worker holiday for medical treatment in accord with stipulation and give holiday for the matter of funeral of the family of worker without deducting from the minimum wage (section 13(a-g)).
Leaves and Holidays Act, 1951	The Project Proponent commits to comply the relevant stipulations(4): ■ For employee to be granted to pay public holidays as announced by the Government in the Myanmar Gazette. On average, Myanmar has 26 public holidays per year, depending on the date of the variable holidays. ■ For additional rules to apply in accordance with other laws, such as the Social Security Law (2012) for employees contributing to the Social Security Fund. ■ To grant 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 to every employee who has completed a period of twelve months continuous service.
Payment of Wages Law, 2016	The Project Proponent commits: ■ That salaries are to be paid at the end of the month or, depending on the size of the employing enterprise, between 5-10 days before the end of the month. The employer is permitted and required to withhold income tax and social security payments. Other deductions, e.g. for absence, may only be withheld in accordance with the law (section 3). ■ That salaries are to be paid either in 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). ■ 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 (section 5). ■ To report to the Department with evidence of payment at later date agreed with the employee if the employer has difficulties to pay wages on time because of significant events (e.g. natural disaster) (section 9), ■ Not to cut the total salary more than 50% of his salary for any deducting from the salary due to the employees' absence (section 10). ■ To comply the stipulation for overtime work, to allow the presiding overtime rate as set by the Law (section 14).
Employment and Skill Development Law, 2013	The Project Proponent commits: ■ To conclude an employment agreement within thirty days after appointing worker to do any work as per section 5 (a)(i, ii) ■ To carry out training programmes for increasing employment skill of the workers who are intended to appoint or who are working presently in his work in accord with the policy of the Skill Development Body according to the requirement of the work (section 14). ■ To carry out to cause to train each or group of workers, according to each or combination of works, in opening on-job trainings, training in workplace systematically, sending to external trainings and training by the system applying information technology in managing and carrying out training programmes for increasing employment skill of the workers (section 15(a)).

	■ To carry out to cause to train persons who have attained 16 years of age, by appointing them as apprentices, the technologies relating to the employment in accord with regulations and by laws stipulated by the Skill Development Body (section 15(b)).
Social Security Law, 2012	The Project Proponent commits: ■ To include the social security funds (section 15(a)). ■ To deduct contributions to be paid by worker from his wages together with contribution to be paid by him and pay to the social security fund and in such case he can incur the expense (section 18(b)). ■ To 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 (section 48 (a)) ■ To 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 (section 51(a)); ■ To pay defaulting fee stipulated under section 88, in addition to the contribution if fails to contribute after effecting insurance for employment injury benefit (section 51(b)). ■ To incur the costs of medical treatment for employment injury occurring from criminal action or omission of the employer, or occurring from employer's failure to keep occupational safety plans and protections, and other benefits entitled to enjoy under this Law in accord with the stipulations without fail (section 53(b)). ■ To 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 (section 54(a)). ■ To keep records of work and lists as per prescription in section 75.
The Workmen's Compensation Act, 1923 (amended in 1955, 1957, 2005)	The Workmen's compensation act had been promulgated in 1923, amended in 1955, 1957, 2005, The Project Proponent commits to comply the stipulations relevant to the project (section 3): ■ For the payment by certain classes of employers to their workmen of compensation for injury by accident. ■ For the liability for compensation of employer's, amount of compensation, compensation to be paid when due and penalty for default, method of calculating wages, review, commutation of half-monthly payments, payment of a lump sum amount, distribution of compensation, compensation not to be assigned, attached or charged, notice and claim, power to require from employers statements regarding fatal accidents, reports of fatal accidents and serious bodily injuries, medical examination, contracting, remedies of employer against stranger, compensation to be first charge on assets transferred by employer, special provisions relating to masters and seamen. ■ For any updating for revising the monetary amount as per the amendment law.
Occupational Safety and Health Law, 2019	The Project Proponent commits: ■ To appoint the occupational safety and health responsible person in order to closely inspect for the safe and health of workers as per types of business defined by Ministry of Labour, Immigration and Population (section 12(a)). ■ To organize the Safety and Health Committee in accordance with the stipulations of the Ministry including the equal numbers of representative from employees and employers for the purposes to implementing the working environment, which is in safe and healthy for the business where the number of workers are not less than the number stipulated by the Ministry. In this case, the committee will be formed for the considerations (section 12(b)).

Myanmar Fire Brigade Law, 2015	■ The Project Proponent commits to abide by the directives of fire safety issued under section 16 by the head of the relevant Township Department of Fire Services (section 24). ■ As a work-site or business exposed to fire hazard, the Project Proponent as a owner or manager being assigned by Project Proponent commits to form the reserve fire brigade and to provide materials and apparatuses for fire safety; in conformity with the directive of the Fire Services Department (section 25).
Myanmar Insurance Law (1993)	Myanmar Insurance is established under this Law as a legal entity having perpetual succession, capable of suing and being sued in its own name. The Project Proponent commits: ■ To arrange Third Party Liability Insurance with Myanma Insurance (section 15) ■ To have General Liability Insurance with the Myanma Insurance as a compulsory requirement for organizations operating as an enterprise which may cause damage to life and property of the public or may pollute the environment (section 16).
Third-Party Liability insurance Rules (notification no.64/2003)	For the motor vehicles to be used in project, the Project Proponent commits: ■ To compulsorily insured with the Myanma Insurance against third-party liability for having his vehicle (section 3(a)). ■ To pay the premium charged by the Myanma Insurance to it or the organization authorized thereby on registration of his motor vehicle or renewal of the registration (section 3(b)).
Explosives Substances Act (1908)	The Project Proponent commits to comply and acknowledges the stipulations (section 4): ■ For 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, whether any injury to person or property has been actually caused or not, to be punished with transportation for life or any shorter term, to which a fine may be added, or with imprisonment for a term which may extend ten years, to which a fine may be added.
Industrial Use Explosive Substance Law (Law no.17/2018)	The Project Proponent commits not to import, transport, store, make, use, hold, and transfer the industrial explosive substances without any approval in accordance with this law as per section 19(a).
Prevention from Danger of Hazardous Chemical and Associated Material Law (Pyidaungsu Hluttaw Law No 28/2013)	The Project Proponent commits: ■ Not to produce, treat and formulate, use, possess, store, distribute, sell, transport, import or export the chemical or related substances prohibited by the Central Leading Board (section 33). ■ Not to operate the chemical and related substances business without license (section 34). ■ Not to use the chemical or the related substances which are unregistered or annulled from the registered list or not met to the quality and norm in the chemical and related substance business (section 35). ■ Not to restrict or disturb the inspecting of the Central Supervisory Board, the Supervisory Board and the Boards of Inspection in respect of the chemical and related substances business (section 36).
Motor Vehicle Law (2015)	The Project Proponent commits to reduce environmental impacts arising from a motor vehicle (section 3 (e)).
Freshwater Fisheries Law, 1991,	The Project Proponent commits: ■ Not to erect, construct place, maintain or arrange any obstruction such as a dam, bank or weir in a freshwater fisheries waters without the permission of the Department (section 36).

	■ Not to cause harassment of fish and other aquatic organisms or pollution of the water in a freshwater fisheries water (section 40). ■ Not to alter the quality of water, volume of water or the water -course in a leasable fishery, reserved fishery and creeks contiguous thereto or in water-courses (section 41).
Underground Water Act, 1930	The underground water act is enacted on the date of 21st June in 1930 whereas it is expedient to conserve and protect underground sources of water supply in the Union of Myanmar. The Project Proponent commits to comply the stipulations: ■ For prohibition from sinking of a tube for the purpose of obtaining underground water except under and in accordance with the terms of a license granted by the water officer. ■ For the powers of Township Officer or sub-divisional officer to close a license tube after exercising jurisdiction over the local area concerned and the expense of such closure shall be recoverable from the owner of the tube as if it were an arrear of land-revenue.
Vacant, Fallow and Virgin Land Management Act 2012, (Pyidaungsu Hluttaw Law No.10 of 2012)	The Project Proponent commits to comply the conditions for Person who is granted the right to use the vacant, fallow and virgin lands (section 16): (a). To use for the purpose granted and in relation to economic enterprise; (b). To carry out to be completed within four years from the date of grant according to the purpose granted (can revise by the Central Committee for losing time due to natural disaster and unstable security conditions; (c). Not to mortgaged, giving, sold, leasing or otherwise transferred or divided without the permission of the Cabinet of the Union Government; (d). To fully pay the land revenue; (e). To comply the conditions prescribed by the Central Committee (f). Not to explore other natural resources below and above ground except the purpose granted; (g). To surrender the natural resources found in the authorized land and the Government being desirous of extracting the same on a commercial resumes the area required therefrom.
The Farmland Act 2012	For utilizing the farmland for other purposes in the interest of the public in respect of the application:- There empowers: ■ The Central Farmland Management Body to give permission to utilize the paddy land for other purposes, with the recommendation of the Region or State Farmland Management Body (section 30(a)); ■ 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 (section 30(b)); The Project Proponent acknowledges these and commits to comply the directions being issued.

4.2.3 International Agreements and Conventions

In addition to the local regulations presented above, Myanmar is also a signatory to the following international conventions which may have relevance to the proposed exploration activities:

- Asia Least Cost Greenhouse Gas Abatement Strategy (ALGAS) (1998) –the Project activities during both construction and drilling phases are expected to contribute to Greenhouse Gases (GHG) emissions;
- United Nations Framework Convention on Climate Change (1994) –the Project activities during both construction and drilling phases are expected to contribute to GHG emissions;
- Montreal Protocol on Substances that Deplete the Ozone Layer (1989) – the Project activities during both construction and drilling phases are expected to contribute to GHG emissions;
- Vienna Convention for the protection of the Ozone layer (1988) –the Project activities during both construction and drilling phases are expected to contribute to GHG emissions; and
- Convention on Biological Diversity (1992) – the Project related activities may impact biological receptors and surrounding biodiversity.

4.2.4 Good International Industry Practice (GIIP) Guidelines

Eni will undertake the impact assessment study and onshore exploration activities in a manner which is guided by AMTE TG 002 r00 “Environmental, Social and Health Impact Assessment in Exploration” and good international industry practice. Applicable guidelines which Eni will consider in preparing its approach include:

- International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012).
- IFC Environmental, Health and Safety (EHS) guidelines, including:
  - General EHS Guidelines (2007);
  - EHS Guidelines for Onshore Oil and Gas Development (2015);
- United Nations Environment Program (UNEP) Guidelines on Environmental Management for Oil and Gas Exploration and Production (1997);
- International Finance Corporation (IFC) and the European Bank for Reconstruction and Development (EBRD) Guidance Note on Workers’ accommodation: Processes and Standards – address processes and standards that should be applied to the provision of workers’ accommodation by applying appropriate standards to the construction and operation of worker housing; and
- Other good international industry practice guidelines from organisations such as the American Petroleum Institute (API), International Petroleum Industry Environmental Conservation Association (IPIECA) and International Association of Oil and Gas Producers (IOGP).

4.3 Institutional Framework

4.3.1 Relevant Organization to the Project

This Project proponent involves multiple organization during the project lifecycle, these includes:

- Ministry of Natural Resources and Environmental Conservation (MONREC) - MONREC has ultimate responsibility in the management and assessment of approval processes under the Environmental Conservation Law;

- Environmental Conservation Department (ECD) – ECD is part of MONREC and they are the authority that reviews the submitted EIA;
- Myanma Oil and Gas Enterprise (MOGE) - MOGE is the state-owned enterprise responsible for working together with oil and gas companies (local and international) in Myanmar and oversees the Production Sharing Contracts (PSCs) in cooperation with foreign oil companies. MOGE involves direct communication and coordination with various levels of different government agencies for health, safety and environment (HSE) related issue; and
- Myanmar Investment Commission - MIC is a government agency responsible for coordinating with ministries (such as the MOEE) and other state entities to facilitate foreign investment in Myanmar.

4.3.2 Administrative Divisions of Myanmar

Myanmar is divided into twenty-one (21) main administrative subdivisions, which include:

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

The administrative subdivisions are detailed in ***Table 4.2***, and an administrative map is presented in ***Figure 4.2***.

Table 4.2: Administrative Regions of Myanmar

Name	Capital	Population (2014)	Area
Ayeyarwady Region	Pathein	6,184,829	35,031.8
Bago Region	Bago	4,867,373	39,402.3
Chin State	Hakha	478,801	36,018.8
Kachin State	Myitkyina	1,689,441	89,041.8
Kayah State	Loikaw	286,627	11,731.5
Kayin State	Pa-an	1,574,079	30,383.0
Magway Region	Magwe	3,917,055	44,820.6
Mandalay Region	Mandalay	6,165,723	37,945.6
Mon State	Mawlamyaing	2,054,393	12,296.6
Rakhine State	Sittwe	3,188,807	36,778.0
Sagaing Region	Sagaing	5,325,347	93,704.8
Shan State	Taunggyi	5,824,432	155,801.3
Tanintharyi Region	Dawei	1,408,401	44,344.9
Yangon Region	Yangon	7,360,703	10,276.7
Naypyidaw Union Territory	Naypyidaw	1,160,242	7,054
Danu Self-Administered Zone	Pindaya	N/A	N/A
Kokang Self-Administered Zone	Laukkai	N/A	N/A
Naga Self-Administered Zone	Lahe	N/A	N/A
Pa-O Self-Administered Zone	Hopong	N/A	N/A

Pa Laung Self-Administered Zone	Namhsan	N/A	N/A
Wa Self-Administered Division	Hopang	N/A	N/A

Source: World Library, http://www.worldlibrary.org/articles/administrative_divisions_of_myanmar

States and regions are divided into districts. Districts consist of townships, which are composed of towns, wards and village-tracts. Village-tracts 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.

Figure 4.2: Myanmar States/Regions and Townships

Source: MIMU, 2015

4.3.3 Myanmar Regulatory Authorities

Matters pertaining to Health, Safety and Environment (HSE) requirements are generally under the jurisdiction of the ministries and state-owned enterprises in the oil and gas sector. Key ministries, agencies and state-owned enterprises that have jurisdiction or are typically involved in HSE requirements and decision-makers for EIAs related to oil and gas operations in Myanmar are included in ***Table 4.3***.

Table 4.3: Key Ministries, Agencies and State-Owned Enterprises Involved in HSE and Decision-Makers for EIAs

Ministry/ Agency	Responsibility
Environmental Conservation Department (ECD) of Ministry of Natural Recourses and Environmental Conservation (MONREC), formerly called the Ministry of Environmental Conservation and Forestry (MOECAF)	The Environmental Conservation Department (ECD) of MONREC has ultimate responsibility in the management and assessment of approval processes under the Environmental Conservation Law. As per the EIA Procedure 2015, all projects and project expansions undertaken having the potential to cause Adverse Impacts are required to undertake IEE or EIA;this Project falls within the EIA category and will require submission (as per the EIA Procedure 2015 Annex A) inclusive of the development of an EMP and to obtain an ECC. The Project actively involve ECD and MONREC through engagement, meetings and submission of the EIA.
Myanmar Oil and Gas Enterprise (MOGE)	MOGE is the state-owned enterprise responsible for working together with oil and gas companies (local and international) in Myanmar and oversees the Production Sharing Contracts (PSCs) in cooperation with foreign oil companies. MOGE involves direct communication and coordination with various levels of different government agencies for health, safety and environment (HSE) related issues.
Ministry of Electricity and Energy (MOEE)	MOEE jointly works with MOGE in managing HSE Issues of oil and gas operators in Myanmar, in which MOEE encourages PSC participants to establish an HSE management system and prepare their own EIA/SIA for their project.As the Project may require electricity from the local grid, this additional consumption will be under the advisement and consideration of MOEE.
Myanmar Investment Commission (MIC)	MIC is a government agency responsible for coordinating with ministries (such as the MOEE) and other state entities to facilitate foreign investment in Myanmar. The MIC is also responsible for granting MIC permits which enable foreign investors to carry out business activities under the Foreign Investment Law (2012). Any development from a party/individual and involvement of any ministry (in this Project case – mainly MOGE) will require engagement with MIC.
Ministry of Transport	The Ministry of Transport is responsible for the country's transport infrastructure, and also operates the Myanmar Port Authority and Marine Administration, which are discussed further below. This Project requires land transportation, of equipment and construction materials including drilling rig.
Ministry of Agriculture, Livestock and Irrigation (MOALI)	The MOALI is responsible for the country's livestock and fishery sectors, as well as agriculture and irrigation. They oversee and manage various components of agriculture, including cultivation, production, procurement, processing and selling. The ministry also plays a role in monitoring and managing the reclamation of fallow and waste land and utilization of those for the improvement in crop production. The Project will be developed in areas where agriculture, farming of livestock and irrigation activities are very common.
Ministry of Security and Border Affairs	Ministry of Security and Border Affairs is a member of the National Defence and Security Council, and is responsible for the development and maintenance of stability of border areas.

General Administration Department (Township Level)	General Administrative Department (GAD) is a civil service body that staffs regional and state-level governments in Myanmar and provides administration for the country's districts and townships. With regards to EIA studies, GAD plays a role in approving and facilitating the township-level plan for public consultation.
Myanma Port Authority	The Myanmar Port Authority is responsible for regulating and administering the coastal ports of Myanmar. Major port facilities administered by the MPA include: ■ Myanmar Port Authority, Yangon; ■ Asia World Port Terminal, located in Ahlone Township of Yangon; ■ Myanmar Industrial Port, Yangon; ■ Myanmar International Terminal Thilawa, (MITT) 25 km from Yangon; and ■ Myanmar Integrated Port Limited (MIPL), Yangon. Also, particularly in Tanintharyi Region: ■ Dawei; ■ Myeik; and ■ Kawthoung. This Project will require to import materials from overseas.
Myanmar Fisheries Federation	The Myanmar Fisheries Federation (MFF) was formed in 1998 from the Myanmar Fishery Association. It is a NGO that deals with the fisheries industries. It was formed as part of the Association of Southeast Asian Nations (ASEAN) Fisheries Federation. The organisation operates at a local and national level with most of the larger fish farmers being members of the local MFF branch. The MFF is governed by a Central Executive Committee which plays a coordinating role and supported by office holders. The roles of the MFF are as follows: ■ Support applications made by its members to DoF for the license to undertake fisheries and aquaculture activities; ■ Support loan applications to the Livestock and Fisheries Bank; ■ Raise issues of collective importance to their members with the DoF, such as accessing initial investment, raw materials for feeds, negotiating with local authorities to change use of land; ■ Assist in the negotiation of selling and harvesting and working collectively; ■ Assist in the transferring of technology to fish farmers; and ■ Assist in the communication and cooperation with trans-boundary organization. This Project will require to import materials from overseas.

4.4 Project's Environmental, Social and Health Standards

4.4.1 Myanmar Environmental Quality (Emissions) Guidelines

4.4.1.1 General Guidelines

Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines were promulgated on December 29th, 2015. The Guidelines are largely based on International Finance Corporation (IFC) Environmental Health and Safety (EHS) Guidelines, and provide the basis for regulation and control of various environmental parameters, including noise and vibration, air emissions, and effluent discharges, from various sources.

Relevant excerpts from the guidelines are as follows:

"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.

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.

8. Further reference should be made by projects to applicable industry-specific IFC EHS guidelines for advice on means of achieving guideline values set out in Annex 1.

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.

11. While these Guidelines generally apply to all projects subject to the EIA Procedure, it is the prerogative of the Ministry to decide how the Guidelines should be applied to existing projects as referred to in the EIA Procedure, as distinguished from new projects. At the Ministry's discretion less stringent levels or measures than provided for in these Guidelines may be specified as appropriate, and a timeframe agreed for a project to fully comply with these Guidelines.

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.

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. "

A summary of environmental standards that are relevant to the Project are shown below.

Wastewater

In addition to industry-specific wastewater guidelines applicable during project operations (*Section 3.4.1.2*), the guideline values in ***Table 4.4*** apply during the construction phase of projects, covering storm water or surface water, and sanitary wastewater discharges from all project sites.

Table 4.4: Site Runoff and Wastewater Discharges (Construction Phase)

Pollutants	Units	Guideline Value
pH	pH	6 – 9
Biological Oxygen Demand (BOD)	mg/L	30
Chemical Oxygen Demand (COD)	mg/L	125
Total Nitrogen	mg/L	10
Total Phosphorus	mg/L	2
Oil and Grease	mg/L	10
Total Suspended Solids	mg/L	50
Total Coliform Bacteria	MPN[(a)]/100 ml	400

Source: IFC General EHS Guidelines: Wastewater and Ambient Water Quality

Note: [(a)] MPN = Most Probable Number

Air Emissions

According to the Myanmar National Environmental Quality (NEQ) (Emission) Guidelines (2015), projects with potentially significant sources of air emissions that may impact ambient air quality, the project should implement measures to prevent or reduce impacts by ensuring that emissions do not result in pollutant concentrations that reach or exceed Myanmar's legislative limits, or in their absence or insufficiency, the current Air Quality and Emissions limits set out in the IFC General EHS Guidelines, as well as World Health Organization (WHO) Air Quality Guidelines. In addition, the guidelines (from both Myanmar and IFC) recommend that the increased ambient pollutant concentrations contributed by the project's emissions should be equivalent to less than 25 percent of applicable air quality standards above baseline conditions. The reason for this stipulation is to allow additional, future sustainable development in the same airshed.

The Government of Myanmar has established numerical standard for ambient air quality in the Myanmar National Environmental Quality (NEQ) (Emission) Guidelines (2015) based on the IFC's Environmental, Health and Safety Guidelines: Air Emissions and Ambient Air Quality (2007) which adopted the WHO Ambient Air Quality Guidelines (2005). The Myanmar NEQ Guidance Values shown in ***Table 4.5*** have been adopted as the ambient air quality guidelines for this Project.

Table 4.5: Ambient Air Quality Guidelines

Parameter	Averaging Period (mean)	Myanmar NEQ Guidance Value (µg/m^3)[(a)]	WHO Guidance Value (µg/m^3)[(b)]
Nitrogen dioxide	1-year 1-hour	40 200	40 (guideline) 200 (guideline)
Ozone	8-hour daily maximum	100	160 (Interim target-1) 100 (guideline)
Particulate matter PM_{10}	1-year	20	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	50	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate matter $PM_{2.5}$	1-year	10	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	25	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Sulphur dioxide	24-hour	20	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10-minute	500	500 (guideline)

Note: (a) Extracted from Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines (2015)
(b) Extracted from WBG EHS General Guidelines, Environmental Chapter, Section 1.1, Table 1.1.1 based on World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile.

Noise Levels

General noise guidelines are presented in ***Table 4.6***.

Table 4.6: General Noise Level Standards

Receptor	Maximum Allowable Noise Level (1 hour) [(a)] dB(A)	
	Day-time 0700 – 2200 hours	Night-time 2200 – 0700 hours
Residential, institutional and education centers	55	45
Industrial/ commercial areas	70	70

Source: Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines (2015)

Odour

As per Myanmar National Environmental Quality (NEQ) (Emission) Guidelines (2015), point and diffuse source odours from industries should be minimized using available prevention and control techniques as described in the IFC EHS industry-specific guidelines. Point source activities are those that involve emissions of odour from a single identifiable source and which generally can be controlled using waste reduction, waste minimization and cleaner production principles or conventional emission control equipment. Diffuse source activities are generally dominated by area or volume source emissions of odour (e.g. intensive agricultural activities) and which can be more difficult to control. Projects should control odours to ensure that odours that are offensive or unacceptable to neighbors do not occur. Generally, odour levels should not exceed five to ten odorant units[1] at the edge of populated areas in the vicinity of a project. Projects with multiple odorous point or diffuse releases, or emitting complex odors should conduct an odour impact assessment to determine ground-level maximum concentrations taking into account site-specific factors including proximity to populated areas and sensitive receptors.

4.4.1.2 Industry-Specific Standards for Onshore Oil and Gas Projects

A list of standards specific to onshore oil and gas development is shown in ***Table 4.7***.

Table 4.7: Effluent and Emission Standards for Oil and Gas Development

Parameter	Guideline
Drilling fluids and cuttings	Treatment and disposal in accordance with applicable standards provided in the IFC EHS Onshore Oil and Gas Development guideline
Produced sand	Treatment and disposal in accordance with applicable standards provided in the IFC EHS Onshore Oil and Gas Development guideline
Produced water	Treatment and disposal in accordance with applicable standards provided in the IFC EHS Onshore Oil and Gas Development guideline For discharge to surface waters or to land: ■ 5-day Biochemical oxygen demand 25 mg/l ■ Chemical oxygen demand 125 mg/l ■ Chlorides 600 mg/l (average), 1,200 mg/l maximum ■ Heavy metals (total)[a] 5 mg/l ■ pH 6-9[b] ■ Phenols 0.5 mg/l ■ Sulfides 1 mg/l ■ Total hydrocarbon content 10 mg/l ■ Total suspended solids 35 mg/l

[1] Industrial odor control. 2002. Environmental guideline No.9, Danish Environmental Protection Agency, Ministry of Environment. The detectability of an odor is a sensory property that refers to the minimum concentration that produces an olfactory response or sensation. An odorant unit is defined as the amount of odorant mixtures which distributed in one cubic meter of air results in odor intensities corresponding to a defined threshold value. The odorant unit is therefore defined by a physiologically measured amount of substance. In practice, offensive odor can only be judged by public reaction to the odor, with the nuisance level being as low as two odorant units and as high as ten odorant units for less offensive odors. An odor assessment criteria of five to ten odorant units is likely to represent the level below which offensive odors should not occur.

Parameter	Guideline
Hydrotest water	Treatment and disposal in accordance with applicable standards provided in the IFC EHS Onshore Oil and Gas Development guideline For discharge to surface waters or to land: ■ 5-day Biochemical oxygen demand 25 mg/l ■ Chemical oxygen demand 125 mg/l ■ Chlorides 600 mg/l (average), 1,200 mg/l maximum ■ Heavy metals (total) 5 mg/l ■ pH 6-9 ■ Phenols 0.5 mg/l ■ Sulfides 1 mg/l ■ Total hydrocarbon content 10 mg/l ■ Total suspended solids 35 mg/l
Completion and well work-over fluids	Treatment and disposal in accordance with applicable standards provided in the IFC EHS Onshore Oil and Gas Development guideline For discharge to surface waters or to land: ■ pH 6-9 ■ Total hydrocarbon content 10 mg/l
Storm water drainage	Storm water runoff should be treated through an oil/ water separation system able to achieve oil and grease concentration of 10 mg/l
Sewage	Holding and discharge to municipal or centralized wastewater treatment systems or onboard treatment to achieve: ■ 5-day Biochemical oxygen demand 30 mg/l ■ Chemical oxygen demand 125 mg/l ■ Oil and grease 10 mg/l ■ pH 6-9 ■ Total coliform bacteria 400/100 ml ■ Total nitrogen 10 mg/l ■ Total phosphorus 2 mg/l ■ Total suspended solids 50 mg/l

Source: National Environmental Quality (Emission) Guidelines, Industry Specific Guidelines, Offshore Oil and Gas, Section 2.1.5.
Notes:
[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)"*

4.4.2 Other Relevant Standards and Guidelines

4.4.2.1 Myanmar National Drinking Water Quality Standards (2019)

Myanmar developed their own National Drinking Water Standards in (2014), which was recently updated (2019). Tresholds values for chemicals of health significance in drinking-water is shown in ***Table 4.8***.

Table 4.8: Requirements of Inorganic Chemical Constituents for Drinking Water

Contaminant	Guideline	
	mg/l	µg/l
Aluminium	0.2	200
Ammonia Nitrogen	1.5	1,500
Antimony	0.02	20
Arsenic	0.05	50
Barium	0.7	700
Boron	2.4	2,400
Cadmium	0.003	3
Calcium	200	200,000
Chloride	250	250,000
Chromium	0.05	50
Copper	2	200
Cyanide	0.07	70
Fluoride	1.5	1,500
Iron	1	1,000
Hardness	500	500,000
Lead	0.01	10
Magnesium	150	150,000
Manganese	0.4	400
Mercury	0.001	1
Nickel	0.07	70
Nitrate (as NO_3 −)	50	50,000
Nitrite (as NO_2 −)	3	3,000
Selenium	0.04	40
Sodium	200	200,000
Sulphate	250	250,000
Total Dissolved Solid (TDS)	1,000	1,000,000

Contaminant	Guideline	
	mg/l	µg/l
Uranium	0.03	30
Zinc	3	3,000

Source: National Drinking Water Quality Standard, Myanmar, 2019

4.4.2.2 Dutch Target and Intervention Values for Soil Remediation (2000)

There are no Myanmar regulations or standards for ambient soil or groundwater quality. In the absence of local or country standards, it is ERM's practice to use globally recognised standards for comparison. In the case of soil and groundwater, the preferred standard is the Earth Intervention value, Dutch Target and Intervention Values, 2000, which are widely utilized as a reference in environmental science literature. Soil and groundwater target intervention values for this standard are presented in ***Table 4.9.***

Table 4.9: Soil and Groundwater Target and Intervention Values

	Soil (mg/kg)		Groundwater (g/l)	
	Target Value	Intervention Value	Target Value	Intervention Value
Metals				
Antimony	3	15	0.15	20
Arsenic	29	55	7.2	60
Barium	160	625	200	625
Cadmium	0.8	12	0.06	6
Chromium	100	380	2.5	30
Cobalt	9	240	0.7	100
Copper	36	190	1.3	75
Mercury	0.3	10	0.01	0.3
Lead	85	530	1.7	75
Molybdenum	3	200	3.6	300
Nickel	35	210	2.1	7.5
Zinc	140	720	24	800
Inorganic compounds				
Cyanide-free	1	20	5	1500
Cyanides-complex (pH<5)	5	650	10	1500
Cyanides-complex (pH>=5)	5	50	10	1500
Thiocyanates (sum)	1	20	-	1500
Aromatic compounds				
Benzene	0.01	1	0.2	30
Ethyl benzene	0.03	50	4	150

Toluene	0.01	130	7	1000
Xylenes	0.1	25	0.2	70
Styrene (vinyl benzene)	0.3	100	6	300
Phenol	0.05	40	0.2	2000
Cresols (sum)	0.05	5	0.2	200
Catechol(o-dihydroxybenzene)	0.05	20	0.2	1250
Resorcinol(m-dihydroxybenzene)	0.05	10	0.2	600
Hydroquinone(p-dihydroxybenzene)	0.05	10	0.2	800
Chlorinated hydrocarbons				
Vinyl chloride	0.01	0.1	0.01	5
Dichloromethane	0.4	10	0.01	1000
1,1 – dichloroethane	0.02	15	7	900
1,2 – dichloroethane	0.02	4	7	400
1,1 – dichloroethene	0.1	0.3	0.01	10
1,2 – dichloroethene	0.2	1	0.01	20
Dichloropropane	0.002	2	0.8	80
Trichloromethane (chloroform)	0.02	10	6	400
1,1,1 – trichloroethane	0.07	15	0.01	300
1, 1, 2 – trichloroethane	0.4	10	0.01	130
Trichloroethene (Tri)	0.1	60	24	500
Tetrachloromethane (Tetra)	0.4	1	0.01	10
Tetrachloroethene (Per)	0.002	4	0.01	40

Source: Dutch Target and Intervention Values for Soil Remediation, 2000[1]

4.4.2.3 World Health Organization (WHO) Standards

Guideline values for chemicals that are of health significance in drinking-water is shown in ***Table 4.10***.

Table 4.10: Guideline Values for Chemicals of Health Concerns in Drinking Water According to WHO

Contaminant	Guideline	
	mg/l	µg/l
Acrylamide	0.0005	0.5

[1] https://www.esdat.net/Environmental%20Standards/Dutch/annexS_I2000Dutch%20Environmental%20Standards.pdf

Contaminant	Guideline	
	mg/l	µg/l
Alachlor	0.02	20
Aldicarb	0.01	10
Antimony	0.02	20
Arsenic	0.01	10
Barium	0.7	700
Benzene	0.01	10
Benzo[a]pyrene	0.0007	0.7
Boron	2.4	2400
Bromate	0.01	10
Bromodichloromethane	0.06	60
Bromoform	0.1	100
Cadmium	0.003	3
Carbon tetrachloride	0.004	4
Chlorate	0.7	700
Chlordane	0.0002	0.2
Chlorine	5	5000
Chlorite	0.7	700
Chloroform	0.3	300
Chlorotoluron	0.03	30
Chromium	0.05	50
Copper	2	2000
DDT and metabolites	0.001	1
Dibromoacetonitrile	0.07	70
Dibromochloromethane	0.1	100
Dichloroacetate	0.05	50
Dichloroacetonitrile	0.02	20
Dichloromethane	0.02	20
Ethylbenzene	0.3	300
Fluoride	1.5	1500
Lead	0.01	10
Mercury	0.006	6
Monochloramine	3	3000

Contaminant	Guideline	
	mg/l	µg/l
Monochloroacetate	0.02	20
Nickel	0.07	70
Nitrate (as NO_3 −)	50	50000
Nitrite (as NO_2 −)	3	3000
Selenium	0.04	40
Toluene	0.7	700
Uranium	0.03	30
Xylenes	0.5	500

Source: WHO, n.d.

4.4.2.4 United States Environmental Protection Authority (EPA)

Guideline values for chemicals that are of health significance in drinking-water is shown in ***Table 4.11***.

Table 4.11: Guideline Values for Chemicals of Health Concerns in Drinking Water According to EPA

Contaminant	Guideline	
	MCLG[1] (mg/l)	MCL[2] µg/l
Microorganisms		
Total Coliforms (including fecal coliform and E. Coli)	0	5.0%
Disinfection Byproducts		
Bromate	0	0.010
Chlorite	0.8	1.0
Haloacetic acids (HAA5)	-	0.060
Total Trihalomethanes	-	0.080
Inorganic Chemicals		
Antimony	0.006	0.006
Arsenic	0	0.010
Barium	2	2
Beryllium	0.004	0.004
Cadmium	0.005	0.005
Total Chromium	0.1	0.1
Copper	1.3	1.3
Cyanide (as free cyanide)	0.2	0.2

Contaminant	Guideline	
	MCLG[1] (mg/l)	MCL[2] µg/l
Fluoride	4.0	4.0
Lead	0	0.015
Mercury (inorganic)	0.002	0.002
Nitrate	10	10
Nitrite	1	1
Selenium	0.05	0.05
Thallium	0.0005	0.002
Organic Chemicals		
Acrylamide	0	-
Benzene	0	0.005
Benzo(a)pyrene (PAHs)	0	0.0002
Carbon tetrachloride	0	0.005
Chlorobenzene	0.1	0.1
1, 2 – dichloroethane	0	0.005
1, 1 – dichloroethylene	0.007	0.007
cis-1,2-Dichloroethylene	0.07	0.07
trans-1,2-Dichloroethylene	0.1	0.1
Dichloromethane	0	0.005
1,2-Dichloropropane	0	0.005
Ethylbenzene	0.7	0.7
Ethylene dibromide	0	0.00005
Polychlorinated biphenyls (PCBs)	0	0.0005
Pentachlorophenol	0	0.001
Tetrachloroethylene	0	0.005
Toluene	1	1
1,2,4-Trichlorobenzene	0.07	0.07
1,1,1-Trichloroethane	0.20	0.2
1,1,2-Trichloroethane	0.003	0.005
Trichloroethylene	0	0.005
Vinyl chloride	0	0.002
Xylenes (total)	10	10

Source: EPA, 2018

Note: [1] Maximum Contaminant Level Goal (MCLG) – the level of a containment in drinking water below which there is no known or excepted risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals

[2] Maximum Contaminant Level (MCL) – the highest level of a containment that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.

4.4.2.5 IFC Air Quality Requirements for Vegetation Protection

IFC makes reference to ecologically sensitive areas in its Performance Standards, requiring for air quality assessment to be conducted but doesn't specify criteria for the assessment. Myanmar does not have such criteria either and therefore the Project is using other internationally recognised sources as recommended by the IFC. ***Table 4.12*** shows the criteria that has been used in this study.

Table 4.12: Critical Levels for the Protection of Vegetation

Substance	Averaging Period	Critical Level (µg/m^3)
Sulfur Dioxide (SO_2)	Annual	20
Oxides of Nitrogen (NO_x)	Annual	30

Source: Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe

4. DESCRIPTION OF PROJECT

This section provides a general description of the facilities and activities associated with the onshore drilling in the Concession Block RSF-5, Myanmar, which includes:

- Project Background
- Project Location;
- Overview of Project Facilities, Components and Activities;
- Logistics and Transportation;
- Workforce;
- Project Schedule;
- Utilities;
- Emissions, Discharges, and Waste Management; and
- Comparison and Selection of Project Alternatives.

4.1 Project Background

Eni Myanmar B.V. (Eni) was awarded the onshore Block RSF-5 and signed a Production Sharing Contract (PSC) with MOGE on 30 July 2014. Eni Myanmar is the operator of the block with 90% W.I. while Myanmar Petroleum Exploration & Production Co. is the JV Partner with 10% W.I.

Eni previously conducted land seismic survey activities in this block in 2017-18, for which an Environmental, Social and Health Impact Assessment (ESHIA) Report[1] was prepared and approved by the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC). Eni is now planning to conduct exploration drilling in Block RSF-5 ("the Project"), which is expected to commence in November-December 2019 and extend for about 180 days. Associated preparatory civil works commencement is subject to the release of necessary authorizations. Block RSF-5 is located in southern central Myanmar, within Magway Region, covering an area of 1,292 km^2.

Eni propose to drill two (2) exploration wells in Block RSF-5, tentatively named ONDWE DEEP-1 and ONDWE DEEP-2, with each well taking approximately 80 days to be drilled including logging and abandoning the wells (plus an additional 20 days of mobilization and demobilization). Well testing activities (about 20 days) could also take place after exploration drilling in case of discovery to check if oil or gas reservoirs are producible in commercial viable quantities. There is no commitment from Eni to produce hydrocarbons at this stage.

4.2 Project Location

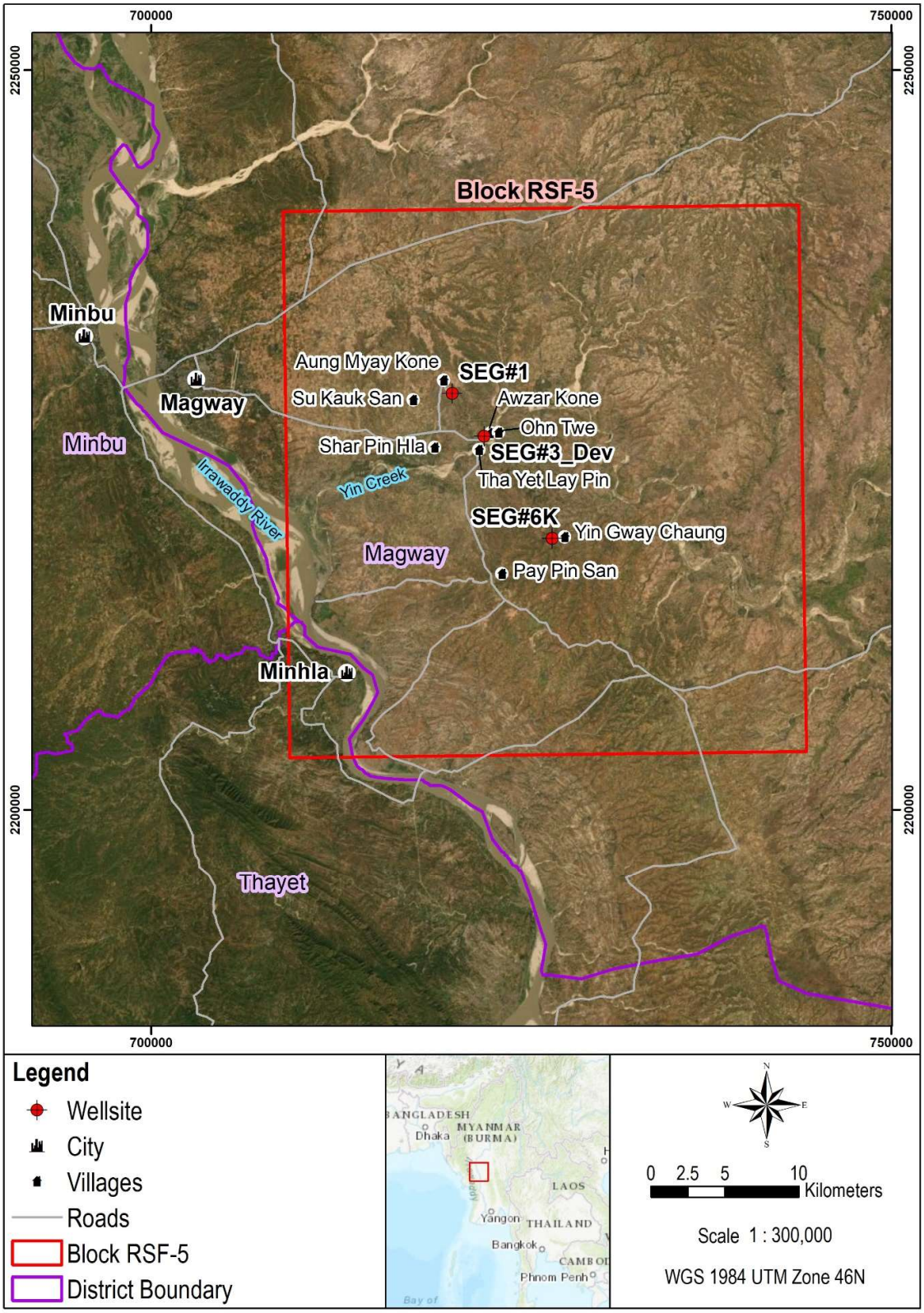
4.2.1 Concession Block and Drilling Area

Block RSF-5 is located approximately between the cities of Magway and Taungdwingyi within Magway Region. The block covers an area of 1,292 km^2 and consists mostly of agricultural land with some low lying forest and shrub areas. The Irrawaddy River is running through the west portion of the block.

[1] Note that the terms "Environmental Impact Assessment (EIA)" and "Environmental, Social and Health Impact Assessment (ESHIA)" are often used interchangeably. Myanmar's EIA Procedure, promulgated in 2015, contains reference and requirements to conduct either "EIA" or, alternatively, "Initial Environmental Examination (IEE)", depending on the scope of the project. Typically seismic projects in Myanmar are required to conduct an IEE. However, at the time of preparation of the previous assessment for the seismic activities, the EIA Procedure was not yet enacted, so the terminology was not legally defined and the report was referred to as an "ESHIA".

The overall potential area of interest for drilling is shown in ***Figure 4.1*** which coincides, in the subsurface, with the Ondwe structure, the main target of the exploration drilling campaign defined below in the drilling Area of Interest (AOI). Additional details on the precise well locations, as well as locations of any storage or accommodation areas, access roads, and auxiliary facilities are presented in this section. The coordinates of Block RSF-5 are shown in ***Table 4.1***.

Figure 4.1: Approximate Location of Drilling Area within Block RSF-5



Source: Eni, 2018

Table 4.1: Coordinates of Block RSF-5

Point	Longitude (E)	Latitude (N)
1	95°00'00"	20°15'00"
2	95°20'00"	20°15'00"
3	95°20'00"	19°55'00"
4	95°00'00"	19°55'00"

Source: Eni, 2018

4.2.2 Proposed Well Locations

Only two (2) wells will be drilled as part of this exploration campaign, however Eni during the project development stages considered three (3) potential well locations to allow for a flexible site investigation. After the drilling of the first well, segments of the Ondwe structure will be investigated and depending on the drilling results and success of the first well, the second drilling location will be drilled. Therefore, this EIA presents description and findings of three (3) wells, whilst the project activities are detailed for well SEG#1.

The coordinates of the proposed well locations are shown in ***Table 4.2***. All the well locations are situated within approximately 20 – 25 km away from Magway airport.

Table 4.2: Well Locations Geographical Coordinates

Well Location	Latitude (GPS° WGS84 deg.)	Longitude (GPS° WGS84 deg.)
Well 1 (SEG#1)	20° 8'17.21"N	95° 6'28.28"E
Well 2 (SEG#3_Dev)	20° 6'42.28"N	95° 7'40.77"E
Well 3 (SEG#6K)	20° 2'55.91"N	95°10'15.99"E

Source: Eni, 2019

4.3 Overview of Project Facilities, Components and Activities

The Project consists of four separate phases, as follows:

- Construction and Site Preparation;
- Drilling Operations;
- Demobilization; and
- Site Restoration.

These are discussed in further detail below.

4.3.1 Construction and Site Preparation Phase

Before drilling operations commence, site preparation activities will take place, including construction/upgrading of access roads, well pad construction, grading of existing land, and establishment of logistics base. The site preparation activities are summarized below.

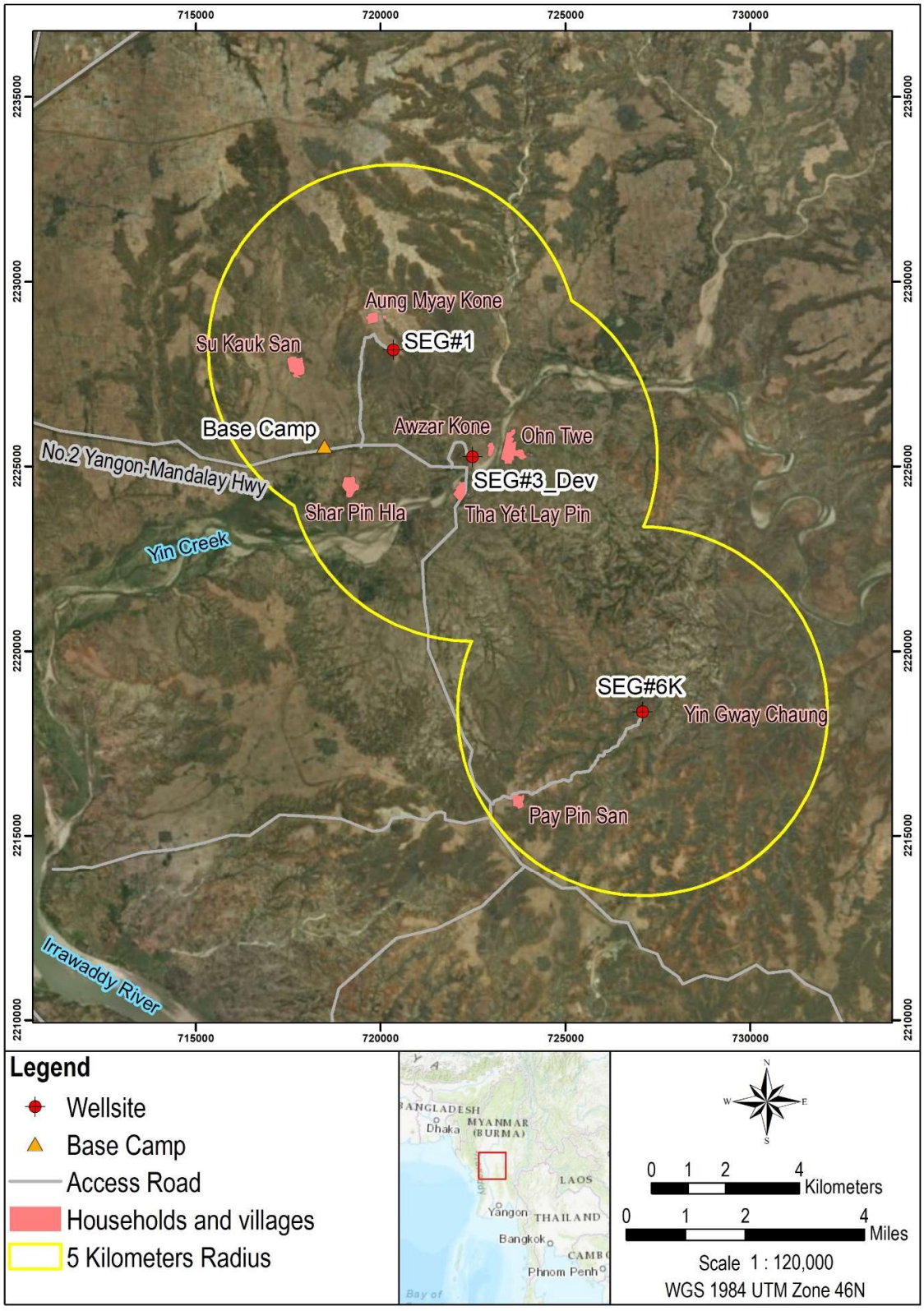
4.3.1.1 Construction and Upgrading of Roads

In order to transport materials, equipment and personnel to the drilling locations, access roads will need to be created and/or upgraded. Eni has prioritized the use of existing roads or tracks in the area to minimize interventions and impacts caused by refurbishment. A general overview and classification of the existing roads inside Block RSF-5 are illustrated, below:

- Roads belonging to the existing public road network (**Primary Existing Roads**) are used for the transportation of the equipment to the drilling location area. They are normally two-way roads with single lane per direction and can be traversed by light and heavy traffic and in particular by long articulated lorries. The Primary Roads will be repaired if any damage is created by the heavy traffic related to Project activity;
- Roads belonging to the minor public road network (**Minor Roads to be Upgraded**) used mainly for agricultural purposes and rarely paved. They are single lane roads which allow the moving of light and heavy traffic. The Minor Roads may need to be modified, upgraded and maintained by Eni for the transit of heavy traffic during the Project; and
- **Access Roads** (**New Roads to be Constructed**) connecting the existing road network to the drilling well site, allowing the movement of light and heavy Project vehicles to facilitate the transportation of equipment and material to the well locations. They are one-way roads with a single lane. Some of the Access Roads will be newly built by Eni.

An overview of the roads to be used for the Project are shown in ***Figure 4.2*****.**

Figure 4.2: Overview of Transport Routes for the Proposed Project



Source: ERM, 2019

Upgrading of Minor Roads

These roads are normally used to reach an area as close as possible to the location from where to start building the main Access Road. The principal use of these roads is by the farmers to access plots of land to cultivate and they are mainly transited by tractors or light vehicles.

They are rarely paved roads and the modification can be designed with tamped earth, formed by compacted clay (laterite) and gravel. The Minor road connecting Aung Myay Kone to the well pad area will be significantly upgraded.

Construction of New Access Roads

Access roads connect the well site location to the minor roads belonging to the public road network. According to the proposed drilling locations, only one section of newly built access road will be required, and it will be relatively short and through a non-sensitive area. Details on the locations of new and upgraded roads will be presented in ***Section 4.4***.

These roads must be designed to sustain the heavy traffic of the drilling rig equipment and operations. The road specifications adopted is the same as the one used for the Minor Roads mentioned above, i.e. tamped earth, formed by compacted clay and gravel. Further details on upgraded and constructed road specifications are discussed below.

Road Specifications

Specifications of upgraded and newly constructed roads can be summarized as follows:

- Access road to the logistics base: upgrade of existing village road (Lateritic Road approximately 170 m from highway junction) with widening the existing road from 3.5/4.0 m to 5.5/6.0 m by 0.25 m thick compacted laterite to allow heavy vehicles passage (60 tons). (Note that the logistics base will be described further in ***Section 4.4.2***)
- Access Road to the village near SEG#1: upgrading of the existing access road along village road (approximate length 3.0 km) from Magway/Taungdwingyi junction and the new access road to approach the well site (approximate length 0.25 km) from existing village road. This new access road will be widened from 3.5/4.0m to 5.5/6.0 m with 0.30 m thick compacted road to allow heavy vehicles passage (60 tons). 2 x 600 mm diameter new pipe culvert will be installed at the new access road. Reinforcement will be required on the existing timber bridge along the road (span 4.5 m x width 4.3 m x high 2.0 m) and brick culvert (span 1.2 m x width 4.3 m x high 1.2 m).

Upgrading of Existing Brigdes

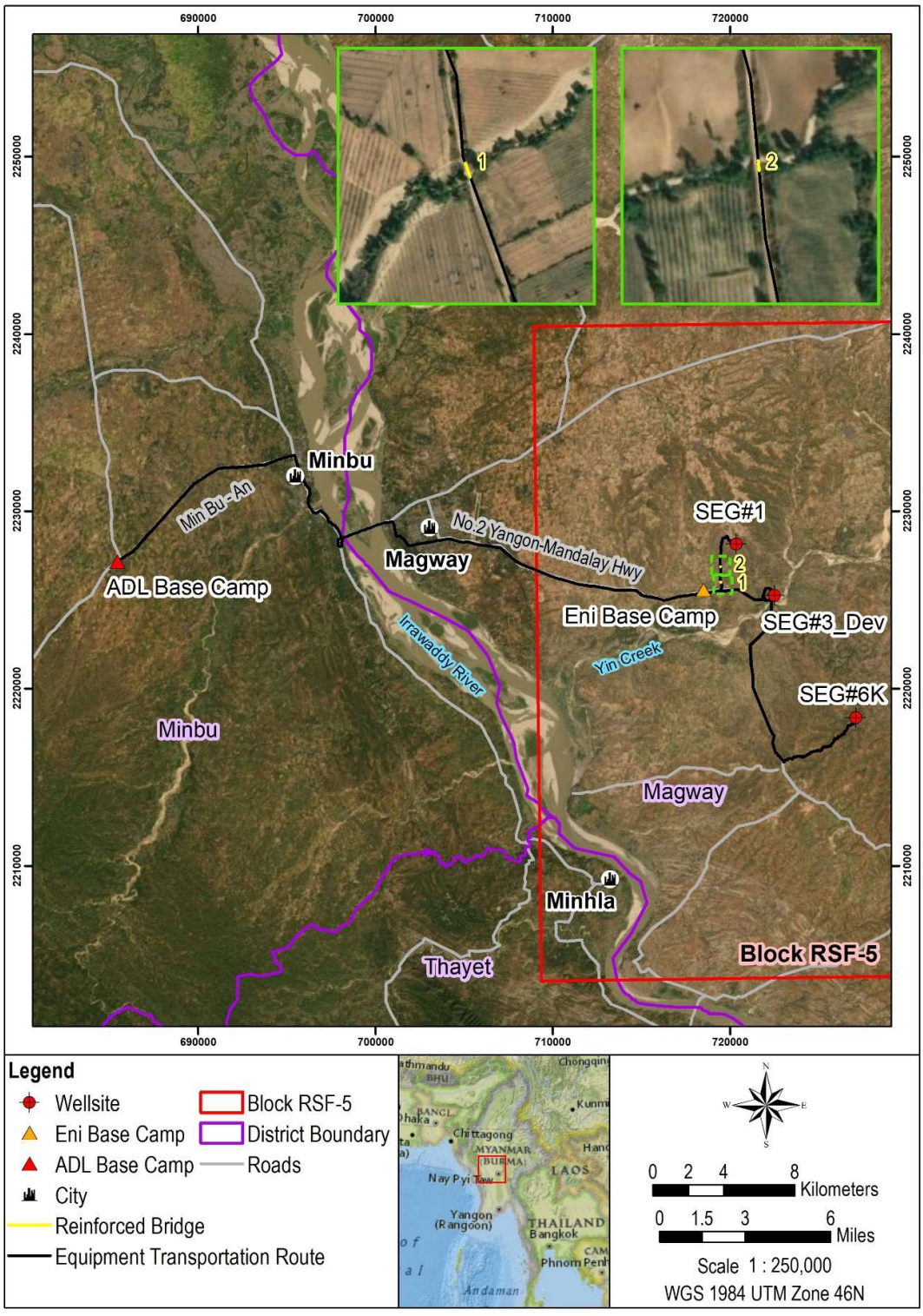
Other upgrading activities that are required are the reinforcement of existing bridges to ensure they are capable of supporting Project vehicles and its loads. The coordinates and location of bridges to be upgraded is shown in ***Table 4.3*** and ***Figure 4.3***.

Table 4.3: Bridge Coordinates to be Upgraded

Bridge Location	Distance	Latitude	Longitude
Point 1 (North)	20 m	20° 7'7.68"N	95°5‘57.22"E
Point 1 (South)		20° 7‘7.09"N	95°5‘57.37"E
Point 2 (North)	8 m	20° 7'35.80"N	95°5'56.96"E
Point 2 (South)		20° 7‘36.05"N	95°5‘56.93"E

Source: Eni, 2019 (modified by ERM)

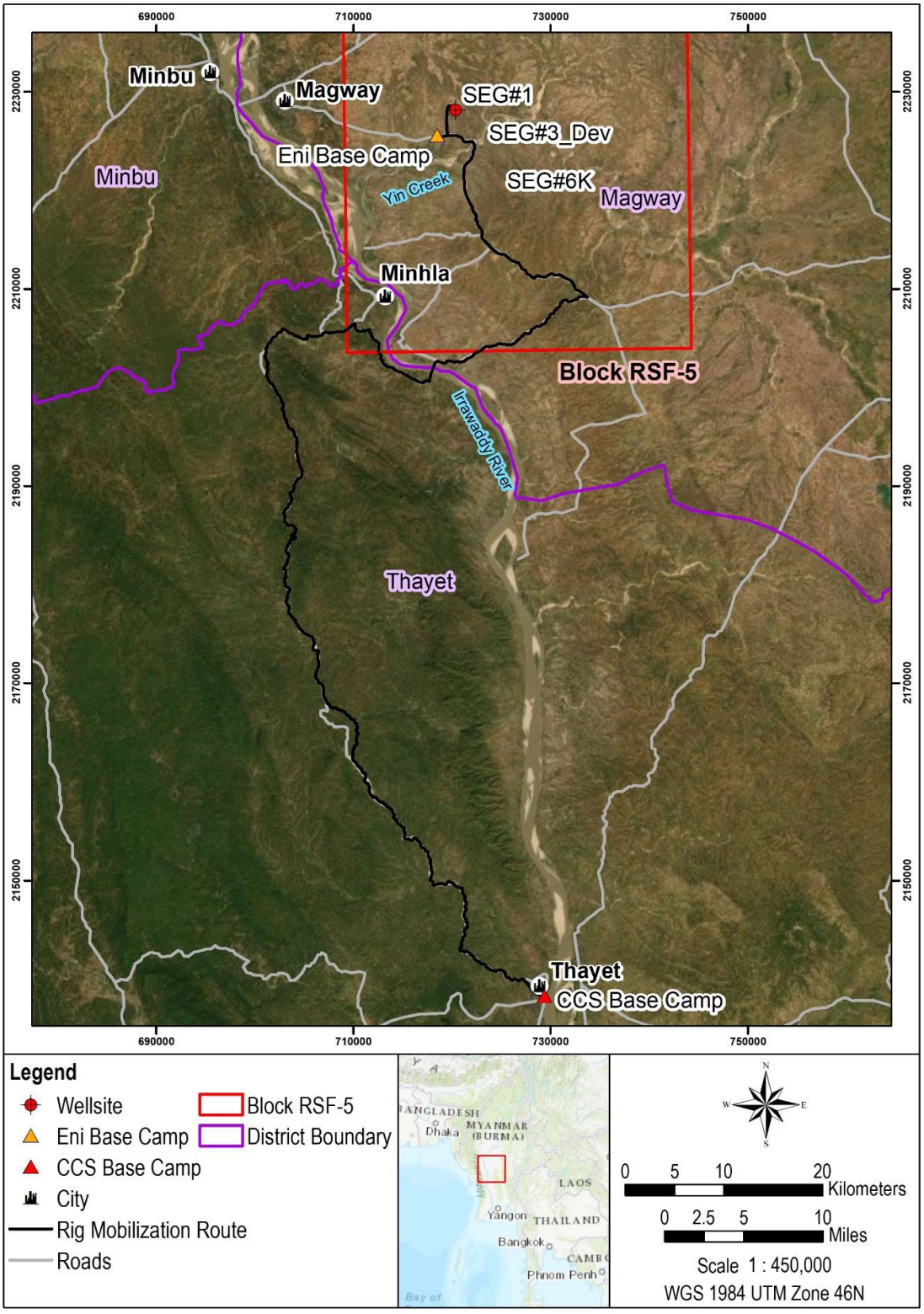
Figure 4.3: Overview of Transportation Routes Highlighting Upgrading Work of Bridges



Source: Eni, 2019 (modified by ERM)

Note: ADL – Asia Drilling Pte. Ltd.

Figure 4.4: Overview of Rig Mobilization Route



Source: Eni, 2019 (modified by ERM)

Note: CCS – Central Camp Site

Road Maintenance

Maintenance and repair of roads used for the Project may include, but not be limited to:

- Grading at regular intervals;
- Repairing of road surfaces;
- Replacement of gravel topping;
- Cleaning and repairing of ditches and culverts;
- Cleaning and regrading of canal crossings;
- Removal of debris including, rock fall, landslide, or stream deposits debris;
- Dust control by sprinkling water to the road surface; and
- Filling and repair of Access Road washed away by flash floods.

4.3.1.2 Well Pad Construction and Installation of Well Pad Infrastructure

Well Pad Components and Infrastructure

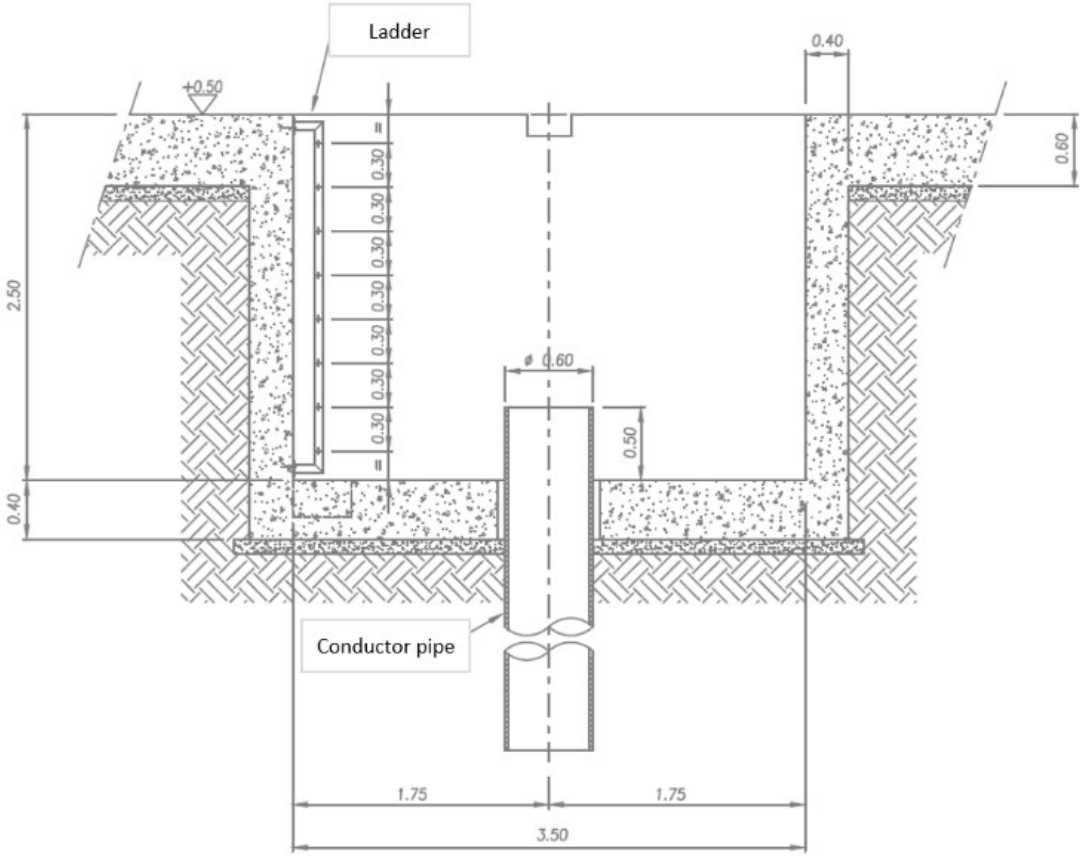
For each drilling well, a "well pad" will be constructed. The well pad is an elevated, stable area of land, with almost all facilities associated with drilling being contained on the pad, including the drilling platform, rig, generators, waste and wastewater treatment and management facilities, some accommodation, offices, storage areas, concreting unit and lay-down areas. The area dedicated to the well pad is approximately 183 m x 156 m. Within this area, only 0.2 ha is dedicated to the rig area, while the remaining surface of the well pad is used for services and equipment.

Typically a well pad will consist of the following main operational infrastructure:

- **Rig Area** - The rig area (also called the dirty area) contains the rig platform, as well as the associated equipment. It is indicatively 50.0 m x 40.0 m levelled, compacted area and with reinforced and water-proofed (by HDPE liner) concrete pad. The rig area will contain all the rig equipment, including mud tank, recycling tank and mud working area. The thickness of the concrete pad will be designed according with the forecast loads and the soil testing results.
- **Rig Substructure Platform** - The rig substructure platform is the main drilling component of the well pad, where the rig is positioned (footprint). The rig substructure platform is indicatively 12.5 m x 17.0 m. The thickness of the concrete pad shall be designed according with the geotechnical investigation results in terms of physic-mechanical soil properties (ground bearing capacity), in addition to the drilling rig characteristics and will be completely oil-waterproof (impermeable);
- **Cellar** - At the centre of the Rig Substructure Platform, the "Cellar" is an indicatively 2.0-2.5 m deep, 3.0 m x 4.0 m rectangular reinforced concrete pit or 3.0 m circular concrete pit, which allows well boring advancing. At the centre of the cellar, will be installed a template for the first pipe (conductor pipe) of about 30" diameter, length about 30 m, as a starter hole for the following drilling operations, according to the Well Program requirements. An example diagram of a cellar is shown in ***Figure 4.5***
- **Operations Area** - The operations area consists of offices, warehouses and other services facilities.
- **Reserve Water Pit** - Within the Rig Area, an excavated area is constructed to collect the water for drilling operations. The pit will have a volume of about 1,000 – 1,500 m^3, with an extension of approximately 25 x 20 m, and 3 m deep. An example diagram of a Reserve Pit is shown in ***Figure*** 4.6.

- **Waste Pit** within the rig area. The waste pit must be waterproof, and with a volume of about 70 – 80 m^3, as required by the drilling operations. As alternative, provision of a buried steel tank of same volume to collect the contaminated storm water or spilled water for disposal can be evaluated by Eni. Additional details on waste management during drilling will be provided in ***Section 4.8.1***;
- **Drilling Cuttings** resulting from drilling operations will be temporarily stored within the rig area and will be frequently collected by the waste management contractor to treat and dispose the residues at their approved facility. Additional details on waste management during drilling will be provided in ***Section 4.8.1***;
- **Diesel Tank Storage Area** - A segregated area, properly signalled and oil-proofed (to avoid spills, leakages, seepage into the soil and/or groundwater) for the diesel tanks as required by the relevant operations and provided with necessary spill kits;
- **Chemical Storage Area** as required by the relevant operations and in accordance to the materials characteristics (e.g. flammability, toxicity etc.), properly labelled;
- **Laydown and Materials Storage Area –** An area will be dedicated for the storage of the drilling casings and of other drilling materials and equipment provided. This area shall be equipped with enough sleepers (Concrete or Timber) to store at least one full column of casing in according with the API rules and Eni standard.
- **Internal Roads** - Internal roads within the well pad are used for the transit of vehicles, to deliver necessary materials and additional equipment.
- **Fences** with minimum height of 2.5 m surrounding the operation area and around possible external pits. Adequate illumination lights should be installed at regular intervals around the fence perimeter.

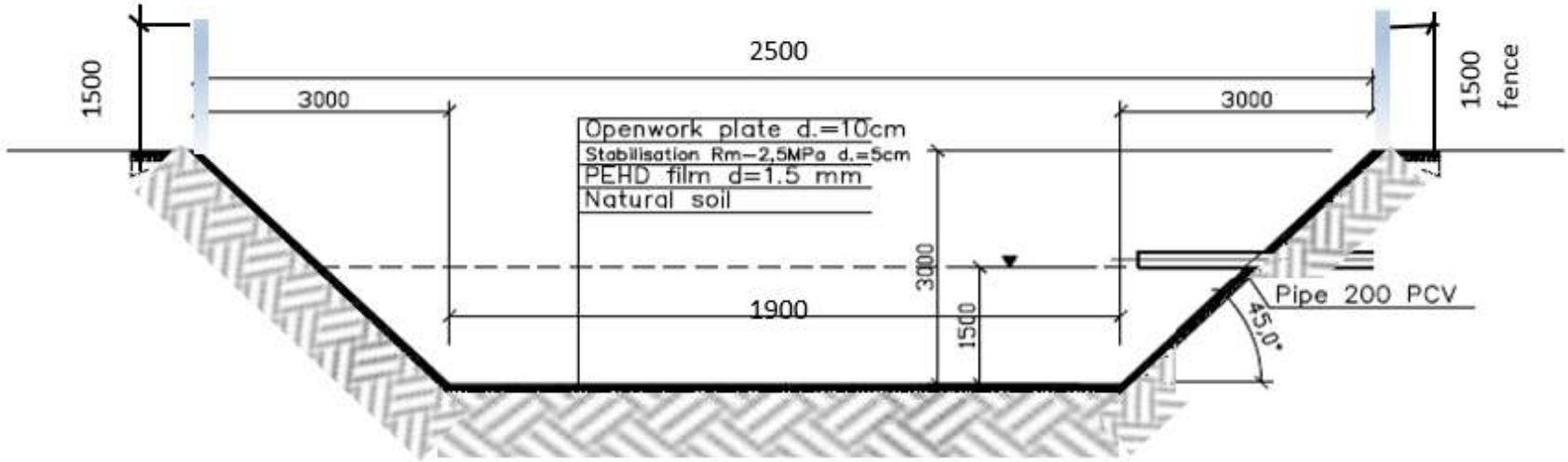
Figure 4.5: Section of Typical Cellar (Example)



Source: Eni, 2019

Note: Units in meters

Figure 4.6: Excavated Reserve Pit (Example)



Source: Eni, 2019

Note: Units in cm

Construction Process for Well Pads

Construction of well pads generally consists of the following steps:

- Site preparation work;
- Earth work;
- Foundation work;
- Drainage system work; and
- Security fence work.

General construction specifications for various well pad components are described below:

- The surface of the well pad must be flat and well compacted, avoiding any loose material and/or soft spots, which can affect the safety of the operations;
- Rig substructure platform and the rig area should be horizontal and covered by a layer of adequate reinforced concrete in compliance with the drilling and equipment weight and layout characteristics. The rig area should also be hydraulically isolated from the operations area, in such a way to collect and dispose of the storm water, which could be contaminated by the drilling operations, to a waste tank.
- The surface of the well pad must be completed with one or more than one of the following systems:
  - Concrete and reinforced concrete (generally for rig substructure and rig (dirty) area);
  - Concrete slabs 15 cm thick, properly aligned, levelled to avoid unsafe interspaces or steps (generally for operations area) and designed with proper lifting points to allow safe installation and removal;
  - Compressed soil (generally for operations area), outside the reinforced concrete area;
- All concrete pad area (Dirty Area) shall be waterproofed by installing a layer of oil resistant HDPE sheeting/liner of 1.5 mm thick reinforced material with all site joints fully sealed and shall be provided with a closed drain system to collect all spilled water and liquids to the waste tank.
- Excavation pit will be waterproofed by placing a HDPE sheet/lining excavation made into the natural soil. The excavated soil will be used to create a 1 m high berm around the pit into the crest of which the sides of the HDPE sheet will be anchored. In case the bottom and sides of the excavation are presenting sharp and protruding stones/objects, a layer of non-woven felt will be placed to prevent damages to the HDPE linen. The pit shall be surrounded and protected by a fence not less than 1.5 m high, in a way to prevent people and animals accidentally falling to the basins.
- The layout orientation shall be in accordance to the predominant local winds.
- The Waste Pit (about 70–80 m^3 volume) shall be excavated or alternatively shall install a buried Waste Steel Tank of the same volume at the boundary of the Operations Area in order to collect the liquids from the Dirty Area Closed Drain. In case the Excavated Waste Pit is chosen, the excavation shall be protected by a geo-textile mesh membrane to provide stability, with a warp strength of minimum 35 kN/m, weft minimum strength of 30 kN/m or as specified/agreed by an Eni Representative. On top of geo-textile membrane, two layers of HDPE foil shall be laid down to ensure the waterproof. In case the Waste Steel Tank is chosen, it shall be buried into an excavation isolated by one layer of HDPE liner and deep enough to keep the top of the tank at the ground level in order to collect the waste from the Dirty Area. The Steel Tank shall be totally sealed with a man hole to allow the periodical removal of any solid deposit.
- The onsite accommodation area for construction workers shall be constructed at a distance not less than 300 m away from the drilling rig area. The accommodation comprises containers of 40

and 20 ft, indicatively, glazed windows with security bars, mosquito screens, cold/warm air conditioners and shutters. All doors to be fitted with approved locks. The containers require being elevated on sleepers (Concrete or Timber) to ease the levelling and to separate the cabin from the ground. The works will include whatever necessary for the camp utilities and facilities (water, sewage, waste pit, electricity, grounding, and floodlighting and internet connection). The camp shall foresee also waste collection and segregation points. The camp will include a field office with relevant utilities. The office may be a converted container or similar raised off the ground, glazed windows with security bars, mosquito screens, cold/warm air conditioners and shutters.

Table 4.4 shows the dimensions of constructed and upgraded features. ***Figure 4.7*** shows example images of the well pad construction process, and ***Figure 4.8*** shows the proposed well pad layout.

Table 4.4: Summary of Dimensions of Constructed and Upgraded Features

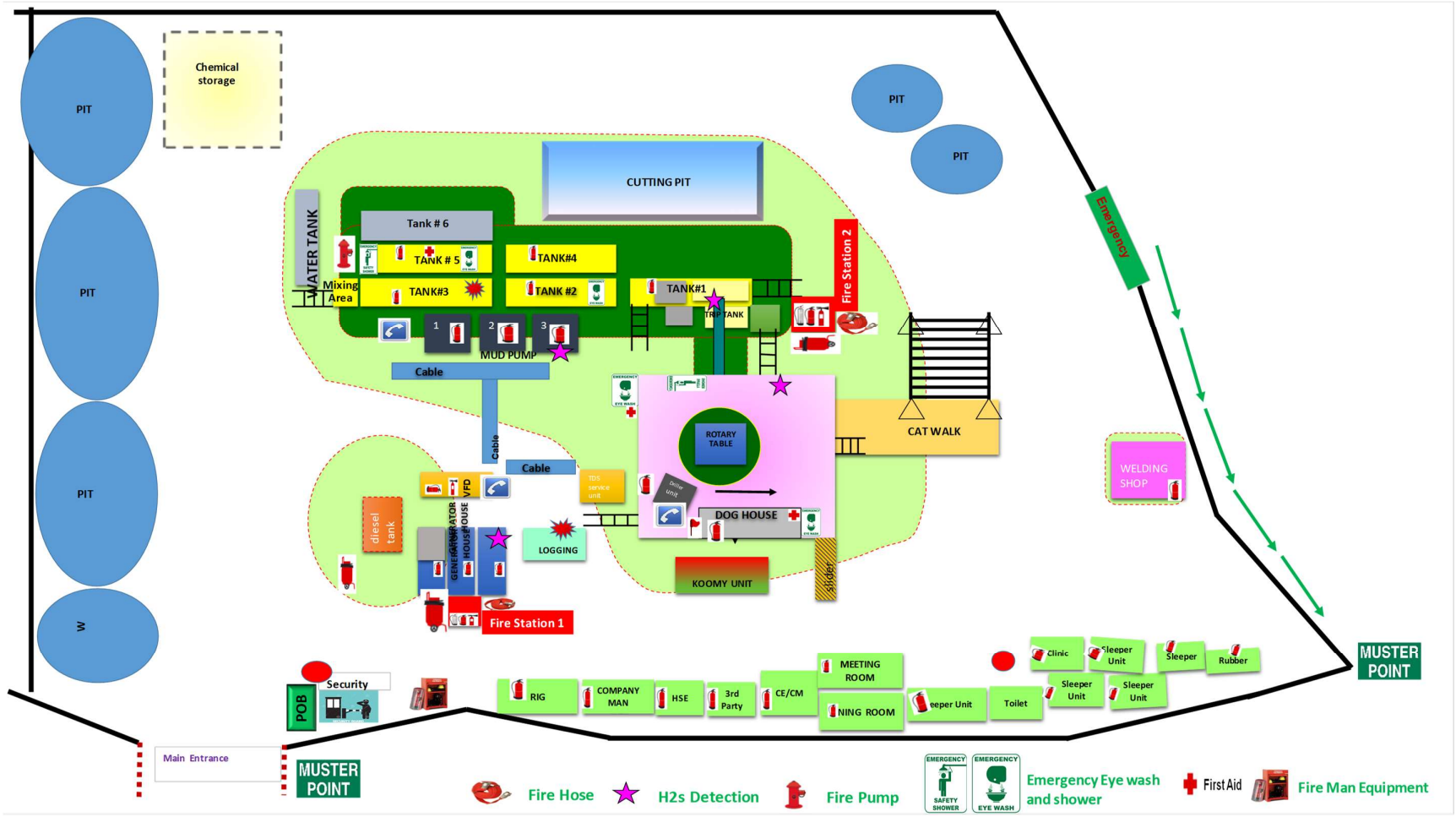
Location	Dimensions		
	Length (m)	Width (m)	Area (m^2)
Well Pad	183	156	28,548
Access Road (to be constructed)	250	6.0	1,500
Access Road (to be upgraded)	8,070	6.0	48,420
Logistics Base	150	130	19,500

Source: Eni, 2019

Figure 4.7: Example Images of Well Pad Construction Process

Source: Eni, 2019

Figure 4.8: Proposed Drilling Site Layout



Source: Eni, 2019

4.3.1.3 Source of Fill Material for Construction and Site Preparation

Construction and site preparation activities will require a substantial quantity of additional soil to be brought in from offsite, called "fill material". All fill material for the Project are available in Magway Township and will be sourced by a local contractor; selected borrow soil (also called "fill material") is available near the well sites, within 9.6 km (6 miles).

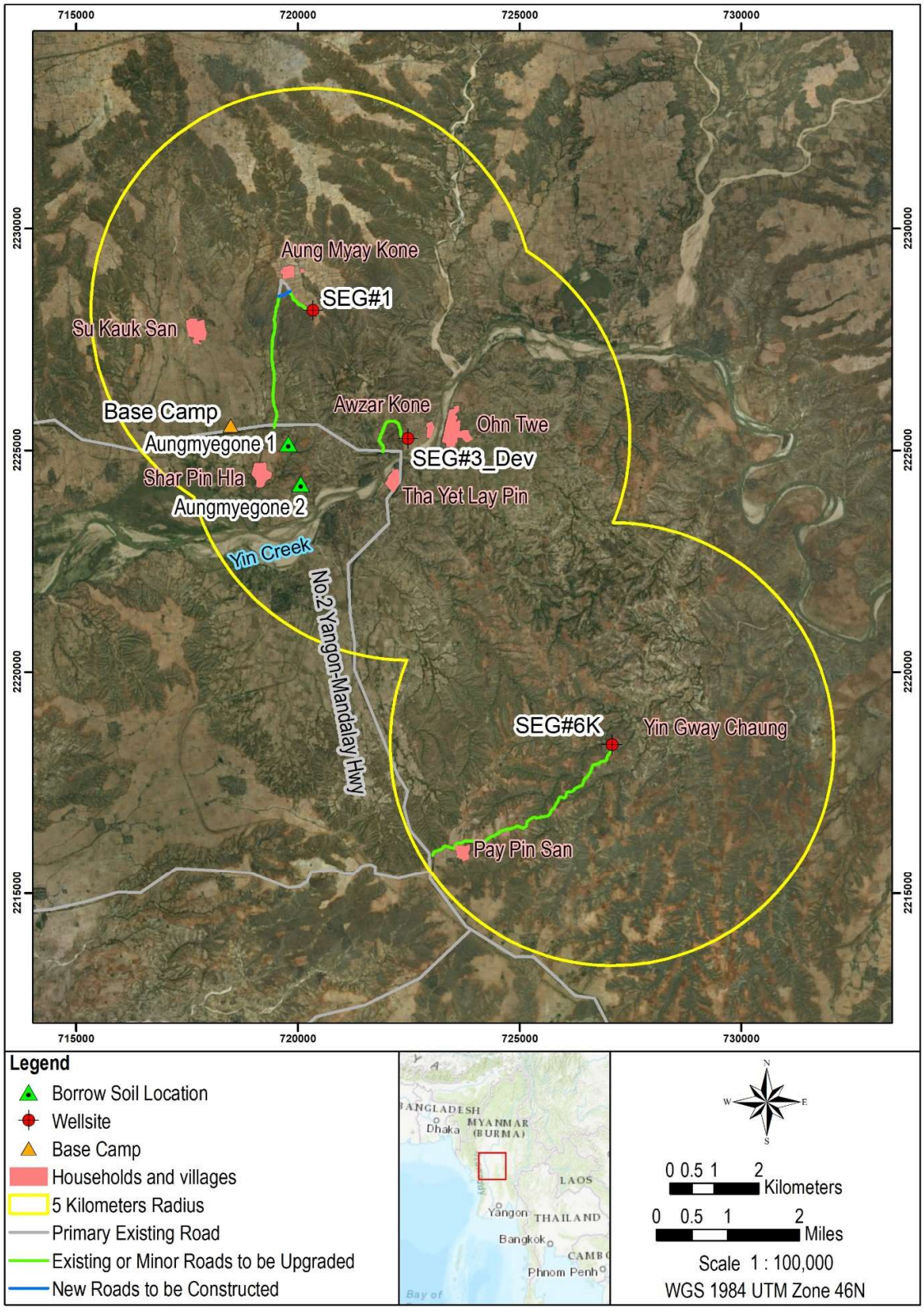
Selected soil has previously been used by Eni in the region for existing rural road construction, and has been approved by Government Department of Rural Road construction. The locations from which soil or fill material will be provisioned are envisaged in ***Figure 4.9***: Fill Material Locations and ***Figure 4.10***. The quantities that will be required are illustrated in ***Table 4.4***: Summary of Dimensions of Constructed and Upgraded Features

Table 4.5: Fill Material Details

Location	Quantity (m^3)
Well Site (per well)	13,680
Access Road	9,235
AD Rig Camp and Access Road	2,000
Total	**24,915**

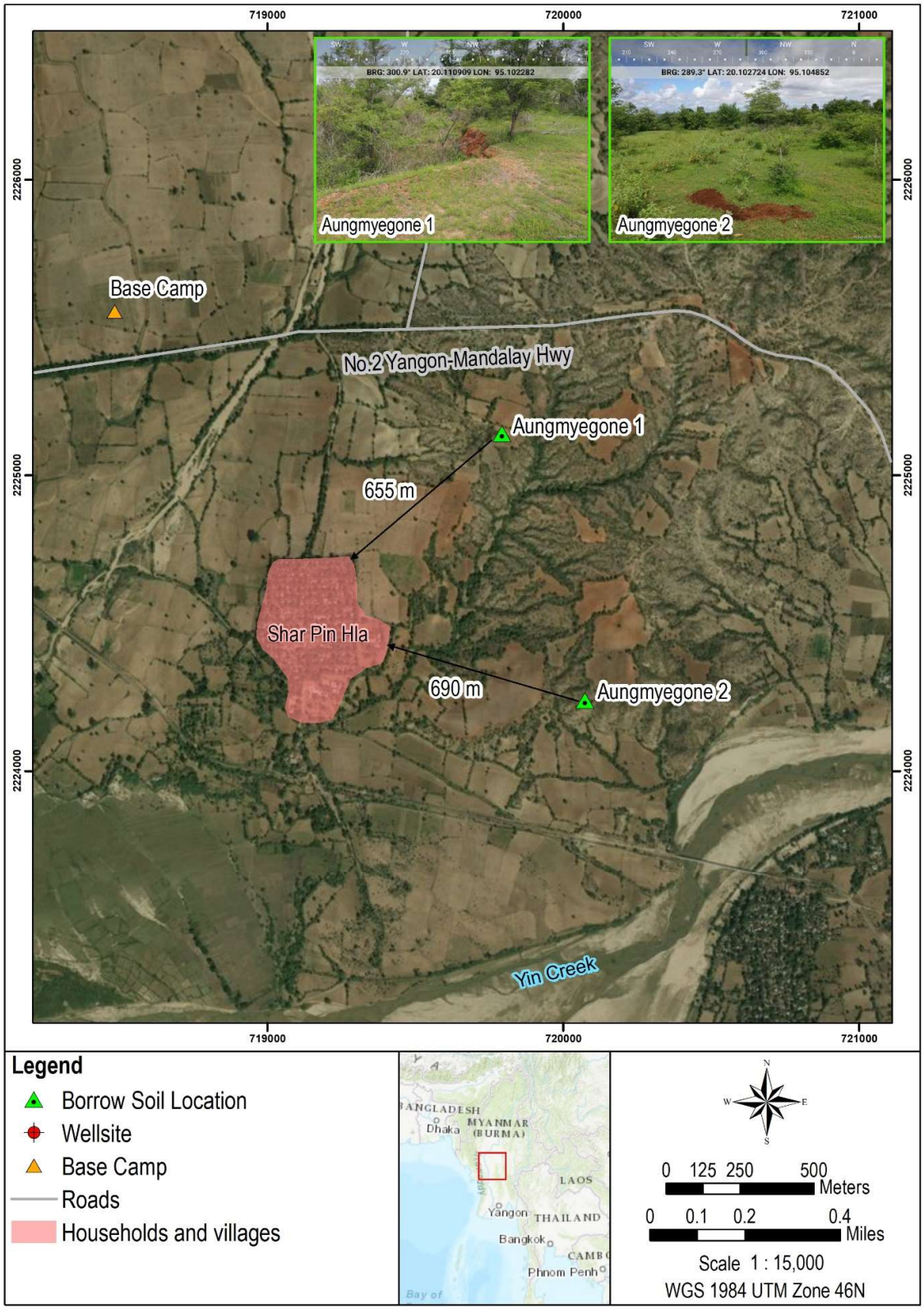
Source: Eni, 2019

Figure 4.9: Fill Material Locations



Source: ERM, 2019

Figure 4.10: Fill Material Locations (Zoomed-in)



Source: ERM, 2019

4.3.1.4 Equipment Required During Construction

During the construction and site preparation phase, various equipment will be required. The key equipment necessary to perform civil works, including soil removal and movement, grading, and compacting, are trucks, excavators, graders, loaders, rollers, and dozers. 50 kVA generators will also be required to supply power during the construction and site preparation phase. ***Figure 4.11*** shows an overview of the key equipment to be used during this phase.

Figure 4.11: Example Equipment to be used during Construction and Site Preparation

	
Dozer	**Grader**
	
Loader	**Single Drum Roller**
	
50 kVA Generator	**Truck**

Source: Eni, 2019

4.3.2 Drilling Phase

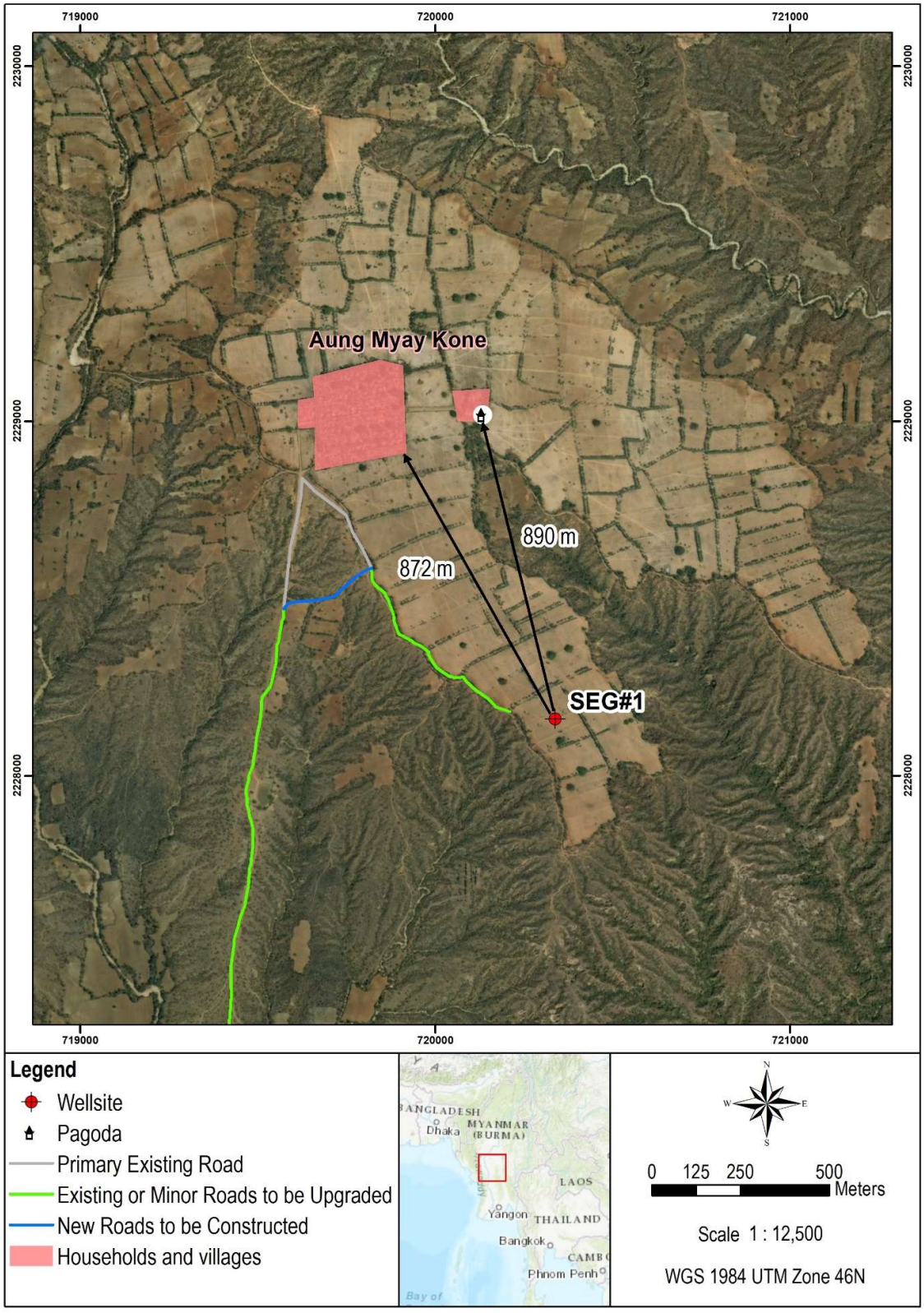
4.3.2.1 Mobilization of Drilling Rig and Equipment

Once the site preparation works are complete, the drilling rig and associated equipment will be transported to the site and assembled at the well pad.

Typically, transportation of the rig will only occur during daylight, and rush hours will be avoided if possible. In order to avoid the potential for accidents that might occur due to the transportation of the drilling rig (both on roads and on the river), Eni will inform the appropriate local administrative authorities and police at least two weeks prior, and will co-ordinate with their staff to set up warning and notification signs. Eni will take full responsibility and restore any damage to roads caused from transportation by project vehicles.

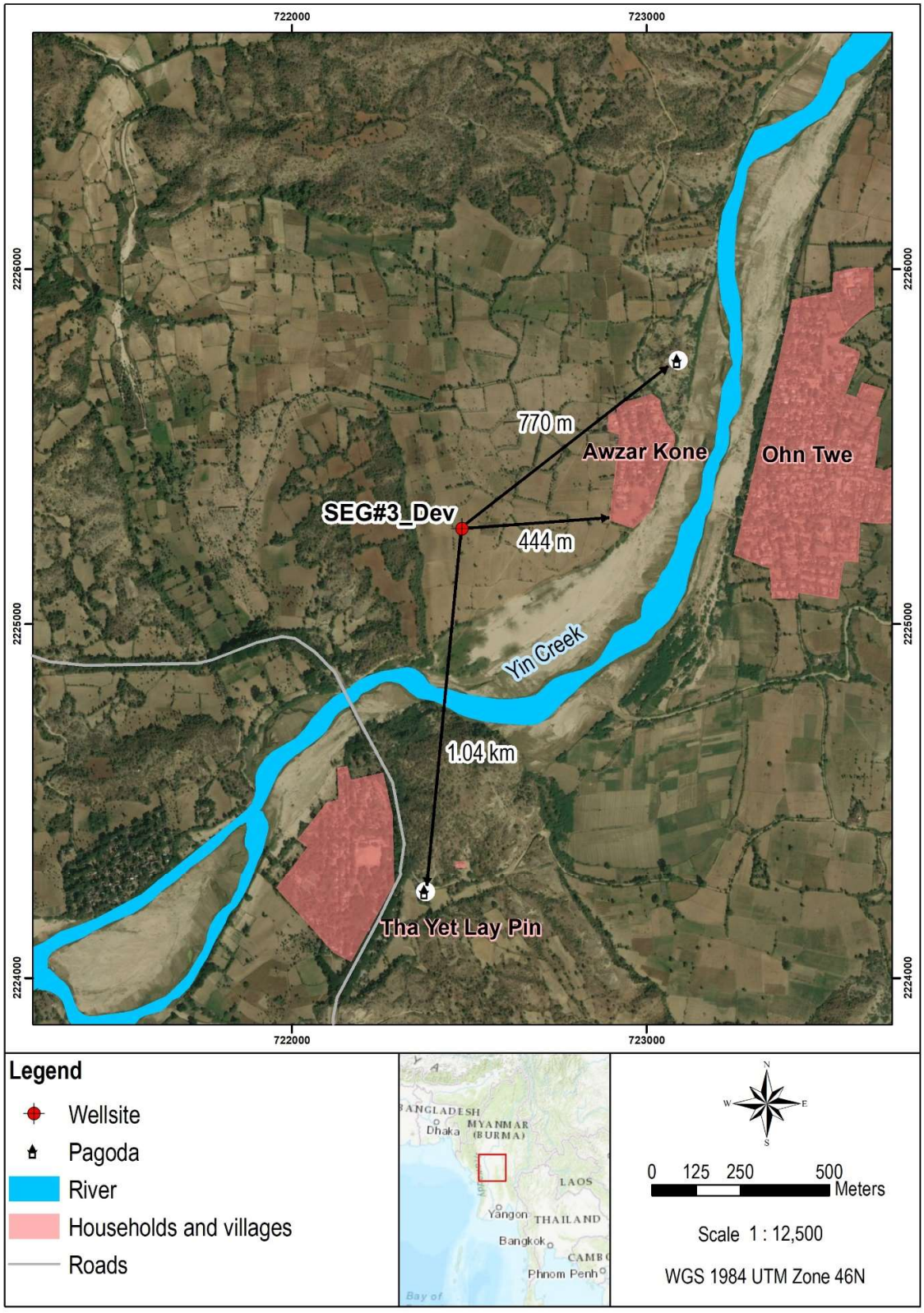
The well sites are located in ***Figure 4.16***: Indicative Drilling Rig Dimensions***Figure 4.17***: Drilling Rig Components and Equipmentwhere the distances in between villages and social receptors and the well sites are highlighted, The closest sensitive social (including cultural) receptor to SEG#1 is. Aung Myay Kone Village (872 m from SEG#1) and a pagoda within the village (890 m from SEG#1) Moreover, the closest sensitive social (including social) receptor to SEG#3_Dev is. Awzar Kone Village (444 m from SEG#3_Dev) and a pagoda behind Awzar Kone Village (770 m from SEG#3_Dev), and Yin Gway Chaung is located 840 m east of SEG#6K. These are shown in ***Figure 4.12***, ***Figure 4.13*** and ***Figure 4.14***.

Figure 4.12: Overview of SEG#1 and Nearby Social Receptors



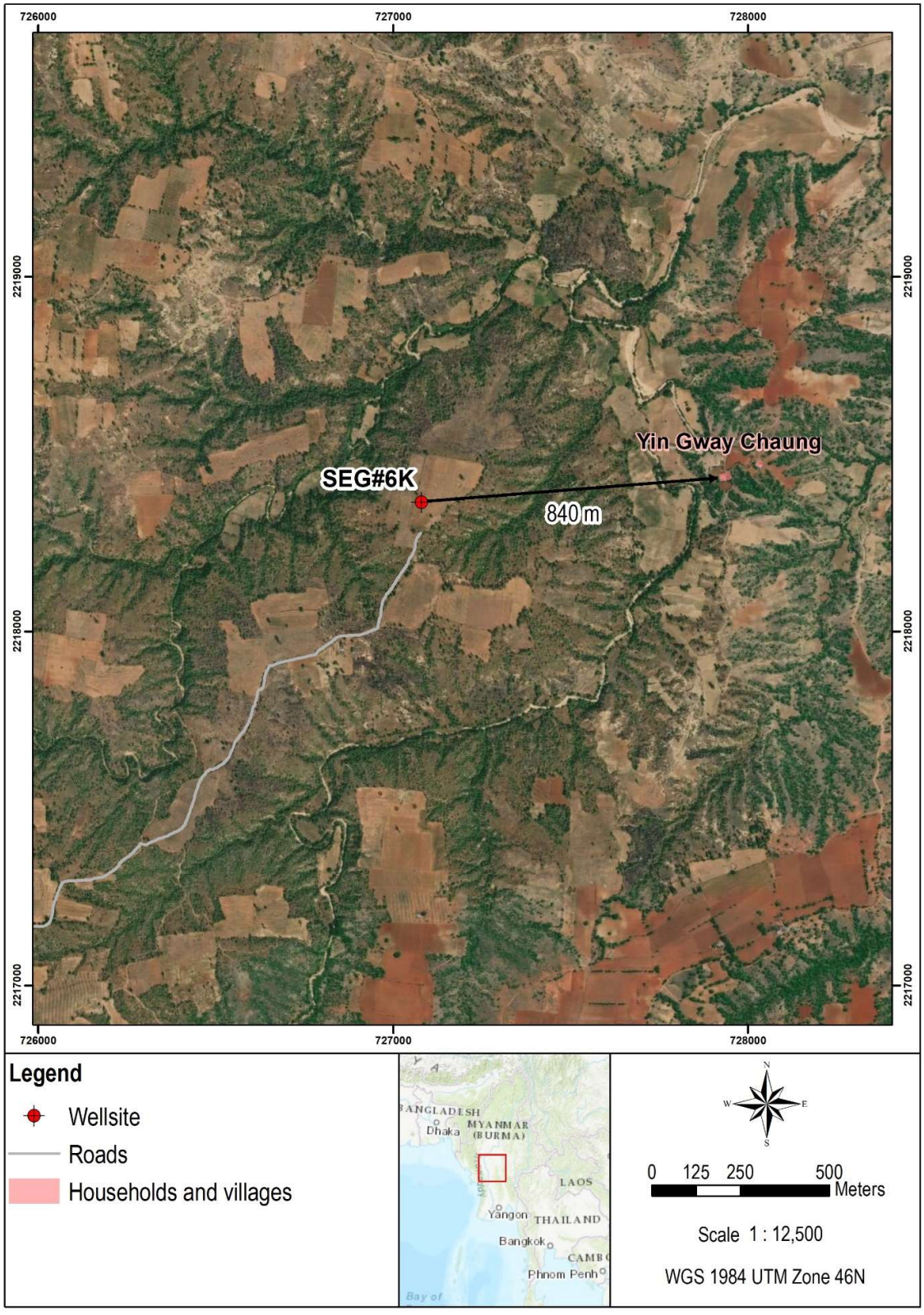
Source: ERM, 2019

Figure 4.13: Overview of SEG#3_Dev and Nearby Social Receptors



Source: ERM, 2019

Figure 4.14: Overview of SEG#6K and Nearby Social Receptors



Source: ERM, 2019

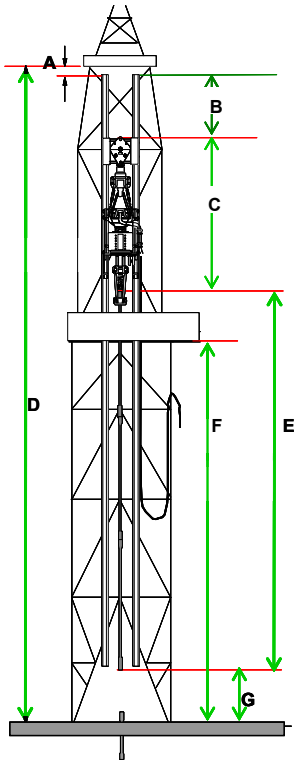
Once on-site, the rig will be manoeuvred into position and assembled on the well pad. The rig will then be hoisted into a vertical position and secured over a period of approximately five days. Additional drilling rig sections, as well as associated equipment such as supporting generators, pumps, hydraulics and hose-lines, will also be installed and connected as required.

Figure 4.15 shows some example images of rig mobilization. ***Figure 4.16*** shows an example schematic of the drilling rig.

Figure 4.15: Rig Mobilization

Source: Eni, 2019

Figure 4.16: Indicative Drilling Rig Dimensions



DIMENSIONS	
A	2.0 m
B	4.1 m
C	9.5 m
D	45 m
E	28.3 m
F	24.5 m
G	3.0 m

Source: Eni, 2019

4.3.2.2 Drilling Rig Specifications

The drilling rig will have general specifications as shown in ***Table 4.6***.

Table 4.6: Drilling Rig Specifications

Parameter	Value
GENERAL RIG INFO	
Average Fuel Daily Consumption in Normal Drilling Operation	6 m^3 / day
Total Truck Trips Required to move the Rig Between Locations	120 trips
Standard Truck Trips Required to Move the Rig Between Locations	90 trips
Out of Standard Truck Trips Required to Move the Rig Between Locations	30 trips
Estimated Rig Up Time (Days)	14 days
Rated Hoisting Capacity of Crane Requested To handle The Heaviest Load during the Rig UP/Down	42 tons
DIESEL FUEL	
Diesel Fuel total storage tank capacity	40 m^3
Diesel Fuel storage tanks quantity	2 units
Diesel Fuel tank capacity of each	40 m^3
Diesel Fuel day-tank capacity	10 m^3

Parameter	Value
POTABLE WATER AT RIG SITE	
Potable Water total capacity	100 m^3
DRILL WATER	
Drill Water tanks quantity	2
Drill Water tank capacity of each	100 m^3
SACK STORAGE	
Covered area for sack storage dimensions	50 m
ELECTRIC POWER GENERATIONS	
Diesel Engine/Generator sets	3 units
Continuous power of each set	1,747 hp
Total continuous power	5,241 hp
Diesel Engine/Generator sets enclosed for noise attenuation	Yes
DIESEL ENGINE	
Diesel Engine quantity	4 units
Make	CAT 3512 B
Environmental Controls	Low Emission, Low Fuel Consumption, Mufflers with Spark Arrestors, Enclosed for Noise Attenuation

4.3.2.3 Drilling Operations

Overview of Drilling

The basic concepts of drilling a typical well can be summarized as follows:

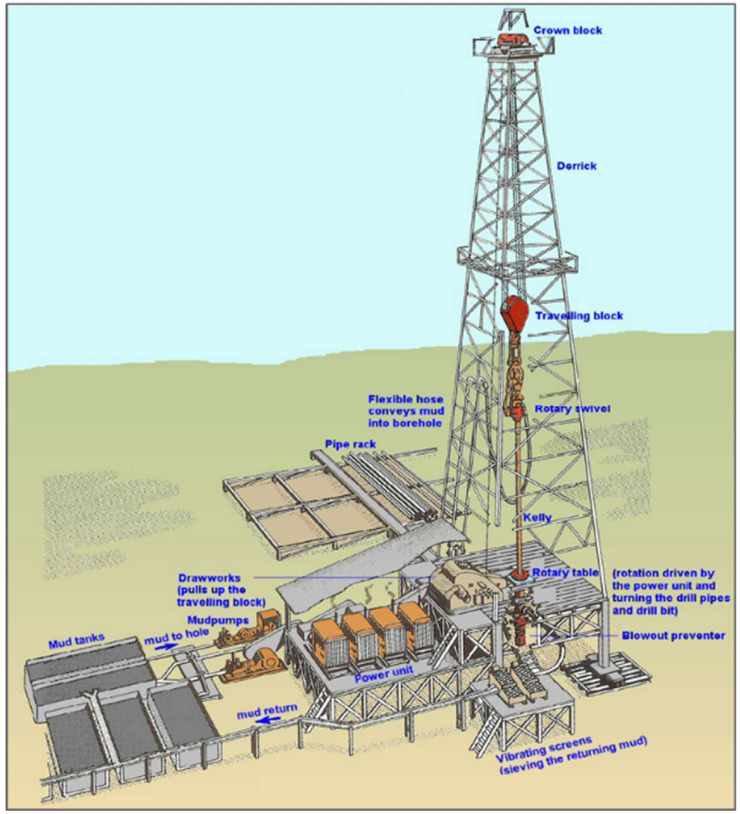
- **Drilling the Hole** – The drill string is a series of long, hollow steel pipes, which can be screwed together. The drill bit is the cutting tool, and is screwed to the end of the drill string. A hoist system within a derrick over the well allows the drill string to be assembled and separated into manageable sections.
- **Drilling Fluids System** – The drill string and bit are lubricated and cooled by a drilling fluid, commonly referred to as “mud”. The type of mud will be chosen based on their toxicity level (as low as practicable), and will be managed according to international best practice and local legislation. This mud is stored in large steel tanks beside the rig, from where it is pumped through a flexible reinforced rubber hose down through the drill string.
- **Mud-Cleaning Equipment** - When the cuttings are brought to the surface with the drilling fluids, they will first pass through a pair of shale shakers. This comprises of a vibrating frame fitted with a series of fine mesh screens, which separate the vast majority of the drill cuttings from the drilling mud. The mud passing through the screen is recirculated, while the cuttings accumulate in the nearby cuttings pit prior to treatment and disposal.
- **Desanders and Desilters** - Desanders and desilters will also be used to separate the finer cuttings from the mud. These consist of an array of specially designed cones, which work on the centrifugal principle by dropping out the heavier solids as the mud is pumped through them

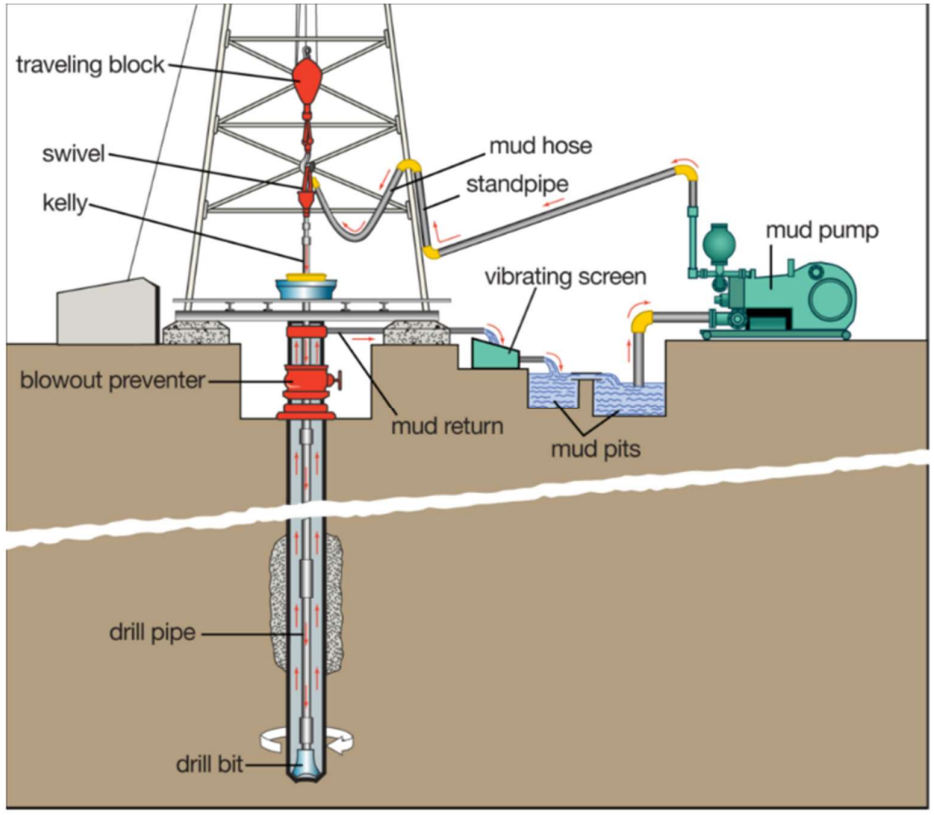
- **Casing and Cementing** – Various sections of the hole will be drilled at different diameters, with the size of the borehole decreasing with depth. Each section of the hole will be lined with thick steel tubing, known as casing, which will be fully cemented in place. This allows the hole to remain stable and for the surrounding geological formations, in particular those that may act as fresh water aquifers, to not be contaminated. This casing also helps in the process of controlling the pressure of any gas that the well might penetrate, as it is prevented from flowing into shallower, less pressurised formations. ***Figure 4.17*** shows an overview of drilling rig components and equipment.

In general there are three distinct stages of the actual drilling process, as illustrated in ***Figure 4.18*** and described below:

1. Installation of Pre-Drill Drive Pipe: This section of pipe is hammered into the ground by a vibrator machine and is used as a guide for the remaining drilling stages.
2. Drilling the Top Well Sections: This refers to the drilling of the upper sections of the well. In the case of Ondwe deep-1, this will consist of the 26" and 17 ½" section. Once each section is drilled, casing is run onto the well shaft and cemented into position.
3. Drilling the Lower Well Sections: The lower well sections will be drilled to the target with 12 ¼" hole to 2,700m and 8 ½" hole to TD 3,800m.

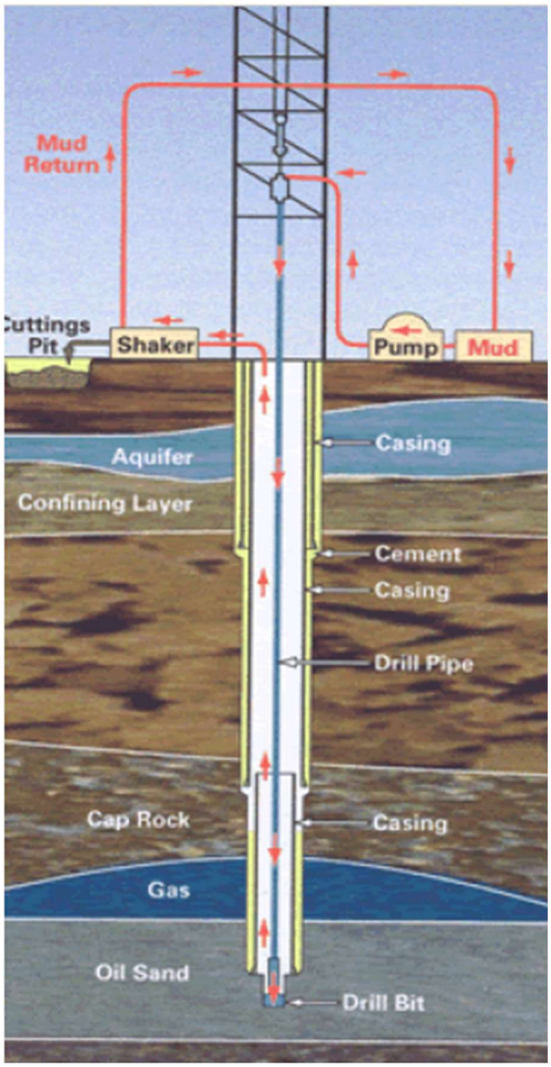
Figure 4.17: Drilling Rig Components and Equipment





Source: Eni, 2019

Figure 4.18: Sub-Surface Drilling Diagram (Example)



Source: Eni, 2019

Well Designs

The preliminary well data design for the two exploration wells of the Project area shown in ***Table 4.7***. ***Figure 4.19*** and ***Figure 4.20*** show the example well profiles.

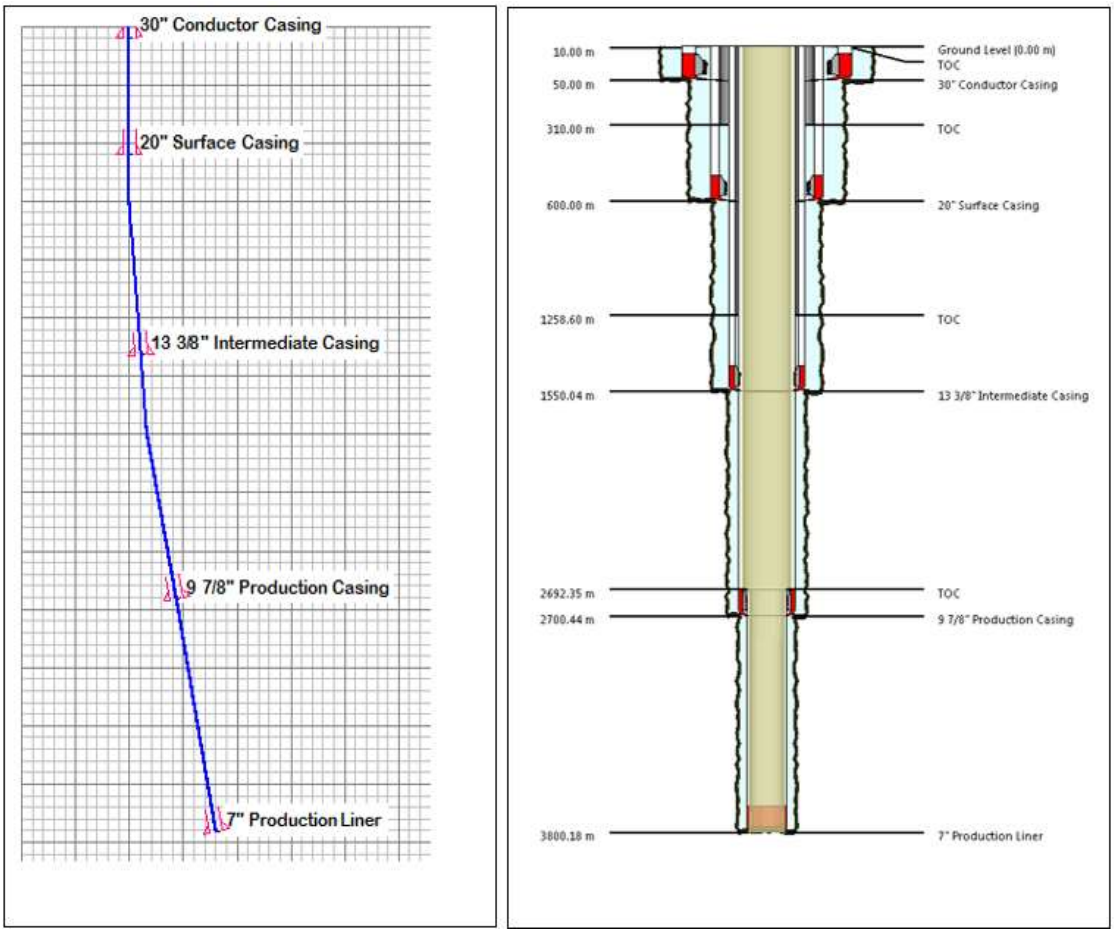
The exploration wells are designed as slightly deviated wells with maximum inclination of 11° for Ondwe Deep-1 and 17° for Ondwe Deep-2 well. The planned TD will be ranging from 3,800 – 4,000m TVDMSL, and the casing setting depth might subject to minor change dictated by actual borehole condition.

Table 4.7: Preliminary Well Design Parameters for ONDWE DEEP-1 and ONDWE DEEP-2 wells

Well	Hole Size	Hole Depth (mTVD)	Hole Depth (mMD)	Casing Size	Casing Depth (mTVD)	Casing Depth (mMD)
ONDWE DEEP- 1	26”	600	600	20”	590	590
	17 ½”	1,550	1,552	13 3/8”	1,545	1,547
	12 ¼”	2,700	2,718	9 7/8”	2,695	2,713
	8 ½”	3,836	3,800	7”	3,830	3,794
ONDWE DEEP- 2	26”	450	450	20”	440	440
	17 ½”	1,750	1,765	13 3/8”	1,745	1,760
	12 ¼”	3,210	3,284	9 7/8”	3,205	3,279
	8 ½”	4,000	4,108	7”	3,990	4,098

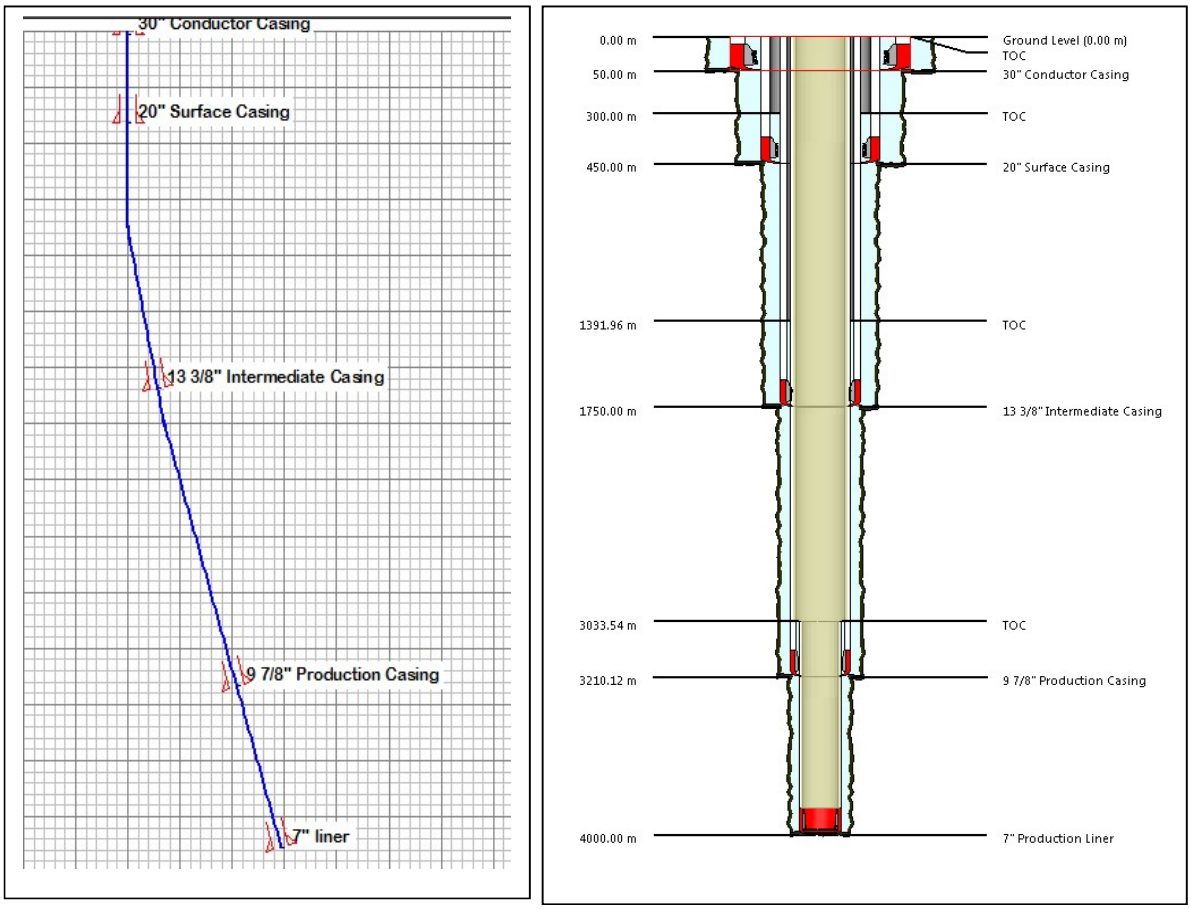
Source: Eni, 2019

Figure 4.19: Preliminary Well Profile (1)



Source: Eni, 2019

Figure 4.20: Preliminary Well Profile (2)



Source: Eni, 2019

Drilling Fluids

Drilling fluid, also called “mud”, performs a number of functions. In addition to 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
- Keeps dense materials such as cuttings in suspension in the borehole to maintain downward pressure in the well when circulation is interrupted (as when adding a new joint of drill-pipe).

Various drilling fluids are required for safe and efficient drilling operations. Some fluids pose a greater potential risk for environmental harm if there is any accidental release or inappropriate disposal. Where possible, fluids that have less potential for adverse impacts to both the environmental and human health will be chosen and used for drilling operations.

Several chemical components are mixed with the base fluid to give the drilling fluid the required rheology needed to suspend solids and achieve development of a ‘clean’ borehole. Other chemicals and additives, required for drilling, typically include bentonite, barite, caustic soda, biocide, emulsions and thinners.

Water-based polymer mud drilling fluids (also called water-based mud, or WBM) will be used for the top well sections. “Non-aqueous fluid” (NAF) will be used for the lower well sections. NAF-based fluids can

be either synthetic or low toxic mineral oil-based (LTMO) NAF fluids are considered to have fewer potential impacts to the environment than oil-based fluids in the case of an accidental loss of containment. Therefore, synthetic or LTMO-based NAF fluids will be used for this Project.

The estimated quantities of drilling fluids per well are as follows (the below are approximate values):

- WBM: 1,690 m^3 per well; and
- NAF: 765 m^3 per well.

The following table (***Table 4.8***) provides a list of the key substances that are likely be used for drilling operations.

Table 4.8: List of Key Drilling Fluid Chemicals

Drilling Fluid	Purpose	General Chemistry
Water-Based Mud (WBM)	Defoamer	Alcohol or Silicone polymer
Water-Based Mud (WBM)	Viscosifier	Xanthan gum / Natural polymer
Water-Based Mud (WBM)	Filtrate control agent	Starch / Natural polymer
Water-Based Mud (WBM)	Shale inhibitor	Amine polymer
Water-Based Mud (WBM)	Shale inhibitor	Potassium chloride
Water-Based Mud (WBM)	Alkalinity control	Caustic Soda
Water-Based Mud (WBM)	Alkalinity control	Sodium Bicarbonate
Water-Based Mud (WBM)	Bactericides	Gluteraldehyde
Water-Based Mud (WBM)	Weighting agent	Barite (Barium Solfate)
Water-Based Mud (WBM)	Viscosifier	Bentonite
Water-Based Mud (WBM)	Filtrate control agent	Poly Anionic Cellulose
Water-Based Mud (WBM)	Bit Balling preventer	Surfactant
Lost Circulation Material (LCM)	Fiber	Cellulosic or synthetic fiber
Lost Circulation Material (LCM)	Bridging agent	Calcium Carbonate
Lost Circulation Material (LCM)	Gelling agent	Synthetic polymer
Non-Aqueous Fluid (NAF)	Viscosifier	Organophilic clay
Non-Aqueous Fluid (NAF)	Primary emulsifier	Oil derivates
Non-Aqueous Fluid (NAF)	Secondary emulsifier	Oil derivates
Non-Aqueous Fluid (NAF)	Filtrate control agent	Synthetic polymer
Non-Aqueous Fluid (NAF)	Emulsion stabilizer	Calcium hydroxide
Non-Aqueous Fluid (NAF)	Alkalinity	Lime
Brine	Brine	Calcium Chloride
Cementing	Spacer additive for OBM	Surfactant
Cementing	Spacer additive for OBM	Mutual solvent

Source: Eni, 2019

All chemicals that may be discharged to the environment during the exploration drilling activity are required to be selected and approved in line with all National laws and regulations. Chemicals considered for use are assessed in terms of their application, discharge and potential risk to the environment.

Drilling fluids will be managed appropriately and associated wasted disposed of according to Myanmar laws and international best practice. Further details on waste management (including drilling waste) are discussed in ***Section 4.8.1***.

Drill Cuttings

Drill cuttings are 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 though.

After being processed by the solids removal equipment (shale shakers, mud cleaner, centrifuge, and vertical dryer) the drill cuttings are separated from the drilling mud and discharged to the dedicated cuttings pit. Drilling mud, except a little fraction adhered to the cuttings, will return to the drilling fluid system.

The exhausted mud will be temporary stored in a dedicated pit and then transported to a dedicated waste plant for treatment. After the treatment the solid and liquid phase will be managed and finally disposed. Exhausted mud and cuttings will be stored separately according to their own characteristics (hazardous, non-hazardous) in dedicated pits, before to be transported and disposed by an authorized waste management facility in Yangon. Further details on waste management (including drilling waste) are discussed in ***Section 4.8.1***.

The following table (***Table 4.9***) shows the estimated produced cutting and exhausted mud volumes for an exploration well.

Table 4.9: Estimate Exhausted Mud and Cuttings

	Exhausted Mud m^3 (Ton)		Cuttings m^3 (Ton)	
	WBM	NAF	From WBM	From NAF
For One (1) Well	1,683 (2,234)	200 (400)	1,211 (2,180)	298 (537)
Total	1,883 (2,634)		1,509 (2,717)	

Source: Eni, 2019

Well Completion

Well testing and well completion operations might be conducted after drilling Ondwe wells in case of hydrocarbons discovery, respectively to prove and to obtain production.

Well testing is a temporary operation aimed at evaluating the reservoir characteristics in terms of hydrocarbon productivity and reservoir extension while the completion phase of an oil or gas well eventually converts the well into a hydrocarbon producer well and takes place after the reservoir formation has been drilled and the production casing cemented. Preliminary completion operations are usually required to clean and condition a wellbore from mud, in order to prepare the well for the following operations.

At the beginning of the completion operations, the wellbore is displaced with a completion brine, necessary to balance the downhole pressure and, at the same time, to complete the removal of mud and solids from the well in order to minimise any potential damage to the formation. A specific tubular string, the completion string, is then run in hole. This string can be secondary named well testing or completion strings, if used during well testing or in the case of preparation for further production

respectively. This string allows surface safety, guaranteeing full control of hydrocarbon flow during the testing or production phase.

Subsequently the weighted completion fluid that maintains sufficient pressure and prevents formation fluids from migrating into the hole, is displaced out of the well-bore in order to start the next phase, hydrocarbon production.

4.3.2.4 Well Logging

Well-logging consists in the recording, using different tools and equipment, of several borehole properties. Well logging can be performed by examining the cuttings of rocks brought to the surface by the circulating mud (mud-logging) or by logging tools measuring rock physical properties.

Well-logging can be run during drilling, a technique known as logging while drilling (LWD) which makes use of tools assembled to the drilling string or after the drilling process as wireline logging (WLL) where instead tools are lowered into the borehole on the end of a wireline. In all cases, the purpose is to gather information on rock properties, , including information about the specific rock layers which indicate the presence of hydrocarbons in the target zones. Logging is also used to monitor the overall drilling process and to verify that the correct drilling equipment, materials, and supplies (such as drilling mud), are being used. It further indicates whether drilling should be halted if unfavourable / potentially hazardous surface or subsurface conditions develop.

Logging generally consists of lowering a device “logging tool, a string of one or more instruments” / or a probe into the well to measure the electromagnetic, acoustic, radiological and the pore pressure properties of the rock layers in order to provide an estimate of the fluid content and characteristics of the various rock layers through which the well passes. Logging devices can have a radioactive source component within the tool and therefore management of the device will need to be in accordance with any associated permit requirements and industry standards.

In order to minimize well operations duration, LWD tools will be the preferred source of information in Ondwe Deep-1 and Ondwe Deep-2 wells while WLL will be run in case of LWD failure or in case of hydrocarbon discovery to further detail formation evaluation, acquire pressure points, collect fluids samples and sidewall cores. The table below provides an overview of the possible well logging program for Ondwe Deep wells.

4.3.2.5 Well Testing

Well testing may be conducted if encouraging indications of hydrocarbons presence are found after drilling in Ondwe Deep-1 well and/or in Ondwe Deep-2 wells.

A well test is a temporary completion of a well to acquire dynamic rate through time, pressure, and fluid property data. The well test often indicates how the well will perform when it is subject to various flow conditions. An analysis is usually performed on the data to determine reservoir parameters and characteristics including pressure, volume, and temperature.

Current testing practices are carried out using modern testing equipment and high resolution pressure data acquisition system, getting the reservoir evaluation objectives depends on the behaviour of the formation fluid properties, well completion, and flow assurance situations are only known when testing is carried out.

The well test objectives are:

- Determine key technical factors of the reservoir (e.g. size, permeability and fluid characteristics) and values for use in future drilling; and
- Obtain representative data including reservoir pressure, production rates and sample(s).

While testing, hydrocarbons are sent to a flare boom with a burner to ensure as complete destruction of fluids (including hydrocarbons) as possible. Flaring may be initiated using LNG or similar fuel to ignite

the mixture. The flow periods and rates will be limited to the minimum necessary to obtain the required reservoir information during the well test.

Downhole sampling, if required, normally consists of recovering reservoir fluids via wireline or through specific tools added directly to the temporary test string. Wireline testing involves running instruments into the borehole on a cable to measure formation pressures and obtain fluid samples. Formation fluids are brought to the surface where the composition can then be analysed.

The following key well testing preventative measures will be implemented during the well testing program:

- Monitor flare performance to maximise efficiency of flaring operation;
- Ensure sufficient compressed air provided to oil burner for efficient flaring;
- Flare equipment appropriately inspected, certified and function tested prior to operations;
- Flare equipment appropriately maintained and monitored throughout well testing operations;
- The equipment is designed and built to appropriate codes and standards and certified; and
- The appropriate emergency stop mechanisms are in place to halt testing in case of emergency.

4.3.2.6 Well Control and Blowout Prevention

Health, safety and environmental protection are prioritised throughout the drilling process. In particular, there is a specific focus and attention during preparation and operations to avoid any potential accidental events, with related hydrocarbon release or uncontrolled flow from downhole to surface (rig floor).

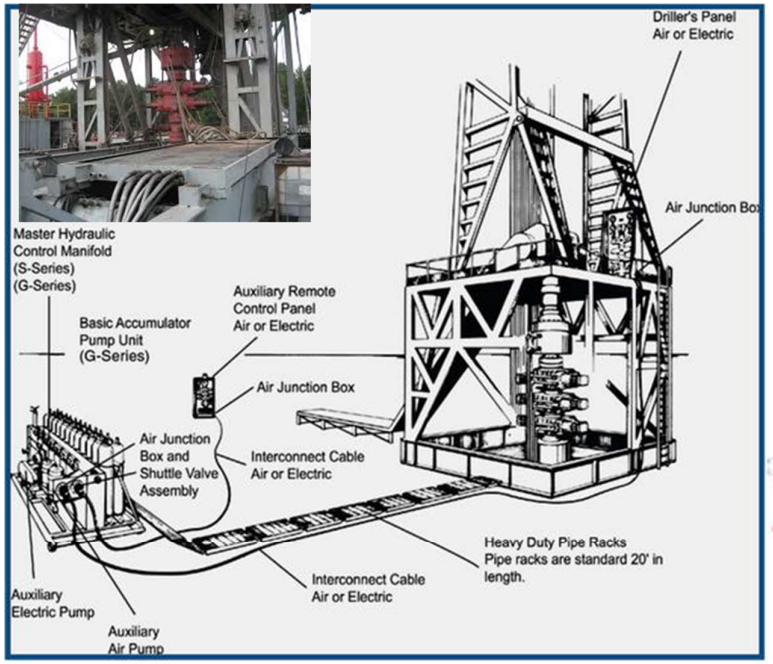
Well control during well operations is a routine function, with each well designed and executed to minimise risk of developing a well control incident. Down-hole conditions, such as shallow gas and high-pressure zones can cause control problems as a sudden variations in well pressure. A well kick can occur if there is an influx of formation fluids with sufficient pressure to displace the well fluids.

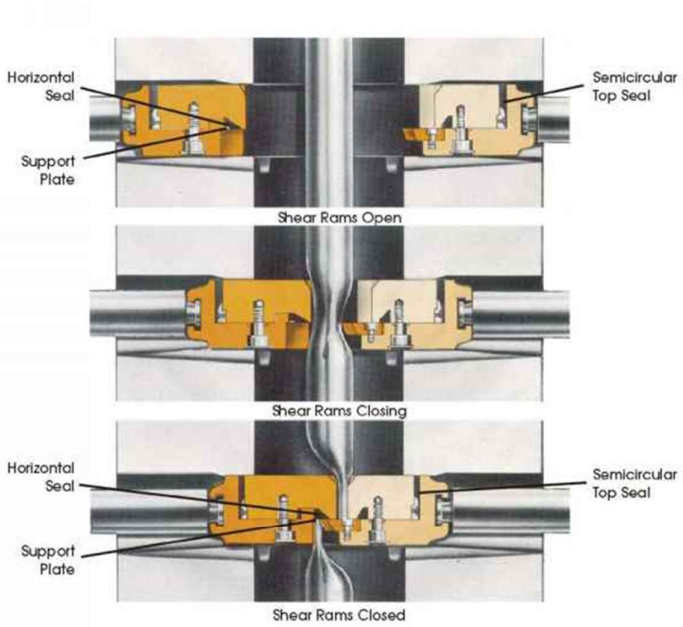
The primary well control against a well kick is provided by the maintenance of a sufficient hydrostatic head of weighted drilling mud/completion brine in the well bore to balance the pressures exerted by fluids in the formation being drilled.

Secondary well control is provided by the installation of mechanical device, such as the float collar in the drilling string and the blowout preventer (BOP) at surface, installed on top of the wellhead after the running and setting of the surface casing. The BOP effectively closes and seals the annulus if there is a sudden influx of formation fluids into the well bore, by the use of a series of hydraulically/electrically actuated rams. In addition, this device allows the formation fluids to be safely vented or pumped at the surface with the well closed, thereby enabling other methods to be applied to restore a sufficient hydrostatic head of mud on the well bore, for example pumping a higher density volume of mud, the so called ‘kill mud’. The capacity and pressure rating of equipment, safety device and the BOP rating exceed the predicted reservoir pressures.

The well control philosophy and procedure, constantly updated by the Eni drilling department, includes the identification and assessment of all well blowout risks. ***Figure 4.21*** shows an overview of the equipment used for well control and blowout prevention in the Project

Figure 4.21: Well Control and Blowout Prevention





Source: Eni, 2019

4.3.2.7 Equipment Used During Drilling

During drilling operations, in addition to the components that make up the well pad, a variety of equipment will be required in order to facilitate and support the drilling operations. A summary of the main equipment and expected quantity is shown in ***Table 4.10***.

Table 4.10: Equipment Required during Drilling

Equipment	Expected Quantity per Well Site
Telescopic Mobile crane 80 Ton	1
Telescopic Mobile crane 50 Ton	1
Fork Lift 5 ton	1
Fork Lift 10 ton	1
40' flat beds & prime mover	3
Vacuum Truck for water transportation	1
100 kVA Generators	2

Source: Eni, 2019

4.3.3 Demobilization Phase

Upon completion of the drilling exploration, all drilling equipment will be demobilized from the exploration areas. Each well is likely to be suspended for testing or plugged and abandoned (P&A), depending on well results and planned future use. Suspension and P&A will be undertaken in accordance with established industry procedures, including installing and verifying temporary barriers to prevent any potential release from the well. Transportation and agricultural activities in the exploration area are expected to resume to normal after demobilization.

4.3.4 Site Restoration Phase

Restoration consist of the actions required, first to recover the ecological function of a site and then, to return it to the “ante-operam” environmental condition for a pre-determined use. Company, state government and/or local regulation may define standards and needs, taking into consideration the conservation of local biodiversity and ecosystem services.

The sites involved in the Company’s activities are currently used as agricultural land, being therefore already anthropized. In any case, as common practice, the topsoil and fertile layer will be removed and stored at a nearby location for later reinstatement and use during site restoration.

All facilities will be removed, material used for construction (e.g. cast concrete), effluents (e.g. septic tanks), pipings etc. will be removed and treated offsite at an approved facility in Yangon unless otherwise requested by community or government.

The following are scenarios considered for site restoration after drilling exploration phase has been completed:

- **Gas not found in commercially producible amount** – in case of not finding or finding non-commercially productive reserves, the Company will permanently plug and abandon the well, remove the well head and excavate up to ca. 4 meter below ground to cut the conductor pipe to that level. Moreover, the conductor pipe will be covered with a blind flange. The rest of the area will be cleared from all encumbrances (cemented areas, pits and liners) from site. The terrain will be wrought so as to move the compacted soil and the original topsoil (reserved at the start of the activities) will again be applied on the ground as per original condition and be officially handover to MOGE.

- **Gas found in commercially producible amount** – the area will be maintained as is for future developments to be determined in the future with accordance to Production Sharing Contract (PSC) agreement.

4.4 Logistics and Transportation

4.4.1 Logistics Overview

To support the drilling exploration activities in Block RSF-5, Eni plans to adapt to the following logistic scenario outlined below:

- The designated entry point of importing materials into the country will be at a port located in Yangon whereby custom clearance formalities have to be performed;
- Drilling tubular material will be transported using the national and regional road network. A logistics base, described further below, will be located adjacent to the asphalt road coming from Magway to SEG#1, where installation and setting up of equipment such as pipe racks will be required as well as temporary covered warehouse;
- Helicopter services will be available (particularly during drilling operations) for medical evacuation in case the situation so dictates. The use of Magway airport for both night and day operations has been granted for emergency purposes;
- A transportation service provider will be selected along with feasibility study of loading/unloading operations and to foresee any necessary improvement of safety measures; and
- Transportation requirements during drilling activities will include movement of personnel, fuel, chemicals and various supplies. Personnel movements to and from location (crew changes, etc.) throughout the day will require multiple trips by minibuses or vans.

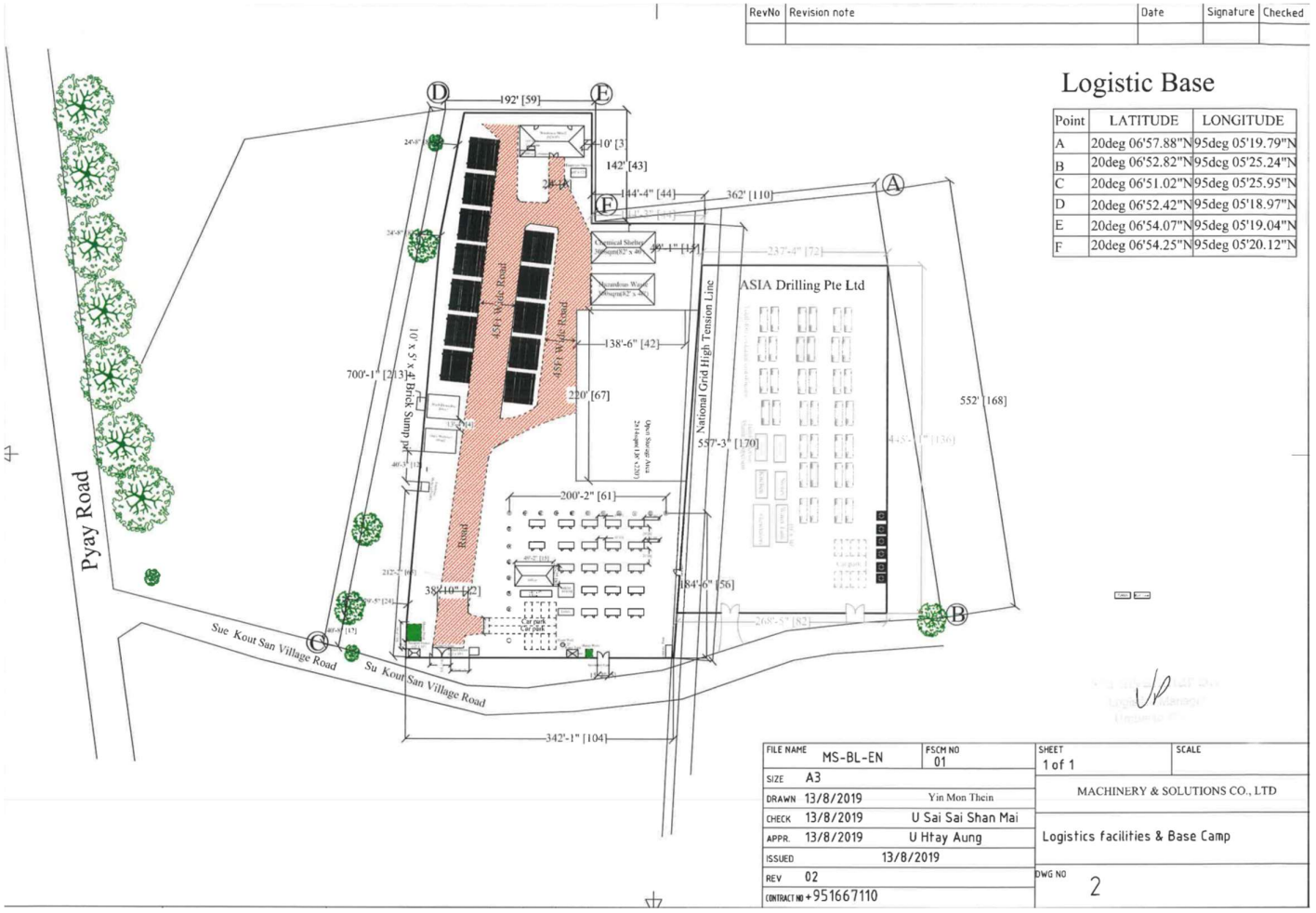
4.4.2 Logistics Base

To support drilling operations and provide accommodation for workers, a logistics base will be constructed adjacent to Pyay Road, accessed by Su Kout San Village Road. The logistics base layout is shown in ***Figure 4.22***, and will consist of the following main components:

- Open storage area/Pipe yard/Warehouse;
- Offices;
- Truck workshop;
- Chemical shelter;
- Hazardous material covered area;
- Generator house;
- Roads and passageways; and
- Accommodation area for drilling and logistic contractors.
- Canteen; and
- First aid clinic.

The logistics base will be fitted with required utilities and facilities (water, sewage, waste pit, electricity, grounding, floodlighting and internet connection, as well as waste collection and segregation points. The minimum area required for the logistics base will be ~150 m x ~130 m = ~19,500 m^2. The actual area acquired will be larger due to space needed for drilling contractor accommodation camp, backup area (in case of unexpected events), and soil storage area for land removed, to be kept for restoration. The accommodation design is aligned with the requirements of IFC and the European bank for Reconstruction and Development (EBRD) Guidance Note on Workers' accommodation.

Figure 4.22: Logistics Base



Source: Eni, 2019

The following ***Table 4.10:*** Equipment Required during Drillingillustrates the different companies to use the logistic base and their different work shifts, respectively.

Table 4.11: Logistic Base Details (Company and Shifts)

Equipment	Work shift (per day)	
	Day shift	Night shift
Eni, MOGE and SOS	6	1
Rig Contractor	47	38
Third party service personnel	66	16
Total	**119**	**55**

Source: Eni, 2019

4.4.3 Transportation Overview

4.4.3.1 Main Transportation Routes

Transportation routes and vehicles used will vary for each project phase and activities to be performed. Main roads involved will be as follows:

SEG #1 Well

- Magwe-Taungdwingyi Primary paved road ("No. 2 Yangon-Mandalay Hwy"), between Magwe and the beginning of the minor road to Aung Myay Gone;
- Minor road from Magwe primary road to Aung Myay Gone;
- Minor road from Magwe primary road to Su Kauk San, for the first 200 meters;
- Access road from Aung Myay Gone to the SEG#1 Well location;
- Newly built access road between the above two minor roads; and
- ***Figure 4.23*** and ***Figure 4.24*** show the transportation routes to SEG #1 Well.

SEG#3_Dev Well

- Magwe-Taungdwingyi Primary paved road ("No. 2 Yangon-Mandalay Hwy"), between Magwe and the beginning of the minor road to Awzar Gone;
- Minor road from Magwe primary road heading towards Awzar Gone; and
- ***Figure 4.25*** shows the transportation routes to SEG #3_Dev Well.

Fill Material

- Filling materials sourcing route for the base construction: From Magwe to logistic Base and back; this route will be used by dump trucks to transport land filling material.
- Filling materials sourcing route for roads construction/enlargement, and well pad: From Magwe to Aung Myay Kone and Well pad, for the entire length of the minor road and back; this route will be used by dump trucks to transport land filling material

Logistics Base

- Logistic base to well pad and back: this route will be used during operational phase to support drilling activities. Flatbed trailer trucks will traverse this road every day, transporting tubular material, chemicals and other consumables. This route will also be used by trucks (vacuum trucks and tankers) collecting waste from the drilling activities. Detail distances between logistic base to well sites.

Table 4.12: Distances between Logisitc Base and Well sites

Route		Distance (m)
From	To	
Logistic Base	SEG#1	4,990
Logistic Base	SEG#3_Dev	5,231
Logistic Base	SEG#6K	15,859

Source: ERM, 2019

4.4.3.2 Number of Vehicles

Construction Phase

During the well pad and road upgrading phase, the following vehicles will be used: 4 trucks, 2 excavator, 2 graders/dozers and a maximum of 10 light vehicles (personnel transportation).

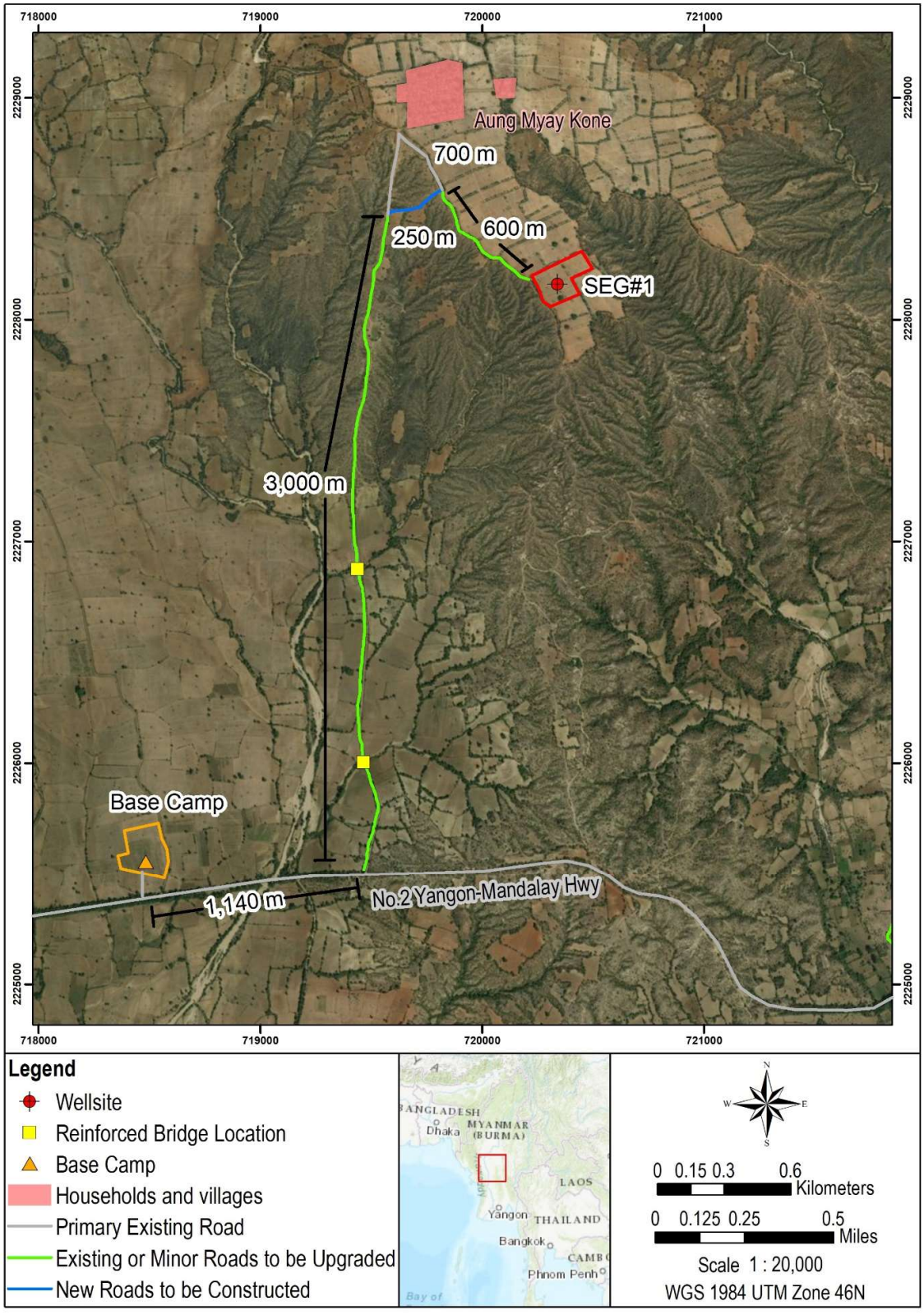
Drilling Phase

The total number of trucks required to transport the rig and set up the base camp will be approximately 170, over the course of approximately 1 month. The anticipated average truck frequency during this time is approximately 6 trucks per day. Approximately 20 trucks will consist of very heavy loads, between 30 tons and 41 tons, and approximately 90 trucks will consist of heavy loads, between 10 tons and 30 tons. During the drilling phase, material movements between base and rig will be performed by 3 flat bead trailer trucks. During the logistics base construction the following vehicles will be used: 2 trucks, 1 excavator and 1 grader/dozer.

With regards to personnel and staff transportation between base camp and well site, buses which can accommodate up to 40 persons will be used. This will be utilized during crew change between shifts. The maximum number of workers at well site at any one time is 100 workers therefore 3 bus trips will be required to fully turnover the onsite staff to a new set of workers. This will often occurs during the morning and evening of the day. Additionally, light duty vehicles (4WD and pick-up trucks) will be used to support transfer of supervisors and Company man. It is anticipated that approximately 4 trips of light duty vehicles will be needed per day but the time of occurrence for these trips will varies depending on their needs.

Eni will implement a Traffic Management Plan, which will include procedures for driving safety, speed limits, avoiding peak traffic periods, pedestrian access, driver training, and community notification. All movements within the area of operations will be optimized to minimize nuisance to the communities, and vehicle movements will be properly monitored and tracked.

Figure 4.23: Transportation to SEG#1 Well site



Source: ERM, 2019

Figure 4.24: Route for New Access Road to SEG#1

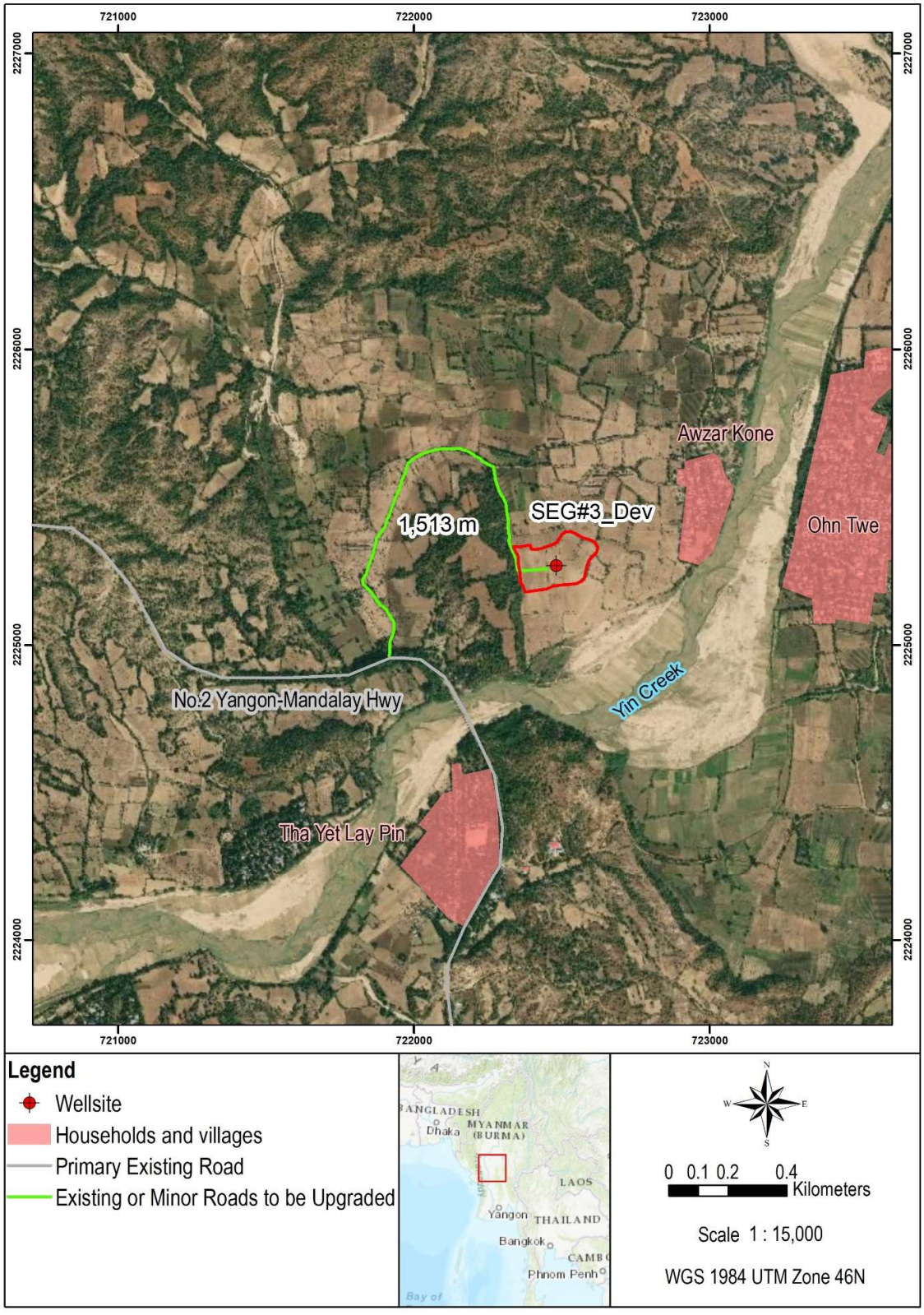
Point	LATITUDE	LONGITUDE
A	20°08'29.93" N	95°06'02.57" E
B	20°08'31.13" N	95°06'10.30" E

New Road Length
250 m

New Road Width
5.5 m

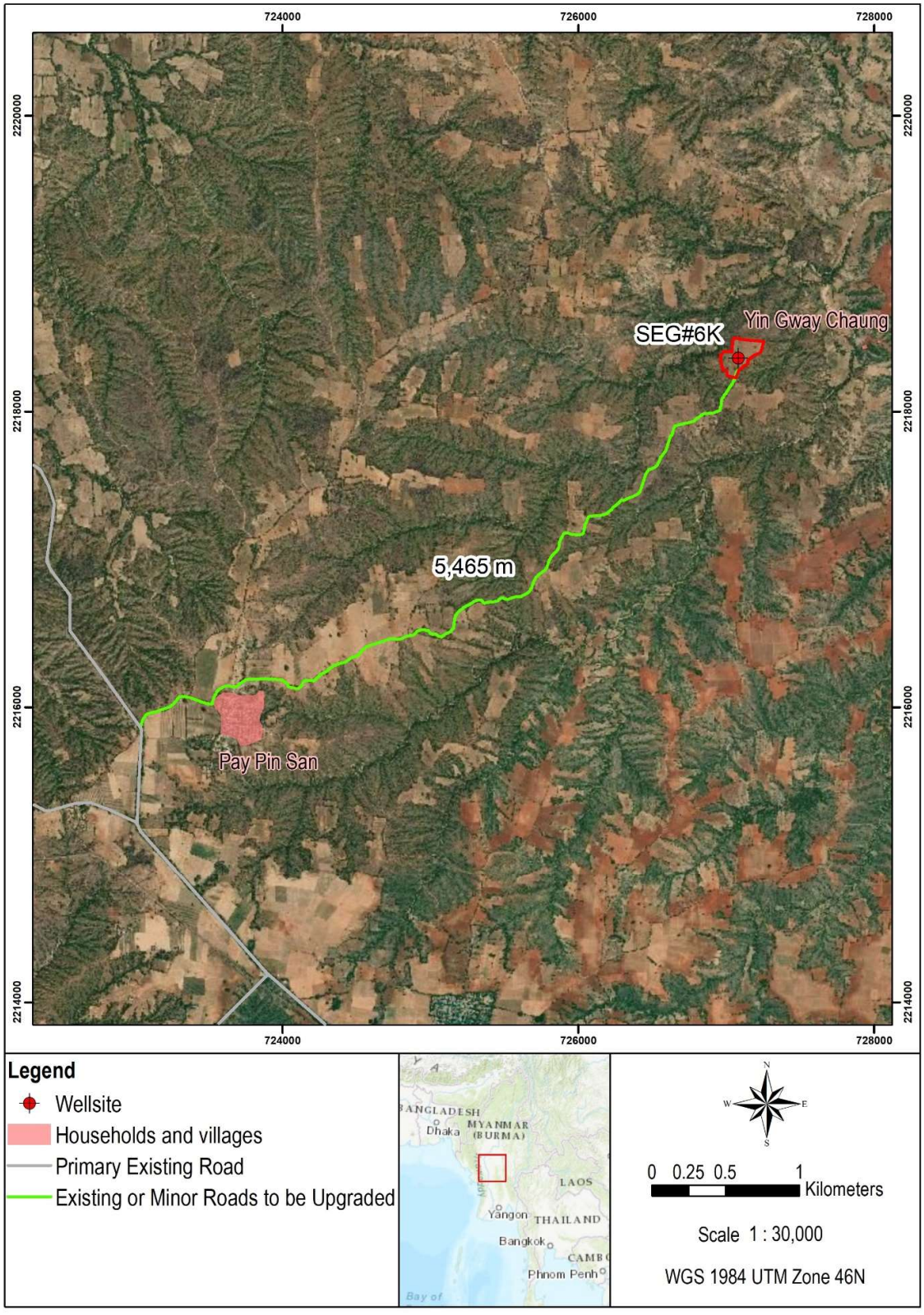
Source: Eni, 2019

Figure 4.25: Transportation to SEG#3_Dev Well site



Source: ERM, 2019

Figure 4.26: Transportation to SEG#6K Well site



Source: ERM, 2019

4.5 Work Force

4.5.1 Workers

During the construction and site preparation phase, the number of workers will vary based on the activity being conducted (for example, roadwork, logistics base, well pads, etc.), but it expected to range from 40 to 60 workers, with peaks up to 100 workers.

The construction activities will be overseen by a permanent ambulance, located on site with a doctor on board to ensure medical coverage in case of ill health or injuries.

During the drilling phase, the total number of workers will range from 120 to 140 workers, primarily located at the logistics base and the well sites. The workers will work in 12 hour shifts, and the maximum number of workers at a single well site at any one time is 100.

During drilling operations, the activities will be supported by the first aid clinic located at the logistic base and the ambulance that will continue to provide support until the finalization of operations. The clinic will provide support for stabilization and assessment of ill health or injuries.

Limited local recruitment will be carried out and prioritized where possible and as determined by Eni.

4.5.2 Drilling Contractor

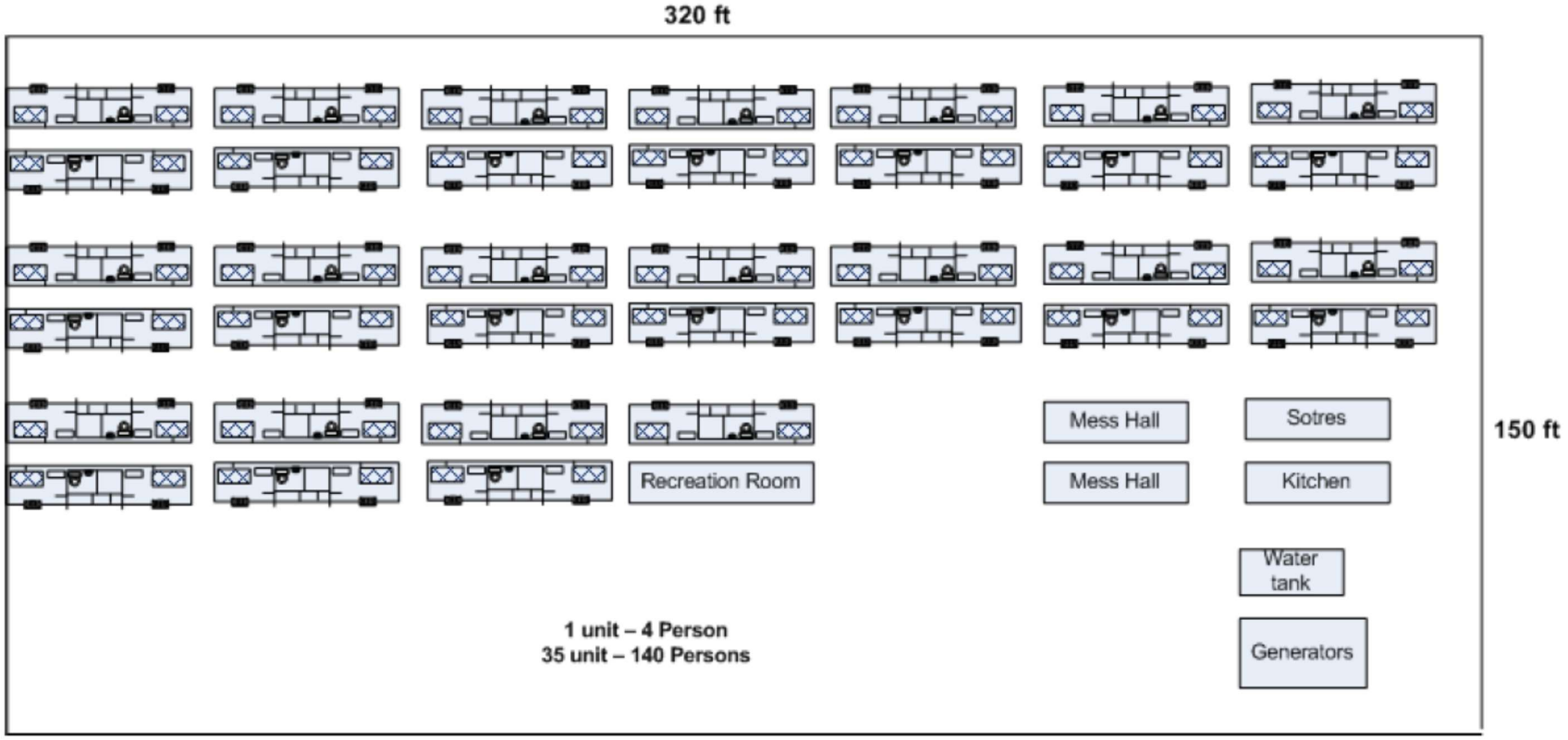
The drilling personnel will be provided by the drilling contractor. Drilling operations and associated services will be conducted on a 24-hour basis. Drill crews will work 12-hour shifts (night and day shifts). The overall supervision of the drilling operation is controlled by Eni, through its company representatives on the site.

4.5.3 Workers Accommodation

During the construction and site preparation phase, accommodation will consist of rented houses in nearby villages, local hotels, and temporary onsite work camps.

The logistics base will be fitted with required utilities and facilities (water, sewage, waste pit, electricity, grounding, floodlighting and internet connection), as well as waste collection and segregation points. The minimum area required for the logistics base will be ~150 m x ~130 m = ~19,500 m^2. The actual area acquired will be larger due to space needed for drilling contractor accommodation camp, backup area (in case of unexpected events), and soil storage area for land removed, to be kept for restoration. These details are aligned with the requirements of IFC and the European bank for Reconstruction and Development (EBRD) Guidance Note on Workers' accommodation.

Figure 4.27: Overview of Worker's Accommodation during Drilling Phase



Source: Eni, 2019

4.6 Project Schedule

Drilling exploration activities are tentatively expected to begin in November-December 2019, subject to commissioning program and work schedule. The drilling, abandonment and demob/restoration of the first well is planned to be completed within June 2020.

In case of hydrocarbon discovery in Ondwe Deep-1, post-well studies will follow to support proper planning of well testing activities on the first well. In case of successful well testing, hence proving reservoir deliverability, the second well (Ondwe Deep-2) will be prepared and drilled to explore another segment of the structure. The full project schedule is shown in ***Table 4.13***.

Table 4.13: Project Schedule for Block RSF-5 Drilling Exploration

Project Activity	Schedule
Site survey and site preparation (include obtaining permits)	June-July 2019 - Subject to Land Acquisition completion
Rig mobilization	November-December 2019 - subject to EIA approval
Well duration	80 days
Mobilization between sites	30 days
Well testing (depending on drilling result)	30 days
Preparation for Drilling Activities (Civil Works)	July 2019
Starting drilling activities	November-December 2019
Drilling exploration activities (not including testing activity)	November-December 2019 – June 2020
Demobilization (not including testing activity)	July 2020

Source: Eni, 2019

4.7 Utilities

4.7.1 Water Usage and Source

Water will be required throughout the life of the Project for drilling operations, construction activities, dust suppression and domestic uses.

Water for personal consumption will be bottled and provided to workers at site.

Construction Phase

Water needs for the civil works (roads preparation and drilling pad construction) will be around 50 m^3/day over a period of three months. This water will be withdrawn from a dedicated water well drilled in the vicinity of the well locations where one principal and another back up water well will be prepared, and both will target water reservoirs that is not in competition with the ones used by the community.

In addition, another water wells will be drilled in the logistic base area to source water.

Domestic consumption during base construction will be around 2-3 m^3 per day and delivered to the personnel of the camp via an elevated water tank. Water will be sourced locally.

Drilling Phase

During drilling operations, water will be withdrawn from the water well drilled during the drilling pad construction and continue to be used until finalization of operations, after which (in case of no success) the water well will be handed over to the community. Estimated water quantities required during the drilling phase are between 4,000 – 5,000 m^3 for each well (across the entire drilling phase).

Currently, there are three (3)) water wells planned: one (1) at the logistic base, two (2) at well sites (1 principle and 1 back-up).

4.7.2 Energy Usage

Significant quantities of energy will also be required to successfully deliver the Project. Energy consumption will be largely attributable to utilization of the main drill rig, along with transport vehicles, generators and the operation of plant and equipment. Generators for electricity will be diesel-powered, as will the majority of transport and other plant and equipment. Natural gas may be used for certain types of plant and equipment (such as forklifts or site vehicles), as well as for cooking. Energy requirements during construction and drilling are summaried below.

Construction Phase

- 60 kVA diesel generator to be used for the construction base; and
- 25 kVA diesel generator to be used for the drilling pad construction.

Drilling Phase

- Rig Site Power Supply: 3 x 1,714 kVA diesel driven generators
- Emergency Generator: 1 x 400 kVA
- Diesel Consumption = approx. 72 m³ (± 8 m³ /day)

4.8 Emissions, Discharges, and Waste Management

4.8.1 Waste Management

Eni will implement a number of robust waste management strategies throughout the Project, including both onsite treatment as well as transport to a licensed offsite waste management facility. Further details are provided below.

4.8.1.1 Overview of Licensed Waste Management Facility

Eni will utilize the services of Golden DOWA Eco-System Myanmar (DOWA) as a licensed waste management contractor, as they are the only supplier in country that meets the Company standards, to support their waste management throughout the Project. DOWA operates a hazardous and non-hazardous waste management facility in Yangon, at the location shown in ***Figure 4.28*** and ***Figure 4.29***.

The main infrastructure at the DOWA facility include:

- Controlled Secured Landfills (***Figure 4.30***)
  - 1 Hazardous Landfill
  - 1 Non-Hazardous Landfill
- Storing/Stabilization Facilities
- Wastewater and Leachate Water Treatment Facility
  - 3 Storage Pits (Equalization Ponds), each with volume 400 m^3
  - Treatment Water Storage Pond (400 m^3)
  - 3 Monitoring Ponds (each 1,500 m^3)
- Office (with Laboratory); and

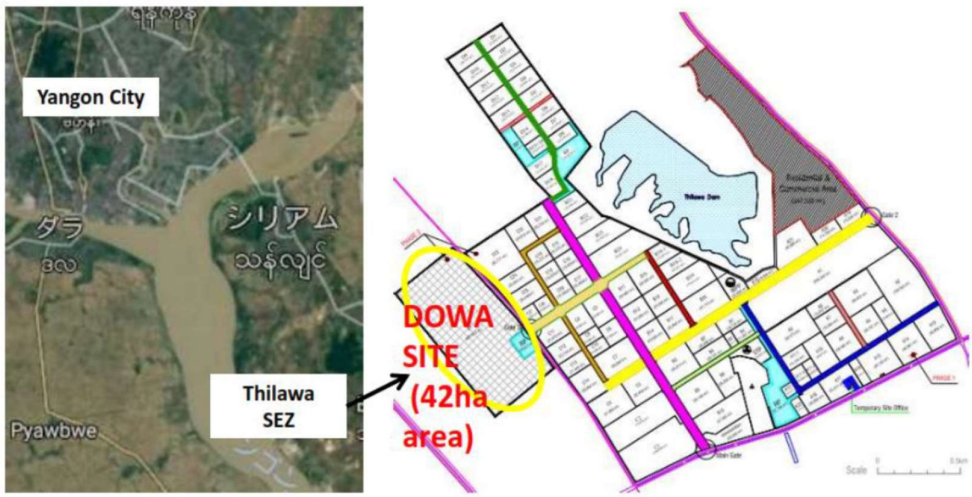
Treatment capacities at the DOWA site are as follows:

- Total storage volume capacity for solids and liquids:
  - 44,000 m^3 for hazardous waste

- 43,000 m^3 for non-hazardous waste
- 900 m^3 total liquid storage volume

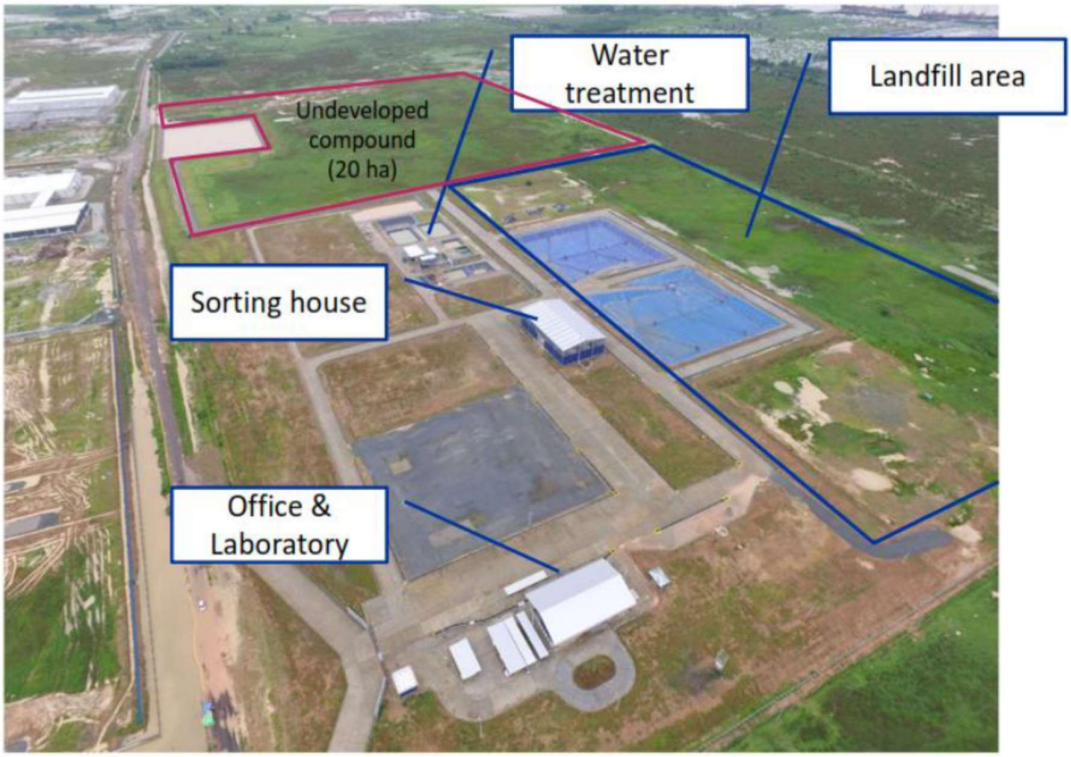
- Daily treatment capacity for solids and liquids:
  - 120 m^3/day liquid
  - 100 ton/day solid

Figure 4.28: Location of DOWA Waste Management Facility



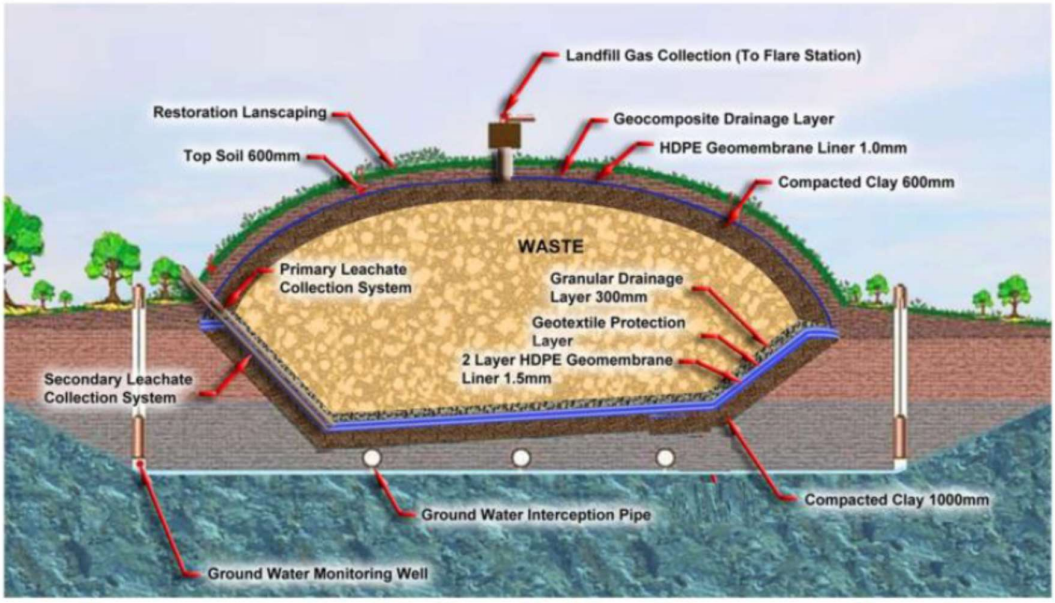
Source: Eni, 2019

Figure 4.29: Aerial View of DOWA Waste Management Facility



Source: Eni, 2019

Figure 4.30: Landfill Operation at DOWA Facility



Source: Eni, 2019

4.8.1.2 Management of Waste from Drill Cuttings and Drilling Fluids

There are two main types of drill cuttings produced from drilling operations due to the two types of drilling fluids used. Drill cuttings from the top sections will be contaminated with water-based mud (WBM), and therefore will be referred to as "WBM Drill Cuttings". Drill cuttings from the bottom sections will be contaminated with non-aqueous fluid (NAF), and therefore will be referred to as NAF Drill Cuttings. The waste produced from these two types of drill cuttings require different waste management techniques. All waste management will be carried out in accordance with Myanmar laws and regulations, Company procedures, and international good practice to minimize any environmental, social or health impacts.

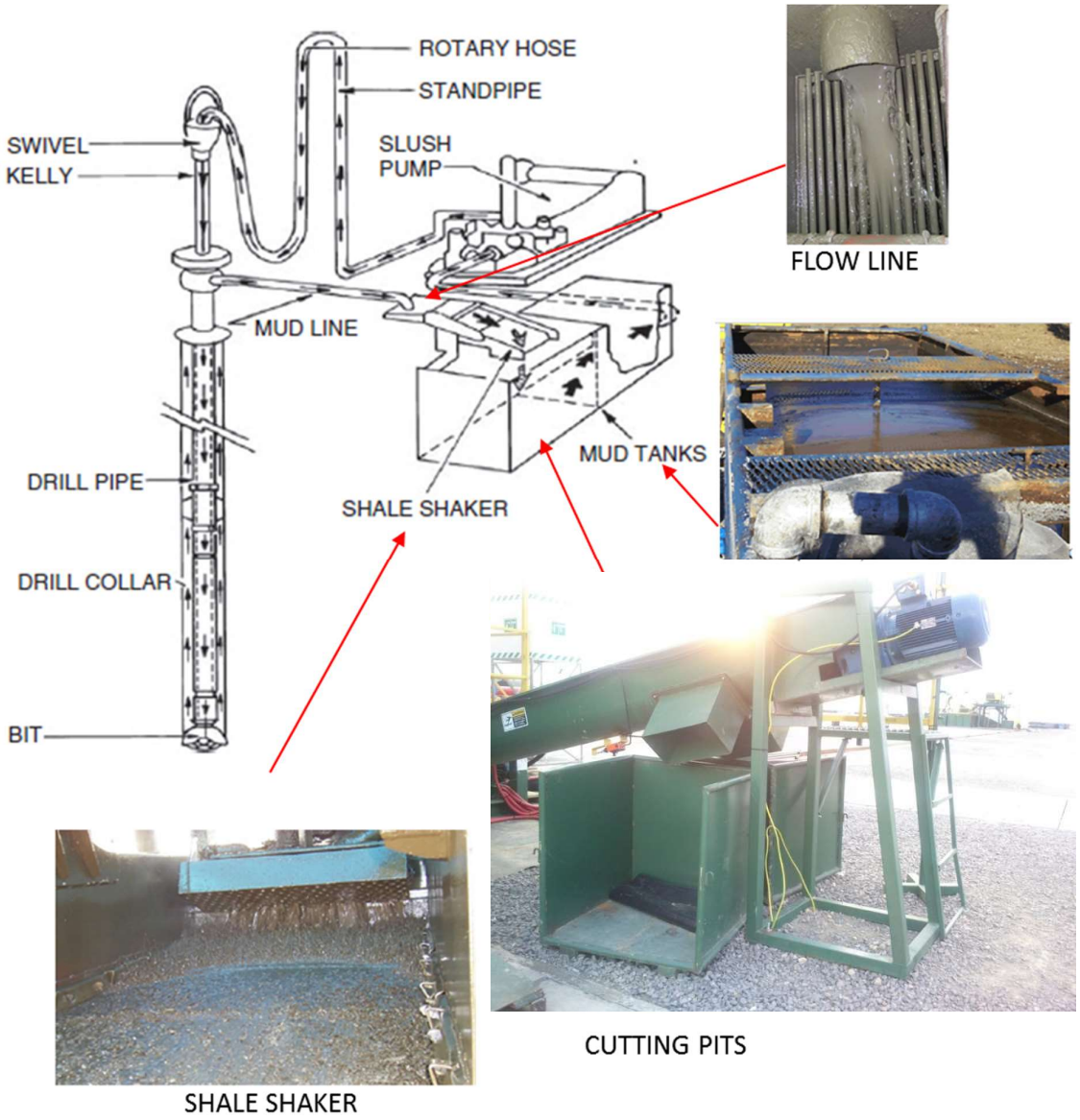
Drill Cuttings and Drilling Fluids management will consist of a combination of onsite treatment as well as transport to the offsite DOWA facility. The main steps involved in the management of mud and cuttings waste are as follows:

- After Cuttings overflow from shale shaker, cuttings will be transport via screw conveyor to Hi-G dryer, to dry the cuttings as much as possible before collected by jumbo bag. Hi-G dryer also can prevent spillage if there are any problem occurred to rig shaker. Keeping the collected cuttings as dry as possible also minimized the leakage during transport to final disposal facility.
- As for the WBM, unwanted water base mud will be discharged to waste pit, dewatering will be used to clarifiy the WBM, it can be re-used to mix mud or for cleaning the rig. By recycle the liquid waste, this eliminated the unnecessary liquid waste volume from the operations. Leftover clarify liquid waste can be pumped again in to the well through the drilling string at lost zone

Onsite Mud and Cuttings Waste Management

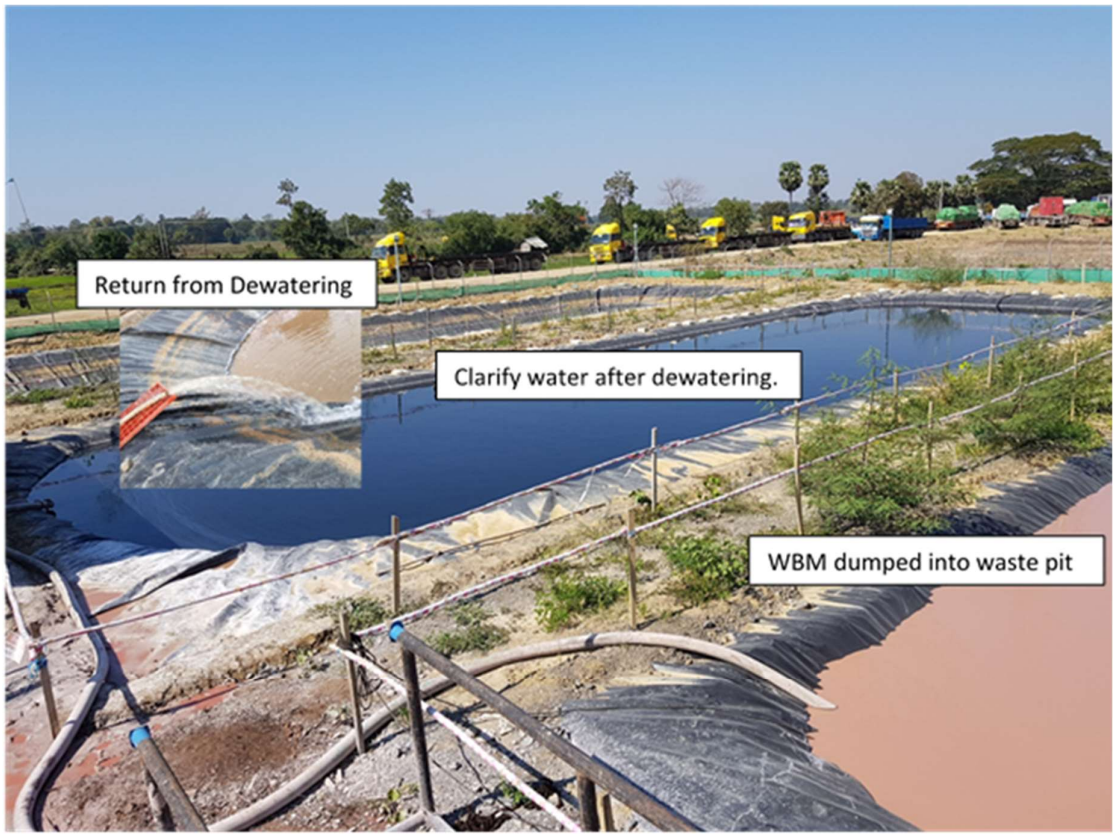
Figure 4.31 shows an overview of the onsite management of mud and cuttings waste. Within each well pad, an area will be designated for temporary storage of the waste, solids and liquids, by an adequate number of pits. The area will be paved with an impermeable concrete surface, covered, fenced, signalled and provided with dedicated collection system and adequate containment to avoid any possible soil contamination. The pits for the temporary storage of solid and liquid waste will be dug in the ground or built with concrete elements and waterproofed to avoid any possible soil contamination. ***Figure 4.32*** and ***Figure 4.33*** shows examples of onsite waste storage pits. The entire area for the pits will be 3,700 m^2, with a general schematic as shown in ***Figure 4.34***.

Figure 4.31: Onsite Waste Management for Mud and Cuttings



Source: Eni, 2019

Figure 4.32: Example of Temporary Solid and Liquid Waste (1 of 2)



Dewatering beaker test

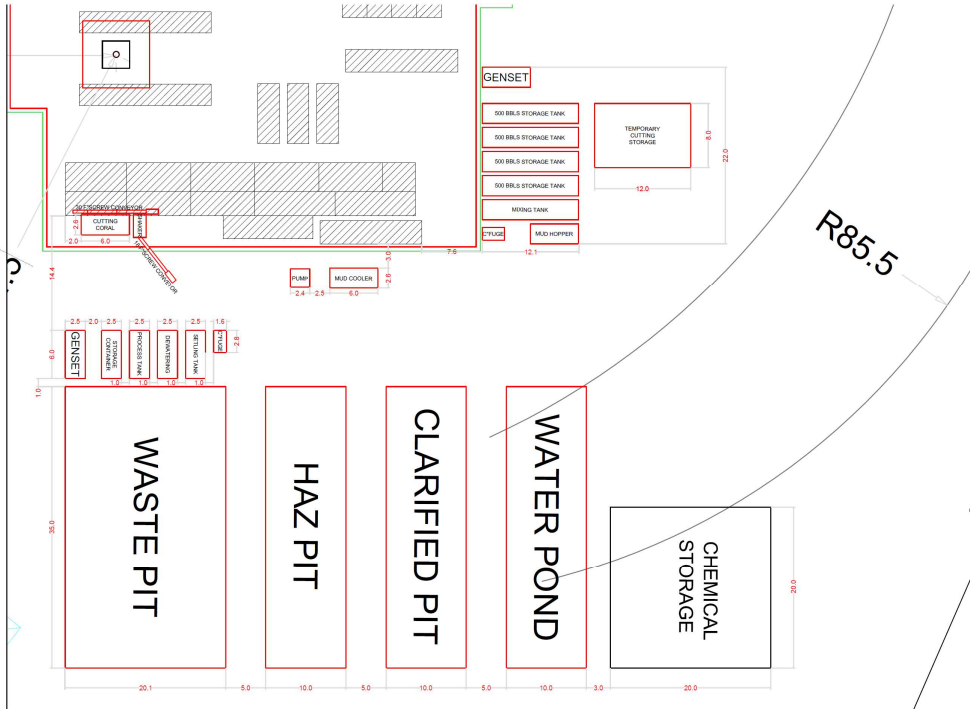
Solid discharge after dewatering (could be collected in Jumbo Bag)

Source: Eni, 2019

Figure 4.33: Example of Temporary Solid and Liquid Waste (2 of 2)

Source: Eni, 2018

Figure 4.34: Schematic for Waste Pits on Site



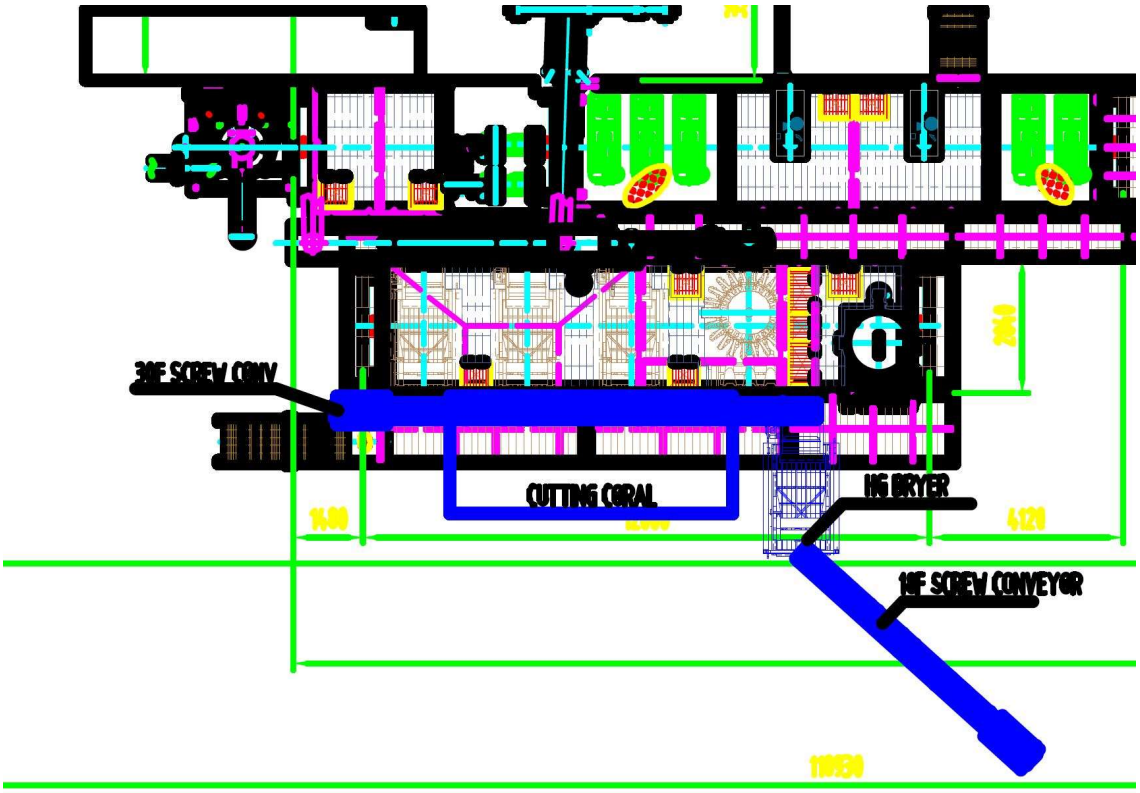
Source: Eni, 2019

Onsite Management of Water-Based Mud and Cuttings

The water-based mud is mixed on site and used for drilling the upper well sections. After the mud has been utilized for drilling, the WBM cuttings are brought to the surface. Management and re-use of mud, as well as cuttings treatment and/or disposal, are part of an integrated system.

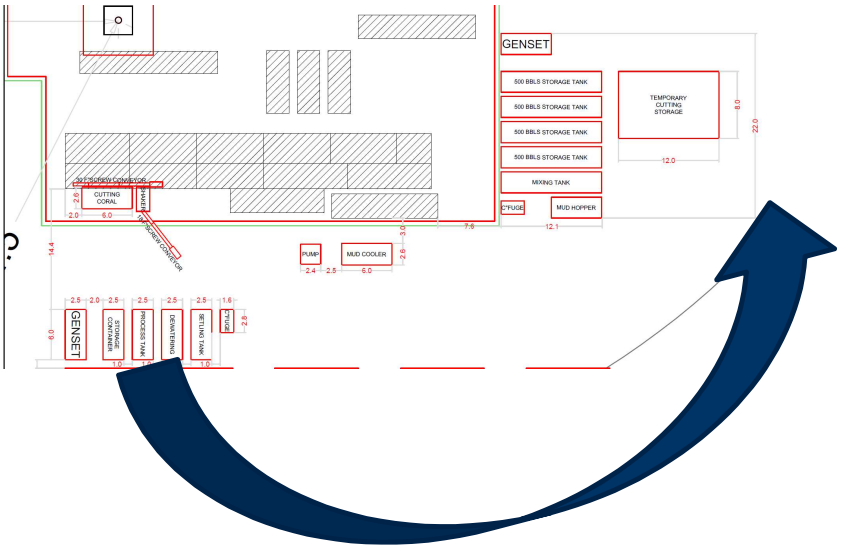
After cuttings being brought to the surface, it will be conveyed by screw conveyor, treated by drying share and stored into jumbo bag shown in ***Figure 4.35*** after each jumbo bag are filled, it will be removed by forklift, then keep at covered temporary storage shown on ***Figure 4.36*** while waiting for trailer to bring the open top container to load onto the truck and transported to disposal facility.

Figure 4.35 Cuttings process from shaker to jumbo bag



Source: Eni, 2019

Figure 4.36 Cuttings Collections to Temporary Storage



Source: Eni, 2019

Onsite Management of NAF Mud and Cuttings

The NAF mud is mixed on site and used for drilling the lower well sections. Excess NAF that is not lost in the hole is collected, stored and removed from site for re-use in future drilling operations. NAF cuttings, after the pre-treatment by solids removal equipment, will be collected into jumbo bag and finally sent to disposal facility for disposal.

NAF will be treated on-site at the well pad location in a liquid mud plant (LMP – see below typical arrangement layout). The LMP will consist of a lined and compacted area of approximately 30 m x 20 m for spotting the LMP equipment (including Genset, fuel tank, etc.). The LMP will be set on a concrete basement that will be bunded for containment and to avoid any spills/overflow of tanks, etc. going into the environment.

Figure 4.37: Example of LMP layout (for reference only)

Source: Eni, 2019

Offsite Mud and Cuttings Waste Management

After onsite treatment, some residual drilling wastes (both water-based and NAF) will be transported by government authorized Contractors, with proper means, to the dedicated DOWA waste plant, where the waste will be treated and finally disposed according to local environmental regulations.

Once at the DOWA plant, there are several potential treatment methods that could be used for mud and cuttings waste, depending on the types and quantities of waste. These include biological treatment, thermal desorption, incineration, and landfills. The appropriate treatment method will be applied by DOWA according to local laws and international best practice.

4.8.1.3 Solid Waste Management

Solid wastes from the Project will be classified, segregated, and disposed of according to various solid waste categories. Various waste management/disposal methods will be implemented for each type of solid waste produced by the Project from construction to decommissioning stages.

Based on previous similar production operations, approximately one (1) kg/person/day of solid waste is expected to be generated. Therefore, the highest quantity of waste produced will be approximately 140 kg/day. Based on previous similar projects, the quantity of hazardous waste during operation is not

expected to exceed 45 kg/month. Details on solid waste management methods for different types of solid waste from the Project are shown in ***Table 4.14***.

Table 4.14: Proposed Solid Waste Management Methods for Project

Waste Type	Examples of Specific Waste Names	Waste Management / Disposal Method
Drilling Waste	■ Drilling Cuttings ■ Drilling Fluids	■ Combination of onsite treatment as well as set to DOWA facilities for further management and disposal
Domestic Waste (including Food Waste)	■ Food scraps ■ Kitchen waste ■ Bottles, cans ■ Uncontaminated fabric or clothing ■ Packaging ■ Newspapers and magazines	■ Sent to DOWA facilities for further management and disposal
Contaminated Absorbent Materials	■ Oily debris; ■ Rags; ■ Gloves; and ■ Spill pads	■ Sent to DOWA facilities for further management and disposal.
Spent Batteries – Dry	■ Alkaline, Nickel-Cadmium, Lithium Ion	■ Sent to DOWA facilities for further management and disposal.
Spent Batteries – Lead Acid	■ Lead Acid	■ Sent to DOWA facilities for further management and disposal.
Construction and Demolition (C&D) Debris	■ Glass ■ Wallboard ■ Wood ■ Pallets ■ Iron ■ Scrap Metal	■ Sent to DOWA facilities for further management and disposal where applicable; ■ Managed by local municipality where applicable. Program of reclaim, recycle, re-use will be implemented if possible (for example, debris could be used as aggregate for stabilizing roads in the village). ■ Donate to community (wood). ■ Return to supplier for recycling (e.g., concrete, glass).
Removed Soil	■ N/A	■ Kept in the proximity of the selected areas, in order to be ready when restoring the land.
Cementing Waste	■ N/A	■ Requires the operation of a cementing unit on-site to mix cement and pump it directly down the well bore, thereby cementing the casings into place and isolating the bore. ■ All waste concrete, excesses and concrete wash-down water will be contained in a designated sealed and signposted area. ■ Solids will be separated out of the concrete pits and crushed for reuse.
Other Hazardous Waste	■ Fuels ■ Lubricants ■ Paints	■ Stored in appropriate storage areas and labelled containers such as tanks and canisters. ■ Storage will be lined, placed in paved and bunded impermeabilized areas to prevent discharges. ■ Transported for disposal at DOWA site.

Source: Eni, 2019

4.8.2 Wastewater

4.8.2.1 Site Stormwater Runoff

Stormwater runoff from the Project well sites will be handled through drainage systems. Stormwater falling in unpaved areas will not be collected (as there's no risk of oil contamination). Stormwater falling on concrete areas will be collected and treated at location facilities.

Any contaminated runoff (i.e., oil from drilling operations) will pass through oil traps where oil will be captured before the runoff is drained into the trench. Water that enters this drainage trench is released into dedicated pit.

With respect to contaminated runoff, the site well pad itself will be built with a gentle camber from the centre to the edge to facilitate flow to a perimeter drainage ditch surrounding the site. Water that enters this drainage trench is released off site via oil traps and sediment traps. The edge of the site will be sloped, and elevated from the surrounding land. Released water will meet the requirements of Myanmar's National Environmental Quality Guidelines as discussed in ***Section 3.4.1***.

4.8.2.2 Sanitary Wastewater

The well site will generate sewage accumulated from toilet facilities, as well as greywater from showers and kitchen. During the construction period, pit latrines will be installed for workers. During drilling and at the logistic base, a sewage treatment system will be installed, consisting of a septic system. Septic tanks will be frequently pumped out and taken to Yangon for treatment. If any discharge is required, all effluent will be treated in accordance with the requirements of Myanmar's National Environmental Quality Guidelines (as discussed in ***Section 3.4.1***) prior to release to the receiving environment.

4.8.3 Air Emissions

The air emissions from the Project will primarily consist of:

- Dust;
- Combustion emissions; and
- Greenhouse Gas Emissions.

During the access road and well pad construction, the main potential Air Quality issues will be dust control. Eni's standard operating procedures will require a contractor to sprinkle water daily on all non-sealed surfaces to subdue the amount of dust and to restrict speed of traffic on portions of the road that have not yet been sealed. Daily consultations by the construction contractor with the local villages will allow for any significant problems to be identified and resolved.

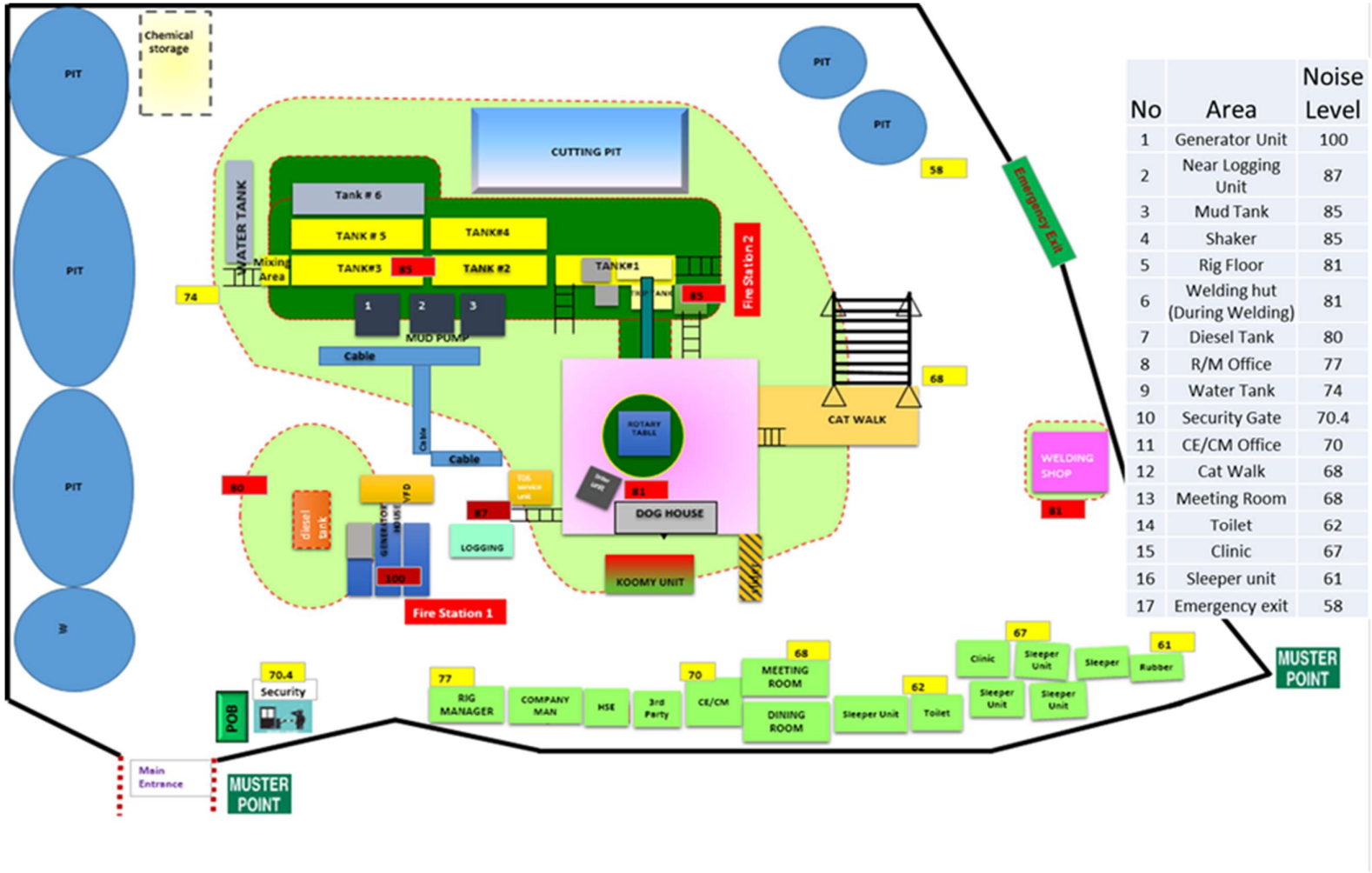
Diesel generators will be used as a source of power supply for the drill rig and other site operations during the drilling phase. The generators will operate 24 hr/day throughout the drilling period. Air pollutants generated from diesel oil combustion will be estimated in ***Section 6*** of this EIA Report.

Emissions of greenhouse gases from the Project will be estimated in ***Section 6*** of this EIA Report.

4.8.4 Noise

Throughout the construction and drilling phases, there will be a number of sources of noise, primarily vehicles, construction equipment, generators, and the drilling rig. Calculated noise levels at sensitive receptors will be described in Section 6 of this EIA Report. ***Figure 4.38*** shows example noise emissions for various pieces of equipment on the well pad, as measured during a previous similar drilling campaign.

Figure 4.38: Example Noise Emissions for Drilling Rig



No	Area	Noise Level
1	Generator Unit	100
2	Near Logging Unit	87
3	Mud Tank	85
4	Shaker	85
5	Rig Floor	81
6	Welding hut (During Welding)	81
7	Diesel Tank	80
8	R/M Office	77
9	Water Tank	74
10	Security Gate	70.4
11	CE/CM Office	70
12	Cat Walk	68
13	Meeting Room	68
14	Toilet	62
15	Clinic	67
16	Sleeper unit	61
17	Emergency exit	58

Source: Eni, 2019

4.9 Comparison and Selection of Project Alternatives

Alternatives to the proposed Project were considered in the early stages of Project design, which included different options available that may avoid or reduce any adverse environmental and/or social impacts. A summary of the different options considered are presented in the following sections.

4.9.1 The 'No Project' Option

The 'No Project' alternative would result in no further exploration activity in Block RSF-5 and, in turn, no further oil and gas development. The exploration for oil and gas stimulates the Myanmar economy and 'No Project' would result in fewer opportunities for gas supply to the domestic market and could lead to fewer employment opportunities and less economic growth. In addition, given the operators obligations regarding Block RSF-5, the 'No Project' alternative is not considered commercially, contractually or technically practicable.

4.9.2 Well Site Locations

A number of alternative well site locations within the area of Interest were considered before selecting the three proposed sites described in this report. In general, the criteria used to select the final well sites was as follows:

- **General Criteria** - The general criteria include an evaluation of geology, topography, land use and significant sensitive areas and infrastructure. The Project explored the location, extent and characteristics of petroleum reservoirs, and selected locations to drill exploration wells based on geological data and seismic interpretation data in the area. The locations were also evaluated for other constraints, such as steep terrain, land use, sensitive areas and distance from roads.
- **Engineering Criteria** - Engineering criteria for well site selection include minimizing difficult terrain (such as drilling in steep topography, rocky areas, etc.), minimizing waterway crossings, maximizing use of existing roads, minimizing logistical issues (including engineering safety concerns), minimizing drilling depth to reservoir and minimizing overall length of access road construction.
- **Economic Criteria** - The site selection process incorporates the assessment of the economic value of a potential petroleum hydrocarbon reservoir, the optimal target and its commercial worth against the cost of the investment (including land cost and compensation, rig rental cost, construction, operation and maintenance costs).
- **Environment, Social and Health Criteria** - Environmental, social and health criteria evaluated to select well site locations include: keeping as far away as possible from environmental and social sensitive areas, including villages, protected areas, important habitats, cultural heritage, water bodies, and sensitive infrastructure.

Initially, five locations were considered for the well sites, as shown in ***Figure 4.39***. Based on the combination of the criteria above, SEG #1, SEG #3_Dev, and SEG #6K were selected as the optimal locations for drilling the exploration wells.

4.9.3 Access Road Route for SEG#1, SEG#3_Dev and SEG#6K

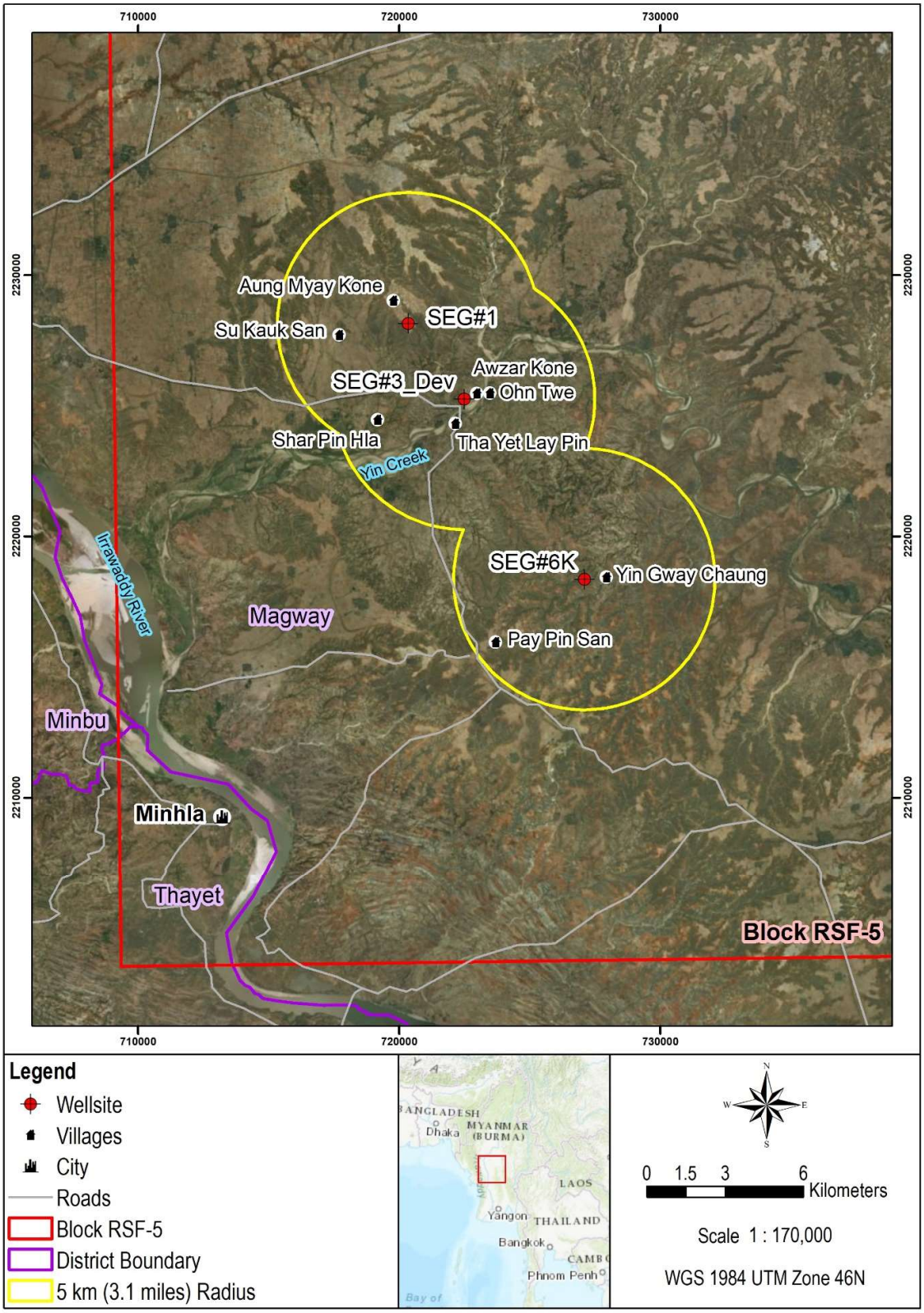
Initially, Eni planned to utilize the existing minor road to access SEG #1, passing very near Aung Myay Kone Village, as shown in ***Figure 4.40***. After evaluation of the social impacts to Aung Myay Kone Village, Eni revised the plan to include construction of a new access road to SEG #1, located 0.30 km away from Aung Myay Kone Village, thus minimizing the social impacts to the village.

Vehicles travelling from the base camp to SEG#3_Dev well site will travel 3,718 m on No.2 Yangon-Mandalay Highway before making a left turn onto an improved road (1,513 m in length) before arriving at the well site.

Vehicles travelling from the base camp to SEG#6K well site will travel 10,394 m on No.2 Yangon-Mandalay Highway before making a left turn onto an improved road (5,465 m in length) before arriving at the well site. The improved route will be adjacent to Pay Pin San Village.

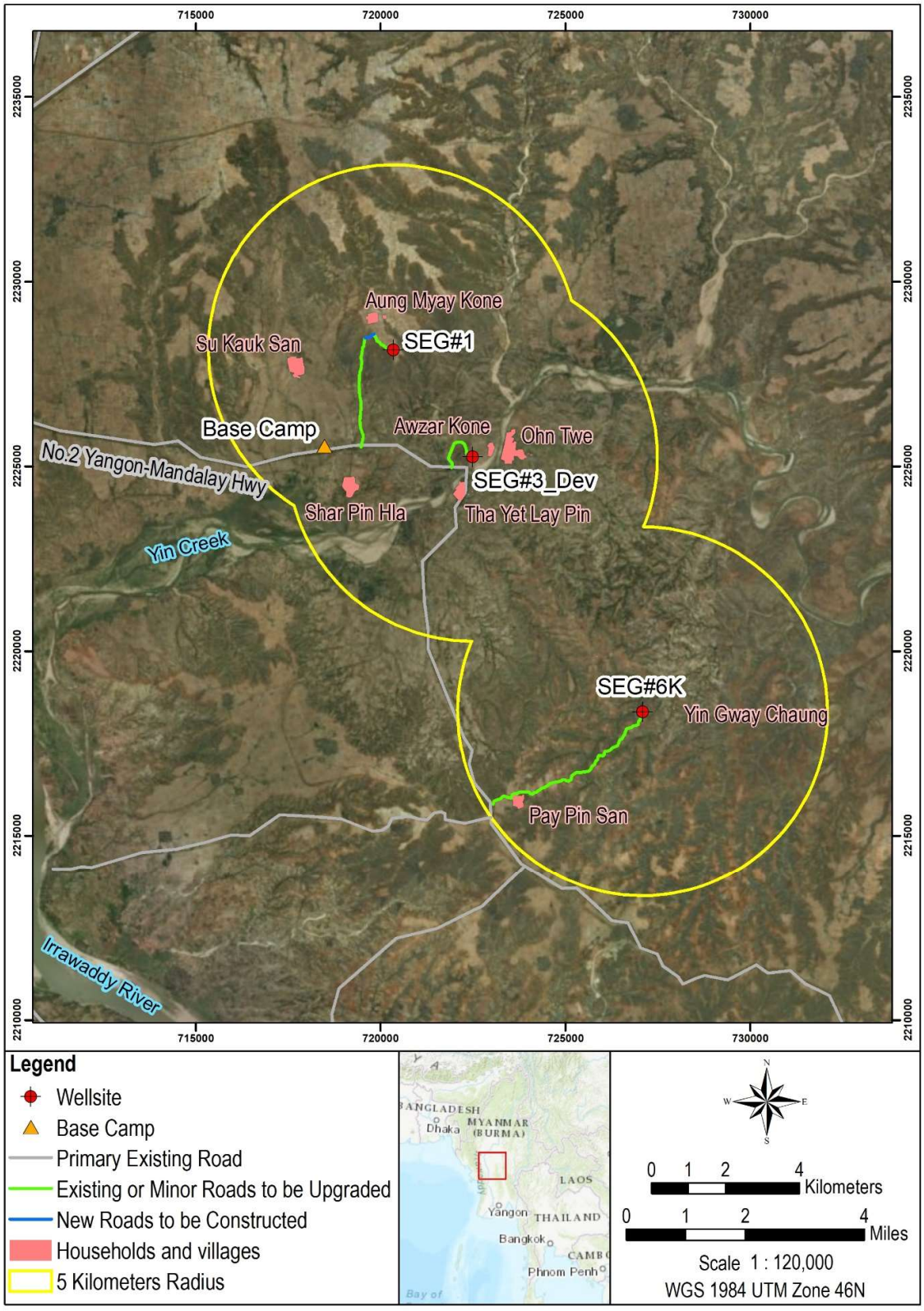
These access routes to SEG#1, SEG#3_Dev and SEG#6K are shown in ***Figure 4.40***.

Figure 4.39: Location of Well sites



Source: ERM, 2019

Figure 4.40: Access Road to Well sites



Source: ERM, 2019

4.9.4 Alternatives Road Routes

As part of the Project alternatives, potential routes were identified and assessed for the most practical and optimal option. These will include considerations to:

- Travel time;
- Distance;
- Social receptors;
- Supporting infrastructures (e.g. bridges and roads); and
- Environmental receptors (e.g. rivers, IBA and KBA).

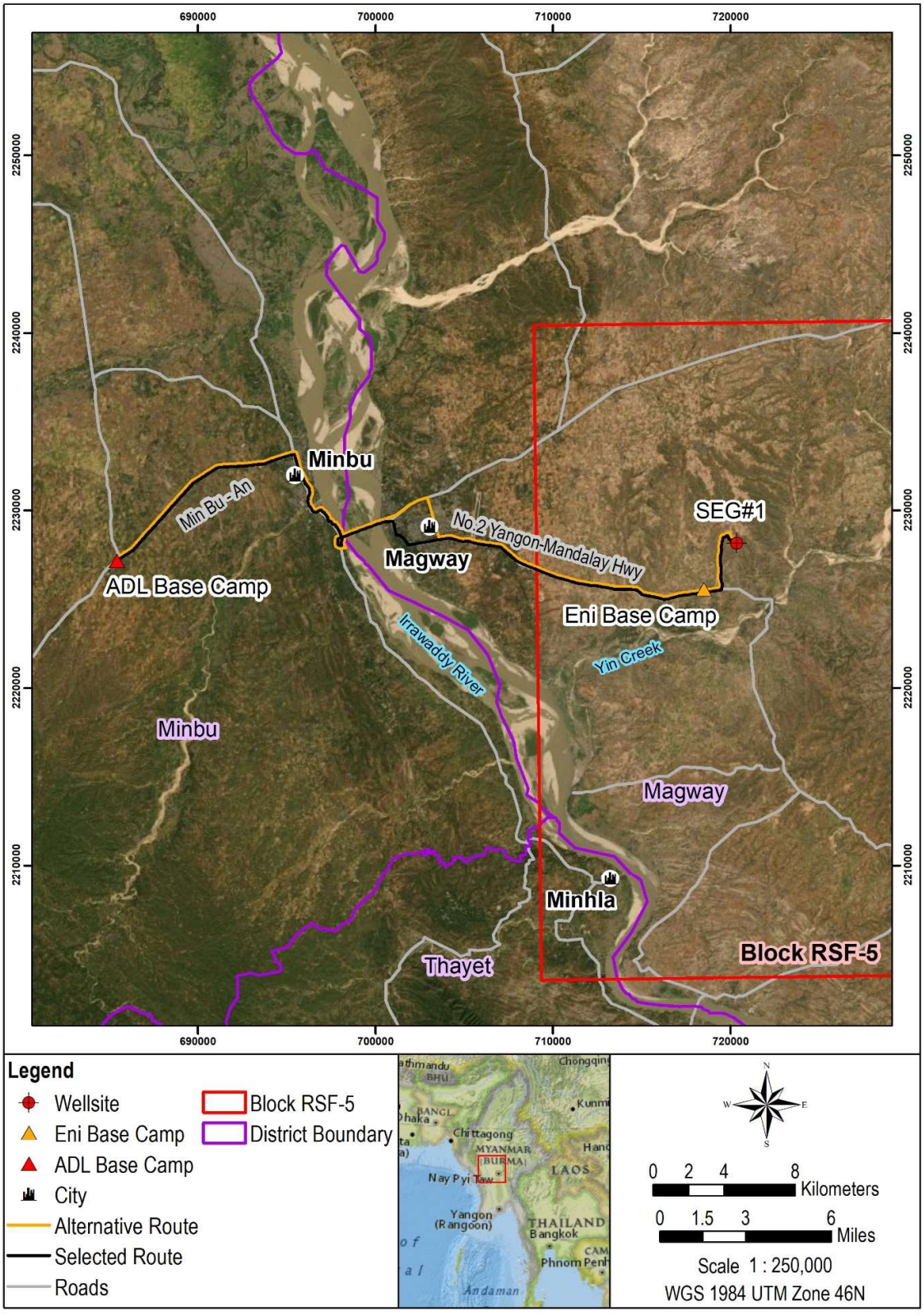
Alternatives road route distances and location is shown in ***Table 4.15***, ***Figure 4.41*** and ***Figure 4.42***.

Table 4.15: Selected and Alternative Route Distances

Purpose of Route	Distance (km)
Rig Mobilization (selected route)	165
Rig Mobilization (alternative route)	155
Equipment Transportation (selected route)	51
Equipment Transportation (alternative route)	53

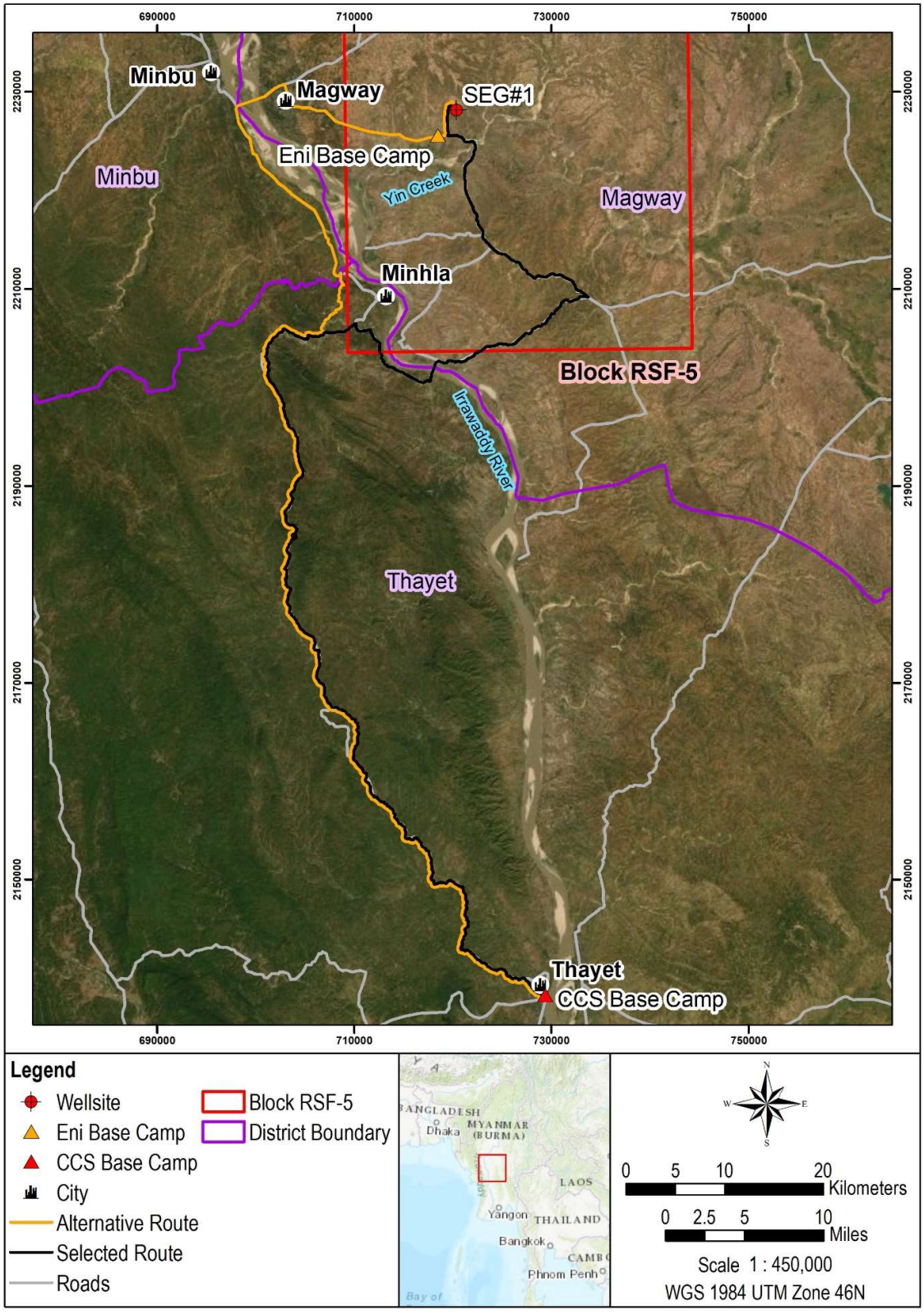
Source: ERM, 2019

Figure 4.41: Equipment Transportation Alternative and Selected Route



Source: ERM, 2019

Figure 4.42: Rig Mobilization Alternative and Selected Route



Source: ERM, 2019

4.9.5 Alternatives for Drilling Fluids

Numerous drilling fluid systems are available, but they can generally be categorized into the following:

- Water-based drilling fluids (or water-based mud, WBM): The continuous phase and suspending medium for solids (or liquid) is water or a water miscible fluid. There are many water-based variations, including gel, salt-polymer, salt-glycol and salt-silicate fluids;
- Non-aqueous drilling fluids (NAF): The continuous phase and suspending medium for solids is a water immiscible fluid that is oil-based, enhanced mineral oil-based, or synthetic-based; and
- Diesel-based fluids are also available, but the use of systems that contain diesel as the principal component of the liquid phase is not considered current good practice.

Factors for selecting the treatment and disposal of drilling fluids and cuttings have been considered, including:

- Minimizing volumes of drilling fluids and drilled cuttings requiring disposal;
- Minimizing environmental hazards related to residual chemical additives on discharged cuttings by careful selection of the fluid system; and
- Careful selection of fluid additives taking into account the technical requirements, chemical additive concentration, toxicity, bioavailability and bioaccumulation potential.

Based on the above, WBM was selected to be used as much as possible for exploration drilling in order to reduce environmental and social impacts. NAF was selected to be used only for the bottom hole sections of the well, with appropriate treatment methods, as discussed in ***Section 4.8.2.1***. The reason that NAF was selected for bottom sections is that it has superior engineering characteristics which are important for the lower well sections, such as shale inhibition, lubricity, well stability, and overall drilling efficiency but especially to control the well.

4.9.6 Alternatives for Drill Cuttings Disposal

Alternatives for the Disposal of drill cuttings comprise (1) onshore disposal subject to different management options and (2) onshore re-injection.

4.9.6.1 Onshore Disposal

This option involves transport of the cuttings generated from the well to an adequate onshore processing facility followed by disposal. There are several technical alternatives to this option outlines below:

- Treatment to remove or reduce oil content (eg composting, incineration, thermal desorption) followed by disposal by land-farming or landfilling;
- Re-use as fuel;
- Re-use as construction materials;
- Disposal in landfills without treatment (minimum oil content requirements may require prior treatment); and
- Disposal by land-farming.

4.9.6.2 Onshore Cutting Injection

This option involves the injection of cuttings into a dedicated cuttings injection well which has already been drilled in nearby areas. This option is not viable for the proposed Project as there are no wells in the field or nearby fields capable for as such a purpose.

4.9.7 Alternatives for Drilling Campaign Schedule

4.9.7.1 Dry Season

Drilling exploration activities are expected to begin in December 2019, subject to commissioning program and work schedule. The drilling, abandonment and demob/restoration of the first well is planned to be completed within June 2020. The construction works and drilling activites during dry season will cause dust dispersion and impact airquality and community health and safety however through the implementation of an environmental and social management plan these impact can be mitigated and managed appropriately

4.9.7.2 Wet Season

To conduct construction and drilling exploration activities during wet season where heavy ranfalls inclusive of flooding events may occur comprise a risk to community health and safety and environmental receptors. Hazardous materials (such as fuels, oils, lubricants or solvents), if not managed appropriately, could accidentally spill or leak, directly impacting surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to biodiversity and social receptors, hence drilling activites during dry season is the preferred alternative.

5. DESCRIPTION OF THE SURROUNDING ENVIRONMENT

5.1 Introduction

A critical part of the EIA is to establish the status of the existing environmental, social and health resources in the Project Study Area (referred to as the baseline) and their status. The environmental, social and health baseline describes the physical, biological and socio-economic resources that characterise the Project Study Area.

This section describes the environmental, social and health conditions which could be affected by Project activities within Block RSF-5.

The discussion of the baseline has been limited to the factors that could have a direct impact on the Project or be impacted by the Project. The baseline data presented in this EIA Report are generally those required to fully understand potentially significant Project impacts.

5.1.1 Setting the Study Limits

The "Study Area" refers to the area considered to adequately understand and describe the baseline conditions likely to be affected by the Project. The Study Area encompasses the primary Project Site, the associated facilities of the Project, areas potentially affected by the cumulative impacts from other developments or future expansion of the Project as well as induced activities of the Project known at the time of the impact assessment. The Study Area includes consideration for the environmental, social and health interactions associated with the project, and also considers downstream impacts, normally associated with aquatic discharges and air emissions. It is good practice to keep the Study Area to a reasonable distance so that the potential impact assessed can be attributed to the Project rather than being affected by influences outside of the Project.

For this Project, an overall Study Area boundary has been defined as a 5 km radius of the proposed well sites. This is a typical study area based on best practice for EIAs for oil and gas exploration projects, and is based on examination of the project activities and their potential impact extent. However, it is noted that Study Areas for certain resources/ receptors may vary depending on the nature of the resource/receptor, the change caused by the Project activities and the type of effect being considered (for example, in some cases it is practical to extend the Study Area based on biodiversity corridors, hydrological boundaries, or socio-economic area of influence). For this reason, the Study Area is further defined for some resources/receptors, within their respective sub-section, to reflect the area that will be considered in the assessment for that resource/receptor.

The Project is located in Block RSF-5, in the central region of Myanmar, within Magway Region. Eni plans to drill two exploration wells in Block RSF-5 which covers a total area of 1,292 km^2 and consists mostly of agricultural land, with some low lying forest and shrubs areas. The Irrawaddy River is adjacent to the western edge of Block RSF-5. The Project covers the activities associated with the site preparation and construction, drilling operation and well abandonment of the proposed Exploration Drilling in Magway Region, Myanmar.

A map of the overall Study Area including the potential locations for drilling well sites and the riverbank landing is shown in ***Figure 5.1***.

5.1.2 Methodology for Data Collection

5.1.2.1 Secondary Data Collection

Information on environmental and social baseline conditions in this report are based primarily on a desk-top review of existing information on the natural environment through the following sources:

- Existing reports and studies;

- Previous ESHIA 2016 of Block RSF-5[1];
- Government/ authority data;
- Internet research; and
- Collation of in-house existing data archives.

5.1.2.2 Primary Data Collection

Primary data pertaining to the existing conditions of the Project Study Area was collected during a number of baseline sampling surveys, as follows:

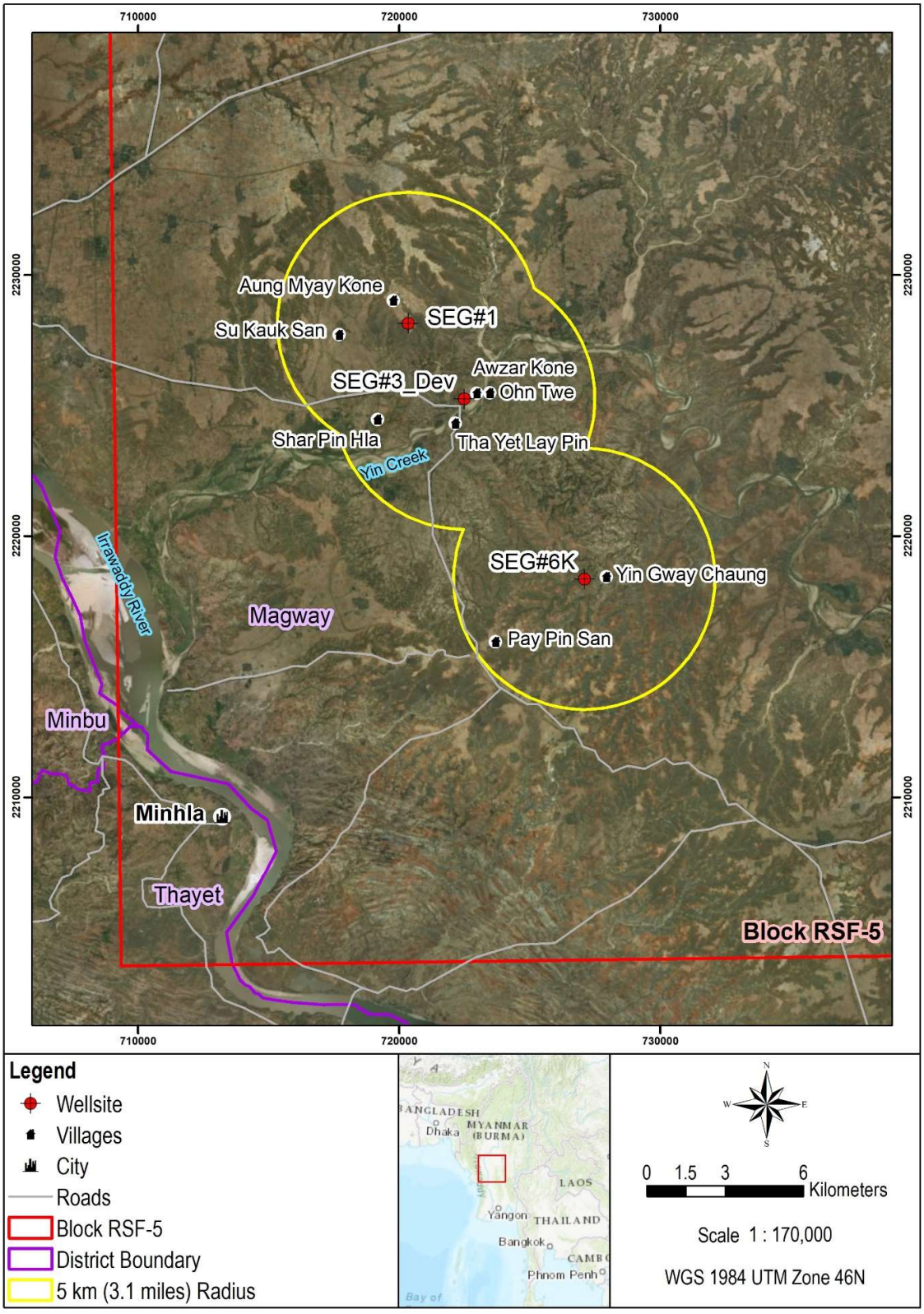
- Air quality – monitoring of air quality was conducted at five (5) locations, specifically targeting air sensitive receptors (ASR), which includes Aung Myay Gone Village, Awzar Gone Village, Ohn Twe Village and two (2) more stations around Ohn Twe Village. The monitoring was recorded continuously for 72 hours per station from 21st March 2019 to 7th April 2019;
- Noise level – monitoring of ambient noise level was conducted at same five (5) location and also in parallel to the air quality monitoring;
- Surface water – samples of surface water was collected at seven (7) locations, targeting the two (2) previous potential riverbank landing locations on the Irrawaddy River (samples were collected upstream and downstream), a sample was also taken from a pond nearby Aung Myay Gone Village as well as upstream and downstream of Ying Chaung River. All samples were collected between 21st and 24th March 2019;
- Soil – sampling was conducted at eight (8) locations, targeting areas around villages in the Project Study Area, these include Ga Gyi Gone Village, Aung Myay Gone Village, Awzar Gone Village, Onn Twe Village and Pay Pin San Village. A sample from top soil (30 cm – 50 cm depth) and sub soil (60 cm – 80 cm depth) were collected at each location. All samples were collected between 23rd and 24th March 2019; and
- Groundwater – groundwater sampling was conducted at six (6) locations all located in or near villages within the Project Study Area, these include Aung Myay Gone Village, Awzar Gone Village, Ohn Twe Village, Tha Yet Lay Pin Village. All samples were collected between 21st and 22nd March 2019.

Further details of each data collection and results will be provided in individual sections.

Where primary data is presented, measured values are compared against threshold values of relevant national or international standards, and where two or more standards exist, the more stringent threshold value is selected, to determine the pre-project environmental conditions.

[1] An ESHIA study was conducted in 2016 by IEM for Eni for a seismic survey. As part of the ESHIA study, a combination of baseline sampling were conducted to compliment the gap of the baseline data and were presented in the report.

Figure 5.1: Overall Project Study Area



Source: ERM, 2019

5.2 Physical Resources

The climate of Myanmar is influenced by its geographical location and surrounding environment. Myanmar is separated from neighboring countries by high mountains towards the north and east while the southwest borders the Indian Ocean. The mountain ranges creates a barrier-effect that divides the different climates during seasonal monsoon variations throughout the year.

The southwest monsoon season generally lasts from late May through end of October, whereas the northeast monsoon occurs from December through April. The range of mean daily maximum and minimum temperature is between 39°C (April) and 14°C (January)[1] , respectively. The rainy season starts from May and ends in October, with August having the highest amount of precipitation (approximately 125 mm). The season of Myanmar can be identified as below:

- Monsoon: May – October;
- Winter: November – January; and
- Summer: February – April.

Block RSF-5 is located in the central plain region of Myanmar, which contains the following climatic zones:

- Tropical steppe climate (Dry Zone[2], BSh), is a semi-arid climate with precipitation less than 600 mm per annum and mean annual temperatures of 26.5°C; and
- Tropical savannah climate (around the Tropical Zone, Aw, shown in ***Figure 5.3***) (Köppen-Geiger climate classification system) with an equatorial climate and a dry winter. However, the average temperature of this climate is similar to tropical monsoon climate.

Table 5.1 and ***Figure 5.2*** show the climate information in Magway Region, Myanmar.

Figure 5.4 shows the average wind speed in Magway Region during different month of the year, where the minimum average wind speed occurs during September while the windiest month is April.

[1] Meteoblue, Climate Magway, Magway Region, Myanmar, 20. 15°N 94. 93°E, 60m asl (above sea level). https://www.meteoblue.com/en/weather/forecast/modelclimate/magway_myanmar_1312609, accessed on November 8, 2018.

[2] The Dry Zone in Myanmar covers over 54,000km, covering 58 townships including area from Magway and Mandalay region, western and central sections of Myanmar

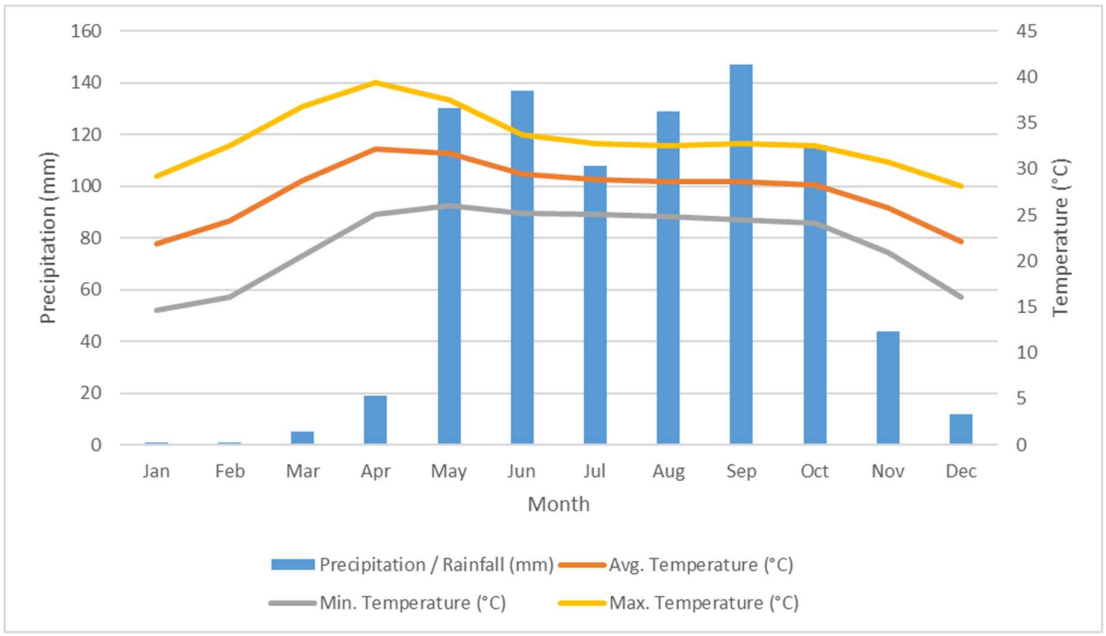
Table 5.1: Climate Data in Magway Region, Myanmar

Climatic Data	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Temperature °C	21.9	24.3	28.7	32.2	31.7	29.4	28.9	28.6	28.6	28.3	25.8	22.1	21.9
Average Min Temperature °C	14.6	16.1	20.6	25.1	26	25.2	25.1	24.8	24.5	24.1	20.9	16.1	14.6
Average Max Temperature °C	29.2	32.5	36.8	39.4	37.5	33.7	32.8	32.5	32.8	32.5	30.7	28.1	29.2
Average Precipitation mm	1	1	5	19	130	137	108	129	147	116	44	12	1
Average Humidity (%)	62	62	65	68	79	86	89	89	86	80	76	69	76

Source: climate-data.org, 2018[1]

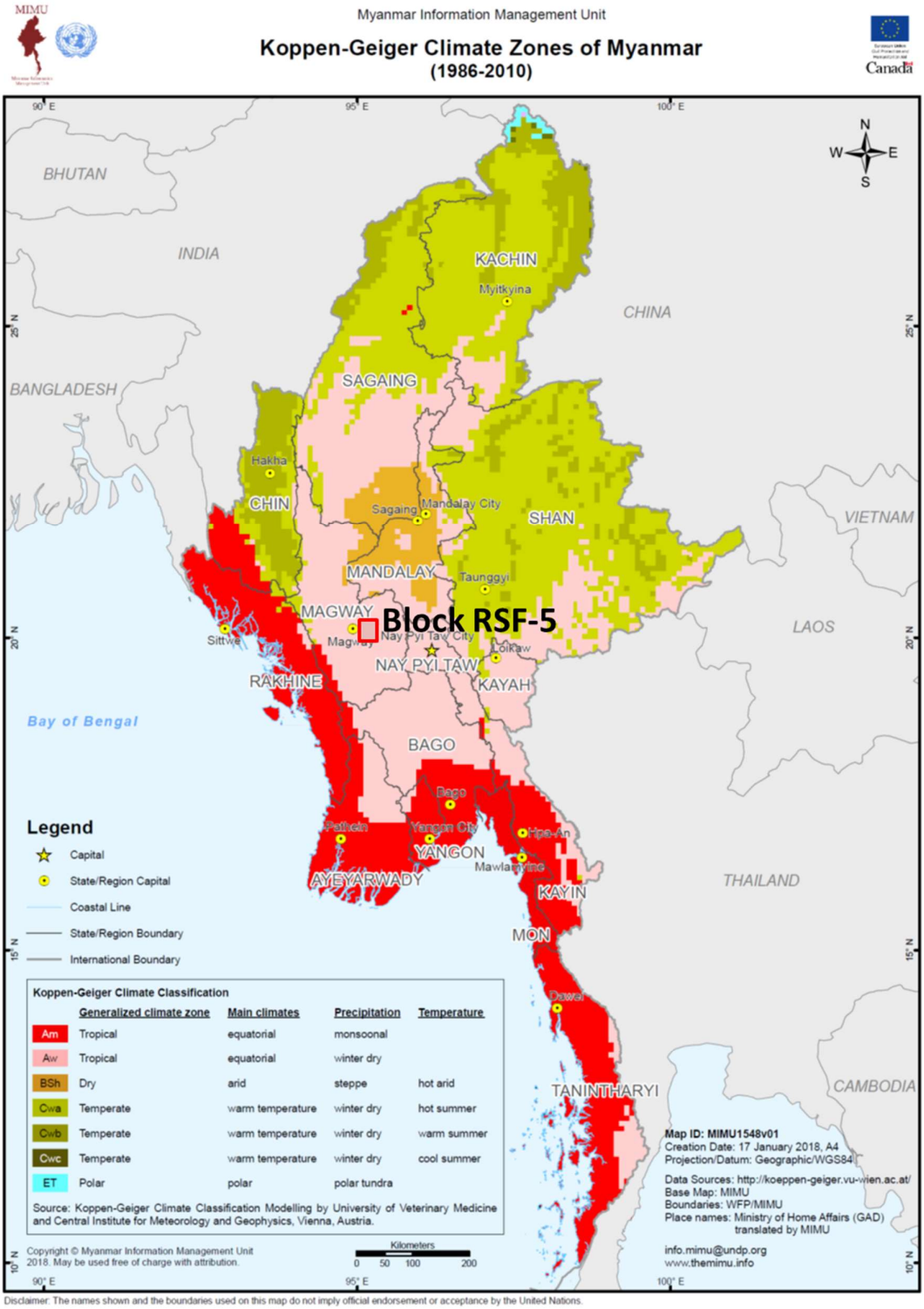
[1] https://en.climate-data.org/asia/myanmar/magway/minbu-7563/#climate-graph

Figure 5.2: Monthly Rainfall and Temperature in Magway Region



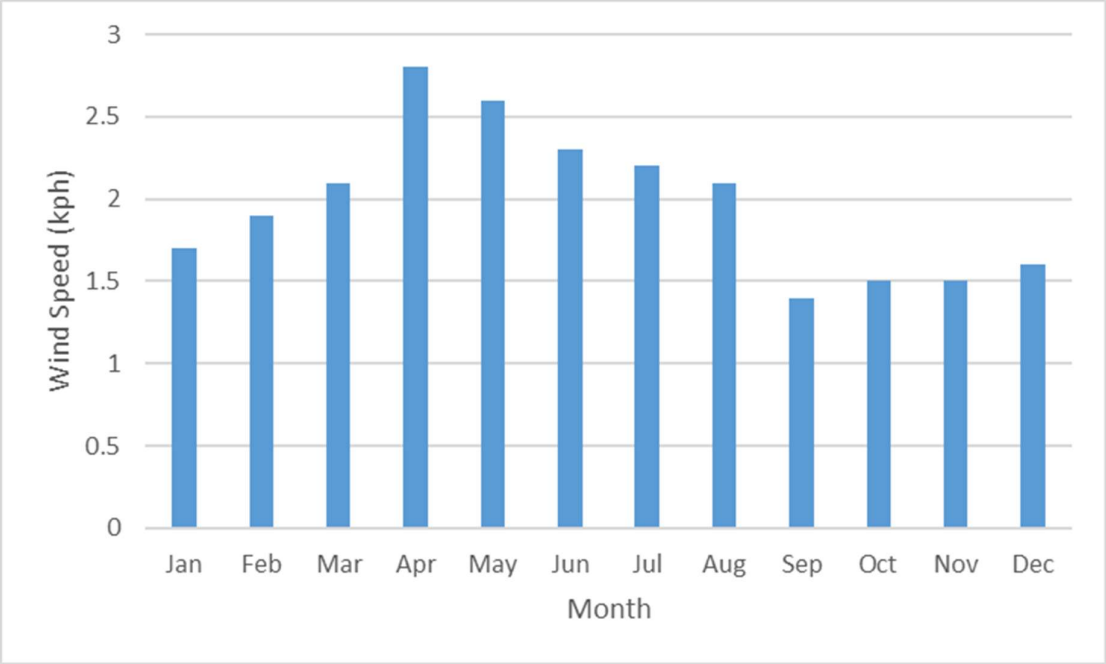
Source: climate-data.org, 2018 (modified by ERM)

Figure 5.3: Koppen-Geiger Climate Zones of Myanmar with Reference to Block RSF-5



Source: MIMU; modified by ERM, 2018

Figure 5.4: Average Wind Speed in Magway Region



Source: Weatheronline.co.uk[1]

5.2.1 Air Quality

5.2.1.1 Overview

Myanmar was ranked in a study conducted by World Health Organisation (WHO), as a country with high levels of particulate matter[2]. The principle sources of emissions to the atmosphere in the immediate vicinity of the Project Study Area are likely to be from household fires from domestic purposes (e.g. cooking, heating and lighting) as well, as from exhaust emissions from road transportation and combustion from waste burning[3].

Previous baseline surveys conducted by Eni in Block RSF-5 for seismic activity included air quality monitoring. The results from the air monitoring survey for the 2016 ESHIA study showed that the average ambient air quality with regards to PM_{10} and $PM_{2.5}$ did not meet the requirements of good air quality as per WHO guidelines. The 1 hour average of NO_2, CO and 8 hour average level of O_3 met the WHO standards. The 24 hours average level of SO_2 was above the standard set by WHO guideline, implicating that this level of SO_2 is considered dangerous to human living within the area[4].

In accordance with IFC guidelines, measurement of existing air quality is required for emissions associated with the Project processes that have the potential to affect the surrounding receptors (eg. human and biodiversity).

[1] https://www.weatheronline.co.uk/weather/maps/city?LANG=en&CEL=C&SI=mph&MAPS=over&CONT=asie&LAND=BM&REGION=0027&WMO=48065&UP=0&R=0&LEVEL=150&NOREGION=1

[2] World Health Organisation, 2016. Ambient Air Pollution: A Global Assessment of Exposure and Burden of Disease, http://apps.who.int/iris/bitstream/10665/250141/1/9789241511353-eng.pdf?ua=1, accessed on November 8, 2018.

[3] MyanmarTimes, 30 SEP 2016, Myanmar's air pollution among the worst in the world: WHO. http://www.mmtimes.com/index.php/national-news/22840-myanmar-s-air-pollution-among-the-worst-in-the-world-who.html

[4] International Environmental Management Co. Ltd., 2016, Environmental, Social and Health Impact Assessment (ESHIA) for Onshore Myanmar Land Seismic Survey Activities in Block RSF-5.

5.2.1.2 Primary Baseline Monitoring

Baseline Monitoring Methodology

Monitoring of air quality parameters (nitrogen dioxide, carbon monoxide, particulate matter 10, particulate matter 2.5, sulphur dioxide, temperature, relative humidity, wind speed, wind direction) was conducted by SEM at 5 monitoring locations continuously for 72 hours per site, between 21st March and 7th April 2019. The air monitoring was conducted with an automatic Haz-Scanner Wireless Environmental Perimeter Air Station (EPAS) which monitor air quality continuously for 72 hours period. Moreover, the ozone concentration measurement was conducted using ozone meter Aeroqual 500 series.

The detailed monitoring methodology is provided in ***Appendix 1***.

Baseline Monitoring Locations

Monitoring locations were chosen to determine the general background concentration in close proximity to human receptors that may be affected by the project activities. Monitoring locations were initially selected using aerial photography and imagery, local available knowledge about villages and settlements, accessibility and safety to determine the location of nearby sensitive receptors. The final monitoring location decision was then made while in the field to determine the most suitable and representative locations for monitoring equipment to be deployed. The monitoring locations are presented in ***Table 5.2*** and ***Figure 5.5***.

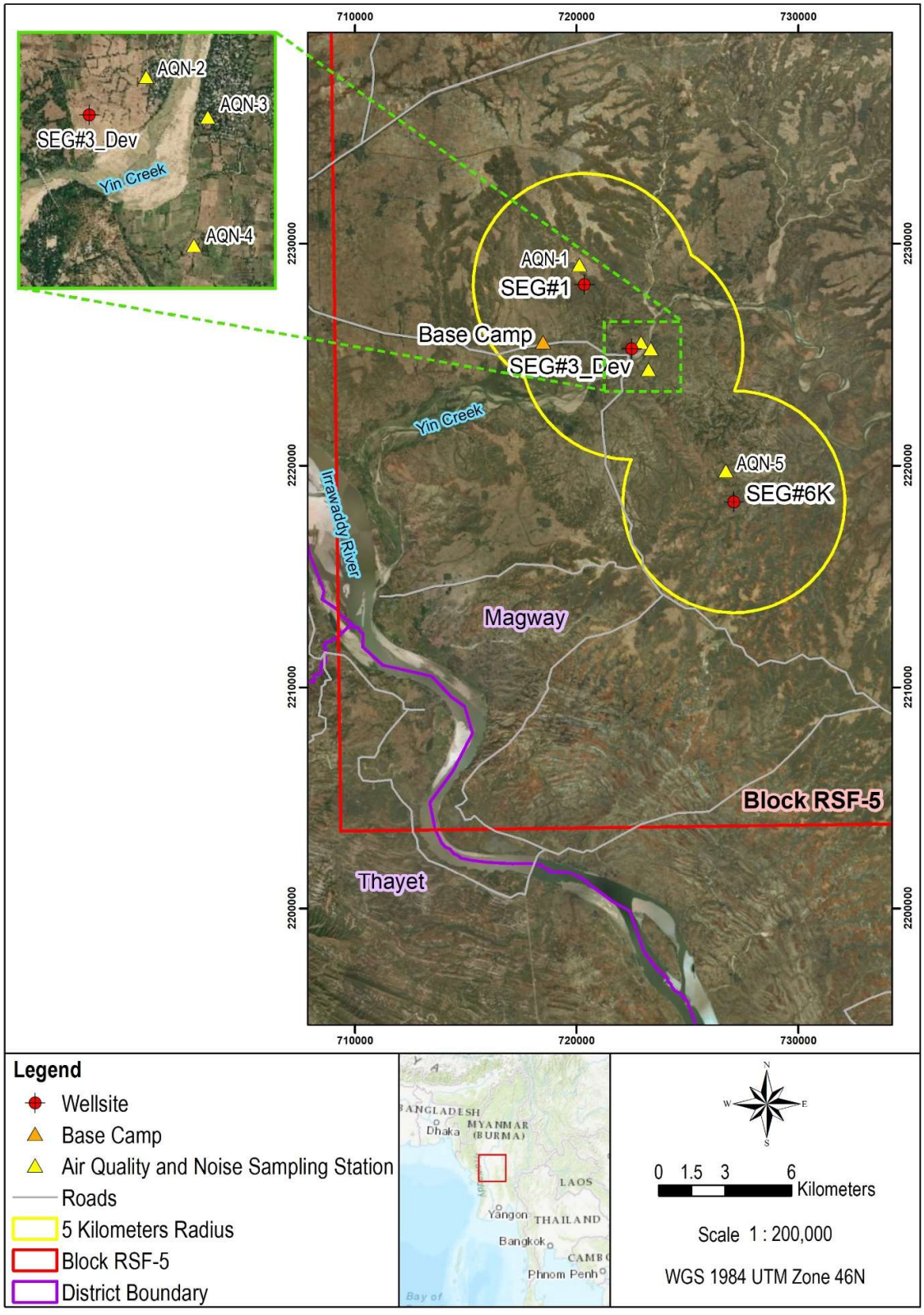
Figure 5.6 shows photographs of field team (SEM supervised by ERM) setting up air quality monitoring stations.

Table 5.2: Ambient Air and Noise Monitoring Locations

Sampling Station	Coordination	Location Description
AQN-1	20°8'46.06"N 95°6'21.37"E	AQN-1 monitoring station was setup in a monastery compound of Aung Myay Gone Village, Magway and Yenbu Township.
AQN-2	20°6'50.94"N 95°7'54.99"E	AQN-2 monitoring station was setup in Awzar Gone Village, Magway Township.
AQN-3	20°6'41.37"N 95°8'10.11"E	AQN-3 monitoring station was setup in Ohn Twe Village, Magway Township.
AQN-4	20°6'11.45"N 95°8'6.22"E	AQN-4 monitoring station was setup 0.97 km south of Ohn Twe village, Magway Township.
AQN-5	20°3'41.10"N 95°10'3.99"E	AQN-5 monitoring station was setup 6.44 km south of Ohn Twe village, Magway Township.

Source: SEM, 2019; modified by ERM, 2019

Figure 5.5: Air Quality and Noise Monitoring Locations



Source: SEM, 2019; modified by ERM, 2019

Figure 5.6: Photographs of Air Quality Monitoring Stations

AQN-1

AQN-2

AQN-3

AQN-4

AQN-5

Source: SEM, 2019

Baseline Monitoring Results and Discussion

Table 5.3 to ***Table 5.7*** shows the results of continuous air quality monitoring measured over 72 hours at the five (5) selected location. The detailed study of air quality is presented in ***Appendix 1***.

The maximum 1-hour average baseline concentration recorded at each monitoring location using the automatic EPAS was compared to the National Environmental Quality Emission Guideline (NEQG). The air quality parameters that exceeded the guideline were $PM_{2.5}$, PM_{10} and SO_2. The exceedance of $PM_{2.5}$ and PM_{10} were found to occur at least once (during the 72 hours continuous monitoring) at all monitoring station. SO_2 were recorded above the guideline value at AQN-2 for all 24 hours reporting period (monitored over 72 hours). AQN-1 wind rose shows wind direction can originate from any direction while other stations, wind largely originate from western side. Elevated levels of particulate matter are common in the Dry Central Zone of Myanmar due to climactic conditions, and are primarily caused by vehicular traffic and wind blown dust. Elevated levels of SO_2 could be due to a number of factors including passing traffic or generators.

Ozone was measured separately, and results are shown in ***Table 5.8***. All stations recorded ground-level ozone levels higher than the Myanmar standard. The most common cause of elevated ozone levels is due to vehicle traffic.

Figure 5.7 to ***Figure 5.9*** shows the wind speed and direction at AQN-1 to AQN-5.

Table 5.3: Ambient Air Quality Results at AQN-1

Date	Time	CO	NO_2	NO	$PM_{2.5}$	PM_{10}	RH	SO_2	Temp.
D.M.Y	Hours	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	%	µg/m³	°C
21-22 March, 2019	24	87.31	75.60	0.77	**35.50**	**50.14**	47.11	14.16	30.77
22-23 March, 2019	24	201.95	177.99	1.12	**30.56**	41.52	46.14	3.73	31.46
23-24 March, 2019	24	199.06	57.68	1.37	**42.24**	**50.14**	43.92	8.40	32.03
Myanmar emission guideline value (24 hours)		-	200 (1 hour)	-	25	50	-	20	-

Source: SEM, 2019; modified by ERM, 2019

Table 5.4: Ambient Air Quality Results at AQN-2

Date	Time	CO	NO_2	NO	$PM_{2.5}$	PM_{10}	RH	SO_2	Temp.
D.M.Y	Hours	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	%	µg/m³	°C
24-25 March, 2019	24	27.59	15.31	37.38	**60.78**	**51.27**	10.70	**29.21**	0.07
25-26 March, 2019	24	29.63	23.70	42.36	**56.01**	47.61	3.19	**30.72**	0.07
26-27 March, 2019	24	7.11	35.96	33.50	**48.00**	44.63	9.86	**30.64**	0.06
Myanmar emission guideline value (24 hours)		-	200 (1 hour)	-	25	50	-	20	-

Source: SEM, 2019; modified by ERM, 2019

Table 5.5: Ambient Air Quality Results at AQN-3

Date	Time	CO	NO_2	NO	$PM_{2.5}$	PM_{10}	RH	SO_2	Temp.
D.M.Y	Hours	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	%	µg/m³	°C
27-28 March, 2019	24	227.56	41.79	36.70	**58.27**	**67.99**	47.82	6.77	30.31
28-29 March, 2019	24	304.97	27.23	26.71	**54.89**	**65.90**	48.50	5.28	28.38
29-30 March, 2019	24	426.90	8.98	33.79	**50.69**	**66.95**	48.39	15.26	29.72
Myanmar emission guideline value (24 hours)		-	200 (1 hour)	-	25	50	-	20	-

Source: SEM, 2019; modified by ERM, 2019

Table 5.6: Ambient Air Quality Results at AQN-4

Date	Time	CO	NO_2	NO	$PM_{2.5}$	PM_{10}	RH	SO_2	Temp.
D.M.Y	Hours	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	%	µg/m³	°C
31 March- 1 April, 2019	24	165.11	61.68	18.39	**53.01**	**57.40**	51.31	0.17	29.42
1-2 April, 2019	24	276.61	36.47	25.43	**54.04**	**58.49**	51.00	2.31	30.29
2-3 April, 2019	24	154.39	14.71	21.73	**41.69**	48.16	49.43	0.93	30.85
Myanmar emission guideline value (24 hours)		-	200 (1 hour)	-	25	50	-	20	-

Source: SEM, 2019; modified by ERM, 2019

Table 5.7: Ambient Air Quality Results at AQN-5

Date	Time	CO	NO_2	NO	$PM_{2.5}$	PM_{10}	RH	SO_2	Temp.
D.M.Y	Hours	µg/m^3	µg/m^3	µg/m^3	µg/m^3	µg/m^3	%	µg/m^3	°C
4-5 April, 2019	24	142.00	70.40	26.91	**40.60**	46.59	45.82	0.08	31.79
5-6 April, 2019	24	148.29	54.77	36.37	**42.98**	49.96	44.49	0.05	33.49
6-7 April, 2019	24	204.84	19.75	28.25	**49.19**	**58.63**	47.88	1.07	32.03
Myanmar emission guideline value (24 hours)		-	200 (1 hour)	-	25	50	-	20	-

Source: SEM, 2019; modified by ERM, 2019

*Note: **Bold** indicates values above the Myanmar NEQG standard*

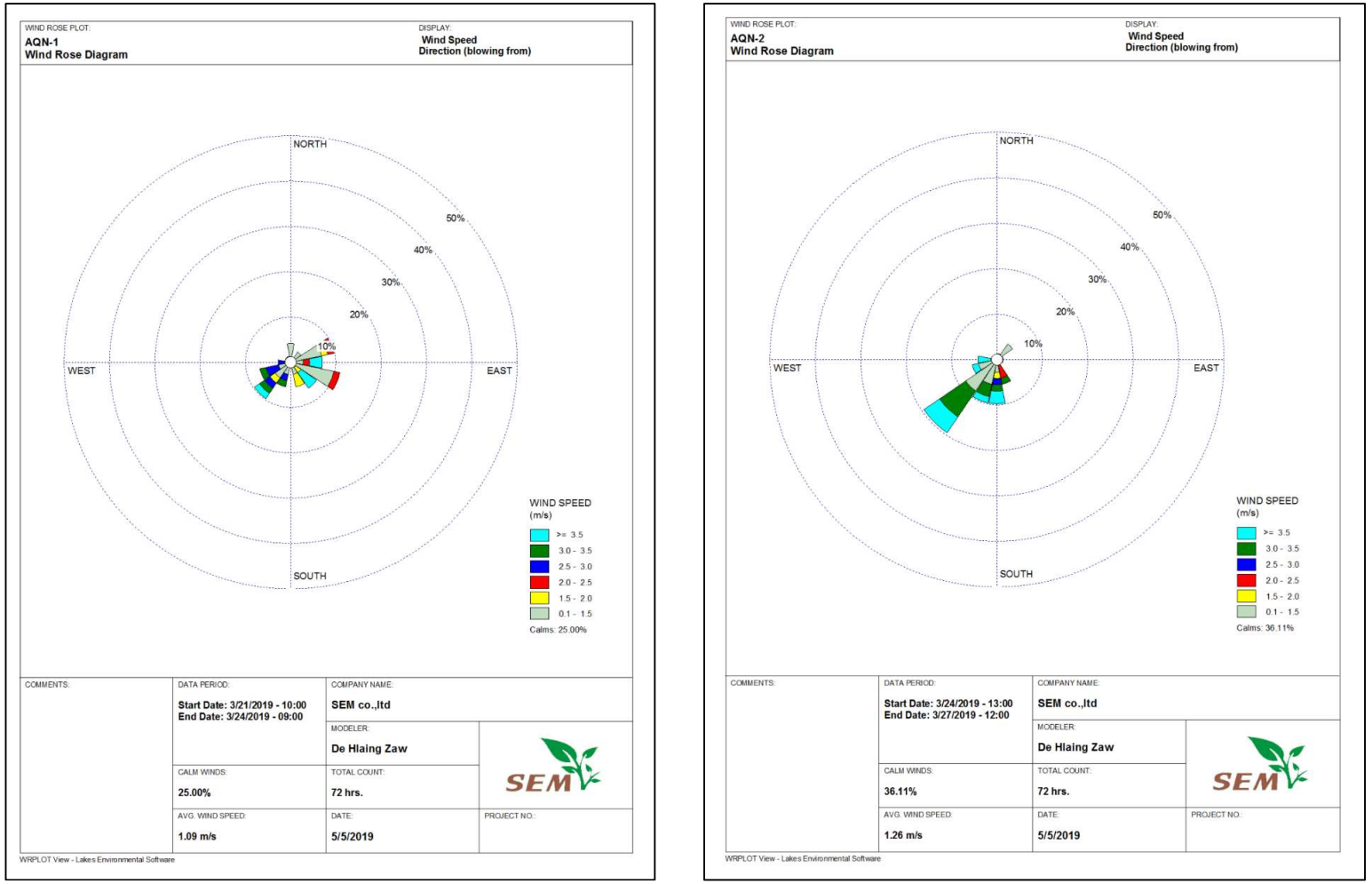
Table 5.8: Ozone Results (8 Hour Sampling)

Station #	Date	Ozone (ppm)	Ozone (µg/m^3)*	Myanmar NEQ Guidance Value (µg/m^3)	WHO Guidance Value (µg/m^3)
AQN-1	21 March, 2019	0.09	**192.6**	100	160 (Interim target-1) 100 (guideline)
	22 March, 2019	0.07	**149.8**	100	160 (Interim target-1) 100 (guideline)
	23 March, 2019	0.06	**128.4**	100	160 (Interim target-1) 100 (guideline)
AQN-2	24 March, 2019	0.07	**149.8**	100	160 (Interim target-1) 100 (guideline)
	25 March, 2019	0.07	**149.8**	100	160 (Interim target-1) 100 (guideline)
	23 March, 2019	0.06	**128.4**	100	160 (Interim target-1) 100 (guideline)
AQN-3	27 March, 2019	0.07	**149.8**	100	160 (Interim target-1) 100 (guideline)
	28 March, 2019	0.07	**149.8**	100	160 (Interim target-1) 100 (guideline)
	29 March, 2019	0.08	**171.2**	100	160 (Interim target-1) 100 (guideline)
AQN-4	30 March, 2019	0.06	**128.4**	100	160 (Interim target-1) 100 (guideline)
	31 March, 2019	0.07	**149.8**	100	160 (Interim target-1) 100 (guideline)
	1 April, 2019	0.06	**128.4**	100	160 (Interim target-1) 100 (guideline)
AQN-5	2 April, 2019	0.07	**149.8**	100	160 (Interim target-1) 100 (guideline)
	3 April, 2019	0.07	**149.8**	100	160 (Interim target-1) 100 (guideline)
	4 April, 2019	0.08	**171.2**	100	160 (Interim target-1) 100 (guideline)

Source: SEM, 2019

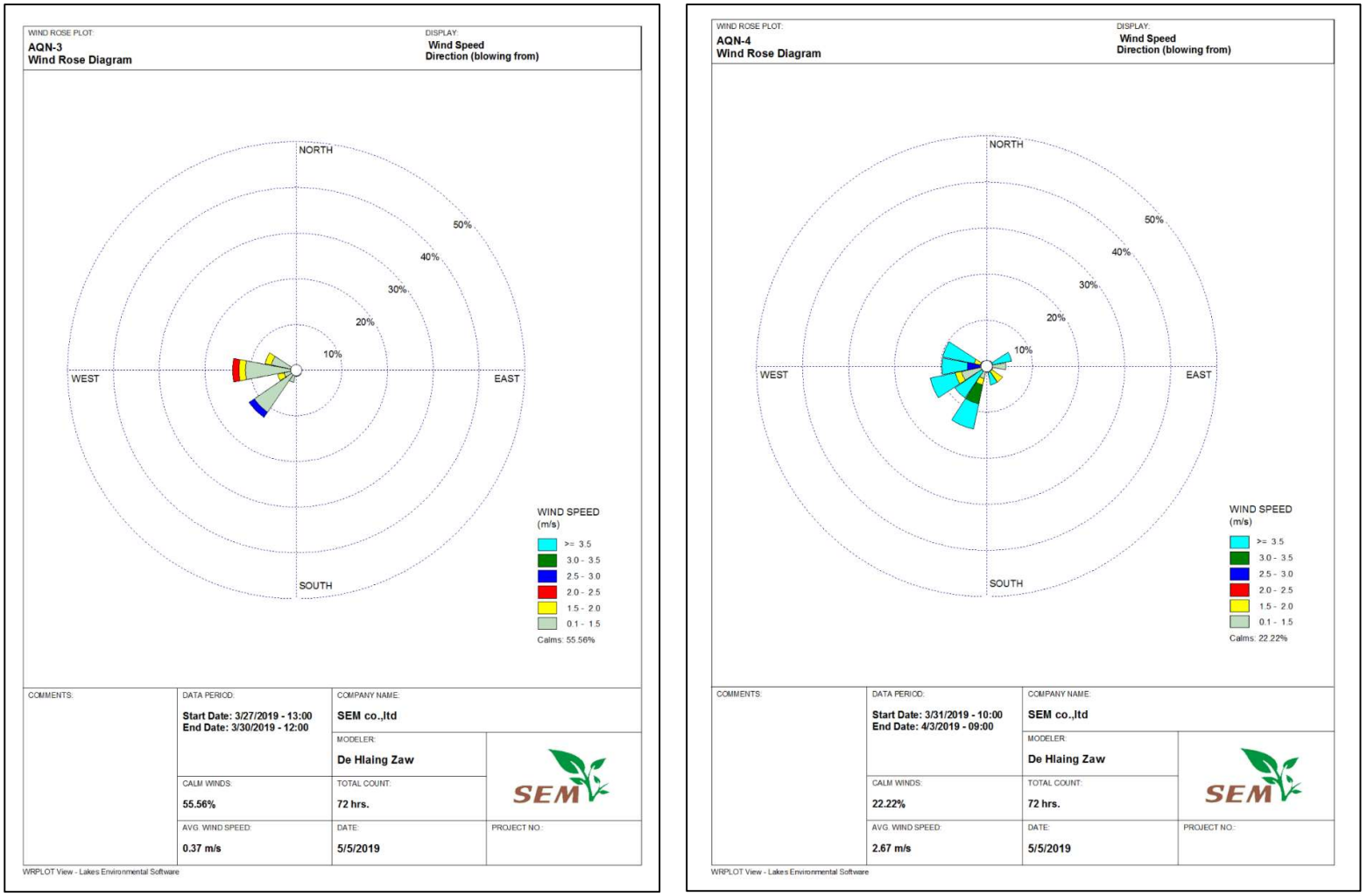
**In air,1 ppm O_3 = 2.14 mg O_3/m^3 = 2,140 µg/m^3*

Figure 5.7: Wind Speed and Direction at AQN-1 to AQN-2



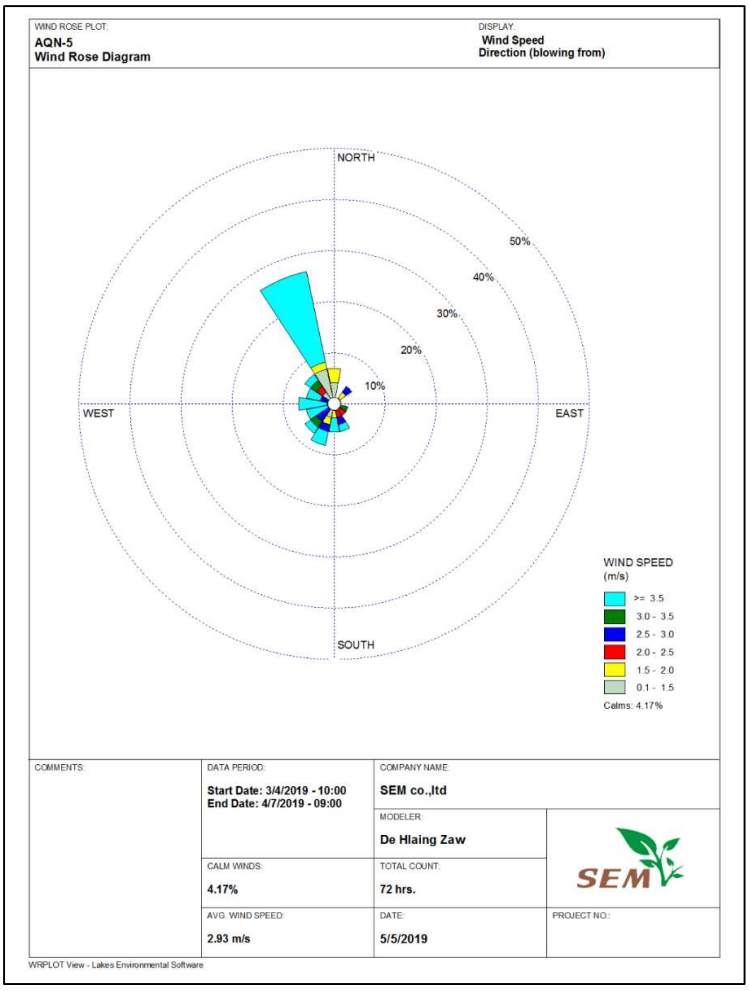
Source: SEM, 2019

Figure 5.8: Wind Speed and Direction at AQN-3 to AQN-4



Source: SEM, 2019

Figure 5.9: Wind Speed and Direction at AQN-5

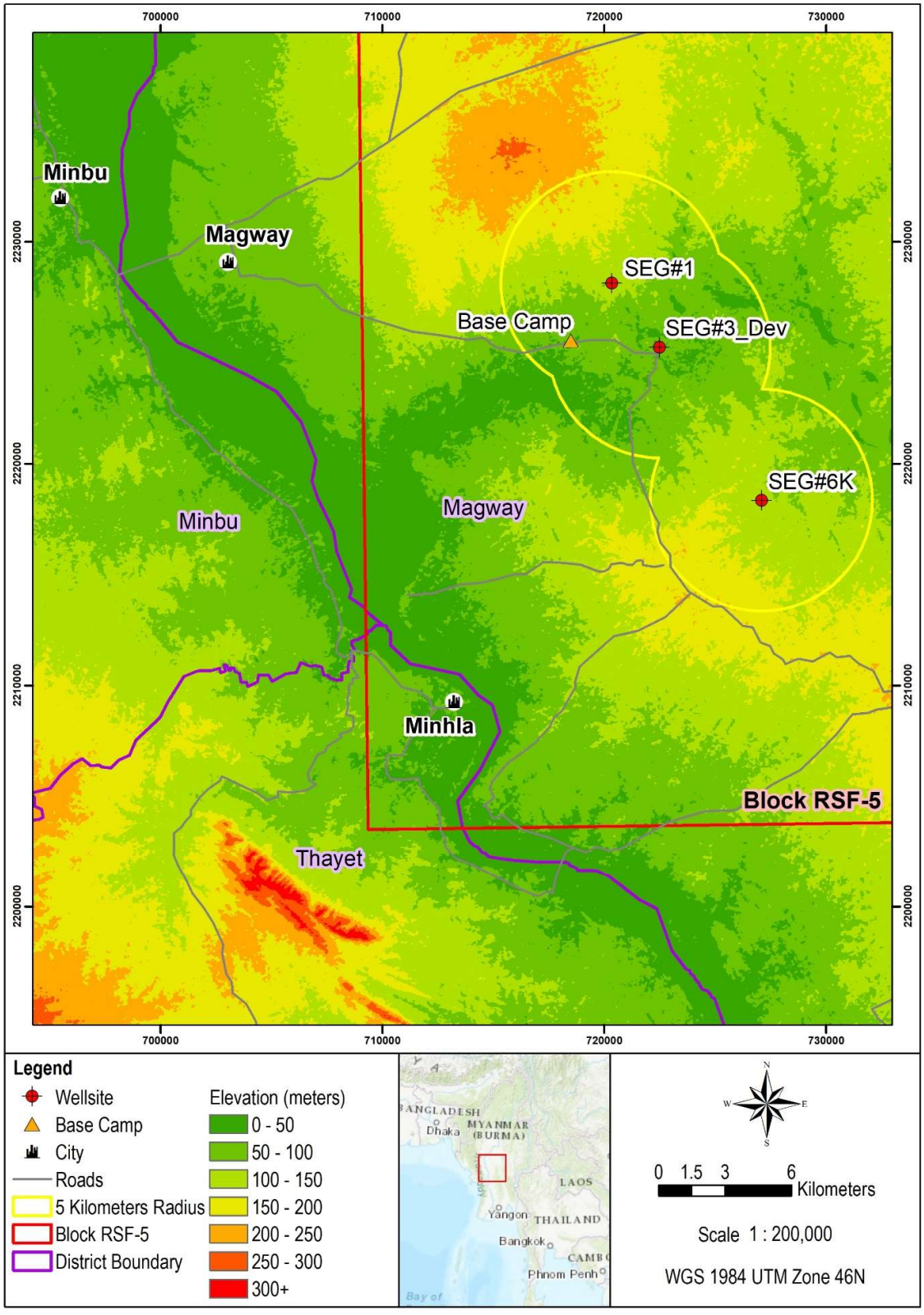


Source: SEM, 2019

5.2.2 Topography

The proposed Project is located on predominantly low-lying topography in Magway Region, which is in the central area of Myanmar. The elevation of Block RSF-5 and its surroundings varies from approximately 32 m to 196 m a.m.s.l. (above mean sea level). The highest region within the Study Area is located north of SEG#1 which has a peak height of 225 m, indicating a generally low topography with few prominent land features. A map of the topography of Magway Region is shown in ***Figure 5.10***.

Figure 5.10: Topography Map of Study Area



Source: MIMU 2016; modified by ERM, 2018

5.2.3 Greenhouse Gas Emissions

According to data from the World Resources Institute (2014), Myanmar's total GHG emissions (excluding land use change and forestry) in 2013 were 98.75 million tons of CO2 equivalent ($MtCO_2$)[1]. The major sectors producing CO_2 emissions are agriculture (65%) and energy (22%).

5.2.4 Noise

5.2.4.1 Overview

Previous baseline survey data from the 2016 ESHIA study conducted by Eni in Block RSF-5 monitored noise levels over 24 hours. The baseline survey found that the 24-hour equivalent continuous noise levels within surrounding area and communities, ranged from 40.4 dBA to 61.5 dBA[4]. All measurements demonstrated to be below 70 dBA, which is the acceptable noise level according to WHO Community Noise Guideline[2] which is also below the acceptable one-hour continuous noise level for the Myanmar standard for industrial and commercial categories[3].

Potential noise sensitive receivers in the area include settlements, pagodas and schools.

5.2.4.2 Primary Baseline Monitoring

Baseline Monitoring Methodology

Noise monitoring was required to be carried out for the purpose of establishing the existing ambient (baseline) noise levels around the Study Area in the absence of the Project activities (pre-project). The baseline noise levels are compared with noise level guidelines to determine the baseline noise levels in the Study Area. This information will then be used to assess the significance of the Project's impact at the noise sensitive receivers (NSRs) during different phases of the Project.

Noise baseline monitoring was conducted at five (5) locations, over 48 hours per location, between 22nd March and 7th April 2019 by SEM. Noise level measurements were conducted according to the relevant methods of the International Organization for Standardization (ISO), which include ISO 1996-1:2003, and ISO 1996:2:2007. Photographs of the noise level monitoring station are shown in ***Figure 5.6***. The equipment used for measurement is a Model SL-4023SD sound level meter (more details are shown in ***Appendix 1***). The sampling periods are shown in ***Table 5.9***.

Table 5.9: Noise Sampling Periods

Sampling Station	Period
AQN-1	22nd – 24th March, 2019
AQN-2	25th – 27th March, 2019
AQN-3	28th – 30th March, 2019
AQN-4	1st – 3rd April, 2019
AQN-5	5th – 7th April, 2019

Source: SEM, 2019

[1] CAIT Climate Data Explorer – Myanmar. [Online] Available at: http://cait.wri.org/profile/Myanmar [Accessed 15 May 2017].

[2] International Environmental Management Co. Ltd., 2016, Environmental, Social and Health Impact Assessment (ESHIA) for Onshore Myanmar Land Seismic Survey Activities in Block RSF-5.

[3] http://www.myanmar-responsiblebusiness.org/pdf/2015-12-29-National-Environmental-Quality_Emission_Guidelines_en.pdf

Baseline Monitoring Locations

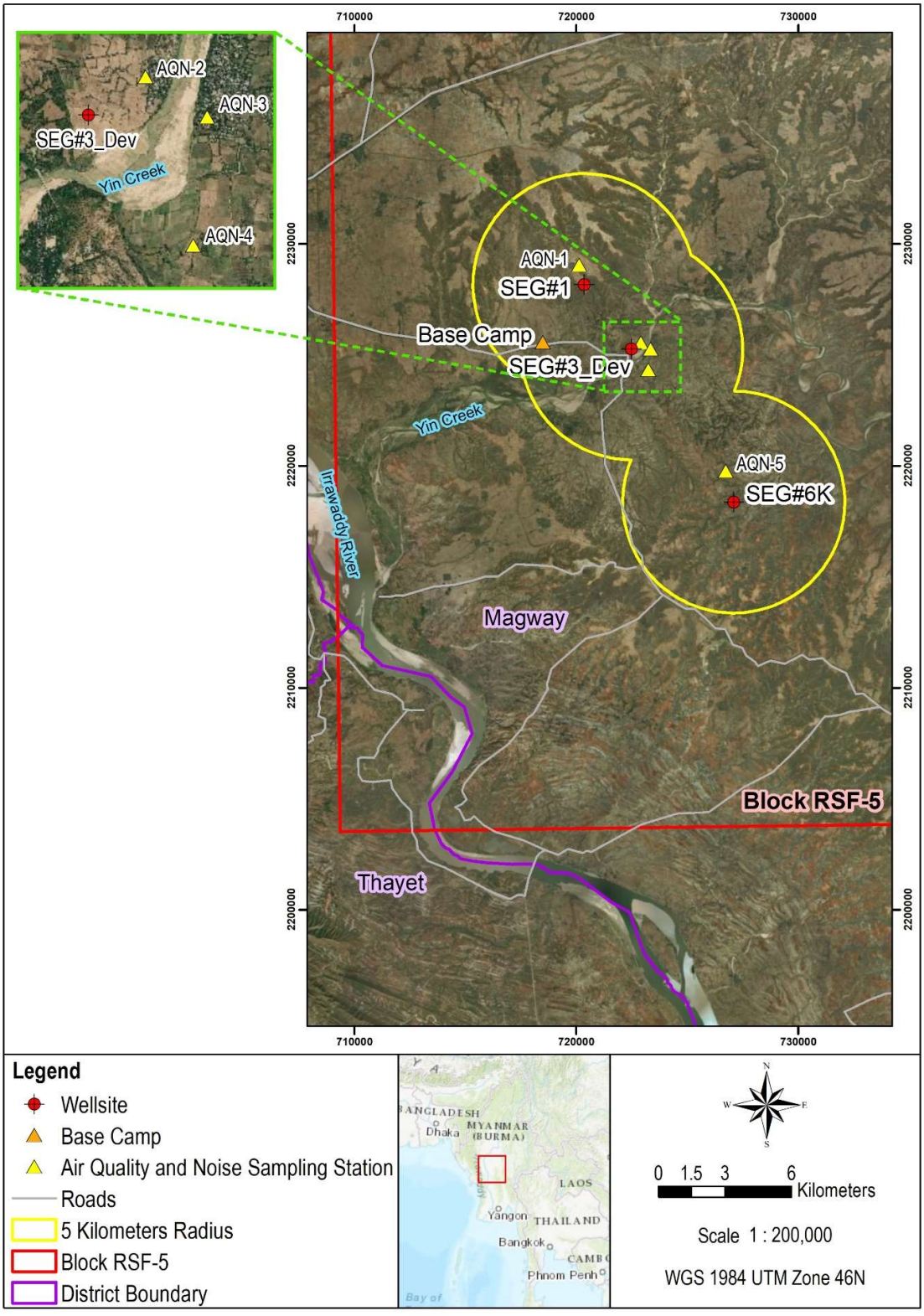
Noise monitoring was undertaken at five (5) locations, at the same location as the air quality monitoring stations. Details of the noise monitoring stations are shown in ***Table 5.10***, and the locations are shown in ***Figure 5.11***.

Table 5.10: Ambient Air and Noise Monitoring Locations

Sampling Station	Coordination	Location Description
AQN-1	20°8'46.06"N 95°6'21.37"E	AQN-1 monitoring station was setup in a monastery compound of Aung Myay Gone Village, Magway and Minbu Township.
AQN-2	20°6'50.94"N 95°7'54.99"E	AQN-2 monitoring station was setup in Awzar Gone Village, Magway Township.
AQN-3	20°6'41.37"N 95°8'10.11"E	AQN-3 monitoring station was setup in Ohn Twe Village, Magway Township.
AQN-4	20°6'11.45"N 95°8'6.22"E	AQN-4 monitoring station was setup 0.97 km south of Ohn Twe village, Magway Township.
AQN-5	20°3'41.10"N 95°10'3.99"E	AQN-5 monitoring station was setup 6.44 km south of Ohn Twe village, Magway Township.

Source: SEM, 2019; modified by ERM 2019

Figure 5.11: Noise Monitoring Locations



Source: ERM, 2019

Baseline Monitoring Results and Discussion

According to the noise baseline results, as shown in ***Table:*** 5.11, the only noise monitoring station that exceeds the noise guideline from NEQG is the AQN-3.

Out of five (5) noise monitoring (recorded over 48 hours) only one average noise level was recorded to be above the respective Myanmar NEQG (National Emission Quality Guideline) standard. This was found at AQN-3 at night time, where the L_{aeq} was recorded to be 50 (where the NEQG standard at night time is 45 dB(A). Further details on the noise monitoring study are presented in the ***Appendix 1***.

Figure 5.12 shows noise level for all noise monitoring locations, graphically.

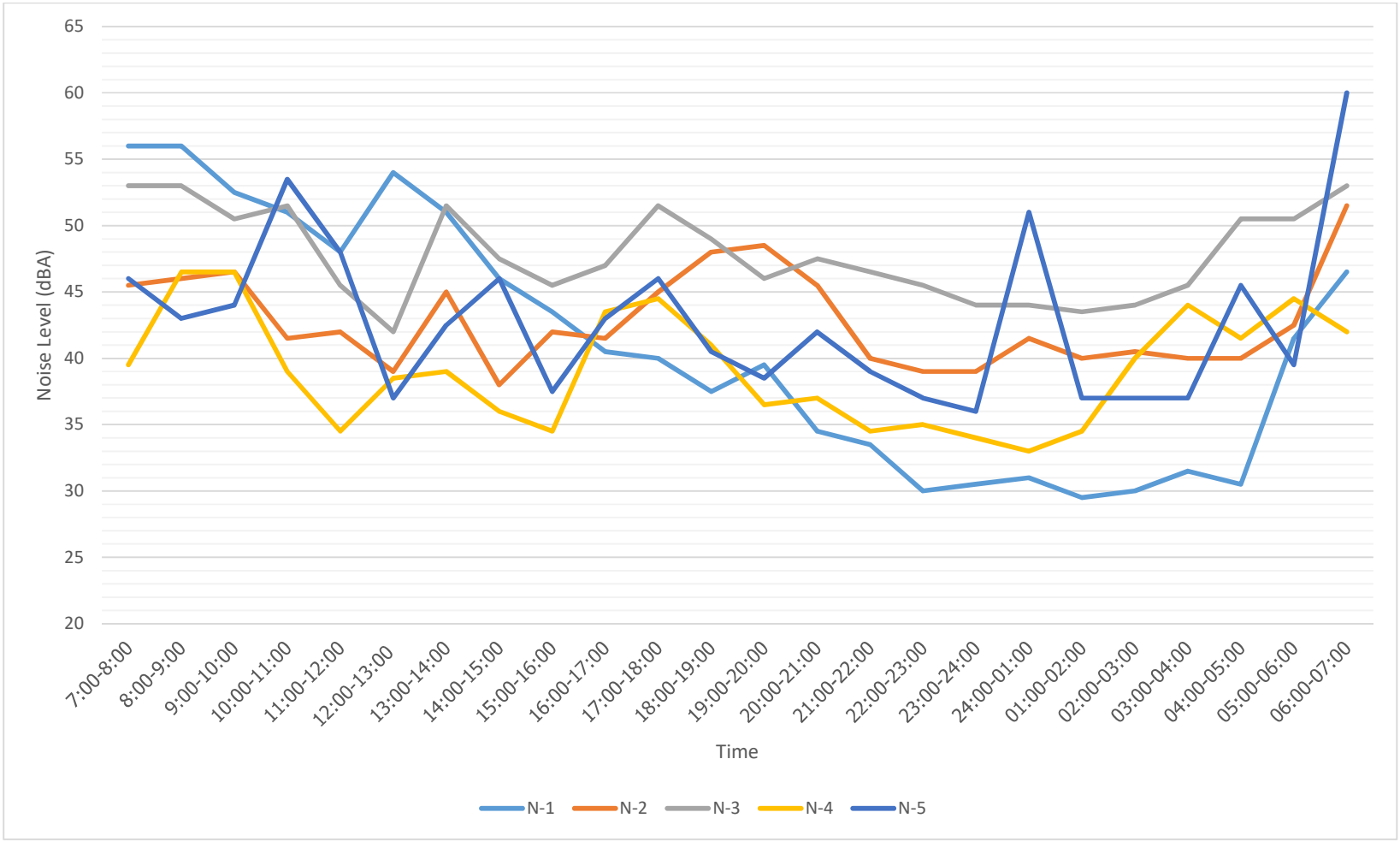
Table: 5.11: Results of A-Weighted Loudness Equivalent (L_{aeq}) Level

Time Period	A-Weighted Loudness Equivalent (Laeq) Level (dBA)	
	Day time (07:00 – 22:00)	Night time (22:00 – 07:00)
AQN-1 (22nd -23rd, March 2019)	46	33
AQN-1 (23rd - 24th, March 2019)	45	34
AQN-2 (25th -26th, March 2019)	43	42
AQN-2 (26th - 27th, March 2019)	44	42
AQN-3 (28th -29th, March 2019)	49	**50**
AQN-3 (29th – 30th, March 2019)	48	43
AQN-4 (1st -2nd, April 2019)	40	37
AQN-4 (2nd -3rd, April 2019)	39	40
AQN-5 (5th -6th, April 2019)	44	45
AQN-5 (6th -7th, April 2019)	43	39
NEQG standard	**55**	**45**

Source: SEM, 2019; modified by ERM, 2019

Note: **Bold** *indicates values above the NEQG standard*

Figure 5.12: Noise Measurement Graph of Station N1, N2, N3, N4 and N5



Source: SEM, 2019; modified by ERM, 2019

5.2.5 Surface Water

5.2.5.1 Overview

Concession Block RSF-5 is located on the Irrawaddy Sub-Basins. The Irrawaddy River originates in the northern region of Myanmar in Kachin. This river flows through Block RSF-5 from the north, and curving towards the western section of the block before continuing south and leaving through the south of the concession block. The total drainage area of lower Irrawaddy is approximately 95,600 km^2, with an estimated flow rate varying from 2,300 m^3/s during the summer to 32,600 m^3/s in the monsoon season[1]. This large variation is caused by the differences of precipitation volume between seasons. Yin Creek is a tributary of Irrawaddy River which flows into Block RSF-5 and is 30 m south of SEG#3_Dev.

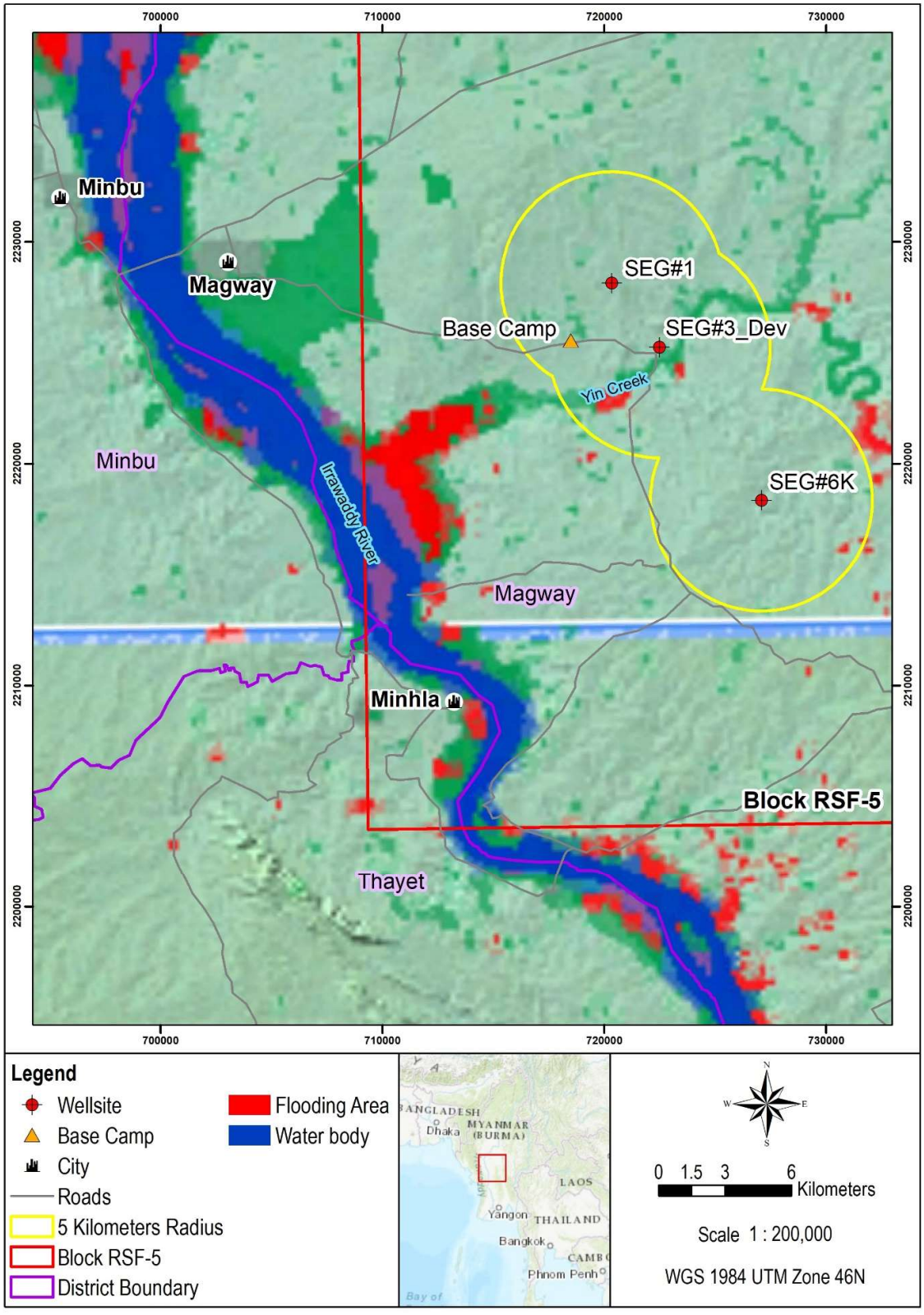
From the previous 2016 ESHIA study, the surface water baseline surveys conducted by Eni, showed that the majority of all surface water quality parameters values were below the guideline for the Protection of Freshwater Aquatic Life and Agriculture set by Canadian Council of Ministers of the Environment as their benchmark (this was the compared standard used in the 2016 ESHIA study). However, the report identified a few parameters that were above the limit, including acidity, total dissolved solids (TDS) and high concentration of Manganese in some surface water bodies[2].

Figure 5.13 shows the historical flood map based on data from 2016. The maps shows that all three (3) potential well sites are not located on any flood area. This demonstrates that the proposed location of well sites is safe from flooding events.

[1] Ministry of Electric Power, 2013, Initial Environment Examination – Proposed Loan Republic of the Union of Myanmar: Power Distribution Improvement Project. https://www.adb.org/sites/default/files/linked-documents/46390-003-ieeab.pdf, accessed on November 8, 2018.

[2] International Environmental Management Co. Ltd., 2016, Environmental, Social and Health Impact Assessment (ESHIA) for Onshore Myanmar Land Seismic Survey Activities in Block RSF-5.

Figure 5.13: Flood Map with Reference to Project Location



Source: Floodobservatory, 2016, modified by ERM, 2019

5.2.5.2 Primary Baseline Sampling

Baseline Sampling Methodology

A total of seven (7) baseline surface water quality locations were sampled by SEM under ERM's supervision on the 20th and 21st March 2019. An overview of the sampling and the findings of their results are presented in the following sub-sections.

Sampling locations were selected based on potential Project interactions that may result or impact the surface water resources. Irrawaddy River is a potential surface water resource that may be impacted by the transportation of equipment and machinery for the Project. A local boat was used to travel between river bank and the sampling site with sampling equipment on-board and samples were collected directly from the boat. For sampling sites located onshore, a vehicle was used to travel between sampling sites, and samples were collected on the side of the water bodies. Water samples were taken and filled into a sterilized plastic and glass sample containers (depending on the measuring parameters). All sampling procedures were conducted strictly according to relevant guidelines and standards with constant supervision from ERM field team technical experts. The detailed listing and explanation of sampling methods and results is shown in ***Appendix 1***. Additionally, in-situ water measurement were also conducted on-site.

All samples were kept in iced cooler boxes and were transported to the laboratory within the holding time specifications. Additionally, flow rate, width and depth of river were measured using multi parameters for water quality (water checker).[1]

The selected water quality parameters recorded from in-situ and laboratory analysis were compare against both the Myanmar NEQG (National Emission Quality Guideline) Standards and IFC General EHS guideline.

Baseline Sampling Locations

The description for each of the sampling locations is shown in ***Table 5.12***, and the geographical locations of each sampling site is shown in ***Figure 5.14***. In-situ parameters were measured on-site and the samples were sent for laboratory testing, which was conducted by ALS-Hong Kong.

Photographs of surface water baseline sampling are shown in ***Figure 5.15***.

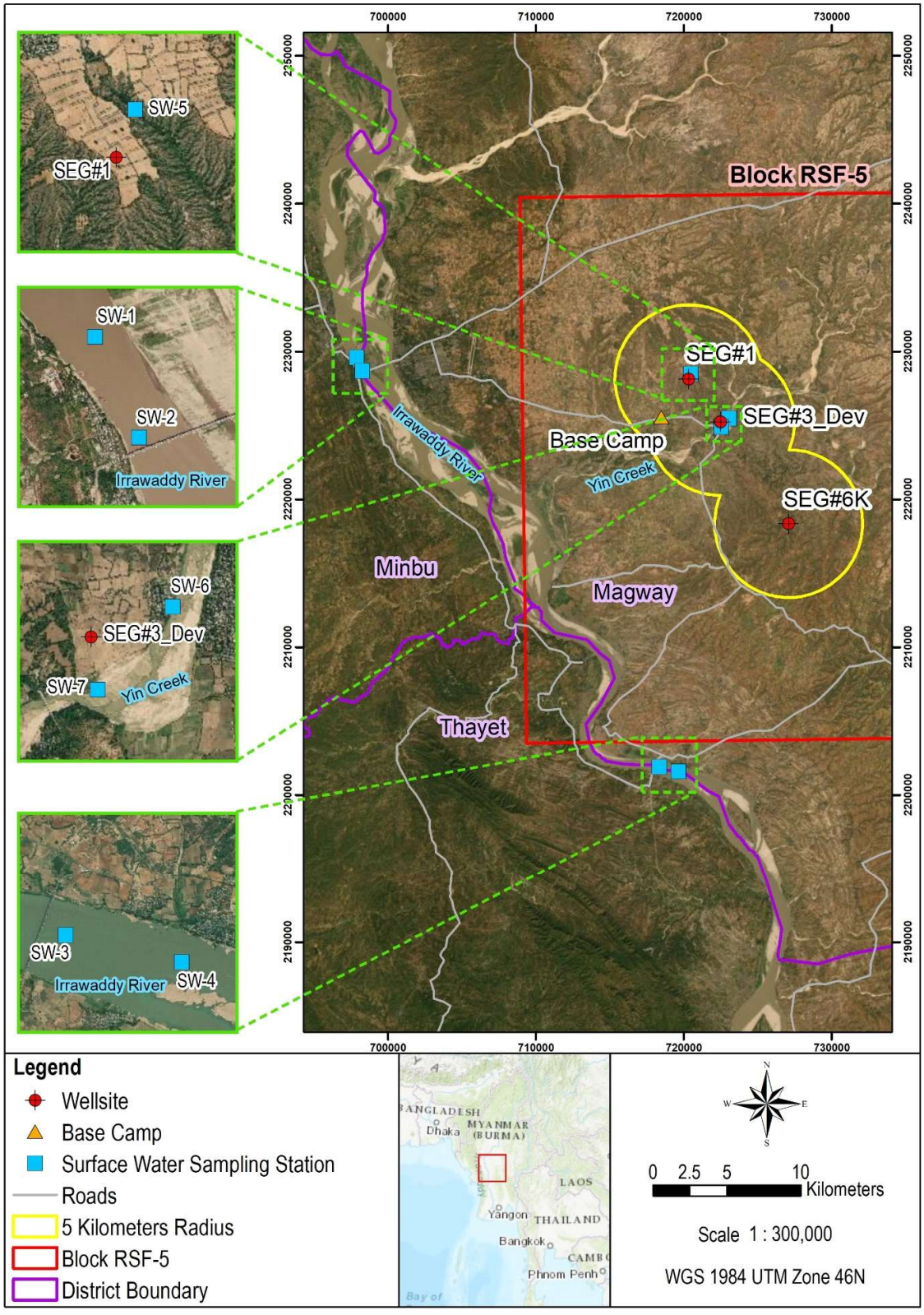
[1] Water Checker manufacturer is HORIBA from Japan – Model/serial no. U52G/SN-G2YBAJWD.

Table 5.12: Surface Water Sampling Locations

Sampling Point	Coordinates	Description of Location
SW 1	20°9'12.85"N 94°53'35.72"E	Upstream of Irrawaddy River, near about 1.15 km north of Magway Bridge
SW 2	20°8'43.16"N 94°53'48.97"E	Downstream of Irrawaddy River, near about 0.13 km north of Magway Bridge
SW 3	19°54'4.42"N 95°5'8.21"E	Upstream of Irrawaddy River, near about 0.2 km southeast of Malon Bridge
SW 4	19°53'53.95"N 95°5'52.88"E	Downstream of Irrawaddy River, near about 0.64 km southeast of Malon Bridge
SW 5	20°8'28.3"N 95°6'33.1"E	In the pond which located near about 0.8 km southeast of Aungmyaekon Village
SW 6	20°6'49.0"N 95°8'1.1"E	Upstream of Ying Chaung, Awzar Gone Village
SW 7	20°6'29.9"N 95°7'42.3"E	Downstream of Ying Chaung, near Ying Chaung Bridge

Source: SEM, 2019; modified by ERM, 2019

Figure 5.14: Surface Water Sampling Locations



Source: SEM, 2019; modified by ERM 2019

Figure 5.15: Photographs of Surface Water Sampling

SW 1

SW 2

SW 3

SW 4

SW 5

SW 6

SW 7

Source: SEM, 2019

Baseline Sampling Results and Discussion

According to the sampling results, most water parameters were found to be within all three compared standards; Myanmar NEQG, IFC and EPA standards (where multiple standards exist for the same parameter, the most stringent standard has been used for comparison) except for suspended solids. Suspended solids at monitoring location SW-1 to SW-5 was measured to be above the standard of 50 mg/L (as per the Myanmar NEQG).

In-situ and laboratory analysis of surface water sampling is shown in ***Table 5.13*** and ***Table 5.14***. The full detail of laboratory results is shown in ***Appendix 2***.

Table 5.13: In-Situ Results of Surface Water Sampling

No.	Sample No./ Physical Parameter	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	Myanmar Standards[a]	EPA Standards[b]	NDWG (Myanmar) 2019[c]
1	Location	Upstream Ayeyarwady River	Downstream Ayeyarwady River	Upstream Ayeyarwady River	Downstream Ayeyarwady River	In the pond	Upstream Ying Chaung	Downstream Ying Chaung	-	-	-
2	Date/Time	20.3.2019 9:00 am	20.3.2019 9:30 am	20.3.2019 12:30 pm	20.3.2019 12:00 pm	21.3.2019 11:45 am	21.3.2019 13:20 pm	21.3.2019 14:00 pm	-	-	-
3	Weather	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	-	-	-
4	Transparency	Low to Medium	Low to Medium	Low to Medium	Low to Medium	Low to Medium	Low to Medium	Low to Medium	-	-	-
5	Colour	Light yellow	Light yellow	Light yellow	Light yellow	Buff	Colourless	Colourless	-	-	-
6	Water Depth (m)	2.2	7.9	4.2	2.8	-	-	-	-	-	-
7	Depth (of sample taken) (m)	-	-	-	-	-	-	-	-	-	-
8	Temp (°C) (water)	25.71	25.75	25.8	25.8	31.47	33.47	34.06	-	-	-
9	pH	8.08	8.11	8.13	8.11	8.27	**8.82**	**8.83**	6-9	5-9	6.5-8.5
10	ORP (mv)	157	194	178	194	209	200	187	-	-	-
11	DO (mg/l)	8.16	8.04	7.97	8.31	4.56	6.86	6.33	-	-	-
12	EC (µs/m)	0.162	0.167	0.165	0.165	0.28	0.9	0.9	-	-	-
13	TDS (ppm)	0.106	0.110	0.107	0.107	0.18	0.58	0.578	-	-	-
14	Turbidity (FNU)	198	214	191	205	473	58.5	59.5	-	-	-

No.	Sample No./ Physical Parameter	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	Myanmar Standards[a]	EPA Standards[b]	NDWG (Myanmar) 2019[c]
15	Salinity (ppt)	0.08	0.08	0.08	0.08	0.13	0.4	0.4	-	-	-

Source: ALS-HK, 2019; modified by ERM, 2019

Note: [a] *Myanmar National Quality Emission Guidelines, 2015 – Wastewater, Storm Water Runoff, Effluent and Sanitary Discharges (general application)*
[b] *United States Environmental Protection Agency (EPA), National Primary Drink Water Regulations & National Secondary Drinking Water Regulation, 2009.*

Table 5.14: Summary of Surface Water Sampling Laboratory Results

Parameter	Unit	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	Myanmar Standards[a]	WHO Standards[b]	EPA Standards[c]	NDWG (Myanmar) 2019[d]
Physical Aggregate Properties												
Suspended Solids (SS)	mg/L	**74**	**84**	**63**	**75**	**86**	8	10	50	-	-	-
pH	pH	8	8	8	8	7.9	**8.7**	**8.8**	6-9	-	-	6.5-8.5
Inorganic Non-metallic Parameters												
Ammonia as N	mg/L	0.08	0.36	0.05	0.01	0.18	0.01	0.03	10	-	-	-
Fluoride	mg/L	0.1	0.1	0.1	0.1	0.2	0.5	0.5	20	1.5	4	1.5
Free Cyanide	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	-	0.2	0.07
Sulphide as S2-	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1	-	-	0.05
Total Cyanide	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1	-	-	0.07
Total Phosphorus as P	mg/L	0.07	0.07	0.07	0.07	0.13	0.02	0.03	2	-	-	-
Total Nitrogen as N	mg/L	0.5	0.5	0.5	0.5	1.5	0.3	0.3	10	-	10	-
Chlorine - Total Residual	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	5	-	-
Metals and Major Cations – Filtered												
Hexavalent Chromium	µg/L	<20	<20	<20	<20	<20	<20	<20	100	-	-	50

Parameter	Unit	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	Myanmar Standards[a]	WHO Standards[b]	EPA Standards[c]	NDWG (Myanmar) 2019[d]
Arsenic	µg/L	<10	<10	<10	<10	<10	<10	<10	100	10	100	50
Iron	mg/L	0.02	0.02	0.02	0.01	0.01	<0.01	<0.01	3.5	-	-	1
Cadmium	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	100	3	5	3
Chromium	µg/L	<1	<1	<1	<1	<1	<1	<1	500	50	100	50
Copper	µg/L	2	2	1	1	2	<1	<1	500	2000	1300	2000
Lead	µg/L	<1	<1	<1	<1	<1	<1	<1	100	10	15	10
Mercury	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10	6	2	1
Nickel	µg/L	<1	<1	<1	<1	4	<1	<1	500	70	-	70
Selenium	µg/L	<10	<10	<10	<10	<10	<10	<10	100	40	50	40
Silver	µg/L	<1	<1	<1	<1	<1	<1	<1	500	-	-	-
Zinc	µg/L	<10	<10	<10	<10	<10	<10	<10	2000	-	-	3000
Metals and Major Cations – Total												
Iron	mg/L	3.45	**4.56**	3.1	3.44	**10.5**	0.26	0.26	3.5	-	-	-
Arsenic	µg/L	<10	<10	<10	<10	<10	<10	<10	100	10	100	50
Cadmium	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	100	3	5	3
Chromium	µg/L	8	10	6	8	19	<1	<1	500	50	100	50
Copper	µg/L	4	5	4	4	6	<1	<1	500	2000	1300	2000
Lead	µg/L	3	3	2	2	5	<1	<1	100	10	15	0.01
Mercury	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	10	6	2	1
Nickel	µg/L	11	13	9	10	20	1	1	500	70	-	70
Selenium	µg/L	<10	<10	<10	<10	<10	<10	<10	100	40	50	40
Silver	µg/L	<1	<1	<1	<1	<1	<1	<1	500	-	-	-
Zinc	µg/L	10	10	<10	10	30	<10	<10	2000	-	-	3000

Parameter	Unit	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	Myanmar Standards[a]	WHO Standards[b]	EPA Standards[c]	NDWG (Myanmar) 2019[d]
Microbiological Testing												
Total Coliforms	CFU/100mL	**200**	**110**	**4**	ND	ND	**20**	**2**	400	-	-	0
Aggregate Organics												
Biochemical Oxygen Demand	mg/L	<2	<2	<2	<2	<2	<2	<2	50	-	-	-
Chemical Oxygen Demand	mg/L	5	12	6	6	40	6	7	250	-	-	-
Oil & Grease	mg/L	<5	<5	<5	<5	<5	<5	<5	10	-	-	-
Phenols (Total)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	-	-	-

Source: ALS-HK, 2019; modified by ERM, 2019

Note: [a] *Myanmar National Quality Emission Guidelines, 2015 – Wastewater, Storm Water Runoff, Effluent and Sanitary Discharges (general application)*
[b] *World Health Organization (WHO), Guidelines for Drinking-Water Quality, Fourth Edition Incorporating the First Addendum, Annex 3: Chemical summary tables.*
[c] *United States Environmental Protection Agency (EPA), National Primary Drink Water Regulations & National Secondary Drinking Water Regulation, 2009..*
ND – Not Detected
[d] *Myanmar National Drinking Water Guideline, 2019*
Bold – *Values above the standards*

5.2.6 Geology

Myanmar can be subdivided into six trending tectonic domains: (a) the Arakan (Rakhine) Coastal Strip; (b) the Indo-Buraman Ranges; (c) the Western Inner-Burma Tertiary Basin; (d) the Central Volcanic Belt; (e) the Eastern Inner-Burma Tertiary Basin; and (f) the Sino-Burma Ranges[1]. The Project Study Area is located on the Western Inner-Burma Tertiary Basin.

Block RSF-5 hosts the Ohn Twe structure which is the objective of the exploration drilling. It is located towards the south along the same hydrocarbon structural trend of Yenangyat-Chauk-Yenangyaung fields[2].

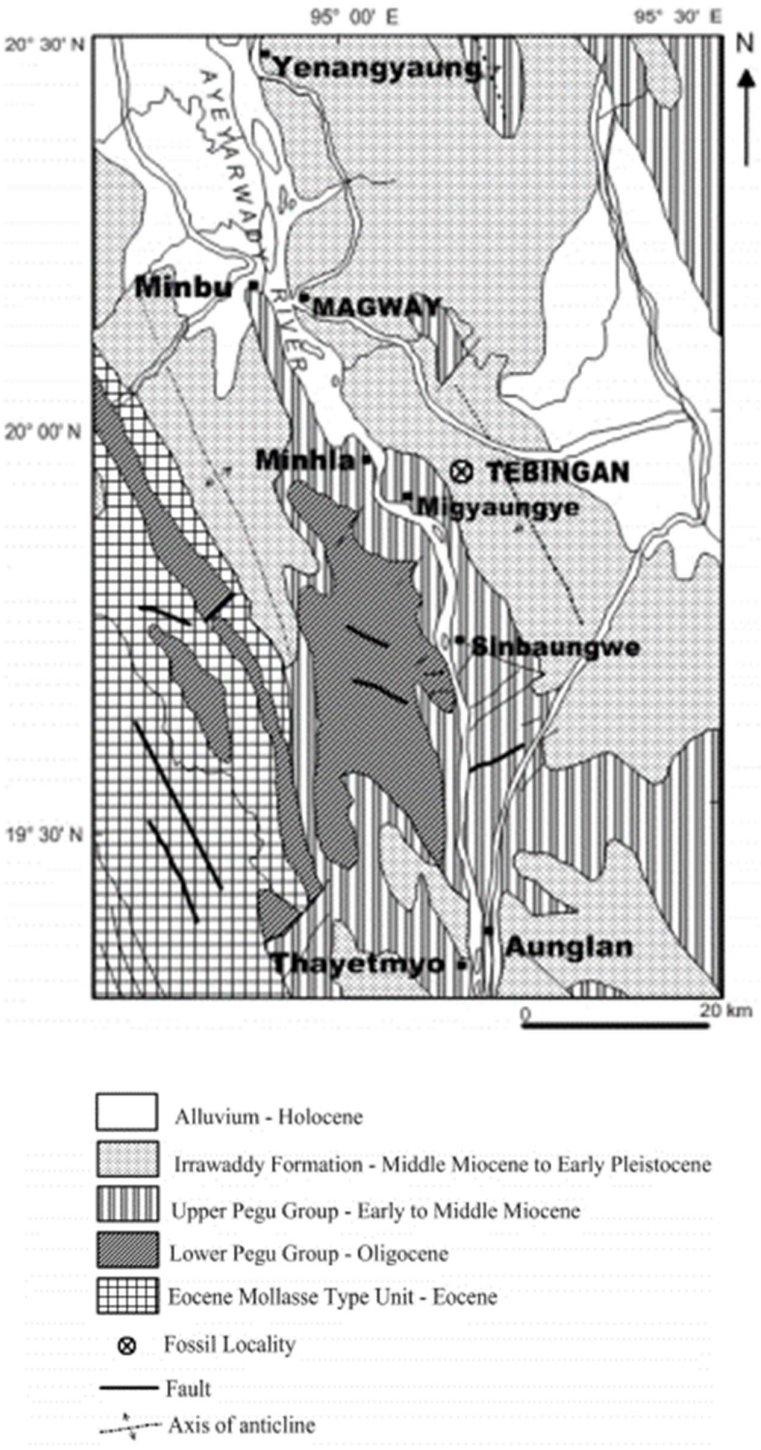
According to ***Figure 5.16***, Block RSF-5 (Magway Region) is situated on Irrawaddy formation from the middle Miocene to early Pliocene epoch (during the Neogene period)[3].

[1] Gadjah Mada University, Department of Geological Engineering, 2010, Report on Regional Geology of Myanmar. http://myanmar-preview.iwmi.org/sites/default/files/Documents/regional_geology_of_myanmar.pdf, accessed on November 8, 2018.

[2] Nyi Nyi Soe, 2017. Stratigraphic Control of Upper Pondaung Sandstone, Letpando Oil Field, Central Myanmar Basin, Search and Discovery Article no. 20408. http://www.searchanddiscovery.com/documents/2017/20408soe/ndx_soe.pdf accessed on November 2018.

[3] Chit Sein and Tin Thein, 2011. A New Amiphicyonid (Mammalia, Carnivora) from the Ayeyarwady Formation of Central Myanmar, University Research Journal (4) no. 5. http://www.myanmar-education.edu.mm/wp-content/uploads/2013/05/04_chit_sein.pdf accessed on November 28, 2018.

Figure 5.16: Geological Map of the Magway Region



Source: Chit Sein and Tin Thein, 2011 [1]

[1] Chit Sein and Tin Thein, 2011. A New Amiphicyonid (Mammalia, Carnivora) from the Ayeyarwady Formation of Central Myanmar, University Research Journal (4) no. 5. http://www.myanmar-education.edu.mm/wp-content/uploads/2013/05/04_chit_sein.pdf accessed on November 28, 2018.

5.2.7 Soil

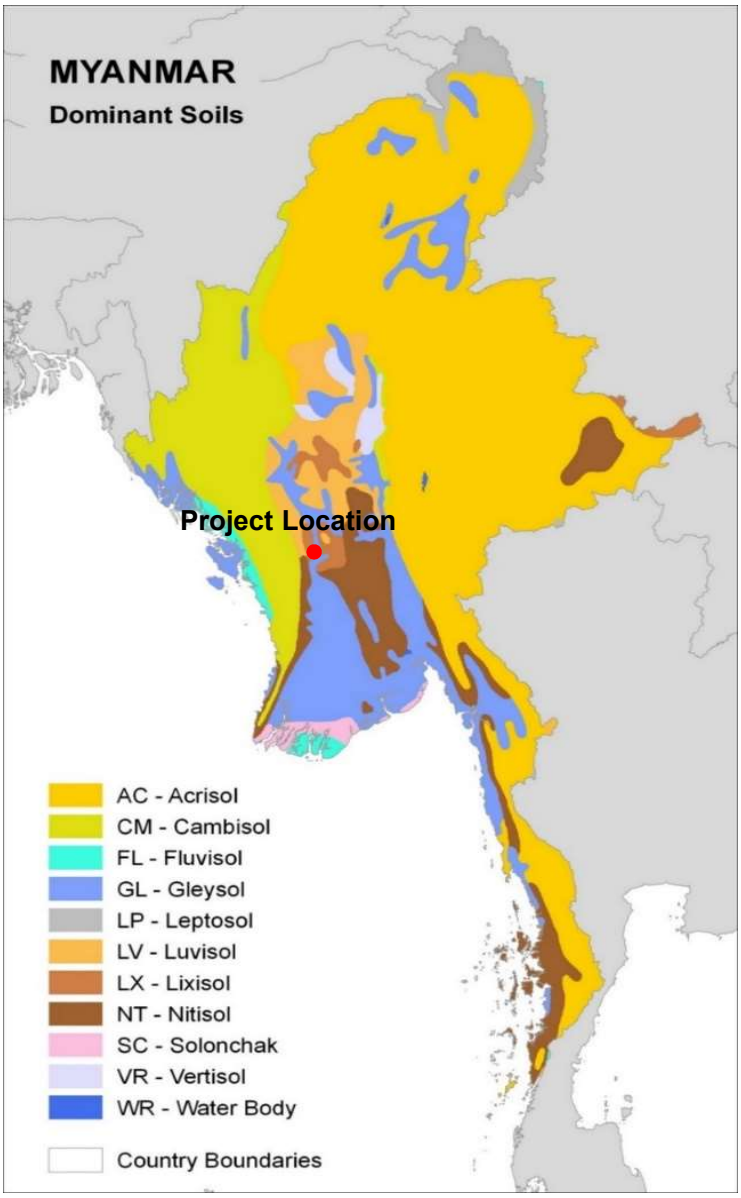
5.2.7.1 Overview

Myanmar has been classified into 10 main soil types; the categorization can be seen by the project location plotted on the Myanmar soil profile map, shown in ***Figure 5.17***. Block RSF-5 is situated on soil classified as Luvisol, Nitisol and Lixisol.

The soil texture in the Project location is generally loamy to clayey, especially in Lixisol soil area. This soil texture is capable of holding water which is favorable for agricultural purposes. The central region is susceptible to wind erosion, while sheet and gully erosion are largely confined to uncultivated areas. Soil erosion and land degradation are the two key components that have led to a declining yield in production potential in the region[1].

[1] Hadden, Lee, R., 2008. The Geology of Burma (Myanmar): An Annotated Bibliography of Burma's Geology, Geography and Earth Science. http://www.dtic.mil/dtic/tr/fulltext/u2/a487552.pdf, accessed November 8, 2018.

Figure 5.17: Myanmar's Soil Profile



Source: Natural Resources Management and Environment Department[1]; modified by ERM, 2018

5.2.7.2 Primary Baseline Sampling

Baseline Sampling Methodology

Soil samples were collected from eight (8) sampling locations (with 2 samples per location – top soil and sub soil samples) in the Study Area between 23 March 2019 and 24 March 2019 and were tested for relevant chemical parameters which are listed in the sub-section below. All sampling procedure were

[1] Natural Resources Management and Environment Department, 2008. Myanmar – FAO/ NR Data, Tools and Maps (General). http://www.fao.org/nr/myanmar/SoilMap_Myanmar_300dpi.pdf, accessed on November 8, 2018.

conducted strictly to the recognised standard procedures[1], which are explained along with complete results in ***Appendix 1***.

The soil samples were collected using a manual hand auger tool, and the samples were collected from top soil (30 cm – 50 cm depth) and sub soil (60 cm – 80 cm depth).

Baseline Sampling Locations

The soil sampling locations are presented in ***Table 5.15***, and shown in ***Figure 5.18***.

Figure 5.19 shows photographs from soil sampling activities.

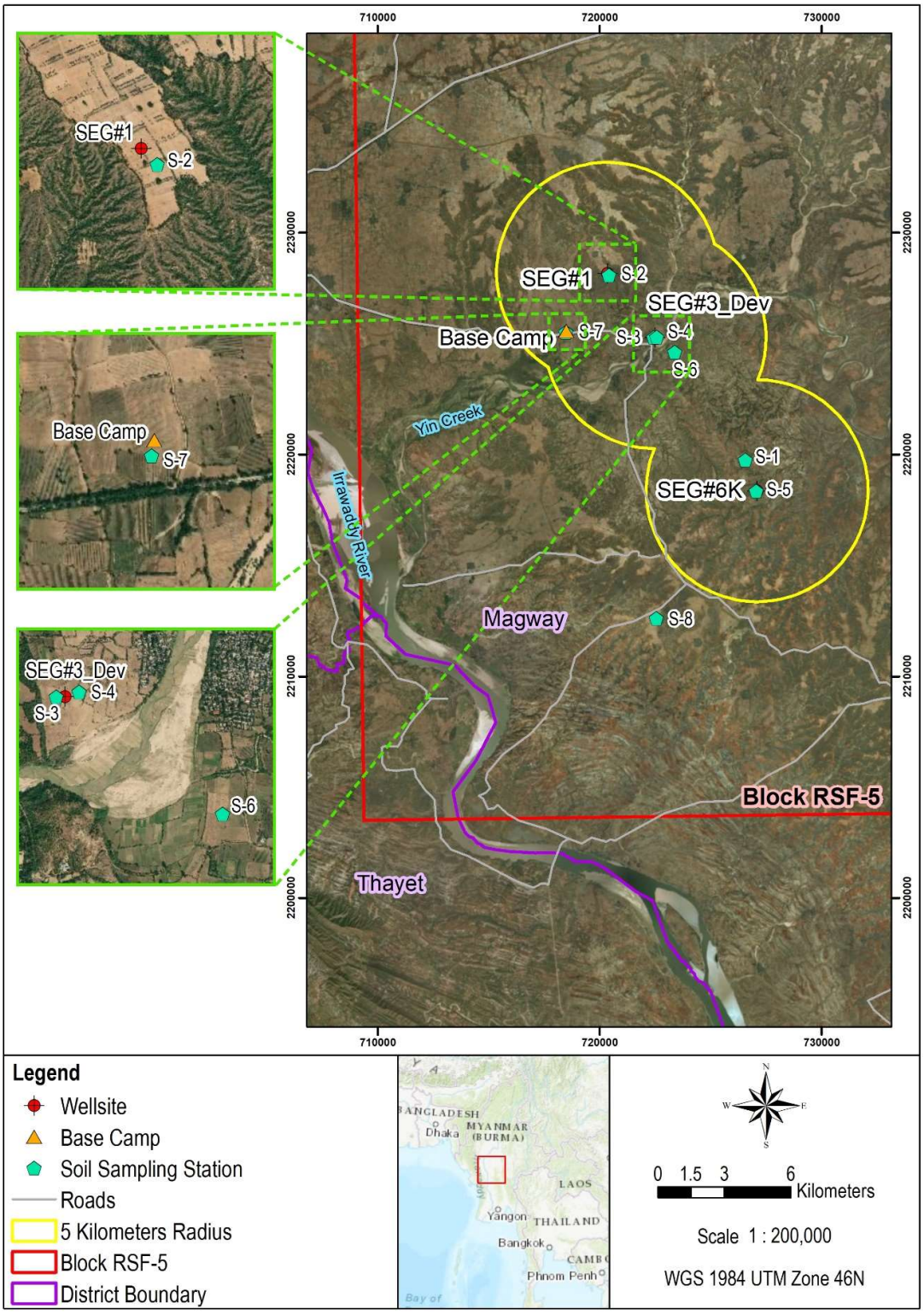
Table 5.15: Soil Sampling Locations

Sampling Point	Coordinates	Description of Sampling Point
S 1	20°3'41.62"N 95°9'58.68"E	Approximately 2.05km southeast of Ge Gyi Gone Village, Magway Township, Magway Region
S 2	20°8'14.84"N 95°6'30.76"E	Approximately 1.06km southeast of Aung Myay Gone Village, Magway Township, Magway Region
S 3	20°6'42.25"N 95°7'39.10"E	Approximately 0.54km southwest of Awzar Gone Village, Magway Township, Magway Region
S 4	20°6'43.06"N 95°7'43.52"E	Approximately 0.43km southwest of Awzar Gone Village, Magway Township, Magway Region
S 5	20°2'55.75"N 95°10'14.93"E	Approximately 3.28km southeast of Ge Gyi Gone Village, Magway Township, Magway Region
S 6	20°6'20.43"N 95°8'11.05"E	Approximately 0.54km south of Ohn Twe Village, Magway Township, Magway Region
S 7	20°6'51.55"N 95°5'22.94"E	Approximately 3.72km southwest of Aung Myay Gone Village, Magway Township, Magway Region
S 8	19°59'50.88"N 95°7'37.63"E	Approximately 2.12km northwest of Pay Pin San Village, Magway Township, Magway Region

Source: SEM, 2019

[1] This is in accordance to the EPA soil sampling (300)_AG.R3 methodology (https://www.epa.gov/sites/production/files/2015-06/documents/Soil-Sampling.pdf).

Figure 5.18: Soil Sampling Locations



Source: ERM, 2019

Figure 5.19: Photo of Soil Sampling

S 1

S 2

S 3

S 4

S 5

S 6

	
S 7	S 8

Source: SEM, 2019

Baseline Sampling Results and Discussion

There are no regulations or standards in Myanmar for ambient soil quality. In the absence of local or country standards, it is ERM's practice to use globally recognised standard to assess soil quality. Therefore, the chosen standard is the Earth Intervention value, Dutch Target and Intervention Values, 2000.

From the soil baseline sampling laboratory analysis, the two parameters that exceeded the standard were Nickel (at sampling location S 3 topsoil, S 4 topsoil, S 5 topsoil, S 5 subsoil, S 6 topsoil and S 6 subsoil) and Vanadium (S 1 topsoil, S 1 subsoil, S 5 topsoil and S 5 subsoil). Other parameters were found to be within the standards. Nickel can originate from both natural sources and anthropogenic activities (such as transportation, industrial site, increasing of consumption of liquid and solid fuels as well as presence of municipal and industrial waste in the vicinity)[1]. Regarding, Vanadium is a product from weathering of rocks and soil erosion processes[2].

Table 5.16 and ***Table 5.17*** presents the baseline results for laboratory analysis from the soil sampling surveys. Soil particle size distribution were also analysed as part of the on field study. It was found that most soil size were categorised as +300µm, +150µm and < 63µm. Full detail of the laboratory soil analysis is presented in ***Appendix 3***.

[1] Pawel Harasim and Tadeusz Filipek, 2014. Nickel in the Environment, Department of Agricultural and Environmental Chemistry Lublin University of Life Sciences. DOI: 10.5601/jelem.2014.19.3.651.
[2] https://www.atsdr.cdc.gov/toxprofiles/tp58-c6.pdf

Table 5.16: Results from Soil Quality Sampling (Station S 1 - S 4)

Parameter	Unit	Results								STANDARD[a]	
		S 1		S 2		S 3		S 4		Target values[b]	Intervention Value[c]
		Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil		
Physical and Aggregate Properties											
pH	-	6.0	6.5	5.4	5.5	6.5	6.3	6.4	6.7	-	-
Electrical Conductivity @ 25°C	µS/cm	6	9	4	6	11	8	9	8	-	-
Salinity	g/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Moisture Content (dried @ 103°C)	%	6.4	7.7	2.7	4.5	13.4	4.7	15.5	18.2	-	-
Inorganic Non-metallic Parameters											
Chloride	mg/kg	<10	<10	<10	<10	20	30	20	20	-	-
Metals and Major Cations											
Arsenic (As)	mg/kg	4	5	2	2	3	2	3	3	29	55
Cadmium (Cd)	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.8	12
Chromium (Cr)	mg/kg	53	55	12	17	39	27	39	33	100	380
Copper (Cu)	mg/kg	4	5	**1**	2	8	5	8	6	36	190
Lead (Pb)	mg/kg	6	6	4	4	6	4	6	5	85	530
Mercury (Hg)	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.3	10
Nickel (Ni)	mg/kg	34	**39**	7	10	**39**	26	**40**	35	35	210
Silver (Ag)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-
Vanadium (V)	mg/kg	**51**	**52**	<10	13	31	21	31	26	42	250[b]
Zinc (Zn)	mg/kg	18	19	6	9	26	16	25	21	140	720
Polyaromatic Hydrocarbons (PAHs)											
Naphthalene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
2-Methylnapthalene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-

Parameter	Unit	Results								STANDARD[a]	
		S 1		S 2		S 3		S 4		Target values[b]	Intervention Value[c]
		Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil		
2-Chloronaphthalene	mg/kg	<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	-	-
Acenaphthene	mg/kg	<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	-	-
Phenanthrene	mg/kg	<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	-	-
Fluoranthene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
Pyrene	mg/kg	<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	-	-
Benz(a)anthracene	mg/kg	<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	-	-
Benzo(b) & Benzo(k)fluoranthene	mg/kg	<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	-	-
Benzo(a)pyrene	mg/kg	<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	-	-
Indeno(1.2.3.cd)pyrene	mg/kg	<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	-	-
Benzo(g.h.i)perylene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
Total Petroleum Hydrocarbons (TPH)											
C6 – C9 Fraction	mg/kg	<2	<2	<2	<2	<2	<2	<2	<2	-	-
C10 – C14 Fraction	mg/kg	<50	<50	<50	<50	<50	<50	<50	<50	-	-
C15 – C28 Fraction	mg/kg	<100	<100	<100	<100	<100	<100	<100	<100	-	-

Parameter	Unit	Results								STANDARD[a]	
		S 1		S 2		S 3		S 4		Target values[b]	Intervention Value[c]
		Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil		
C29 – C36 Fraction	mg/kg	<100	<100	<100	<100	<100	<100	<100	<100	-	-
TPH (Volatile)/BTEX Surrogate											
Dibromofluoromethane	%	90.8	98.8	90.5	98.7	99.9	101	98.6	90.8	-	-
Toluene-D8	%	97.6	97.6	97.6	98.1	99.7	97.8	99.7	98.7	-	-
4-Bromofluorobenzene	%	108	105	108	104	102	110	103	94.1	-	-
Acid Extractable Surrogates											
2-Fluorophenol	%	77.8	70.2	74	70.6	70.4	76.2	70.6	66.2	-	-
Phenol-d6	%	71.8	65.6	67.2	69.2	65.8	63.2	65	60.6	-	-
2.4.6-Tribromophenol	%	95.6	99.6	97.4	88.6	96.4	78.8	97.8	84.6	-	-
Base/Neutral Extractable Surrogates											
Nitrobenzene -d5	%	95.2	85.6	91.8	86	84.4	85.2	85.4	80.6	-	-
2-Fluorobiphenyl	%	71.4	65.6	67	65.4	65.4	65.4	64.4	60.4	-	-
4-Terphenyl-d14	%	91.2	84.4	88	84	83.2	80.8	80.8	78.6	-	-
TPH (Volatile)/BTEX Surrogates											
Dibromofluoromethane	%	90.8	98.8	90.5	98.7	99.9	101	98.6	90.8	-	-
Toluene-D8	%	97.6	97.6	97.6	98.1	99.7	97.8	99.7	98.7	-	-
4-Bromofluorobenzene	%	108	105	108	104	102	110	103	94.1	-	-

Source: ALS-HK, 2019

Note: [a] *Earth Intervention value, Dutch Target and Intervention Values, 2000*
[b] *Target values – indicate the level at which there is sustainable soil quality*
[c] *Intervention values – indicates the level at which soil for humans, plant and animal life, is seriously impaired or threatened*

Table 5.17: Results from Soil Quality Sampling (Station S4-S8)

Parameter	Unit	Results								STANDARD	
		S 5		S 6		S 7		S 8		Target values	Intervention Value
		Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil		
Physical and Aggregate Properties											
pH	-	7.8	9.1	6.4	6.4	6.1	6.0	5.6	5.8	-	-
Electrical Conductivity @ 25°C	µS/cm	24	43	4	4	3	3	7	15	-	-
Salinity	g/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Moisture Content (dried @ 103°C)	%	18.7	10.4	4.6	6.2	3.9	6.5	15.8	11.8	-	-
Inorganic Non-metallic Parameters											
Chloride	mg/kg	20	20	20	30	20	50	30	40	-	-
Metals and Major Cations											
Arsenic (As)	mg/kg	3	3	3	4	3	3	4	5	29	55
Cadmium (Cd)	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.8	12
Chromium (Cr)	mg/kg	64	56	43	47	21	20	29	34	100	380
Copper (Cu)	mg/kg	14	14	9	10	3	3	3	4	36	190
Lead (Pb)	mg/kg	7	6	6	7	4	4	6	6	85	530
Mercury (Hg)	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.3	10
Nickel (Ni)	mg/kg	**99**	**89**	**42**	**51**	20	22	23	22	35	210
Silver (Ag)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-
Vanadium (V)	mg/kg	**66**	**57**	35	38	16	17	27	33	42	250[b]
Zinc (Zn)	mg/kg	38	34	28	31	14	14	14	15	140	720
Polyaromatic Hydrocarbons (PAHs)											
Naphthalene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
2-Methylnapthalene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-

Parameter	Unit	Results								STANDARD	
		S 5		S 6		S 7		S 8		Target values	Intervention Value
		Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil		
2-Chloronaphthalene	mg/kg	<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	-	-
Acenaphthene	mg/kg	<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	-	-
Phenanthrene	mg/kg	<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	-	-
Fluoranthene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
Pyrene	mg/kg	<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	-	-
Benz(a)anthracene	mg/kg	<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	-	-
Benzo(b) & Benzo(k)fluoranthene	mg/kg	<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	-	-
Benzo(a)pyrene	mg/kg	<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	-	-
Indeno(1.2.3.cd)pyrene	mg/kg	<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	-	-
Benzo(g.h.i)perylene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
Total Petroleum Hydrocarbons (TPH)											
C6 – C9 Fraction	mg/kg	<2	<2	<2	<2	<2	<2	<2	<2	-	-
C10 – C14 Fraction	mg/kg	<50	<50	<50	<50	<50	<50	<50	<50	-	-
C15 – C28 Fraction	mg/kg	<100	<100	<100	<100	<100	<100	<100	<100	-	-

Parameter	Unit	Results								STANDARD	
		S 5		S 6		S 7		S 8		Target values	Intervention Value
		Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil		
C29 – C36 Fraction	mg/kg	<100	<100	<100	<100	<100	<100	<100	<100	-	-
TPH (Volatile)/BTEX Surrogate											
Dibromofluoromethane	%	97.0	104	91.4	97.9	96.6	98.9	98.5	97.4	-	-
Toluene-D8	%	99.7	97.4	97.4	98.0	98.5	97.8	98.3	97.3	-	-
4-Bromofluorobenzene	%	106	107	109	109	109	109	108	107	-	-
TPH (Volatile)/BTEX Surrogate											
Dibromofluoromethane	%	90.8	98.8	90.5	98.7	99.9	101	98.6	90.8	-	-
Toluene-D8	%	97.6	97.6	97.6	98.1	99.7	97.8	99.7	98.7	-	-
4-Bromofluorobenzene	%	108	105	108	104	102	110	103	94.1	-	-
Acid Extractable Surrogates											
2-Fluorophenol	%	89.2	79	79	71	86.4	74.4	75.8	80.2	-	-
Phenol-d6	%	86	73.4	70.8	64.6	93.2	61.8	68.6	69.6	-	-
2.4.6-Tribromophenol	%	95	90.4	85.6	99.8	98.2	85.2	94	84.6	-	-
Base/Neutral Extractable Surrogates											
Nitrobenzene -d5	%	95	95.4	91.8	81	94.8	82	85.4	89.8	-	-
2-Fluorobiphenyl	%	79.4	72.4	69	61.4	80.6	63.2	64.8	70.4	-	-
4-Terphenyl-d14	%	91.6	92.2	85.4	77.6	100	82.4	82.8	88.6	-	-
TPH (Volatile)/BTEX Surrogates											
Dibromofluoromethane	%	97	104	91.4	97.9	96.6	98.9	98.5	97.4	-	-
Toluene-D8	%	99.7	97.4	97.4	98	98.5	97.8	98.3	97.3	-	-
4-Bromofluorobenzene	%	106	107	109	109	109	109	108	107	-	-

Source: ALS-HK, 2019; modified by ERM, 2019

Note: [a] *Earth Intervention value, Dutch Target and Intervention Values, 2000*

[b] *Target values – indicate the level at which there is sustainable soil quality*

[c] *Intervention values – indicates the level at which soil for humans, plant and animal life, is seriously impaired or threatened*

Table 5.18: Soil Particle Size Distribution – Weight Retained

Sample	Total dry weight (gram)	Sieve Size							
		>2mm	710µm-2mm	300-710µm	150-300µm	106-150µm	75-106µm	63-75µm	<63µm
S 1 (Top soil)	93.6	< 0.1	0.7	26.1	27.9	6.4	4.0	1.1	27.3
S 1 (Sub soil)	92.3	< 0.1	0.8	29.8	24.6	5.8	4.1	0.7	26.5
S 2 (Top soil)	97.3	< 0.1	4.2	43.0	24.1	5.3	3.6	0.5	16.4
S 2 (Sub soil)	95.5	< 0.1	5.1	44.8	19.8	3.8	2.4	0.5	19.1
S 3 (Top soil)	86.7	0.3	0.7	8.6	32.9	11.8	5.2	0.8	26.4
S 3 (Sub soil)	95.4	1.5	0.6	13.1	44.3	13.1	5.8	0.9	16.0
S 4 (Top soil)	84.6	< 0.1	0.2	1.6	33.0	16.7	6.8	1.0	25.3
S 4 (Sub soil)	81.9	< 0.1	< 0.1	0.5	45.3	12.8	4.1	0.6	18.5
S 5 (Top soil)	81.3	2.1	0.5	3.3	31.1	8.8	4.9	0.5	30.3
S 5 (Sub soil)	89.6	8.3	1.5	3.7	31.5	8.6	4.3	0.8	30.9
S 6 (Top soil)	95.3	< 0.1	0.4	4.9	33.6	14.7	7.2	1.4	33.0
S 6 (Sub soil)	93.8	< 0.1	0.2	3.5	37.0	11.5	3.9	0.6	37.1
S 7 (Top soil)	96.1	0.1	6.4	45.1	19.4	4.3	2.9	0.5	17.4
S 7 (Sub soil)	93.5	< 0.1	7.3	44.8	17.5	4.0	2.6	0.5	16.7
S 8 (Top soil)	84.3	< 0.1	2.5	21.2	33.2	6.0	2.9	0.5	17.9
S 8 (Sub soil)	88.2	< 0.1	3.6	21.3	31.9	5.5	2.1	0.3	23.5

Source: ALS-HK, 2019; modified by ERM, 2019

Table 5.19: Soil Particle Size Distribution – Percent Retained

Sample	Total dry weight (%)	Sieve Size							
		>2mm	710µm-2mm	300-710µm	150-300µm	106-150µm	75-106µm	63-75µm	<63µm
S 1 (Top soil)	100.0	< 1	< 1	27.9	29.8	6.8	4.3	1.2	29.2
S 1 (Sub soil)	100.0	< 1	< 1	32.2	26.6	6.2	4.4	< 1	28.8
S 2 (Top soil)	100.0	< 1	4.3	44.2	24.8	5.5	3.7	< 1	16.9
S 2 (Sub soil)	100.0	< 1	5.4	46.9	20.7	4.0	2.5	< 1	19.9
S 3 (Top soil)	100.0	< 1	< 1	9.9	38.0	13.6	6.0	< 1	30.4
S 3 (Sub soil)	100.0	1.6	< 1	13.8	46.4	13.7	6.1	< 1	16.8
S 4 (Top soil)	100.0	< 1	< 1	1.9	39.0	19.7	8.1	1.2	29.9
S 4 (Sub soil)	100.0	< 1	< 1	< 1	55.3	15.6	5.1	< 1	22.6
S 5 (Top soil)	100.0	2.5	< 1	4.0	38.2	10.8	6.0	< 1	37.2
S 5 (Sub soil)	100.0	9.3	1.6	4.2	35.1	9.6	4.8	< 1	34.5
S 6 (Top soil)	100.0	< 1	< 1	5.1	35.2	15.5	7.6	1.5	34.6
S 6 (Sub soil)	100.0	< 1	< 1	3.8	39.5	12.2	4.1	< 1	39.6
S 7 (Top soil)	100.0	< 1	6.7	46.9	20.2	4.5	3.0	< 1	18.1
S 7 (Sub soil)	100.0	< 1	7.8	47.9	18.7	4.3	2.8	< 1	17.8
S 8 (Top soil)	100.0	< 1	3.0	25.1	39.3	7.1	3.5	< 1	21.3
S 8 (Sub soil)	100.0	< 1	4.0	24.1	36.1	6.3	2.4	< 1	26.7

Source: ALS-HK, 2019; modified by ERM, 2019

Table 5.20: Soil Particle Size Distribution – Cumulative Percentage Retained

Sample	Total dry weight (%)	Sieve Size							
		>2mm	710µm-2mm	300-710µm	150-300µm	106-150µm	75-106µm	63-75µm	<63µm
S 1 (Top soil)	-	< 1	< 1	28.7	58.5	65.3	69.6	70.8	100.0
S 1 (Sub soil)	-	< 1	< 1	33.2	59.9	66.1	70.5	71.2	100.0
S 2 (Top soil)	-	< 1	4.4	48.7	73.4	78.9	82.6	83.1	100.0
S 2 (Sub soil)	-	< 1	5.5	52.4	73.1	77.1	79.6	80.1	100.0
S 3 (Top soil)	-	< 1	1.1	11.0	49.0	62.6	68.6	69.6	100.0
S 3 (Sub soil)	-	1.6	2.2	16.0	62.4	76.1	82.2	83.2	100.0
S 4 (Top soil)	-	< 1	< 1	2.1	41.1	60.8	68.9	70.1	100.0
S 4 (Sub soil)	-	< 1	< 1	< 1	56.1	71.7	76.7	77.4	100.0
S 5 (Top soil)	-	2.5	3.1	7.1	45.3	56.1	62.1	62.8	100.0
S 5 (Sub soil)	-	9.3	10.9	15.1	50.2	59.8	64.6	65.5	100.0
S 6 (Top soil)	-	< 1	< 1	5.5	40.8	56.2	63.8	65.4	100.0
S 6 (Sub soil)	-	< 1	< 1	4.0	43.5	55.7	59.8	60.4	100.0
S 7 (Top soil)	-	< 1	6.8	53.7	73.8	78.3	81.4	81.9	100.0
S 7 (Sub soil)	-	< 1	7.9	55.8	74.6	78.8	81.7	82.2	100.0
S 8 (Top soil)	-	< 1	3.1	28.2	67.6	74.6	78.1	78.7	100.0
S 8 (Sub soil)	-	< 1	4.1	28.2	64.3	70.6	73.0	73.3	100.0

Source: ALS-HK, 2019; modified by ERM, 2019

5.2.8 Groundwater

5.2.8.1 Overview

Groundwater is the main source for potable domestic water supply in Magway Region, with over 4,400 groundwater wells[1]. Groundwater sources are also utilized for irrigation purposes in some areas. Local industries in Magway Region draw approximately 23% of their water requirement from groundwater whereas larger factories such as sugar and paper mills utilize surface water. Observed aquifers in Magway Region have a maximum depth of 350 m[1].

Based on Water Utilization Department of Myanmar, they have divided Myanmar's groundwater bodies into 13 major aquifers, namely: Alluvian, Irrawaddian, Peguan, Ecoene, Flysch, Cretaceous, Kalaw, Plateau Limestone, Lebyin, Cambrian, ChaungMaGyi, Metamorphic and Igneous. Block RSF-5 is situated on two different aquifer types, that is, Irrwaddian and Peguan aquifer. As for its quality, Peguan aquifer water quality is generally not suitable for drinking due to the high salinity and TDS[2].

Previous groundwater surveys were conducted as part of the 2016 ESHIA, where the groundwater quality concerns were similar to surface water, with slight acidity, high TDS, coliform and Manganese concentration. For groundwater this can potentially be caused by natural geological and hydrological processes whereby infiltration and leaching of chemicals is transferred from soil to unconfined aquifers.

Exploitation of Myanmar's aquifers has thus far been limited to municipal water supply and intensive irrigation of vegetables and other high value crops from hand-dug wells[3]. The estimated groundwater potential in the Irrawaddy (Lower) Region, where the Project is located, is 153.25 km^3, as shown in ***Table 5.21***.

Table 5.21: Estimated Groundwater Potential across Myanmar

River Basin	Catchment Area (km^2)	Groundwater Potential (km^3)
Chindwin	115,300	57.58
Irrawaddy (Upper)	193,300	92.60
Irrawaddy (Lower)	95,600	153.25
Sittoung	48,100	28.40
Rivers in Rakhine State	58,300	41.77
Rivers in Tanintharyi Region	40,600	39.28
Thanlwin (within Myanmar)	158,000	74.78
Mae Klong (within Myanmar)	28,600	7.05
Total	**737,800**	**494.71**

Source: FAO[4]

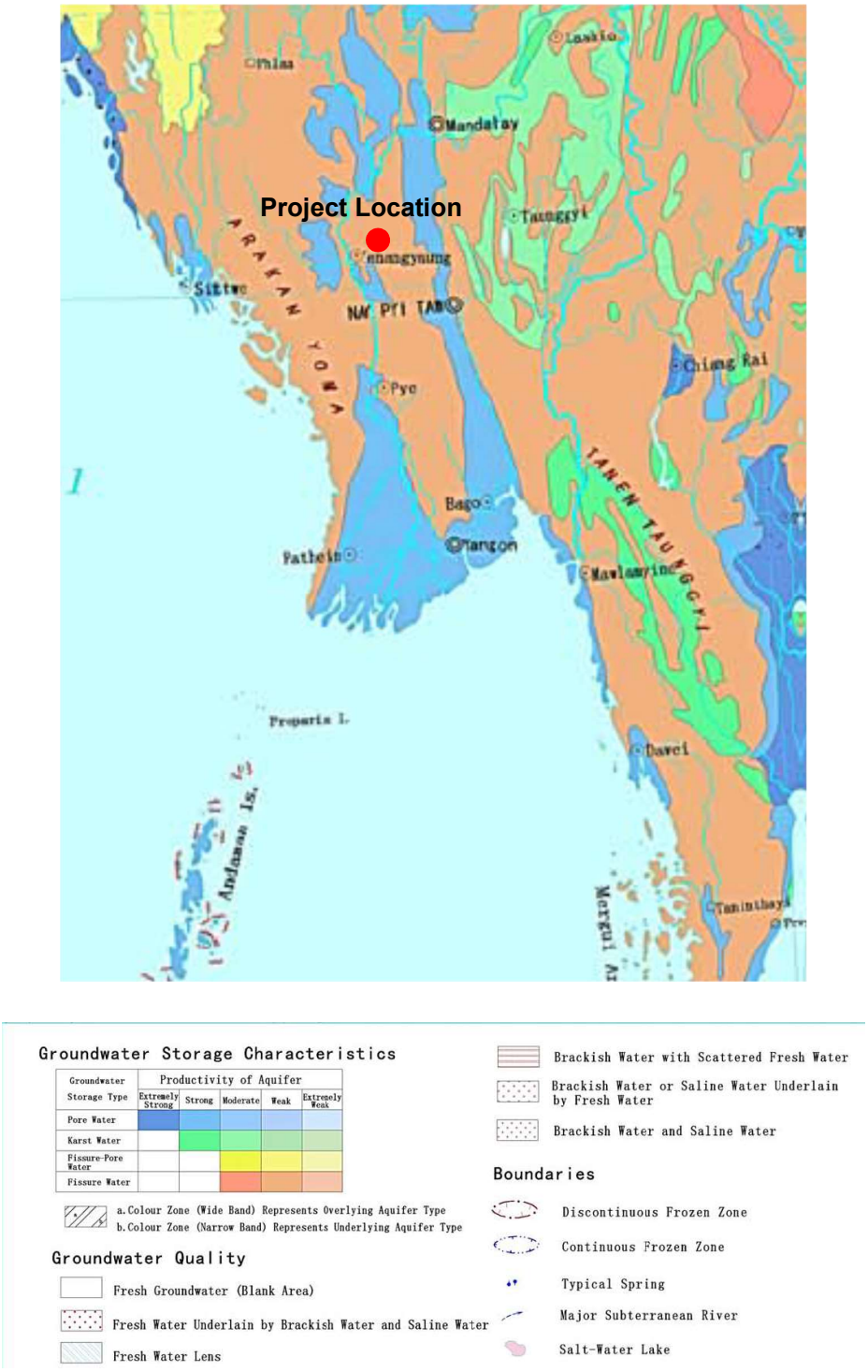
[1] International Water Management Institute, 2015, Integrated Assessment of Groundwater Use for Improving Livelihoods in the Dry Zone of Myanmar. http://www.iwmi.cgiar.org/Publications/IWMI_Research_Reports/PDF/pub164/rr164.pdf, accessed on November 9, 2018.

[2] Japan International Cooperation Agency, Chapter III Water supply improvement plan in the central dry zone. http://open_jicareport.jica.go.jp/pdf/11740990_05.PDF, accessed on November 9, 2018.

[3] http://www.fao.org/nr/water/espim/country/myanmar/print1.stm

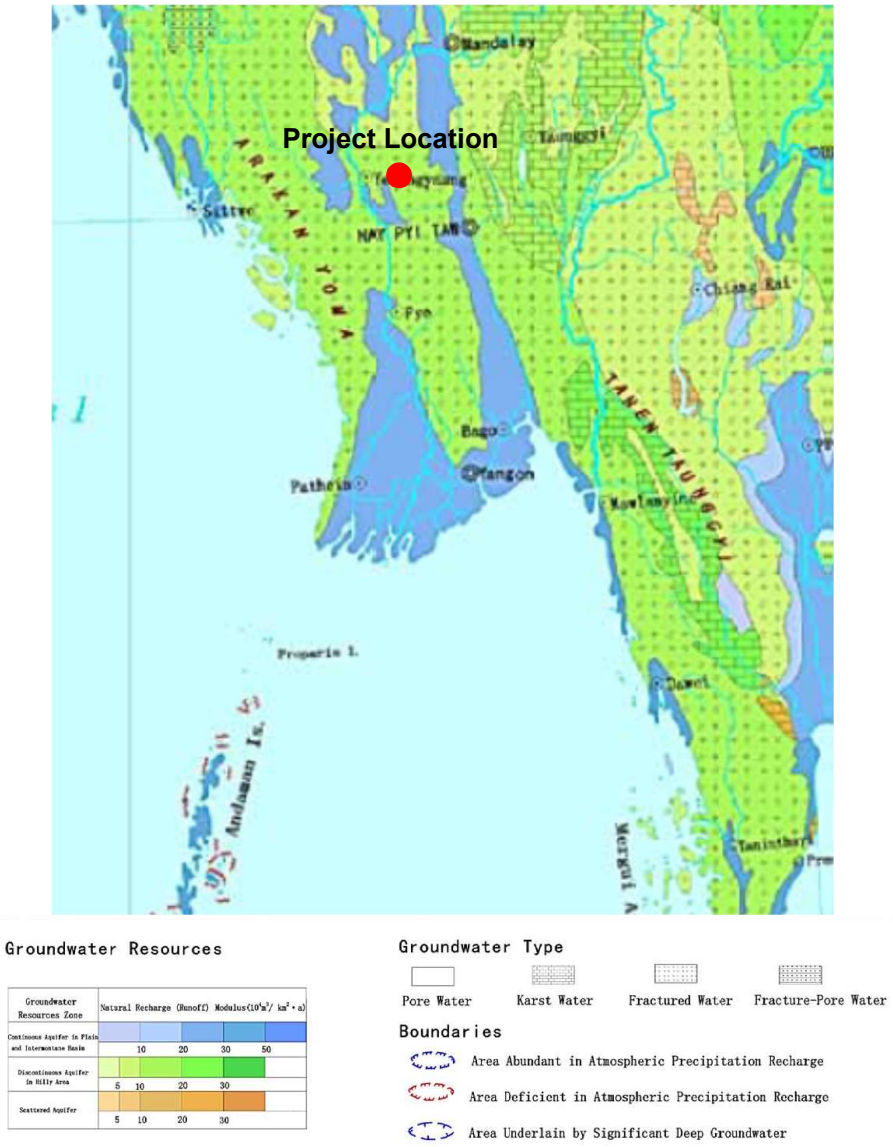
[4] http://www.fao.org/docrep/008/ae546e/ae546e04.htm

Figure 5.20: Hydrogeological Map of Myanmar



Source: Adapted from “Groundwater Serial Maps of Asia”, which was compiled by the Institute of Hydrogeology and Environmental Geology of CAGS in 2012

Figure 5.21: Groundwater Types in Myanmar



Source: Adapted from Groundwater Serial Maps of Asia", which was compiled by the Institute of Hydrogeology and Environmental Geology of CAGS in 2012

5.2.8.2 Primary Baseline Sampling

Baseline Sampling Methodology

Baseline groundwater quality sampling surveys in the Study Area have been conducted, as part of this ESIA Study. A total of six (6) groundwater samples were taken around and within the Study Area by SEM under ERM's supervision on 21st and 22nd March 2019.

Groundwater samples were taken by multi parameters (i.e. water checker) for water quality for some wells and collected in plastic and sterilized glass sample containers. All sampling was conducted in strict accordance to recognized standard procedures[1] as listed together with the sampling results in

[1] As per EPA Groundwater Sampling (301)_AF.R3

Appendix 1. The parameters such as pH, temperature, dissolved oxygen (DO), electrical conductivity (EC), total dissolved solids (TSD), odor, and colour were measured at each site in-situ. The parameters that were measured by laboratory analysis are listed together with the results in ***Table 5.23***

Full detail of sampling methods and in-situ measurement results is shown in ***Appendix 1***; parameters that were selected for sampling listed below.

All samples were preserved using appropriate preservation chemicals according to the best practice for each sample's storage requirements (as per the relevant USEPA[1] and APHA[2] methodologies), All samples were then kept in iced cooler boxes during the sampling period in the field and for transportation to the laboratory. The detailed laboratory study and analysis is presented in ***Table 5.24***.

The equipment that were used to test groundwater quality is a multi parameters for water quality (water checker). [3]

Baseline Sampling Locations

The six (6) locations are shown in ***Figure 5.22***, and each location is described in ***Table 5.22***.

Figure 5.23 shows photographs from groundwater sampling activities.

Table 5.22: Groundwater Sampling Locations

Sampling Point	Coordinates	Description of Sampling Point
GW 1	20° 08' 44.1"N 95° 06' 03.4"E	At tube well which located in Aung Myay Gone Village
GW 2	20° 06' 47.7"N 95° 07' 58.7"E	At tube well which located in Awzar Gone Village
GW 3	20° 06' 44.1"N 95° 08' 13.3"E	At tube well which located in Ohn Twe Village
GW 4	20° 06' 11.2"N 95° 08' 06.4"E	At tube well which located near Ohn Twe Village
GW 5	20° 06' 15.6"N 95° 07' 10.9"E	At tube well which located in Tamo Village
GW 6	20° 06' 14.9"N 95° 07' 28.9"E	At tube well which located in Ying Seik Village

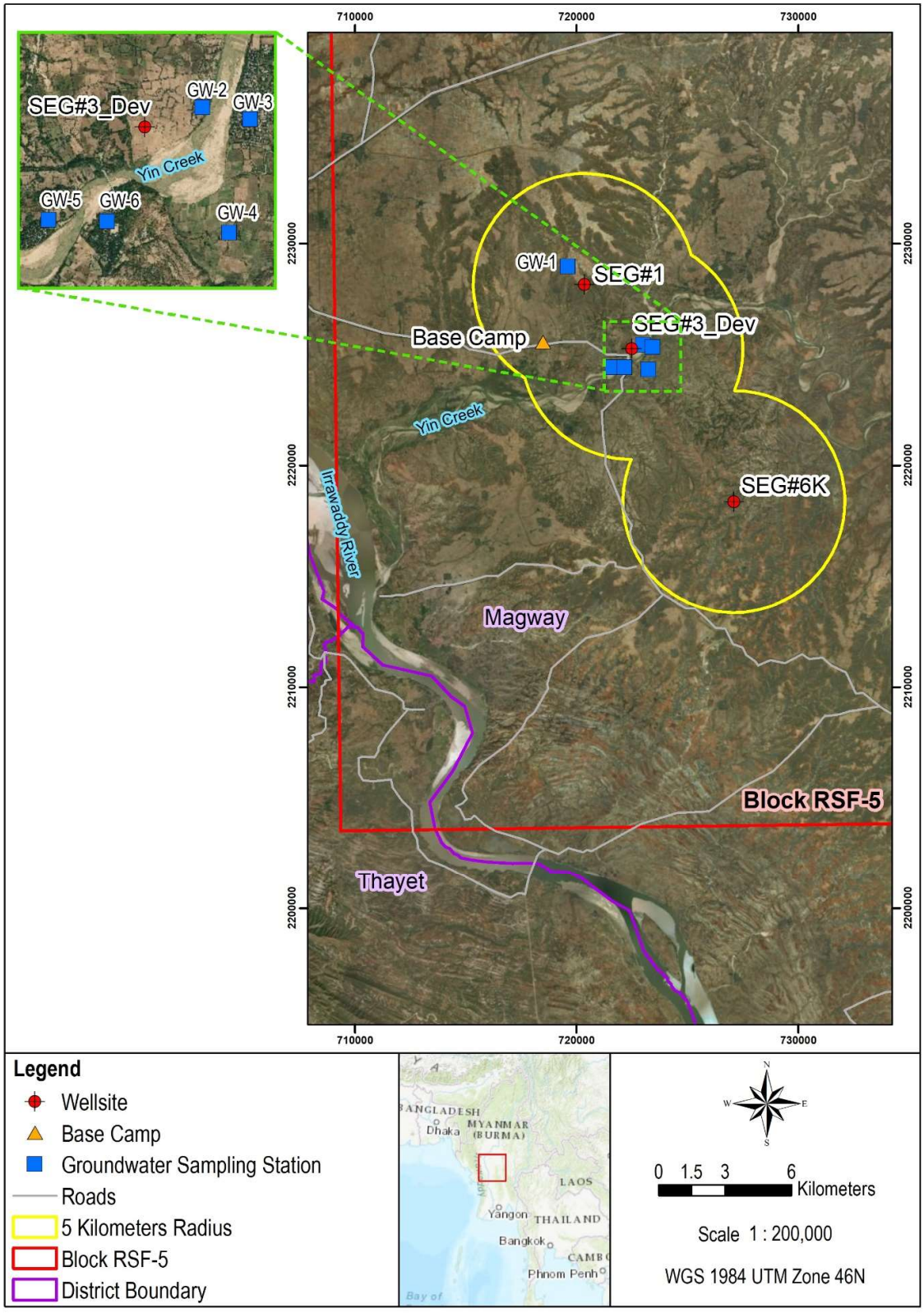
Source: SEM, 2019; modified by ERM, 2019

[1] United States Environmental Protection Agency

[2] American Public Health Association

[3] Water Checker manufacturer is HORIBA from Japan – Model/serial no. U52G/SN-G2YBAJWD.

Figure 5.22: Groundwater Sampling Locations



Source: ERM, 2019

Figure 5.23: Photographs from Groundwater Sampling

GW 1

GW 2

GW 3

GW 4

GW 5

GW 6

Source: SEM, 2019

Baseline Sampling Results and Discussion

Groundwater in-situ sampling and laboratory results are presented in ***Table 5.23*** and ***Table 5.24***. Almost all results were found to be below the compared standards, with the exception of nitrogen at GW3, iron at GW4, and total coliform at GW6. Elevated iron could be due to natural geological conditions. Nitrogen is most likely due to agricultural runoff containing fertilizers. Elevated coliform levels could be due to agricultural/livestock runoff or inappropriate wastewater management practices in communities.

Table 5.23: Results of In-situ Groundwater Quality Measurement and Analysis

No.	Sample No./ Physical Parameter	GW1	GW2	GW3	GW4	GW5	GW6	Myanmar Standards	EPA Standards[a]
1	Location	Tube well	Tube well	Tube well	Tube well	Tube well	Tube well	-	-
2	Date/Time	21.3.2019 10:15 am	22.3.2019 10:30 am	22.3.2019 12:00 pm	22.3.2019 4:06 pm	22.3.2019 11:00 am	22.3.2019 11:30 am	-	-
3	Weather	Sunny	Sunny	Sunny	Sunny	Sunny	Sunny	-	-
4	Transparency	High	High	High	High	High	High	-	-
5	Colour	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	-	-
6	Water Depth (m)	200	20	12	13	25	9	-	-
7	Temp (°C) (water)	30.5	27.99	29.32	29.85	29.16	28.52		
8	pH	7.76	8.01	7.42	7.34	7.64	7.84	6-9	6.5-8.5
9	ORP (mv)	99	102	191	50	138	146		
10	DO (mg/l)	2.29	3.95	3.12	2.67	2.71	2.66	-	-
11	EC (µs/m)	0.76	1.27	6.01	2.86	1.53	0.8	-	-
12	TDS (ppm)	0.47	0.81	3.79	1.83	0.98	0.52	-	-
13	Turbidity (FNU)	41.4	91.5	41.6	62.1	55.2	43.0	-	-
14	Salinity (ppt)	0.37	0.6	3.25	1.48	0.76	0.3		

Source: SEM, 2019

Note: [a] United States Environmental Protection Agency (EPA), National Primary Drink Water Regulations & National Secondary Drinking Water Regulation, 2009

Table 5.24: Summary of Groundwater Sampling Laboratory Results

Parameter	Unit	GW 1	GW 2	GW 3	GW 4	GW 5	GW 6	Myanmar Standards	WHO Standards[a]	EPA Standards[b]
Physical and Aggregate Properties										
Suspended Solids (SS)	mg/L	<2	4	<2	11	<2	<2	50	-	-

Parameter	Unit	GW 1	GW 2	GW 3	GW 4	GW 5	GW 6	Myanmar Standards	WHO Standards[a]	EPA Standards[b]
pH	pH	7.9	8	7.5	7.4	7.8	7.9	6-9	-	-
Inorganic Non-metallic Parameters										
Ammonia as N	mg/L	<0.01	0.05	0.04	0.32	0.01	0.3	10	-	-
Fluoride	mg/L	0.3	0.2	1.5	0.4	1.2	0.4	20	1.5	4
Free Cyanide	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	-	0.2
Sulphide as S2-	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1	-	-
Total Cyanide	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1	-	-
Total Phosphorus as P	mg/L	<0.01	0.05	0.02	0.04	0.06	0.04	2	-	-
Total Nitrogen as N	mg/L	<0.1	1.9	**186**	0.7	0.4	0.4	10	-	10
Chlorine - Total Residual	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	5	-
Metals and Major Cations – Filtered										
Hexavalent Chromium	µg/L	<20	<20	<20	<20	<20	<20	100	-	-
Arsenic	µg/L	<10	<10	<10	<10	<10	<10	100	10	100
Iron	mg/L	<0.01	0.05	<0.01	<0.01	<0.01	<0.01	3.5	-	-
Cadmium	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	100	3	5
Chromium	µg/L	<1	<1	<1	<1	<1	<1	500	50	100
Copper	µg/L	1	<1	1	<1	<1	<1	500	2000	1300
Lead	µg/L	1	<1	<1	<1	<1	<1	100	10	15
Mercury	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10	6	2
Nickel	µg/L	<1	<1	<1	<1	<1	<1	500	70	-
Selenium	µg/L	<10	<10	<10	<10	<10	<10	100	40	50
Silver	µg/L	<1	<1	<1	<1	<1	<1	500	-	-
Zinc	µg/L	900	<10	<10	<10	<10	<10	2000	-	-

Parameter	Unit	GW 1	GW 2	GW 3	GW 4	GW 5	GW 6	Myanmar Standards	WHO Standards[a]	EPA Standards[b]
Metals and Major Cations – Total										
Iron	mg/L	0.02	0.58	0.04	**4.11**	0.1	0.03	3.5	-	-
Arsenic	µg/L	<10	<10	<10	<10	<10	<10	100	10	100
Cadmium	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	100	3	5
Chromium	µg/L	<1	<1	<1	<1	<1	<1	500	50	100
Copper	µg/L	<1	<1	<1	<1	<1	<1	500	2000	1300
Lead	µg/L	1	<1	<1	<1	<1	<1	100	10	15
Mercury	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	10	6	2
Nickel	µg/L	<1	<1	1	<1	<1	<1	500	70	-
Selenium	µg/L	<10	<10	<10	<10	<10	<10	100	40	50
Silver	µg/L	<1	<1	<1	<1	<1	<1	500	-	-
Zinc	µg/L	910	<10	<10	<10	<10	<10	2000	-	-
Microbiological Testing										
Total Coliforms	CFU/100mL	ND	ND	ND	ND	ND	**610**	400	-	-
Aggregate Organics										
Biochemical Oxygen Demand	mg/L	<2	<2	<2	<2	<2	<2	50	-	-
Chemical Oxygen Demand	mg/L	2	<2	6	3	<2	2	250	-	-
Oil & Grease	mg/L	<5	<5	<5	<5	<5	<5	10	-	-
Phenols (Total)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	-	-

Source: ALS-HK, 2019

Note: [a] *World Health Organization (WHO), Guidelines for Drinking-Water Quality, Fourth Edition Incorporating the First Addendum, Annex 3: Chemical summary tables.*
[b] *United States Environmental Protection Agency (EPA), National Primary Drink Water Regulations & National Secondary Drinking Water Regulation, 2009.*
ND – Not Detected
Bold – Values above the standards

5.3 Biological Resources

5.3.1 Introduction

The description of the biodiversity baseline in this section consists of an analysis of the biodiversity interests within the Project Study Area, including protected areas, habitats of high biodiversity value, and species of conservation concern as well as general flora and fauna assemblages. Methods used to obtain this data included GIS analysis, desk based data collection and a biodiversity field survey.

This section is divided into the results from the desktop assessment (secondary data), and the results from the biodiversity field survey (primary data).

5.3.2 Desktop Assessment (Secondary Data)

5.3.2.1 Ecoregion Description

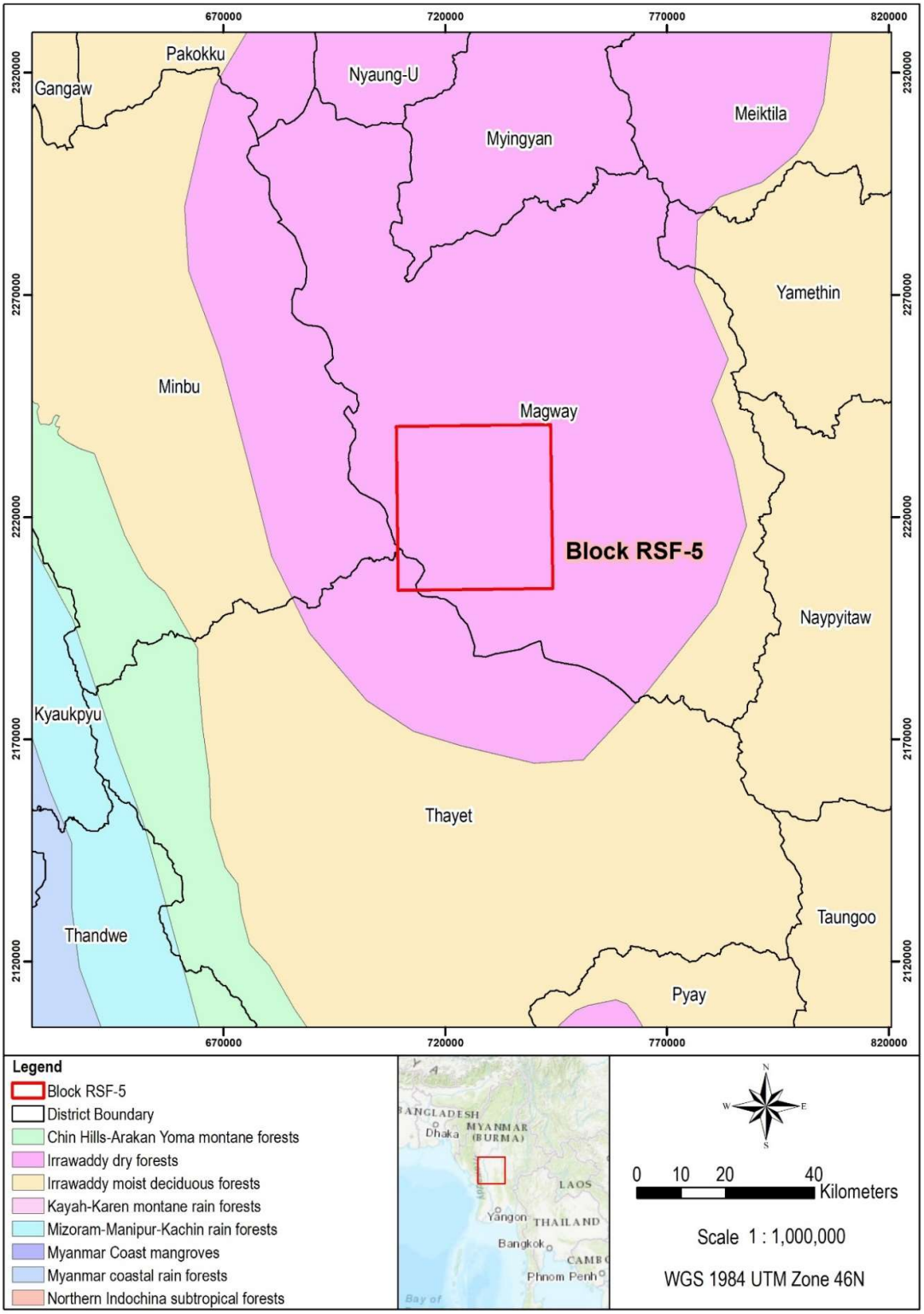
WWF defines an ecoregion as a "large unit of land or water containing a geographically distinct assemblage of species, natural communities, and environmental conditions."

The boundaries of an ecoregion are not fixed and sharp, but rather encompass an area within which important ecological and evolutionary processes most strongly interact.

The Global Ecoregions are the results of regional analyses of biodiversity across the continents and oceans of the world, completed in collaboration with hundreds of regional experts worldwide and by conducting extensive literature reviews. These ecoregions were chosen from outstanding examples of each terrestrial, freshwater, and marine major habitat type. Ecoregions are based on the following parameters: species richness; endemism; higher taxonomic uniqueness (e.g., unique genera or families, relict species or communities, primitive lineages); extraordinary ecological or evolutionary phenomena (e.g., extraordinary adaptive radiations, intact large vertebrate assemblages, presence of migrations of large vertebrates); and global rarity of the major habitat type.

Corridors of conservation value have been identified in Myanmar; of these corridors, only one, the Irrawaddy River Sinbyugyun to Minbu Corridor, is partially included in Block RSF-5 (see ***Appendix 5***). As shown below in ***Figure 5.24***, the ecoregion of the Project Study Area only constitutes of Irrawaddy Dry Forest. This ecoregion has a harsh climate and is extremely dry, with average rainfall about 650 mm per year. The dry zone is subject to southerly winds during the summer, resulting in wind erosion of the topsoil. The forests in this ecoregion are dominated by dry forests. The stands are low in stature, with thorny trees. Common species include *Terminalia oliveri* and *Tectona homiltoniana*. Trees associated with them are *Acacia catechu* and *Bauhinia racemosa*. Most of the forests in this ecoregion have been converted to agriculture or degraded, and remaining forests lack biodiversity.

Figure 5.24: Ecoregion Map



Source: SEM, 2019; modified by ERM, 2019

5.3.2.2 Terrestrial Biodiversity

Flora

The flora in the Project Study Area comprise the typical flora for a dry dipterocarp forest in central Myanmar. However, a potentially rare plant species, the latpanphyu or also known as white silk cotton tree, (*Ceiba pentandra)*, has been sighted during a previous field survey conducted for the 2016 ESHIA, within the 3 km area from Outo village in Yesagyo Township, in Magway Region. Although, this is outside of Block RSF-5 and outside the Study Area of the Project, there may be specimens present in the Study Area as well. According to data obtained from Integrated Biodiversity Assessment Tool (IBAT), species of conservation significance found within the 50 km radius of Block RSF-5 (reported by the local community and provided with additional information supplied by the IUCN red list criteria), are shown in ***Table 5.25***. As defined by the FAO, an area of Permanent Forest Estate (PFE) refers to a forest area that is designated to be reserved as forest and may not be converted to other land use. The PFE in Central Dry Zone (CDZ) spans large parts of Mandalay, Magway and lower Sagaing divisions, and is further classified into three categories: (i) Reserve Forests; (ii) Protected Areas, and (iii) Protected Public Forest (PPF), as illustrated in ***Table 5.26*** and ***Table 5.27***.

Table 5.25: Number of Fauna and Flora Species Reported by IBAT in Block RSF-5

Taxonomic Group	Common Name	Total Assessed Species	Total (CR, EN & VU)	Critically Endangered (CR)	Endangered (EN)	Vulnerable (VU)	Near Threatened (NT)	Least Concerned (LC)	Data Deficient (DD)
Aves	Birds	479	21	5	6	10	30	428	0
Mammalia	Mammals	101	22	2	8	12	5	74	0
Reptilia	Reptiles	51	2	0	0	2	0	46	3
Actinopterygii	Fish	76	0	0	0	0	7	57	12
Insecta	Insects	90	0	0	0	0	1	83	6
Magnoliopsida	Flowering plants	47	0	0	0	0	0	43	4
Liliopsida	Seed plants	56	0	0	0	0	0	54	2
Gastropoda	Mollusks	61	0	0	0	0	0	49	12
Malacostraca	Crustaceans	11	0	0	0	0	0	7	4
Bivalvia	Bivalves	39	0	0	0	0	0	27	12
Amphibia	Amphibian	17	0	0	0	0	0	17	0
Arachnida	Chelicerate arthropods	4	0	0	0	0	0	4	0
Polypodiopsida	Ferns	3	0	0	0	0	0	3	0
Total		**1,035**	**45**	**7**	**14**	**24**	**43**	**847**	**55**

Source: IBAT, 2019[1]

[1] IBAT (2019) Integrated Biodiversity Assessment Tool: World Bank Group Biodiversity Risk Screen. ENI RSF-5. Retrieved March 04, 2019.

Table 5.26: Forest Categories in Central Dry Zone of Myanmar per Region

Category	Region			Total
	Sagaing	Magway	Mandalay	
Forest Reserve	28	85	49	162
Protected Public Forest	21	40	18	79
Protected Areas	5	2	5	12
Total	**54**	**127**	**72**	**253**

Source: Camille Bann et. al., 2017

Table 5.27: Forest Categories (ha) and (%) in Central Dry Zone of Myanmar

Category	Number	Area (ha)	% of Land Area
Reserve Forests	812	12,054,572	17.80
Protected Public Forest	326	4,731,669	7.0
Protected Areas	39	2,891,535	5.75
Total	**1,177**	**20,668,676**	**30.55**

Source: Camille Bann et. al., 2017

Fauna

Fauna species known from the area are also very typical of those inhabiting dry dipterocarp forests. Species of conservation significance found within the 50 km radius of Block RSF-5 (from the Integrated Biodiversity Assessment Tool (IBAT) reportedly sighted by local community, are shown in ***Table 5.25***. Critically endangered and endangered species are listed in ***Table 5.28*** and their respective breeding season is presented in ***Table 5.29***. Selected endemic/near endemic species outlined in National Biodiversity Strategy and Action Plan 2015-2016 [1].

These species are endemic to Myanmar and have a smaller geographic range, hence, they are well representative of the Project Area. For this reason, the project activities will have a higher impact to the species' breeding characteristics.

Of the species listed in ***Table 5.28***, the following five bird species are reported to be endemic to Myanmar and are potentially present in the Study Area, namely, Vinous-breasted Myna (*Acridotheres burmannicus*), streak-eared bulbul (*Pycnonotus blanfordi*), White-throated Babbler (*Chatarrhaea gularis*), Burmese Bushlark (*Mirafra microptera)*, and Hooded Treepie (*Crypsirina cucullata)*. In addition, based on the IUCN Redlist, Hooded Treepie (*Crypsirina cucullata)* has also been categorized as a Near Threatened species in Myanmar[2].

[1] https://www.cbd.int/doc/world/mm/mm-nbsap-v2-en.pdf

[2] [2] IBAT (2019) Integrated Biodiversity Assessment Tool: World Bank Group Biodiversity Risk Screen. ENI RSF-5. Retrieved March 04, 2019.

Table 5.28: List of Critically Endangered (CR) and Endangered (EN) and Endemic Species in Myanmar

Species name	Common name	IUCN Category	Myanmar Listing*	Endemic to Myanmar
Aythya baeri	Baer's Pochard	CR		Not Endemic
Emberiza aureola	Yellow-breasted Bunting	CR		Not Endemic
Gyps bengalensis	White-rumped Vulture	CR		Not Endemic
Gyps tenuirostris	Slender-billed Vulture	CR		Not Endemic
Sarcogyps calvus	Red-headed Vulture	CR		Not Endemic
Aquila nipalensis	Steppe Eagle	EN		Not Endemic
Haliaeetus leucoryphus	Pallas's Fish-eagle	EN		Not Endemic
Heliopais personatus	Masked Finfoot	EN		Not Endemic
Leptoptilos dubius	Greater Adjutant	EN		Not Endemic
Pavo muticus	Green Peafowl	EN		Not Endemic
Sterna acuticauda	Black-bellied Tern	EN		Not Endemic
Manis javanica	Sunda Pangolin	CR		Not Endemic
Manis pentadactyla	Chinese Pangolin	CR		Not Endemic
Axis porcinus	Hog Deer	EN		Not Endemic
Cuon alpinus	Dhole	EN		Not Endemic
Elephas maximus	Asian Elephant	EN		Not Endemic
Hoolock hoolock	Western Hoolock Gibbon	EN		Not Endemic
Orcaella brevirostris	Irrawaddy Dolphin	EN		Not Endemic
Rucervus eldii	Eld's Deer	EN		Not Endemic
Trachypithecus phayrei	Phayre's Leaf-monkey	EN		Not Endemic
Viverra megaspila	Large-spotted Civet	EN		Not Endemic
Acridotheres burmannicus	Vinous-breasted Myna	LC		Endemic
Pycnonotus blanfordi	Streak-eared Bulbul	LC		Endemic
Chatarrhaea gularis	White-throated Babbler	LC		Endemic
Mirafra microptera	Burmese Bush Lark	LC		Endemic
Crypsirina cucullata	Hooded Treepie	NT		Endemic

Source: IBAT, 2019

Notes: Based on IUCN Red list 2019 NE – Not Evaluated, DD – Data Deficit, LR/LC – Least Concerned/Lower, Risk, EN – Endangered, NT – Near Threatened
** Species draft list outlined within the Myanmar National Biodiversity Action Plan 2015-2025*

Table 5.29: Breeding Season of Endemic Species within the Study Area

Species name (scientific name)	Status	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Vinous-breasted Starling (*Acridotheres burmannicus**)	EN												
	LC												
Streak-eared Bulbul (*Pycnonotus blanfordi**)	EN												
	LC												
White-throated Babbler (*Chatarrhaea gularis**)	EN												
	LC												
Burmese Bush Lark (*Mirafra microptera**)	EN												
	LC												
Hooded Treepie (*Crypsirina cucullata** [c])	EN												
	NT												

Source: IUCN, 2019; Avibirds, 2019; Animaldiversity, 2019

Note: [a] *Mating can occur year round especially during wet season*
[b] *Mating occurs intermittently throughout the year but peak month is August and September*
[c] *Unknown*
* *Endemic to Myanmar and were found during the biodiversity survey*

5.3.2.3 Aquatic Biodiversity

Myanmar's fresh water is estimated to support over 350 freshwater fish species, a significant proportion of species that may be nationally endemic[1]. The Irrawaddy River is Myanmar's largest river, which runs through the west side of Block RSF-5, and is a healthy habitat for at least 43 aquatic species[2].

5.3.2.4 Invasive Species

Invasive species are any species that are non-native to a particular ecosystem and whose introduction and spread causes, or are likely to cause, socio-cultural, economic or environmental harm or harm to human health (FAO, 2013). Invasive species are naturalized species that reproduce often in large numbers and are spread over a large area, damaging native species (FAO, 2005).

According to the Global Invasive Species Database (GISD) (2019), 97 species have been identified as invasive species in Myanmar. A checklist of invasive species is provided in ***Appendix 4***. However, the database was unable to specifically state in which part of Myanmar the invasive species are being introduced.

5.3.2.5 Protected Areas and Sensitive Ecosystems

National Legally Protected Areas

According to Protected Planet database, and ERM in-house database concerning nationally protected areas, Myanmar has designated 59 areas within the country that are assigned as protected areas, more information outlined in ***Appendix 5***. No protected areas are present within Block RSF-5, as shown in ***Figure 5.25.*** The nearest protected areas are Wenthtikan Bird Sanctuary, located 50 km from the block, and Shwesettaw Wildlife Sanctuary, located 30 km from the block.

Key Biodiversity Areas

Key Biodiversity Areas (KBAs) are areas that regularly support significant populations of restricted range species which are considered to have global conservation priorities. This is because there are few or no other locations in the world for which conservation action for these species can be undertaken[3]. The identification of KBAs is considered to be an appropriate approach to identify areas as it helps to ensure that the global persistence of biodiversity (at genetic, species, and/or ecosystem levels) is preserved[4]. These areas are identified using globally standardised criteria and thresholds, and have delineated boundaries. They include vital habitat for threatened plant and animal species in terrestrial, freshwater and marine ecosystems[5]. More information is outlined in ***Appendix 5***.

No KBAs are found within and around the Project Area. The nearest KBA is 12 km from Project Area, as illustrated in ***Figure 5.25***.

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[1] Kullander, S. O., Ferraris, Jr, C. J., and Fang, F. (2004) Nga Myanmar fishes. World Wide Web electronic publication. Swedish Museum of Natural History.

[2] Fishbase.org, 2018, Freshwater Fish Species in Irrawaddy River [Central Myanmar (Burma)]. http://fish.mongabay.com/data/ecosystems/Irrawaddy.htm, accessed November 15, 2018.

[3] Convention on the Conservation of Migratory Species of Wild Animals. (2012). *Report from Myanmar Conservation of migratory water birds and their habitat in Myanmar* (p. 2). Convention on the Conservation of Migratory Species of Wild Animals. Retrieved from https://www.cms.int/sites/default/files/document/Inf_11_2_Report_from_Myanmar_0.pdf

[4] Palmer, C. (2019). *Key Biodiversity Areas Programme Strategic Plan Summary 2018-2024* (p. 3). Key Biodiversity Areas. Retrieved from http://www.keybiodiversityareas.org/userfiles/files/KBA%20strategic%20plan-%20WEB.pdf

[5] IUCN (2016) A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0. First edition. Gland, Switzerland: IUCN.

Important Bird Areas (IBAs)

Important Bird Areas (IBAs) refers to sites that have been identified to be globally important for the conservation of bird populations on the basis of an internationally agreed set of criteria[1]. For example important nesting and roosting areas.

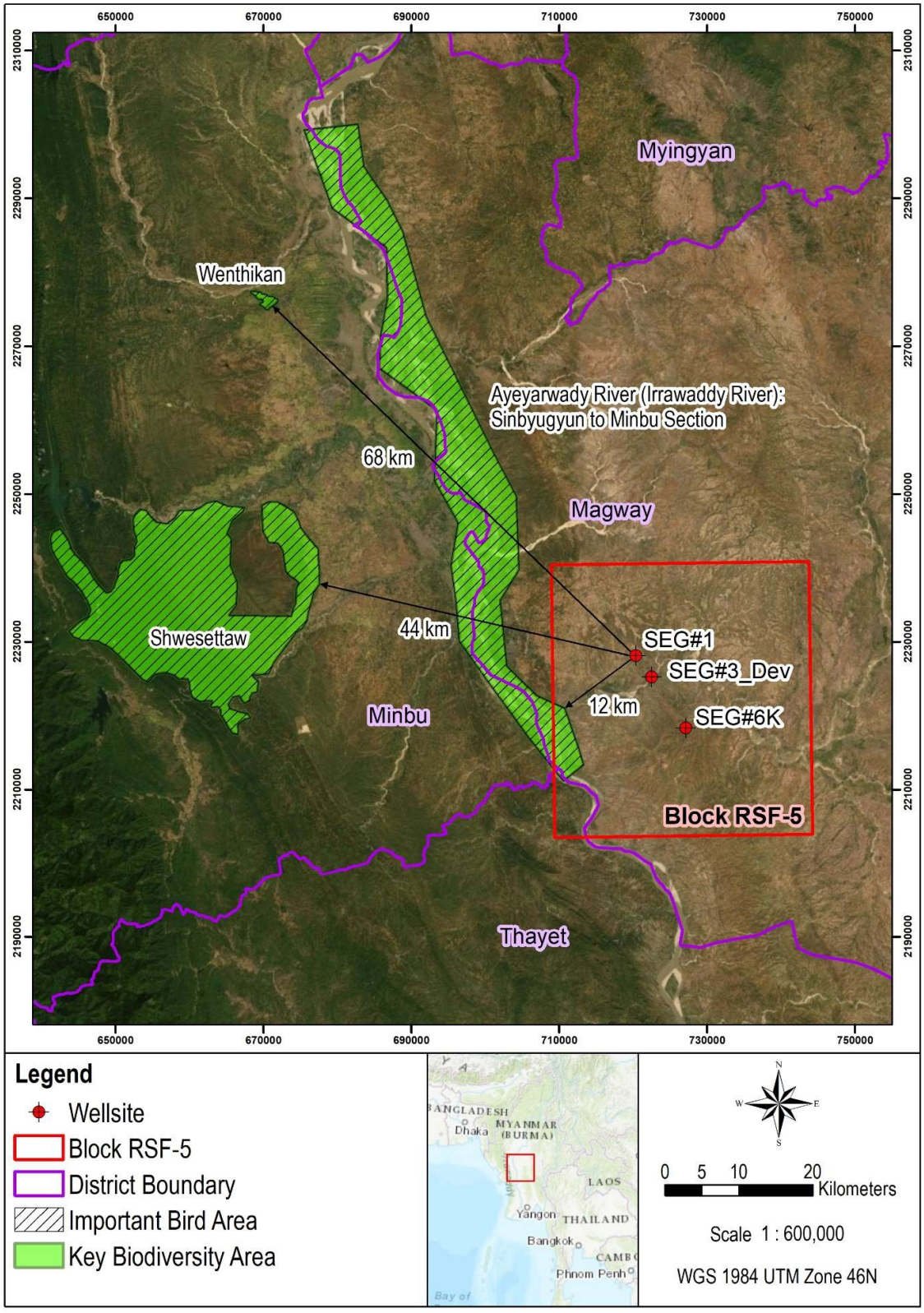
No Important Bird Areas (IBAs) are found within and around the Project Area. The nearest IBA is 12 km from Project Area, as illustrated in ***Figure 5.25***.

Endemic Bird Areas

In addition, no legally protected areas are present in the Study Area, but the whole Block RSF-5 is included in the Endemic Bird Area of Irrawaddy Plains, which extends in central Myanmar and the block is also included in the Indo-Burma biodiversity hot spot).

1 Donald, P., Fishpool, L., Ajagbe, A., Bennun, L., Bunting, G., Burfield, I, Butchart, S., Capellan, S., Crosby, M., Dias, M., Diaz, D., Evans, M., Grimmett, R., Heath, M., Jones, V., Lascelles, B., Merriman, J., O'brien, M., Ramírez, I., Waliczky, Z., Wege, D. (2019) "Important Bird and Biodiversity Areas (IBAs): the development and characteristics of a global inventory of key sites for biodiversity," Bird Conservation International. Cambridge University Press, 29(2), pp. 177–198. doi: 10.1017/S0959270918000102.

Figure 5.25: Protected Areas near Project



Source: SEM, 2019; modified by ERM, 2019

5.3.2.6 Ecosystem Services

Ecosystem services refer to the direct and indirect contributions of ecosystems, which human populations derive from[1]. They can be divided into the following categories:

- Supporting;
- Provisioning;
- Regulating; and
- Cultural services.

Biodiversity is not an ecosystem service in its own right, but possesses different elements that help support other ecosystem services. Increased levels of biodiversity (i.e. greater variety of genes, species, and ecosystem) tend to support a broader range of ecosystem services[2]. For this reason, improving biodiversity can also help to strengthen the resilience of ecosystem services.

Supporting Services

Supporting services are services (e.g. fish, crops, livestock, and timber) that enable the on-going structure of ecosystems to endure, as well as the living organisms and elements within them[3]. This is particularly important for local populations who may rely on hunting and gathering of wildlife for their survival. Unlike other types of services, they differ in that their impacts on people are either indirect or occur over a very long time[4]. For example, project activities may reduce access to food, thus, affecting both security and basic materials supporting the livelihood of the local community.

Regulating Services

Regulating services defined as benefits obtained from the regulation of ecosystem (i.e. floods, water flow regulation, land degradation, and disease) that can be essential for maintaining the health and security of people in the even to extreme weather conditions (e.g. storms or droughts)[5]. Oil and gas *regulating* service dependencies are typically more indirect and include a range of physical functions provided by vegetation and habitats such as erosion control, water filtration, and flood control. For instance, project activities, may degrade the area with activities such as earths works, and waste management within the Study Area.

Cultural Services

Cultural services such as recreation, tourism, aesthetic enjoyment and spiritual values can be extremely important in terms of providing personal satisfaction and livelihoods[6]. They can be important for remotely operating workforces that can benefit in terms of enjoyment, health and motivation, from activities such as ecotourism and bird watching, and simply from appreciating the surrounding undisturbed landscapes[7]. For instance, noise as well as visual disturbances may affect local residents quality of living and recreational activities.

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[1] Ecosystem services. Retrieved from https://biodiversity.europa.eu/topics/ecosystem-services

[2] Seddon, N., Mace, G., Naeem, S., Tobias, J., Pigot, A., & Cavanagh, R. et al. (2016). Biodiversity in the Anthropocene: prospects and policy. *Proceedings Of The Royal Society B: Biological Sciences*, *283*(1844), 20162094. doi: 10.1098/rspb.2016.2094

[3] Petrovic, E.K., Vale, B. and Zari, M.P., 2017. *Materials for a Healthy, Ecological and Sustainable Built Environment: Principles for Evaluation*. Woodhead Publishing.

[4] Pérez, G. and Perini, K. eds., 2018. *Nature based strategies for urban and building sustainability*. Butterworth-Heinemann.

[5] Regulating services. (2019). Retrieved from http://www.fao.org/ecosystem-services-biodiversity/background/regulating-services/en/

[6] UIS, 2009 UNESCO Framework for Cultural Statistics, 2009.

[7] Cultural services. (2019). Retrieved from http://www.fao.org/ecosystem-services-biodiversity/background/cultural-services/en/

Provisioning services

Oil and gas *provisioning* service dependencies include use of water, aggregates and timber for consumption by staff, and for the construction and operation of facilities[1]. In terms of provisioning services, oil and gas impacts include potentially restricting access for gathering wild food; on regulating services include reducing erosion and flood control through loss of vegetation cover[2].

5.3.3 Biodiversity Field Survey (Primary Data)

5.3.3.1 Introduction

A series of biodiversity surveys was undertaken during the dry season (in between 23rd to 27th April, 2019). SEM conducted these surveys to determine the existence and potential distribution of priority biodiversity values within the Study Area. The priority values focused on Critical Habitat[3] triggers as well as species of conservation significance. As part of the seismic survey, a biodiversity field survey was conducted in 2016, a total number of 65 flora species and 86 fauna species were observed during the survey. The biodiversity field survey and inspection report is shown in ***Appendix 5***.

Habitat assessment were also undertaken to inform Natural Habitat[4] and Modified Habitat[5] mapping as per by IFC PS6 Performance Standards. ***Figure 5.27*** shows the areas where surveys were conducted. The biodiversity field surveys targeted flora, birds, mammals, fish, amphibians, reptiles and insects for the Project Study Area.

The biodiversity surveys also ground-truthed the secondary data collection and evaluated the potential presence of High Biodiversity Value (HBV) species from which it was possible to identify whether Critical Habitat was triggered for any species in accordance with the International Finance Corporation's (IFC) Performance Standard 6 (PS6) Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC, 2012).

5.3.3.2 Methodology Overview

Pre-Mobilisation Planning

Publically available sources of information as well as ERM in-house data were analysed to determine potential priority biodiversity values within the Study Area and AoI, which serves the purpose of identifying species and habitats for the survey; planning survey locations (including local village interviews) and target flora and fauna species[6].

Aerial imagery was used to provide a spatial understanding of the pattern of vegetation communities and human uses on the site, and to map access routes and internal tracks.

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[1] Hannah, L., 2014. *Climate change biology*. Academic Press.

[2] Provisioning services. (2019). Retrieved from http://www.fao.org/ecosystem-services-biodiversity/background/provisioning-services/en/

[3] Critical Habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregator species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes

[4] Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

[5] Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition.

[6] Multilateral Financing Institutions Biodiversity Working Group & Cross Sector Biodiversity Initiative, July 2015. Good Practices for the Collection of Biodiversity Baseline Data.

In addition, planning for consultation with local ecologists (see ***Appendix 5***) to augment the baseline information, particularly concerning species that may potentially be present or previously sighted, was conducted to enhance understanding of the Project Study Area.

Determination of Biodiversity Survey Areas

The biodiversity survey areas, shown in ***Figure 5.27*** were determined based on the areas of habitat likely to be present based on the species screened during the desktop assessment. The areas were selected by the biodiversity subcontractor based on their local knowledge of the significant biodiversity areas, desktop screening exercises, remote sensing and review of data indicating natural habitat areas.

Error! Reference source not found. outlines the areas of land classes within the Study Area .

Table 5.30: Habitats and Land Use within the Study Area

Habitats and Land use	Description	Description (as per Myanmar Land Category)	Example Photo of Land Use
Agricultural land	The agricultural land use identified with the Project Study Area comprise mainly rice farming with some grazing areas for livestock such as cattle and goats and lotus ponds.	Farm Land - Agricultural cultivation (with user certificate)	
Scrub land, grassland and disturbed land	Scrub land habitats contain thickets of shrubs and young trees mixed with scattered grasses and wildflowers. A proportion of the site can be classed as disturbed habitat associated with derelict urban sites. Vegetation communities are varied, consisting of taller ruderal plants and lower (often grazed) grasses and herbs. Grassland are large open area with grasses and with minimal trees or shrub coverage and are often used for grazing purposes.	Grazing Land – Landing that is covered in grass or other plants that are suitable for grazing purposes Virgin Land – Can be processed to become farm land. A common land use in these lands is shifting cultivation or cultivation by those without user cetificates.	

Habitats and Land use	Description	Description (as per Myanmar Land Category)	Example Photo of Land Use
Urban and residential areas	Residential areas are used by local people and contain dwellings, gardens and small agricultural patches. Some natural vegetation including large trees may have existed for shading purposes. Areas around the project site contain residential areas associated with Yangon City to the north and Dala village on the southern bank of the Irrawaddy river. The rest of the area around the site consists of small villages and isolated rural dwellings.	-	
Standing water/waterlogged areas	Ditches and depressions in and around the Project Area contain standing water or are permanently waterlogged. Vegetation present is characterised by aquatic plants includingthe invasive *Eichhornia crassipes* and *Alternanthera philoxeroides.*	-	

Habitats and Land use	Description	Description (as per Myanmar Land Category)	Example Photo of Land Use
The Irrawaddy River (and its associated tributaries) and river bank	The stretch of river within the Project Area is an estuarine system but the stretch does not contain mangrove habitat, which is restricted to the southernmost zone of the river.	-	

Site Reconnaissance

A targeted site reconnaissance was carried out at the proposed drilling locations to ground truth information gathered and supplement it with site observations, data, and photographs. The areas were selected by the biodiversity subcontractor based on their local knowledge of the significant biodiversity areas, desktop screening exercises, remote sensing and review of data indicating natural habitat areas. The following objectives apply to the assessment:

- Identification of flora and fauna assemblages;
- Identification of ecologically sensitive areas;
- Identification of species of conservation value;
- Identification of future biodiversity monitoring and enhancement opportunities; and
- Identification of habitats and or areas of concern potentially containing species of conservation interest (e.g. species protected by local legislation and endemic to Myanmar or listed in international conventions for conservation of habitat or listed in International Union for Conservation of Nature (IUCN) Red Data Book.

The Field survey used the following sampling methodologies:

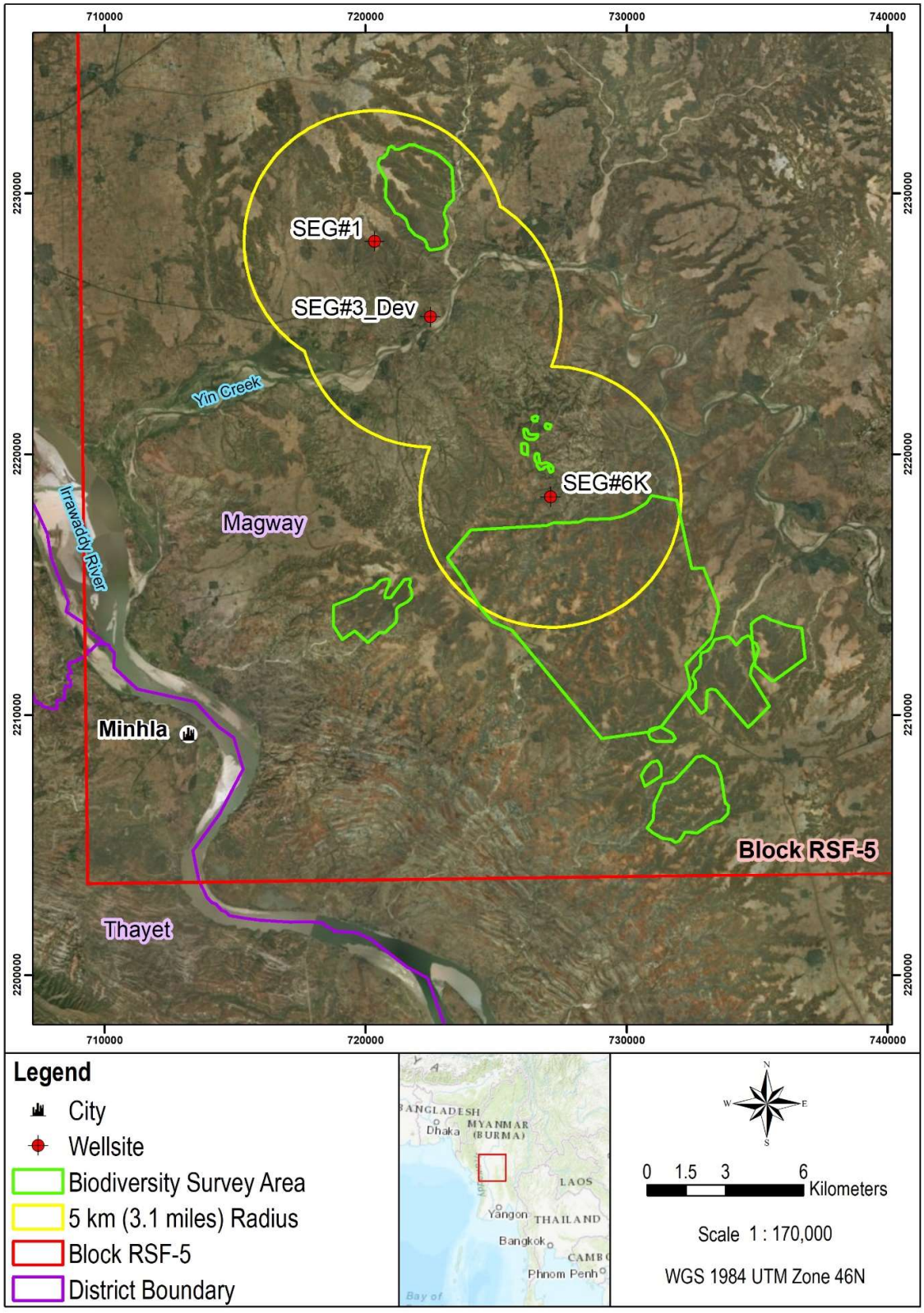
- Direct observation;
- Observation of fauna signs (e.g. footprints, scat, and feeding signs);
- Mist net survey; and
- Consultation with local residents (***Figure 5.26***).

Further methodology on specific surveys will be provided in the sections below, and the Biodiversity Survey Report is located in ***Appendix 5.***

Figure 5.26: Interviews with Local People


Source: SEM, 2019

Figure 5.27: Biodiversity Survey Areas



Source: SEM, 2019; modified by ERM, 2019

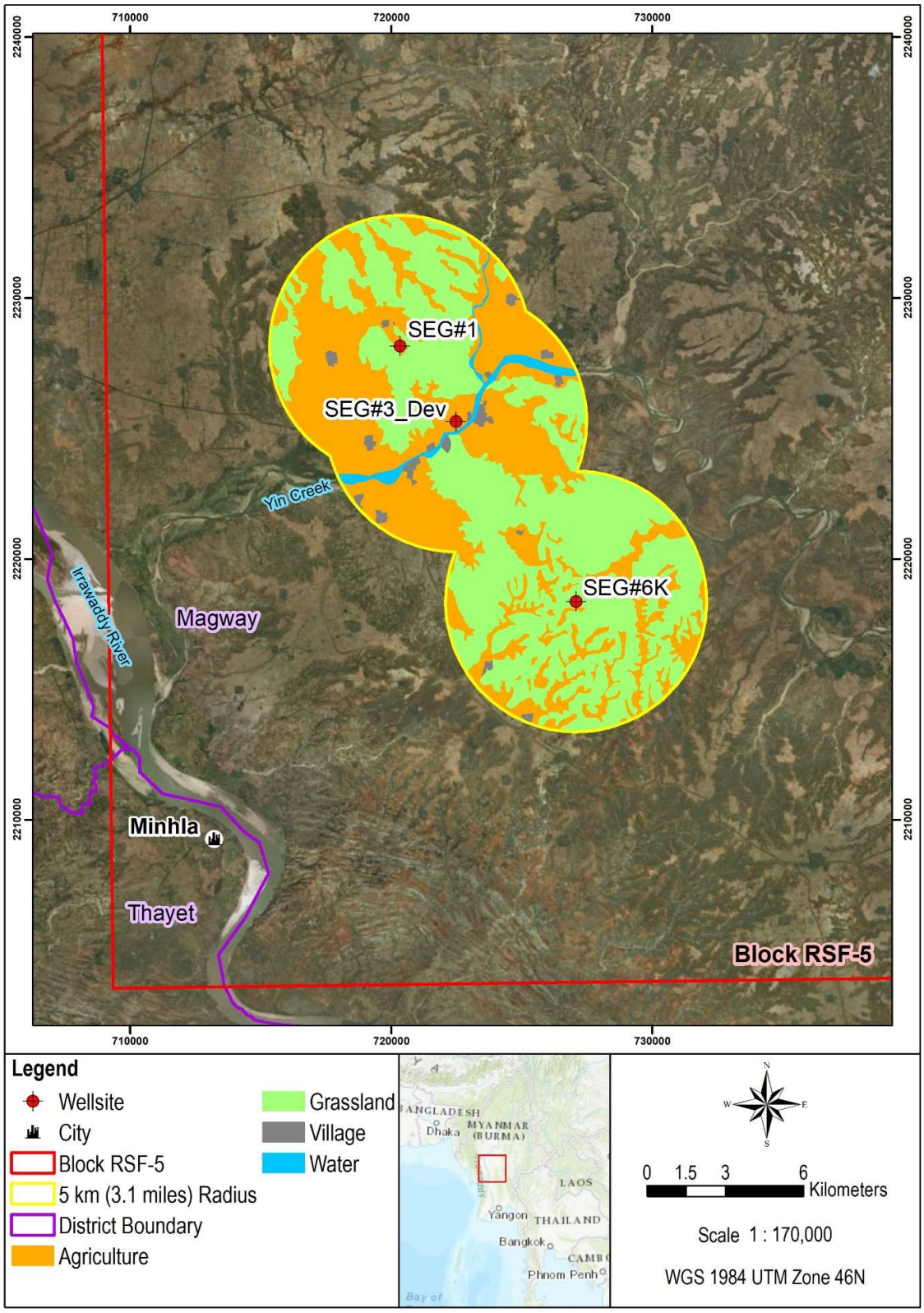
5.3.3.3 Results of Biodiversity Field Survey

Habitat Mapping

Satellite imagery was used to classify the habitats identified within the Project Study Area and AoI, following common land class categorisation and IUCN habitat classification scheme [1]. These land classes were then ground truthed during the field survey. The major habitats and land use areas identified during the survey include agriculture, scrubland and grassland, urban and residential, standing water/waterlogged and riverine habitat. ***Figure 5.28*** and shows the distribution of the land classes within the Study Area based on ***Table 5.30***.

[1] https://www.iucnredlist.org/resources/habitat-classification-scheme

Figure 5.28: Habitats and Land Use within the Study Area



Source: SEM, 2019; modified by ERM, 2019

Habitat Classification

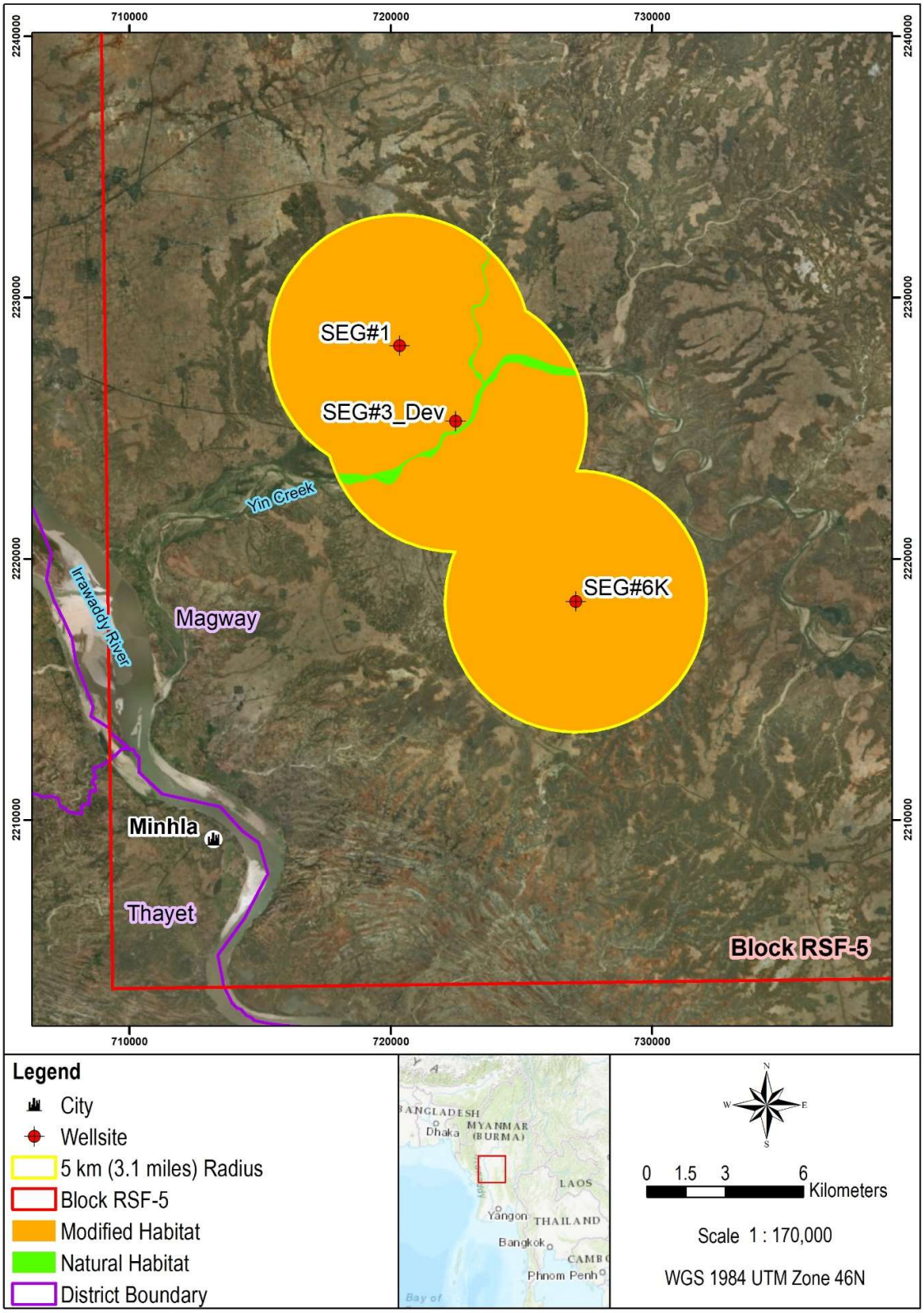
IFC PS6 asses the distribution of Natural Habitat and Modified Habitat in order to identify risks and mitigation measures for biodiversity values during the impact assessment phase. ***Table 5.31*** provides a description of natural and modified categories assessed upon visual evaluation with specialised professional, and ***Figure 5.29*** provides the distribution of natural and modified habitat within the Study Area. In and around the proposed Project Study Area, two major natural habitat types were found: shrub land, and dry forest area, as shown in ***Figure 5.30***. The estimations of natural versus modified habitat recorded at well site and riverbanks in the biodiversity surveys are approximately 2% (or 324 ha) natural habitat, and approximately 98% (or 18,262 ha) modified habitat.

Table 5.31: Natural and Modified Habitats within the Study Area

Habitat and Land use	IFC PS Habitat Classification	Justification
Roads	Modified Habitat	Roads are considered to be modified habitat. The ecological functions of the areas have been totally removed.
Agricultural land	Modified Habitat	Agricultural land is considered modified habitat. Little if any natural vegetation remains in these areas with predominately rice paddies or grazing land. Human use has substantially modified the condition of the habitat.
Scrub land, grassland and disturbed land	Modified Habitat	Scrub land and grassland is considered to be modified habitat in the Study Area. Historic clearing of the mid storey and canopy has removed the forest structure. The habitat is in a substantially modified state. On recently disturbed land, pioneer vegetation communities (including invasive species) have recently colonised areas of human disturbance.
Urban and residential areas	Modified Habitat	Urban and residential areas are considered as modified habitat. Human use has substantially modified the condition of the habitat.
Standing water/waterlogged areas	Modified Habitat	Artificial ie manmade ditches for drainage heavily modified watercourses and waterlogged depressions and ponds within the site are considered to be modified habitat. Standing/waterlogged areas around Study Area remain wet for the majority of the year.
The Irrawaddy River (and its associated tributaries)	Natural Habitat	The Irrawaddy River and its associated tributaries are considered to be natural habitat. Although containing sediment loads, the aquatic ecosystem contains naturally occurring species and is not in a substantially modified state.
Dry forest	Natural Habitat	Its composition of density and size of the tree is not uniform. The forest is not dense and has low number of species. Xerophytic types of vegetation grow where water supply is limited.
Shrubland	Natural Habitat	Shrubs comprise shrubs and small trees, in Myanmar, this habitat type plays a significant role in supporting many types of wildlife, especially for the bird community because it serves as an excellent nesting ground for many shrubland birds such as Hooded Treepie (*Crypsirina cucullata*) and White-throated Babbler (*Chatarrhaea gularis*).

Source: ERM, 2018

Figure 5.29: Natural Habitat and Modified Habitat within the Study Area



Source: ERM, 2018

Figure 5.30: Natural Habitat Types in the Study Area

Shrub Land	
	
Dominated by evergreen shrub thickets and young trees mixed with scattered grasses and wildflowers.	Composition of density and size of plant species is not uniform across this habitat type. Xerophytes are only found in areas where water supply is limited.
Dry Forest	
	

Source: SEM, 2019

Flora

Survey Method

A Global Positioning System (GPS) was used to navigate and mark coordinates between sample plots. Techniques such as plotless sampling and transect sampling were implemented with assistance of skilled local residents to record flora species observed within the Project Study Area, as outlined in ***Appendix 5***. Plotless sampling technique was conducted at random selected points within the survey area, whereas transect sampling was conducted across the sample site to determine specific sampling points.

Survey Results

Thirty-three (33) flora species were identified in the proposed Project Study Area, shown in ***Appendix 5***. Flora species that were observed during the field survey are classified as either Not Evaluated (NE); Data Deficit (DD); Least Concerned/ Lower Risk (LC); or Endangered (EN) based on the categories and criteria provided by the IUCN Red List.

Birds

Survey Methods

Transects and opportunistic methods were used to census the species richness while point counting was used to obtain the relative measure of bird abundance. Geographic coordinates for each bird survey site are reported in ***Table 5.32*** below and illustrated in ***Figure 5.31.***

Due to the fact that the observer has little knowledge of the sampling site prior to conducting field survey, an opportunistic sampling was chosen to help make sampling decisions during the process of collecting data, to obtain knowledge of the setting. Photographs were also taken for species identification, observed numbers and habitat utilization. To conduct species identification, field guide books and equipment such as binoculars, camera and GPS were used to identify the observed bird species.

Table 5.32: Bird Watching Transects

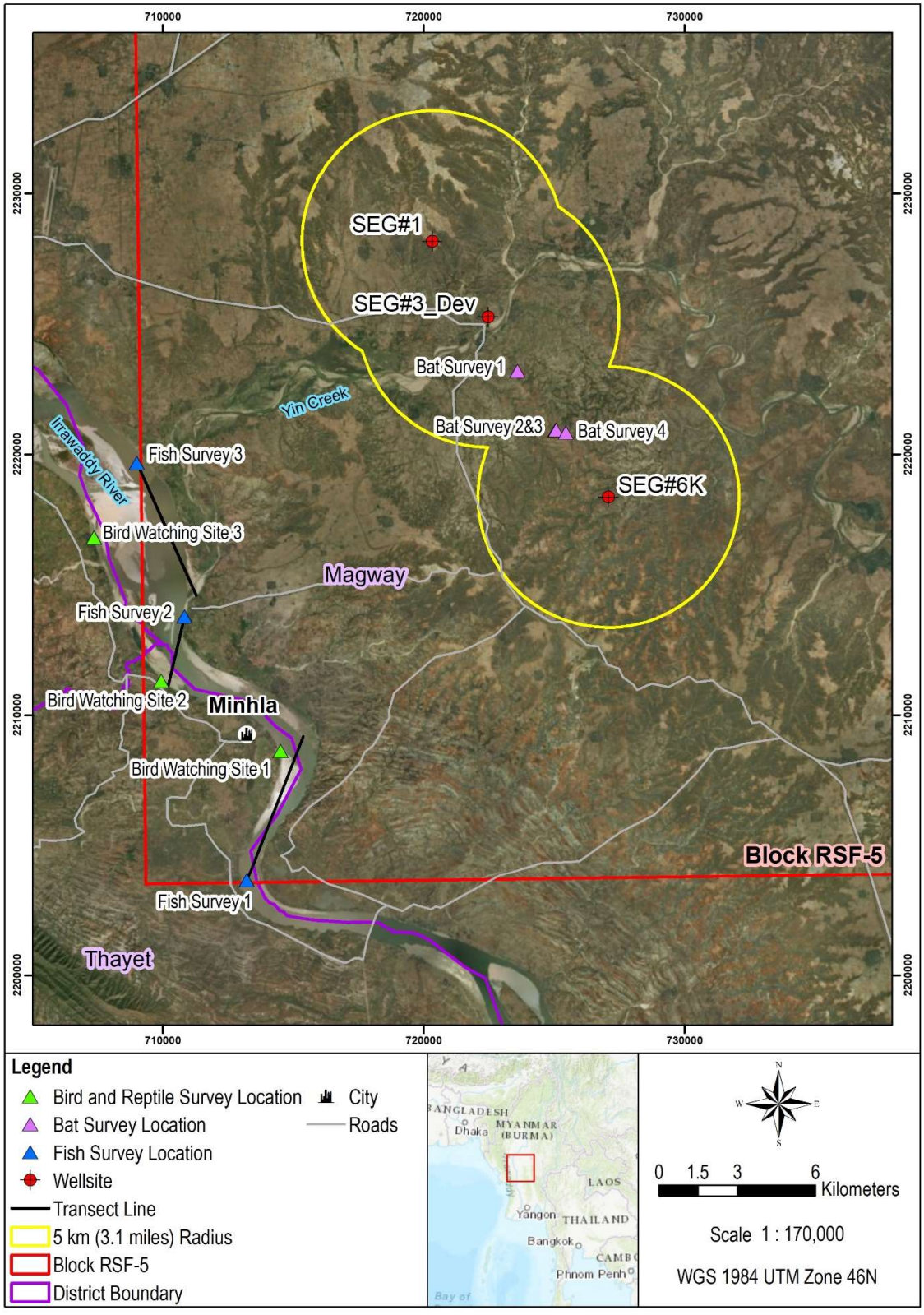
Survey Location	Transect	Latitude	Longitude
Bird Watching Site 1	Start point	19°58'06.46" N	95°04'00.87" E
	End point	19°55’02.80” N	95°02’13.28” E
Bird Watching Site 2	Start point	20°00'37.22" N	95°00'56.64" E
	End point	19°59'06.84" N	95°00'32.68" E
Bird Watching Site 3	Start point	20°02'36.67" N	95°00'30.48" E
	End point	20°00'59.50" N	95°01'11.08" E

Source: SEM, 2019

Survey Results

A total of 53 bird species of 47 genera belonging to 28 families were recorded in the survey area, as shown in ***Appendix 5***. 13 of the observed species were shore birds, while 40 of the observed species were forest birds. Out of the 53 observed bird species, the following five species are endemic to the survey area, namely, Vinous-breasted Myna (*Acridotheres burmannicus*), streak-eared bulbul (*Pycnonotus blanfordi*), White-throated Babbler (*Chatarrhaea gularis*), Burmese Bushlark (*Mirafra microptera)*, and Hooded Treepie (*Crypsirina cucullata)*. No threatened species was found in this area according to the globally threatened status.

Figure 5.31: Fauna Transects and Sampling Points



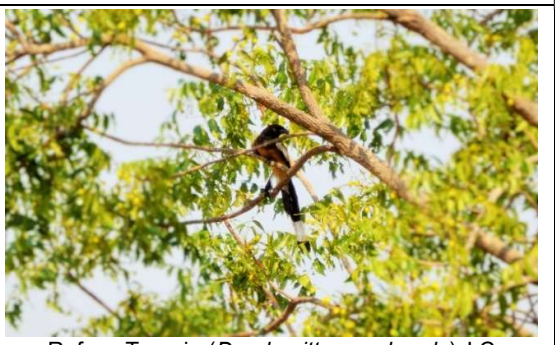
Source: ERM, 2019

Figure 5.32: Bird Species Recorded In and Around the Survey Area

Pacific Golden Plover (*Pluvialis fulva*); LC


Hooded Treepie (*Crypsirina cucullata*); NT/Endemic

Burmese Spot-billed Duck (*Anas Poecilorhyncha haringtoni*); LC


Rufous Treepie (*Dendrocitta vagabunda*); LC

Little Pratincole (*Glareola lactea*); LC


White-throated Babbler (*Chatarrhaea gularis*); LC/Endemic

Source: SEM, 2019

Notes: Based on IUCN Red list 2019 NE – Not Evaluated, DD – Data Deficit, LR/LC – Least Concerned/Lower, Risk, EN – Endangered, NT – Near Threatened

Mammals

Survey Methods

Three types of observational methods were carried out to survey mammal species found in and around the Study Area:

(1) direct observation,

(2) identification of signs (e.g. footprints, scat, feeding signs), and

(3) interviews with local community

Point count and transect count techniques were conducted during daytime, by which direct observation was used to survey arboreal species such as squirrels and tree shrews while identification of tracks and

signs was used to survey small carnivores. Geographic coordinates for each bat survey site are reported in ***Table 5.33*****,** and illustrated in ***Figure 5.31***. Photographs of encountered signs (e.g. footprints, scat, feeding signs) were taken and later examined for species identification with the help from local residents.

In addition, nocturnal mammals such as bats were surveyed using mist nets[1]. Through the use of mist netting, the fine nature of the nylon mesh helps to disrupt the bats' echolocation and cause them to fly into the net and become entangled. Once captured, they were then gently removed and measured for important characteristics such as sex, reproductive status, and age.

Table 5.33: Bat Survey Coordinates

Survey Location	Latitude	Longitude
Bat Survey 1	20° 5'34.03"N	95° 8'18.27"E
Bat Survey 2	20° 4'20.29"N	95° 9'8.07"E
Bat Survey 3	20° 4'19.95"N	95° 9'7.50"E
Bat Survey 4	20° 4'16.63"N	95° 9'21.24"E

Source: SEM, 2019

Survey Results

A total of 5 mammal species of 5 genera belonging to 5 families were recorded during the survey period from 23rd to 27th April, 2019, as shown in ***Appendix 5***. 3 species were observed and the presence of 2 species, as illustrated in ***Figure 5.33***, were acknowledged through interviews with local people who reside near to the survey area. According to the IUCN Red List, no threatened species was found in this area.

[1] It is critical to remove captured individuals as quickly as possible to reduce stress and the risk of injury.

Figure 5.33: Mammal Species Recorded In and Around the Survey Area

Asian Whiskered Myotis (*Myotis muricola*); LC

Asian Whiskered Myotis (*Myotis muricola*); LC

Prepare Mist Net for Bat Survey

Mist Net

Northern Tree Shrew (*Tupaia belangeri*); LC

Source: SEM, 2019

Notes: Based on IUCN Red list 2019 NE – Not Evaluated, DD – Data Deficit, LR/LC – Least Concerned/Lower, Risk, EN – Endangered, NT – Near Threatened

Fish

Survey Methods

Interviews with local fishermen were conducted to obtain information on the fishery process such as types of gears used (e.g. traps, hooks, lines, gill nets), number of fishing time per day, and target species. As part of the fish survey, fish specimens were collected by using traps to catch various types of fish species like surface dwellers and bottom dwellers, as locations as illustrated in ***Table 5.34*** and illustrated in ***Figure 5.34*****.** All fish were then photographed and measured for key identifying characteristics.

Table 5.34: Fish Survey Points

Survey Location	Latitude	Longitude
Fish Survey Point 1	19°58'06.46" N	95°04'00.87" E
Fish Survey Point 2	20°00'37.22" N	95°00'56.64" E
Fish Survey Point 3	20°02'36.67" N	95°00'30.48" E

Source: SEM, 2019

Survey Results

A total of 50 species belonging to 15 families were identified and recorded from the Irrawaddy River and near Project Study Area, as shown in ***Appendix 5***. The most recorded species are Chola barb (*Puntius chola*), Catla (*Catla catla*) and Rohu (*Labeo rohita*). The dominant Family is Cyprinidae. According to the IUCN Red List of threatened species, the following three fish species are near threatened species (NT) (2019), namely, Manipur osteobrama (*Osteobrama belangeri*), Indian butter-catfish (*Ompok bimaculatus*), and Boal (*Wallago attu*). Other fish species were classified under least concerned and not evaluated. Photographs of key fish species recorded are shown in ***Figure 5.34***.

Figure 5.34: Fish Species Recorded In and Around the Survey Area

Indian potasi (*Neotropius acutirostris*); LC

Boga labeo (*Labeo boga*); LC

Batchwa vacha (*Eutropiichthys vacha*); LC

Karnataka labeo (*Labeo calbasu*); LC

Chola barb (*Puntius chola*); LC

Indian gagata (*Gagata cenia*); LC

	
Manipur osteobrama (*Osteobrama belangeri*); NT	Tank goby (*Glossogobius giuris*); LC

Source: SEM, 2019

Notes: Based on IUCN Red list 2019 NE – Not Evaluated, DD – Data Deficit, LR/LC – Least Concerned/Lower, Risk, EN – Endangered, NT – Near Threatened

Herpetofauna

Survey Methods

Reptile surveys were conducted during daytime through point count method by directly observing and active searching in all major habitat types that were surveyed for birds as illustrated in ***Figure 5.31*** and coordinates shown in ***Table 5.35*** as well as in potential hiding places (e.g. among leaf litter, inside holes, under stones and logs). In the event that captured specimens could not be collected for preservation, photographs were taken and further consulted with local residents. In addition, all visual observations were also documented to examine the morphometric characters (e.g. sizes, shapes, patterns, spots, stripes, body length, and colour) of each specimen.

Table 5.35: Herpetofauna Transects

Survey Location	Transect	Latitude	Longitude
Herpetofauna Site 1	Start point	19°58'06.46" N	95°04'00.87" E
	End point	19°55’02.80” N	95°02’13.28” E
Herpetofauna Site 2	Start point	20°00'37.22" N	95°00'56.64" E
	End point	19°59'06.84" N	95°00'32.68" E
Herpetofauna Site 3	Start point	20°02'36.67" N	95°00'30.48" E
	End point	20°00'59.50" N	95°01'11.08" E

Source: SEM, 2019

Survey Results

A total of seven reptile species of six genera belonging to five families were recorded during the survey period, as shown in ***Appendix 5***. Five species were observed by surveyors and two species were inferred to be present based on interviewed from local people who live near the survey area. Based on the IUCN Red List of Threatened Species, no threatened and endemic species were found in and around the survey area. Photographs of key reptile species recorded are shown in ***Figure 5.35.***

Figure 5.35: Herpetofauna Species Recorded In and Around the Survey Area

Common Butterfly Lizard (*Leiolepis belliana*); LC

Garden Lizard (*Calotes versicolor*); NE

Blue Forest Lizard (*Calotes mystaceus*); NE

Common House Gecko (*Hemidactylus frenatus*); LC

Source: SEM, 2019

Notes: Based on IUCN Red list 2019 NE – Not Evaluated, DD – Data Deficit, LR/LC – Least Concerned/Lower, Risk, EN – Endangered, NT – Near Threatened

5.3.3.4 Key Findings of the Biological Receptors in the Project Study Area

The dominant habitat inside the Study area comprise mostly modified habitat (agricultural land) and the natural habitat is dry dipterocarp forest, shrub land and some degraded mangroves close to the riverbanks.

The biodiversity survey identified a total of 53 bird species, 5 mammal species, 7 herpetofauna species, and 50 fish species during the field observation. Of those, a total of 5 species of birds are endemic to the Study Area, namely vinous-breasted myna (*Acridotheres* burmannicus), streak-eared bulbul (*Pycnonotus blanfordi*), white-throated babbler (*Chatarrhaea gularis*), Burmese bush lark (*Mirafra microptera*), and hooded treepie (*Crypsirina cucullata*).

5.3.4 Critical Habitat Assessment

ERM has assessed critical habitat according to the thresholds within IFC PS6 to identify conservation significant species or habitats of concern within the Project area may warrant specific management and monitoring during the Project development. This section aims to identify critical habitat candidate

species within an area of analysis called an Ecologically Appropriate Area of Analysis (EAAA)[1]. The critical habitat screening assessment is a useful screening tool as part of a risk based approach to biodiversity management. For this Project, the EAAA is aligned with the Project Study Area, with particular emphasis on the biodiversity survey area, which was defined and explained previously. The following subsections define the critical habitat triggers and identify critical habitat candidate species.

Critical Habitat Triggers

Critical habitat is defined in IFC PS6 as areas with 'high biodiversity value', including (i) habitat of significant importance to Critically Endangered and/or Endangered11 species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes'.

Critical habitat is not limited to pristine or highly biodiverse areas but can include both modified habitat and natural habitats that support the biodiversity values that trigger the critical habitat criterion. Critical habitats can therefore be a subset of both modified habitat and natural habitat.

Critical habitat criteria are defined in PS6 Guidance Note 6 (GN6), Paragraphs GN69 to 97 (updated November 2018). ***Table 5.36*** provides detail of the qualifying requirements for critical habitat criteria 1 to 3 (i.e. thresholds), while details of the likely qualifying interests for Criterion 4 and 5 are defined based on research and expert opinion.

The five criteria are 'triggers' in that if an area of habitat meets any one of the criteria, it will be considered critical habitat irrespective of failing to meet any other criterion[2]. Therefore, critical habitat can be determined through a single criterion or where a habitat holds biodiversity meeting all five criteria. This approach is generally more cautious but is used more widely in conservation[3]. Critical habitat criteria therefore have two distinctive characteristics. First, components of biodiversity are essentially assigned to only two levels of conservation significance, those that trigger critical habitat and those that do not. Second, each criterion is applied separately and not in combination, meaning that the scores are not cumulative.

The assessment for critical habitat was undertaken as a screening process against the criteria defined within the IFC PS 6 Guidance Note, involving GIS analysis and desk based data collection, including a review of previous biodiversity studies.

Table 5.36: Critical Habitat Criteria (IFC PS6 Guidance Note 2019)

Criteria	Thresholds
Criterion 1: Critically Endangered (CR) / Endangered (EN) species:	(a) Areas that support globally-important concentrations of an IUCN Red-listed EN or CR species (0.5% of the global population AND 5 reproductive units of a CR or EN species); (b) Areas that support globally-important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in (a).

[1] An EAAA is defined by IFC PS6 as an area with a clearly demarcated boundary within which the biological communities and/or management issues have similarities with each other than they do with those in neighbouring areas. It represents the scale at which critical habitat is assessed using the quantitative thresholds identified with Criteria Habitat Criteria

[2] The Biodiversity Consultancy (TBC) (2013) Getting through PS6: Critical Habitat and its requirements. Case Studies from Guinea and Mongolia. Whitmore, T.C. (1984) Tropical Rain Forests of the Far East. Oxford University Press. Second Edition.

[3] McDonald-Madden, E. Gordon, A. Wintle, B. Walker, S. Grantham, H. Carvalho, S. Bottrill, M. Joseph, L. Ponce, R. Stewart, R. & Possingham, H. P. (2009). "True" Conservation Progress. Science 323: 43-44.

Criteria	Thresholds
	(c) As appropriate, areas containing nationally/regionally-important concentrations of an IUCN Red-listed EN or CR species.
Criterion 2: Habitat of significant importance to endemic and/or restricted-range species;	(a) Areas that regularly hold ≥10% of the global population size AND ≥10 reproductive units of a species.
Criterion 3: Habitat supporting globally significant concentrations of migratory species and/or congregatory species;	(a) Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle. (b) Areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.
Criterion 4: Highly threatened and/or unique ecosystems	(a) Areas representing ≥ 5% of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN. (b) Other areas, not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning.
Criterion 5: Areas associated with key evolutionary processes	No set criteria

Source: IFC, 2019

Notes: Endemic Species = an endemic species is one that has ≥ 95 percent of its global range inside the country or region of analysis1; Restricted-range Species = Species with world distributions of less than 50,000km1; Migratory species = Any species or lower taxon of wild animals, in which a significant proportion of the members of the entire population or any geographically separate part of the population cyclically and predictably crosses one or more national jurisdictional boundaries2; Congregatory Species = Species that gather in globally significant numbers at a particular site and at a particular time in their life cycle for feeding, breeding or resting (during migration)[3].

Critical Habitat Candidate Species (Criteria 1-3)

For Criteria 1 to 3, this exercise considers if habitats in which the candidate species are found could qualify as critical habitat under the IFC PS6. Candidate species were identified from previous biodiversity studies and other relevant desktop information sources. The critical habitat candidates and assessment against thresholds are summarised in ***Table 5.37***. Criteria 4 and 5 are not applicable to any of the species found in the Study Area (criteria 4 is applicable to ecosystems). In order to determine if the EAAA could provide critical habitat, each relevant species that was directly observed or predicted to occur onsite were subject to assessment. Biological and ecological requirements, likelihood of occurrence, migratory/ congregatory patterns and population dynamics were key themes involved in this assessment. In the table, Extent of Occurrence (EOO) refers to the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy.

[1] International Finance Corporation. (2019). Biodiversity Conservation and Sustainable Management of Living Natural Resources. Guidance Note 6. 6 (GN52), 16.
[2] Convention on the Conservation of Migratory Species of Wild Animals (1979) Convention on the Conservation of Migratory Species of Wild Animals. Convention on Migratory Species Secretariat, Bonn, Germany.
[3] Langhammer PF, Bakarr MI, Bennun LA, et al (2007) Identification and gap analysis of Key Biodiversity Areas: targets for comprehensive protected area systems. IUCN, Gland, Switzerland

Table 5.37: Candidate Critical Habitat Species (Criteria 1-3) and Assessment

Common Name	Scientific Name	Record Type	IUCN Listing	Criterion 1	Criterion 2	Criterion 3	Species information*	CH rationale
Vinous-breasted Myna	*Acridotheres burmannicus*	DO	LC		x		Vinous-breasted Myna is an endemic species to Myanmar and can be found in habitat types such as shrubland, artificial/terrestrial, and grassland. Its geographic range covers an estimated extent of occurrence (EOO) of 420,000 km in areas from sea level elevation up to 1500m. Though the number of mature individuals is reported to be unknown by the IUCN Redlist, it is believed that its population size is increasing due to more and more suitable habitats being generated in Myanmar (Feare and Craig, 1998)[1]. Threats faced by this species include international trade for pets/display animals and horticulture.	Vinous-breasted Myna is not a restricted-range species because its EOO exceeds the threshold of 50,000 km^2 (Criterion 2). Therefore, it does not meet the conditions outlined for criterion 2.
Streak-eared Bulbul	*Pycnonotus blanfordi*	DO	LC		x		Streak-eared Bulbul is a bird species native to Myanmar, Cambodia, Malaysia, Thailand, and Vietnam. It can be found in habitat types such as shrubland and artificial/terrestrial forest and has an estimated extent of occurrence (EOO) of 1,910,000 km^2. As outlined by the IUCN Redlist, its current population trend is	Streak-eared Bulbul is not a restricted-range species because its EOO exceeds the threshold of 50,000km^2 (Criterion 2). Therefore, it does not meet the conditions outlined for criterion 2.

[1] Feare, C.; Craig, A. 1998. Starlings and Mynas. Christopher Helm, London.

Common Name	Scientific Name	Record Type	IUCN Listing	Criterion 1	Criterion 2	Criterion 3	Species information*	CH rationale
							observed to be stable, however, its number of mature individuals is still unknown.	
White-throated Babbler	*Chatarrhaea gularis*	DO	LC		x		White-throated Babbler is an extant species to Myanmar and has an estimated extent of occurrence (EOO) of 285,000 km^2. Its habitat types include shrubland and artificial/terrestrial forest. According to the IUCN Redlist, its number of mature individuals is still unknown but its current population trend has been reported to be stable.	White-throated Babbler is not a restricted-range species because its EOO exceeds the threshold of 50,000km^2 (Criterion 2). Therefore, it does not meet the conditions outlined for criterion 2.
Burmese Bush Lark	*Mirafra microptera*	DO	LC		x		Burmese Bush Lark is an extant species to Myanmar that can be found in habitat types such as artificial/terrestrial grassland and shrubland. Its geographic range covers an estimated extent of occurrence (EOO) of 104,000 km^2 According to the IUCN Redlist, its current population trend has been reported to be stable, however, its number of mature individuals is still unknown.	Burmese Bush Lark is not a restricted-range species because its EOO exceeds the threshold of 50,000km^2 (Criterion 2). Therefore, it does not meet the conditions outlined for criterion 2.

Common Name	Scientific Name	Record Type	IUCN Listing	Criterion 1	Criterion 2	Criterion 3	Species information*	CH rationale
Hooded Treepie	*Crypsirina cucullata*	DO	NT		x		Hooded Treepie is a bird species which can be found in habitat types such as artificial/terrestrial shrubland and forest. Its geographic range covers an estimated extent of occurrence (EOO) of 180,000 km^2. According to the IUCN Redlist, its population trend is currently decreasing with an unknown number of mature individuals. Today, threats faced by this bird species include agriculture and deforestation.	Hooded Treepie is not a restricted-range species because its EOO exceeds the threshold of 50,000km^2 (Criterion 2). Therefore, it does not meet the conditions outlined for criterion 2.
Manipur osteobrama	*Osteobrama belangeri*	DO	NT			x	Manipur osteobrama is a species endemic to Myanmar and can be found in wetlands (inland) habitat type. Its geographic range covers an estimated extent of occurrence (EOO) of 102,300 km^2. Primary threats faced by this species include commercial captive breeding for food production. According to the IUCN Redlist, both its population trend and number of mature individuals are still unknown.	The EAAA is not considered significant to Manipur osteobrama in terms of regular refuge points or available resources. It is unlikely that the EAAA supports ≥ 1 percent of the global population or supports ≥10 percent of the global population of a species during periods of environmental stress. This species is not considered

Notes: DO = Direct Observation; IO = Indirect Observation; P = Predicted; EN = Endangered; NT = Near Threatened; LC = Least Concern; X = Yes

5.4 Social and Health Resources

5.4.1 Project Social Area of Influence

The Project Site and its surrounding area are referred to as the 'Study Area', which stretches 5 km around each of the project site as previously described in ***Section 5.1.1***.

The Social Area of Influence (SAoI), where data collection has been conducted to help establish the socio-economic baseline, is defined as the area inhabited or used by stakeholders and likely to be positively or negatively affected by the Project. This includes short, long term or permanent changes, positive and negative effects as well as direct, induced or indirect impacts.

The Project SAoI of the Project span over three (3) Townships, namely Magway, Minhla and Minbu and 74 villages (see ***Figure 5.36***).

5.4.2 Data Collection

The information presented in this Section was gathered initially through a desktop review of publicly available sources. In addition, to provide a more precise understanding of the social, socio-economic, health and cultural heritage conditions in the Project area, primary data have been collected just after the first Public Consultation session between March 19th and March 23th 2019. The methods for gathering primary data included household questionnaires, face-to-face interview with key informants and focus group discussions with designated interviewees. Key stakeholder groups includes village leader, women, fisherman, nurse/ medical/ health officers and famers within the local villages. A total of 150 household questionnaires as well as 13 Focus Group Discussions and 16 Key Informant Interviews have been administered in Magway, Minhla and Minbu Townships. Examples of the tools used for primary data collection for social baseline are included in ***Appendix***

The collection of secondary and primary data provided an opportunity to triangulate the data to confirm the accuracy of the information presented. Given the limited secondary data available at the local level, it also ensured a more robust baseline against which the likely impacts associated with the Project could be assessed.

Data provided in this chapter for local level baseline and indicated without specific footnote is extracted from ERM's interview process

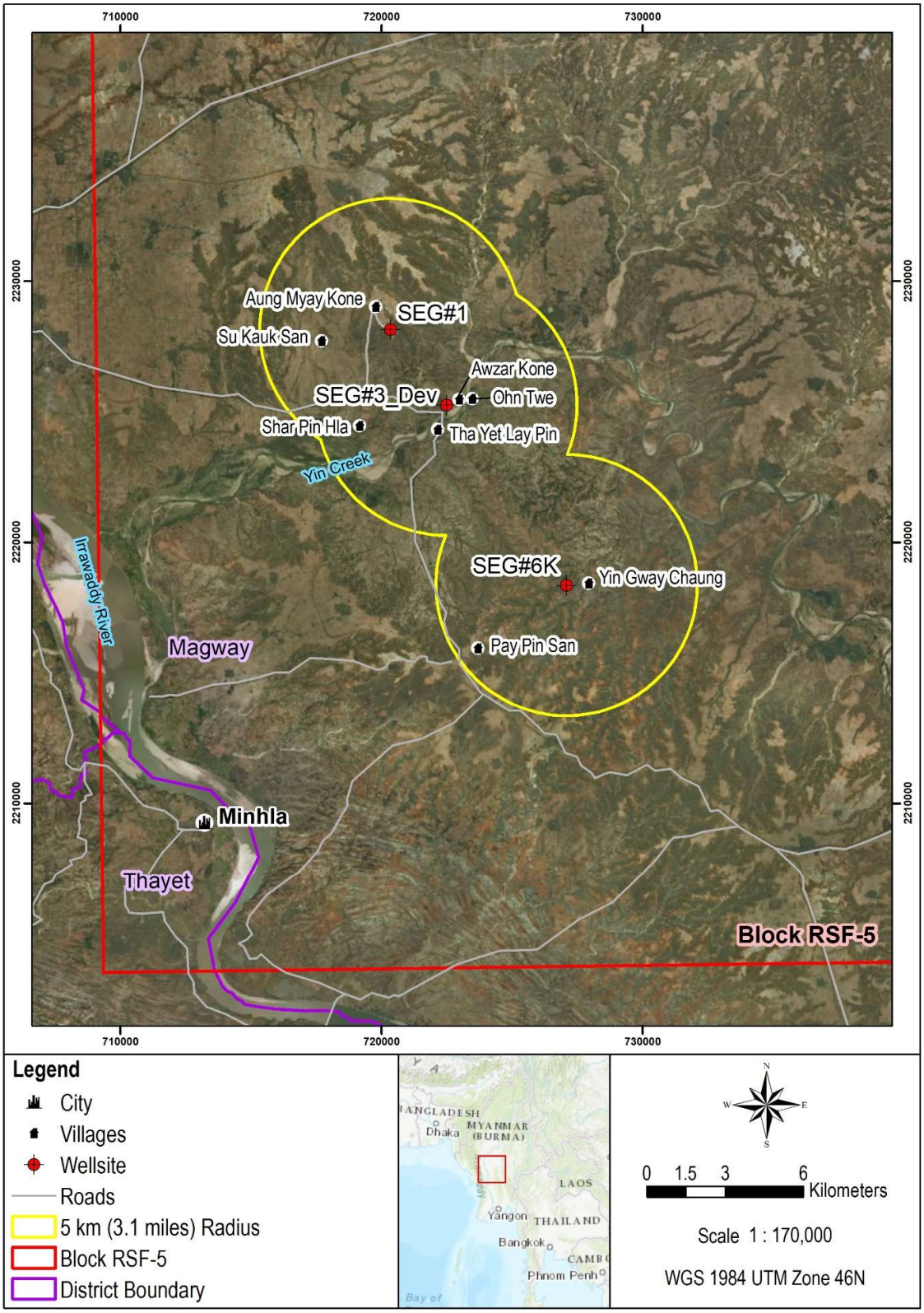
5.4.3 Social Receptors

The baseline focuses on the receptors that may be impacted or influenced by the Project due to their proximity to the Project site and/ or Project associated infrastructure. ***Figure 5.36*** and ***Table 5.38*** summarize the villages and receptors within the Study Area.

Table 5.38: Villages within the Study Area

Township	Villages
Magway Township	Aung Myay Gone, Pay Pin San, Ohn Twe, Awzar Gone, Mi Kyaung Ye, Yin Gway Chaung, Su Kauk San, Shar Pin Hla, Saik Kya,, Sitt Ko Pin and Ge Gyi Gone Village
Minhla Township	See, Sin Ma Kya, Shan Tat, Sit Sa Noet, Kyauk Pa Tung, San Kan, Nyaunt Pin Tha, Kone Gyi, Sat Pyar, Kanyin Gyi, Ban Pyin, Sann Le, Nagar Eike, Myae Char, Pin Ga, Bweit, Sin Ma Taung, San Aing, Nyaung Waing, Lin Kei, Kyauk Lat Khat, Pan Taw Pyin, Let Pan Ta Gar, Daung Boke, Pa Ni Son, Ye Kyaw, Myo Ma, Myo Thit, Ma Lun, Htan Kaing, Yae Khar, Nwar Le, Yone Yat, San Gyi, Yae Ngan, Ywar Taw, Lar Aing, Mi Laung Kone, Lel Hla, Pay Taw Kone, Kwat Thit, Yae Nan Ma, Yaw Twin Gyi, Daung Boke, Dee Doke Kan, Sa Line, Ooe Bo Kone, Auk Kaing, Linn Kae, Kan Toke, Kani, Malunsam, Kyauk Pon, Ka Daung Kyin, Sam, Thakhut Kwin, Tha Pyay Taw, and Ta Lote Yin Village
Minbu Township	Bayar, Hluttaw, Pan Taung, and Min Hal Kyin Village

Figure 5.36 Project Social Area of Influence

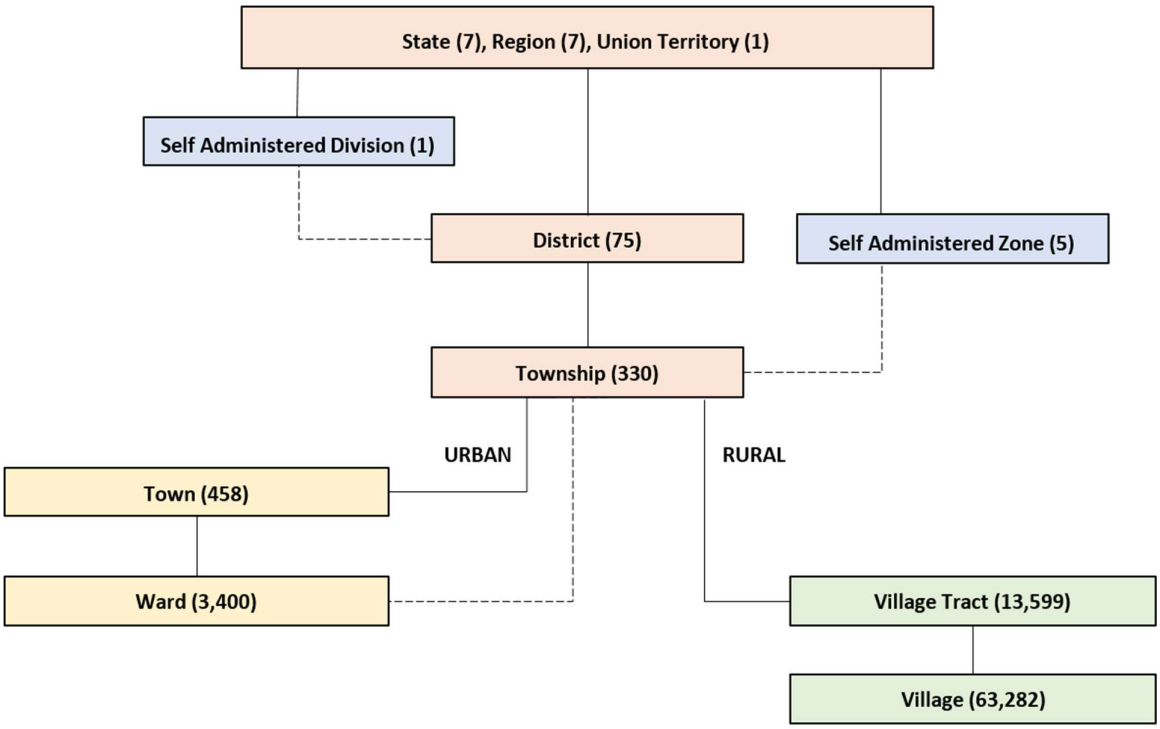


Source: Eni, 2019; modified by ERM, 2019

5.4.4 Administrative Organisation

Myanmar became Democratic in 2010[1] by adopting the unitary system with a president as the head of the state. Myanmar government structure is divided into three sectors; the Judiciary, Executive and Legislative. The Executive sector is where the Union Ministries and Union Civil Servant Board are operated. Myanmar administrative structure is composed of 7 Stages, 7 Regions, 75 Districts, and 330 Townships (***Figure 5.37***). More detail on administrative regions in Myanmar can be refer to ***Section 3.3.1***: Administrative Division of Myanmar. The capital city of Myanmar is Nay Pyi Taw.

Figure 5.37 Myanmar Administrative Structure



Source: MIMU, 2017[2]

[1] Akar, O. (July, 2016). Local administration and policy implementation in local government of Myanmar. Retrieved April 4, 2019 from www.grips.ac.jp/teacher/oono/hp/course/student_slides/2016/akar_localgovts.pptx+&cd=4&hl=th&ct=clnk&gl=th

[2] Myanmar Information Management Unit (MIMU). (December, 2018). Myanmar Administrative. Retrieved on April 4, 2019 from http://themimu.info/sites/themimu.info/files/documents/Administrative_Structure_2008Constitution_Dec2018.pdf

Magway region comprises of five districts; Gangaw, Pakokku, Minbu, Magway, and Thayet district (***Figure 5.38***). There are total of 26 Townships, 166 wards and 4,795 villages established in the region.

Magway Township covers a total area of 1,767 km^2 in Magway district. There are 15 wards and 61 village tracts in the Township[1]. The capital city is Magway city.

Minhla Township have the total area of 2,371.4 km^2 in Thayet district. There are 6 wards and 63 village tracts in the Township[2]. The capital city is Thayet city.

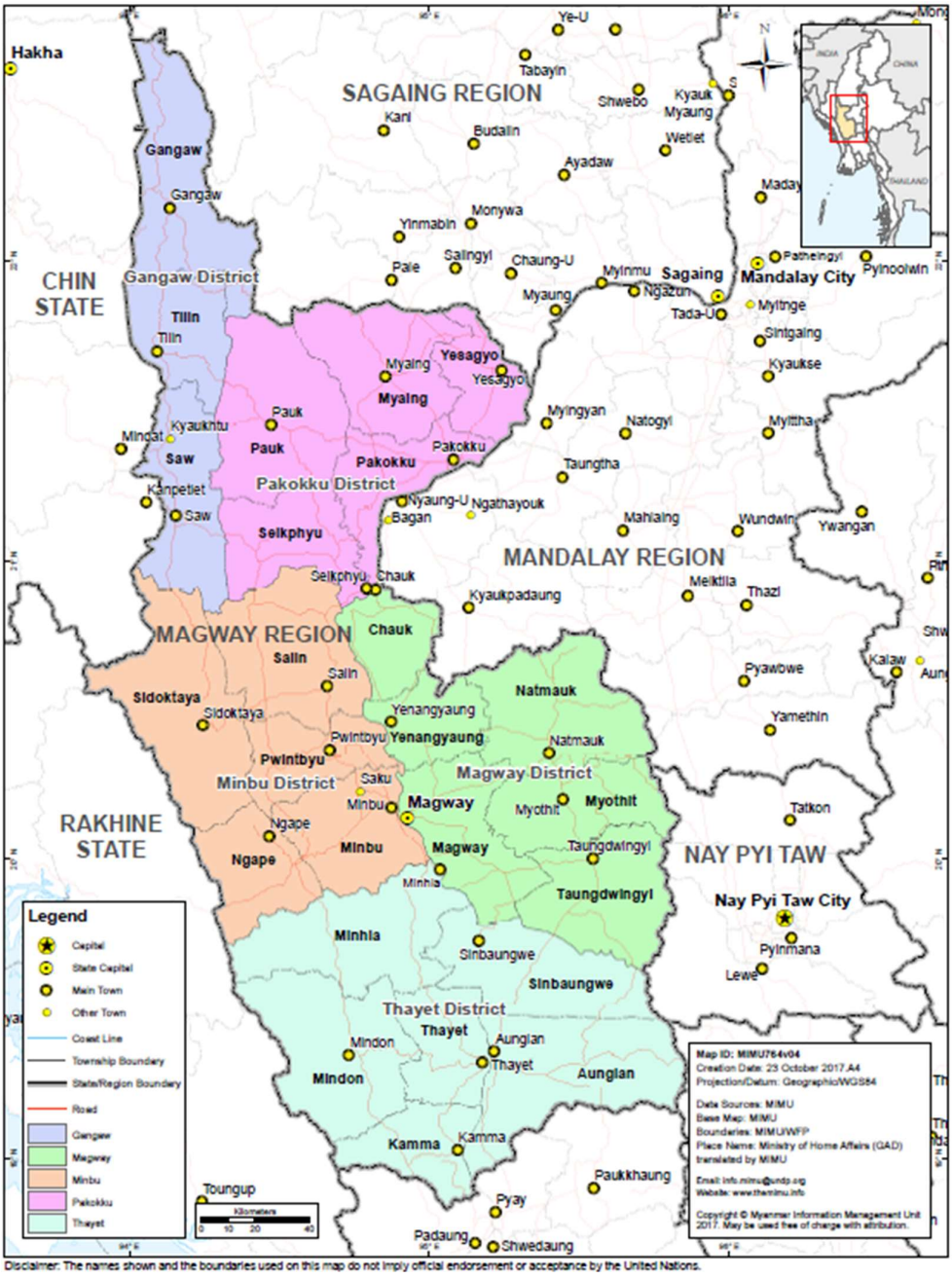
Minbu Township have a total area of 1,664.6 km^2 in Minbu district. There are 7 wards and 67 village tracts in the Township[3]. The capital city is Minbu city.

[1] Department of Population, Ministry of Immigration and Population A. (October, 2017). The 2014 Myanmar population and housing cencus: Magway region, Magway district, Magway township report. *The republic of the union of Myanmar*. (pp.7,11). Retrieved March 18, 2019 from https://themimu.info/sites/themimu.info/files/documents/TspProfiles_Census_Magway_2014_ENG.pdf

[2] Department of Population, Ministry of Immigration and Population B. (October, 2017). The 2014 Myanmar population and housing cencus: Magway region, thayet district, minhla township report. *The republic of the union of Myanmar*. (pp.7, 28). Retrieved March 19, 2019 from http://themimu.info/sites/themimu.info/files/documents/TspProfiles_Census_Minhla_2014_ENG.pdf

[3] Department of Population, Ministry of Immigration and Population C. (October, 2017). The 2014 Myanmar population and housing cencus: Magway region, Minbu district, Minbu township report. *The republic of the union of Myanmar*. (pp.7, 28) Retrieved March 19, 2019 from https://themimu.info/sites/themimu.info/files/documents/TspProfiles_Census_Minbu_2014_ENG.pdf

Figure 5.38: District Map of Magway Region



Source: Department of Population, Ministry of Immigration and Population (MIMU), 2017

5.4.5 Demographic Profile

Magway Region

Based on the region census report, there was 3,917,055 people living in Magway region in 2014, making it ranks seventh in population size in Myanmar. This number comprised 1,813,974 male (46.3%) and 2,103,081 female (53.7%). The gender ratio was 86 males per 100 females. In this region, most people are aged from 15 – 64 years old. About 1,729,280 of people over 14 years old were married[1].

The dominant religion in the region is Buddhism (98.8%), while Christianity, Islam, Hindu and others religions are also present in small numbers (***Table 5.39***).

Table 5.39: Percentage of Magway Region's Population by Religion

Religion	Percentage
Buddhist	98.8
Christian	0.7
Islam	0.3
Hindu	0.1
Animist	0.1
Others	Less than 0.1%
None	Less than 0.1%

Source: Department of Population, Ministry of Immigration and Population A. (October, 2017), p.13

The population density was 87 people per km^2. Out of the total population, a majority (85%) lived in the rural area, while a large part of the population (1,235,030 people) resided in Magway district. There was 3,786,538 people who lived within a total of 919,777 conventional households (a place where one or more persons share living quarter and meals, regardless of whether they are related or unrelated and is usually headed by a male) with on average 4 people per households[1].

According to the World Food Program (WFP), in 2016, Magway region was considered to be economically one of the poorest regions in Myanmar. Varied causes were identify as the lack of jobs, poor infrastructure and services, limited access to land, inadequate farming input and food insecurity for the vulnerable[2].

Magway Township

With a population of 289,247 people in the Township, the population density was about 164 people per km^2 (almost twice the region density). There are more females than males with 154,144 (53.3%) and 135,103 (46.7%) respectively. The gender ratio was 88 males per 100 females. In this Township, the population of aged 15-64 was 67.5% or 195,250 people (***Figure 5.39***[1]). Base from the household survey conducted by ERM, the majority of the population are of Bamar ethnicity.

There were 68,677 households, with an average size of 4 people per households in Magway Township. The majority of the people lived in the rural areas. Overall, most household in the Township are living in bamboo houses (52.5%) and followed by wooden house (27.1%)[3]. However, based on the household

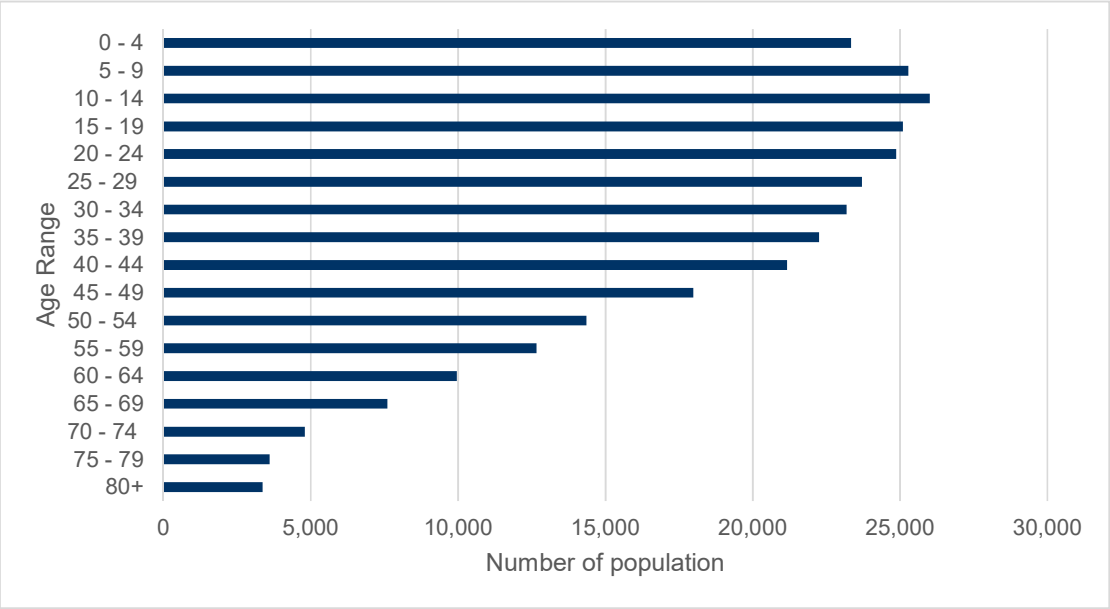
[1] Department of Population, Ministry of Immigration and Population. (May, 2015). The 2014 Myanmar population and housing cencus: Magway region report, census report volume 3-h. *The republic of the union of Myanmar*. (pp. 10-12,16). Retrieved March 18, 2019 from http://www.dop.gov.mm/sites/dop.gov.mm/files/publication_docs/magway_region_census_report_-_english.pdf

[2] WFP Myanmar. (June, 2016). Magway operation brief. *WFP Myanmar*. Retrieved March 21, 2019 from https://www.wfp.org/sites/default/files/wfpMYA_MagwayOB_June16.pdf

[3] Department of Population Ministry of Immigration and Population A, (October, 2017). pp.7, 28

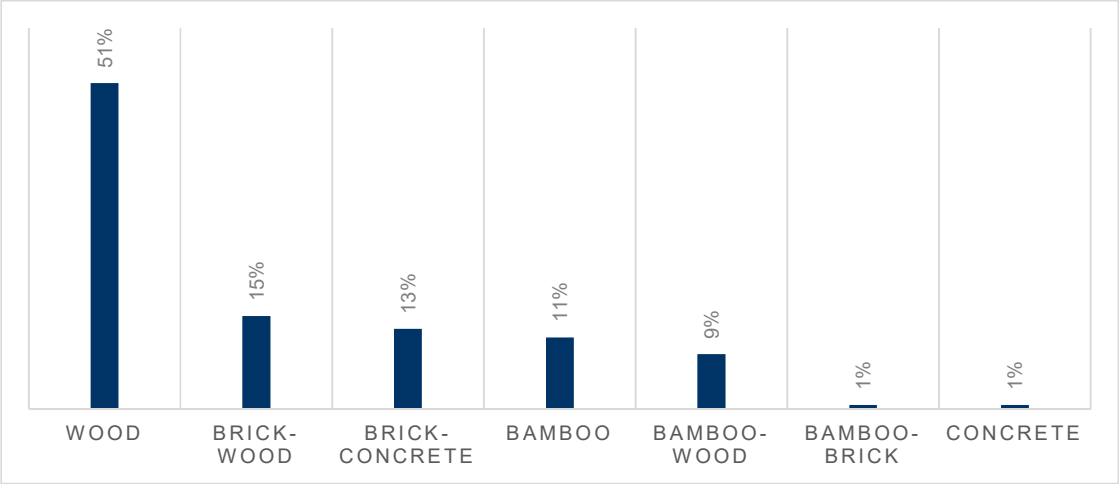
survey, half of the interviewees' house were constructed with wood or partially wood more than bamboo and about 28% were made from brick (***Figure 5.40***).

Figure 5.39: Population Ranges in Magway Township



Source: MIMU, 2015; modified by ERM, 2019

Figure 5.40: Housing Material in Magway Township



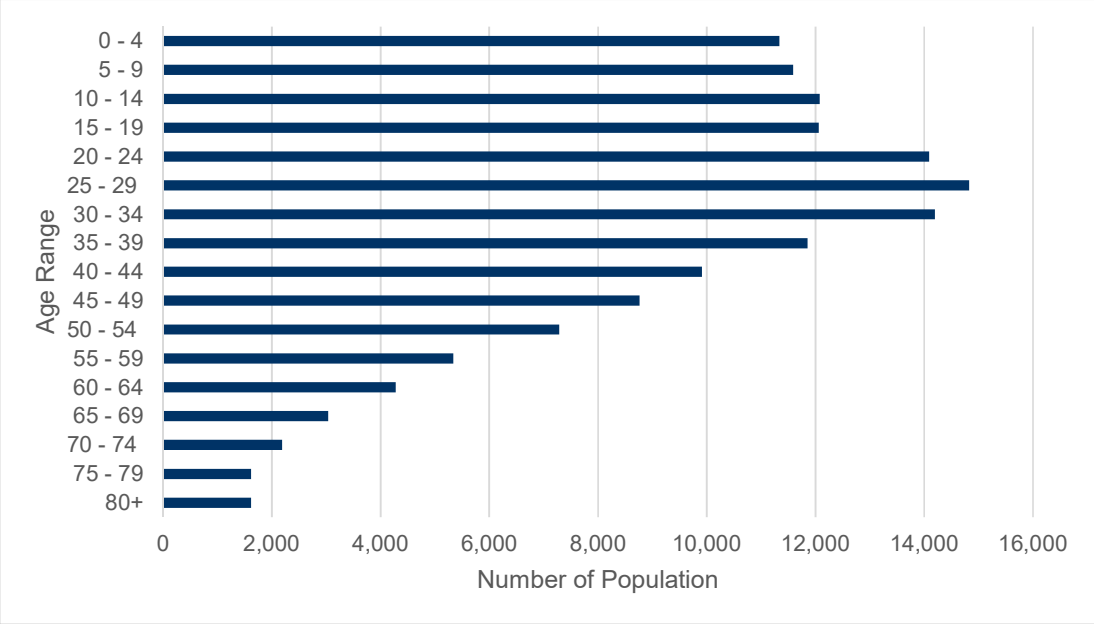
Source: ERM, 2019

Minhla Township

There was 146,082 people in the Township in 2014 with a population density of about 61.6 people per km^2. Male population was slightly higher than female with 73,133 (50.1%) and 72,949 (49.9%) respectively. The gender ratio was about 100 males per 100 females. The population of aged 15 – 64 in the Township was 70.2% or 102,612 people (***Figure 5.41***).

There were 31,622 household, with an average size of 4 people per household. It was reported that the majority of the population in the Township lived in the rural areas (91.4%) and most houses in the Township are made from bamboo (48.9%)[1].

Figure 5.41: Population Ranges in Minhla Township



Source: MIMU, 2016; modified by ERM, 2019

Minbu Township

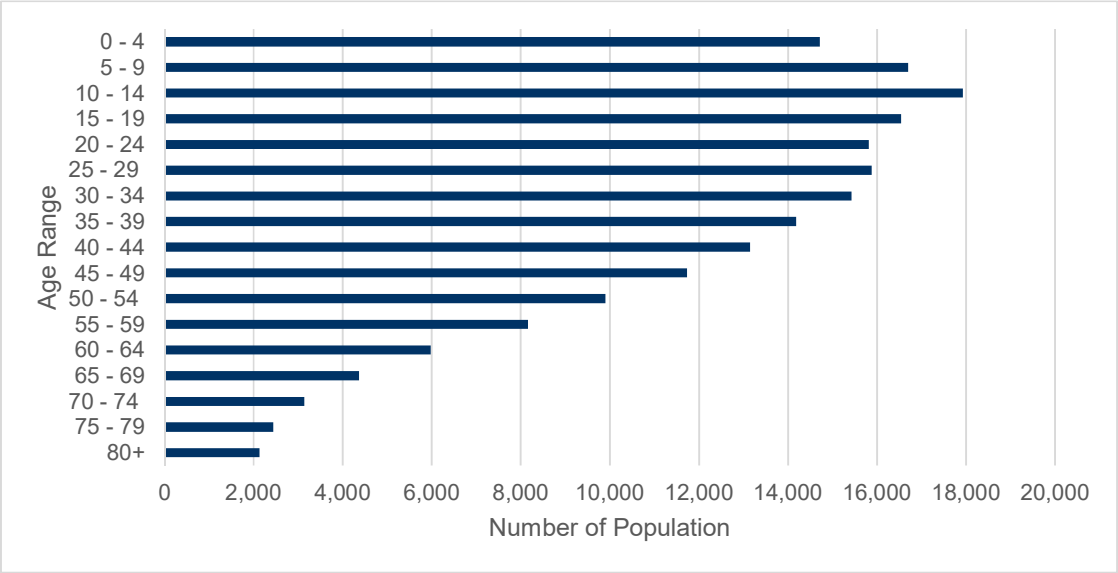
There was 188,182 people in the Township with a population density of 113 people per km^2. Male population was lower than female with 88,262 (46.9%) and 99,920 (53.1%) respectively. The gender ratio was 88 males per 100 females. The population of aged 15 – 64 in the Township was 67.4% or 126,764 people (***Figure 5.42***).

There were 43,817 household with an average size of 3.9 people per household. The majority of the population live in the rural areas. Most houses in the Township are made from bamboo (64%)[2].

[1] Department of Population Ministry of Immigration and Population B, (October, 2017). pp.7, 28

[2] Department of Population, Ministry of Immigration and Population C. (October, 2017). pp.7, 28

Figure 5.42: Population Ranges in Minbu Township



Source: MIMU, 2016, modified by ERM, 2019

5.4.6 Livelihood and Economy

Local people cultivate rice, chillies, beans and corn in river valleys and seasonal sandbars. Cotton, beans and sesame are cultivate in mountain valleys and uplands. Oil production takes place in the western margin of the lowlands, mainly to the west of Irrawaddy River. In addition, there are a number of “hand-dug oil well” communities, which are a unique phenomenon in Myanmar.

In addition, the labour force participation rate (the ratio between the labour force; employed and unemployed, and the size of the total population) in Magway region was 71.3% (aged 15 - 64). On the other hand, the unemployment rate was 3.3%[1].

5.4.6.1 Employment

Magway Region

In 2014, the labour force participation rate, the number of people actively participating in the labor force (working or actively searching a job) divided by the total number of people eligible to participate in the labor force (population aged between 15 and 64 years old) in Magway region was 71.3% of those aged 15 – 64, with a higher rate for male (86.8%) than female (58.5%). The unemployment rate of the same group was only 3.3%[2]. The other 28.7% were unemployed people who were not actively looking for a job during the reference period of the census.

Magway Township

In 2014, the labour force participation rate in Magway Township was 66.2% of 104,280 people (aged 15 – 64), with a higher rate for male (83.6%) than female (51.5%). The unemployment rate of the same group was only 2.8%. Among those who were unemployed, about 41.7% were household workers (Employees with specific task within household including child care, cleaning, meal planning, and

[1] Department of Population Ministry of Immigration and Population, (May, 2015). p. 96, 165

[2] Department of Population Ministry of Immigration and Population, (May, 2015). p. 2

household administration[1]) and 31.7% was a full time student[2]. The other 28.7% (aged 15-64) were unemployed people who were not actively looking for a job during the reference period of the census.

Approximately 36% of people working in the Township were working as skilled agricultural, forestry, and fishery workers (***Table 5.41***).

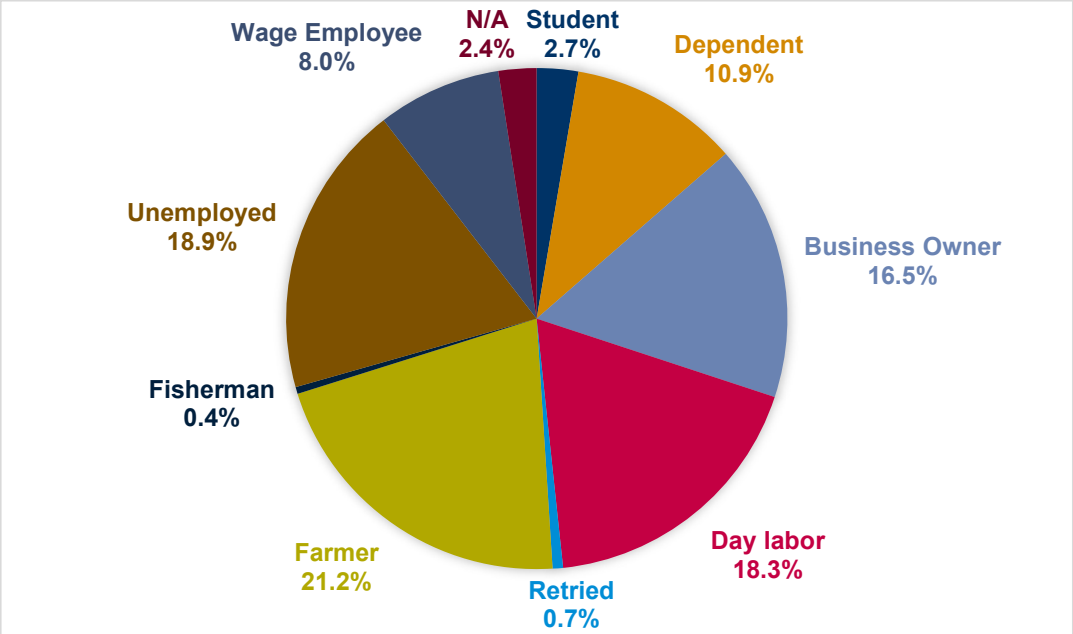
According to the household survey, most interviewees in the Township are working as farmers, day labour and business owner. In addition, unemployment also rank high at 18.9% as seen in ***Figure 5.43***.

Based on the Village Leaders survey, there are more male engaging in the farming and fishery sector, while more female are engaging in the business sector (Small and Medium Enterprises, trading) According to the interviewees, both male, female, and youths wants a better job opportunities that would suit their skills and education. Certificates and licenses that some of the interviewees earn are the electrician certificate (3%), Teacher license (3%), computer certificate (3%), driver license (2%), nurse license (1%), and accountant certificate (1%).

The main sources of income is agriculture (45%). However, the highest income is from business and part time job. Even though fishery is not significant among the interviewees, it represent a good source of income (***Table 5.40***). Other sources of income also include, receiving remittances from others (21%) and borrowing money from family, friends, Myanmar Agricultural Bank and other institutions. Most people borrow money for their investment in agriculture, business, fishery, and livestock activities.

The most common expenses that most interviewees spent on are related to housing, education and medical expenses.

Figure 5.43: Occupational Status in Magway Township



Source: ERM, 2019

[1] BusinessDictionary. (n.d.). Household worker definition. Retrieved May 16, 2019 from http://www.businessdictionary.com/definition/household-worker.html

[2] Department of Population Ministry of Immigration and Population A, (October, 2017). pp.18-23

Table 5.40: Sources of Income in Magway Township (Annually)

Sources	Average Annual Income Received per Household (kyats)
Business	13,435,909
Part Time Job	4,064,000
Fishery	3,200,000
Local Wage Employment	2,846,364
Farming	1,790,969
Government Assistance	1,058,000
Other	2,146,667

Source: ERM, 2019

Minhla Township

In 2014, the labour force participation rate in Minhla Township was 76.8% (aged 15 – 64), with higher rate for male (91.3%) than female (61.9%). The unemployment rate of the same group was about 2.5%. Among those who were unemployed, about 40.7% were household workers and 30.9% were full time students[1]. The other 23.2% (aged 15-64) were unemployed people who were not actively looking for a job during the reference period of the census. About 58% of those who aged 15 - 64 and are employed, were working as skilled agricultural, forestry, and fishery workers (***Table 5.41***).

Minbu Township

In 2014, the labour force participation rate in Minbu Township was 69.9% from 77,814 people (aged 15 – 64), with higher rate for male (86.2%) than female (55.7%). The unemployment rate of the same group was 3.6%. Among those who were unemployed, 42% was a household worker and 32.3% was a full time student[2]. The other 30.1% (aged 15-64) were unemployed people who were not actively looking for a job during the reference period of the census. About 42.4% of those who aged 15 - 64 and are employed, were working as skills agricultural, forestry, and fishery workers (***Table 5.41***).

[1] Department of Population Ministry of Immigration and Population B, (October, 2017). pp.18-23

[2] Department of Population Ministry of Immigration and Population C, (October, 2017). pp.18-23

Table 5.41: Types of Employment in Magway, Minhla, and Minbu Townships

Occupations	Number of People		
	Magway Township	Minhla Township	Minbu Township
Services and Sales Workers	28,467	5,396	20,433
Craft and Related Trades Workers	4,545	5,845	2,477
Elementary Occupations	11,495	2,420	4,487
Skilled Agricultural, Forestry and Fishery Workers	43,024	37,366	32,982
Plant and Machine Operators and Assemblers	16,173	3,770	9,790
Clerical Support Workers	3,890	1,905	2,224
Technicians and Associate Professionals	3,609	2,634	1,438
Professionals	3,358	765	1,690
Managers	1,019	348	381

Sources: Department of Population Ministry of Immigration and Population A, (October, 2017), Department of Population, Ministry of Immigration and Population B. (October, 2017), Department of Population, Ministry of Immigration and Population C. (October, 2017). Adapted by ERM, 2019.

5.4.6.2 Government and NGOs support

People, in some villages, also receive support from various NGOs such as United Nations Development Programme (UNDP), Winstar, Win lock, Substance Abuse Research Association (SARA), Yadanar Metta, Pact Myanmar, and Checs-V. These organization provide training, equipment, seeds, and loans for to the villagers. According to the interviewees, the UNDP provide training about soil conservation methods, while Pact Myanmar, Mahar Mate, and Sa Htar Pa Nar Microfinance are for loans.

5.4.6.3 Agriculture, Fishery and Livestock

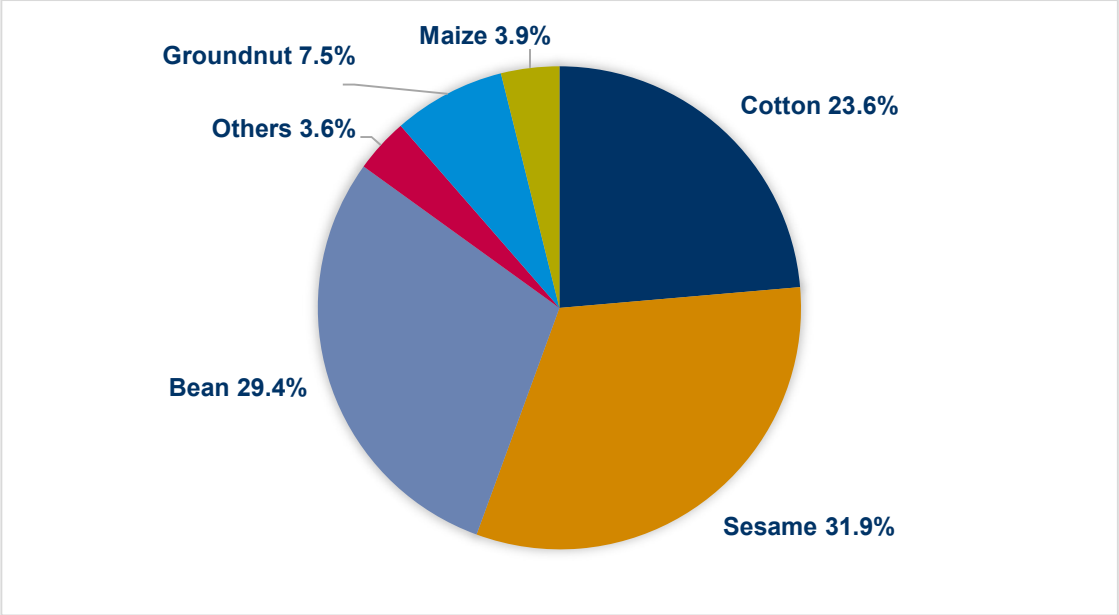
Agriculture

The FAO, reported that there were a total of 590,978 households (56%) who engaged in agriculture in Magway region[1].

According to the Village Leaders survey, about 74% of their people are engaging in agriculture activities. Average wages for male and female in agriculture sector are about 5,000 and 4,600 kyats per day respectively. The most popular cash crops in Magway Township are sesame, bean, and cotton (***Figure 5.44***). The planting season is usually around May-August and harvesting all year round depending on the type of planted crops. Moreover, the average land holding size is about 2.2 acres. Most people do not live on the cultivated land.

[1] FAO et al. (2015). Agriculture and livelihood flood impact assessment in myanmar. pp. 15, 34-35. Retrieved March 21, 2019 from http://www.fao.org/fileadmin/user_upload/emergencies/docs/Final_Impact_Assessment_Report_final.pdf

Figure 5.44 Cash Crops in Magway Township



Source: ERM, 2019

**Note: Others crops are Pigeon Pea, Corn, Lablab Bean, Onion, Potato, Mango, and Green gram.*

Livestock Raising

According to the Village Leader surveys, about 31% of the people are engaged in the livestock raising activities. The most common livestock among the villagers is cattle (44%), chickens (33%), and pig (22%). Cattle are mostly reared for agriculture activities (ploughing the fields), while chickens and pig are for selling and consumption.

Fishery

About 30% of the villages in Magway are engaging in fishery activities. They mostly rely on river freshwater fishing[1]. There are also hatcheries of freshwater fish fingerlings establish within the region[2].

On the other hand, referring to the household survey, the fishery activities are not significant among the Magway interviewees. There was only 1% that actively participating in the fishery activities. They usually fish at the Irrawaddy River, using drift netting as their main tool. The common catches are Mrigal, Boal, Rita, River Catfish, and Silond Catfish.

Forestry

Based on the survey, 18% of the interviewees are participating in the collection of forestry products. They collect fuelwood, bamboo shoots, and mushrooms around and outside the village for household consumption.

According to the village leaders, there are about 30 household in Ohn Twe and Ge Gyi Gone that are making coal. None of the interviewees is involving in mining activities.

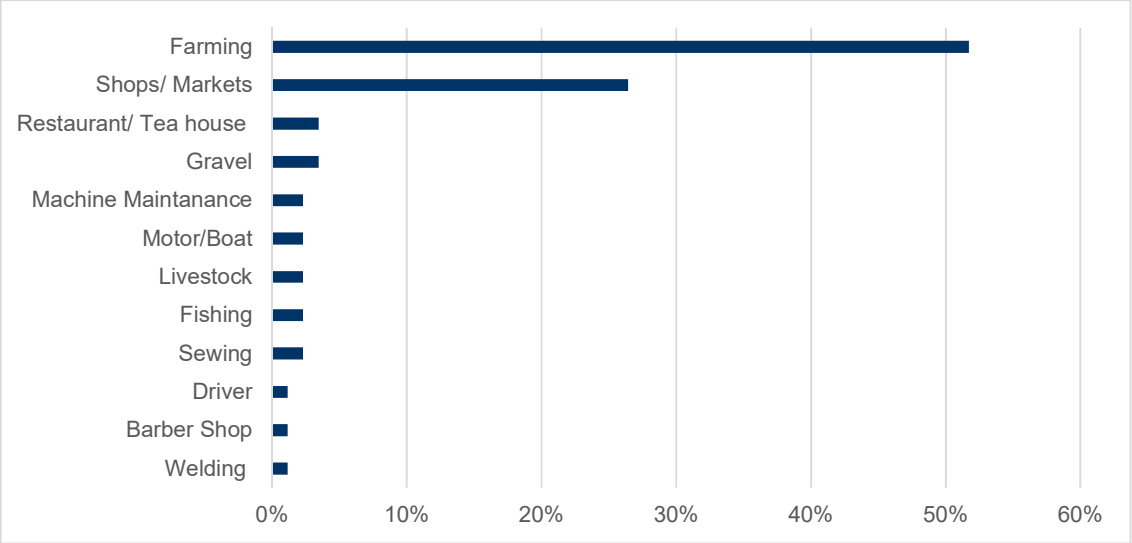
[1] FAO et al. (2015).

[2] FAO and Ministry of Agriculture, Livestock and Irrigation. (June, 2016). Fisheries and Aquaculture. *Government of the republic of the Union of Myanmar.* p.33. Retrieved March 21, from http://www.fao.org/3/a-bl827e.pdf

5.4.6.4 Private Business

According to the survey, more than half of the interviewees (59%) are operating a private business within their village. These business are mainly shops/markets and restaurants (***Figure 5.45)***

Figure 5.45: Types of Business in Magway Township



Source: ERM, 2019

5.4.6.5 Tourism

Touristic sites within Magway Region include Yokesone Monastery, Myat Tha Lon Pagoda, Shin Bin Maha Laba Man Temple, Fort Min Hla (historical site) and Salay House (historical museum)[1]. These sites are scattered along the Irrawaddy River bank with Myathalun Pagoda located near the Block RSF-5 (19 km to the North-west of the logistic base) and Fort Min Hla located within the block (18 km to the south of the logistic base). Overall tourism statistics for Myanmar are summarised in ***Table 5.42***. Tourists visiting these sites are mainly Myanmar citizens with most of the foreign visitor going to Bagan site 3 hours by road north of Magway.

There are 38 hotels and motels in the region which were reported to host annually 20,000 foreign tourists by the tourist department[2]. Moreover, one of the tourist destination, located in Minbu town is the mud volcanoes called Nga Ka Pwe Taung (Dragon lake). It consists of a pool of butane gas and mud adjacent to a small pagoda[3].

Another tourist attraction in Minbu is the Auk Settawyar (the lower footprint of the Buddha) and A Htet Settawyar (the upper footprint), located near Mann creek at Thitsadepaka hill. Every year from February to April, the Shwesettaw Pagoda festival is held there[4].

[1] United Nations Development Programme, Myanmar, 2015, Local Governance Mapping – The State of Local Governance: Trends in Magway. http://themimu.info/sites/themimu.info/files/documents/Report_Local_Governance_Mapping_Magway_UNDP_Jan2015.pdf, accessed on November 13, 2018.

[2] Thaibiz Myanmar. (September, 2018). Myanmar tourism authorities are working to open a new tourist information counter in magway region. Retrieved March 21, 2019 from http://www.thaibizmyanmar.com/en/news/detail.php?ID=1497

[3] Lonely Planet. (n.d.). Nga Ka Pwe Taung. Retrieved March 21, 2019 from https://www.lonelyplanet.com/myanmar-burma/magwe/attractions/nga-ka-pwe-taung/a/poi-sig/1544604/1335719

[4] Meiktila, W. (February, 2015). A walk in the buddha's footsteps. *The Nation*. Retrieved March 21, 2019 from http://www.nationmultimedia.com/life/A-walk-in-the-Buddhas-footsteps-30254593.html

Table 5.42: Myanmar Tourist Statistics Summary

	Year		
	2015	2016	2017
Total expenditure (US$)	2,122 M[a]	2,197.15 M[a]	1,969 M[a]
Average length of stay (nights)	9	11	9
Number of visitor arrivals (person)	4,681,020	2,907,207	3,443,133

Note: [a] million

Source: Myanmar Tourism Statistics (2017)[1]

5.4.7 Education

Magway Region

In 2017, the education system in Myanmar was change to align with other ASEAN countries. Current education system is 5-4-3 system which comprised of 5 years of primary school, 4 years of lower secondary school and 3 years of upper secondary school. The starting age for schools is 6 years old; aged 6 – 10 will be in primary school, aged 11 – 14 years old will be in lower secondary school, and aged 15 – 17 years old will be in high or upper secondary schools. This system is different from the previous 5-4-2 system of which begin from aged 5 with a duration of 11 years of schooling.[2].

The literacy rate in Magway region was 92.2% (2017)[5]. According to the data provided in ***Table 5.43***, most people in Magway region drop out the education system after primary school (grade 1-5).

The number of school in 2014 in the region was 4,097 schools[3] and 120 monastic schools[4].

Magway Township

Most of the population in Magway Township start attending school when they are 6 years old. The number of attendance start to constantly drop after they reach the aged of 9 (females) and 10 (males). The literacy rate in Magway Township for those 15 and over was 92.9%, similar to the rest of the country. However, the household survey showed that about 83% of the interviewees cannot read and write in other language than Myanmar.

About 18.4% of those aged over 24, have never attend school[5]. Majority of people graduated from primary school or about grade 5 (11 years old) (***Table 5.43***).

Minhla Township

Similar to the Magway Township, most people start school when they are 6 years old. The number of attendance start to drop after age 11 for both males and females. Moreover, the literacy rate (aged 15 and over) in Minhla Township in 2014 was 92.9%. However, there were 15.6% (aged over 24) who

[1] Ministry of Hotels & Tourism. (2017). Myanmar Tourism Statistics 2017. Retrieved from http://tourism.gov.mm/wp-content/uploads/2018/06/Myanmar-Tourism-Statictics-2017.pdf

[2] Department of population, ministry of labour, immigration and population. (June, 2017). The 2014 Myanmar Population and Housing Census - Thematic report on education. *The republic of the union of Myanmar.* Retrieved from https://myanmar.unfpa.org/sites/default/files/pub-pdf/4H_Education_0.pdf

[3] Department of Statistical Organization. (2014). Education statistics by level and by region and state (school). *Central statistical organization.* Retrieved March 21, 2019 from http://mmsis.gov.mm/statHtml/statHtml.do?orgId=195&tblId=DT_MMDS_YAQ_0001_NTO

[4] Myanmar information management unit. (February, 2017). Monastic Education in Myanmar. Retrieved March 21, 2019 from http://www.themimu.info/sites/themimu.info/files/documents/Sector_Map_Monastic_Education_2016-2017_MIMU962v06_22Feb2017_A3.pdf

[5] Department of Population Ministry of Immigration and Population A, (October, 2017). pp.14-17

have never attended school[1]. In addition, majority of the people also graduated from primary school (***Table 5.43***).

Minbu Township

Similar to the other Townships, some people start school at aged 5 while most people start school at 6 years old. The number of attendance of both male and female drop after aged 12. The literacy rate of those who aged 15 and over in Minbu Township was 93.7%. There were 12.9% (aged over 24) who have never attended school[2]. The same as both Magway and Minhla Townships, most people graduated from primary school (***Table 5.43***).

Table 5.43: Level of Education Completed by the Population (2014)

Levels of Education Completed	Magway Region	Magway Township	Minhla Township	Minbu Township
None	431,477	30,313	13,261	13,726
Primary school (Grade 1 – 5)	1,118,113	66,908	46,199	52,523
Middle school (Grade 6 – 9)	338,652	28,534	12,099	18,274
High school (Grade 10 – 11)	173,607	17,270	6,915	10,679
Diploma	5,157	495	171	283
University / college	136,623	17,621	4,766	8,318
Post-graduate and above	5,618	1,377	114	310
Vocational training	3,507	275	102	191
Others	26,047	1,862	1,299	2,182

Source: Department of Population, Ministry of Immigration and Population. (May, 2015).

Note: The number in the table represents number of populations aged 25 years old and over.

[1] Department of Population Ministry of Immigration and Population B, (October, 2017). pp.14-17

[2] Department of Population Ministry of Immigration and Population C, (October, 2017). pp.14-17

5.4.8 Public Health

In Myanmar, most common diseases and health problems consists of tuberculosis, underweight in children, malnutrition, Malaria, and AIDs[1]. Other related diseases are Typhoid fever, Cholera, and Japanese Encephalitis[2]. Rank second in Southeast Asia in HIV prevalence rate (0.7%), it was estimate in 2017 that about 220,000 people are living with HIV[3].

In 2015, there were 193 private hospitals, 201 private specialist clinics, 776 private dental clinics, and 3,911 private general clinics. For public healthcare facilities, there were only 1,056 public hospital with 56,748 beds and 1,684 rural health centres in 2014. However, this number does not include the special health facilities such as maternal and child health centres (348), and traditional medicine hospital and clinics (259)[4].

Magway Region

In 2016, there were 263 Malaria cases in the region. This considered very low compared with the Sagaing region that have 9,675 cases[5].

The life expectancy rate in Magway region was 62.3 years with a large difference between the 67.5 years for females and 57.1 for males[6].

The fertility rate for Magway region was 2.1 children per woman (aged 15 - 49). In addition, the maternal mortality ratio in the region was 344 deaths (during pregnancy/ delivery or within 42 days of termination of pregnancy) for 100,000 live births, which considered very high compared with the other regions. The infant and under 5 mortality ratios are 84 and 101 deaths per 1,000 live births[7].

As it can be seen in the ***Table 5.44*** below, there are many cause of hospitalization in the region. The most common cause were single spontaneous delivery and single delivery by caesarean section.

[1] Health, Health Care and Diseases in Myanmar – Facts and Details, May 2014 (Web)

[2] Hazzard, D. (September, 2017). Health status: The most common Diseases in burma. *The Borgen Project.* Retrieved April 3, 2019 from https://borgenproject.org/common-diseases-in-burma/

[3] Avert. (January, 2019). HIV and AIDS in Myanmar. Retrieved April 3, 2019 from https://www.avert.org/professionals/hiv-around-world/asia-pacific/myanmar

[4] Latt, N., Cho S., Htun, N., Saw, Y., Myint, M., Aoki, F., Reyer, J., Yamamoto, E., Yoshida, Y., Hamajima, N., (May, 2016). Healthcare in Myanmar. *Nagoya Journal of Medical Science*. 78 (2). pp. 123 – 134. Retrieved April 3, 2019 from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4885812/

[5] Nay Pyi Taw, (September, 2017). Public health statistic (2014-2016). Ministry of health and sports, department of public health. p.36. Retrieved April 3, 2019 from https://reliefweb.int/sites/reliefweb.int/files/resources/Public_Health_Statistics_Report2014-2016_web.pdf

[6] Department of population ministry of immigration and population, (May, 2015). p. 13

[7] Department of population ministry of immigration and population, (October, 2017). p.43

Table 5.44: Cause of Hospitalization in Magway Region (2016)

Cause of Hospitalization	Number of People Hospitalized in 2016
Single spontaneous delivery	15,010
Single delivery by caesarean section	13,246
Diarrhoea and gastroenteritis of presumed infectious origin	9,520
Viral infection of unspecified site	9,139
Other and unspecified injuries of the head	7,741
Injury of unspecified body region	6,676
Gastritis and duodenitis	6,433
Acute upper respiratory infection of multiple and unspecified sites	6,372
Senile cataract	6,144
Single delivery by forceps and vacuum extractor	3,650
Other cataract	3,300
Fever of unknown origin	3,300
Pneumonia, organism unspecified	3,118
Acute appendicitis	3,087
Mental and behavioural disorders due to use of alcohol	2,677
Other causes	116,277

Source: Ministry of Health and Sports & Department of Medical Services. (June, 2018). p.148

In 2016, in Magway region, there were 100 hospitals, 3,129 sanctioned beds, 3,736 available beds, 216,998 admissions, 215,690 discharges and deaths, 965,099 patient days, 2,148 numbers of death, hospital death rate at 1%, and 513,948 out-patient attendance. Here, hospital death rate is the calculation between number of deaths, and number of discharges and deaths[1]. Sanctioned bed is the official bed capacity of the hospital[2].

Magway Township

The fertility rate in Magway Township was 2.1 children per woman. The mortality ratios of infant and under aged 5 are 74 and 89 deaths per 1,000 live births[3].

A total of 9,833 people were recognised as disabled in the Township. People with eye-related disabilities were the most common in this Township followed by locomotion disability (***Table 5.45***).

According to the survey, the most common sickness among interviewees are common fever, heart disease, diabetes, and gout. Nevertheless, the village leaders also thinks that their villagers are also subject to respiratory tract infection.

[1] Ministry of health and sports & Department of medical services. (June, 2018). Hospital statistic report 2014-16. *The republic of the union of Myanmar.* (p.13, 28). Retrieved March 20. 2019 from https://themimu.info/sites/themimu.info/files/documents/Report_Hospital_Statistics_Report_2014-16_MOHS_Jun2018.pdf

[2] Amin, C. (September, 2017). Hospital statistics. *Linkedin slide share*. Retrieved March 20, 2019 from https://www.slideshare.net/zulfiquer732/hospital-statistics-79835548

[3] Department of Population Ministry of Immigration and Population A, (October, 2017). pp.40-43

There are health facilities within the walking distances available in most villages; such as health centre and station hospital. However, the pharmacy are rarely available in the Township, based from the village leaders there is a pharmacy in the Mi Kyaung Ye village.

In some village, general treatment, vaccination, and delivery service are available. Most child delivery either takes place at the hospital or at home with the midwife. About 90% of the new-borns receives proper vaccination. In case of serious medical issue or emergency, most villagers would travel to the Magway hospital in Magway town (about 17 km in the Northern West from the planned logistic base).

For specific health services, mosquito insecticide is available in Mi Kyaung Ye and Yin Gway Chaung village. Vaccination for Elephantiasis are available in most village. While vaccination for Tuberculosis, Measles and Japan Encephalitis are only available in some villages.

Minhla Township

The fertility rate in Minhla was 2 children per woman. The mortality ratios of infant and under aged 5 are 87 and 105 deaths per 1,000 live births[1].

With varied types of disabilities, Minhla have the total of 5,142 people of certain disability. Similar to Magway Township, people with vision-related disabilities were the most common (2,905 people) in Minhla (***Table 5.45***).

Minbu Township

In Minbu, the fertility rate was 2.1 children per woman. The mortality ratios of infant and under aged 5 are 74 and 89 deaths per 1,000 live births[2].

There were 8,501 people with a certain disability. The most common disability was vision-related disabilities followed with locomotion disability (***Table 5.45***).

Table 5.45: Number of Disabilities

Types of disabilities	Magway Region	Magway Township	Minhla Township	Minbu Township
Eye related	109,996	4,871	2,905	4,693
Locomotion	85,498	2,782	1,978	2,302
Memory	64,916	4,282	1,625	3,668
Hearing	58,546	3,084	1,617	2,419

Source: The 2014 Myanmar Population and Housing Census (Yangon Region) – The Union Report, May 2015 (Web)

5.4.9 Utilities

5.4.9.1 Energy

Magway Region

Although 22.7% of the total population have accessed to electricity through the national grid, the most common sources of lighting in the region was battery[3].

[1] Department of Population Ministry of Immigration and Population B, (October, 2017). pp.40-43

[2] Department of Population Ministry of Immigration and Population C, (October, 2017). pp.40-43

[3] Department of Population Ministry of Immigration and Population, (May, 2017). p.3

Magway Township

In Magway Township, 39.7% of households had access to the grid electricity for lighting (***Table 5.46***). This number was considered high comparing to other Township in the region. Regardless of that, there were about 29% that use battery for lighting, especially in the rural areas (40.2%)[1].

According to the survey, 49% of the interviewees have access to the grid. Those who do not are using solar (43%), battery (7%) and candle (1%) as light sources.

Firewood was very common for cooking in the Township with the number of 69% followed by electricity of 20.7% (***Table 5.47***). In the rural areas, most households were using firewood (90.9%) for cooking, while most households in the urban areas use electricity[1].

About 99% of the interviewees do not have access to gas as their source of cooking fuel. Instead, the most common sources of cooking fuel are wood (71%) and electricity (25%); this is the same as the Township usage. Only, 4% uses charcoal. Most sources of cooking fuel can be gathered within the village (83%).

Minhla Township

In Minhla Township, the most common lighting sources was candle (28.2%), followed by the private generator (25.1%). About 21.8% of the households have an access to the grid electricity, mostly resident in urban areas[2].

Moreover, 78.3% of households in Minhla use mainly firewood as cooking fuels, 13.4% electricity, and 7.9% charcoal (***Table 5.47***). Most household in urban areas use electricity (40%) and charcoal (33.5%), while rural areas mainly use firewood (83.3%) and some electricity (10.6%)[2].

Minbu Township

In Minbu Township, 35.3% have access to the grid electricity for lighting, while another 32.9% used candle and 15.2% used battery. In the rural areas, candle (39.9%) was the most common sources of light followed by electricity (21.5%)[3].

Similar to the other Townships in the study areas, firewood is the main material for cooking fuel (80.4%) in both urban and rural areas. Only 5.7% use charcoal for cooking[3].

Table 5.46: Sources of Energy for Lighting

Sources of Lighting	Magway Region	Magway Township	Minhla Township	Minbu Township
Electricity	22.7%	39.7%	21.8%	35.3%
Kerosene	0.4%	0.1%	0.3%	0.1%
Candle	22.5%	6%	28.2%	32.9%
Battery	26.8%	29%	12.1%	15.2%
Generator (Private)	11.5%	7.5%	25.1%	8.8%
Water mill (Private)	0.8%	< 0.1%	0.3%	< 0.1%
Solar system/ energy	10.1%	8.8%	9.5%	4.9%
Other	5.2%	8.9%	2.7%	2.7%

Source: Department of Population Ministry of Immigration and Population, (May, 2015), Department of Population Ministry of Immigration and Population A, (October, 2017), Department of Population, Ministry of Immigration and

[1] Department of Population Ministry of Immigration and Population A, (October, 2017). pp.33-36

[2] Department of Population Ministry of Immigration and Population B, (October, 2017). pp.33-36

[3] Department of Population Ministry of Immigration and Population C, (October, 2017). pp.33-36

Population B. (October, 2017), Department of Population, Ministry of Immigration and Population C. (October, 2017). Adapted by ERM, 2019.

Table 5.47: Sources of Energy for Cooking

Sources of Lighting	Magway Region	Magway Township	Minhla Township	Minbu Township
Electricity	9.2%	20.7%	13.4%	11%
LPG	0.2%	0.1%	0.1%	2.3%
Kerosene	< 0.1%	< 0.1%	< 0.1%	<0.1%
Biogas	0.1%	0.1%	< 0.1%	0.1%
Firewood	84.9%	69%	78.3%	80.4%
Charcoal	5.1%	9.5%	7.9%	5.7%
Coal	0.2%	0.3%	0.2%	0.2%
Other	0.3%	0.2%	0.1%	0.2%

Source: Department of Population Ministry of Immigration and Population, (May, 2015), Department of Population Ministry of Immigration and Population A, (October, 2017), Department of Population, Ministry of Immigration and Population B. (October, 2017), Department of Population, Ministry of Immigration and Population C. (October, 2017). Adapted by ERM, 2019.

5.4.9.2 Water Use

According to Myanmar Information Management Unit (MIMU), water sources in Myanmar are divided into two types: improved drinking water and unimproved drinking water (***Table 5.50***). Water use in Myanmar has been increasing, particularly in the agricultural and industrial sectors. ***Table 5.48*** shows the water use in different sectors for the year 2008-09. As much as 89% of water use is tapped for irrigation purposes, while about 8% is for domestic consumption and 3% is for industry.

Table 5.48: Water Use by Different Sectors in Myanmar

Sector	Surface Water	Groundwater	Total
Domestic	3%	68%	8%
Industrial	3%	9%	3%
Irrigation	94%	23%	89%

Source: Ministry of Agriculture and Irrigation[1]

Magway Region

The main source for water consumption (drinkable) and household use (non-drinkable) in Magway Region households is from tube well and protected water bodies. Multiple Indicator Cluster Survey, an international household survey conducted between 2009 and 2010 by UNICEF demonstrated that 79% of Magway households has access to improved water sources[2].

Magway Township

In Magway Township about 81.9% of household have access to improve sources such as tap water, piped, tube well, borehole, protected well and spring, and bottle water. Only about 18.1% of the household get their drinking water from unimproved sources. The most common unimproved water sources is river, stream, and canal (***Table 5.50***). In addition, small number of households in the urban areas still got drinking water from the unimproved water sources but it was not as common as the rural (21.7%)[3]. The most common source for non-drinking water is from tube well and borehole (***Table 5.51***).

Base on the household survey, about 91% of the interviewees do not have access to tap water. Instead, the main sources of non-drinking water is mainly from the tube well, which is considered as sufficient in quantity and of fair quality.

Their main sources of drinking water are from unimproved sources such as Irrawaddy River (44%), and spring such as Yin Creek (43%). Only a small number of interviewees get drinking water from tube well (***Table 5.49***). However, most of the interviewees agree that these sources are sufficient to their usage and was considered of good quality. According to the Village Leaders, the alternative sources for drinking water are also hand-dug well, artesian well, and rain water.

1 Ministry of Agriculture and Irrigation, (September, 2013). Retrieved April 3, 2019 from http://danishwater.dk/wp-content/uploads/2013/09/Ministry-of-Agriculture-and-Irrigation-Department-of-Water-Resources-Utilization-Sustainable-Development-and-Management-of-Groundwater-in-Myanmar.pdf

2 UNICEF, n.d. Magway Region – A snapshot of Child Wellbeing. https://www.unicef.org/myanmar/Magway_Region_Profile_30-07-15.pdf, accessed on November 28, 2018.

3 Department of Population Ministry of Immigration and Population A, (October, 2017). pp.31-32

Table 5.49: Sources of Drinking Water in Magway Township

Sources	Percent of Interviewees
Irrawaddy River	44%
Spring (Yin Creek)	43%
Tube Well	13%

Source: ERM, 2019

Minhla Township

Using the same categories, there are two sources of drinking water: improved and unimproved drinking water. About 57.9% household in Minhla have access to improved water sources. Overall, most of them access drinking water from protected well and spring. However, most of the urban households usually have access to tap water while the rural households access to the protected well. For unimproved water sources, the most common source for drinking is the river, stream, and canal (***Table 5.50***). The most common source for non-drinking water is from river, stream, and canal (***Table 5.51***).

Minbu Township

In Minbu Township, 83% of households have access to improved drinking water sources. The most common improved sources is the tube well and borehole (59.8%) which is more common in the rural areas. In urban areas, tap water is the most common water source. Nonetheless, the other 17% of the total household in the township have access to the unimproved water sources. The most common unimproved source is the river, stream, and canal (***Table 5.50***). The most common source for non-drinking water is from tube well and borehole (***Table 5.51***).

Table 5.50: Sources of Drinking Water

Sources of Drinking Water	Magway Region	Magway Township	Minhla Township	Minbu Township
Total improved drinking water	76.6%	81.9%	57.9%	83%
Tap water/ piped	7.7%	4.4%	16%	15.7%
Tube well/ borehole	48.5%	48.7%	12.1%	59.8%
Protected well/ spring	18.6%	16.1%	29.3%	6%
Bottled water/ water purifier	1.8%	12.7%	0.5%	1.5%
Total unimproved drinking water	23.4%	18.1%	42.1%	17%
Unprotected well/ spring	3.3%	2.2%	9%	0.6%
Pool/ pond/ lake	5.6%	2.6%	4.8%	2.3%
River/ stream/ canal	11.1%	11.3%	25.5%	7.5%
Waterfall/ rain water	0.9%	0.2%	1%	< 0.1%
Other	2.5%	1.4%	1.8%	6.6%

Source: Department of Population Ministry of Immigration and Population, (May, 2015), Department of Population Ministry of Immigration and Population A, (October, 2017), Department of Population, Ministry of Immigration and Population B. (October, 2017), Department of Population, Ministry of Immigration and Population C. (October, 2017). Adapted by ERM, 2019.

Table 5.51: Sources of Non-Drinking Water

Sources of Drinking Water	Magway Region	Magway Township	Minhla Township	Minbu Township
Tap water/ piped	8.1%	9.3%	14.8%	13.9%
Tube well/ borehole	50.4%	63.6%	13.8%	62%
Protected well/ spring	17.1%	8.2%	15.9%	6.4%
Unprotected well/ spring	2.5%	1.6%	5.5%	0.6%
Pool/ pond/ lake	7.8%	6.5%	17.9%	2.6%
River/ stream/ canal	10.7%	9.1%	28.8%	8.1%
Waterfall/ rain water	0.8%	< 0.1%	1.5%	< 0.1%
Bottle water/ water purifier	< 0.1%	0.1%	< 0.1%	0.1%
Other	2.6%	1.6%	1.8%	6.4%

Source: Department of Population Ministry of Immigration and Population, (May, 2015), Department of Population Ministry of Immigration and Population A, (October, 2017), Department of Population, Ministry of Immigration and Population B. (October, 2017), Department of Population, Ministry of Immigration and Population C. (October, 2017). Adapted by ERM, 2019.

5.4.9.3 Sanitation

Magway Region

While most population have accesses to improve sanitation facilities, 17.5% of the household in Magway region have no toilet facilities. The most common improve sanitation facilities is water seal (***Table 5.52***).

Magway Township

About 80.5% of the household have the improved sanitation facility such as flush toilet and water seal. When compared to the other township in the region, Magway rank top on the improved sanitation facilities. Nonetheless, there are still about 14.7% of the population who did not have access to any sanitation facilities (***Table 5.52***).

According to the household survey, about 92% of the interviewees have access to flush toilet. The most common type of sanitation facility in this township are pour flush latrine and dry pit latrine. Nonetheless, there are still also small percentage of those who do not have access to the any sanitation facilities.

Minhla Township

In 2014, there was only 15.2% of the conventional households in Minhla that have access to the improved sanitation facilities, with most of them accessing to the water seal (14.6%). The most common form of sanitation facility in this township is the pit with 67.6% of the total households. Also about 10.6% have no access to any type of sanitation facilities (***Table 5.52***).

Minbu Township

Up to 86.9% of the conventional household in Minbu have access to the improved sanitation facilities. Similar to Minhla, water seal is the most common sanitation facility in the township (85.9%). The use of other facilities are varied but only access by less than 3% of the households. Moreover, 11.9% of the households did not have access to any type of the sanitation facility (***Table 5.52***).

Table 5.52: Type of Sanitation Facilities

Type of Toilet	Magway Region	Magway Township	Minhla Township	Minbu Township
Flush	0.7%	0.9%	0.6%	1%
Water seal	67.7%	79.6%	14.6%	85.9%
Total Improved Sanitation	68.4%	80.5%	15.2%	86.9%
Pit	12.9%	4.3%	67.6%	0.9%
Bucket	0.5%	0.3%	1.9%	0.1%
Other	0.7%	0.2%	4.7%	0.2%
None	17.5%	14.7%	10.6%	11.9%

Source: Department of Population Ministry of Immigration and Population, (May, 2015), Department of Population Ministry of Immigration and Population A, (October, 2017), Department of Population, Ministry of Immigration and Population B. (October, 2017), Department of Population, Ministry of Immigration and Population C. (October, 2017). Adapted by ERM, 2019.

5.4.9.4 Waste Management Facilities

In Myanmar, waste collection and disposal is traditionally the responsibility of local municipal authorities. However, the City development Committees and Pollution Control and Cleansing Departments (PCCDs) in Yangon, Mandalay and Nay Pyi Taw have set different standards for their solid waste management[1].

According to the World Bank[2] in 2012, the solid waste generation in Myanmar was 5,616 tonnes/day, and is anticipated to increase to 21,012 tonnes/day by 2025. Mandalay, Yangon and Nay Pyi Taw generate the majority of Myanmar's produced waste (55%); with Yangon producing the most waste (1,981 tonnes/day).

The breakdown of each waste type generation per different city development is presented in ***Table 5.53***.

The waste management system for the three city development is described in ***Table 5.54***.

[1] Gamaralalage, D., Premakumara, J., Hengesbaugh, M., Quick study on waste management in Myanmar. (June, 2016). Institute for Global Environmental Strategies (IGES). p.4. Retrieved May 16, 2019 from https://www.iges.or.jp/files/research/scp/PDF/20160613/17_Quick_study_Web.pdf

[2] The World Bank (2012) A Global Review of Solid Waste Management [Online] Available at: http://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1334852610766/What_a_Waste2012_Final.pdf [Accessed 12 April 2017]

Table 5.53: Solid Waste Generation of Mandalay, Yangon and Nay Pyi Taw City Development Committee

Solid Waste Category	Mandalay City Development Committee (MCDC)	Yangon City Development Committee (YCDC)	Nay Pyi Taw City Development Committee (NCDC)
Total Waste Generation	955 tons/day	1,981 tons/day	160 tons/day
Waste generation per capita	0.6 kg/person/day	0.4 kg/person/day	0.5 kg/person/day
Composition and characterisation (percent)	Organic waste – 64% Plastic – 14% Paper/cardboard – 6% Wood – 3% Textile – 4% Glasses – 2% Metal – 1% Others – 6%	Food waste – 69% Plastic – 8% Paper – 3% Green leaves – 8% Textile – 2% Glasses – 1% Metal – 1% Glue – 3% Others – 5%	Organic waste – 84% Non-combustible waste – 3% Combustible waste – 3% Plastic waste – 10%
Composition and characterisation (tons/day)	Organic waste – 611.2 Plastic – 133.7 Paper/cardboard – 57.3 Wood – 28.65 Textile – 38.2 Glasses – 19.1 Metal – 9.55 Others – 57.3	Food waste – 1366.89 Plastic – 158.48 Paper – 59.43 Green leaves – 158.48 Textile – 39.62 Glasses – 19.81 Metal – 19.81 Glue – 59.43 Others – 99.05	Organic waste – 134.4 Non-combustible waste – 4.8 Combustible waste – 4.8 Plastic waste – 16

Source: Gamaralalage, D., Premakumara, J., Hengesbaugh, M.,(June, 2016)

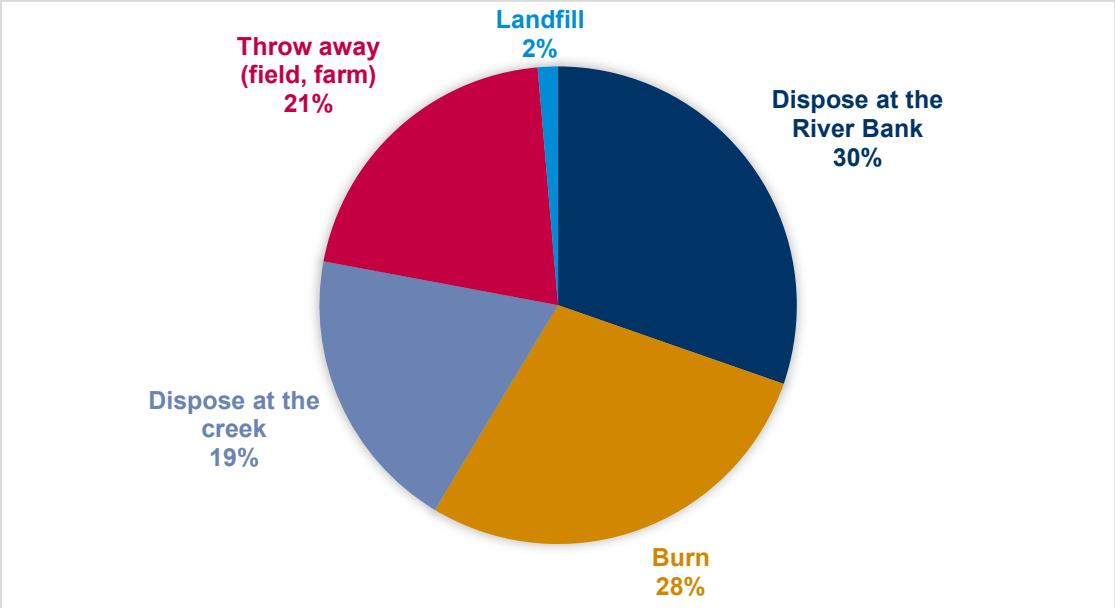
Table 5.54: Solid Waste Management of Mandalay, Yangon and Nay Pyi Taw City Development Committee

Solid Waste Category	Mandalay City Development Committee (MCDC)	Yangon City Development Committee (YCDC)	Nay Pyi Taw City Development Committee (NCDC)
Waste Separation, collection and Transport	■ Waste collection method (door to door waste collection, bell ringing block collection to the household, collect the waste from collective bin site, sweeping the waste on the road)	■ Daily collection ■ Bell ringing collection system, collection at street dump yards, temporary storage system ■ Transport by trucks to landfill	■ Bell ringing collection system in the city ■ Carried with trucks and disposed to the open dumping site
Waste Treatment and Recycling	■ One (1) incinerator (stopped operation) – 30 tons/day at Thaung Inn Myout Inn (southern part of Mandalay) ■ One (1) anaerobic digester – 30 tons/day (pilot project for rural areas) ■ One (1) incinerator pit at Kyar Ni Kan (northern part of Mandalay for medical waste only)	■ Recycling materials (plastic, tin/can, bottle, iron, glass, textile) ■ No correct data, assumption is that 86 tons/day generated waste is recycling	■ No pre-treatment ■ No treatment ■ No recycle
Waste Disposal	■ Landfill 1 (engineering landfill) – 450 ton/day at Kyar Ni Kan (northern part of Mandalay) ■ Landfill 2 (engineering landfill) – 300 ton/day at Thaung Inn Myout Inn (southern part of Mandalay)	■ Open dumping	■ 6 current dumping areas ■ Open dumping
Hazardous (industrial/medical)	■ Collect daily from large hospitals and clinics ■ All clinical wastes are incinerated in an incineration put at Kyar Ni Kan expect large body parts ■ Large body parts are incinerated at cemeteries ■ Only expired medicines are submerged as a special case in combining and classifying with Ministry of health	■ Collect waste (one a day for special clinic, once or twice per week for polyclinic) ■ Categorize into three types (yellow colour for infectious waste, red colour for sharpening and syringes, needles, blue and green for domestic waste ■ Infectious waste (incineration) ■ Sharp waste (submerged to concrete deep well)	■ Collect only on call ■ Collect separately ■ Disposed to the same area of domestic waste dumping ■ No pre-treatment ■ No special incineration put for hospital waste ■ Only the large body parts are incinerated in the cemeteries with the approval of doctors

Source: Gamaralalage, D., Premakumara, J., Hengesbaugh, M (June, 2016)

According to the Magway interviewees, most villages in Magway Township do not have any proper waste disposal/management facilities. Therefore, disposing of waste into nearby water sources is the most common waste disposal methods among villagers. Burning waste is also a common method as seen in the ***Figure 5.46***, all of which may affect the surrounding environment and hygiene in the villages.

Figure 5.46: Waste Disposal in Magway Township



Source: ERM, 2019

5.4.10 Infrastructure, Transportation, and Amenities

Magway Region

The most popular method of transportation in Magway region is the bullock-cart, follow by motorcycle and bicycle (***Table 5.55***). Motorcycle and bicycle are commonly used in urban households. However, in rural areas bullock-cart and motorcycle are more commonly used[1].

According to ***Table 5.56***, radio and television are the most common equipment among households. Nonetheless, there were also 30.3% of the households that did not have any of the amenities items.

Magway Township

Base mainly on the conventional household, motorcycle is the most common transportation method in Magway Township with the number of 29,508 out of 68,677 households or 43%. However, bullock-cart is also as common as the motorcycle with the number of 21,837 households or 31.8% (***Table 5.55***), especially in the rural areas (21,723 households) where it rank top[1].

According to the household survey, the most common mode of transportation is also the motorcycle (71%), followed with traveling by foot (26%) and bus, van, or car (3%).

In addition, about 83% of the interviewees do not have paved road to their home. Most road surface are dirt (78%), followed by asphalt (20%), while the rest are stone and concrete (2%). Most interviewees consider the quality and condition of the transportation system are good but about 22% thinks it is in poor condition.

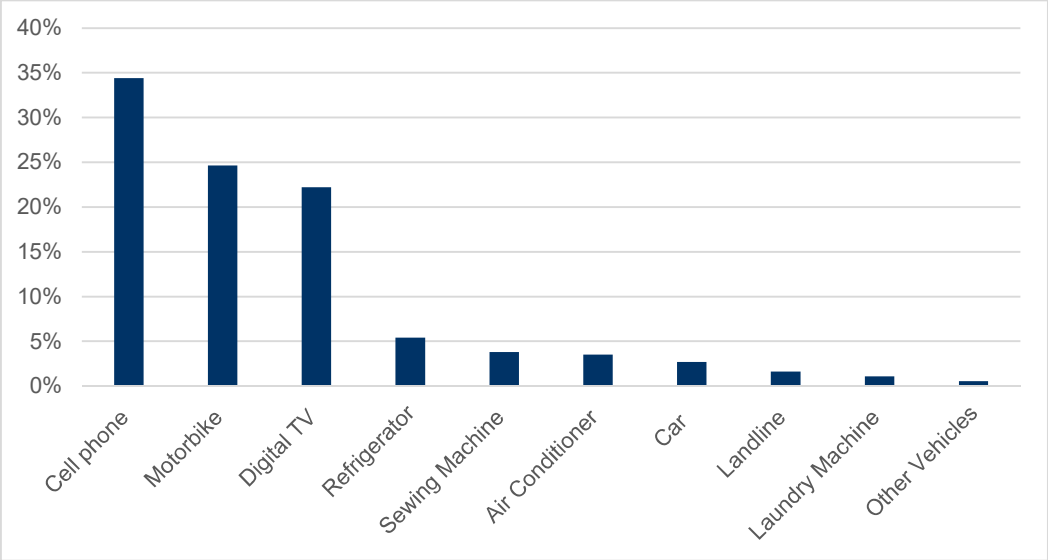
[1] Department of Population Ministry of Immigration and Population A, (October, 2017). pp.37,39

The focus group interviews indicated that most people are travelling to the market using motorcycle because the markets are located about 0.5 – 2 hours away from their villages. The most famous markets in the Township are Mi Kyaung Ye Market, Vendor, and Magway Market.

For amenities, about 47.5% in the Township have television, 37% have radio, and 34.4% have mobile phone (***Table 5.56***). Most household in the urban areas have more access to the television and mobile phone while most households in the rural would access to the radio. Only 3.1% of the household have access to the internet[1].

However, based on the household survey, most household owned a mobile phone (85%); some household can own up to 4 mobile phones. More than half of the household have motorbike (61%) and digital TV (55%). Other amenities such as refrigerator, air conditioner, car, and landline are not common amongst the interviewees (***Figure 5.47***). In addition, about 95% have access to mobile signal and 51% to internet.

Figure 5.47: Accessible Amenities in Magway Township



Source: ERM, 2019

Minhla Township

In Minhla, out of 31,622 household the most common methods of transportation is the motorcycle and the bullock-cart (***Table 5.55***). Similar to the region, motorcycle and bicycle are mostly used in urban areas and bullock-cart in rural areas[1].

About 44.3% of conventional household have radio, 40.9% have television, and 32.5 have mobile phone. Moreover, about 4.7% have access to the internet at home (***Table 5.56***). This number is slightly higher than the number of Magway Township. Interestingly, Minhla also have a higher access to the mobile phone than the Thayet district and Magway region[1].

[1] Department of Population Ministry of Immigration and Population B, (October, 2017). pp.37, 39

Minbu Township

In Minbu, within 43,817 households, motorcycle (45.5%) and bicycle (34.3%) are the most common transportation methods (***Table 5.55***). In the rural areas, the most popular transportation method is motorcycle (14,815 households), followed by bullock-cart (12,703 households)[1].

45.7% of household in Minbu have television, 38% have radio, and 28.8% have mobile phone. About 3% have access to the internet at home (***Table 5.56***).

Table 5.55: Type of Transportations

Transportation	Magway Region	Magway Township	Minhla Township	Minbu Township
Car/ Truck/ Van	1.4%	2.6%	2.4%	1.8%
Motorcycle/ Moped	38.8%	43%	50.3%	45.5%
Bicycle	30.7%	23.2%	15.2%	34.3%
4-Wheel Tractor	0.9%	0.8%	0.5%	1.3%
Canoe/ Boat	1.3%	0.3%	0.3%	0.6%
Motor Boat	0.5%	0.4%	0.2%	0.4%
Cart (bullock)	41.3%	31.8%	47%	30.4%

Source: Department of Population Ministry of Immigration and Population, (May, 2015), Department of Population Ministry of Immigration and Population A, (October, 2017), Department of Population, Ministry of Immigration and Population B. (October, 2017), Department of Population, Ministry of Immigration and Population C. (October, 2017). Adapted by ERM, 2019.

Table 5.56: Type of Amenities

Amenities	Magway Region	Magway Township	Minhla Township	Minbu Township
Radio	47.9%	37%	44.3%	38%
Television	37.9%	47.5%	40.9%	45.7%
Landline Phone	3.5%	5.6%	2.4%	3.1%
Mobile Phone	23.9%	34.4%	32.5%	28.8%
Computer	1.2%	3.3%	1.3%	1.7%
Internet at home	3.4%	3.1%	4.7%	3%
None of the Items	30.3%	28.8%	29.1%	30.6%
All of the Items	0.2%	0.3%	0.1%	0.2%

Source: Department of Population Ministry of Immigration and Population, (May, 2015), Department of Population Ministry of Immigration and Population A, (October, 2017), Department of Population, Ministry of Immigration and Population B. (October, 2017), Department of Population, Ministry of Immigration and Population C. (October, 2017). Adapted by ERM, 2019.

[1] Department of Population Ministry of Immigration and Population C, (October, 2017). p.39

5.4.11 Cultural Resources

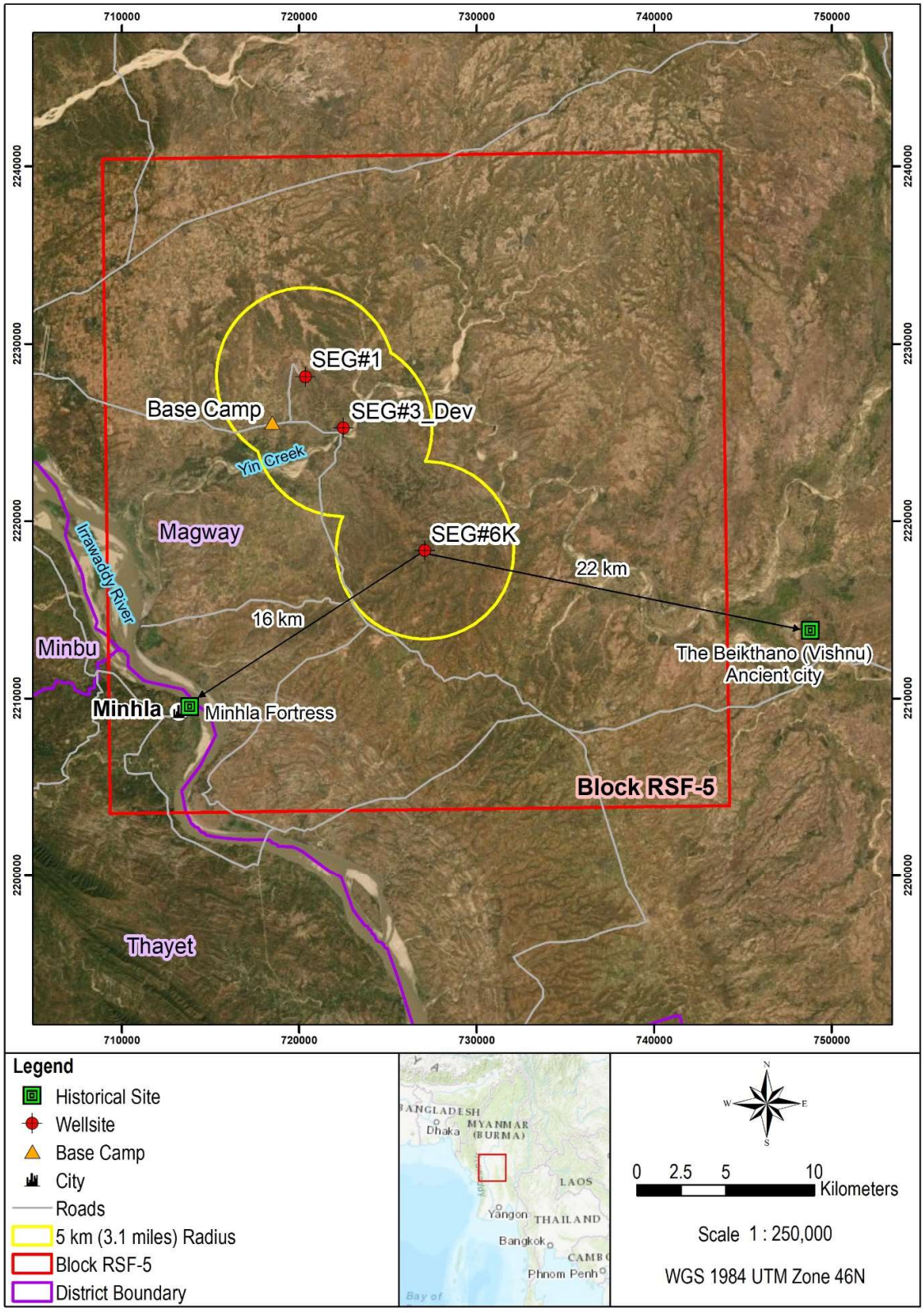
While there are few cultural sites scattered near the Block RSF-5, there two significant cultural landmarks; the Myathalun Pagoda, which is located on the river side of the Irrawaddy, 2 km to the South near the transportation route between Minbu and Magway Township and about 19 km to the South-east from the logistic base. The Minhla Fortress is located 16 km to the southwest from SEG#6K. And the Beikthano (Vishnu) Ancient city is located 22 km southeast from SEG#6K. These cultural site locations are shown in ***Figure 5.48*** and the coordinates is presented in ***Table 5.57***.

Table 5.57: Coordinates of Cultural Sites

Cultural Site	From well site	Latitude	Longitude
The Beikthano (Vishnu) Ancient City	22 km southeast of SEG#6K	19°59'47.85"N	95°23'30.08"E
Minhla Fortress	16 km southwest of SEG#6K	19°58'14.73"N	95° 2'36.25"E

Source: ERM, 2019

Figure 5.48: Cultural Sites from Well sites



Source: ERM, 2019

According to the survey, there are pagodas spreading within most villages but they do not fall within the project areas. However, there is a small pagoda in Tha Yet Lay Pin village located about 1.04 km to the South of the SEG#3_Dev drilling site.

Another key cultural and religious component to be considered are the cemetery and graveyards; 4 are recorded to exist in the Magway Region[1]. This limited number might be due to the cultural factors of disposition method in Myanmar. Cremation is the most common in Myanmar. After the cremation ceremony, the remains are placed in an urn within an indoor or outdoor mausoleum or columbarium, a family burial plot, or an urn garden. The option of scattering the remains is also available[2].

In addition, a small cemetery and an old monastery (about 100 years old) were identify near the Project sites during the baseline study. This cemetery and the monastery were located about 255 and 300 meters respectively in the North-east away from the SEG#3_Dev drilling site.

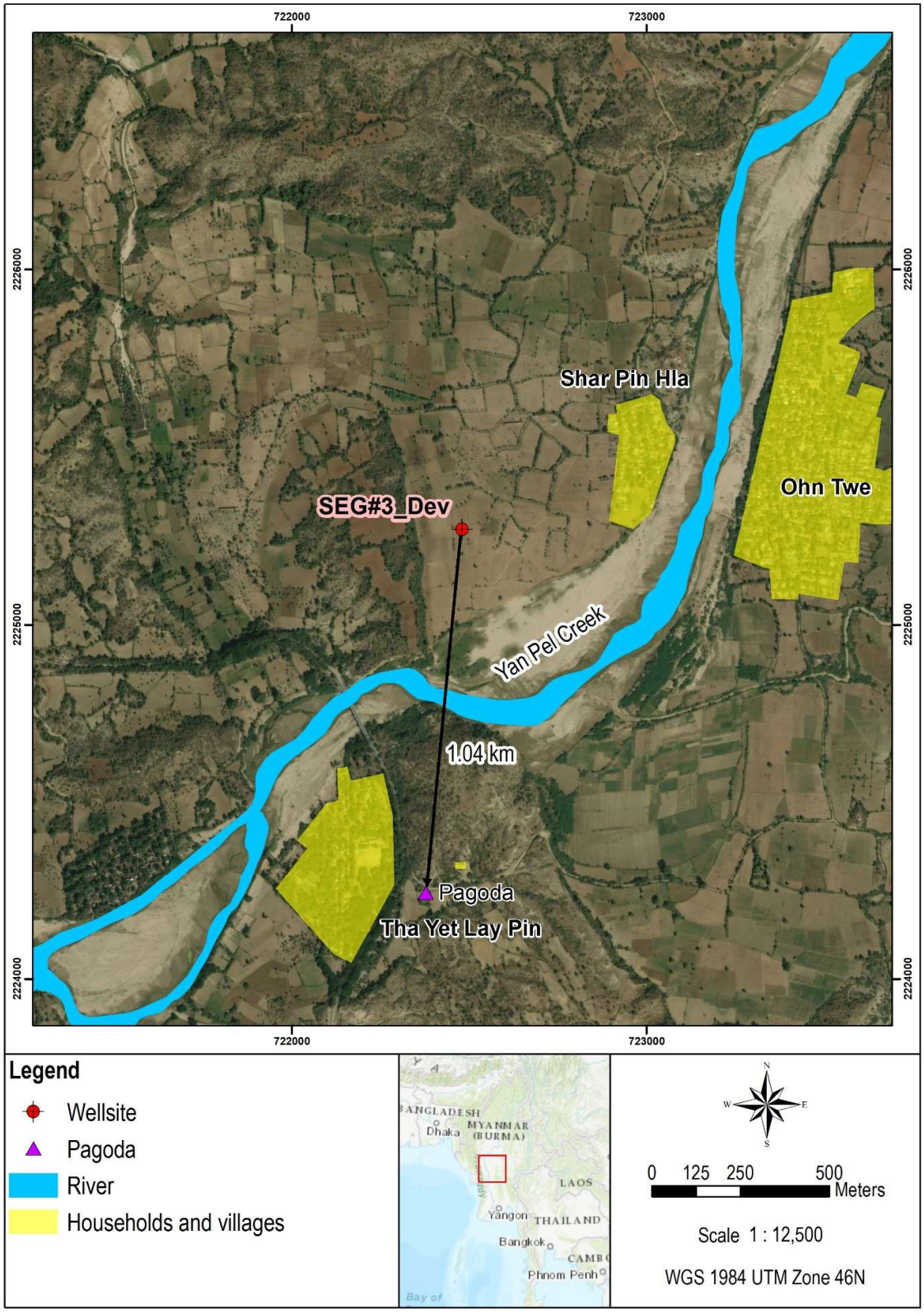
5.4.12 Visual Components

The existing visual landscape of the Project Study Area consists of primarily dry, open landscape, with sparse and stunted vegetation, and limited forested and hilled areas. The elevation is fairly consistent, although some hilly terrain exists. In terms of man-made structures, the only significant visual components across the Project Study Area are pagodas. ***Figure 5.50*** presents typical visual conditions within the Project area.

[1] PlacesMap.net, 2018, Cemetery at Magway Region, Myanmar (Burma). https://placesmap.net/MM/Magway/cemetery/, accessed on November 15, 2018.

[2] n.d. Myanmar cremation services – Myanmar cremation guide. *Funeral Arrangements Guide*. Retrieved April 4, 2019 from http://www.funeral-arrangements-guide.com/myanmar-cremation-services-myanmar-cremation-guide/

Figure 5.49: Pagoda in Project Area



Source: ERM, 2019

Figure 5.50: Visual Landscape in Project Study Area

Source: ERM, 2019

6. IMPACT ASSESSMENT

6.1 Impact Assessment Methodology and Approach

This section of the EIA provides an assessment of potential impacts arising from the Project. The impacts are organized by topic, and have been divided into three main aspects: environment, social and health. The contents presented in this chapter are as follows:

Section 6.1 *Impact Assessment Methodology and Approach*;

Section 6.2 *Identification of Potential Impacts (Outcome of Scoping); and*

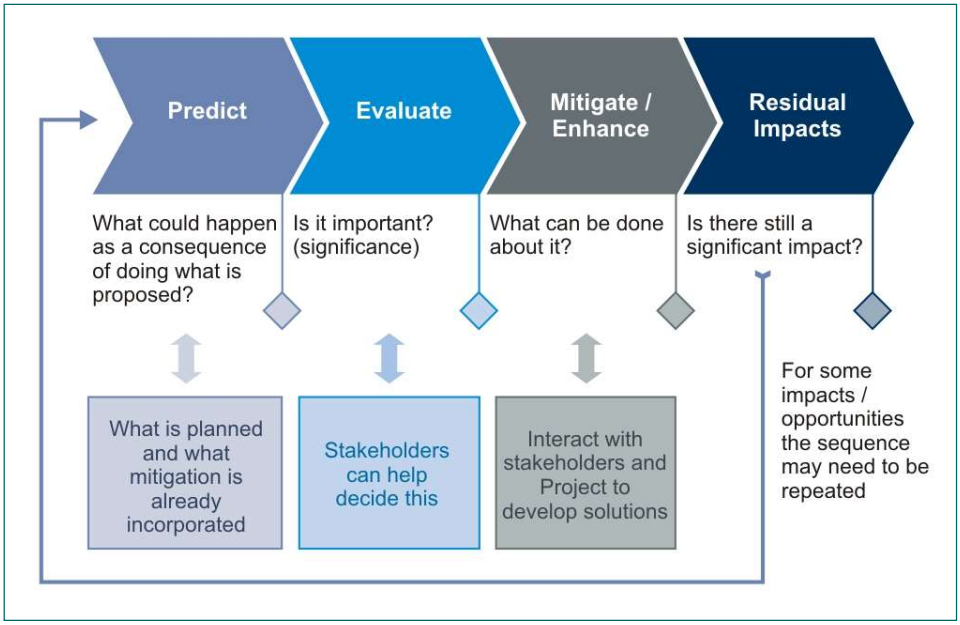
Section 6.3 *Assessment of Environmental, Social and Health Impacts.*

6.1.1 Impact Assessment

Impact identification and assessment starts with scoping and continues through the remainder of the impact assessment process. The principal impact assessment steps are summarized in ***Figure 6.1*** and comprise:

- Impact prediction: to determine what could potentially happen to resources/receptors as a consequence of the Project and its associated activities;
- Impact evaluation: to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor;
- Mitigation and enhancement: to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts; and
- Residual impact evaluation: to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.

Figure 6.1: Impact Assessment Process



Source: ERM, 2012

6.1.1.1 Prediction of Impacts

Prediction of impacts is essentially an objective exercise to determine what could potentially happen to the environmental and social sensitive receptors/resources as a consequence of the Project and its associated activities. From the potentially significant interactions identified in scoping, the potential impacts to the various resources/receptors are elaborated. The diverse range of potential impacts considered in the assessment process typically results in a wide range of prediction methods being used, including quantitative, semi-quantitative and qualitative techniques.

6.1.1.2 Evaluation of Impacts

Description of Impact Characteristics

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

Table 6.1: Impact Characteristic Terminology

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

Source: ERM, 2012

The definitions for the "type" designations are shown in ***Table 6.2***. Definitions for "extent", "duration", "scale", and "frequency" are resource/receptor-specific.

Table 6.2: Impact Type Definitions

Designations	Definition
Direct	Impacts that result from a direct interaction between the Project and a resource/receptor.
Indirect	Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment.
Induced	Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project.

Source: ERM, 2012

Additional Considerations for Assessing Impact to Biodiversity

There are some special considerations for the methodology of assessing impacts to biodiversity and ecosystem services, with regards to classification of direct impacts, indirect impacts or induced impacts. This is explained further below.

Direct Impacts to Biodiversity

Potential impacts to habitats and species will primarily stem from the temporary and permanent footprint of the Project. The significance of these potential impacts have been assessed according to the quality or importance of the habitat or species involved and the magnitude of the impacts it is predicted to experience. The majority of Project activities will be relatively short-term with most impacts resulting from disturbance and displacement and also some potential risk for direct physical harm. Changes to the environment that will impact flora and fauna include:

- Habitat Loss and Degradation within the Project Area;
- Noise, light, visual and vibration impacts (during site preparation) which may cause disturbance to species or displacement; and
- Direct incidental loss of fauna species during construction (from road traffic accidents or other).

Indirect or Induced Impacts to Biodiversity

Potential impacts to habitats may also occur as a result of induced impacts resulting from the development of additional entrance points to the area enabling easier access to habitats for exploitation (for logging, or poaching) as well as the potential introduction of alien species.

Induced impacts may occur from unsustainable harvesting of species or increased recreational disturbance or removal of habitat. Indirectly flora and fauna may also be affected by loss and fragmentation of habitat upon which they rely or use substantially and by the introduction of barriers to movement. In summary, the following indirect or induced impacts may occur.

- Habitat Loss (induced);
- Habitat Fragmentation and Edge Effects
- Introduction of invasive species and pathogens that may outcompete resident species;
- Displacement of species causing increased competition in surrounding area;
- Species Loss from poaching, collection of forest products (from induced impacts resulting from improved access; and
- Physical changes to soil structure due to potential for increased erosion and sedimentation as a result of site preparatory works

The significance of these potential impacts has been assessed according to the importance of the species and habitats involved and the magnitude of the impacts it is predicted to experience.

Additional Considerations for Unplanned Events

An additional characteristic that pertains only to unplanned (or accidental) events is *likelihood*. The *likelihood* of an unplanned event occurring is designated using a qualitative scale, as described in ***Table 6.3***.

Table 6.3: Definitions of Likelihood Designations (for Unplanned Events only)

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

Source: ERM, 2012

Determining Impact Magnitude

Once impact characteristics are defined, the next step in the impact assessment phase is to assign each impact a 'magnitude'. Magnitude is typically a function of some combination (depending on the resource/receptor in question) of the following impact characteristics:

- Extent;
- Duration;
- Scale; and
- Frequency.

Additionally, for unplanned events only, magnitude incorporates the 'likelihood' factor discussed above.

Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the impact. The magnitude designations themselves are universally consistent, but the definitions for these designations vary depending on the resource/receptor. The universal magnitude designations are:

- Positive;
- Negligible;
- Small;
- Medium; and
- Large.

In the case of a *positive* impact, no magnitude designation (aside from 'positive') is assigned. It is considered sufficient for the purpose of the impact assessment to indicate that the Project is expected to result in a *positive* impact, without characterizing the exact degree of positive change likely to occur.

The impact magnitude for various specific receptors/receivers is provided in ***Table 6.4 - Table 6.10***.

Table 6.4: Impact Magnitude for Soil Quality

Magnitude Designation	Definition
Negligible	■ Change well within the bounds of normal natural variation. No effect detectable or recovery within a very short timescale (<1 year). Could occur over any size of area.
Small	■ Change likely to adversely affect the quality/value of the soil but recovery is expected in the short term (i.e. 1 – 4 years). Changes are over a small to moderate area. Impacts beyond levels of natural variation that do not exceed assessment criteria (i.e. low intensity), for any duration or geographic extent.
Medium	■ Change over a moderate (i.e. 1 – 100 ha) to large area, likely to adversely affect the quality/value of the soil but recovery is predicted in the medium term (i.e. 5 – 10 years) and there is predicted to be no permanent impact to its integrity. Conversely, change over a small area (i.e. <1 ha) with direct adverse permanent or long-term effects.
Large	■ Change is likely to cause a direct adverse permanent or long-term (i.e. >10 years) effect on the quality/value of the soil over a large area (i.e. >100 ha).

Source: ERM, 2017

Table 6.5: Impact Magnitude for Groundwater Quality

Magnitude Designation	Definition
Negligible	■ Change is within natural variation for the time of year
Small	■ Change is 75% of standard/guideline levels ■ Short-term consumption that does not restrict other users consumption
Medium	■ Occasional exceedances of ambient / seasonal range or standard / guideline levels; localised and / or limited duration ■ Long-term consumption. Project consumption is <25% of the resource available at the time of use
Large	■ Repeated exceedances of ambient / seasonal range or standard / guideline levels; not localised and / or occurring over a prolonged duration ■ Long-term consumption. Project consumption is >25% of the resource available at the time of use

Source: ERM, 2015

Table 6.6: Magnitude for Surface Water Quality

Magnitude Designation	Definition
Negligible	■ Change is within natural variation for the time of year ■ No alteration to existing drainage regimes and characteristics
Small	■ Change is 75% of standard/guideline levels ■ Short-term consumption that does not restrict other users consumption ■ Some alteration to existing drainage regimes and characteristics but not material
Medium	■ Occasional exceedances of ambient / seasonal range or standard / guideline levels; localised and / or limited duration ■ Long-term consumption. Project consumption is <25% of the resource available at the time of use ■ Significant alteration to existing drainage regimes and patterns over a short-term period or localised area
Large	■ Repeated exceedances of ambient / seasonal range or standard / guideline levels; not localised and / or occurring over a prolonged duration ■ Long-term consumption. Project consumption is >25% of the resource available at the time of use ■ Significant alteration to existing drainage regimes and patterns over a long-term period for a localized area or a short-term period for a large area

Source: ERM, 2012

Table 6.7: Impact Magnitude for Biodiversity - Habitat

Magnitude Designation	Definition
Negligible	■ No existing habitat is affected
Small	■ Affects only a small area of habitat, such that there is no loss of viability/ function of the habitat.
Medium	■ Affects part of the habitat, but does not threaten the long term viability/ function of the habitat.
Large	■ Affects the entire habitat, or a significant proportion of it, and the long term viability/ function of the habitat is threatened.

Source: ERM, 2012

Table 6.8: Impact Magnitude for Biodiversity – Species

Magnitude Designation	Definition
Negligible	No species is affected.
Small	Effect does not cause a substantial change in the population of the species, or other species dependent on it.
Medium	Effect causes a substantial change in abundance and/ or reduction in distribution of a population over one, or more generations, but does not threaten the long term viability/ function of that population, or any population dependent on it.
Large	Affects entire population, or a significant part of it causing a substantial decline in abundance and/ or change in and recovery of the population (or another dependent on it) is not possible either at all, or within several generations due to natural recruitment (reproduction, immigration from unaffected areas).

Source: ERM, 2012

Table 6.9: Impact Magnitude for Ecosystem Services

Magnitude Designation	Definition
Negligible	Change remains within the range commonly experienced during baseline conditions within the household or community.
Small	Minor deviation from the normal range during baseline conditions. The impact causes a reduction in the availability or functionality of the Ecosystem Service across a small area and has implications for a small number of receptors. The change in the service is for a short duration or occurs with low frequency.
Medium	Clearly evident difference from baseline conditions. The impact results in a reduction in the availability or functionality of the Ecosystem Service across a substantial area or number of people and is of medium duration or occasional frequency. Does not threaten the long-term viability of the service.
Large	Change dominates over baseline conditions. The impact results in the loss of all or a significant proportion of the availability or functionality of an Ecosystem Service and/or has implications for a large proportion or absolute number of receptors. The long-term viability of the service is threatened.

Source: ERM, 2012

Table 6.10: Impact Magnitude for Social and Health Impacts

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

Source: ERM, 2012

Determining Resource/Receptor Sensitivity

In addition to characterizing the magnitude of impact, the other principal impact evaluation step is definition of the sensitivity (including vulnerability and importance) of the impacted resource/receptor. There are a range of factors to be taken into account when defining the sensitivity of the resource/receptor, which may be physical, biological, cultural or human. Other factors may also be considered, such as legal protection, government policy, stakeholder views and economic value.

As in the case of magnitude, the sensitivity designations themselves are universally consistent, but the definitions for these designations vary on a resource/receptor basis. The sensitivity designations for all resources/ receptors are:

- Low;
- Medium; and
- High.

The receptor sensitivities for various resources and receptors are provided in ***Table 6.11 – Table 6.17.***

Table 6.11: Sensitivity Criteria for Impacts to Soil Quality

Sensitivity Designation	Definition
Low	■ Low soil fertility not used for agriculture, contaminated made-ground soils at brownfield sites, soils not supporting any particularly sensitive or important habitats.
Medium	■ Typical agricultural land, soils supporting specific habitats (e.g. forests), soils on residential sites
High	■ Intensively farmed, highly fertile soils, wetland soils, soils which host shallow aquifers relied upon for abstraction or essential for river base flow, soils of specific characteristics (e.g. pH, carbon content, mineralogy) that support specific significant or high-value flora or faunal habitats.

Source: ERM, 2017b

Table 6.12: Sensitivity Criteria for Groundwater Quality

Sensitivity Designation	Definition
Low	■ The groundwater resource supports aquatic habitat or population, but the habitat/population is common/ non-diverse/ insignificant. Additionally, the groundwater resource may support local human community.
Medium	■ The groundwater resource supports diverse or susceptible populations of flora and/or fauna. Groundwater resource supports some local communities.
High	■ The groundwater resource supports economically important or biologically unique species or provides essential habitat/ nutrients to sustain such species. Local communities are very reliant on groundwater resource.

Source: ERM, 2015

Table 6.13: Sensitivity Criteria for Surface Water Quality

Sensitivity Designation	Definition
Low	■ The water resource does not support diverse aquatic habitat or populations, or supports aquatic habitat or population that is low quality.
Medium	■ The water resource supports diverse populations of flora and/or fauna.
High	■ The water resource supports economically important or biologically unique aquatic species or provides essential habitat for such species.

Source: ERM, 2012

Table 6.14: Sensitivity Criteria for Biodiversity - Habitat

Sensitivity Designation	Definition
Low	■ Habitats with no, or only a local designation/ recognition, habitats of significance for species listed as Least Concern (LC) on IUCN Red List of Threatened Species, habitats which are common and widespread within the region, or with low conservation interest based on expert opinion.
Medium	■ Habitats within nationally designated or recognised areas, habitats of significant importance to globally Vulnerable (VU), Near Threatened (NT), or Data Deficient (DD) species, habitats of significant importance for nationally restricted range species, habitats supporting nationally significant concentrations of migratory species and/ or congregatory species, and low value habitats used by species of medium value.
High	■ Habitats within internationally designated or recognised areas, habitats of significant importance to globally Critically Endangered (CR) or Endangered (EN) species, habitats of significant importance to endemic and/ or globally restricted-range species, habitats supporting globally significant concentrations of migratory species and/ or congregatory species, highly threatened and/ or unique ecosystems, areas associated with key evolutionary species, and low or medium value habitats used by high value species.

Source: ERM, 2012

Table 6.15: Sensitivity Criteria for Biodiversity - Species

Sensitivity Designation	Definition
Low	■ Species and sub-species of LC on the IUCN Red List, or not meeting criteria for medium or high value.
Medium	■ Species on IUCN Red List as VU, NT, or DD, species protected under national legislation, nationally restricted range species, nationally important numbers of migratory, or congregatory species, species not meeting criteria for high value, and species vital to the survival of a medium value species.
High	■ Species on IUCN Red List as CR, or EN. Species having a globally restricted range (i.e. plants endemic to a site, or found globally at fewer than 10 sites, fauna having a distribution range (or globally breeding range for bird species) of less than 50,000 km2), internationally important numbers of migratory, congregatory species, key evolutionary species, and species vital to the survival of a high value species.

Source: ERM, 2012

Table 6.16: Sensitivity Criteria for Ecosystem Services

Sensitivity Designation	Definition
Low	Minimal areas of vulnerabilities; consequently with a high ability to adapt to changes brought by the project.
Medium	Few areas of vulnerability; but still retaining an ability to at least in part adapt to change brought by the project
High	Profound or multiple levels of vulnerability that undermine the ability to adapt to changes brought by the project.

Source: ERM, 2012

Table 6.17: Receptor Sensitivity for Local Communities

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

Source: ERM, 2012

Determining Impact Significance

Once magnitude of impact and sensitivity of resource/receptor have been characterized, the significance can be assigned for each impact. Impact significance is designated using the matrix shown in ***Table 6.18***.

Table 6.18: Impact Significance

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

Source: ERM, 2019

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

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

Box A: Context of Impact Significances

An impact of **negligible** significance is one where a resource/receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.

An impact of **minor significance** is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/ vulnerability/ importance. In either case, the magnitude should be well within applicable standards.

An impact of **moderate** significance has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP).

An impact of **major significance** is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of EIA is to get to a position where the Project does not have any major residual impacts. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a facility.

6.1.2 Identification of Mitigation and Enhancement Measures

Once the significance of an impact has been characterised, the next step is to evaluate which mitigation and enhancement measures are warranted. For the purposes of this impact assessment, the following mitigation hierarchy has been adopted:

- **Avoid at Source, Reduce at Source:** avoiding or, when it is not possible, reducing at source through the design of the Project (e.g., avoiding by siting or re-routing activity away from sensitive areas or reducing by restricting the working area or changing the time of the activity).
- **Abate on Site**: add something to the design to abate the impact (e.g., pollution control equipment, traffic controls, perimeter screening and landscaping).
- **Abate at Receptor:** if an impact cannot be abated on-site then control measures can be implemented off-site (e.g., noise barriers to reduce noise impact at a nearby residence or fencing to prevent animals straying onto the site).
- **Repair or Restore**: some impacts involve unavoidable damage to a resource (e.g. agricultural land and forestry due to creating access, work camps or materials storage areas) and these impacts can be addressed through repair, restoration or reinstatement measures.
- **Compensate and/or Offset** where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate (e.g., planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries access, recreation and amenity space).

The priority in mitigation is to first apply mitigation measures to the source of the impact (i.e., to avoid or reduce the magnitude of the impact from the associated Project activity), and then to address the resultant effect to the resource/receptor via abatement or compensatory measures or offsets (i.e., to reduce the significance of the effect once all reasonably practicable mitigations have been applied to reduce the impact magnitude).

6.1.3 Residual Impact Evaluation

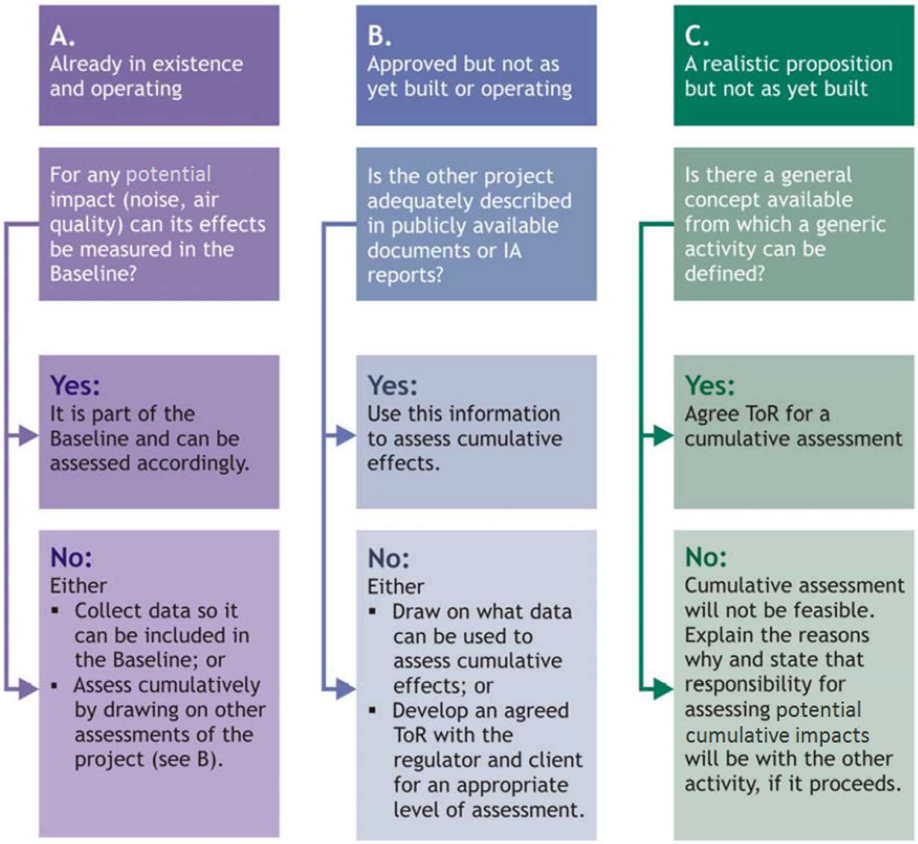
Once mitigation and enhancement measures are declared, the next step in the EIA Process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the implementation of the proposed mitigation and enhancement measures.

6.1.4 Cumulative Impact Assessment

Cumulative impacts and effects are those that arise as a result of an impact and effect from the Project interacting with those from another activity to create an additional impact and effect. These are termed cumulative impacts and effects. How such potential impacts and effects are assessed is strongly influenced by the status of the other projects (e.g. already in existence or approved/planned or proposed) and how much data are available to characterize the magnitude of the potential impacts.

The methodology for Cumulative Impact Assessment based on status of existing facilities is illustrated in ***Figure 6.2***. For this Project, the potential cumulative impacts of drilling operations in Block RSF-5, combined with all phases of the Project activities, were assessed based on analysis of baseline data collected at the project location, and assessment of the significance of potential impacts using similar methodology to that used for direct impacts (above).

Figure 6.2: Cumulative Impact Assessment Process



6.2 Identification of Potential Impacts (Outcome of Scoping)

For the proposed Project, potential impacts have been identified through a systematic process whereby the features and activities (both planned and unplanned) associated with the preparation, operation and decommissioning of the Project have been considered with respect to their potential to interact with resources/receptors.

As a tool for conducting scoping, a Scoping Matrix has been utilized, and is presented in ***Figure 6.3.*** The Scoping Matrix presents the various Project activities that could reasonably act as a source of impact down the vertical axis, and the resources/receptors relevant to the baseline environment have been listed across the horizontal axis. Each resulting cell on the Potential Interactions Matrix thus represents a potential interaction between a Project activity and a resource/receptor. Potential impacts have each been classified in one of three categories:

- **No interaction (White Cell):** where the Project is unlikely to interact with the resource/receptor (e.g., wholly marine projects may have no interaction with the terrestrial environment);
- **Interaction likely, but not likely to be significant (Grey Cell):** where there is likely to be an interaction, but the resultant impact is unlikely to change baseline conditions in an appreciable/detectable way; and
- **Significant negative interaction (Black Cell)**: where there is likely to be an interaction, and the resultant impact has a reasonable potential to cause a significant effect on the resource/receptor.

- **Significant positive interaction (Green Cell)**: where there is likely to be an interaction, and the resultant impact has a reasonable potential to cause a significant positive effect on the resource/receptor.

It should be noted that the list of project activities is not intended to be exhaustive but rather an identification of key aspects of the Project operations that have the potential to interact with the environment/ cause environmental impacts. The list of resources/receptors is also a focused list of the key aspects of the environment that are considered vulnerable or important in the context of Project activities.

Figure 6.3: Potential Interactions Matrix

Project Phases and Activities	Environmental Resources									Socio-Economic Resources							Health Resources	
	Air Quality	Greenhouse Gas	Noise and Vibration	Soil	Topography	Surface Water Quality	Hydrology	Groundwater	Biodiversity and Ecosystem Services	Land/River Use and Livelihood (incl. Economic Displacement)	Public Infrastructure and Utilities	Visual Landscape	Cultural Heritage	Tourism	Socio-Economy	Demographics (incl. Physical Displacement)	Community Health and Safety	Occupational Health, Safety and Working Conditions
Site Preparation and Construction																		
Land Acquisition										■			■			■		
Land Preparation and Earthworks Activities*	■	■	■	■	■	■	■		■	■	■	■	■	■	■		■	■
Riverbanks Improvement/Construction	■	■	■	■		■	■		■	■	■			■	■		■	■
Sourcing of Fill Material				■	■				■	■		■			■		■	■
Transportation of Workers, Materials, Waste	■	■	■	■	■	■	■	■	■	■	■		■		■		■	■
Water Use						■	■	■	■		■				■		■	■
Energy Use and Power Supply	■	■	■														■	■
Solid Waste Management**				■		■		■	■	■	■			■	■		■	■
Wastewater Management***				■		■	■	■	■	■	■			■	■		■	■
Hazardous Materials Storage and Handling				■		■		■	■	■				■			■	■
Labour Influx and Worker Accommodation									■	■	■			■	■	■	■	■
Drilling Operation																		
Rig Mobilization to Site	■	■	■	■	■	■	■	■	■	■	■		■	■	■		■	■
Drilling and Casing Activities	■	■	■	■				■	■			■	■		■		■	■
Transportation of Workers, Materials, Waste	■	■	■	■	■	■	■	■	■	■	■		■				■	■
Water Use							■	■	■		■						■	
Energy Use and Power Supply	■	■	■														■	■

Project Phases and Activities	Environmental Resources									Socio-Economic Resources							Health Resources	
	Air Quality	Greenhouse Gas	Noise and Vibration	Soil	Topography	Surface Water Quality	Hydrology	Groundwater	Biodiversity and Ecosystem Services	Land/River Use and Livelihood (incl. Economic Displacement)	Public Infrastructure and Utilities	Visual Landscape	Cultural Heritage	Tourism	Socio-Economy	Demographics (incl. Physical Displacement)	Community Health and Safety	Occupational Health, Safety and Working Conditions
Solid Waste Management**				■		■		■	■	■	■						■	■
Wastewater Management***				■		■	▒	■	■	■	■						■	■
Hazardous Materials Storage and Handling				■		■		■	■								■	■
Labour Influx and Worker Accommodation									■	▒	■				■	■	■	■
Testing and Well Abandonment																		
Well Perforation						▒		▒										
Flaring and Venting	■	■	■															
Well Testing	■	■																
Unplanned Events																		
Vehicle Accidents									■		■			▒	▒		■	■
Accidental Spills/Leaks				■		■	■	■	■	■	■			▒	▒		■	■
Well Blowout	■	■	■	■		■		■	■	■	■			▒	▒	■	■	■
Fire and Explosion (not due to Blowout)	■	■	■	■		■		■	■	■	■			▒	▒	■	■	■
Natural Disasters (i.e. Earthquake)				■	■	■	■	■	■	■	■	▒	▒	▒	▒	▒	■	■

* Land preparation and earthworks activities are those activities required for clearing and delineation of site, site levelling, soil improvement and soil excavation for construction of well pads and access roads.

** Solid Waste Management includes all types of solid wastes and waste sources, including non-hazardous/hazardous, drill cuttings (in the drilling phase), etc. The types of waste and their impacts are further delineated and specified within the relevant impact assessment sections.

*** Wastewater Management includes all kinds of wastewater, including sewage, industrial wastewater, produced water, drilling fluids (in the drilling phase), stormwater, etc. The types of wastewater and their impacts are further delineated and specified within the relevant impact assessment sections.

Project Phases and Activities	Environmental Resources									Socio-Economic Resources							Health Resources	
	Air Quality	Greenhouse Gas	Noise and Vibration	Soil	Topography	Surface Water Quality	Hydrology	Groundwater	Biodiversity and Ecosystem Services	Land/River Use and Livelihood (incl. Economic Displacement)	Public Infrastructure and Utilities	Visual Landscape	Cultural Heritage	Tourism	Socio-Economy	Demographics (incl. Physical Displacement)	Community Health and Safety	Occupational Health, Safety and Working Conditions

Key:

	Interactions are identified as unlikely to occur
	Interactions are identified as likely to occur, but the resulting impacts are not likely to be significant
	Interactions are identified as likely to occur, and the resulting impacts are potentially significant
	Interactions are identified as likely to occur, and the resulting impacts are potentially significant (and positive)

6.2.1 Scoped-In Impacts to be Assessed

Based on the outcomes of Scoping, the following potentially significant impacts will be assessed further in this EIA:

- Potential Impacts to Environmental Resources including:
  - Air Quality;
  - Greenhouse Gas;
  - Noise and Vibration;
  - Soil;
  - Topography;
  - Surface Water Quality;
  - Hydrology;
  - Groundwater; and
  - Biodiversity and Ecosystem Services.
- Potential Impacts to Social and Health Resources including:
  - Land/River Use and Livelihood;
  - Public Infrastructure and Utilities;
  - Visual Landscape;
  - Cultural Heritage;
  - Socio-Economy;
  - Demographics;
  - Community Health and Safety; and
  - Occupational Health, Safety and Working Conditions.
- Potential Impacts due to Accidental Events (unplanned events).
  - Vehicle Accidents
  - Accidental Release;
  - Well Blowout;
  - Fire or Explosion (not due to blow out); and
  - Natural Disasters.

The impact assessment in the following section focuses mainly on these interactions.

6.3 Environmental Impact Assessment

6.3.1 Air Quality and Greenhouse Gas (GHG)

6.3.1.1 Source of Impact

As determined during scoping, potential impacts to air quality and greenhouse gas emissions may occur due to:

Site Preparation and Construction:

- Land preparation and earthworks activities;
- Riverbanks improvement/construction (if applicable);
- Transportation of workers, materials, waste; and
- Energy use and power supply.

Drilling Operations:

- Rib mobilization to site;
- Drilling and casing activities;
- Transportation of workers, materials, waste; and
- Energy use and power supply.

Testing/Well Abandonment:

- Flaring; and
- Well testing.

6.3.1.2 Summary of Relevant Baseline Conditions

Results from baseline air quality monitoring in the Project Study Area found relatively high levels of particulate matter and SO_2 at some locations. Potential causes of particulate matter include natural levels due to being a dry dusty region, and local dust-producing activities including agriculture, open burning, and use of wood stoves. The elevated SO_2 level throughout the survey area can be attributed to usage of diesel fuel with high sulphur content in power generators. Overall the air quality in the region can be considered as moderate due to high levels of particulate matter.

The annual CO_2 release of Myanmar was 210 Million metric tons CO_2 in 2014 (World Bank, 2014).

6.3.1.3 Assessment of Impacts – Site Preparation and Construction Phase

Air Pollutant and Greenhouse Gas Emissions

During site preparation activities, combustion products will be released from vehicles transporting personnel and equipment and construction machinery. Site preparation and construction activities will include building the well site, grading the logistics base, and constructing/upgrading access roads. This may involve the use of graders, rollers, water trucks, tractor/bulldozers, backhoes, graders, compactors, jack-hammers and dump trucks.

The primary pollutants emitted will include particulate matter (PM), carbon monoxide (CO), nitrogen oxides (NOx), hydrocarbons (HC), and volatile organic compounds (VOCs). Combustion of fossil fuels in stationary and mobile combustion sources will produce greenhouse gases (e.g. carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). ***Table 6.19*** summarizes the potential impacts of various gases produced by the project activities. Overall, both GHG and non-GHG air pollutants from the use of vehicles and construction equipment during the Site Preparation and Construction phase are unlikely to cause a significant impact to ambient air quality or greenhouse gas levels, due to the relatively small amounts of these gases to be released over a large distributed area and relatively short duration. A more significant air quality concern during this phase is dust, which will be discussed below.

Table 6.19: Potential Impacts of Combustion Emissions and Greenhouse Gases

Emission Species	Potential Environmental Impact
CO	Indirect GHG. Enhances low-level of ozone formation.
CO_2	GHG. Contributes to atmospheric GHG concentrations.
NO_X	Air pollutant. Contributes to the formation of acidic species that can be deposited by wet and dry processes, potentially impacting aquatic and terrestrial ecosystems.
N_2O	Air pollutant and GHG. A source of ozone depletion. Deficiency of vitamin B12 in human health.
SO_x	Air Pollutant. Contributes to the formation of acidic species that can be deposited by wet and dry processes, potentially impacting aquatic and terrestrial ecosystems.
CH_4	Air pollutant and GHG. Contributes to climate change and ground level ozone air pollution, which can exacerbate respiratory and cardiovascular problems.
Total Hydrocarbons	Air Pollutant. Precursor to ground-level ozone and a major component of smog.

Dust

During Site Preparation and Construction, land preparation and road construction/upgrading activities have the potential to generate dust, which may impact nearby communities, as well as potentially impact biodiversity due to settling of dust on vegetation adjacent to the Project Area. In addition, dust will be dispersed by vehicles driving on dirt roads or off road: vehicles grind dust into finer particles, and tire rotation and eddy air currents lift particles into the air. Dust dispersion will also be caused by filling and compaction during construction. Excessive dust deposition on flora may act to suppress growth through limiting photosynthesis and the dusted foliage may also become unpalatable to foraging fauna.

AP-42 Section 13.2.3, Miscellaneous Source, Heavy Construction Operation[1], provides information on emission factors to assess particulates emissions from construction activities. A conservative emission factor for construction activity operation is 1.2 tons of total suspended particulate (TSP) per acre per month (or 98.8 kg/hectare/day). The value is most applicable to construction operations with medium activity level and semiarid climate. Because the above emission factor is referenced to TSP, use of this factor to estimate particulate matter (PM) no greater than 10 µm (PM_{10}) emissions will result in conservatively high estimates, and therefore represents a worst case scenario. The emission rate (Q) and dust concentration (C) can be estimated as shown in the equations below, which are based on a simplified box model.

$$Q\ (mg/s) = \frac{98.8\ (kg/ha/d) * \text{area}\ (ha) * 10^6 (mg/kg)}{24 * 60 * 60 (s/d)} \qquad \textbf{Eq. 6-1}$$

The total area to be considered for dust generation consists of 2 well pads, upgraded/constructed access roads, and the logistics base. The largest (worst case) dimensions of each of these components is shown below in ***Table 4.4***.

[1] https://www3.epa.gov/ttnchie1/ap42/ch13/final/c13s02-3.pdf

Table 6.20: Summary of Dimensions of Constructed and Upgraded Features

Feature*	Dimensions			
	Length (m)	Width (m)	Area (m^2)	Area (ha)
Well Pads (each)	183	156	28,548	2.85
Access Road (new)	250	6.0	1,500	0.15
Access Road (upgraded, cumulative)	8,070	6.0	48,420	4.84
Logistics Base	150	130	19,500	1.95

* To assess the worst case potential impacts, the largest features (i.e. largest well pad dimensions, longest 2 of 3 access roads, etc.) have been assumed

Source: Eni, 2019

However, it is important to note that not every feature will be constructed or upgraded simultaneously. In particular, the upgrading of roads will occur in a phased approach, whereby dust concentrations from a particular section will disperse before the next section is constructed/upgraded. As a worst case scenario for estimating dust concentration, the dust generated from disturbance along 500 m of road and one completed well pad will be used. The dust concentration for each component is estimated by using the box model of ***Equation 6-2***:

$$C\ (mg/m^3) = \frac{Q\ (mg/s)}{d\ (m) * W\ (m/s) * M\ (m)} \qquad \textit{Eq. 6-2}$$

where

C = Dust Concentration (mg/m^3)
Q = Emissions at Source (mg/s)
d = Width (the smallest dimension of each feature is used for worst case scenario) (m)
W = Average wind speed (Magway Region - 2 m/s[1])
M = Mixing Height (m) (average of 1,534 m, based on data from a station at the Thai-Myanmar border, which is the closest monitoring station with publicly available mixing height data[2])

The results of the dust emission rate and dust concentration calculations are shown in ***Table 6.21***.

Table 6.21: Dust Concentration from Construction Works

Feature	Area (ha)	Dust Emission Rate (mg/s)	Minimum Width (m)	Project Contribution to Dust ($\mu g/m^3$)	Average Existing Baseline PM_{10} ($\mu g/m^3$)	Predicted Environmental Concentration (PEC) ($\mu g/m^3$)
Well Pad	3.00	7,718.75	250	10.06	53.69	63.75
Access Roads	0.3	343.06	6	18.64	53.69	72.33
TOTAL				28.70	53.69	136.08

Using the above assumptions, the dust concentration resulting from construction activities is added to the average PM_{10} ambient concentration at the Project site. The highest combined dust concentration would be 136.08 µg /m^3 during simultaneous construction and vehicle traffic over one entire well pad and 500 m of road. Although this value exceeds the Myanmar NEQG ambient PM_{10} standard for 24-

[1] https://www.weatheronline.co.uk/

[2] https://pdfs.semanticscholar.org/74a5/87bb0e465cf833056b827a873a2f4d6e4091.pdf

hours (50 µg/m^3), it is lower than the WHO Guidance Value (Interim targe-1) of 150 µg/m^3. In addition, this represents a worst case estimate, with multiple construction activities taking place simultaneously and emitting continuous dust. In reality PM_{10} concentrations generated from the project would be intermittent and dust would disperse due to atmospheric conditions. Additionally, much of the Site Preparation and Construction will be conducted during the rainy season, which would minimize dust. Overall the magnitude of the impact is considered medium.

Significance of Impact - Site Preparation and Construction

Evaluation of impacts to air quality, dust and greenhouse gas emissions from the Project from Site Preparation and Construction activities has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.22***.

Table 6.22: Assessment of Impacts on Air Quality and Greenhouse Gas due to Site Preparation and Construction

Significance of Impact					
Impact	■ Temporary emissions of nitrogen oxides (NOx), sulphur dioxide (SO2), dust and particulates (PM_{10} and $PM_{2.5}$) from onsite mobile and non-mobile construction-related activities eg land preparation and/or construction and transportation of workers and equipment. ■ Increased emission of GHGs from construction site vehicles and equipment (eg combustion emissions from energy use from power supplies) could release GHGs and air-pollutants to the atmosphere. ■ Dust dispersion is expected from transportation of materials, land preparation activities such as excavating, grading and clearing existing vegetation; and ■ Potential dust generation from temporary stockpiles during construction access of roads.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts are considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to air quality and greenhouse gases would be direct impacts through the release of gases and dust from Project activities.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The impact to air quality during construction and site preparation is considered to be short-term, as the activity takes place over a short period of time (approximately 3-4 months), and air quality will return to existing condition after the Site Preparation and Construction activities are finalized.				
Impact Extent	**Local**	Regional	International		
	Impacts would primarily be limited to the Project Area and hence would be considered to be local, however winds may potentially carry pollutants and dust into surrounding communities.				
Impact Scale	■ Site preparation activities will cover the well pad area, logistics base, access road, and surroundings, as well as the river bank landing site, which is cumulatively a large area. ■ Overall, both GHG and non-GHG air pollutants from the use of vehicles and construction equipment during the Site Preparation and Construction phase are unlikely to cause a significant impact to ambient air quality or greenhouse gas levels, due to the relatively small amounts of these gases to be released over a large distributed area and relatively short duration. ■ The highest combined dust concentration would is estimated to be 136.08 µg /m^3, which exceeds Myanmar's NEQG standard.				
Impact Frequency	Site preparation and transportation activities will happen repeatedly throughout the day during this phase.				
	Positive	Negligible	Small	**Medium**	Large

Significance of Impact				
Impact Magnitude	Based on the combination of the above impact characteristics the impact magnitude is considered to be medium.			
Receptor Sensitivity	Low	**Medium**	High	
	Existing air quality in the Project Area is moderate, with noted elevated levels of particulate matter and SO_x. There are communities near to the construction activities, but no particularly vulnerable populations (such as hospitals or schools). Overall receptor sensitivity is considered medium.			
Impact Significance	Negligible	Minor	**Moderate**	Major
	The combination of a Medium Resource Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.			

Mitigation and Management Measures - Site Preparation and Construction

- Land clearing/disturbance to be minimised to the extent possible;
- Optimization of construction schedule and placement of laydown areas/temporary camp sites to reduce overall traffic movements/distance travelled, thus reducing GHG emissions from transport;
- Implement a Traffic Management Plan;
- Develop and implement a Dust Management Plan (DMP);
- Water sprinkling for dust suppression where dust is being created from works impacting nearby community;
- All sand and aggregates will be stored in bunded areas and are not allowed to dry out unless specifically required;
- Consider using clean diesel (low sulphur diesel);
- Shut down generators, compressors, and other equipment when not in use;
- Where possible, use energy efficient devices and energy conserving technologies (such as LED lighting) to reduce overall energy use.
- Only strip and clear areas specifically required for planned Project works;
- Reduce vehicle speed when passing nearby communities;
- Do not overload vehicles;
- Fully cover truck loads during material transportation;
- Procurement to consider the energy efficiency of all new mobile and fixed equipment;
- Regularly inspect and maintain vehicles, engines and generators operating at optimal efficiency; and
- Use optimal transport routes (to reduce distance) and if possible, obtain fill material from as near the well sites as possible to reduce transportation distances (and emissions).

Significance of Residual Impact - Site Preparation and Construction

Residual impacts would be expected to be of **Minor** significance.

6.3.1.4 Assessment of Impacts – Drilling Operations Phase

Drilling activities have the potential to cause a decrease of the air quality in the vicinity of the project, resulting from fuel combustion from vehicles, equipment and drilling rig.

Dust Emissions

Traffic-related dust generation will occur during the drilling phase, primarily due to the mobilization of the drilling rig. Mobilization and demobilization of the drilling rig will require the largest road/truck movements to the site, with the highest potential for dust generation and associated impacts on the local community. However, dust generation is expected to be significantly lower than that from the Site Preparation and Construction phase due to lack of earthworks activities, and a comparatively short duration for rig mobilization.

Air Pollutant Emissions

The main source of air pollutants will be from the power supply for the drilling rig. Unlike during the Site Preparation and Construction phase, the air pollutant emissions from the drilling rig may cause a relatively more significant impact due to the continuous operation, longer duration, and stationary point source emission rather than emissions dispersed over a large area. The rig will be powered by diesel driven generator sets, and the generators will operate 24 hr/day throughout a maximum drilling period of 80 days per well. Average daily fuel consumption during normal Drilling Operation is 6,000 L/day. Based on a compilation of air pollution emission factors established by the U.S. Environmental Protection Agency (EPA), carbon monoxide, nitrogen oxides, and sulphur oxides will be emitted at estimated quantities shown in ***Table 6.25***.

The magnitude of impacts is then determined on the basis of two factors:

1. The increase in pollutant concentrations in air as a result of the Project (Project Contribution - PC or potential incremental impact); and
2. The total air pollutant concentrations arising as a result of the existing baseline added to the PC (the Predicted Environmental Concentration – PEC, or cumulative impact).

The PC and PEC are considered in the context of the relevant air quality standards (AQS). On the basis of the PC, PEC and the relevant AQS, the magnitude is determined as shown in ***Figure 6.4***.

Figure 6.4: Determination of Magnitude of Impacts due to Air Pollutants

Magnitude of Potential Impacts

	Undegraded Airshed (Baseline < AQS)	Degraded Airshed (Baseline >AQS)
Negligible	PC < 25% of AQS	PC <10% of AQS
Small	PC >25% of AQS, <50% of AQS, and PEC <100% of AQS	PC >10% of AQS, <15% of AQS
Medium	PC >25% of AQS, <50% of AQS, and PEC >100% of AQS; or PC >50% of AQS, <100% of AQS, and PEC <100% of AQS	PC >15% of AQS, <25% of AQS
Large	PC >100% of AQS	PC >25% of AQS

To obtain estimated concentrations (PC and PEC) of pollutants, the total emission quantities from ***Table 6.23*** are combined with a simplified box model, as used for dust calculations (***Equation 7-2***), taking *d* as the width of the well pad (approx. 250 m), and *Q* as the emission rate based on quantity released over the drilling phase. Estimated concentrations of pollutants due to the Project (based on 80 days drilling per well, 24 hours per day), as well as the equivalent impact magnitude are presented in ***Table 6.24***. The total estimated emission values are considered a worst case scenario.

For NOx, the PC is equivalent to 0.46% of the compared AQS, and the PEC is equivalent to 24.53% of the compared AQS. For SO_x, the PC is equivalent to 0.31% of the AQS, and PEC is equivalent to 49.90% of the equivalent AQS. For CO, PC is equivalent to 0.002% of the AQS, and PEC is equivalent to 1.69% of the AQS. Therefore, based on the criteria in ***Figure 6.4,*** the magnitude of impact is **Negligible** for all three compared air pollutants.

Table 6.23: Estimated Emission of Air Pollutants from Drilling

Air Pollutant	Emission Factor (kg/TJ)	Fuel Consumption (kg/day/well)	Fuel Consumption (TJ/day/well)	Estimated Emission of Air Pollutant (tonne/day/well)	Total Estimated Emission (tonnes)
Nitrogen Oxides (NO_x)	1,896	5,038	0.218	0.41	66.23
Sulphur Oxides (SO_x)	126			0.027	4.40
Carbon Monoxide (CO)	410			0.269	14.32

*Includes 80 days of drilling/well x 2 wells
Sources: US.EPA[1]
Note: Density of diesel oil is 0.8397 kg/l, IEA (2004)[2]; Net Calorific Values is 43.33 TJ/Gg, IEA (2009)[3]

Table 6.24: Estimated Pollutant Concentrations and Impact Magnitude

Air Pollutant	Total Estimated Emission during Drilling (tonnes)	Average Baseline Concentration (µg/m^3)	Project Contribution (µg/m^3)	Predicted Environmental Concentration (µg/m^3)	Standard Value* (µg/m^3)	Equivalent Impact Magnitude
Nitrogen Oxides (NO_x)	66.23	48.13	0.93	49.06	200 (24 hour)	Negligible
Sulphur Oxides (SO_x)	4.40	9.92	0.06	9.98	20 (24 hour)	Negligible
Carbon Monoxide (CO)	14.32	173.55	0.20	173.75	10,310 (8 hour)	Negligible

* For NO_x and SO_x, the standard value is taken from the Myanmar NEQG. For CO, there is no standard value in the Myanmar NEQG, so the standard has been taken from EPA's NAAQS Table[4]. As EPA results are presented in units of ppm, they can be converted to µg/m^3 for CO by assuming molecular weight of 28.01 g/mol, 1 atmosphere, and temperature of 25 degrees Celcius, and using the formula Concentration (CO, µg/m^3) = 1000*(0.0409 X Concentration (CO, ppm) X 28.01).

[1] "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.
[2] Densities of Oil Product, Energy Statics Working Group Meeting
[3] CO2 Emission from Fuel Combustion, Documentation for Beyond 2020 Files
[4] United States Environmental Protection Agency, National Ambient Air Quality Standards, https://www.epa.gov/criteria-air-pollutants/naaqs-table

Greenhouse Gas Emissions

Greenhouse gas emissions during the drilling phase will primarily originate from the drilling rig, as well as vehicle transportation throughout the drilling phase, especially for drilling rig mobilization and demobilization. Approximately 120 truck trips will be required to mobilize the rig. However, the vehicles will not operate all at the same time and GHG emissions as such will be generated intermittently. For the drilling rig, drilling will last approximately 80 days per well, and power generation will be required continuously. However, relative quantity of GHG emissions are expected to be comparatively low for all activities during this phase, and will be temporary and over a short duration. Sources of emissions are not expected to have any significant long-lasting impact on the atmosphere, and the atmosphere will attenuate and disperse the potential emissions.

Significance of Impact – Drilling Operations

Evaluation of impacts to air quality and greenhouse gas as a result of drilling activities has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.25***.

Table 6.25: Assessment of Impacts on Air Quality and Greenhouse Gas due to Drilling Operations

Significance of Impact					
Impact	■ Increased combustion of fossil fuels from mobile sources used to transport rig. ■ Increased combustion of fossil fuels from stationary sources used for operation of the drilling rig.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts is considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to air quality, dust and greenhouse gases would be direct impacts through the release of gases and dust from Project activities.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The impact to air quality is considered to be short-term as the activity takes place over a short period of time (80 days per well), and air quality will return to existing condition after Drilling Operations are finalized.				
Impact Extent	**Local**	Regional	International		
	Impacts would be limited to the Project Area and hence would be considered to be local, however winds may potentially carry air pollutants into surrounding communities.				
Impact Scale	Drilling operations emission includes the well pad area and surroundings. Total dust emissions are expected to be very low in comparison with the site preparation phase. Air pollutant emissions were also calculated to be low, with concentrations from project activities being far less than the compared air quality standards.				
Impact Frequency	Drilling operations and associated emissions will happen repeatedly throughout the day for the duration of Drilling Operations.				
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large
	Based on the combination of the above impact characteristics, the impact magnitude is considered to be negligible.				

Significance of Impact				
Receptor Sensitivity	Low	**Medium**	High	
	Existing air quality in the Project Area is moderate, with noted elevated levels of particulate matter and SO_x. There are communities near to the construction activities, but no particularly vulnerable populations (such as hospitals or schools). Overall receptor sensitivity is considered medium.			
Impact Significance	**Negligible**	Minor	Moderate	Major
	The combination of a Medium Receptor Sensitivity and Negligible Impact Magnitude will result in an overall Negligible Impact.			

Mitigation and Management Measures – Drilling Operations

- Implement same measures as for Site Preparation and Construction.

Significance of Residual Impact – Drilling Operations

Residual impacts would be expected to be of **Negligible** significance.

6.3.1.5 Assessment of Impacts – Well Testing and Well Abandonment Phase

Flaring is used to consume waste gases (including hydrogen sulphide rich gases and gases burned during emergencies) in a safe and reliable manner through combustion in an open flame.

In addition, associated demobilization activities carrying exhaust gas from vehicles, have the potential to affect nearby sensitive receptors. These would be similar to the impacts during the construction phase, but on a smaller scale and for shorter duration.

Significance of Impact – Well Testing and Abandonment

Evaluation of impacts to Air quality and greenhouse gas emissions as a result of well testing and abandonment has been assessed and results are presented in ***Table 6.26***.

Table 6.26: Assessment of Impacts on Air Quality and Greenhouse Gas due to Well Testing and Abandonment Activities

Significance of Impact				
Impact	■ Emission of air pollutants and GHG due to flaring and well testing. ■ Emissions during well abandonment, which would be similar to during Site Preparation and Construction but on a smaller scale.			
Impact Nature	**Negative**	Positive	Neutral	
	Impact is considered to be adverse (negative).			
Impact Type	**Direct**	Indirect	Induced	
	Impacts to air quality, dust and greenhouse gases would be direct impacts through the release of gases and dust from Project activities.			
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	The impact to air quality from is considered to be short-term as the activity takes place over a short period of time, and air quality will return to existing condition after abandonment.			
Impact Extent	**Local**	Regional	International	
	Impacts would be limited to the Project Area and hence would be considered to be local, however winds may potentially carry air pollutants into surrounding communities.			

Significance of Impact					
Impact Scale	Overall impact scale is expected to be considerably less than during the construction or drilling phases.				
Impact Frequency	Emissions will be released intermittently for the duration of well testing and flaring and well abandonment activities.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the combination of the above impact characteristics, the impact magnitude is considered to be small.				
Receptor Sensitivity	Low	**Medium**	High		
	Existing air quality in the Project Area is moderate, with noted elevated levels of particulate matter and SO_x. There are communities near to the construction activities, but no particularly vulnerable populations (such as hospitals or schools). Overall receptor sensitivity is considered medium.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Receptor Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures – Well Testing and Abandonment

- Implement the same proposed management and mitigation measures for impacts during Site Preparation and Construction;
- Monitor flare performance to maximise efficiency of flaring operation;
- Ensure sufficient compressed air provided to oil burner for efficient flaring;
- Flare equipment appropriately inspected, certified and function tested prior to operations;
- Flare equipment appropriately maintained and monitored throughout well testing operations;
- The equipment is designed and built to appropriate codes and standards and certified; and
- The appropriate emergency stop mechanisms are in place to halt testing in case of emergency.

Significance of Residual Impact – Well Testing and Abandonment

Residual impacts would be expected to be of **Negligible** significance.

6.3.2 Soil and Topography

6.3.2.1 Source of Impact

As determined during scoping, potential impacts to soil and topography may occur due to the following interactions:

Site Preparation and Construction

- Land preparation and earthworks activities;
- Riverbanks improvement/construction;
- Sourcing of fill material;
- Solid waste management;
- Wastewater management; and
- Hazardous materials storage and handling.

Drilling Operation

- Solid waste management;
- Wastewater management; and
- Hazardous materials storage and handling.

6.3.2.2 Summary of Relevant Baseline Conditions

The Project Study Area is located on predominantly low-lying topography in Magway Region, in the Central of Myanmar. The Project Study Area elevation varies from 32 m to 196 above mean sea level.

The soil texture in the Project location is generally loamy to clayey, especially in Lixisol soil area. This soil texture is capable of holding water which is favorable for agricultural purposes. The central region is susceptible to wind erosion, while sheet and gully erosion are largely confined to uncultivated areas. Soil erosion and land degradation are the two key components that have led to a declining yield in production potential in the region[1].

During the baseline study of the Study Area, soil sampling were conducted at eight (8) different locations and were sampled for two horizons (top soil and sub soil[2]); these results are presented in ***Section 5***. Sampling locations were based around potential drilling sites, landing sites, accommodation and logistics bases. From the result only two parameters were found to exceed target value of soil standard as per the Dutch Target and Intervention Values[3], these are Nickel (at survey location S 1 sub soil, S 3 top soil, S4 top soil, S 5 top and sub soil and S 6 top and sub soil) and Vanadium (S 1 top and sub soil and S 5 top and sub soil). Additionally, no polyaromatic hydrocarbons (PAHs) and total petroleum hydrocarbons (TPH) were found to be above the LOR (limit of reporting).

[1] Hadden, Lee, R., 2008. The Geology of Burma (Myanmar): An Annotated Bibliography of Burma's Geology, Geography and Earth Science. http://www.dtic.mil/dtic/tr/fulltext/u2/a487552.pdf, accessed November 8, 2018.

[2] Top soil ranges from 0-10 cm while sub soil starts from 30+ cm.

[3] Dutch Target and Intervention Values, 2000 (the New Dutch List).

Table 6.27: Results from Soil Quality Sampling (S 1 – S 8) for Physical and Aggregate Properties Only

Parameter	Unit	Results							
		S 1		S 2		S 3		S 4	
		Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil
Physical and Aggregate Properties									
pH	-	6.0	6.5	5.4	5.5	6.5	6.3	6.4	6.7
Electrical Conductivity @ 25°C	µS/cm	6	9	4	6	11	8	9	8
Salinity	g/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Moisture Content (dried @ 103°C)	%	6.4	7.7	2.7	4.5	13.4	4.7	15.5	18.2

Parameter	Unit	Results							
		S 5		S 6		S 7		S 8	
		Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil	Top Soil	Sub Soil
Physical and Aggregate Properties									
pH	-	7.8	9.1	6.4	6.4	6.1	6.0	5.6	5.8
Electrical Conductivity @ 25°C	µS/cm	24	43	4	4	3	3	7	15
Salinity	g/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Moisture Content (dried @ 103°C)	%	18.7	10.4	4.6	6.2	3.9	6.5	15.8	11.8

Source: ALS-HK, 2019; modified by ERM, 2019

6.3.2.3 Assessment of Impacts – Site Preparation and Construction Phase

Land Preparation/Construction and Transportation Activities

Topography may potentially be altered due to Project Activities – primarily vegetation clearing, box-cutting for roadways, and bulk earthworks for pad construction and road construction and upgrades. Most routes to the Project location are either existing roads or roads to be upgraded with a short section of new access road required (between No.2 Yangon-Mandalay Highway and drilling site SEG#1). These minor changes to the local landscape and relief (topography) are unlikely to constitute a significant potential impact.

The well pads have been designed to limit potential impacts to existing site topography. Minor contouring works are likely to be required, however this is unlikely to constitute a significant impact to the natural landscape.

Changes to soil structure may be caused by mechanical disturbance to the soil, either through site clearing activities, bulk earthworks, importation of fill material from other locations, or as a result of compaction to the soil surface during road/culvert upgrades and pad construction. This has the potential to result in loss of soil fertility, increased erosion, and the destruction of habitat for essential soil fauna and microfauna. Additionally, compaction of the soil surface may also potentially result in changed hydrological characteristics, which could create additional surface run-off (and increase the flow velocity of this run-off), as well as reducing infiltration into subsurface aquifers.

Sourcing of fill material, if not conducted carefully could import invasive species, bring in contaminated soil.

Riverbanks, if present in the final configuration of the project, will also generate impacts to soil whereby creating an impermeable surface as well as increasing compaction on the upgraded or constructed area.

Study Area soils may also potentially be eroded due to Project activities – primarily vegetation clearing, box-cutting for roadways, and bulk earthworks for pad construction and road construction and/or upgrades. Soils near the Project are mostly sandy clay loam texture, with appearance varying from light to dark and blackish yellow. The distribution of the soil shows mostly sand, followed by a smaller composition of clay and silt. As a result, intrinsic erosion risk is potentially significant, though not extreme.

Waste Management, Wastewater Management, and Hazardous Materials Management

Site soils may potentially be impacted through site sanitation facilities, site waste management facilities and hazardous substances such as fuel and oil, especially in case of inadequate management. Sanitation facilities have the potential to temporarily impact soil biochemistry, particularly by increasing the levels of nutrient such as nitrates and phosphates. The potential to contaminate the soils with pathogens such as E. coli, amoebic dysentery or cholera also potentially represent an issue of concern. Although this may not be an immediate issue for the soil itself, this can act as a source of disease for local people and livestock, and both the pathogens and excess nutrients could eventually be washed into surface water bodies or infiltrate groundwater aquifers and bring contamination and degradation of quality as an indirect impact. Domestic wastes may have similar potential impacts on soil chemistry, however pathogen risk is lower and the risk of chloride impacts is higher.

Potential impacts associated with an accidental release of hazardous substances or industrial wastes – primarily hydrocarbon-based products such as diesel fuel and engine oil – may result in potential longer-term negative impacts to site soils. These substances may be toxic to flora, fauna and microbes, however these may also have the potential to lead to long-term health impacts if exposure pathways are completed. Additionally, many of these substances are slow to decompose and have low mobility meaning that they may persist on the affected area for an extended period. As with sanitation risks mentioned above, there is also a potential risk that these substances may eventually wash into local waterways or infiltrate nearby groundwater aquifers.

Anticipated waste and hazardous materials management and storage areas are summarized below:

- **Waste Pit** within the rig area. The waste pit must be waterproof, and with a volume of about 70 – 80 m^3, as required by the Drilling Operations. As alternative, provision of a buried steel tank of same volume to collect the contaminated storm water or spilled water for disposal can be evaluated by Eni;
- **Diesel Tank Storage Area** - A segregated area, properly signed and oil-proofed (to avoid spills, leakages, seepage into the soil and/or groundwater) for the diesel tanks as required by the relevant operations and provided with necessary spill kits;
- **Chemical Storage Area** as required by the relevant operations and in accordance to the materials characteristics (e.g. flammability, toxicity etc.); and
- **Laydown and Materials Storage Area –** An area will be dedicated for the storage of the drilling casings and of other drilling materials and equipment provided. This area shall be equipped with enough sleepers (Concrete or Timber) to store at least one full column of casing in according with the API rules and Eni standard.

For this assessment, solid waste includes both hazardous waste and non-hazardous waste. Quantities of hazardous waste are anticipated to be relatively small during the construction and site preparation phase, mostly consisting of contaminated absorbent materials, spent (dry) batteries, spent (lead acid) batteries, and potentially contaminated construction debris. Additionally, some concrete and cementing waste are expected to be generated onsite after demobilization. Waste concrete (include excess concrete and concrete wash-down water) will be contained in a designated area. Solids concrete waste will be segregated out of the concrete puts and crushed for reuse. In case reuse is not possible or deemed inadequate, DOWA will be responsible for managing all concrete waste generated onsite.

Table 6.28: Non-hazardous Waste (Domestic Waste) Generation from the Project during Construction

Domestic Waste Generation	Number of Workers On-site	Total Non-Hazardous Waste (per day)
0.5 kg per person per day	100 workers	50 kg per day

Source: IGES, 2016[1]

Wastewater includes sewage, industrial wastewater, and storm water. The primary type of wastewater during the construction phase will be sewage waste, quantities of which are shown in ***Table 6.29***.

Table 6.29: Sewage Generation from the Project during Construction

Sewage Generation	Number of Workers On-site	Total Sewage (per day)
0.01 to 0.06 m^3 per person per day	100 workers	1.0 to 6.0 m^3

Source: CE Publication, 2017[2]

Hazardous materials storage and handling includes but are not limited to diesel fuel, lubricants, paints, etc. The exact quantity of hazardous materials utilized and stored during the construction phase is expected to be relatively small.

[1] Dickella Gamaralalage Jagath Premakumara, 2016. Quick Study on Waste Management in Myanmar – Current Situation and Key Challenges, Policy Researcher of the Institute for Global Environmental Strategies (IGES), Japan.
[2] CE Publication, the Management of Ship-Generated Waste On-board Ships, 2017.

Significance of Impact - Land Preparation/Construction and Transportation.

Evaluation of impacts to topography from the Project in Site Preparation and Construction activities has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.30***.

Table 6.30: Assessment of Impacts on Soil and Topography due to Land Preparation/Construction and Transportation

Significance of Impact					
Impact	Site preparation and construction activities such as land preparation and earthworks activities, riverbank improvement and construction and sourcing of fill material may have impacts to exacerbate the erosion of soil, soil compaction and contamination of fill material and thus alter the topography and landscape features.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts to soil and topography would be considered to be adverse.				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to topography would be direct impacts by mechanical disturbance to the earth surface from either clearing activities, bulk earthworks, importation of foreign fill material or compaction to soil surface during road upgrades/construction and well pad construction. Impacts to soil would be direct impacts by mechanical disturbance to the earth surface from either clearing activities, bulk earthworks, importation of foreign fill material or compaction to soil surface during road upgrades/construction and well pad and logistic base construction.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	Impacts to soil and topography is considered to be short-term as the activities takes place over a short period of time (4 months).				
Impact Extent	**Local**	Regional	International		
	Impacts would be limited to the Project Area and hence would be considered to be local.				
Impact Scale	Impacts to topography would be limited to one well pad, logistic base and road construction and improvement area (9.7968 ha). ■ Well pad area – 28,548 m^2 SEG#1 ■ New access road – 1,500 m^2 ■ Access road to be upgraded – 48,420 m^2 ■ Logistic base – 19,500 m^2 The amount of fill material needed for Site Preparation and Construction is estimated 24,915 m^3.				
Impact Frequency	Activities potentially impacting soil and topography during site establishment will happen repeatedly throughout the day for the duration of Site Preparation and Construction stage. Additionally, impacts relating to fill material will occur during a specific duration of the Site Preparation and Construction phase. Rainfall events will increase the impacts to soil and therefore the frequency of this will be dependent on frequency of rainfall events. This is anticipated to be low due to comparatively low rainfall in central dry region.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is considered as small.				

Significance of Impact				
Receptor Sensitivity	Low	**Medium**	High	
	The topography features of the Project Area are not unique or rare. The soil chemistry and characteristics of the Project Area are at low to moderate quality and used by the locals for agricultural purposes. The soil in this region is also susceptible to wind erosion but are confined to uncultivated areas.			
Impact Significance	Negligible	**Minor**	Moderate	Major
	The combination of a Medium Receptor Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.			

Mitigation and Management Measures - Land Preparation/Construction and Transportation

Topography

- Limit construction works only to well pads, logistics base, and access roads;
- Clear vegetation only as required to install the proposed facilities;
- Check weather daily for the area. Stop earthworks during heavy rain; and
- Installation of erosion controls (such as silt fences, gravel, temporary geotextiles, etc.) where embankments are exposed to prevent erosion during heavy rains and provide adequate drainage facilities in the area that might be interested by runoff and flash floods.

Soil

- Consideration of retaining topsoil for reinstatement (during area restoration) where possible;
- Limit construction works only to well pads, logistics base, and access roads;
- Avoid unnecessary vegetation clearance only as required to install the proposed facilities;
- Check weather daily for the area. Stop earthworks during heavy rain;
- Install drainage facilities where necessary if compaction and runoff is expected for heavy rain;
- Installation of erosion controls where embankments are exposed to prevent erosion during heavy rains;
- Consider validation sampling of imported fill material (same parameters as baseline sampling to check for contamination); and
- Make sure that fill materials are obtained from approved or designated locations/areas.

Significance of Residual Impact - Land Preparation/Construction and Transportation

Residual impacts would be expected to be of **Negligible** significance.

Significance of Impact - Management of Solid Waste, Wastewater and Hazardous Materials

Evaluation of impacts to soil from the Project in Site Preparation and Construction activities from solid waste, wastewater and hazardous material management and handling has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.31***.

Table 6.31: Assessment of Impacts on Soil during Site Preparation and Construction due to Management of Waste, Wastewater and Hazardous Materials

Significance of Impact					
Impact	Solid waste, wastewater and hazardous materials, if inappropriately managed, could lead to impacts on surface water, soil and groundwater. Secondary receptors such as biodiversity and human who interact with these soil may also be impacted indirectly.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts to soil would be considered to be adverse.				
Impact Type	**Direct**	**Indirect**	Induced		
	Impacts to soil would likely be direct impacts by contaminating soil from inappropriate solid waste management, wastewater management and hazardous materials storage and handling with indirect impacts on communities and biodiversity receptors.				
Impact Duration	Temporary	**Short-term**	**Long-term**	Permanent	
	Activities causing impacts to soil are considered to be short-term as they take place over a short period of time (4 months). However, if contamination to the soil occurs, the impact duration can be long-term.				
Impact Extent	**Local**	Regional	International		
	Impacts would be limited to the Project Area and hence would be considered to be local.				
Impact Scale	■ The quantity of non-hazardous waste generated is estimated to be 30 kg per day. ■ Quantities of hazardous materials and waste are anticipated to be relatively small during the construction and site preparation phase, mostly consisting of diesel fuel, lubricants, paints, etc. ■ The volume of wastewater generated is estimated to be 0.6 – 3.6 m^3 per day.				
Impact Frequency	Impacts to soil from solid waste and hazardous material management and disposal is expected to occur intermittently but repeatedly during the Site Preparation and Construction phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is considered as small.				
Receptor Sensitivity	Low	**Medium**	High		
	The soil chemistry and characteristics of the Project Area are at low to moderate quality and used by local community for agricultural purposes.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Receptor Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures - Management of Solid Waste, Wastewater and Hazardous Materials

Common General Measures

- Compact well pad to reduce the amount and rate of infiltration;
- Conduct regular inspections of waste and sanitation areas;
- Conduct monitoring of water and soil quality in order to assess no contamination has occurred; and

- Provide adequate facilities for collection and treatment of wastewater (as required), storage and legal disposal of general waste, solid waste, chemicals etc.

Solid Waste Management (Hazardous and Non-Hazardous)

- All type of waste must be handled, stored, and disposed in accordance with relevant regulations and provision of waste management plan that will be issued;
- Do not locate waste management / handling and storage areas near sensitive environments or waterways; Segregate and store waste in appropriate, secure, and properly labelled containers and ensure temporary stored wastes are collected and transported to treatment and disposal sites in due time as prescribed by law and best practices;
- Waste storage areas are to be contained and separated for hazardous/non-hazardous wastes, with a sealed impermeable base;
- Provide drip pans under engines;
- Provide bunds around fuel storage tanks;
- Clean up spills immediately and dispose into appropriate bin for collection;
- Keep adequate spill kits on site and on waste transport vehicles;
- Designate, confine and label waste collection and waste management area(s) and systems;
- Waste materials will be managed under Eni's Waste Management Plan;
- Unload temporary storage areas according to law prescriptions or best practices;
- Offsite waste receiving facilities must be capable of receiving and processing the amounts of waste from the Project and not be overwhelmed; and
- Use the services of an authorized and permitted waste facilities and services to support waste management (i.e. DOWA) and ensure an adequate waste management hierarchy to be respected.

Wastewater Management

- Disposal of general waste, solid waste, chemicals etc.;
- Treat waste from sanitation facilities prior to disposal;
- Potentially contaminated stormwater (falling onto concrete base) will be collected and treated offsite;
- Install sanitation and treatment systems for work personnel at well pad. Pit latrines can be installed short-term, until proper sanitation systems are installed, but should not be adopted for long-term use;
- Use authorized and permitted waste facilities and services;
- Where discharge is required, effluent shall be treated to meet water quality standards as per Myanmar's NEQG; and
- Offsite waste receiving facilities must be capable of receiving and processing the amounts of waste from the Project and not be overwhelmed. DOWA (the chosen waste management contractor is capable of storing 44,000 m^3 of hazardous waste, 43,000 m^3 of non-hazardous waste and 900 m^3 of liquid).

Hazardous Materials Storage and Handling

- Do not locate waste management / handling and storage areas near waterways;
- Segregate and store waste in appropriate, secure, and properly labelled containers;
- Hazardous waste storage areas are to be contained, with a sealed base, and covered;

- Maintain spill kits/equipment, and posted spill procedures, on site and with any Project related works.
- Design well pad to be above known flood levels;
- All fuel and hazardous substance storage areas to be located above historical flood level;
- Segregate and store hazardous waste in appropriate, secure, and properly labelled containers;
- Contain all fuel tanks and other hazardous substances in a fully bunded area with a storage capacity of at least 110% of the total potential storage volume;
- Store and handle all hazardous substances in accordance with their SDS;
- Keep a register for all hazardous substances on site and relevant Material Safety Data Sheets (SDSs) readily accessible for reference;
- Develop and implement controls and standard operating procedures for the use of hazardous materials to prevent accidental spills or releases;
- Refueling and machinery maintenance is to be undertaken in a designated, sealed, bunded area;
- Appropriate spill contaminant kits are to be made available on site; and
- Clean up all fuel spills immediately.

Significance of Residual Impact - Management of Solid Waste, Wastewater and Hazardous Materials

Residual impacts would be expected to be of **Minor** significance.

6.3.2.4 Assessment of Impacts – Drilling Operation Phase

General activities and impacts related to solid waste, wastewater management and hazardous materials storage and handling with soil as the main receptor is similar to Site Preparation and Construction phase.

Solid Waste, Wastewater and Hazardous Material Storage and Handling

Drilling fluids will be used in the Drilling Operation phase, some of which contain hazardous components. The NAF-based fluids may contain a range of hydrocarbons and heavy metals. The management/disposal protocols for these fluids are discussed in Project Description Section (***Section 4***); however, improper drilling practices, remediation, storage or handling techniques could result in potential impacts to soil quality.

The estimated mud per well is 1,883 m^3 (2,634 ton) and cutting is 1,509 m^3 (2,717 ton) where these volumes are a mix of WBM and NAF. However the generation of these mud and cuttings are from different drilling phases (shallow and deep section of the well) and therefore will be segregated and treated separately (as discussed in ***Section 4)***. Drilling fluids will be stored on-site in facilities with impermeable bases with a bund providing containment (these are considered as hazardous waste). During drilling, mud will be separated from cuttings. Mud will be reused, whilst an area on the well pad will be dedicated to the storage and management of drill cuttings. Mud and cuttings will be treated by DOWA Eco-System Co., Ltd., an authorized waste management company.

For this assessment, solid waste includes both hazardous waste and non-hazardous waste. From previous similar projects, the quantity of the hazardous waste during Drilling Operation is not expected to exceed 45 kg/month.

Table 6.32: Non-hazardous Waste (Domestic Waste) Generation from the Project during Drilling

Domestic Waste Generation	Number of Workers On-site	Total Non-Hazardous Waste (per day)
0.5 kg per person per day	140 workers	70 kg per day

Source: IGES, 2016[1]

Wastewater includes sewage, industrial wastewater, and potentially contaminated storm water. Sewage quantities during the drilling phase are shown in ***Table 6.33***. Other types of wastewater, such as those from the rig pad, are difficult to be quantified as they are dependent on rainfall events. Eni will implement appropriate management methods for contaminated runoff, including pits and drainage channels with sufficient capacity, and oil traps.

Table 6.33: Sewage Generation from the Project during Drilling

Sewage Waste Generation	Number of Workers On-site	Total Waste (per day)
0.01 to 0.06 m^3 per person per day	140 workers	1.4 to 8.4 m^3

Source: CE Publication, 2017[2]

Additional hazardous materials stored during the drilling phase include chemicals used for mixing drilling fluids.

Significance of Impact - Management of Solid Waste, Wastewater and Hazardous Materials

Evaluation of impacts to soil from the Project in Drilling Operation activities from solid waste, wastewater and hazardous material management and handling has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.34***.

Table 6.34: Assessment of Impacts on Soil during Drilling Operation due to Management of Waste, Wastewater and Hazardous Materials

Significance of Impact			
Impact	Drilling operation activities during solid waste, wastewater and hazardous material management and handling, if not managed appropriately, could directly impact soil as well as secondary receptors such as biodiversity and human that interact with the impacted soil. Other impacts are related to drill cuttings being buried on-site which has the potential to contaminate the underlying and surrounding soil.		
Impact Nature	**Negative**	Positive	Neutral
	Impacts to soil would be considered to be adverse.		
Impact Type	**Direct**	**Indirect**	Induced
	Impacts to soil would likely be direct impacts by contaminating soil from inappropriate solid waste management, wastewater management and hazardous materials storage and handling with indirect impacts on communities and biodiversity sensible receptors.		

[1] Dickella Gamaralalage Jagath Premakumara, 2016. Quick Study on Waste Management in Myanmar – Current Situation and Key Challenges, Policy Researcher of the Institute for Global Environmental Strategies (IGES), Japan.
[2] CE Publication, the Management of Ship-Generated Waste On-board Ships, 2017.

Significance of Impact					
Impact Duration	Temporary	**Short-term**	**Long-term**	Permanent	
	Activities causing impacts to soil are considered to be short-term as they take place over a short period of time (3 months). However, if contamination to the soil occurs, the impact duration can be long-term.				
Impact Extent	**Local**	Regional	International		
	Impacts would be limited to the Project Area and hence would be considered to be local.				
Impact Scale	■ The quantity of non-hazardous waste is estimated to be 70 kg per day. ■ The volume of mud and cuttings is estimated to be 5,351 ton per well (mix of both WBM and NAF). ■ The quantity of hazardous waste generated is estimated to be 45 kg per month based on previous similar projects. The volume of wastewater is estimated to be 1.4 to 8.4 m^3 per day.				
Impact Frequency	Activities potentially impacting soil from solid waste, wastewater, and hazardous material management and disposal is expected to occur intermittently but repeatedly during the Drilling Operation phase.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Based on the above impact characteristics, the impact magnitude is considered as medium.				
Receptor Sensitivity	Low	**Medium**	High		
	The soil chemistry and characteristics of the Project Area are at low to moderate quality and used by the locals for agricultural purposes.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a Medium Receptor Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures - Management of Solid Waste, Wastewater and Hazardous Materials

Common General Measures

- Limit mixing of drilling fluids on site – pre-mix whenever possible;
- Use water based/ synthetic oil fluids and in general more eco-compatible fluids whenever possible;
- Treat water used during Drilling Operations prior to any discharge off-site.;
- Store mud and cuttings in adequate containers and ensure appropriate offsite treatment and disposal;
- Fully contain oil-based mud and recirculate;
- Regularly monitor cuttings pits to detect any potential loss of containment;
- Drill cuttings and mud requiring disposal are to be fully contained and transported by authorized and permitted transport Service Company and permitted waste facility;
- Drilling cuttings containing water-based mud (WBM) will be treated and managed appropriately. The WBM will be temporarily stored in a dedicated pit and transported to the waste management area offsite;
- Conduct monitoring of water and soil quality in order to assess no contamination has occurred; and
- Drilling cuttings containing non-aqueous fluids (NAF) will be collected and treated offsite by an approved waste management facility.

Wastewater Management

- Potentially contaminated run-off should be directed to sumps or evaporation pits, and treated prior to any discharge to surroundings;
- Where discharge is required, effluent should be treated to meet water quality standards as per Myanmar's NEQG;
- Provide concrete rig pad with drainage gutters to collect runoff to a suitably sized lined or concrete dirty water pit to collect water from rig pad with sediment and oil trap. Test water before discharge and treat or dispose as appropriate; and
- Monitor water level in dirty water pit regularly and maintain at least 0.3 m freeboard (not overflow).

Hazardous Materials Storage and Handling

- Develop and implement controls and standard operating procedures for the use of hazardous substances to prevent spills and accidents;
- All hazardous materials to be transported, stored and managed according to their SDS; and
- Appropriate spill contaminant kits are to be made available on-site.

Significance of Residual Impact - Management of Solid Waste, Wastewater and Hazardous Materials

Residual impacts would be expected to be of **Minor** significance.

6.3.3 Noise and Vibration

6.3.3.1 Source of Impact

As determined during scoping, potential impacts to noise & vibration in the surrounding environment may occur due to:

Site Preparation and Construction

- Land preparation and earthworks activities;
- Riverbanks improvement/construction;
- Transportation of workers, materials, waste; and
- Energy use and power supply.

Drilling Operations

- Rig mobilization to site;
- Drilling and casing activities;
- Transportation of workers, materials, waste; and
- Energy use and power supply.

Testing/Well Abandonment

- Flaring.

6.3.3.2 Summary of Relevant Baseline Conditions

Due to the rural nature of the area, the acoustic environment is considered to have low ambient noise levels. Noise pollution sources in the Project Area are likely to include the vehicle traffic from nearby roads, as well as any industries or generators in the neighbouring communities.

Ambient noise monitoring survey was carried out to prepare for the seismic survey in Block RSF-5 at 5 locations in between dates of 22nd March 2019 and 7th April 2019. The measurements found that the

ambient noise measurements taken within Block RSF-5 had 24-hour equivalent noise levels ranging from 33 dB (A) to 50 dB (A). Measurements were made at "daytime" and "night-time".

All day time measurements demonstrated to be below 55 dBA, which is the acceptable noise level NEQG standard. Most night time noise levels also met the standard, with exception of Ohntwe Village (50 dBA) which was slightly above the NEQG standard of 45 dBA. This is most likely the result of motorbike traffic and diesel generator use for electricity.

6.3.3.3 Assessment of Impacts – Site Preparation and Construction Phase

Noise

During the Site Preparation and Construction phase, noise will primarily be generated from Project vehicles and construction equipment. Maximum noise levels generated by various pieces of typical equipment present during construction are listed in ***Table 6.35***.

Table 6.35: Typical Noise Levels from Construction Equipment

Source	Maximum dB (A) at Source	Number of Sources at One Time
Bulldozer	85	1
Backhoe	80	1
Grader	85	1
Compactor	82	1
Heavy trucks (dump trucks)	88	1
Water truck (L_{max} truck)	84	1
Jack-hammer	80	1

Source: US Federal Highway Administration, US Department of Transportation, 2008; reference distance 50 ft (15.24m); (http://ops.fhwa.dot.gov/wz/workshops/accessible/Schexnayder_paper.htm)

The most intense and longest duration preparation and construction activities will take place at the well pads; therefore they will be the main focus of the noise impact assessment. Noise will also be generated during construction and upgrading of the access roads. However, while these activities will take place closer to sensitive receptors than the well pads, they are expected to be of comparatively short duration and intensity.

The nearest sensitive receptors to the proposed well pads are residential houses and villages. The closest receptor is a village located 435 m from the center of the well pad SEG#3_Dev, as illustrated in ***Table 6.36***.

Table 6.36: Nearby Sensitive Receptor to Well Pads

Name	Distance to Nearest Sensitive Receptor (Village/Households) (from center, in meters)
SEG#1	815.81
SEG#3_Dev	434.71
SEG#6K	479.64

Based on methodology from the US Department of Transportation for estimation of construction and equipment noise, noise levels at various distances from a source can be calculated using ***Equation 6-7:***

$$L_{eq}(equipment) = L_w - 20 * \log_{10}(D/D_o) \qquad \textbf{Eq. 6-7}$$

Where

L_{eq} *(equipment)*	=	the A-weighted, equivalent sound level at a receptor resulting from the operation of a single piece of equipment at distance D (dB(A))
Lw	=	Noise emission level of the particular piece of equipment at reference distance D_0 (dB(A))
D	=	Distance from the receptor to the piece of equipment (m)
D_0	=	Reference distance where the source noise emission level was measured

Source: FHWA[1]

For the Project, it is necessary to calculate the overall noise level produced by the simultaneous operation of several pieces of equipment. The overall noise level at a receptor is simply the sum (on an energy basis) of the individual contributions of each piece of equipment. Mathematically, the overall noise level at a receptor from several sources can be calculated using ***Equation 6-8***:

$$L_{eq}(site) = 10 * \log_{10}\left(\sum_{i=1}^{n} 10^{Leq\ (equipment)_i/10}\right) \qquad \textbf{Eq. 6-8}$$

Where

L_{eq} *(site)*	=	the A-weighted, overall equivalent sound level obtained by summing the individual equipment noise levels on an energy basis.
n	=	Number of sources
L_{eq} *(equipment)*$_i$	=	the A-weighted, equivalent sound level at a receptor resulting from the operation of a single piece of equipment at distance D from its source, dB(A). Obtained from ***Equation 6-7***.

It should be noted that not all construction equipment will be operating at the same time. The overall construction noise level is governed primarily by the noisiest pieces of equipment. The quieter pieces do not affect the overall level, but they do reduce the magnitude of the fluctuations in the noise level (FHWA, 2011). As a representation of noise levels during Site Preparation and Construction, the data will be used for the three noisiest pieces of equipment (dump truck, grader and bulldozer). The total noise during site preparation at various distances from the site is shown in ***Table 6.37***.

[1] http://www.fhwa.dot.gov/environment/noise/highway/hcn03.htm

Table 6.37: Estimated Noise Levels during Site Preparation

D (m)	Do (m)	Leq (equipment) (dB(A))			Leq (site) (dB(A))
		Leq (bulldozer)	Leq (grader)	Leq (dump truck)	
15.24	15.24	85.00	85.00	88.00	91.02
50	15.24	74.68	74.68	77.68	80.70
75	15.24	71.16	71.16	74.16	77.17
100	15.24	68.66	68.66	71.66	74.68
150	15.24	65.14	65.14	68.14	71.15
200	15.24	62.64	62.64	65.64	68.65
434.71	**15.24**	**55.90**	**55.90**	**58.90**	**61.91**
500	15.24	54.68	54.68	57.68	60.70
1000	15.24	48.66	48.66	51.66	54.68

The nearest sensitive receptors are residences in the vicinity of the proposed well pad. The nearest residence to the proposed well pad (SEG#3_Dev) is approximately 435 m (from center of well pad). The maximum noise level at this distance is estimated to be 61.91 dB (A) during the site preparation phase. This exceeds both the daytime (55 dB (A)) and night time (45 dB (A)) standards from Myanmar's NEQG. In order to maintain the noise level at a minimal level (as far as practicable to the Project activity) mitigation measures are presented in "Mitigation and Management Measures" for each phases below.

It is common practice to judge potential construction noise impact magnitude by exceedance of absolute noise thresholds rather than exceedance of baseline noise levels or noise standards, because it is usually well above baseline noise levels as noise standards, as is the case with this Project. The noise thresholds and associated magnitudes are derived as shown in ***Table 6.38***. The equivalent impact magnitude rating for medium term exposure (1 to 6 months) and a Daytime Noise Level (Leq) of less than 75 dB (A) is equivalent to a Negligible impact magnitude. For Night-time Noise Level greater than 60 dB (A), the impact magnitude is considered Large. As most construction activities will take place during daytime, overall the impact magnitude can be considered Small.

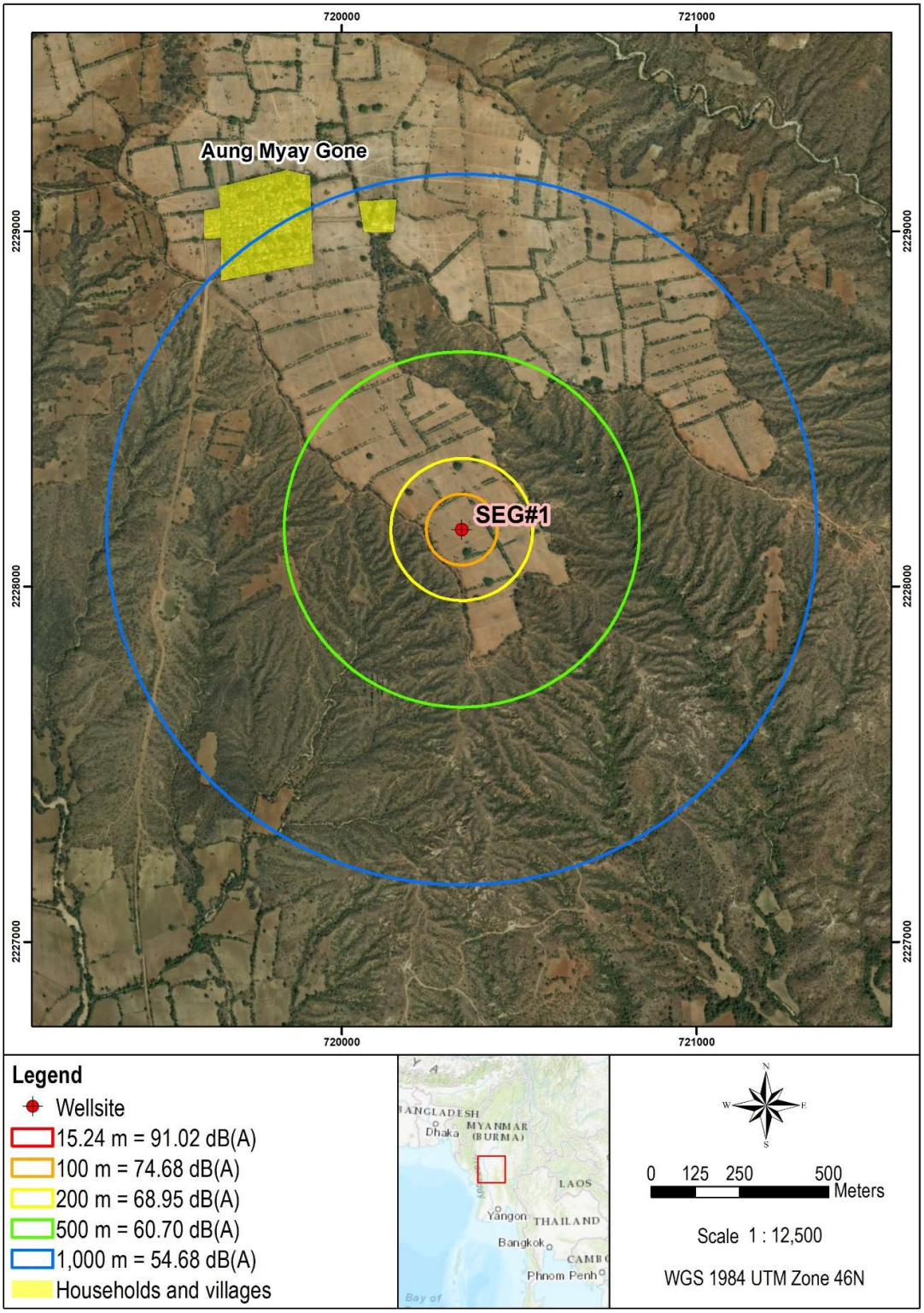
Table 6.38: Potential Construction Noise Impact Magnitudes

Operating Period	Daytime Noise Level, LAeq, day dB				Night-time Noise Level, LAeq, night dB			
Impact Rating	Negligible	Small	Medium	Large	Negligible	Small	Medium	Large
Short term exposure < 1 month	<70	70-75	>75-80	>80	<55	55-60	>60-65	>65
Medium term exposure 1 to 6 months	<65	65-70	>70-75	>75	<45	45-55	>55-60	>60
Long term exposure > 6 month	<55	55-60	>60-65	>65	<45	45-50	>50-55	>55

Source: ERM, 2012

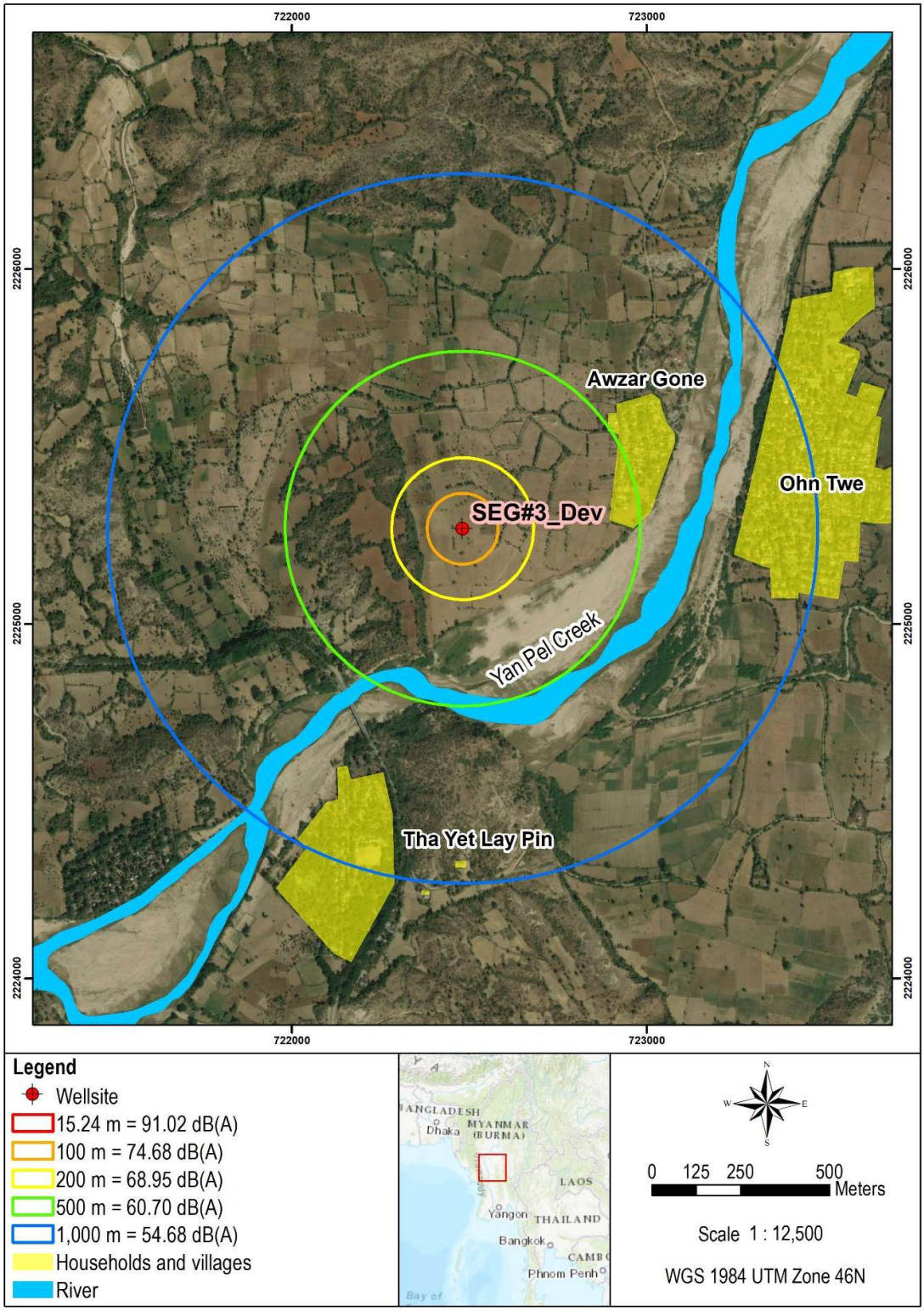
Noise contour maps for each of the potential well pads during the site preparation phase are presented in ***Figure 6.5***, and ***Figure 6.6***, The estimated noise levels represent a worst-case estimation. These contour maps are drawn based on ***Table 6.37*** and calculations of noise levels with consideration to the largest noise emitting equipment and dissipation of noise level over distance (using ***Equation 6-7*** and ***Equation 6-8***. Not all equipment is likely to operate at the same time. In addition, the trees, other vegetation, and the topography surrounding the well pad are expected to lead to a far more rapid attenuation of noise.

Figure 6.5: Noise Contours during Site Preparation and Construction (Maximum Noise Level), SEG#1



Source: ERM, 2019

Figure 6.6: Noise Contours during Site Preparation and Construction (Maximum Noise Level), SEG#3_Dev



Source: ERM, 2019

Vibration

Unlike noise, vibration dissipates rapidly over a distance such that the magnitude and extent of vibration impacts are commonly very minimal when compared to noise. Potential vibration impacts from this stage of the Project are likely to be minimal. Upgrading of access roads will take place adjacent to sensitive vibration receivers (rural dwellings). Local residents may sense the vibration associated with the use of equipment, but it would be intermittent and expected to be of small magnitude. Cosmetic or structural damage to the buildings is unlikely to occur.

A pagoda was identified in Tha Yet Lay Pin Village which is located 1.04 km away from the SEG#3_Dev, however, vibration from drilling operation dissipates rapidly and is not expect to cause significant impact to the pagoda. Moreover, Beikthano (Vishnu) Ancient city and Minhla Fortress is located 22 km and 16 km, respectively, from SEG#6K, but vibration from eventual drilling at both locations will be undetectable due to the distance, and as such, no impact to the cultural sites is expected to occur.

Significance of Impact – Site Preparation and Construction

Evaluation of impacts to noise and vibration as a result of the project activities has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.39***.

Table 6.39: Assessment of Impacts on Noise & Vibration Levels from Site Preparation and Construction

Significance of Impact					
Impact	Increased noise and vibration from construction vehicles and equipment.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts is considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to noise and vibration would be direct impacts from Project activities.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	Overall site preparation activities are relatively short term (3-4 months).				
Impact Extent	**Local**	Regional	International		
	Impacts would be limited to the Project Area and vicinity, and hence would be considered to be local.				
Impact Scale	Maximum estimated noise levels due to Site Preparation and Construction of the well pads is approximately 61.91 dB (A) at the nearest village. This exceeds both the daytime (55 dB (A)) and night time (45 dB (A)) standards from Myanmar's NEQG; however it falls within common threshold values for small impact magnitude during daytime. These are maximum instantaneous levels; average ambient levels are likely to be much lower due to staggered equipment use and sound absorption by the surrounding topography. There will also be noise impacts due to upgrading and construction of access roads, although these will be for shorter duration and smaller intensity than the activities at the well pads. Vibration levels at villages due to Site Preparation and Construction are expected to be slightly increased from baseline levels but will be a minor nuisance in comparison to noise levels.				
Impact Frequency	Noise and vibration impacts have the potential to occur repeatedly throughout the day for Site Preparation and Construction activities.				
	Positive	Negligible	**Small**	Medium	Large

Significance of Impact				
Impact Magnitude	Based on the combination of the above impact characteristics, the impact magnitude is considered to be small.			
Receptor Sensitivity	Low	**Medium**	High	
	Some human receptors may be more sensitive to the impact, but overall the community retains the ability to cope with changes. The nearest community is 435 meters from the center of SEG#3_Dev site. There are no hospitals or schools in the vicinity of the well pads. Overall receptor sensitivity is medium.			
Impact Significance	Negligible	**Minor**	Moderate	Major
	The combination of a Medium Receptor Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.			

Mitigation and Management Measures – Site Preparation and Construction

- Comply with Eni's Noise and Vibration Management – opi-sg-hse-012-e&p-r01-Noise-and-Vibration-Management (***Appendix 7***);
- Equipment to be operated and maintained in accordance with manufacturer specifications;
- Where possible, carry out loud[1] or vibration intensive construction activities during the daytime;
- Respond to noise-related complaints, and make modifications or other agreement with complainant where possible and appropriate;
- Consider installing noise barrier if sensitive receptors nearby[2] well sites
- Reposition noisy equipment to reduce offsite noise impacts
- Schedule operation of noisy construction equipment at different times;
- Use mufflers on diesel/gas driven machinery;
- Inform details and schedule of activities to community;
- Provide Personal Protective Equipment (PPE) for employee to wear appropriately; and
- Undertake any vibration intensive works during the day-time.

Significance of Residual Impact – Site Preparation and Construction

Residual impacts would be expected to be of **Minor** significance.

6.3.3.4 Assessment of Impacts – Drilling Operations Phase

Noise will be generated from Project vehicles, generators and drilling and casing operations. The noise levels from the various pieces of equipment present during drilling are listed in ***Table 6.40***. Sensitive receptors for the drilling phase are the same as those identified for Site Preparation and Construction activities. During Drilling Operations, the highest noise levels are expected from generators for the drilling rig. Using ***Equations 6-7*** and ***6-8***, the noise levels at various distances are shown in ***Table 6.41***.

[1] Any operation that generate noise level greater than 55 dB(A) during day and 45 dB(A) during night. Where the noise baseline level is above 55 dB(A) during the day or 45 dB(A) during the night, operation that increases this baseline by 3 dB(A) is considered as loud.

[2] This is considered base on the noise level measured at the sensitive receptors/receivers whereby if the noise measured is greater than 55 dB(A) during day or 45 dB(A) during night, these are therefore considered as significant impacted receptors.

Table 6.40: Typical Noise Levels from Drilling Equipment

Source	Maximum dB (A) at Source	Number of Sources at One Time
Drilling Rig	85	1
Generator (for drilling)	100	3

Source: US Federal Highway Administration, US Department of Transportation, 2008; reference distance 50 ft (15.24m); (http://ops.fhwa.dot.gov/wz/workshops/accessible/Schexnayder_paper.htm)

Table 6.41: Estimated Noise Levels during Drilling

D (m)	Do (m)	Leq (site) (dB(A)), from generators
15.24	15.24	100.00
50	15.24	89.68
75	15.24	86.16
100	15.24	83.66
150	15.24	80.14
200	15.24	77.64
434.71	**15.24**	**70.90**
500	15.24	69.68
1000	15.24	63.66

Source: ERM, 2019

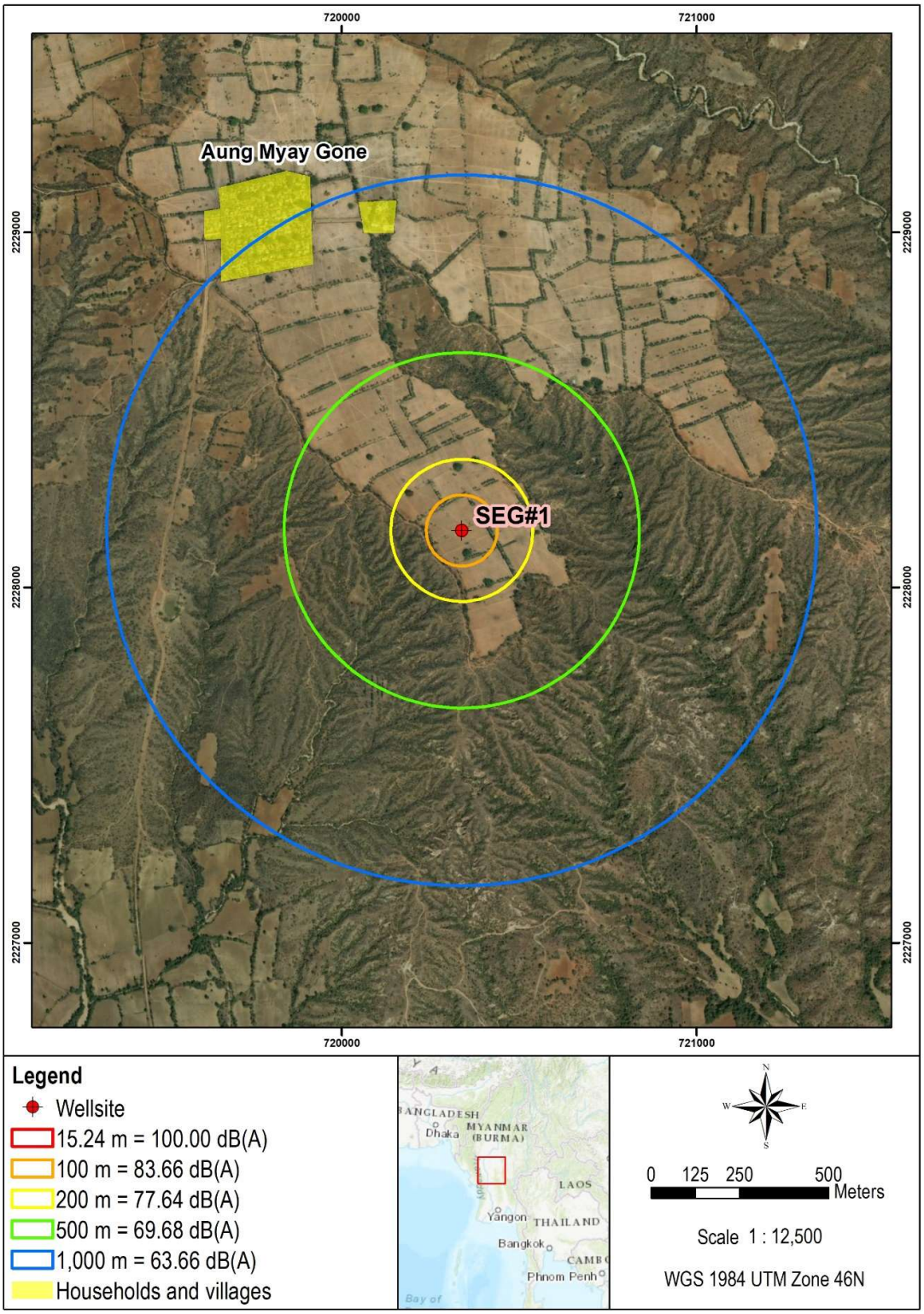
The maximum estimated noise level due to drilling at the nearest sensitive receptor is 70.9 dB (A). This exceeds both the daytime (55 dB (A)) and night time (45 dB (A)) standards from Myanmar's NEQG. Similar to potential construction noise impact magnitude, potential drilling noise impact magnitude is determined by exceedance of absolute noise thresholds rather than exceedance of baseline noise levels or standards. The potential impact rating for medium-term exposure (1 - 6 months) and a Daytime Noise Level (Leq) of less than 65 dB (A) is equivalent to a Negligible potential impact magnitude. The impact rating for medium-term exposure and a Night-time Noise Level of over 60 dB (A) is equivalent to a Large potential impact magnitude. Since the Drilling Operations will be carried out 24 hours per day, the overall magnitude of noise impact during the drilling phase is considered Large.

Noise contour maps for the drilling phase are presented in ***Figure 6.7***, and ***Figure 6.8.*** The estimated noise levels represent a worst-case condition: the trees, other vegetation, and the topography surrounding the well pad will lead to attenuation. Drilling activities are expected to last approximately 80 days per well (160 days total for 2 wells); noise levels will return to previous levels upon cessation of drilling activities.

Vibration

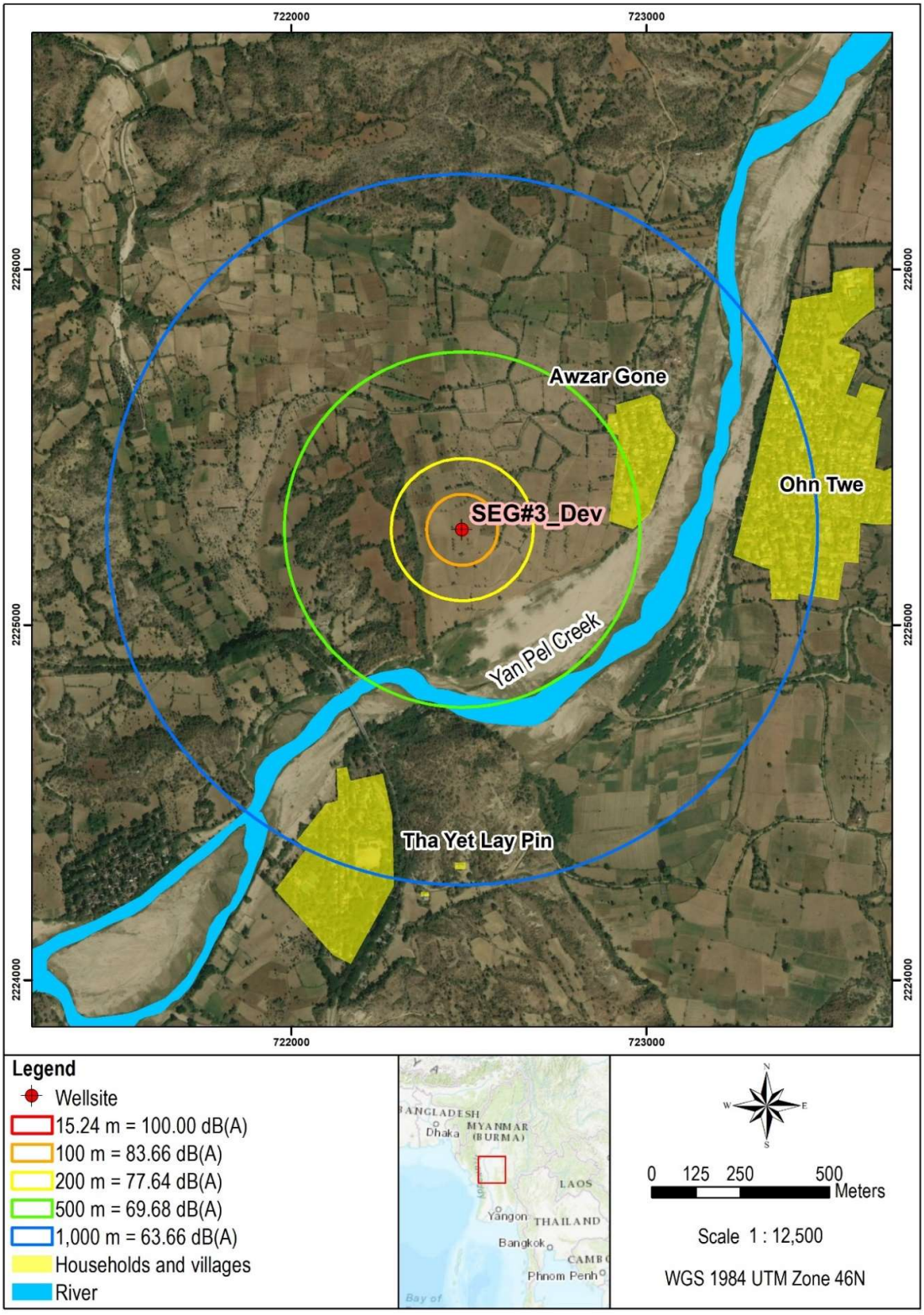
Under normal operating conditions for Drilling Operations, significant vibration impacts at the surface are at sensitive receptors are very unlikely and would be very minor in comparison to the noise impacts.

Figure 6.7: Noise Contours during Drilling (Maximum Noise Level), SEG#1



Source: ERM, 2019

Figure 6.8: Noise Contours during Drilling (Maximum Noise Level), SEG#3_Dev



Source: ERM, 2019

Significance of Impact – Drilling Operations

Evaluation of impacts to noise and vibration as a result of conducting drilling activities has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.42***.

Table 6.42: Assessment of Impacts to Noise & Vibration from Drilling Operations

Significance of Impact					
Impact	■ Increased noise and vibration from machinery and vehicles used to transport rig. ■ The use of equipment and machinery, particularly generators for the drilling rig, during 24 hour drilling activities will generate noise that may impact nearby residents. ■ Noise associated with the Drilling Operations has the potential to disturb local nocturnal species.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts are considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to noise and vibration would be direct impacts from Project activities.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The drilling phase will last approximately 80 days per well, and is considered a short-term impact.				
Impact Extent	**Local**	Regional	International		
	Impacts would be limited to the Project Area and vicinity, and hence would be considered to be local.				
Impact Scale	Maximum estimated noise levels due to drilling is approximately 70.90 dB (A) at the nearest village. This exceeds both the daytime (55 dB (A)) and night time (45 dB (A)) standards from Myanmar's NEQG. For common threshold values, the impact magnitude is considered small during day time and large during night time. As the rig will operate 24 hours, overall impact magnitude is considered large. These are maximum instantaneous levels; average ambient levels are likely to be much lower due to sound absorption by the surrounding topography. Vibration levels at villages due to drilling are expected to be slightly increased from baseline levels but will be a minor nuisance in comparison to noise levels.				
Impact Frequency	Potential noise and vibration impacts will occur repeatedly throughout the day and night for the duration of Project during drilling				
Impact Magnitude	Positive	Negligible	Small	Medium	**Large**
	Based on the combination of the above impact characteristics the impact magnitude is considered to be large.				
Receptor Sensitivity	Low	**Medium**	High		
	Some human receptors may be more sensitive to the impact, but overall the community retains the ability to cope with changes. The nearest community is 435 meters from the center of SEG#3_Dev site. There are no hospitals or schools in the vicinity of the well pads. Overall receptor sensitivity is medium.				
Impact Significance	Negligible	Minor	Moderate	**Major**	
	The combination of a Medium Receptor Sensitivity and Large Impact Magnitude will result in an overall Major Impact.				

Mitigation and Management Measures – Drilling Operations

- Implement same mitigation and management measures as for Site Preparation and Construction; and
- Ensure that generators for drilling rig are kept in enclosures to reduce sound output.

Significance of Residual Impact – Drilling Operations

Residual impacts would be expected to be of **Moderate** significance.

6.3.3.5 Assessment of Impacts – Well Testing and Abandonment Phase

A well test is a temporary completion of a well to acquire dynamic rate through time, pressure, and fluid property data. Flaring is controlled burning that takes place during temporary emergency situations or well testing activities which could potentially release noise. These, in any case are restricted in time.

Once drilling is completed, the well will be plugged and abandoned. This will involve setting cement plugs inside the wellbore and testing them for integrity. Upon completion of the drilling exploration, all drilling equipment will be demobilized from the exploration areas, and sites will be restored to their previous pre-Project state.

Noise and vibration generated during this phase is expected to be for shorter duration and far less intensity than during the construction or drilling phases.

Significance of Impact - Well Testing and Abandonment

Evaluation of impacts to noise and vibration from well testing and abandonment has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.43***.

Table 6.43: Assessment of Impacts to Noise & Vibration Levels from Well Testing and Abandonment

Significance of Impact					
Impact	Potential impacts from noise to surrounding receptors from well testing and abandonment				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts are considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to noise and vibration would be direct impacts from Project activities.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The well testing and abandonment will be short term, taking 1-2 months.				
Impact Extent	**Local**	Regional	International		
	Impacts would be restricted to the local area.				
Impact Scale	Noise and vibration levels generated from the Project during this phase would be expected to be of lower intensity and shorter duration than during the other phases, and would most likely be within established threshold values.				
Impact Frequency	Noise impacts will occur intermittently but repeatedly throughout the well testing and abandonment phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the combination of the above impact characteristics the impact magnitude is considered to be small.				

Significance of Impact				
Receptor Sensitivity	Low	**Medium**	High	
	Some human receptors may be more sensitive to the impact, but overall the community retains the ability to cope with changes. The nearest community is 435 meters from the center of SEG#3_Dev site. There are no hospitals or schools in the vicinity of the well pads. Overall receptor sensitivity is medium.			
Impact Significance	Negligible	**Minor**	Moderate	Major
	The combination of a Medium Receptor Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.			

Mitigation and Management Measures - Well Testing and Abandonment

- Implement same measures as for Site Preparation and Construction activities.

Significance of Residual Impact - Well Testing and Abandonment

Residual impacts would be expected to be of **Negligible** significance.

6.3.4 Surface Water Quality

6.3.4.1 Source of Impact

As determined during scoping, potential impacts to surface water quality may occur due to:

Site Preparation and Construction

- Land preparation and earthworks activities;
- Riverbank construction and/or improvement;
- Water use;
- Solid waste management;
- Waste water management; and
- Hazardous materials storage and handling.

Drilling Operation

- Solid waste management;
- Waste water management; and
- Hazardous materials storage and handling.

6.3.4.2 Summary of Relevant Baseline Conditions

The Project Area is located on the Irrawaddy Sub-Basins where the Irrawaddy River originates in the northern region of Myanmar (Kachin). The largest river that flows through Block RSF-5 is the Irrawaddy River, starting from the northern side of the Block, and curving towards the left section before continuing down and leaving through the south of the concession block.

From the previous ESHIA study conducted in 2016, surface water sampling were examined to determine the baseline of surface water quality. The key concerns from this study were high pH, total dissolved solids (TDS) and Manganese in multiple of the sampling locations. Potential reasoning for high Manganese concentration is likely to be caused by surface run-off from areas with agricultural activities and washing the nutrients into open nearby surface water body. Moreover, the high pH and TDS can be explained by the dry season the sample was taken in, thus resulting in low precipitation and build-up of solids.

During the baseline survey for this Study, a total of seven (7) surface water sampling were conducted at different locations within the interest Study Area to form part of the baseline data. According to the sampling results, most water parameters were found to be within all three compared standards; Myanmar NEQG, IFC and EPA standards except for suspended solids. Suspended solids at monitoring location SW-1 to SW-5 was measured to be above the standard of 50 mg/L.

The sensitive receptors/resources that may be affected by potential impacts to surface water in the Project Area are the immediate nearby water bodies, open water bodies that is in the surface flow path, logistics base and access roads.

6.3.4.3 Assessment of Impacts – Site Preparation and Construction Phase

Land Preparation and Earthwork Activities

This phase would require vegetation clearance, excavation, filling and hardening of ground surfaces, which will alter the local hydrological patterns in the areas. These activities will occur along the route of the access roads, at laydown areas and at the site to be developed for the well pad and logistics base. Surface water bodies may have the potential to be affected by changes to their flow rates and discharge volumes due to variation in the drainage patterns in their basin. Additionally, the exposure of soil during earthworks can potentially lead to erosion and the loading of runoff with sediments, which can lead to increased turbidity in downstream waters.

The mobilization of sediment exposed by the Project's earthworks could have the potential to affect receiving drainage basins, and vehicle transportation around the Project Study Area and along access roads could have the potential to disturb soil surfaces, potentially leading to erosion and consequently sedimentation of waterways.

Riverbanks, if decided to be constructed, will also generate impacts to soil whereby creating an impermeable surface as well as increasing compaction on the upgraded or constructed area.

Water Use

During Site Preparation and Construction, water will be required for operational and domestic consumption. A well-established water system will be constructed to withdraw raw water from the designated water source. Various chemicals (both hazardous and non-hazardous) will be present on-site, so there is a potential contamination risk to surface water quality during drawing water from the water source. These risk are associated with the toxicity, chemical components and volume of the substance used on-site. Therefore, the Project will require a water extraction system that prevents cross contamination from the chemicals on-site into the water sources.

Solid Waste, Wastewater and Hazardous Material Storage and Handling

Untreated sewage from the accommodation camps could have the potential to enter surface water if not adequately designed and positioned to reflect the local hydrological regimes. Periods of high rainfall could lead to the overflow of the pit latrines and overland flow, or rapid through-flow of the effluent to surface water prior to its full digestion in the soil. Raw sewage can potentially impact surface water quality by promoting the growth of algae, high concentration of coliform and delivering pathogens that may be harmful to human and ecological receptors.

Similarly, waste management facilities, if improperly managed, may result in potential impacts to surface water by the introduction of harmful substances during runoff events. Of particular importance are the potential impacts from chlorides, nutrients such as nitrates and phosphates, and pathogens such as E. Coli or Typhoid, all of which are present in typical domestic waste. Chlorides can have acute effects on aquatic biodiversity, as well as long-terms effect such as inhibition of plant growth and interruption of invertebrate reproductive cycles. Nutrients such as phosphates or nitrates can also be immediately toxic to aquatic fauna, but may also result in algal blooms (also known as eutrophication) or excessive growth of undesirable plant species.

Surface water quality can have the potential to be impacted by introduction of hazardous chemicals, such as oil and grease or spilled chemicals present on equipment and ground surfaces (where this will be addressed in the unplanned events impact assessment section). These pollutants can be mobilized during washing or storm water runoff. The discharge of wastewater produced during concreting can also lead to changes in the pH of the receiving water body, if the water is not first treated.

To prevent potential impacts to surface and groundwater from untreated runoff, an additional concrete bund around the rig pad, and earthen bunds around the facilities used to store hazardous materials to contain potential accidental releases. Impermeable concrete bases will be established at areas containing or using hazardous materials, which include workshops, storage and refuelling areas. All of this infrastructures will incorporate adequate drainage.

The estimated quantities of solid waste, hazardous materials, and wastewater were discussed previously under the impacts to soil and topography (***Section 6.3.2***).

Significance of Impact – Land Preparation/Construction and Transportation

Evaluation of impacts to surface water due to land preparation/construction activities has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.44***.

Table 6.44: Assessment of Impacts on Surface Water due to Land Preparation/Construction

Significance of Impact					
Impact	Earthworks during construction may promote soil erosion and, in turn, increase the sediment loads of nearby streams and rivers. Accidental sedimentation or contamination could occur during water use from surface water bodies.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts are considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to surface water would be direct impacts by enhancing soil erosion through earthworks activity. Additionally, sedimentation and contamination of water can also be categorised as direct impact.				
Impact Duration	Temporary	**Short-term**	**Long-term**	Permanent	
	Activities causing impacts to surface water would be short-term as they take place over a short period of time (4 months). However, if contamination to the surface water occurs, the impact duration can be long-term.				
Impact Extent	**Local**	Regional	International		
	Impacts would likely be restricted to the local area.				
Impact Scale	Most impacts to surface water due to construction and site preparation would be relatively small during planned operations. Impacts due to unplanned events such as spills are assessed separately in ***Section 6.5***. Potential sedimentation of waterways could occur due to erosion and soil movement from construction vehicles and machinery, but this can be controlled with appropriate mitigation measures.				
Impact Frequency	Potential impacts would occur intermittently but repeatedly throughout the Site Preparation and Construction phase. Frequency of impacts are also linked to rainfall events.				
	Positive	Negligible	Small	**Medium**	Large

Significance of Impact				
Impact Magnitude	Based on the combination of the above impact characteristics the impact magnitude is considered to be medium.			
Receptor Sensitivity	**Low**	Medium	High	
	The surface water quality is in reasonably good condition with high seasonal fluctuation of water level throughout the year.			
Impact Significance	Negligible	**Minor**	Moderate	Major
	The combination of a Low Receptor Sensitivity and Medium Impact Magnitude will result in an overall Minor Impact.			

Mitigation and Management Measures - Land Preparation/Construction and Transportation

Land Preparation and Earthwork Activities and Riverbank Improvement and/or Construction

- Implement same measures as for impacts to soil (refer to ***Section 6.3.3***).

Water Use

- Implement same measures as for other impacts to surface water (refer to ***Section 6.3.4***).

Significance of Residual Impact – Land Preparation/Construction and Transportation

Residual impacts would be expected to be of **Negligible** significance.

Significance of Impact – Management of Solid Waste, Wastewater and Hazardous Materials

Evaluation of impacts to surface water during Site Preparation and Construction activities from solid waste, wastewater and hazardous material management and handling has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.45***.

Table 6.45: Assessment of Impacts on Surface Water during Site Preparation and Construction due to Management of Waste, Wastewater and Hazardous Materials

Significance of Impact				
Impact	Impacts to surface water may originate from inappropriate management and handling of waste, wastewater and hazardous materials as a result of contamination of surface water bodies.			
Impact Nature	**Negative**	Positive	Neutral	
	Impacts are considered to be adverse (negative).			
Impact Type	**Direct**	Indirect	Induced	
	Impacts to surface water would likely be direct impacts by contamination.			
Impact Duration	Temporary	**Short-term**	**Long-term**	Permanent
	Activities causing impacts to surface water are considered to be short-term as they take place over a short period of time (4 months). However, if contamination to the surface water occurs, the impact duration can be long-term.			

Significance of Impact					
Impact Extent	**Local**	Regional	International		
	Impacts would likely be restricted to the local area.				
Impact Scale	■ The quantity of non-hazardous waste generated is estimated to be 50 kg per day. ■ Quantities of hazardous materials and waste are anticipated to be relatively small during the construction and site preparation phase, mostly consisting of diesel fuel, lubricants, paints, etc. ■ The volume of wastewater generated is estimated to be 1.0 – 6.0 m^3 per day.				
Impact Frequency	Activities potentially impacting surface water from hazardous, non-hazardous, solid waste and hazardous material management and disposal is determined to occur intermittently but repeatedly during the Site Preparation and Construction phase.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Based on the combination of the above impact characteristics the impact magnitude is considered to be medium.				
Receptor Sensitivity	Low	**Medium**	High		
	The surface water quality is in relatively good condition with high seasonal fluctuation of water level throughout the year.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a Medium Receptor Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures – Management of Solid Waste, Wastewater and Hazardous Materials

Solid Waste Management

- Implement same measures as for management of solid waste, wastewater and hazardous materials impacts to soil (refer to ***Section 6.3.3***).

Significance of Residual Impact – Management of Solid Waste, Wastewater and Hazardous Materials

Residual impacts would be expected to be of **Minor** significance.

6.3.4.4 Assessment of Impacts – Drilling Operation Phase

Solid Waste, Wastewater and Hazardous Material Storage and Handling

Drilling fluids will be used in the Drilling Operation phase, some of which contain hazardous components. The NAF-based fluids may contain a range of hydrocarbons and heavy metals. The management/disposal protocols for these fluids are discussed in Project Description Section (***Section 4***); however, improper drilling practices, remediation, storage or handling techniques could result in potential impacts to nearby surface water.

The estimated mud per well is 1,883 m^3 (2,634 ton) and cutting is 1,509 m^3 (2,717 ton) where these volume is a mix of WBM and NAF. Drilling fluids will be stored on-site in facilities with impermeable bases with a bund providing containment (these are considered as hazardous waste). During drilling, mud will be separated from cuttings. Mud will be reused, whilst an area on the well pad will be dedicated to the storage and management of drill cuttings. This will include settlement ponds and other treatment facilities as discussed in ***Section 4***. Mud and cuttings will be treated by DOWA Eco-System Co., Ltd., an authorized waste management company.

As discussed for Site Preparation and Construction Phase activities, surface water can have the potential to be impacted by accidental releases which are collected by storm water or during washing

of the surfaces and equipment and transported to downstream of water ways and surface water bodies (these are assessed in the unplanned event impact assessment, refer to ***Section 6.3.8***). In addition, the concrete base of the rig pad has the potential to come in contact with oil and chemicals during standard operation during Drilling Operation.

The estimated quantities of solid waste and wastewater were discussed previously under the impacts to soil and topography (***Section 6.3.2***).

Significance of Impact – Management of Solid Waste, Wastewater and Hazardous Materials

Evaluation of impacts to surface water from inappropriate solid waste, wastewater and hazardous material management and handling during Drilling Operation phase has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.46***.

Table 6.46: Assessment of Impacts on Surface Water during Drilling Operation due to Management of Solid Waste, Wastewater and Hazardous Materials

Significance of Impact					
Impact	Impacts to surface water may originate from inappropriate management and handling of hazardous, non-hazardous waste, wastewater and hazardous material could contaminate surface water bodies.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts is considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to surface water would likely be direct impacts by increasing sediment and contamination (via overflowing of cutting pits or leaching) of surface water bodies. Impacts of reducing water availability of the surface water body is also considered as direct impact.				
Impact Duration	Temporary	**Short-term**	**Long-term**	Permanent	
	Activities causing impacts to surface water are considered to be short-term as they take place over a short period of time (3 months). However, if contamination to the surface water occurs, the impact duration can be long-term.				
Impact Extent	**Local**	Regional	International		
	Impacts would likely be restricted to the local area.				
Impact Scale	■ The quantity of non-hazardous waste is estimated to be 70 kg per day. ■ The volume of mud and cuttings is estimated to be 5,351 ton per well (mix of both WBM and NAF). ■ The quantity of hazardous waste generated is estimated to be 45 kg per month based on previous similar projects. ■ The volume of wastewater is estimated to be 1.4 to 8.4 m^3 per day.				
Impact Frequency	Activities potentially impacting surface water from hazardous, non-hazardous, solid waste and hazardous material management and disposal is determined to occur intermittently but repeatedly during the Drilling Operation phase.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Based on the combination of the above impact characteristics the impact magnitude is considered to be medium.				
Receptor Sensitivity	Low	**Medium**	High		
	The surface water quality is in relatively good condition with high seasonal fluctuation of water level throughout the year.				

Significance of Impact				
Impact Significance	Negligible	Minor	**Moderate**	Major
	The combination of a Medium Receptor Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.			

Mitigation and Management Measures – Management of Solid Waste, Wastewater and Hazardous Materials

- Implement same mitigation measures as soil (refer to ***Section 6.3.3***)

Significance of Residual Impact – Management of Solid Waste, Wastewater and Hazardous Materials

Residual impacts would be expected to be of **Negligible** significance.

6.3.5 Hydrology

6.3.5.1 Source of Impact

As determined during scoping, potential impacts to hydrology patterns and regime may occur due to:

Site Preparation and Construction

- Land preparation and earthworks activities; and
- Water use.

Drilling Operation

- Water use.

6.3.5.2 Summary of Relevant Baseline Conditions

Irrawaddy River flows through Block RSF-5 from the north, and curving towards the western section of the block before continuing south and leaving through the south of the concession block. The total drainage area of lower Irrawaddy is approximately 95,600 km^2, with an estimated flow rate varying from 2,300 m^3/s during the summer to 32,600 m^3/s in the monsoon season[1]. This large variation is caused by the differences of precipitation volume between seasons.

6.3.5.3 Assessment of Impacts – Site Preparation and Construction Phase

Site Preparation and Construction activities is planned to be carried out in July to November 2019, thus the initial land clearance and earthworks will start from July onwards. One of the greatest concerns that the Project can bring about towards hydrology is related to flooding events however, this will be assessed under unplanned events as a subcategory of natural disasters. Project activities that may impact the hydrological regime and patterns are described below.

Land Preparation and Earthworks Activities

Activities from land preparation and earthworks, if not managed and conducted appropriately, can potentially lead to soil transporting into river causing sedimentation which ultimately alter and impact the hydrology and the aquatic biodiversity that uses the water as a habitat.

[1] Ministry of Electric Power, 2013, Initial Environment Examination – Proposed Loan Republic of the Union of Myanmar: Power Distribution Improvement Project. https://www.adb.org/sites/default/files/linked-documents/46390-003-ieeab.pdf, accessed on November 8, 2018.

Additionally, these activities can result in soil compaction, vegetation removal and an increase in impermeable (or slowly permeable) surfaces. The subsequent increase in surface runoff may, therefore, increase soil erosion and the risk of flooding.

Due to the activities that occurs during land preparation and earthwork activities which will change the topography profile, this will directly impact the change of the natural flow patterns as well as the catchment area and hence the volume, flow rate and direction of flow of the hydrology.

If erosion is not managed, associated potential impacts could include excessive sedimentation of local waterways, loss of topsoil and reduction in soil fertility, detrimental changes to site hydrology, and – in more extreme cases – landslides.

Riverbanks Improvement/Construction

Similarly to land preparation and earthworks, riverbanks activities will have a direct impact of soil erosion that cause alteration to the hydrology regime which in turn causes sedimentation.

Water Use

Water use can cause changes to the hydrology regime in cases of extracting large volume of water and hence affecting the flow rate. One of the key variables related to the flow rate is the volume of water in the river channel. Assuming other environmental variables and parameters are constant, when volume of water increases, the flow rate of the river will increase proportionally whereas when the water volume decreases, the flow rate will decrease. The change of flow rate could induce consequential impacts associated to hydrology, such as riverbank erosion and, accumulation of sediment which may lead to alteration of topography thus in turn impacting the flow regime.

Flooding events

Torrential monsoon rains and rising river levels and lanslides are common in Myanmar during the rainy season, more than hundred thousand people have been affected by floods last rainy season (2019), inclusive of the Ayeyarwaddy region [1]. Site preparation and construction will take place during dry season and thus limited surface runoff and flooding risk is anticipated.

Significance of Impact – Land Preparation/Construction and Water Use

Evaluation of impacts to hydrology from Site Preparation and Construction activities has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.47***.

Table 6.47: Assessment of Impacts to Hydrology due to Land Preparation/Construction Activities and Water Use

Significance of Impact			
Impact	Land preparation and earthwork activities during Site Preparation and Construction activities will impact soil erosion which leads to alteration of topography which in turn would change the flow regime and hence the hydrology. Additionally, land clearing (decrease precipitation interception), riverbanks improvement and construction and well construction (increase of impermeable surfaces) could increase surface runoff and thus increasing soil erosion and risk of flooding.		
Impact Nature	**Negative**	Positive	Neutral
	Impacts to hydrology are considered to be adverse (negative).		
Impact Type	**Direct**	Indirect	Induced

(1) https://reliefweb.int/report/myanmar/myanmar-floods-and-landslide-information-bulletin

Significance of Impact				
	Impacts to hydrology would be direct impacts by soil erosion and deposition of soil causing changes in topography and hence alter the flow regime of Yin Creek and consequently its hydrology.			
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	Impacts to hydrology due to Site Preparation and Construction activities are considered to be short-term.			
Impact Extent	**Local**	Regional	International	
	Impacts would be limited to the Project Area and downstream of impacted water bodies but is expected to be within the local extent (i.e. Yin Creek).			
Impact Scale	Impacts to hydrology would be limited to the well pad, riverbank construction/improvement, accommodation area, logistics base, and road construction/improvement areas. Estimated area that will undergo changes during this phase is: ■ Well pad area – 28,548 m^2 SEG#1 ■ New access road – 1,500 m^2 ■ Access road to be upgraded – 48,420 m^2 ■ Logistic base – 19,500 m^2 The scale of impact regarding water use will be dependent on the volume of project water use, this is expected to be relatively small. This is likely to impact the surrounding water bodies (i.e. Yin Creek) around the construction and upgraded area by changing the flow path and volume.			
Impact Frequency	Activities potentially impacting the hydrology from Site Preparation and Construction activities will happen repeatedly throughout the day for the duration of Site Preparation and Construction phase.			
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is considered as small.			
Receptor Sensitivity	Low	**Medium**	High	
	The Irrawaddy River and Yin Creek is located in the central dry zone with high seasonal fluctuation of precipitation volume as well as a number of secondary users downstream. Alteration to the Irrawaddy River and Yin Creek cause chain impact to the secondary receptors that rely heavily on the flow regime and volume of the river/creek. Henceforth the receptor sensitivity is considered as medium.			
Impact Significance	Negligible	**Minor**	Moderate	Major
	The combination of a Medium Receptor Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.			

Mitigation and Management Measures – Land Preparation/Construction and Water Use

- Divert drainage water via artificial ditches with appropriate capacity to maintain existing flow patterns; and
- Implement same measures as for impacts to soil (refer to ***Section 6.3.3***).

Significance of Residual Impact – Land Preparation/Construction and Water Use

Residual impacts would be expected to be of **Negligible** significance.

6.3.5.4 Assessment of Impacts – Drilling Operation Phase

Water Use

Similarly to Site Preparation and Construction phase, the amount of water drawn from the water body will impact the hydrology patterns where the significance of the impact is correlated to the volume of water extraction.

Significance of Impact – Water Use

Evaluation of impacts to hydrology from water use during Drilling Operation activities has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.48***.

Table 6.48: Assessment of Impacts to Hydrology due to Water Use

Significance of Impact					
Impact	Project's water use requirements will impact surface water hydrology due to changes in water quantities and flow patterns.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts to hydrology is considered to be adverse (negative).				
Impact Type	**Direct**	**Indirect**	Induced		
	Impacts to hydrology would likely be direct impacts by drawing water from the river thus directly reducing the water volume in the water body. Secondary receptors that rely on flow regime and volume of the river are also indirectly impacted.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	Impacts to hydrology due to water use is considered to be short-term impact.				
Impact Extent	**Local**	Regional	International		
	Impacts would be limited to the Project Area and downstream but is expected to be within the local extent.				
Impact Scale	Impacts to hydrology is estimated to be relative to the amount of water drawn from the water body, this is anticipated to be 4,000 m^3.				
Impact Frequency	Activities potentially impacting the hydrology from water use will happen repeatedly throughout the day for the duration of Drilling Operation phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is considered as small.				
Receptor Sensitivity	Low	**Medium**	High		
	The Irrawaddy River is located in the central dry zone with high seasonal fluctuation of precipitation volume as well as a number of secondary users downstream. Alteration to the Irrawaddy River can cause subsequent impacts to the secondary receptors that rely heavily on the flow regime and volume of the river. Henceforth the receptor sensitivity is considered as medium.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Receptor Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures – Water Use

- Implement same mitigation measures for impacts to surface water from water use activities during Site Preparation and Construction phase (refer to ***Section 6.3.2***).

Significance of Residual Impact – Water Use

Residual impacts would be expected to be of **Negligible** significance.

6.3.6 Groundwater

6.3.6.1 Source of Impact

As determined during scoping, potential impacts to groundwater quality and quantity may occur due to:

Site Preparation and Construction

- Water use;
- Solid waste management;
- Waste water management; and
- Hazardous materials storage and handling.

Drilling Operation

- Drilling and casing activities;
- Water use;
- Solid waste management;
- Waste water management; and
- Hazardous materials storage and handling.

6.3.6.2 Summary of Relevant Baseline Conditions

Groundwater is the principle source for potable domestic water supply in Magway Region, with over 4,400 groundwater wells. Secondary use of groundwater is for irrigation purposes in certain areas where surface water is not sufficient.

From the previous ESHIA study conducted in 2016, groundwater sampling were also examined to accompany the baseline data. The primary baseline study showed that there were high total dissolved solids (which exceeded the recommended levels for drinking water) was recorded in multiple deep tube wells that were used by the locals. One of the reason for this could be from natural evaporation of water, introduction of dissolved solids from precipitation or rock weathering processes in the aquifer generating solids that is overtime dissolved into the water[1]. Other concerns are related to the high salinity and pH in deep tube well. This is also likely to be caused by natural processes and interaction between the aquifer wall material and the groundwater.

Through groundwater sampling (conducted in March 2019), majority of the parameters for six groundwater samples was found to be within the relevant standards (Myanmar National Emission Quality Guideline, EPA and WHO). There are certain parameters that did not satisfy the standard, these are Total Nitrogen at GW 3, iron at GW 4 and total coliform at GW 6. Both of these contaminants (total Nitrogen and Coliform) are generally found in animal manure, sewage waste, compost and decomposing roots and leaves[2]. Therefore, the high content of total nitrogen and coliform can be

[1] Eni, 2016. Environmental, Social and Health Impact Assessment (ESHIA) for Onshore Myanmar Land Seismic Survey Activities in Block RSF-5

[2] http://www.npi.gov.au/system/files/resources/7d847ea1-c7a2-e874-7d07-e57720f0122b/files/factsheet-totalnitrogen_0.pdf

explained by the nearby activities and land use of the groundwater well that was sourced for baseline sampling. Nevertheless, this demonstrates that the groundwater quality within the region and consequently the Project Study Area is in reasonably good condition.

It is well noted that any potential impacts to site soils and surface water bodies may potentially impact groundwater systems. As such, many of the potential impacts and mitigation measures are outlined in ***Section 6.3.3*** and ***Section 6.3.4***.

The sensitive receptors/resources that may be affected by potential impacts to groundwater in the Project Area are the aquifers immediately below the well pad, logistics base and access roads, potentially including neighbouring aquifers that may be affected by groundwater movement.

6.3.6.3 Assessment of Impacts – Site Preparation and Construction Phase

Water Use

Similarly to water use impacts related to surface water, water consumption during this phase can influence both the quality and quantity of groundwater availability. Depending on the volume of water requirement during this phase and the potential of cross-contamination from the Project Study Area, the magnitude of impact will vary dependent on these variables. Consumption during construction is estimated to be 40 – 50 m^3 per day.

Solid Waste, Wastewater and Hazardous Material Management

As with soil and surface water, sanitation and waste management facilities associated with the Project have the potential to impact groundwater with hydrocarbons, heavy metals, chlorides, nutrients and pathogens, which may eventually permeate to the water table. The same is true for any hazardous substances stored on-site such as fuels, oils or industrial solvents.

Significance of Impact – Water Use

Evaluation of impacts to groundwater from Site Preparation and Construction activities has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.49***.

Table 6.49: Assessment of Impacts to Groundwater Due to Water Use

Significance of Impact				
Impact	Draw-down from extraction of on-site groundwater wells will impact groundwater levels.			
Impact Nature	**Negative**	Positive	Neutral	
	Impacts to groundwater is considered to be adverse (negative).			
Impact Type	**Direct**	Indirect	Induced	
	Impacts to groundwater would likely be direct impacts by drawing water from groundwater sources. This leads to a direct impact of decrease in water volume.			
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	Impacts to groundwater due to water use is considered to be short-term as the activities takes place over a short period of time (4 months).			
Impact Extent	**Local**	Regional	International	
	Impacts would be limited to the Project Area and hence would be considered to be local.			
Impact Scale	Impact scale to groundwater would be dependent on the volume of water use from groundwater source, this is anticipated to be very limited and therefore relatively small (estimated consumption is 40 – 50 m^3 per day during site preparation phase).			

Significance of Impact					
Impact Frequency	Activities potentially impacting the groundwater during site establishment will happen repeatedly throughout the day for the duration of Site Preparation and Construction phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is considered as small.				
Receptor Sensitivity	Low	**Medium**	High		
	The groundwater quality is in relatively good condition with sufficient water throughout the year.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Receptor Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures – Water Use

- Make sure that groundwater wells are installed to a suitable depth;
- Only use approved and permitted groundwater wells; and
- Keep a record of the water consumption and do not exceed the abstraction capacity of the well

Significance of Residual Impact – Water Use

Residual impacts would be expected to be of **Negligible** significance.

Significance of Impact – Management of Solid Waste, Wastewater and Hazardous Materials

Evaluation of impacts to groundwater from waste and hazardous material management and handling during Site Preparation and Construction activities has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.50***.

Table 6.50: Assessment of Impacts to Groundwater due to Management of Solid Waste, Wastewater and Hazardous Materials

Significance of Impact					
Impact	Inappropriate management and disposal of hazardous and non-hazardous waste will lead to impacts to groundwater via infiltration of soil and surface water.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts to groundwater would be considered to be adverse.				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to groundwater would likely be direct impacts by contamination from waste infiltrating through soil and into groundwater thus contaminating the aquifer.				
Impact Duration	Temporary	**Short-term**	**Long-term**	Permanent	
	Activities causing impacts to groundwater would be short-term as they take place over a short period of time (4 months). However, if contamination to the groundwater occurs, the impact duration can be long-term.				
Impact Extent	**Local**	Regional	International		
	Impacts would likely be restricted to the local area.				

Significance of Impact					
Impact Scale	■ The quantity of non-hazardous waste generated is estimated to be 50 kg per day. ■ Quantities of hazardous materials and waste are anticipated to be relatively small during the construction and site preparation phase, mostly consisting of diesel fuel, lubricants, paints, etc. ■ The volume of wastewater generated is estimated to be 1.0 – 6.0 m^3 per day.				
Impact Frequency	Activities potentially impacting the groundwater during site establishment will happen repeatedly throughout the day for the duration of Site Preparation and Construction phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the above impact characteristics, the impact magnitude is considered as small.				
Receptor Sensitivity	Low	**Medium**	High		
	The groundwater quality is in relatively good condition with sufficient water throughout the year.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Receptor Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures – Management of Solid Waste, Wastewater and Hazardous Materials

- Implement same measures for impacts to soil from management of solid waste, wastewater and hazardous materials (refer to ***Section 6.3.3***).

Significance of Residual Impact – Management of Solid Waste, Wastewater and Hazardous Materials

Residual impacts would be expected to be of **Negligible** significance.

6.3.6.4 Assessment of Impacts – Drilling Operation Phase

Drilling and Casing Activities

The key activities to be undertaken during this phase of works which may potentially impact negatively on groundwater resources within the Study Area include:

- Mobilization and set up of drilling rig and equipment;
- Risks associated with sub-surface drilling; and
- Demobilization of Drilling Operations.

If these activities are not appropriately managed, the most significant potential impact to site aquifers would be due to accidental release of hazardous materials, particularly fluids from the drilling sleeve. Sources of impacts already discussed for Site Preparation and Construction Phase are also relevant to Drilling Operation Phase, with notable addition of drilling fluids.

In the event of a well blowout, which is an unplanned event (refer to ***Section 6.5*** for this assessment), this may also impact groundwater bodies by contaminating the resource with hydrocarbons and other pollutants.

Water Use

Water for all activities will be obtained from groundwater wells (which will be constructed by Eni) and/or surface water bodies. Water will be required during Drilling Operations, and approximately 45 m^3 of water per day will be required. For each well, if drilling takes around three (3) months, approximately

4,000 m^3 of water will be required. If two (2) wells are drilled in total, approximately 8,000 m^3 of water may be required for Drilling Operations for the Project. This is relatively a large amount of water if all are to be drawn from deep tube well aquifer.

Solid Waste, Wastewater and Hazardous Material Management

The NAF-based drilling fluid and drill-cutting management risks outlined in soil and surface water impact assessment sections also exist for groundwater due to the potential for lateral percolation through the soil profile, or longitudinal cross-contamination where groundwater and surface water sources merge. The potential for additional impacts exist during drilling activities where it is possible for groundwater to be impacted by drilling fluids through defective or incorrectly-installed drill casings.

Additionally, transportation, storage and utilization of materials, drilling fluids, oils and chemicals as well as the management of drilling mid and cuttings may also cause impact to groundwater if the handling procedure is not taken care of appropriately.

Although the potential for secondary health related impacts from groundwater contamination exist, the likelihood of this occurring is considered low provided that appropriate safety measures and industry best-practice standards are strictly abided by. The initial well casing is designed to isolate shallow aquifers surrounding the well bore, in effect protecting both the well from groundwater intrusion and aquifers from Drilling Operations.

The estimated quantities of solid waste and wastewater were discussed previously under the impacts to soil and topography (***Section 6.3.2***).

Significance of Impact – Drilling Operations and Water Use

Evaluation of impacts to groundwater during Drilling Operation has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.51***.

Table 6.51: Assessment of Impacts to Groundwater due to Drilling Operations and Water Use

Significance of Impact				
Impact	Impacts to groundwater from accidental releases of fluids from drill sleeve. Additional impacts to groundwater may be from water use of the project impacting groundwater availability depending on source and quantity of water required during Drilling Operation.			
Impact Nature	**Negative**	Positive	Neutral	
	Impacts is considered to be adverse (negative).			
Impact Type	**Direct**	Indirect	Induced	
	Impacts to groundwater would be direct.			
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	Impacts to groundwater from drilling and casing activities is considered to be short-term as the activities takes place over a short period of time (3 months). Water use will occur over a short term (3 months).			
Impact Extent	**Local**	Regional	International	
	Impacts would likely be restricted to the local area.			
Impact Scale	Impact scale to groundwater from drilling and casing activities would be considered as moderate. Scale of impact from water use is dependent on the volume of water required which is anticipated to be 4,000-5,000 m^3 per well over the drilling period.			

Significance of Impact					
Impact Frequency	Impact would occur only during abnormal operation whereby accidental release of fluids from the drill sleeve. However, if the operation is running normally, this is anticipated to never occur during the Drilling Operation. Impact for water use is expected to occur intermittently but repeatedly during Drilling Operation.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Based on the combination of the above impact characteristics the impact magnitude is considered to be medium.				
Receptor Sensitivity	Low	**Medium**	High		
	The groundwater quality is in good condition with sufficient water throughout the year.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a Medium Receptor Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures – Drilling Operations and Water Use

The following mitigation measures are planned for the Project:

- Make sure that groundwater wells are installed to a suitable depth (at least 5 m);
- Only use approved and permitted groundwater wells and keep track of abstraction and of water parameters; and
- Make sure well design allows for isolation of aquifers and shallow gas from the well bore.

Significance of Residual Impact – Drilling Operations and Water Use

Residual impacts would be expected to be of **Minor** significance.

Significance of Impact – Management of Solid Waste, Wastewater and Hazardous Materials

Evaluation of impacts to groundwater from waste and hazardous materials storage and handling during Drilling Operation has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.52***.

Table 6.52: Assessment of Impacts to Groundwater due to Management of Solid Waste, Wastewater and Hazardous Materials

Significance of Impact			
Impact	Solid waste, wastewater and hazardous material management and handling consequent to drilling operations, if not managed appropriately, could directly impact groundwater as well as indirectly have influence secondary receptors such as biodiversity and human that interact with the impacted groundwater resource. Other impacts are related to drill cuttings being buried on-site which has the potential to contaminate the underlying and surrounding groundwater penetrating through the stratum layers.		
Impact Nature	**Negative**	Positive	Neutral
	Impacts is considered to be adverse (negative).		
Impact Type	**Direct**	**Indirect**	Induced

Significance of Impact					
	Impacts to groundwater would be direct. Additional impacts related to secondary receptors utilising the groundwater resource will be considered as indirect impact type.				
Impact Duration	Temporary	**Short-term**	**Long-term**	Permanent	
	Activities causing impacts to soil are considered to be short-term as they take place over a short period of time (3 months). However, if contamination to the soil occurs, the impact duration can be long-term.				
Impact Extent	**Local**	Regional	International		
	Impacts would likely be restricted to the local area.				
Impact Scale	■ The quantity of non-hazardous waste is estimated to be 70 kg per day. ■ The volume of mud and cuttings is estimated to be 5,351 ton per well (mix of both WBM and NAF). ■ The quantity of hazardous waste generated is estimated to be 45 kg per month based on previous similar projects. ■ The volume of wastewater is estimated to be 1.4 to 8.4 m^3 per day.				
Impact Frequency	Activities potentially impacting the groundwater during site establishment will happen repeatedly throughout the day for the duration of Drilling Operation phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the combination of the above impact characteristics the impact magnitude is considered to be small.				
Receptor Sensitivity	Low	**Medium**	High		
	The groundwater quality is in good condition with sufficient water throughout the year.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Receptor Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures – Management of Solid Waste, Wastewater and Hazardous Materials

- Implement same measures as impacts to soil from management of solid waste, wastewater and hazardous materials.

Significance of Residual Impact – Management of Solid Waste, Wastewater and Hazardous Materials

Residual impacts would be expected to be of **Negligible** significance.

6.3.7 Biodiversity and Ecosystem Services

6.3.7.1 Source of Impact

As determined during scoping, potential impacts to Biodiversity and Ecosystem Services may occur due to the following project activities:

Site Preparation and Construction

- Land preparation and earthworks activities;
- Riverbanks improvement/construction;
- Sourcing of fill material;
- Transportation of workers, materials, waste;

- Solid waste management;
- Wastewater management;
- Hazardous materials storage and handling; and
- Labour influx and worker accommodation.

Drilling Operations

- Rig mobilization to site;
- Drilling and casing;
- Transportation of workers, materials, waste;
- Water use;
- Solid waste management;
- Wastewater management;
- Hazardous materials storage and handling; and
- Labour influx and worker accommodation.

6.3.7.2 Summary of Relevant Baseline Conditions

Corridors of conservation value have been identified in Myanmar; of these corridors, only one, the Irrawaddy River Sinbyugyun to Minbu Corridor, is partially included in Block RSF-5. In addition, no legally protected areas are present in the Study Area, but the whole Block RSF-5 is included in the Endemic Bird Area of Irrawaddy Plains, which extends in central Myanmar and the block is also included in the Indo-Burma biodiversity hot spot and is likely to comprise critical habitat (www.ibat-alliance.org, 2019). The Irrawaddy river is home to a large diversity of animals, including about 43 fish species, but 350 species may potentially be present, with some endemic. The critically endangered Irrawaddy Dolphin, (*Orcaella brevirostris*) are not expected to be present in the Project Area because its home range is closer to wetlands, and other large mammals are not thought to be present but some big birds are potentially using the area, especially during rainy season.

A biodiversity survey of Eni Myanmar's Block RSF-5 petroleum exploration area was completed during August 29 - 31, 2016. The survey was undertaken as part of the Environmental, Social and Health Impact Assessment (ESHIA) of a proposed 3D Seismic Program. The survey concluded that a few dipterocarp species, *Shorea obtusa* (Thit Yar) and *Shorea siamensis* (In Gyin), are present and the endemic *Tectona hamitonia* was detected, however, most of the block is dominated by the Acacia species. Native vegetation cover within the exploration block has been subject to a prolonged period of alteration and human activity and only dry forests are naturally found.

The August 29-31, 2016 biodiversity reconnaissance survey confirmed the presence of 32 species of bird, and 2 species of mammal. Focused community interviews identified potentially further 15 mammals, 13 birds, 30 species of reptile, 21 species of amphibian, 14 species of invertebrate, and 17 species of fish that may be resident or transient in the block. Of those, no iconic species are mentioned however underreporting is a possibility.

A series of additional biodiversity surveys were undertaken during the dry season (in between 23rd to 27th April, 2019), for this EIA study. From these surveys, thirty-three (33) flora species were identified in the proposed Project Study Area, where the endangered Htan (*Borassus flabellifer*) was observed to be widespread.

Out of the 53 observed bird species, the following five species are endemic to the survey area: Vinous-breasted Myna (*Acridotheres burmannicus*), streak-eared bulbul (*Pycnonotus blanfordi*), White-throated Babbler (*Chatarrhaea or Turdoides gularis*), Burmese Bushlark (*Mirafra microptera*), and Hooded Treepie (*Crypsirina cucullata*). Furthermore, the area may host other threatened birds, such as Whitebellied Heron (*Ardea insignis)*, White-winged Duck (*Cairina scutulata)*, Green Peafowl (*Pavo*

muticus) and Pale-capped Pigeon (*Columba punicea)* and Burmese Collared-dove (Streptopelia xanthocycla).

The area comprises largely modified habitat with very few natural habitat enclaves. No critical habitat has been identified within the Project Area of Influence.

6.3.7.3 Assessment of Impacts – Site Preparation and Construction Phase

Impacts to Terrestrial Biodiversity

Biodiversity are not likely to be impacted by Project activities since the area comprise mostly modified habitat and contain limited feeding grounds for certain species. The site preparation operations are scheduled to take place in the rainy season, as such, increased runoff due to earthworks and land preparation may potentially impact sensitive receptors.

Erosion due to Earthworks Activities during Construction

Land preparation will likely expose portions of the Project Area to soil erosion (wind and/or runoff) until infrastructure construction or replanting is completed to stabilise the land surface. The Project Area could be subject to further run-off and erosion issues. Erosive processes can transport sediment through overland flow and via streams. It is likely that overland flow generated in the Project Area will eventually enter the aquatic environment, which causes a range of ecological impacts (e.g. sedimentation and nutrient enrichment). This impact has potential to degrade downstream habitat areas or change habitat characteristics and as such influence suitability for native flora and fauna communities.

Habitat Fragmentation

Clearing of habitat may be carried out for Site Preparation and Construction, through civil works, e.g. access roads, levelling, laying and compaction for drilling preparation. Habitat fragmentation is an important threat to global biodiversity and edge effects are dominant drivers of change in many fragmented landscapes. Edge effects can have significant impacts on flora and fauna species diversity, composition, community dynamics and ecosystem functioning and are most apparent when more uniform habitats, particularly forests, are disturbed. Eni has prioritized the use of existing roads or tracks in the area to minimize interventions and impacts.

Accidental Mortality due to Transportation of Workers and Materials

The development of new access roads, as well as increased traffic on existing roads, presents a risk of accidental mortality or injury to fauna as a result of collision with moving vehicles. The likelihood of death or injury may be reduced to a degree as noise, light and presence of humans will in itself act as a deterrent for fauna entering such areas. Based on the assumption that the establishment of new roads will be restricted to established areas or other habitat areas of low biodiversity value and no new roads will be established within important habitat areas, the exposure of fauna to collision risk with Project vehicles is considered to be non-significant.

Invasive Species Introduction through Fill Material during Construction

Habitat contamination may take place due to fill materials or wastewater discharge and runoff if they are not managed correctly. Species are termed invasive aliens when:

(i) they are non-native to an ecosystem, and

(ii) when their introduction is liable to cause environmental harm, or harm to human health and livelihoods, because they spread rapidly and have negative effects on native species (through competition, predation, or disease).

Invasive species can be flora, fauna, or other organisms (*eg* microbes). Anthropogenic actions are the primary means by which invasive alien species are introduced to an ecosystem. They can very rapidly dominate ecological communities when introduced because of a lack of natural predators or

competitors, resulting in habitat degradation and loss of biodiversity. All species are at risk from disease, and introduced diseases have caused problems for a number of species (including plants) in other parts of the world.

Contamination due to Wastes, Wastewater, and Hazardous Materials

Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to physical receptors which, in turn may impact biodiversity, furthermore, terrestrial animals may be attracted to food waste which may increase rodents (rats and mice) and ants.

Increase of Hunting and Poaching due to Labour Influx and Worker Accommodation

Labour influx and worker accommodation may lead to unauthorized hunting and harvesting of plants and animals by workers which could impact biodiversity. Work camps may also disturb sensitive fauna by light and noise disturbance. Hunting, poaching and wildlife trade are critical issues for the conservation of species; unsustainable hunting to obtain meat, animal parts or live individuals for the pet trade can cause population declines and local extinction. Eni will implement and adhere to a management plan which clearly prohibits hunting and poaching activities by local workforce; hence this potential impact is not considered to impact sensitive receptors.

Impacts to Terrestrial Ecosystem Services

Ecosystem services include provisioning services, such as use of water, aggregates and timber which may be interrupted by the project activities. The project may cause negative impacts due to potentially restricting access to gathering wild food; or impact regulating services because there may be increased erosion and less flood control through loss of vegetation cover for construction purposes.

Regulating services such as flood and storm control, or water flow regulation, can be essential for maintaining the health and security of people in the event of extreme weather conditions, e.g. storms or droughts. The project may cause impacts by clearing of vegetation, which may generate loss of carbon sequestration services. In addition, clearing vegetation induce reduction in flood and erosion control and water purification.

In addition if the vegetation clearance include agricultural areas these have a cultural services role, as a source of livelihood and independence. Some areas may have served as cultivated land for generations and hence have cultural significance to the communities and individuals who rely upon them.

Impacts to Aquatic Biodiversity

Construction Activities at Potential River Landing Site

Disturbance and displacement of aquatic fauna by underwater noise can occur from preparation activities eg river transport activities, if Eni utilizes a river landing for the Project.

Vessel movements generate noise by cavitation caused by the rotation of propellers. Cavitation occurs when tiny bubbles form in the water and are a result of a propeller moving through it. When the bubbles collapse they create an audible shock wave. Underwater sound travels as a pressure wave and underwater sound can, at very high levels, increase potential for injury to the sensitive auditory organs of aquatic fauna or, at lower levels cause disturbance and a change in behavior, however short term.

Erosion due to Earthworks activities during Construction

Construction activities include drainage works (e.g. storm water drainage systems) and use of construction equipment which may negatively impact flora and fauna due to increased sediment loading of streams and rivers and potential harm to flora and fauna by physical degradation or loss of habitats.

Contamination due to Wastes, Wastewater, and Hazardous Materials

Inappropriate management and disposal of hazardous or non-hazardous waste and wastewater could lead to impacts to surface water quality and subsequently impact aquatic receptors in eg nearby river and streams and eutrophication may potentially occur.

Impacts to Aquatic Ecosystem Services

Provisioning Services and Cultural services

In terms of provisioning services, impacts include potentially restricting access for fishing and an impact to cultural services due to limited access to nearby aquifers and or river due to construction activities.

Significance of Impacts - Site Preparation and Construction

Evaluation of impacts to biodiversity and ecosystem services as a result of Site Preparation and Construction for the Project has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.53.***

Table 6.53: Assessment of Impacts on Biodiversity and Ecosystem Services from Site Preparation and Construction Activities

Significance of Impact					
Impact	Potential impacts to Biodiversity and Ecosystem Services due to Site Preparation and Construction				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts to Biodiversity and Ecosystem Services would be considered to be adverse.				
Impact Type	**Direct**	**Indirect**	**Induced**		
	Impacts to Biodiversity and Ecosystem Services would be direct, indirect and induced impacts with potential degradation of habitat and direct disturbance to species.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The potential impact to Biodiversity and Ecosystem Services from Site Preparation and Construction is considered to be short-term as the activity takes place over a short period of time (3-4 months for construction).				
Impact Extent	**Local**	Regional	International		
	Impacts would be limited to the Project Area and Area of Influence, hence would be considered to be local.				
Impact Scale	The impacts from Site Preparation and Construction is limited to the Project Area. Minimal disturbance and/or loss of habitat is expected, such that there is no loss of viability or function of the habitat. Slight change could be expected over a limited area, returning to background levels within a few metres or tens of metres. Temporary and localised physical changes/disturbance. Minor deviation from the normal range of baseline conditions would be expected. Potentially a reduction in the availability or functionality of the Ecosystem Services across a small area with implications for a small number of receptors. The change in the service is for a short duration or occurs with low frequency.				
Impact Frequency	The impacts will be continuous during Site preparation and Construction.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the combination of the above impact characteristics the impact magnitude is considered to be small.				
Receptor Sensitivity	Low	**Medium**	High		
	Biodiversity Receptors have some ability to tolerate impacts but a detectable change (e.g. a change in distribution) may occur. Receptors have some ability to avoid the most negative consequences of the impact or can partially adapt to it (e.g. by moving to other suitable				

Significance of Impact				
	areas). Receptors would be expected to recover to an acceptable status over the short term to medium term (e.g. 1-10 years). Some habitats in the Project Area are of importance to globally Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD) species, and species with nationally restricted ranges. Habitats may support nationally significant concentrations of migratory species and/or congregatory species, and habitats used by species of medium value. The season is not considered to be breeding and migration season for critically endangered species. *Ecosystem Services* There are areas of vulnerability; but they still retain ability to at least in part adapt to change brought by the Project. Overall receptor sensitivity is considered Medium.			
Impact Significance	Negligible	**Minor**	Moderate	Major
	The combination of a Medium Receptor Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.			

Mitigation and Management - Site Preparation and Construction

- Implement all relevant mitigation measures related to soil management and waste management;
- Minimize disturbance to river sediments when constructing/installing riverbank landings;
- Comply with Eni's relevant EHS Policies and Technical Guidelines, including but not limited to:
  - AMTE-TG-008_Illumination Assessment Mitigation Measures;
  - AMTE TG 012_Sustainable-Water-Management-for-Upstream-Sector;
  - AMTE-TG-013_BES;
- Work areas will be clearly demarcated and any activities outside these areas will be prohibited;
- Biosecurity during all phases of the Project will be ensured by washing all equipment to remove mud, seeds and other potential pathogens to ensure no invasive species or pathogens are introduced into the area (see IPIECA alien invasive species guidelines (IPIECA, 2010);
- Make sure that fill materials are obtained from approved or designated locations/areas;
- Raise awareness in the personnel and adequately train the drivers;
- Prohibit vehicles from moving offsite or off of designated transportation routes onto surrounding land;
- Induction training for site personnel will include a mandatory segment on biodiversity. In this induction details of key requirements will be provided such as:
  - Access points, access restrictions, and potentially no-go areas
  - Ban on foraging, fishing and hunting;
  - Protected plant and fauna species to be aware of;
  - Outline of vegetation clearance procedures including species not to cut, and the minimum size of tree that should be felled (20 cm diameter at breast height (dbh) following best practice guidance (Energy & Biodiversity Initiative, 2009);

- What to do in the advent of disturbing species (both from an occupational health and biodiversity perspective);
- Outline of vegetation clearing protocols (size of trees to be removed etc.);
- Waste management system;
- Ban on use of forest products; and
- Requirements for washing of equipment when accessing or exiting the site.

- Limit clearing of established vegetation (especially limited clearing of Htan or *Borassus flabellifer*), and other potential habitat areas to only the extent required for gathering fill material;
- Consider validation sampling of imported fill material (same parameters as baseline sampling to check for contamination);
- Clearly mark the extent of areas to be cleared;
- Restrict speed of vehicles to reduce risk of collision;
- Minimise clearing of natural vegetation leaving in place smaller vegetation, topsoil, root stock, seeds and endangered or protected species;
- Labour camps will be located within existing cleared areas without need for clearing of forest for the construction of labour camps;
- Limit clearance of natural vegetation and interference with natural drainage flows;
- Prohibit vehicles from moving offsite or of designated transportation routes onto surrounding land;
- Compact well pad to reduce the amount and rate of infiltration; and
- Design well pad to be above known flood levels.

Significance of Residual Impact - Site Preparation and Construction

Residual impacts would be expected to be of **Minor** significance.

6.3.7.4 Assessment of Impacts – Drilling Operations Phase

Impacts to Terrestrial Biodiversity

Noise, Vibration and Light Impact due to Drilling and Casing Operations

Drilling activities will cause impacts from noise and vibration, as well as light contamination, which may negatively influence the distribution and habits of endemic or endangered fauna, in particular avifauna, which may avoid feeding grounds and usage of certain corridors due to disturbance. Furthermore, noise and light associated with the Drilling Operations could potentially disturb local nocturnal species, and light contamination may attract insects and birds and disturb wildlife in general.

The Drilling Operations are scheduled to take place in dry season in between November/December–April and the demobilization in May/June, which is generally outside the breeding and mating season for endemic avifauna; their breeding season is typically during the wet season.

Accidental Mortality due to Transportation of Workers and Materials

The development of new access roads, as well as increased traffic on existing roads, presents a risk of accidental mortality or injury to fauna as a result of collision with moving vehicles. The likelihood of death or injury may be reduced to a degree as noise, light and presence of humans will in itself act as a deterrent for fauna entering such areas. Based on the assumption that the establishment of new roads will be restricted to established areas or other habitat areas of low biodiversity value and no new roads will be established within important habitat areas, the exposure of fauna to collision risk with Project vehicles is considered to be non-significant.

Contamination due to Wastes, Wastewater, and Hazardous Materials

Actions during the drilling phase can potentially result in accidental releases or spills of contaminated material, including but not limited to NAF drilling fluids or associated drilling wastes, which can be toxic to flora and fauna. The close proximity of potential well pad locations to the aquatic environment increases the likelihood that spilled contaminated material could enter the water environment via runoff. Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to physical receptors which, in turn may impact biological receptors and biodiversity. Furthermore, terrestrial animal may be attracted to food waste which may increase rodents (rats and mice) and ants. The drilling activities will take place mainly during dry season which reduce the potential impacts of contamination from wastes since limited run off and erosion is expected during this season.

Increase of Hunting and Poaching due to Labour Influx and Worker Accommodation

Labour influx and worker accommodation in work camps may lead to unauthorized hunting and harvesting of plants and animals by workers which could impact biodiversity. Work camps may also disturb sensitive fauna by light and noise disturbance. Hunting, poaching and wildlife trade are critical issues for the conservation of species; unsustainable hunting to obtain meat, animal parts or live individuals for the pet trade can cause population declines and local extinction. Eni will implement and adhere to a management plan which clearly prohibits hunting and poaching activities by local workforce; hence this potential impact is not considered to impact sensitive receptors.

Impacts to Terrestrial Ecosystem Services

Interruption of Provisioning Services

Ecosystem services include provisioning services such as use of water, which may be interrupted by the project activities. In addition, the project may cause negative impacts due to potentially restricting access for gathering wild food; or impacting regulating services due to increased erosion. Regulating services such as flood and storm control, or water flow regulation can be essential for maintaining the health and security of people in the event of extreme weather conditions, e.g. storms or droughts. Furthermore, ecosystem cultural services such as recreation, tourism, aesthetic and spiritual values can be extremely important in terms of providing personal satisfaction and livelihoods. The drilling area may cause disturbance (visual, auditory and physical) of wild habitats, iconic species and landscapes, in general.

Impacts to Aquatic Biodiversity

Contamination due to Wastes, Wastewater, and Hazardous Materials

Inappropriate management and disposal of hazardous or non-hazardous waste and wastewater could lead to impacts to surface water quality and subsequently impact aquatic receptors in eg nearby river and streams and eutrophication may potentially occur. Any contaminated runoff (i.e., oil from Drilling Operations) will pass through oil traps where oil will be captured before the runoff is drained into the trench. Water that enters this drainage trench is released into a dedicated pit. Moreover, Eni has appropriate waste management standards and procedures in place so significant impacts to aquatic fauna and flora are not expected.

Impacts to Aquatic Ecosystem Services

Provisioning Services and Cultural services

In terms of provisioning services, impacts include potentially restricting access to areas and an impact to cultural services due to limited access to nearby habitat. The drilling area may also cause disturbance (visual, auditory and physical) of wild habitats, iconic species and landscapes, in general. In addition, an influx of workers in the area could increase illegal fishing by workers, leading to impact to biodiversity and associated ecosystem services.

Significance of Impacts - Drilling Operations

Evaluation of impacts to biodiversity and ecosystem services as a result of Drilling Operations has been conducted in accordance with the methodology and terminology presented in ***Section 6.1.*** Results are presented in ***Table 6.54***.

Table 6.54: Assessment of Impacts to Biodiversity and Ecosystem Services from Drilling Operations

Significance of Impact					
Impact	■ Potential impacts to Biodiversity and Ecosystem Services due to Drilling Operations.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts to Biodiversity and Ecosystem Services would be considered to be adverse.				
Impact Type	**Direct**	**Indirect**	**Induced**		
	Impacts to Biodiversity and Ecosystem Services would be direct, indirect and induced impacts, with potential degradation of habitat and direct disturbance to species.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The potential impact to Biodiversity and Ecosystem Services from Drilling Operations is considered to be short-term as the activity takes place over a short period of time (80 days per well).				
Impact Extent	**Local**	Regional	International		
	Impacts would be limited to the Project Area and Area of Influence, hence would be considered to be local.				
Impact Scale	The impacts from drilling are limited to the Project Area. Minimal disturbance and/or loss of habitat is expected, such that there is no loss of viability or function of the habitat. Slight change could be expected over a limited area, returning to background levels within a few metres or tens of metres. Temporary and localised physical changes/disturbance. Minor deviation from the normal range of baseline conditions would be expected. Potentially a reduction in the availability or functionality of the Ecosystem Services across a small area with implications for a small number of receptors. The change in the service is for a short duration or occurs with low frequency.				
Impact Frequency	The impacts will be continuous during Drilling Operations.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the combination of the above impact characteristics the impact magnitude is considered to be small.				
Receptor Sensitivity	Low	**Medium**	High		
	Biodiversity Receptors have some ability to tolerate impacts but a detectable change (e.g. a change in distribution) may occur. Receptors have some ability to avoid the most negative consequences of the impact or can partially adapt to it (e.g. by moving to other suitable areas). Receptors would be expected to recover to an acceptable status over the short term to medium term (e.g. 1-10 years). Some habitats in the Project Area are of importance to globally Vulnerable (VU), Near Threatened (NT) or Data Deficient (DD) species, and species with nationally restricted ranges. Habitats may support nationally significant concentrations of migratory species and/or congregatory species, and habitats used by species of medium value.				

Significance of Impact				
	The season is not considered to be breeding and migration season for critically endangered species. *Ecosystem Services* There are areas of vulnerability; but they still retain ability to at least in part adapt to change brought by the Project. Overall receptor sensitivity is considered Medium.			
Impact Significance	Negligible	**Minor**	Moderate	Major
	The combination of a Medium Receptor Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.			

Mitigation and Management Measures - Drilling Operations

- Apply all mitigation measures from soil and waste management;
- Comply with Eni's relevant EHS Policies, including:
  - AMTE-TG-008_IlluminationAssessmentMitigationMeasures;
  - AMTE TG 012_Sustainable-Water-Management-for-Upstream-Sector;
  - AMTE-TG-013_BES;
- Work areas will be clearly demarcated and any activities outside these areas will be prohibited;
- Biosecurity during all phases of the Project will be ensured by washing all equipment to remove mud, seeds and other potential pathogens to ensure no invasive species or pathogens are introduced into the area (see IPIECA alien invasive species guidelines (IPIECA, 2010);
- Prohibit vehicles from moving offsite or off of designated transportation routes onto surrounding land.
- Prohibit workers from foraging, fishing and hunting and raise awareness through training for all the personnel at site.
- Limit interference with natural drainage flows;
- Prohibit vehicles from moving offsite or of designated transportation routes onto surrounding land;
- Implement an Erosion and Sediment Control Plan;
- Include in the contract requirement the clause of avoiding works during breeding seasons in areas for which IUCN listed species have been recorded;
- Implement directional lighting to reduce light spill to species;
- Limit mixing of drilling fluids on site – pre-mix wherever possible;
- Treat water used during Drilling Operations prior to any discharge off-site, or dispose to licensed waste management contractor (i.e. DOWA, as discussed in ***Section 4***). Where discharge is required, effluent shall be treated to meet water quality standards as per Myanmar NEQG;
- Store mud and cuttings in pits and ensure appropriate offsite treatment and disposal.
- Fully contain oil-based mud and recirculate where possible;
- Regularly monitor cuttings pits to detect any potential loss of containment;

- Drill cuttings and mud containing non-aqueous fluids (NAF) are to be fully contained and transported by authorized and permitted transport Service Company and permitted waste facility (i.e. DOWA, as discussed in ***Section 4***); and
- Drilling cuttings containing water-based mud (WBM) will be treated and managed appropriately.

Significance of Residual Impact - Drilling Operations

Residual impacts would be expected to be of **Minor** significance.

6.4 Social and Health Impact Assessment

Settlements located closest to the Project infrastructure are likely to experience negative and positive impacts as a result of the Project activities, including economic opportunities, social and environmental changes, lifestyle changes, and changes to community health and safety. Other social receptors located further from the Project may also benefit or experience negative impacts from the Project.

The predicted impacts to the social environment as a result of the proposed Project are described in this section. The presence of economical, industrial, touristic and religious activities within the Study Area have all been considered as part of the assessment of impacts. In this section, interviewees refer to the local stakeholders that have been engaged with during the social baseline data collection (as described in the Social Baseline Chapter of this report) for this Project in early 2019.

This section also develops management and mitigation measures needed to ensure that any identified impact can be avoided, reduced, mitigated to as low as reasonably practical or compensated for. Such measures are presented and will form part of the overall Environmental and Social Management Plan (***ESMP, Section 8***) for the Project.

All the Evaluation of social impacts during the site preparation and construction and drilling operation for the Project shown below, has been conducted in accordance with the methodology and terminology presented in ***Section 6.1*****.**

6.4.1 Land Use and Livelihood (including Economic Displacement)

6.4.1.1 Source of Impact

As determined during scoping, potential impacts to Land/River Use and Livelihood may occur due to the following project activities:

Site Preparation and Construction:

- Land Acquisition;
- Land Preparation and Earthworks Activities;
- Sourcing of Fill Material;
- Transportation of Workers, Materials, Waste;
- Solid Waste Management; and
- Wastewater Management.

Drilling Operations:

- Solid Waste Management; and
- Wastewater Management.

6.4.1.2 Summary of Relevant Baseline Conditions

About 74% of the population in Magway Township engage in agricultural activities and 45% of the interviewees earn income from it (meaning they sell part of their production). The average annual income per household from agriculture activities is 1,790,696 Kyats. The average land holding size is about 2.2 acres (0.89 ha). In addition 31% of the total population have livestock.

Fishery is not significant in the Township with only 1% of the interviewees in Magway practicing fishing in the Irrawaddy River.

More than half of the interviewees are operating a business within the villages (56%), mostly shops/ markets and restaurant, with an average annual income per household of 13,435,909 Kyats.

In Minhla Township and Minbu Township about 58% and 42.4% respectively were working as skilled agriculture, forestry and fishery workers.

With regards to current condition of transportation infrastructure, most roads around the villages are unpaved (i.e. laterite) which will lead to dust emissions from vehicle using these, and impacting the livelihood of local farmers (dust deposit on plant reduce their photosynthesis capacities and therefore the yield).

6.4.1.3 Assessment of Impacts - Site Preparation and Construction Phase

Land Acquisition

Although Eni has prioritized the use of existing roads and tracks in the area, some of those will need to be expanded or upgraded, in addition a new 250 m long road will also be constructed.

During the site preparation and construction, about 21.5 acres (8.7 ha) of agricultural land will be acquired for the construction of the well pads and logistic base. The construction of the well pads will take around 4 months. The land will be permanently acquired for well sites and road, while only rented temporarily for the logistic base.

The location of the new road, upgrades on minor roads, well pads, and the logistic base are presented in ***Section 4: Project Description***.

Land Preparation and Earthworks Activities

The land preparation and earthworks activities will generate dust emissions which can reduce productivity of the impacted plant and therefore have effect on the livelihood of the farmers using these fields (reduction of yield).

Eni's standard operating procedures require the contractor to sprinkle water daily on all non-sealed surfaces to subdue the amount of dust and to restrict speed of traffic on portions of the road that have not yet been sealed.

Sourcing of Fill Material

All construction materials are available in Magway Township and will be sourced by the contractor in Magway. The selected borrow pit is within 9.6 km (6 miles) of the wells site and has been approved by the government.

Transportation of Workers, Materials, Waste

Drilling material and equipment as well as workers will be transported to the logistic base and drilling site by road. Vehicles to be used during site preparation and construction include dump trucks (Land filling material), flatbed trailer trucks (tubular material, chemicals and other consumables), trucks such as vacuum trucks and tanker (collecting waste from drilling activities) and minibuses or vans for transportation of workers. Since most roads are unpaved, the use of heavy vehicles will cause dust emissions onto nearby agricultural land potentially reducing yield and impacting livelihood of farmers.

Solid Waste Management

During construction, mostly domestic waste and minimal construction wastes will be produced; these will be handled by the local municipality. Particularly, domestic waste (including food waste) will be sent to municipal waste landfill in Magway. Contaminated absorbent material (oily debris, rags, and spill pads), spent batteries (dry and lead acid), and construction and demolition debris will be sent to DOWA. Any hazardous waste generated will be appropriately handled (i.e. stored until collection or direct transport to an adequate and approved facility).

Wastewater Management

Pit latrines will be installed for the construction workers on temporary onsite work camps.

Significance of Impact - Land Acquisition

Evaluation of impacts to land use and livelihood due to land acquisition has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.55***.

Table 6.55: Assessment of Impacts on Land/River Use and Livelihood from Land Acquisition

Significance of Impact					
Impact	Potential impacts to Land Use and Livelihood due to land acquisition				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts from land acquisition will be Negative (adverse).				
Impact Type	**Direct**	Indirect	Induced		
	Potential impacts from land acquisition will be direct.				
Impact Duration	Temporary	**Short-term**	Long-term	**Permanent**	
	The land take for logistic base will be short term, only during the Project duration. However, land acquired for roads and well pads are permanently acquired by MOGE.				
Impact Extent	**Local**	Regional	International		
	Impacts will be limited to the direct Project area, therefore considered as local.				
Impact Scale	The total area to be impacted by the construction of the project is about 22 acres (8.9 ha).				
Impact Frequency	The impacts will be experienced continuously from Site preparation and Construction to the end of the project and after for the well pad areas.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is small since the project only cover a limited area of agricultural land and procedure are already in place to compensate land owners for the loss of land during construction, but some land will be permanently impacted.				
Receptor Sensitivity	Low	Medium	**High**		
	Land acquisition will cause economic displacement to some household in Magway where most people mainly rely on agriculture. The limited amount of land available for economical resettlement and educational level will also prevent an easy mitigation on impact to livelihood.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a High Receptor Sensitivity and Small Impact Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures - Land Acquisition

The following mitigation and management measures should be implemented to reduce potential impacts of Land Acquisition due to Site preparation and Construction:

- Undertake Land acquisition in accordance with the Myanmar law (Refer to ***Section 3***);
- Land take and vegetation clearance will be minimised to the extent possible in terms of both size and duration; and as such, when no further activities are planned, land should be returned to land owner restoring it at its original status as much as possible;
- Compensate stakeholders whose land is temporarily or permanently impacted during construction and operation using market price with a premium to compensate for the change and allow for restoration of the land to its original state for the logistic base area;
- Prioritize impacted stakeholders in the recruitment process for unskilled positions. In particular, prioritize those whose land is permanently impacted. Training for these unskilled position should also be proposed to allow people with the lack of education/training to be engaged.
- Engage a third party to develop resettlement action plans and livelihood restoration plans for those whose land is permanently impacted by the Project;
- Compensate stakeholders whose crops is being impacted during site preparation and construction using market price identify by government led committee (including village heads). Compensation should be paid until land has been restored to its initial productive state;
- Develop and implement a Stakeholder Engagement Plan that include measures to notify local stakeholders in advance of any particularly activities on land/river use. This will ensure that stakeholders can anticipate and appropriately respond to the change and limitation in their livelihood; and
- Develop and implement a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities are affected by the Project activities.

Significance of Residual Impact - Land Acquisition

The significance of the residual impact is expected to be Minor. It is recommended that during construction and drilling, Eni should monitor the employment of stakeholders whose land has been temporarily or permanently impacted by Project activities. Eni should engage monthly with these stakeholders after the start of construction to ensure their livelihood has not been significantly impacted negatively by the Project.

For those whose land is permanently impacted by the Project (at the well pad locations), a monitoring of the livelihood restoration plan will have to be implemented over a minimum of 3 years after Project start date.

Significance of Impact - Dust Generation

Evaluation of impacts to land use and livelihood due to dust generation has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.56***.

Table 6.56: Assessment of Impacts on Land use and Livelihood from Dust Generating Activities during Site Preparation and Construction

Significance of Impact					
Impact	Potential impacts to land use and livelihood due to dust generating activities				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts from dust generating activities will be negative				
Impact Type	Direct	**Indirect**	Induced		
	Potential impacts from dust generating activities will be indirect.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The potential impact of dust generation activities is considered to be short-term.				
Impact Extent	**Local**	Regional	International		
	Impacts will be limited to the AoI along the road and near the Project sites, therefore considered as local.				
Impact Scale	All nearby areas of the construction site and transportation routes will be impacted but the exact scale will depend on other meteorological factors. It is expected that the scale will remain small as the activity will take place during the rainy season.				
Impact Frequency	The impacts will be intermittent during site preparation and construction, linked to transport and land preparation activities.				
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large
	As management measures already exist (e.g. watering of the roads), the impact will be short-term and the scale of the impact is expected to be small, the resulting magnitude of the impact is likely to be negligible.				
Receptor Sensitivity	Low	**Medium**	High		
	The impact from a decrease in yield will be medium on receptor as agriculture is the main livelihood in the area, but the reduction in productivity is not expected to be important and limited in scale.				
Impact Significance	**Negligible**	Minor	Moderate	Major	
	The combination of a Medium Receptor Sensitivity and Negligible Impact Magnitude will result in an overall Negligible Impact.				

Mitigation and Management Measures - Dust Generation

Although the impact is expected to be Negligible, it is recommended that the following mitigation and management measures are implemented to reduce potential impacts due to Site preparation and Construction:

- Implement all mitigation measure from ***Section 6.3.1: Air Quality*** to reduce dust generation impact from construction and transportation activities;
- Develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities are affected by the Project activities.

Significance of Impact - Waste and Wastewater Management

All the activities that will produce waste and pollution are described in the surface water, soil and ground water and unplanned event sections. These sections also include impacts and management methods. The impacts from waste and wastewater management activities are expected to have either negligible negative impact on agricultural activities, provided they are adequately managed as per the mitigation

measures in the above mentioned sections of this EIA, or positive impact on employment with the use of local contractor or public services for the collect and management of construction wastes.

Mitigation and Management Measures - Waste and Wastewater Management

- All the mitigation measures in the surface water, soil and groundwater and unplanned event sections should be applied. In addition the project should develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities/livelihood are affected by the Project activities.

6.4.1.4 Assessment of Impacts – Drilling Operation Phase

Solid Waste Management

Solid wastes from the Project will be classified, segregated, and disposed of according to various solid waste categories. Based on previous similar production operations, approximately one (1) kg/person/day of solid waste is generated. Therefore, the highest quantity of waste produced will be approximately 140 kg/day.

Eni will utilize the services of Golden DOWA Eco-System Myanmar (DOWA); hazardous and non-hazardous waste management company in Yangon as a licensed waste management contractor to manage the solid wastes throughout the Project.

Wastewater Management

All waste treatment and management facilities will be located on the well pad (including septic tanks for the small accommodation camp).

The well pad itself will be built specifically to collect and dispose the storm water that could be polluted by the drilling operations to a waste tank (70- 80 m^3). Water runoff from the project well sites will be handled through drainage systems. Any contaminated runoff (i.e., oil from drilling operations) will pass through oil and sediment traps before discharge.

During drilling operation, a sewage treatment system will be installed to treat any effluent before discharged.

Eni will also utilize DOWA service to manage wastewater during the drilling operation.

Significance of Impacts - Drilling Operations

All the impacts from waste and wastewater management during drilling and mitigation measures are described in the surface water impact assessment section. The impacts from waste and wastewater management activities during drilling are expected to have either negligible negative impact on agricultural activities or positive impact on employment with the use of the licensed local contractor services for the collect and management of construction wastes.

Mitigation and Management Measures - Drilling Operations

- Apply all mitigation measures described in the ***Section 6.3.4: Surface Water*** ; and
- Develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities are affected by the Project activities.
- Ensure local licensed facilities for waste management have sufficient excess capacity to be able to handle and manage (both treatment and disposal) the waste produced by the project

6.4.2 Public Infrastructure and Utilities

6.4.2.1 Source of Impact

As determined during scoping, potential impacts to Public Infrastructure and Utilities may occur due to the following project activities:

Site Preparation and Construction:

- Land Preparation and Earthworks Activities;
- Transportation of Workers, Materials, Waste;
- Water Use;
- Solid Waste Management;
- Wastewater Management; and
- Labour influx and worker Accommodation.

Drilling Operations:

- Rig Mobilization to Site;
- Transportation of workers, Material, Waste;
- Water Use;
- Solid Waste Management;
- Wastewater Management; and
- Labour Influx and Worker Accommodation.

6.4.2.2 Summary of Relevant Baseline Conditions

Although there is about 100 hospitals and health centres in the Magway region, the public infrastructure are considered insufficient for most villagers especially health facilities. Although there are health centers and some station hospital within their villages, only few pharmacy and hospital are available. The villagers need to travel to Magway town in the case they need serious medical treatment.

Travelling to the nearest market takes between 0.5 and 2 hours by motorcycle. About 83% of the interviewees in Magway Township do not have paved road to their home and most of the available roads are unsealed.

Most households in Magway Township do not have access to tap water. Instead, tube well is the main source for domestic use, and river (Irrawaddy) and spring (Yin creek) are the sources for drinking water. Most of the interviewees agree that these sources are sufficient to their usage and of fair quality. Other alternative sources for drinking water included hand-dug well, artesian well, and rain water. In Minhla, most households get their drinking water from protected well and spring, and non-drinking water from river, stream, and canal. In Minbu, most of the households get their drinking water and non-drinking water from tube well and borehole.

According to the interviewees, there are no specific waste treatment/ management facilities in the villages. Villagers mostly dispose waste by throwing away in the water bodies and land or burn the wastes.

6.4.2.3 Assessment of Impacts - Site Preparation and Construction Phase

Land Preparation and Earthworks Activities

Well site construction will last about 4 months. The use of heavy machines and vehicles will cause vibration which might affect local infrastructure such as roads. The equipment to be used are

Excavators, Dozer, Grader, Loader, Single drum roller and trucks. In particular, during the construction two (2) Trucks, one (1) Excavators, and one (1) Grader/Dozer will be used.

Transportation of Workers, Materials, Waste

Drilling material and equipment will be transported to the logistic base in Magway region through the roads. The used vehicles for transportation are dump trucks (Land filling material), flatbed trailer trucks (tubular material, chemicals and other consumables), and trucks such as vacuum trucks and tanker (collecting waste from drilling activities). These heavy vehicle can cause damage to the existing roads. Some roads wil be upgraded for this purpose.

The transportation will be scheduled during daylight and at times to avoid the rush hours as much as possible. Eni will inform the appropriate authorities (Regional and Townships) at least two week prior the activity and set up the warning and notification signs informing local stakeholders of the activity taking place. Eni will take full responsibility and restore any damage to roads or infrastructure caused by the project vehicles. Upgrading and provision of maintenance of existing roads framework will benefit the community, thus, increasing Community Health and Safety. However, this may also cause an increment in traffic which pose a risk to Community Health and Safety.

Water Use

Water wells will be drilled in operational area separate from the local water source. Consumption during base construction is estimate to be around 2-3 m^3 per day.

Solid Waste Management

During construction, only domestic waste and minimal building waste will be produced, which will be handled by the local municipality.

Wastewater Management

Pit latrines will be installed for the construction workers on temporary work camps. Domestic waste will be handle according to the accommodation and local regulations.

Labour Influx and Worker Accommodation

During 4 months of site preparation and construction, about 100 workers at most will be recruited. Workers accommodation will consist of rented houses in nearby villages, local hotels, and temporary onsite work camps. The onsite accommodation will be located at least 300 m away from the drilling rig area with proper utilities, amenities and vector prevention structure.

Significance of Impacts - Site Preparation and Construction

Evaluation of impacts to public infrastructure and utilities due to site preparation and construction has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.57***.

Table 6.57: Assessment of Impacts on Public Infrastructure and Utilities during Site Preparation and Construction Activities

Significance of Impact			
Impact	Potential impacts to public infrastructure and utilities during the Site preparation and Construction due to land preparation, earthwork, transport and labour influx.		
Impact Nature	**Negative**	**Positive**	Neutral
	Impacts to public infrastructure and utilities will be Negative (adverse) however upgrading of existing roads is positive .		
Impact Type	**Direct**	Indirect	Induced
	Impacts to public infrastructure and utilities will be direct.		

Significance of Impact				
Impact Duration	Temporary	**Short-term**	**Long-term**	Permanent
	The potential impact to public infrastructure and utilities is short-term as the impact will be experienced only during construction, however the upgrading of existing roads and routes is long term.			
Impact Extent	**Local**	Regional	International	
	Impacts will be limited to the Project area and AoI, therefore considered as local.			
Impact Scale	The impacts from Site preparation and Construction on public infrastructures and utilities is limited to the project areas, worker accommodations and transportation routes.			
Impact Frequency	The impacts will be continuous during Site preparation and Construction (about 4 months), and as long as the rroad refurbishments lasts.			
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude will be small due to limited number of new workers in the area, limited distance to be covered by construction vehicle, frequency of the transport of heavy machinery and existing management practices. Any potential damage to roads will be subject to restoration			
Receptor Sensitivity	Low	Medium	**High**	
	The receptor sensitivity is high as stakeholders living near the project area have little or no alternative to travel and public infrastructures, services and utilities are limited and considered insufficient.			
Impact Significance	Negligible	Minor	**Moderate**	Major
	The combination of a High Receptor Sensitivity and Small Impact Magnitude will result in an overall Moderate Impact.			

Mitigation and Management Measures - Site Preparation and Construction

The following mitigation and management measures will be implemented in addition to Eni existing management practices to reduce potential impacts due to Site preparation and Construction:

- Ensure that company medical services have sufficient capacity and capability to treat a reasonable amount of workers at the same time;
- Provide trained personal in first aid permanently at well site e.g. supervisor
- Liaise and coordinate with the nearest hospitals to transport patients in case of injury or accident.
- Provide ambulance at well site/area of operations to send patients to hospital in case of emergency
- Prioritize the recruitment of unskilled position from Project SAoI to reduce number of transferring workers;
- Develop and implement a Traffic Management Plan to minimize the impact experienced by road users as a result of the Project. The Traffic Management Plan should be developed in consultation with local stakeholders. Stakeholders should be notified in advance (see next measure) of the Project commencing, of traffic routes that will be utilized and, where known, periods of increased traffic volumes. Where possible, traffic movements will be coordinated so as to limit disruptions to local activities in accordance to the Company Traffic Management Plan;
- Develop and implement a Stakeholder Engagement Plan as part of the Project. The plan should include measures to notify local stakeholders in advance of any particularly activities on public infrastructures. This will ensure that stakeholders can anticipate and appropriately respond to the change and limitation of uses; and

- The Project should also develop a Grievance Mechanism to collect grievances from local stakeholders whose regular use of public infrastructures and utilities is affected by the Project activities.

Significance of Residual Impact - Site Preparation and Construction

Residual impacts would be expected to be of **Minor** significance. Reparation of roads damaged by Project activities should be done in a timely manner to reduce the duration of impact for local users of the roads. Grievance log should be reviewed weekly to ensure there is no increase of impacts to local infrastructure and utilities, in particular regarding the water availability in villages close to Project activities.

6.4.2.4 Assessment of Impact - Drilling Operation Phase

Rig Mobilization to Site

The use of heavy vehicles during rig mobilization will cause vibration which might affect local infrastructure such as roads and bridges.

Transportation of Workers, Material, Waste

The Flatbed trailer trucks will travel between the logistic base to well pad and back every day for material transportation. Trucks (vacuum trucks and tankers) will also be used to collect waste from the drilling activities. Rig transportation and base camp setting will require about 170 trucks, for 1 month. The average truck frequency during this process is about 6 truck per day. Within 170 trucks, 20 will handle a very heavy loads (30 - 41 tons) and 90 will handle heavy loads (10 - 30 tons). This will increase the road traffic and potential road damages.

Personnel movements to and from location (crew changes, etc.) throughout the day will also require multiple trips by minibuses or vans.

Water Use

Consumption during drilling operation will be around 4,000 m^3 per day. The water will be extracted from the water wells drilled during construction phase with a potential risk to impact water availability for local stakeholders if the groundwater tables used by the Project are the same as the ones used by local villages.

Solid Waste Management

Solid wastes from the Project will be classified, segregated, and disposed of according to various solid waste categories. Based on previous similar production operations, approximately one (1) kg/person/day of solid waste is expected to be generated during the drilling phase. Therefore, the highest quantity of waste produced will be approximately 140 kg/day.

Eni will utilize the services of Golden DOWA Eco-System Myanmar (DOWA); hazardous and non-hazardous waste management company in Yangon as a licensed waste management contractor to manage solid waste throughout the Project.

Wastewater Management

Wastewater treatment and management facilities such as septic tanks and sewage system will be located on the well pad.

The well pad itself will be built specifically to collect and dispose the storm water that could be polluted by the drilling operations to a waste tank (70- 80 m^3). Water runoff from the project well sites will be handled through drainage systems. Any contaminated runoff (i.e., oil from drilling operations) will pass through oil and sediment traps before discharge.

During drilling operation, a sewage treatment system will be installed to treat any effluent before discharged.

Labour Influx and Worker Accommodation

The drilling operation will last around 3 months (24hr/day) with about 140 workers at the well site and the logistic base. The maximum number of workers at the single well site at one time is 100 workers. In addition, worker accommodation will be located in the logistic base with proper utilities, amenities and vector prevention structure.

Significance of Impact - Drilling Operations

Evaluation of impacts to public infrastructure and utilities due to drilling operations has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.58.***

Table 6.58: Assessment of Impacts on Public Infrastructure and Utilities during Drilling Operations

Significance of Impact					
Impact	Potential impacts to public infrastructure and utilities due to Drilling Operations				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts to public infrastructure and utilities will be Negative (adverse).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to public infrastructure and utilities will be direct.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The potential impact to public infrastructure and utilities during drilling, lasting only 3 month, is short-term.				
Impact Extent	**Local**	Regional	International		
	Impacts will be limited to the Project area and AoI, therefore considered as local.				
Impact Scale	The impacts from Drilling Operation is limited to the project area and local infrastructures used directly by the Project.				
Impact Frequency	The impacts will be experienced six (6) times per day for one (1) month during the rig mobilization, twice daily for transport of workers and potentially continuously for the impact from water use.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude will be small as the impacts will be short term, with a limited frequency and number of transport necessary. Wastes will be handled by experienced third party in dedicated facilities and utilities and amenities will be provided on site for the workers.				
Receptor Sensitivity	Low	Medium	**High**		
	The receptor sensitivity is high as stakeholders living near the project area have little or no alternative to travel and public infrastructures, services and utilities are limited and considered insufficient.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a High Receptor Sensitivity and Small Impact Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures - Drilling Operations

The following mitigation and management measures will be implemented to reduce potential impacts due to drilling operation:

- Ensure that company medical services have sufficient capacity and capability to treat a reasonable amount of workers at the same time;
- Prioritize the recruitment of unskilled position from Project SAoI to reduce number of transferring workers. Workers recruited during construction phase should be retained in the work force when possible.
- Develop and implement a traffic management plan to minimize the impact experienced by road users as a result of the Project. The traffic management plan should be developed in consultation with local stakeholders. Stakeholders should be notified in advance of the Project commencing of traffic routes that will be utilised and, where known, periods of increased traffic volumes. Where possible, traffic movements will be coordinated so as to limit disruptions to local activities;
- Regularly check the condition of the roads on planned routes and repair when necessary.
- Continue to implement the Stakeholder Engagement Plan and Grievance Mechanism developed for the construction phase as part of the Project.
- Ensure water well have the adequate capacity to supply water to the project without any lack of the availability to the community or worsening of the water quality; perform a monitoring of the wells and other water sources to verify it.

Significance of Residual Impact - Drilling Operations

Residual impacts would be expected to be of **Minor** significance. Reparation of roads damaged by Project activities should be done in a timely manner to reduce the duration of impact for local users of the roads. Grievance log should be reviewed weekly to ensure there is no increase of impacts to local infrastructure and utilities, in particular regarding the water availability in villages close to Project activities.

Significance of Impact - Construction of Access Roads

Evaluation of impacts to public infrastructure and utilities due to construction of access roads has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.59***.

Table 6.59: Assessment of Impacts on Public Infrastructure and Utilities from New Constructed Road during Drilling

Significance of Impact			
Impact	Potential impacts on Public Infrastructure and Utilities due to new constructed road.		
Impact Nature	Negative	**Positive**	Neutral
	Potential impacts will be positive.		
Impact Type	**Direct**	Indirect	Induced
	Potential impacts would likely be direct impacts.		

Mitigation and Management Measures - Construction of Access Roads

The following management measures will be implemented to maximize local benefits from the new road:

- Set up proper traffic signs and equipment to ensure traffic safety on the new road; and

- Enforce speed limits in the project area
- Cooperate with the local authority to determine the local speed limited on the new road.

6.4.3 Visual Landscape

6.4.3.1 Source of Impact

As determined during scoping, potential impacts to Land/River Use and Livelihood may occur due to the following project activities:

Site Preparation and Construction:

- Land Preparation and Earthworks Activities.

Drilling Operations:

- Drilling and Casing Activities.

6.4.3.2 Summary of Relevant Baseline Conditions

Most of the visual landscape in Magway region are dry, open landscape, with sparse and stunted vegetation, and limited forested and hilled areas. The elevation is fairly consistent, although some hilly terrain exists. In terms of man-made structures, the only significant visual components across the Project Study Area are pagodas (1.04 km South of SEG#3_Dev drilling site), monastery (300 m North-east from SEG#3_Dev drilling site), and cemetery (255 m North-east from SEG#3_Dev drilling site).

Villages located nearest to the Project site which will be impacted by the presence of rig are: Aung Myay Gone, Pay Pin San, Ohn Twe, Awzar Gone, Mi Kyaung Ye, Yin Gway Chaung, Su Kauk San, Shar Pin Hla, Saik Kya, Sit Kobin and Ge Gyi Gone Village. According to the Village Leader Survey, Yin Gway Chaung, Ohn Twe, and Mi Kyaung Ye have experience with other projects or engaged with other corporation before. It is possible that some of the villages might have experience with visual of heavy machines and vehicles.

6.4.3.3 Assessment of Impacts - Site Preparation and Construction Phase

Land preparation and earthworks activities will alter the physical landscape both underground and on topsoil from installation of structures, earthwork and cementing activities. Additionally, the transportation and movement of vehicles will also impact the physical presence around the project areas.

Varity of machines and vehicles that are unfamiliar to the local will be use during the construction; Dozer, Grader, Loader, and Single drum roller. In particular, during the base construction two (2) Trucks, one (1) Excavators, and one (1) Grader/Dozer will be used.

Significance of Impact - Site Preparation and Construction

Evaluation of impacts to visual landscape due to site preparation and construction has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.60***.

Table 6.60: Assessment of Impacts on Visual Landscape Condition during Site Preparation and Construction Activities

Significance of Impact			
Impact	Potential impacts to visual envelope and landscape due to the changed landforms during site preparation, as well as presence of numerous construction and transportation vehicles.		
Impact Nature	**Negative**	Positive	Neutral

Significance of Impact				
	Impacts to visual and landscape condition will be Negative (adverse)			
Impact Type	**Direct**	Indirect	Induced	
	Impacts visual and landscape condition will be direct impacts with potential degradation of the scenic value.			
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	The potential impact to visual and landscape is considered to be short-term (4 months).			
Impact Extent	**Local**	Regional	International	
	Impacts will be limited to the Project area and AoI, therefore considered as local.			
Impact Scale	The impacts is limited to the Project area with small associated transportation routes and number of vehicles.			
Impact Frequency	The impacts will occur intermittently but repeatedly throughout Site Preparation and Construction phase.			
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Based on the impact characteristics above, the impact magnitude is considered to be small with limited number of vehicles, transportation route, and impact frequency.			
Receptor Sensitivity	**Low**	Medium	High	
	The receptor sensitivity is Low as scenic value of the area is not significant, and activities during construction will primarily take place during the daytime (where community sensitivity to light impacts is not a factor).			
Impact Significance	**Negligible**	Minor	Moderate	Major
	The combination of a Low Receptor Sensitivity and Small Impact Magnitude will result in an overall Negligible Impact.			

Mitigation and Management Measures - Site Preparation and Construction

Although most of the impacts are largely unavoidable, the following mitigation and management measures will be implemented to reduce potential impacts due to Site Preparation and Construction on the visual environment:

- Limit the removal of trees and other natural features in the project areas to the strict minimum necessary evaluating the particular species to be removed and their protection status;
- Develop and implement a Stakeholder Engagement Plan as part of the Project. The plan should include measures to notify local stakeholders in advance of any particularly activities that would impact visual landscape. This will ensure that stakeholders can anticipate and appropriately respond to the change; and
- Develop a Grievance Mechanism to collect grievances from local stakeholder regarding visual impact.

Significance of Residual Impact - Site Preparation and Construction

Residual impacts would be expected to be of **Negligible** significance.

6.4.3.4 Assessment of Impact - Drilling Operation Phase

During drilling activities, the drilling rig will require lighting for safety and night time operation. This will cause impact to the surrounding social receptors. Additionally, the physical presence of the drilling rig (height of 45 m) will impact the communities and villagers scenic angle living in the nearby area.

Significance of Impact - Drilling Operations

Evaluation of impacts to visual landscape due to drilling operations has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.61***.

Table 6.61: Assessment of Impacts on Visual Landscape during Drilling Operations

Significance of Impact					
Impact	Potential impacts to visual envelope and landscape due to the presence of the rig and lighting at night time.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts to visual and landscape condition will be Negative (adverse).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to visual and landscape condition will have direct impacts by creating nuisance to the surrounding villages as well as degrading the scenic-value.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The potential impact to visual and landscape condition is short-term (3 months).				
Impact Extent	**Local**	Regional	International		
	Impacts will be limited to the drilling sites, therefore considered as local.				
Impact Scale	The impacts is limited to the Project area.				
Impact Frequency	The impacts will be continuous during Drilling Operations while the light disturbance intensified during night time operation.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Based on the above impact characteristics, the impact magnitude is considered to be medium.				
Receptor Sensitivity	Low	**Medium**	High		
	The receptor sensitivity is medium as the area is mostly in the dark at night and no local visual features are comparable height to the rig.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a Medium Receptor Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures - Drilling Operations

The following mitigation and management measures will be implemented to reduce potential impacts due to Drilling Operation:

- Illuminate the area as necessary, keeping the intensity as low as possible and direct/focus lighting on well pad areas only.

Significance of Residual Impact - Drilling Operations

Residual impacts would be expected to remain of **Moderate** significance.

6.4.4 Cultural Heritage

6.4.4.1 Source of Impact

As determined during scoping, potential impacts to Cultural Heritage may occur due to the following project activities:

Site Preparation and Construction:

- Land Preparation and Earthworks Activities.

Drilling Operations:

- Rig Mobilization to Site; and
- Drilling and Casing Activities.

6.4.4.2 Summary of Relevant Baseline Conditions

About four (4) cultural landmarks were observed in the Study Area. The Minhla Fortress is located 16 km to the southwest from the SEG#6K. There is also a small pagoda in Tha Yet Lay Pin village located about 1.04 km to the South of the SEG#3_Dev drilling site. A small cemetery and old monastery (about 100 years old) were also identified about 255 and 300 meters respectively to the northeast of the SEG#3_Dev drilling site. It is to be noted that according to the Building law, minimum distance from the cultural heritage site is 120 feet (40 meters). None of the cultural heritage sites mentioned above are within this distance from the Project sites.

6.4.4.3 Assessment of Impact - Site Preparation and Construction Phase

The use of heavy machines and vehicles during site preparation and construction can cause vibration that might affect the cultural heritage sites. The following equipment are to be used during that phase; Dozer, Grader, Loader, Single drum roller. In particular, during the base construction two (2) Trucks, one (1) Excavators, and one (1) Grader/Dozer will be used. In addition, the Project traffic could interfere with cultural or religious activities taking place at the cemetery and monastery located near SEG#3_Dev drilling site.

Significance of Impact - Site Preparation and Construction

Evaluation of impacts to cultural heritage due to site preparation and construction has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.62***.

Table 6.62: Assessment of Impacts on Cultural Heritage from Site Preparation and Construction Activities

Significance of Impact				
Impact	Potential impacts to cultural heritage sites due to Site preparation and Construction			
Impact Nature	**Negative**	Positive	Neutral	
	Impacts to cultural heritage will be Negative (adverse).			
Impact Type	**Direct**	Indirect	Induced	
	Impacts to cultural heritage will be direct			
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	The potential impact to cultural heritage will be experienced over a short-term period.			

Significance of Impact					
Impact Extent	**Local**	Regional	International		
	Impacts will be limited to the Project area and AoI, therefore considered as local.				
Impact Scale	The impacts from Site preparation and Construction is limited to the project area				
Impact Frequency	The impacts will be experienced continuously during Site preparation and Construction.				
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large
	The impact Magnitude is Negligible as it will be short term and at a small scale and the closest cultural heritage site, the cemetery, is 255 m away from SEG#3_Dev drilling site.				
Receptor Sensitivity	Low	**Medium**	High		
	The receptor sensitivity is Medium as the monastery located near Seg#3_Dev drilling site, although about 255 and 300 m at nearest, is more than 100 years old, considered in poor conditions and no similar cultural heritage site exists within the direct area around the Project site.				
Impact Significance	**Negligible**	Minor	Moderate	Major	
	The combination of a Medium Receptor Sensitivity and Negligible Impact Magnitude will result in an overall Negligible Impact.				

Mitigation and Management Measures - Site Preparation and Construction

Although the impact is negligible, all the measures described in the Impacts from Environmental Emissions (noise, dust, vibration) section will be implemented. In addition:

- The contractor during construction will monitor weekly the condition of any cultural heritage closest to the project site. If damage is done to the structure by project activities, compensation should be organised to restore the building to its state before the damage occur.
- The contractor will develop the construction planning in discussion with the nearest temple/monastery in order to make sure that any Project activity near the monastery (e.g transport of large equipment) do not take place during special religious activities.
- Develop and implement a Stakeholder Engagement Plan as part of the Project. The Project will also include a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities
- A procedure for chance finds should be issued and training done to workers
- Construction equipment to use designated roads and Project area only, avoid traveling off roads and enforce speed limit.

6.4.4.4 Assessment of Impact - Drilling Operation Phase

Rig transportation, drilling and casing activities will cause vibration which similarly to construction phase might affect nearby local cultural heritage sites.

Significance of Impact - Drilling Operations

Evaluation of impacts to cultural heritage due to drilling operations has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.63***.

Table 6.63: Assessment of Impacts on Cultural Heritage from Drilling Operations

Significance of Impact					
Impact	Potential impacts to cultural heritage due to Drilling Operations				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts to cultural heritage will be Negative (adverse).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to cultural heritage will be direct				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The potential impact to cultural heritage from Drilling Operations is considered to be short-term as the activity takes place over a short period of time.				
Impact Extent	**Local**	Regional	International		
	Impacts will be limited to the Project area and AoI, therefore considered as local.				
Impact Scale	The impacts is limited to the project area				
Impact Frequency	The impacts will be continuous during Drilling Operations.				
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large
	The impact Magnitude is Negligible as the vibration from the drilling activities is not expected to be of a sufficient intensity when reaching the nearby cultural heritage site.				
Receptor Sensitivity	Low	**Medium**	High		
	The receptor sensitivity is Medium as the monastery located near Seg#3_Dev drilling site is more than 100 years old, considered in poor conditions and no similar cultural heritage site exist within the direct area around the Project site.				
Impact Significance	**Negligible**	Minor	Moderate	Major	
	The combination of Medium Receptor Sensitivity and Negligible Impact Magnitude will result in an overall Negligible Impact.				

Mitigation and Management Measures - Drilling Operations

Although the impact is negligible, all the measures described in the Impacts from Environmental Emissions (noise, dust, vibration) section will be implemented for impact by environmental emissions. In addition:

- The Project staff will monitor weekly the condition of any cultural heritage closest to the project site. If damage is done to the structure of the site by project activities, compensation should be organised to restore the building to its condition before the damage occur.
- Develop the operation planning in discussion with the nearest temple/monastery in order to make sure that any Project activity (in particular the rig mobilization) near the monastery (e.g transport of large equipment) do not take place during special religious activities.
- Eni will develop and implement a Stakeholder Engagement Plan as part of the Project. The Project will also include a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities

6.4.5 Socio-Economy

6.4.5.1 Source of Impact

As determined during scoping, potential impacts to Socio-Economy may occur due to the following project activities:

Site Preparation and Construction:

- Land Preparation and Earthworks Activities;
- Sourcing of Fill Material;
- Transportation of Workers, Materials, Waste; and
- Labour influx and worker Accommodation.

Drilling Operations:

- Labour Influx and Worker Accommodation.

6.4.5.2 Summary of Relevant Baseline Conditions

At the Township level, 74% of the people engage in agricultural activities. As per the results of interviews described in the baseline chapter of this report and reflecting more precisely the conditions in the Project Social Area of Influence, the most common occupation is farming (21.2%), day labour (18.3%), often in the agriculture sector and business owner (16.5%). Unemployment reach 18.9% amongst the interviewees. The interviewees are expecting better job opportunities that suit their skills and education. A small number of the interviewees also have an electrician certificate (3%), teacher license (3%), computer certificate (3%), driver license (2%), nurse license (1%), and accountant certificate (1%).

In addition, the most common business in Magway Township is shops/markets and restaurant.

6.4.5.3 Assessment of Impacts - Site Preparation and Construction Phase

During the four months of site preparation and construction, the Project will require a maximum of 100 construction workers to work on roadwork, logistics base, well pads, etc. It is expected that this will include unskilled, semi-skilled and skilled workers and that some of these could be filled by local stakeholders.

All construction materials will also be sourced by the local contractor in Magway, providing a wide range of business and employment opportunities. This is referred to as indirect employment.

Significance of Impact - Site Preparation and Construction

Evaluation of impacts to socio-economy due to site preparation and construction has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.64***.

Table 6.64: Assessment of Impacts on Socio-Economy from Site Preparation and Construction Activities

Significance of Impact			
Impact	Potential impacts on socio-economy due to site preparation and construction		
Impact Nature	Negative	**Positive**	Neutral
	Potential impacts on socio- economy will be positive		
Impact Type	**Direct**	**Indirect**	Induced
	Potential impacts would likely be direct and indirect impacts.		

Mitigation and Management Measures - Site Preparation and Construction

The following mitigation and management measures will be implemented to maximize local benefits from Site preparation and Construction:

- The workforce will be sourced from areas close to the Project after a training and selection process; and thereafter at a regional or national level. Given that levels of educational achievement and formal employment experience in relevant sectors is low within the SAoI, it is assumed that the majority of the available local labour may be unskilled or at most semi-skilled.
- Ensure a fair hiring process.
- Procurement of goods using local businesses whenever possible.
- Use local sources of fill material that are obtained from approved or designated locations/areas.

6.4.5.4 Assessment of Impact - Drilling Operation Phase

During 3 months (24hr/day) of drilling operation, the Project will require up to 140 workers at the well sites and logistic base. The workers will work in 12 hour shifts, and the maximum number of workers at a single well site at any one time is 100 workers.

The project will require goods and services throughout the operation which might provide opportunities for the expansion and establishment of local businesses.

Significance of Impact - Drilling Operations

Evaluation of impacts to socio-economy due to drilling operations has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.65***.

Table 6.65: Assessment of Impacts on Socio-Economy from Drilling Operations

Significance of Impact			
Impact	Potential impacts on socio-economy due to drilling operation		
Impact Nature	Negative	**Positive**	Neutral
	Potential impacts on socio-economy will be positive		
Impact Type	**Direct**	**Indirect**	Induced
	Potential impacts would likely be direct and indirect impacts.		

Mitigation and Management Measures - Drilling Operations

The following mitigation and management measures will be implemented to maximise local benefits from drilling operation:

- N/A – positive measure

6.4.6 Demographics (including Physical Displacement)

6.4.6.1 Source of Impact

As determined during scoping, potential impacts to Demographics may occur due to the following project activities:

Site Preparation and Construction:

- Land Acquisition;

- Labour influx and worker Accommodation.

Drilling Operations:

- Labour Influx and Worker Accommodation

6.4.6.2 Summary of Relevant Baseline Conditions

In Magway Township, there were 289,247 people with a population density of about 164 persons per km^2.

In Minhla Township, there were 146,082 people, population density being of about 61.6 people per km^2.

In Minbu Township, there were 188,182 people in the township with a population density of 113 persons per km^2.

Related to the potential risk of physical displacement (resulting from destruction of houses located within the Project areas), no ongoing construction activities of other major infrastructure are located within any of the Project areas (well pad, logistic base, roads). Therefore no physical resettlement related to the destruction of houses is expected.

6.4.6.3 Assessment of Impacts - Site Preparation and Construction Phase

Land Acquisition

The acquisition of land for the Project accounts for a total of 22 acres (8.9 ha). Since none of the land to be acquired include any building or construction, the land acquisition process for the Project is not expected to have any impact on demographics.

Labour Influx and worker Accommodation

During four months of site preparation and construction, a maximum of 60 workers will be employed on the Project. Some of these workers are expected to be from the Project Social Area of Influence (SAoI). This afflux of workers could impact local demographics.

Workers accommodation will consist of rented houses in nearby villages, local hotels, and temporary onsite work camps. The onsite accommodation will be no less than 300 m away from the drilling rig area with proper utilities and amenities.

Significance of Impact - Site Preparation and Construction

Evaluation of impacts to demographics due to site preparation and construction has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.66***.

Table 6.66: Assessment of Impacts on Demographics from Site Preparation and Construction Activities

Significance of Impact			
Impact	Potential impacts to demographics due to influx of workers during Site preparation and Construction activities		
Impact Nature	**Negative**	Positive	Neutral
	Impacts to demographics would be considered to be Negative (adverse).		
Impact Type	**Direct**	Indirect	Induced
	Impacts to demographics would be direct.		

Significance of Impact				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	The potential impact to demographics from Site preparation and Construction is considered to be short-term as the activity takes place over a short period of time.			
Impact Extent	**Local**	Regional	International	
	Impacts will be limited to the Project area and SAoI, therefore considered as local.			
Impact Scale	The impacts from Site preparation and Construction is limited to the villages closest to the construction sites and logistic base.			
Impact Frequency	The impacts will be continuous during Site preparation and Construction.			
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large
	The impact Magnitude is Negligible as the number workers necessary for the construction phase is small and it is expected that some will be from the Project SAoI.			
Receptor Sensitivity	**Low**	Medium	High	
	The receptor sensitivities is Low as the size of nearby villages and their population are large in number when compared with number of new workers.			
Impact Significance	**Negligible**	Minor	Moderate	Major
	The combination of a Low Receptor Sensitivity and Negligible Impact Magnitude will result in an overall Negligible Impact.			

Mitigation and Management Measures - Site Preparation and Construction

No specific mitigation measures are necessary for this negligible impact.

6.4.6.4 Assessment of Impacts - Drilling Operation Phase

During 3 months of drilling activity, a maximum of 140 workers will be employed on the Project. Some of these workers are expected to be from the Project SAoI. This afflux of workers could impact local demographics.

In addition, the main workers accommodation will be located at the logistic base and the onsite accommodation will be no less than 300 m away from the drilling rig area with proper utilities.

Significance of Impact - Drilling Operations

Evaluation of impacts to demographics due to drilling operations has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.67.***

Table 6.67: Assessment of Impacts on Demographics from Drilling Operations

Significance of Impact			
Impact	Potential impacts to demographics due to increasing of workers during Drilling Operations		
Impact Nature	**Negative**	Positive	Neutral
	Impacts to demographics would be considered to be Negative (adverse).		
Impact Type	**Direct**	Indirect	Induced
	Impacts to demographics would be direct.		

Significance of Impact				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent
	The potential impact to Demographics from Drilling Operations is considered to be short-term as the activity takes place over a short period of time.			
Impact Extent	**Local**	Regional	International	
	Impacts will be limited to the Project area and SAoI, therefore considered as local.			
Impact Scale	The impacts from Drilling is limited to the project SAoI.			
Impact Frequency	The impacts will be continuous during Drilling Operations.			
Impact Magnitude	Positive	**Negligible**	Small	Medium	Large
	The impact magnitude is Negligible as the number of workers is limited, some will come from the Project SAoI and the expats will be accommodated at the logistic base.			
Receptor Sensitivity	**Low**	Medium	High	
	The receptor sensitivities is low as the size of SAoI is large when compare with number of workers. In addition, workers are likely to stay in the project sites and logistic base with little interaction with the locals.			
Impact Significance	**Negligible**	Minor	Moderate	Major
	The combination of a Low Receptor Sensitivity and Negligible Impact Magnitude will result in an overall Negligible Impact.			

Mitigation and Management Measures - Drilling Operations

No specific mitigation measures are necessary for this negligible impact.

6.4.7 Community Health and Safety

6.4.7.1 Source of Impact

As determined during scoping, potential impacts to Community Health and Safety may occur due to the following project activities:

Site Preparation and Construction:

- Land Preparation and Earthworks Activities;
- Sourcing of Fill Material;
- Transportation of Workers, Materials, Waste;
- Water Use;
- Energy Use and Power Supply;
- Solid Waste Management;
- Wastewater Management;
- Hazardous Materials Storage and Handling;
- Labour influx and worker Accommodation.

Drilling Operations:

- Rig Mobilization to Site;
- Drilling and Casing Activities;

- Transportation of workers, Material, Waste;
- Water Use;
- Energy Use and Power Supply;
- Solid Waste Management;
- Wastewater Management;
- Hazardous Materials Storage and Handling;
- Labour Influx and Worker Accommodation.

6.4.7.2 Summary of Relevant Baseline Conditions

In Magway region, the most common diseases are high blood pressure, common fever, heart disease, diabetes, and gout. There are health centres within walking distances available in most villages but these are considered inadequate and insufficient by the local population. In case of serious medical issue or emergency, the villagers will have to travel to Magway hospital which is about 19 km away from the project sites.

The common mode of transportation in Magway, Minhla and Minbu are motorcycle, bicycle and bullock-cart. Magway interviewees mainly use motorcycle but also travel by foot. Traffic is very light on the roads in the Project SAoI.

6.4.7.3 Assessment of Impacts - Site Preparation and Construction Phase

During the four months of site preparation and construction, about 60 workers will be recruited. Workers accommodations will consist of rented houses in nearby villages, local hotels, and temporary onsite work camps. The onsite accommodations will be no less than 300 m away from the drilling rig area with proper utilities, amenities and vector prevention.

The presence of Eni workforce will result in interactions between the workforce and local people. As it is unlikely that the entire workforce will come from the Project SAoI, workers from outside of the local area will also be present. These workers may be subject to communicable diseases and STDs.

In the event of an outbreak of an airborne (e.g., TB) or food-borne illness among the workers, the area where local workers live, and any settlement visited by Project workforce may also become susceptible to these infectious diseases.

An increase in the transmission of communicable diseases may occur as the result of the introduction of workers into the area and creation of vector habitat (worker camps).

In terms of communicable diseases, given the country and region statistic, Tuberculosis, Malaria, HIV and AIDs should be considered. Receptors that are located closest to the Project site are likely to be most affected by an increase in vector habitat. If left untreated, communicable diseases can lead to long-term health issues and/ or in some instances death. In other words, the impact can be characterized as being long-term and in some instances permanent.

Eni will utilize the services of Golden DOWA Eco-System Myanmar (DOWA); hazardous and non-hazardous waste management company in Yangon to manage all produced wastes throughout the Project. In addition, all waste will be transported by government authorized Contractors.

The handling, transport and treatment of the Project waste by the contractors during construction may also result in risks to public health due to contamination of water resources and spread of disease carrying species such as rats.

The construction activities and sourcing of fill material will create environmental emissions which may impact on community health and safety, in particular disruption of sleep (noise), impact to structure integrity (vibration) or aggravation of respiratory illness (dust).

The risk of injuries will also increase during construction activities of the Project sites (including construction of logistic base and well pads, transportation of equipment, material, workers, and waste) associated with the presence of mechanical equipment, excavation areas, and movement of equipment and people by road. Possible increased of vehicle traffic from vehicle operated by Eni and their contractors increases the risk of accidents and injuries (up to and including deaths).

Unplanned event (including leak of non-hazardous and hazardous waste from vehicles or storage) will affect local people who are living close to the drilling sites or living along the roads.

Significance of Impact - Site Preparation and Construction

Evaluation of impacts to community health and safety due to site preparation and construction has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.68***.

Table 6.68: Assessment of Impacts on Community Health and Safety during Site Preparation and Construction Activities

Significance of Impact					
Impact	Potential impacts to community health and safety due to Site preparation and Construction				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts to community health and safety will be Negative (adverse).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to community health and safety will be direct.				
Impact Duration	Temporary	Short-term	**Long-term**	**Permanent**	
	The potential impact to community health and safety from Site preparation and Construction could be long lasting, even permanent, if left untreated or resulting in death.				
Impact Extent	**Local**	Regional	International		
	Impacts will be limited to the Project area and AoI, therefore considered as local.				
Impact Scale	The impact scale is small due to the limited number of potentially impacted people.				
Impact Frequency	The impacts could occur at a rare frequency during Site preparation and Construction.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	The impact Magnitude is Medium as the potential changes for the local population can have long term adverse consequences but with a rare frequency, at a small scale and the limited number of additional workers. The Project also already have in place vector management measures.				
Receptor Sensitivity	Low	**Medium**	High		
	The Receptor Sensitivity is Medium with low awareness on transmittable disease and possible low number of new workers. The Receptor Sensitivity is Medium as most population in SAoI have low awareness on transmittable diseases and on construction activities and traffic risks. Medical facility in the area are also considered insufficient in number.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a Medium Receptor Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures - Site Preparation and Construction

The following mitigation and management measures will be implemented to reduce potential impacts due to Site preparation and Construction on Community Health and Safety:

- Implement all the mitigation measures from Air and Noise impact sections;
- Training for all workers on the transmission routes and common symptoms of communicable diseases. This can help reduce the potential for workers to unknowingly transmit communicable diseases. This may also help to increase knowledge within Project SAoI – e.g. through the training of workers that have been sourced from the local area;
- Establish a workforce code of conduct, which include the specific measures that target anti-social behaviour, such as becoming involved with commercial sex workers. Any employee or Contractor found in violation of the Code shall face disciplinary measures;
- Ensure proper and adequate health care infrastructure within project sites workers accommodation;
- Provision of onsite health care and medical facilities, to ensure that basic medical attention and first aid treatment can be sought during the hours that the work is being undertaken at the Project site. This will also help reduce the potential pressure on local health care facilities;
- Undertake pre-employment screening to ensure fitness for work. It is important that the pre-screening process does not result in discrimination, but instead is used as a tool to minimize the transmission of communicable diseases;
- Ensure there is access to free condoms (including female condoms) at the worker camp to promote safe sexual practices;
- Conduct information, education and communication campaigns amongst Project personnel on hygiene and sanitation.
- The Project should develop a Traffic Management Plan covering vehicle safety, speed limits on roads, driver and passenger behaviour, use of drugs and alcohol, hours of operation, rest periods and location of rest stops and accident reporting and investigations;
- Require Project drivers to be trained in defensive driving within the previous 3 years;
- All vehicles used for the project should be regularly serviced and maintained;
- Local speed limits should be adhered to when travelling through communities by all Project related traffic. Such speed limits will have the added advantage of reducing dust emissions;
- Undertake consultation with communities along key transport routes to inform them about the potential for increased traffic movements prior to any changes;
- Ensure that signs are put up around construction sites advising people of the risks associated with trespass. All signs should be in pictogram form to ensure those with low levels of literacy to understand the signs;
- Ensure that there is adequate fencing around construction site to minimise the risk of trespass. Fencing will be checked daily to ensure that it is in good condition and to look for any signs of entry;
- Develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities.
- A complementary occupational health and safety plan should be developed – to focus on managing potential issues that may affect the Project workforce. The plan should include measures to minimize the potential for the workforce to contract a communicable disease and subsequently introduce the disease in their home village/ community.
- Plan heavy traffic activities with local stakeholders to avoid peak hours, start or end of school hours or specific local activities (such as religious festival).

- Implement appropriate education on infectious and sexually transmitted diseases.
- Survey and remove mosquito-breeding sources at camp site weekly or as appropriate (i.e. fog)

Significance of Residual Impact - Site Preparation and Construction

Residual impacts would be expected to be of **Minor** significance due to the potential for long term or permanent impact in case of accident. Therefore, on-going monitoring and evaluation of the management measures and community health situation will be needed. If monitoring indicates an increase in the transmission of communicable diseases, the management measures will need to be revised. This includes monitoring the Project's direct activities as well as Project contractors.

6.4.7.4 Assessment of Impacts - Drilling Operation Phase

During operational phase of the Project, approximately 140 staff will be working at the well pads and logistic base. Worker accommodation will be located in the logistic base with proper utilities and vector control. The expatriate workforce will be mainly constituted of skilled employees who are expected to have good understanding of health and safety risks, in particular in relation to communicable diseases

Fences will be set up with minimum height of 2.5 m surrounding the operation area and around possible external pits along with adequate illumination lights. The pit will be surrounded by a fence not less than 1.5 m high to prevent people and animals accidentally falling to the basins.

The Flatbed trailer trucks will travel between the logistic base to well pad and back every day during drilling activities which will increase the road traffic and risk of injuries.

Personnel movements to and from location (crew changes, etc.) throughout the day will require multiple trips by minibuses or vans.

Significance of Impact - Drilling Operations

Evaluation of impacts to community health and safety due to drilling operations has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.69***.

Table 6.69: Assessment of Impacts on Community Health and Safety during Drilling Operations

Significance of Impact					
Impact	Potential impacts to community health and safety due to Drilling Operations				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts to community health and safety will be Negative (adverse).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts to community health and safety will be direct				
Impact Duration	Temporary	Short-term	**Long-term**	**Permanent**	
	The impact could be long lasting, even permanent, if left untreated or resulting in death.				
Impact Extent	**Local**	Regional	International		
	Impacts will be limited to the Project area and AoI, therefore considered as local.				
Impact Scale	The impact scale is small due to the limited number of people potentially impacted.				
Impact Frequency	The impacts could occur at a rare frequency during Site preparation and Construction.				
	Positive	Negligible	Small	**Medium**	Large

Impact Magnitude	The impact Magnitude is Medium as the potential changes for the local population can have long term adverse consequences but with a rare frequency, at a small scale and the limited number of additional workers. The Project also already have in place vector management measures.			
Receptor Sensitivity	**Low**	Medium	High	
	The receptor sensitivities is Low as workers are likely to stay within the project sites and logistic base with little interaction with the locals. Moreover, most workers should have good understanding about disease and injuries management from training during construction phase as well as some local population.			
Impact Significance	Negligible	**Minor**	Moderate	Major
	The combination of a Low Receptor Sensitivity and Medium Impact Magnitude will result in an overall Minor Impact.			

Mitigation and Management Measures - Drilling Operations

The following mitigation and management measures will be implemented to reduce potential risk due to drilling operation:

- Implement all the mitigation presented in the air quality, noise and surface water assessment sections.
- Training for all workers on the transmission routes and common symptoms of communicable diseases. This can help reduce the potential for workers to unknowingly transmit communicable diseases. This may also help to increase knowledge within Project SAoI – e.g. through the training of workers that have been sourced from the local area;
- Undertake pre-employment screening to ensure fitness for work. It is important that the pre-screening process does not result in discrimination, but instead is used as a tool to minimize the transmission of communicable diseases and provides information on the “baseline” status of each worker to be able to assess each effect to health that might come from the job performed;
- Develop and implement a Workforce Code of Conduct with specific measures that target anti-social behaviour, such as becoming involved with commercial sex workers. Any employee or Contractor found in violation of the Code shall face disciplinary measures.
- Keep the Stakeholder Engagement Plan and the Grievance Mechanism updated to collect grievances from local stakeholder affected by the Project activities
- Ensure that signs are put up around the site advising people of the risks associated with trespass. All signs should be in diagram form to ensure those with low levels of literacy understand the signs.
- Fencing will be checked daily to ensure that it is in good condition and to look for any signs of entry.

Significance of Residual Impact

Residual impacts would be expected to be of **Negligible** significance.

6.4.8 Occupational Health, Safety and Working Conditions

6.4.8.1 Source of Impact

As determined during scoping, potential impacts to occupational health, safety and working conditions may occur due to the following project activities:

Site Preparation and Construction:

- Land Preparation and Earthworks Activities;
- Sourcing of Fill Material;

- Transportation of Workers, Materials, Waste;
- Water Use;
- Energy Use and Power Supply;
- Solid Waste Management;
- Wastewater Management;
- Hazardous Materials Storage and Handling; and
- Labour influx and worker Accommodation.

Drilling Operations:

- Rig Mobilization to Site;
- Drilling and Casing Activities;
- Transportation of workers, Material, Waste;
- Energy Use and Power Supply;
- Solid Waste Management;
- Wastewater Management;
- Hazardous Materials Storage and Handling;
- Labour Influx and Worker Accommodation.

6.4.8.2 Summary of Relevant Baseline Conditions

Health and safety standards in the construction sector are relatively low in Myanmar. National occupational safety and health legislation is very limited with the main laws to consider for the Project being the Prevention and Control of Communicable Diseases (Law No. 1/95), Law Amending the Factories Act 1951 (Pyidaungsu Hluttaw Law No. 12/2016) and Prevention From Danger of Chemical and Associated Materials Law, 2013 (28/2013). Myanmar has ratified 23 out of 189 ILO conventions. Experience of industrial health and safety standards is limited in the Project SAoI.

6.4.8.3 Assessment of Impacts - Site Preparation and Construction Phase

During site preparation and construction phase, there will be about 60 workers at most on site. As much as possible the company will try to source workforce from Project. Given that levels of educational achievement and formal employment experience in relevant sectors is low within the SAoI, it is assumed that the majority of the available local labour may be unskilled or at most semi-skilled.

Workers accommodation will consist of rented houses in nearby villages, local hotels, and temporary onsite work camps. The onsite accommodation will be equip with proper utilities and amenities.

The nature of the activities mean that there is the potential for accidents and injuries to occur if occupational health and safety systems are not developed and strictly enforced for all Project personnel.

The potential impacts on the workers (unskilled, semi-skilled and skilled) of the Project are likely to result from the civil construction activities, truck movement, heat stress and hot surface, electrocution, chemical exposure, falling objects, working at height or in confined spaces and any unplanned event that may occur during the construction phase of the Project. These impacts are likely to increase in proportion to the increase in activity.

The risk of injuries will also increase during construction activities of the well site (including construction of logistic base, transportation of equipment, material, workers, and waste) associated with the presence of mechanical equipment, excavation areas, and movement of equipment and people by road. Possible increased of vehicle traffic from vehicle operated by Eni and their contractors increases the risk of accidents and injuries (up to and including deaths).

In the case of limited health facilities and unavailability of Magway airport a medical evacuation helicopter might be establish.

Unplanned event (including the leak of non-hazardous and hazardous waste from vehicles or storage) will also affect the Project workers who are proximate to the drilling site.

Significance of Impact - Site Preparation and Construction

Evaluation of impacts to occupational health and safety due to site preparation and construction has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.70***.

Table 6.70: Assessment of Impacts on Occupational Health, Safety and Working Conditions during Site Preparation and Construction Activities

Significance of Impact					
Impact	Potential impacts to occupational health, safety and working conditions due to Site preparation and Construction				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts to occupational health, safety and working conditions will be Negative (adverse).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts on occupational health, safety and working conditions will be direct				
Impact Duration	Temporary	Short-term	**Long-term**	**Permanent**	
	Impact has the potential to have a long lasting effect with injured workers being unable to work for a long time or even permanent in case of accident crippling or killing workers.				
Impact Extent	**Local**	Regional	International		
	Impacts would be considered to be local.				
Impact Scale	The impacts from Site preparation and Construction is limited to the workers engaged during that phase, i.e 60.				
Impact Frequency	The impact likely occurs during site preparation and construction with a rare frequency.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	The impact magnitude is potentially medium with long term and potentially permanent impact but with a rare frequency and small scale.				
Receptor Sensitivity	Low	**Medium**	High		
	The vulnerability of receptor is likely to be medium with presence in the workforce of unskilled staff with low education level, no experience of similar employment, limited safety culture and limited awareness of H&S risks and best practice.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a Medium Receptor Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures - Site Preparation and Construction

The following mitigation and management measures will be implemented to reduce potential risk due to site preparation and construction:

- The Project will develop and implement a Construction Occupational Health and Safety Management Plan (OHSMP) in line with good industry practice and corporate policies and specific to the Project AoI and Project activities;
- The Contractor will prepare and implement a Health, Safety and Environmental Plan prior to commencing work (and to be approved by Company) that includes method statements for work activities, construction sequence and safety requirements and arrangements to carry out the activities;
- Measures will be implemented to reduce the likelihood and consequence of the potential hazards. This shall include (but not limited to) the following hazards:
  - falling from height;
  - entanglement with machinery;
  - tripping over permanent obstacles or temporary obstructions;
  - slipping on greasy walkways;
  - falling objects;
  - asphyxiation;
  - explosion;
  - contact with dangerous substances;
  - electric shock;
  - variable weather conditions;
  - lifting excessive weights; and
  - traffic operations.
- A Permit to Enter system will be established to ensure that only authorised persons gain entry to the construction site;
- Permit To Work (PTW) will be released to workers for each specific job to be performed and based on a risk assessment;
- All persons working on the construction site will be provided information about risks on Site and arrangements will be made for workers to discuss health and safety with the Contractor;
- All workers will be properly informed, consulted and trained on health and safety issues;
- Personal Protective Equipment (PPE) shall be worn at all times on the construction Site. This shall include as appropriate safety shoes, safety eyewear, hard hats as minimum and other equipment (e.g. masks, gloves, goggles, mufflers and coverall) as necessary for the specific job. Non-slip or studded boots will be worn to minimize the risk of slips;
- Before starting work all the appropriate safety equipment and the first-aid kits will be assembled and checked as being in working order. Breathing apparatus if necessary will be tested at regular intervals in the manner specified by the manufacturer;
- All lifting equipment, gear and cranes as well as the operators of such equipment and machinery will be certified by a competent third party. The equipment will be regularly tested and inspected. All hoist ways will be guarded;
- All scaffolding will be erected and inspected in conformity with the Factories Act (1951) or more stringent international practices and the appropriate records maintained by the Contractor;
- Required Personal Protective Equipment and gear (e.g. safety harness) will be provided for the specific job, considering the inherent risk. Where sound levels cannot be reduced at the source, suitable hearing protection will be provided when noise levels indicate aLeq of more than 85 dB(A).

When hearing protection is used, arrangements will be made to ensure the wearers can be warned of other hazards. Zones where the Leq might exceed prescribed limits, must be signaled;

- The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations;
- The contractor will comply with the IFC Performance Standard 2, local regulation and ILO conventions signed by Myanmar;
- Monitor deviation to the internal standard guiding labour practices and applying to the supply chain to ensure that no child and/or forced labour will be employed by the EPC contractor and its sub-contractors;
- An Occupational, Health, and Safety (OHS) monitoring programme should be put in place to verify the effectiveness of prevention and control strategies and a workers grievance mechanism developed and implemented;

Significance of Residual Impact - Site Preparation and Construction

Residual impacts would be expected to be of **Minor** significance due to the impossibility to completely reduce the accident risk to zero and the potential negative effects on workers.

6.4.8.4 Assessment of Impacts - Drilling Operation Phase

During the drilling operation (3 months), approximately 140 staff will be working at the well site and the logistic base. The maximum number of workers at the single well site at one time is 100 workers. In addition, worker accommodation will be located in the logistic base with proper utilities and vector management. These staff are expected to have a better understanding of health and Safety risks associated with the operation due to training and experienced gained during construction.

Project activities likely to present a risk during operation are linked with light vehicle travel at site, use of heavy equipment during drilling operations, and work at height. Heat stress and hot surface, electrocution and chemical exposure also present a risks for workers during the operation phase of the Project. Unplanned event like fire and explosion also present a risk for workers during operation but are covered under the unplanned event section of this report.

Significance of Impact due - Drilling Operations

Evaluation of impacts to community health and safety due to drilling operations has been conducted in accordance with the methodology and terminology presented in ***Section 6.1***. Results are presented in ***Table 6.71***.

Table 6.71: Assessment of Impacts on Occupational Health, Safety and Working Conditions from Drilling Operations

Significance of Impact				
Impact	Potential impacts to occupational health, safety and working conditions due to Drilling Operations			
Impact Nature	**Negative**	Positive	Neutral	
	Impacts to occupational health, safety and working conditions will be Negative (adverse).			
Impact Type	**Direct**	Indirect	Induced	
	Impacts occupational health, safety and working conditions will be direct.			
Impact Duration	Temporary	Short-term	**Long-term**	**Permanent**
	Impact has the potential to have a long lasting effect with injured workers being unable to work for a long time or even permanent in case of accident crippling or killing workers.			

Impact Extent	**Local**	Regional	International	
	The impact is limited to the Project sites and villages from which workers may be coming from, therefore is expected to be local.			
Impact Scale	The impact is limited to the workers at the sites, i.e 140.			
Impact Frequency	The impact likely occurs during the drilling operation with a rare frequency.			
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	The Impact Magnitude is potentially medium with long term impact but with a rare frequency and small scale.			
Receptor Sensitivity	**Low**	Medium	High	
	The Receptor Sensitivity is low due to training during construction phase.			
Impact Significance	Negligible	**Minor**	Moderate	Major
	The combination of a Low Receptor Sensitivity and Medium Impact Magnitude will result in an overall Minor Impact.			

Mitigation and Management Measures - Drilling Operations

The following mitigation and management measures will be implemented to reduce potential impacts due to drilling operation:

- Keep implementing the mitigation measures from the construction phase.
- The Occupational Health and Safety Management Plan (OHSMP) will be updated to integrate the new potential risks of the drilling operation and be linked to the Emergency Response Plan for unplanned event.
- Maintain the grievance mechanism for workers.

Significance of Residual Impact - Drilling Operations

Residual impacts would be expected to be of **Minor** significance due to the impossibility to reduce the accident risk to zero and the potential negative effects on workers.

6.5 Assessments of Impacts due to Unplanned Events

An unplanned event is defined as an incident that is not planned to occur as part of the Project (e.g., accidents), but that can potentially to occur. Since such events are not planned, they are evaluated in a different manner from planned events, specifically by evaluating the consequence of a realistic scenario for an unplanned event and taking into consideration the likelihood that the event will occur.

Oil and gas exploration activities come with the potential for adverse consequences on both environmental and human receptors in the event of non-routine or accidental events. Even with the application of the latest industry standards and consideration of the highest measures of safety, accidental events may still occur due to human error, equipment failure, natural disasters or other unforeseen circumstances. The primary unplanned events that could adversely affect the physical, biological and human environment are:

- Vehicle accidents;
- Accidental fuel and chemical spills and leaks during transfer, handling, and storage;
- Wellhead blowout;
- Fire & explosion (other than wellhead blowout); and
- Natural disasters e.g. earthquake or flooding events.

6.5.1.1 Assessment of Impacts – Vehicle Accidents

Source of Impact

Potential impacts due to accidents during transportation may occur during the multiple project phases: Site Preparation and Construction, drilling or during well testing and demobilization.

Assessment of Impact

Myanmar has the second highest death toll of road accidents in Southeast Asia, according to the WHO (World Health Organization). A total of 4,887 reported road fatalities were reported in 2016. It should be noted that traffic accidents are under-reported in Myanmar, hence the WHO estimated the caused fatalities to be as high as 10,540, in 2016.

For deaths by road user category, the WHO has estimated the following:

- 1% of total accidents were caused by buses;
- 3% by heavy trucks;
- 3% and 7% by 4-wheeled cars and light vehicles, drivers and passengers, respectively;
- 3% by cyclists;
- 14% pedestrians; and
- The remaining 65% of motorized 2 and 3 wheelers (3% belong to others category).

According to UNESCAP (2016), in 2015 in Myanmar there were 5,385,175 registered vehicles, and 15,676 reported accidents (30 accidents per 10,000 vehicles), with fatality index of 8.21 fatal accidents per 10,000 vehicles[1]. For a one month period, this would average to 2.5 accidents per 10,000 vehicles per month, and 0.684 fatal accidents per 10,000 vehicles per month.

The most traffic-intensive operations of the project will be the mobilization of the drilling rig and preparation of logistics base. The drilling rig will be transported by road from Thayet, a distance ranging from 220 - 280 km by road to the three proposed well pad locations. The total truck trips required to mobilize the rig, and to transport the rig between well locations, is approximately120. This is equivalent

[1] https://www.unescap.org/sites/default/files/11.%20Road%20Safety%20Situation%20in%20Myanmar.pdf

to cumulative round trip distance of 67,200 km for initial rig mobilization. Approximately 50 vehicles will be also required for preparation and operations during the logistics base construction and operation and during drilling activities. The total duration for rig mobilization and logistics base preparation is approximately one month.

During the drilling phase, there will be continued requirements for transportation of workers and equipment from logistics base to the well pads. However in comparison to rig mobilization, the transportation volume and road distance travelled will be much less.

Ideally an analysis of the likelihood of traffic accidents and fatalities throughout the course of the Project would compare with statistics of accidents-per-vehicle-km driven. However, this data is not currently available in Myanmar, and therefore comparisons can only be made against the number of fatal accidents per vehicle (traveling by road). Assuming a total of 170 vehicles traveling during rig mobilization and logistics base preparation over the course of one month, and average accident ratios of 2.5 accidents per 10,000 vehicles per month (total) and 0.684 accidents per 10,000 vehicles per month (fatal), the total number of accidents involving Project vehicles expected over the rig mobilization period would be 0.0425 per one month, with number of fatal accidents 0.0116 per one month.

Therefore, the likelihood of a fatal traffic-related accidents occurring at least once is in 86 similar onshore drilling exploration projects, based on the above statistics, 1 fatal traffic-related accidents could be expected to occur (assuming no mitigation or control measures are implemented). This is based on national statistical data only, and does not take into account local or regional variations, or the Project's safety standards. The actual occurrence of traffic-related accidents and fatalities is expected to be much lower. The likelihood of this unplanned event is therefore rated as unlikely. The consequence is however significant as it could potentially result in injury or death, in addition to causing damage to vehicles, loss of inventory, fuel and chemical spills.

Eni will implement a number of measures to reduce the risk of traffic accidents, and to mitigate the severity of any accidents that do occur. A complete list of measures is provided below, including providing adequate training, implementing traffic management plans and journey management plans, and implementing safe driving policies. Additionally, in case of any accidents, Eni has an Emergency Response Plan, which sets out the management procedures to be put in place by the contractor to mitigate the potential impacts due to transportation accidents.

Significance of Impact

Table 6.72: Assessment of Potential Impacts due to Vehicle Accidents/ Collisions

Significance of Impact				
Impact	Transportation accidents associated with the Project may occur during transportation of equipment and personnel.			
Impact Nature	**Negative**	Positive	Neutral	
	Impacts are considered to be adverse (negative).			
Impact Type	**Direct**	Indirect	Induced	
	Impacts from transportation accidents would be direct impacts from Project activities.			
Impact Duration	Temporary	Short-term	**Long-term**	**Permanent**
	In the event of a transportation accident, the duration of the immediate impact would be brief, but in the event of injury or death the duration would be long-term or permanent.			
Impact Extent	**Local**	Regional	International	
	Impacts would likely be restricted to the local area.			

Significance of Impact					
Impact Scale	If a transportation accident does occur, the accident may result in injury and in a worst-case scenario, death, and medium scale and short-term potential impact on the environment. A major transport accident, although extremely unlikely, could result in multiple fatalities.				
Impact Frequency	The frequency over the course of the Project is most likely to be zero occurrences. Transportation accidents would be a non-repeating, unplanned, event-related impact.				
Impact Likelihood	Unlikely (The event is unlikely but may occur at some time during normal operating conditions, i.e. the event has occurred within industry). Eni will implement appropriate measures to avoid and mitigate accidents.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Based on the combination of the above impact characteristics the impact magnitude is considered to be medium.				
Receptor Sensitivity	Low	Medium	**High**		
	Considering the possibility for injury or death, but taking into account the relative rarity of occurrence, human receptors would be considered to be of high sensitivity/vulnerability to transportation accidents.				
Impact Significance	Negligible	Minor	Moderate	**Major**	
	The combination of a High Receptor Sensitivity and Medium Impact Magnitude will result in an overall Major Impact.				

Mitigation and Management Measures

Project will implement the following mitigation measures to avoid vehicle collisions:

- Implement driving safety standards and enforced speed limits;
- Provide training to drivers, including training the drivers about presence of sensitive traffic areas, e.g. location of schools, shrines, pagodas, temples, mosques, health clinics, hospitals etc. in the Project Area and impose and enforce reduced speed limits for these areas;
- Avoid haulage tasks during peak traffic periods and school drop-off and pick-up times;
- Maintain pedestrian access wherever possible, including access to any settlements and other facilities;
- Notify the local communities about proposed changes to local traffic access due to construction activities and clearly signal the changed traffic conditions;
- Use only properly licensed drivers and transport companies;
- Vehicles operating in the area on behalf of the company must be fitted with In Vehicle Monitoring Systems (IVMS);
- Implement "No Night Driving Policy" and foresee breaks for long travels;
- All Project vehicles shall use designated roads only, and avoid traveling off roads;
- Implement driving safety standards as part of a Traffic Management Plan, including enforced speed limits.
- Implement Eni's relevant policies and procedures, including:
  - Emergency Response Plan and Strategy;
  - pol HSE 001 Eni Myanmar r02 - HSE Policy;
  - pol HSE 002 2016 eni Myanmar r02 - Driving Policy;

- pol HSE 003 Eni Myanmar r02 – Alcohol, Smoking and Drug Policy;
- pro HSE 017 2016 r00 - Land Transportation; and
- Management plans relevant to occupational health and safety and working conditions.

Significance of Residual Impact

Provided in-place control measures are implemented and are effective, the response and consequences of such an event occurring during the Project will be managed and response optimised as per Eni's risk and incident reporting and management protocols: *pro HSE 005 2015 r00 - HSE Risk Management and Risk Reporting, pro HSE 007 2015* and *Eni Myanmar r01 Incident Notification Investigation and Reporting*.

Due to low likelihood and implementation of robust mitigation measures, the relevant significance of residual impact is considered **Minor**.

6.5.1.2 Assessment of Impacts – Accidental Fuel and Chemicals Spills and Leaks

Source of Impact

During the project, there is the potential for hazardous materials to spill or leak into the surrounding environment which can lead to pollution of watercourses and potential impacts to human health. Spill may occur during transportation of the rig outside the Project Site may also contaminate surrounding areas and thus affecting activities as well as disrupt transportation.

Assessment of Impact

Spills may arise as a result of failures during transfer, storage and use of materials such as lube oil, hydraulic oil, fuel, and chemicals.

In general, oil spilled into the environment undergoes a number of physic-chemical changes depending on the type and volume spilled and the prevailing weather conditions. Spilled oil containing light hydrocarbon fractions (e.g. diesel) tend to evaporate quickly compared with heavier (crude) spills. The evaporation process will be enhanced by warm air temperatures and moderate winds and will produce considerable changes in density, viscosity and volume of the spill.

Lube/ hydraulic oils, if released into the aquatic environment, spread rapidly to form a thin surface film. These oils evaporate more slowly than diesel even in warm ambient water conditions. These materials are also persistent and can remain on the water surface for considerable periods of time. These substances typically consist of highly refined synthetic hydrocarbon with low toxicity to aquatic life and negligible aromatics content.

The estimated quantities of drilling fluids required per well are 1,690 m^3 WBM and 765 m^3 NAF. Drilling chemicals are typically stored in small quantities during a drilling campaign and should any spills occur, the soil and associated aquifers acts as a massive source of dilution allowing for a great decrease in the chemical concentration within a short duration. In addition, Eni's systems and procedures for handling of hazardous chemicals and management of waste will reduce the likelihood and consequence of any potential release.

Given the location of Block RSF-5 potential drill sites areas in relation to closest sensitive environmental and biological receptors, it is unlikely that a spill of significant volume would ever reach sensitive resources, even if left unmitigated.

Standard controls and procedures will be in place to prevent and manage any spills (i.e. quick disconnect couplings for transfer hoses, routine maintenance and inspection of storage facilities, containment/ recovery systems, appropriate waste management procedures, and an oil spill contingency and response plan).

The potential impact's geographic extent would primarily be on-site with small potential to spread outside of Block RSF-5, by waterways. The impact would likely be of a short duration due to dilution and natural degradation processes of the spilled substance, but in a worst case could possibly have long-term effects on aquatic flora and fauna even from this short period of contact or exposure. The impact is therefore evaluated to have a moderate scale of consequence. The likelihood of the event is considered as "unlikely to occur but known of in the industry".

Significance of Impact

Table 6.73: Assessment of Potential Impacts due to Accidental Fuel and Chemical Spills and Leaks

Significance of Impact					
Impact	Accidental spills of, waste, diesel and lubricants could potentially impact soil and groundwater, surface water and biodiversity and ecology and occupational health and safety and public health and also all aquatic receptors if spills reach streams and/or aquifers.				
Impact Nature	**Negative**	Positive	Neutral		
	Impact is considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced		
	Impacts would be considered to be direct due to the effects of the released substance.				
Impact Duration	Temporary	**Short-term**	**Long-term**	Permanent	
	Direct impacts would be short-term in the event of an accidental release. The possibility of such an occurrence will be present throughout the duration of the Project, although the risk of offsite diesel spill will be highest during periods with increased use of vehicles. Impacts from an accidental spill or leak could also potentially be long-term due to subsequent effects to aquatic ecosystems.				
Impact Extent	**Local**	Regional	International		
	Impacts would be limited to the Project Area and hence would be considered to be local (diesel is light and would evaporate rapidly before it drifts outside of the Project Area).				
Impact Scale	The majority of accidental releases would be small quantities. However, there is potential for a major diesel spill resulting from the collision of Project vessels on the river (if they are utilized). Resulting rupture of a vessel's fuel tank could release up to 1,700 m^3 or around half of the fuel carried by a typical tugboat or barge vessel. The resulting release could impact aquatic biodiversity. Additionally, in the case of a major accident or total loss of containment on the drilling pad, large quantities of hazardous materials could be released into the surrounding environment, causing impacts to soil, groundwater, surface water, terrestrial and aquatic biodiversity, and potentially causing secondary impacts to community health and safety.				
Impact Frequency	Project activities that have the potential to cause an accidental release, will occur repeatedly throughout the Project. However, an accidental release is considered an unplanned event and its frequency is expected to be low throughout the Project duration, provided that existing/in-place controls are implemented				
Impact Likelihood	Unlikely (The event is unlikely but may occur at some time during normal operating conditions, i.e. the event has occurred within industry). Eni will implement appropriate measures to avoid and mitigate accidental fuels/leaks and spills.				
	Positive	Negligible	Small	**Medium**	Large

Significance of Impact				
Impact Magnitude	The magnitude of potential impacts due to accidental release varies depending on the nature (i.e. toxicity/ hazard level to the environment), volume, and fate (i.e. sink, float and disperse) of the spilled chemicals. Based on the above assessments of the various types of releases, the overall magnitude of an accidental release is considered medium.			
Receptor Sensitivity	Low	**Medium**	High	
	The Project is relatively far from very sensitive ecosystems, but critically endangered species may inhabit some areas and nearby social receptors may depend on water use from the river. Receptor Sensitivity is considered Medium.			
Impact Significance	Negligible	Minor	**Moderate**	Major
	The combination of a Medium Receptor Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.			

Mitigation and Management Measures

- Store chemicals, fuels, and lubricating oil in a secured storage area with impervious (cement or plastic sheet) floor and bund wall and according to SDS;
- Handle all chemicals according to their SDS;
- Comply with Eni's Guidelines-for-Oil-Spill-Contingency-Planning;
- Provide training and conduct spill exercises;
- Provide appropriate medical care, clean-up, and file incident or accident reports;
- Provide spill kits onsite and adequate PPEs to workforce for minor spills;
- Implement Eni's management plans relevant to occupational health and safety and working conditions;
- Develop a response plan to ensure that spills into waterways and onto roads are dealt with on a timely basis;
- Implement protective and containment procedures to remediate the spill;
- Spill and mitigation efforts are to be reported and well documented;
- Implement Eni's Emergency Response Plan and Strategy; and
- Use a Shipboard Oil Pollution Emergency Plan (SOPEP) and/ or Oil Spill Response Plan in place for all barges/vessels involved in the project activities.

Significance of Residual Impact

Provided in-place control measures are implemented and are effective, the response and consequences of such an event occurring during the Project will be managed and response optimised as per Eni's risk and incident reporting and management protocols: *pro HSE 005 2015 r00 - HSE Risk Management and Risk Reporting, pro HSE 007 2015* and *Eni Myanmar r01 Incident Notification Investigation and Reporting*.

Due to low likelihood and implementation of robust mitigation measures, the relevant significance of residual impact is considered **Minor**.

6.5.1.3 Assessment of Impacts – Wellhead Blowout

Source of Impact

An uncontrolled well event could result in heat, fire or explosion, potentially impacting biodiversity (flora and fauna) surrounding the Project site, as well as posing risks to public health and worker health and safety.

Assessment of Impact

Blowouts during drilling have an inherent risk of fire due to the flammability of hydrocarbon gas when mixed with air. The main risk is to the health and safety of the concessionaire's employees and contractors working at the well site at the time of any incident and damage to equipment and structures, as well as to nearby communities and biodiversity

A kick is an uncontrolled flow of formation fluids into the borehole and a blowout is the uncontrolled release at the surface. Not all kicks involve hydrocarbons; commonly they involve fresh or salty water. A kick can be controlled in the first instance by increasing the specific gravity of the drilling mud, which increases the effective pressure exerted by the mud on the formation, or by shutting in the well at the surface and increasing the mud weight. The ultimate response to a kick is to close the blow-out preventer (BOP) valve (pipe rams) to completely shut-in the well.

A blowout only occurs if all of the measures taken to control a kick fail and the pressure cannot be contained by the BOPs or the well casing ruptures. The most common cause of a blowout is that the well encounters unexpectedly high formation pressures or there is a rapid loss of the drilling mud into fractures or caverns in the formation. In areas where previous wells have already been drilled, the maximum formation pressures and depths of any over-pressured zones or lost circulation zones have been determined. The well plan is designed based on this information and sizes the BOPs to contain the pressure and the casing is positioned to establish control. Thus, there are numerous control systems, plans and procedures that have to fail in order for a blowout to occur. Nevertheless, they can occur and are a potential hazard that every well faces. Consequently, all Drilling Operations are planned taking into account the blowout risk and personnel are trained and experienced in the procedures needed to control a kick and prevent a blowout.

If a blowout contains hydrocarbons, these have the potential to mix with the air, providing oxygen, and a spark can cause the mixture to ignite. As the fluids flowing from the well will be under significant pressure, the result will be a 'jet' of flame that will shoot out in the direction of any holes in the well head (usually this is directed vertically).

The potential impact of a blowout will depend on the amount of hydrocarbons flowing from the well and their pressure. A blowout could have the potential to create a significant hazard to anyone without protective clothing. Even if a fire does not ignite, the released gas can lead to suffocation or poisoning.

Blowouts are rare events. Blowout frequencies have been compiled by International Association of Oil & Gas Producers (OGP, 2010). The relevant results for gas production operations are summarized in ***Table 6.74***. Based on these statistics, the risk of a blowout resulting in potential environmental, social and health impacts is rated as very low.

Table 6.74: Relevant Blowout Frequency and Probability Rates

Operation	Category	Historical Frequency	Unit	Probability
Exploration Drilling, shallow gas (Appraisal)	Blowout (surface flow)	1.3×10^{-3}	Per drilled well	1 in 769
	Diverted well release	3.2×10^{-4}	Per drilled well	1 in 3,125

	Well release	3.2×10^{-4}	Per drilled well	1 in 3,125
Exploration Drilling, deep (Appraisal)	Blowout (surface flow)	1.4×10^{-3}	Per drilled well	1 in 714

Source: OGP. 2010. Risk Assessment Data Directory. Report No. 434-2.

Significance of Impact

Table 6.75: Assessment of Potential Impacts due to Well Blowout

Significance of Impact				
Impact	■ A blowout can result in the release of hydrocarbons (gas) into the air and surrounding environment at high pressure, potentially impacting biodiversity and ecology, occupational health and safety, and public health.			
Impact Nature	**Negative**	Positive	Neutral	
	Accidental events such as well blowout would be considered to be a negative impact.			
Impact Type	**Direct**	Indirect	Induced	
	Impacts would be considered to be direct due to the effects of the well blowout.			
Impact Duration	Temporary	Short-term	Long-term	**Permanent**
	The duration of a blowout would be short-term, however the consequential impacts in a worst case scenario could be catastrophic, and resulting injuries or deaths would be permanent.			
Impact Extent	**Local**	Regional	International	
	Impacts would be limited to the Project Area and AoI hence would be considered to be local for well blowout.			
Impact Scale	Blowouts may result in multiple on-site fatalities, operations being curtailed, and medium scale impacts on biodiversity and ecosystem services.			
Impact Frequency	The frequency over the course of the Project is most likely to be zero occurrences. Well blowouts would be a non-repeating, unplanned, event-related impact			
Impact Likelihood	Unlikely (The event is unlikely but may occur at some time during normal operating conditions, i.e. the event has occurred within industry). During exploration drilling, the statistical likelihood of a blowout is 1 in 769 per drilled well of shallow gas.			
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Although the occurrence is unlikely, the scale and consequence of impact due to well blowout would be potentially very large, including toxicity to biodiversity and potential injuries or fatalities to workers. However, the scale of the impact will be mitigated significantly by Eni existing/in-place controls. Overall impact magnitude is considered to be medium.			
Receptor Sensitivity	Low	Medium	**High**	
	As the key receptor for accidental events may be considered to be workers, who could be injured or killed during a blowout, their receptor sensitivity is considered high.			
Impact Significance	Negligible	Minor	Moderate	**Major**
	The combination of a High Receptor Sensitivity and Medium magnitude will result in an overall Major Impact.			

Mitigation and Management Measures

The Project will implement the following mitigation measures:

- Carefully plan Drilling Operation by identifying shallow gas hazards, using high quality materials for well construction, using standard drilling and well control standard operating procedures, and using proper drilling mud formulation with additives if necessary (well kill fluids, loss control and weighting agents);
- Install blowout preventer (BOP) stacks and shear rams;
- Test safety devices prior to start-up for function and integrity;
- Continuously monitor pressure in the well and recycled mud during drilling;
- Provide high-pressure water-spray dousing system on drilling rig;
- Provide blow out response procedure plan in addition workers will be trained about this plan before start Drilling Operation;
- Provide warning sign and firefighting equipment during Drilling Operation;
- Provide fire/muster drill plan and conduct regular drills;
- Implement Eni's Emergency Response Plan and Strategy;
- Comply with opi_sg_hse_040-ups-r01-HSE Unsafe Condition and Unsafe Act;
- Undertake drilling with international best practice safety procedures as per API and all applicable ENIs policies and standards;
- Install a valve system (Christmas Tree) around the mount of the well in order to maintain petroleum pressure of the well at a suitable level;
- Train employees on emergency procedures and induct all who are accessing the site;
- Install alarms and windsocks (to be audible and visible from whole site);
- Always check the pressure in the well and recycled mud; and
- Implement applicable Eni Standards and Guidelines.

Significance of Residual Impact

Provided in-place control measures are implemented and are effective, the response and consequences of such an event occurring during the Project will be managed and response optimised as per Eni's risk and incident reporting and management protocols: *pro HSE 005 2015 r00 - HSE Risk Management and Risk Reporting, pro HSE 007 2015* and *Eni Myanmar r01 Incident Notification Investigation and Reporting*.

Due to low likelihood and implementation of robust mitigation measures, the relevant significance of residual impact is considered **Minor**.

6.5.1.4 Assessment of Impacts – Fire and Explosion (other than wellhead blowout)

Source of Impact

Potential impacts due to fire and explosion (not due to blowout) during the Project activities.

Assessment of Impact

Potential sources of fire other than from a release of hydrocarbons from the well include the burning of garbage, discarded cigarettes, the presence of diesel fuel on site, oil storage, and the gas potentially generated during drilling. The risk of fire or explosion is reduced through standard operating procedures.

Burning of garbage will be prohibited and smoking will be restricted to safe areas. Diesel is not easily ignited; the flash point of diesel is in the range of 40 to 100 °C. Furthermore, the lower explosive limit (LEL) of diesel fuel is 0.6 percent which equals a concentration of approximately 6,000 ppm. It is unlikely that a fuel spill would result in this concentration when occurring in an open area, such as the well site.

The magnitude of impact depends on type of fire as detailed below.

1. Fire with no explosion: the hazards of this type include generating heat radiation, causing burned skin. Long exposure to smoke could result in failure of respiratory system.
2. Fire with other incidents: Explosion and toxic materials release may occur along with fire. Hazards of this type are from heat radiation, pressure from explosive waves, and exposure to toxic chemicals.
3. Fire after explosion: Explosion usually occurs with no warning sign and fire would start immediately if fuel is available nearby. Hazards of this type are from pressure of explosive waves and high heat radiation.

The likelihood of a fire/explosion resulting in potential health and social impacts is low. However, due to the potentially large scale (including injuries/fatalities), magnitude is considered medium.

The drilling rig will follow fire and explosion emergency response plans. The plan aims to prepare personnel to respond to the incident immediately and efficiently. This would minimize the risk of loss of life and property. Project personnel will also attend daily and weekly safety meetings. All personnel will be informed of assembly points and muster points in case of fire. In addition, the rig will be provided with fire extinguishing system or control systems, rescue and first-aid systems, and automatic warning systems.

Significance of Impact

Table 6.76: Assessment of Potential Impacts due to Fire and Explosion

Significance of Impact				
Impact	■ Fire and explosion could affect biodiversity, personnel, machines and equipment. Fires and explosions could also impact residential areas if near enough.			
Impact Nature	**Negative**	Positive	Neutral	
	Impact is considered to be adverse (negative).			
Impact Type	**Direct**	Indirect	Induced	
	Impacts would be considered to be direct due to the effects of the fire/explosion.			
Impact Duration	Temporary	Short-term	**Long-term**	Permanent
	Duration would be short-term in the event of a fire/explosion, although the risk of such an occurrence will be present throughout the duration of the Project. Impacts from a fire/explosion could also potentially be long-term or even permanent due to subsequent effects to biodiversity residential housing areas, and/or due to fatalities.			
Impact Extent	**Local**	Regional	International	
	Impacts would be limited to the vicinity of the fire/explosion, and hence would be considered to be local.			
Impact Scale	Although fire/explosion is an unlikely occurrence, the scale of a potential impact is large, as it could result in extensive damage to biodiversity or housing complex, as well as potential injuries or fatalities to workers.			
Impact Frequency	The frequency over the course of the Project is most likely to be zero occurrences. Fire and explosion would be a non-repeating, unplanned, event-related impact.			

Likelihood	Unlikely (The event is unlikely but may occur at some time during normal operating conditions, i.e. the event has occurred within industry). Based on E&P Forum QRA Directory (1996) data, fires for gas operations statistically occur in 1 of 300.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Although the occurrence is unlikely, the scale of impact due to fire or explosion would be potentially large, including major damage, and potential injuries or fatalities to workers. However, the scale of the impact will be mitigated significantly by Eni's existing/in-place controls. Overall impact magnitude is considered to be small provided that existing/in-place controls are effectively implemented.				
Receptor Sensitivity	Low	Medium	**High**		
	As the key receptors for fire or explosion are workers, who could be injured or killed during a fire or explosion, their receptor sensitivity is considered high.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a High Receptor Sensitivity and Small Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures

The Project will implement the following mitigation measures:

- Provide warning signage;
- Provide medic, first aid kit and first aid room at well site;
- Pre-communicate and coordinate with local firefighting brigade/station;
- Implement Eni's Emergency Response Plan and Strategy;
- Implement applicable Eni Standards and Guidelines;
- Undertake all testing and commissioning, as well as abandonment works as required to applicable API international standards;
- Implement the recommended mitigation measures for Well Blowouts;
- Restrict smoking to controlled areas only;
- Conduct fire training and response drills;
- Obtain map and route of existing gas pipelines along proposed access routes (if applicable);
- Multiple mechanical barriers and bridge plugs shall be set into the abandoned well;
- Hydraulic barrier(s) should be incorporated into the design of the abandonment; and
- The well should be sealed and capped at the surface.

Significance of Residual Impact

Provided that existing and ad-hoc control measures are implemented and effective, the response and consequences of such an event occurring during the Project will be managed and response optimised as per Eni's risk and incident reporting and management protocols: *pro HSE 005 2015 r00 - HSE Risk Management and Risk Reporting, pro HSE 007 2015* and *Eni Myanmar r01 Incident Notification Investigation and Reporting*. In addition, provided in-place control measures are implemented and are effective, the likelihood of such an event occurring during the Project will have been reduced to As Low as Reasonably Practicable (ALARP).

Due to low likelihood and implementation of robust mitigation measures, the relevant significance of residual impact is considered **Minor**.

6.5.1.5 Assessment of Impacts – Natural Disasters (e.g. earthquake)

Source of Impact

Natural disasters may impact project activities eg earthquake or flooding events. An earthquake may trigger release of gas, accidental fire or a gas blowout. Potential impacts may occur to a larger area, which would include local community.

Assessment of Impact

Natural disasters which are not specifically related to the project can have potential impacts on the Project. Indirectly, this can result in hazardous conditions in the local community or may increase the potential impacts of the natural disaster.

Magway is located in an earthquake prone zone, with ten (10) earthquakes in the past 365 days M1.5 or greater. This year the largest registered earthquake in the area was of magnitude 5.1 in Pyay, Bago[1]. In 2016, a 6.8 magnitude earthquake occurred with epicentre near Chauk in Magway Region, which is approximately 100 km north of the Project Area[2]. Thus, earthquake is perceived as a major natural disaster that occurs in the region, which may result in severe damage to human life and property.

Flooding may also be a threat; in 2018 ten people were killed and more than 100,000 was forced to flee their homes after days of heavy monsoon rains flooded villages in central and southern Myanmar, according to the Burmese National Disaster Management Committee[3]. Magway Region was particularly impacted, with more than 70,000 affected. In 2015, seasonal flooding killed around 100 and displaced more than 200,000 people in some of the worst flooding to effect the country in a decade. Myanmar is implementing a disaster risk reduction plan[4] before 2020 and the World Bank recently approved a 117 million USD budget to enhance disaster risk management in Myanmar, to be implemented until 2023, with the following key components to be included:

- Increase the disaster resilience of Myanmar by enhancing the MoPF's capacity to integrate disaster and climate resilience into budgets and sectoral investment planning and enhance the Government's capacity to meet post-disaster funding needs;
- Enhance flood Risk Management;
- Ensure Safer Public Facilities and Critical Infrastructure;
- Build institutional capacity and increase public awareness; and
- Enhance emergency responses.

Significance of Impact

Table 6.77: Assessment of Potential Impacts due to Natural Disasters

Significance of Impact			
Impact	■ Natural disasters which are not specifically related to the project can have potential impacts on the Project. Indirectly, this can result in hazardous conditions in the local community or may increase the potential impacts of the natural disaster.		
Impact Nature	**Negative**	Positive	Neutral
	Accidental natural disasters would impact negatively		
Impact Type	Direct	Indirect	**Induced**

[1] https://earthquaketrack.com/mm-15-magway/recent

[2] https://frontiermyanmar.net/en/news/powerful-6-8-magnitude-earthquake-hits-magway-region-central-myanmar.

[3] https://edition.cnn.com/2018/07/31/asia/myanmar-floods-intl/index.html

[4] https://www.preventionweb.net/english/professional/policies/v.php?id=56201

Significance of Impact				
	Impacts would be considered to be induced, whereby the impacts result from other activities (which are not part of the Project) but are magnified as a consequence of the Project.			
Impact Duration	Temporary	Short-term	**Long-term**	Permanent
	Impacts from an earthquake or flooding could potentially be long-term or even permanent due to subsequent effects to biodiversity residential housing areas, and/or due to fatalities.			
Impact Extent	**Local**	**Regional**	International	
	The extent of the impact from natural disasters would be regional, however the induced secondary impacts attributable to the Project would be local.			
Impact Scale	Although natural disasters are a relatively unlikely occurrence, the scale of a potential impact is large, as it could result in extensive damage to biodiversity or infrastructure, as well as potential injuries or fatalities to workers.			
Impact Frequency	The frequency of the occurrence would be expected to be rare.			
Likelihood	The prediction of an earthquake is not possible. However, the area has suffered ten earthquakes in the past 365 days. Likelihood is considered “possible”.			
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	Considering the location of the project and its proximity to a populated area, the magnitude of this impact is assessed as medium.			
Receptor Sensitivity	Low	Medium	**High**	
	Action Plans and disaster risk reduction measures are being implemented at this time in Myanmar but the Magway area may remain vulnerable until those measures are fully implemented and working.			
Impact Significance	Negligible	Minor	Moderate	**Major**
	The combination of a High Receptor Sensitivity and Medium Magnitude will result in an overall Major Impact.			

Mitigation and Management Measures

- Eni’s Emergency Response Plan (described further in ***Appendix 7***) should collaborate/integrate with the Disaster Management Plan of Magway Province during emergency situation;
- The neighborhood communities should be made aware of the evacuation plan and should prepare ward level disaster response plans;
- Mitigation measures for other Unplanned Events (including blowout and fire and explosion) are also applicable;
- Drilling pad structure and equipment design must be durable to withstand flooding or earthquake;
- Build up well pad and access roads higher than historical flood levels;
- Avoid construction of well site and access roads in areas that may flood
- Check weather forecasts daily to ensure there are no major storms or weather events foreseen which could affect the safety of Project activities; and
- Implement applicable Eni Standards and Guidelines, including any relevant to severe weather plans.

Significance of Residual Impact

Provided in-place control measures are implemented and are effective, the response and consequences of such an event occurring during the Project will be managed and response optimised as per Eni's risk and incident reporting and management protocols: *pro HSE 005 2015 r00 - HSE Risk Management and Risk Reporting, pro HSE 007 2015* and Eni *Myanmar r01 Incident Notification Investigation and Reporting*.

Due to low likelihood and implementation of robust mitigation measures, the relevant significance of residual impact is considered **Minor**.

7. CUMULATIVE IMPACT ASSESSMENT

7.1 Introduction

The IFC (2012) [1] defines cumulative impacts as impacts that result from the successive, incremental, and/or combined effects of an action, project, or activity added to other existing, planned, and/or reasonably anticipated actions, projects, or activities.

Cumulative impacts summarised in this section refer to the additional impacts that may be caused by other developments or activities in the vicinity of the Project Area, that, when added to the impacts of the proposed Project, combine to cause a greater impact. Such impacts may arise due to spatial overlap or temporal overlap.

IFC (2012) emphasizes that cumulative impacts that should be assessed are those generally recognised as important on the basis of scientific concerns and or concerns from affected communities.

The methodology for Cumulative Impact Assessment based on status of existing facilities is illustrated in ***Figure 7.1.*** For this Project, the potential cumulative impacts were combined with all phases of the Project activities, were assessed based on analysis of baseline data collected at the project location, and assessment of the significance of potential impacts using similar methodology to that used for direct impacts (above).

The methodology used in the setting of the spatial and temporal boundaries for this CIA was largely qualitative. The following factors have been considered within the methodology:

- Temporal boundaries have been set based on desktop review of available information pertaining to other proposed Projects within the area (see below), the present Project schedule, understanding of Government strategy with regards to the long term development of the area, and the continual nature of some of the external stressors; and
- Spatial (or Geographic) boundaries are a composite of the location of sensitive receptors, assessed impacts of the Project and the degree to which they may overlap with other external projects and stressors to impact upon an identified sensitive receptor.

For this project, the temporal boundary would essentially be the periods in which the Project schedule overlap with the schedules of other nearby projects or external drivers. The spatial boundary would consist primarily of the Project Study Area, but for some potential impacts it may extend beyond this if the Project activities overlap with other project's activities (for example utilization of public roadways).

Table 7.1 presents the Project Study Area summary.

Table 7.1: Project Study and Survey Areas

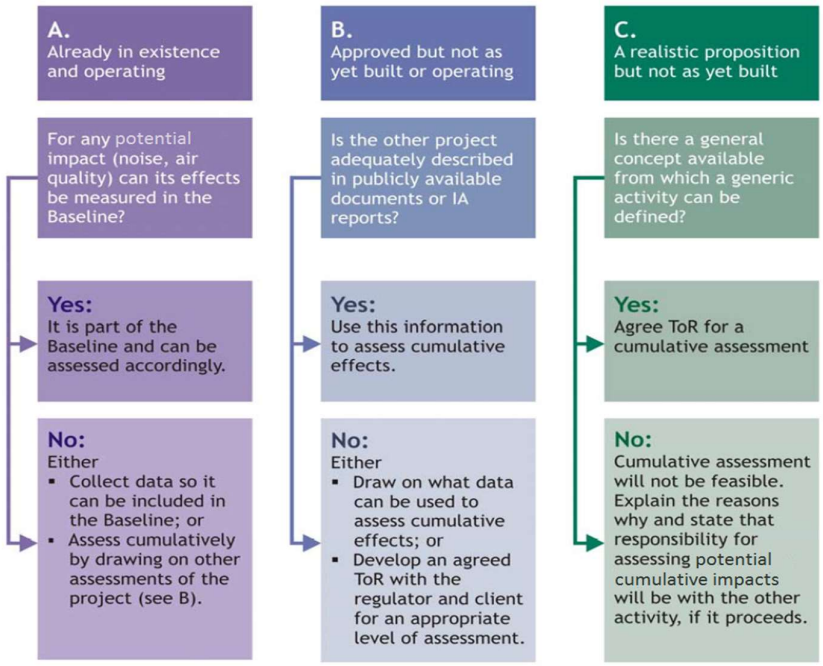
Study and Survey Area	Area (ha)
Project Study Area (Radius of 5 km for well site and 1 km for riverbank landing)	18,586
Community Study Area (Radius of 5 km for well site)	18,900
Biodiversity Survey Area (Selective Areas)	8,740

Source: ERM, 2019

AOI = Area of Influence; ha = hectares.

[1] IFC Performance Standards on Environmental and Social Sustainability, January 2012, International Finance Corporation, World Bank Group

Figure 7.1: Cumulative Impact Assessment Process



Source: ERM, 2012

7.2 Limitations

The limitations applicable to this CIA include: (1) incomplete information about other projects and activities (e.g., the information is not available in the public domain); (2) uncertainty with respect to the implementation of future projects; and (3) difficulty in establishing thresholds or limits of acceptable change for receptors, and therefore the significance of cumulative impacts.

7.3 Identification of Other Projects

Through a thorough review of publically available information of existing and future planned projects and activities located within the spatial and temporal boundaries of the Project (Eni Exploration Drilling in RSF-5 Project), which may potentially result in cumulative impacts are identified.

A Philippines-based energy company has signed the share purchase agreement with two Thai EPC contractors to construct a 220 MW solar power plant located in Minbu, Magway region[1]. The project was first announced in May 2013, began construction in 2016 (expecting to deliver 3 x 50 MW phases and a final 70 MW phase) with the first phase expected to be completed by the first quarter of 2019. After completion, the project is expect to feed electricity to the grid, based on a 30-year power purchase agreement between Green Earth Power (GEP) and MOEE. ***Figure 7.2*** shows location of Minbu with reference to Block RSF-5. Potential impacts from this project is related to increase in transportation and dust emission during the construction period as well as the physical presence of the plant during operation phase. The construction schedule of this solar plant project is expected to overlap with the Proposed Project construction (and site preparation) and drilling operation phase entirely.

In addition, MOEE has begun constructing the 170 MW solar power plant in Minbu, Magway region[2]. This project is anticipated upon completion to generate 350 million kilowatt hours yearly where this will

[1] https://consult-myanmar.com/2018/07/03/basic-energy-buys-stake-in-2-thai-epc-firms-working-on-220-mw-myanmar-pv-project/

[2] https://consult-myanmar.com/2018/02/13/minbu-solar-power-plant-construction-begins/

supply power to 210,000 households. GEO Co. Ltd., a Myanmar company, is now implementing the project based on a build-operate-transfer (BOT) system. The Project will be built in four (4) phases with 40 MW installed each in the first three (3) stages and the final phase of 50 MW. ***Figure 7.2*** shows location of Minbu with reference to Block RSF-5. Potential impacts from this project is related to increase in transportation and dust emission during the construction period as well as the physical presence of the plant during operation phase. The construction schedule of this solar plant project is expected to overlap with the Proposed Project construction (and site preparation) and drilling operation phase entirely.

The closest drilling site (SEG#1) is located 25 km to the east of Minbu Town, however, since the exact locations of the above solar projects are unknown, it is estimated that the distance between the projects is greater than 25 km as the potential location for a solar plant is likely located further west of the drilling site. Potential cumulative impacts between the projects include those arising from utilizing the same transport routes, utilising of public infrastructures and amenities (such as power supplies, water supplies, licensed waste contractor), labour and influx of job opportunities.

7.4 Scoping of Potential Cumulative Impacts

Prior to assessing cumulative impacts, the project interactions and sensitive receptors that could potentially be affected by cumulative interactions from the other projects or external drivers discussed in ***Section 7.3***.

To be included in the CIA, a receptor must be first confirmed to be valued by other identifiable stakeholder group and/or the scientific community. Secondly, the receptor must be reasonably expected to be affected by *both* the Project components under evaluation (i.e. the exploration drilling) and combination of other projects and/or external drivers.

The EIA considered potential Project impacts across a range of abiotic, biotic and social components that were identified during the Project screening and scoping phase. In addition, input from stakeholders has been collected as part of the EIA stakeholder engagement and consultation process. Engagement activities included interaction with governmental authorities, communities, population groups, and social organization present in the Study Area.

Based on the above, the following potential cumulative impacts and receptors have been included in this CIA:

- Cumulative impacts due to combined emissions (e.g. GHG, dust) on representative air sensitive receptors;
- Cumulative impacts due to combined noise levels on representative noise sensitive receptors;
- Cumulative impacts due to utilisation of public infrastructures and amenities (primarily roads);
- Cumulative impacts due to visual landscape by the physical presence on landscape.

Figure 7.2: Solar Power Plant Project (in Minbu) in Relation to Block RSF-5

Source: MIMU, 2016; modified by ERM, 2019

7.5 Assessment of Cumulative Impacts

7.5.1 Air and Noise

Air and noise emissions from nearby projects would overlap in temporal extent (drilling project is expected to start in November 2019 and end in July 2020 and both Solar Plant projects are anticipated to overlap this period), but unlikely to have spatial overlap (i.e. the distance between drilling site and other projects is greater than 25 km, far beyond the distance of expected noise impacts, and very unlikely to lead to significant cumulative impacts to air quality). The Eni RSF-5 project will be conducted and managed in compliance with emissions threshold values, and the nearby solar projects would also

be required by law to do so. Hence, the magnitude and extent of cumulative impacts is expected to be small. Significance of cumulative impacts due to air and noise emissions are expected to be **negligible**, provided that the respective management plans to reduce dust dispersion and temporary air quality worsening in the proximity of the project areas is properly executed.

7.5.2 Utilisation of Public Infrastructure and Amenities

The Project is anticipated to have both spatial and temporal overlap in term of utilization of public infrastructure and amenities (primarily transportation) with other projects.

Transport of materials, equipment and personnel will be required during the proposed Project, as well as for the construction of the nearby solar power plants. The vehicle requirements and transport routes for the solar plants are not known. However, currently there is limited road infrastructure within the region, and therefore the combined transportation requirements of the projects may lead to cumulative impacts on the infrastructure (due to potential simultaneous use of same transport routes), as well as potential secondary health and safety impacts. Increased traffic volume may be noticeable on major transport routes, for example on road between Thayet and the Project Site (via Ayeyawady Bridge (Malun)) and No.2 Yangon-Mandalay Highway. It is expected that the potential cumulative impacts on traffic, if properly mitigated, and with implementation of journey management plans will be localised and the impact will be of **minor** significance.

7.5.3 Physical Presence

Impacts to visual landscape from physical presence of the RSF-5 drilling project will be significant, but will be short-term duration. This impact is anticipated to overlap in temporal extent with other projects during this period, however, spatial extent is unlikely to overlap as the distance between the drilling project and solar plant project is over 25 km. Visual impacts from the drilling Project would not be expected at this distance, and therefore the cumulative impacts is considered to be of **negligible** significance.

7.6 Mitigation and Management Measures

Recommendations of mitigation and management measures are provided for each of the above impacts for the drilling Project, as detailed in the EMP (***Section 8***). Given the small magnitude and negligible-minor significance of cumulative impacts anticipated as a result of the Project and neighbouring activities, current mitigation measures are deemed sufficient to manage potential cumulative impacts. The only additional measure that is recommended is for the Project to maintain awareness and, if possible, communication with adjacent industrial developments and project activities, in order to maximize cooperation and reduce the likelihood for cross-project interactions.

8. ENVIRONMENTAL MANAGEMENT PLAN

8.1 Introduction

This section presents the Environmental Management Plan (EMP) for the Project. This EMP provides the procedures and processes which will be applied to the Project activities to check and monitor compliance and effectiveness of the mitigation measures to which Eni has committed. In addition, this EMP is used to ensure compliance with statutory requirements and corporate safety and environmental policies.

8.2 Project's Environmental, Social and Health Policies and Commitments

8.2.1 Eni's Environmental, Social and Health Policies

Eni has developed specific guidelines and standards for its operations that will be met during project activities. A summary of these guidelines are included below:

- Eni Policies (e.g. Sustainability, Our People, The Integrity in our Operations etc.);
- Eni E&P Division – Quality Requirements: this document defines the contractor's Management System requirements to be applied to the Contract Scope of Work during the bid stage and during the execution of works;
- Eni E&P Division - Contract HSE Requirements for abroad services (Rev 01, Aug 2010): Sets out the minimum requirements, as well as recommendations for everything relevant to the Health, Safety & Environment aspects of the project;
- Eni Upstream Technical Guideline – AMTE-TG-002 "Environmental, Social and Health Impact Assessment in Exploration" (11/03/2016). This Technical Guideline provides guidance for carrying-out the Environmental, Social and Health Impacts Assessment (ESHIA) process in oil and gas projects during the exploration phase. It describes the purpose, basic steps, approach and timing to identify environmental, social and health aspects and timely mitigate project-related impacts through the preparation and the implementation of an ESHIA for exploration activities.;
- Eni Upstream Technical Guideline – AMTE TG 002 annex C r00 "Environmental, Social and Health Impact Assessment in Exploration – Environmental Baseline Data". The annex to the technical guidelines describe the environmental components that should be investigated while conducting ESHIA process (unless different requirements by host Country legislation) in order to define the baseline context in which the exploration activity is going to be developed and against which to assess changes;
- Eni Upstream Technical Guideline - AMTE-TG-013 "Biodiversity and Ecosystem Services Impact Assessment and Management". This Technical Guideline (TG) provides guidance for managing Biodiversity and Ecosystem Services (BES) issues in onshore and offshore oil and gas projects during all project phases, from exploration to decommissioning;
- Eni Upstream Technical Guideline – AMTE-TG-014 "Technical Guideline – HSE Aspect on Decommissioning Activities". This Technical Guideline provides guidance for managing HSE aspect related to the decommissioning activities, including information on the main HSE items for each step necessary to plan and implement a Decommissioning Project;
- Eni Upstream Professional Operating Instruction: Local Stakeholder Engagement (opi ssc 001 eni spa); Social Context Analysis (opi ssc 002 eni spa); Community Investment Management (opi ssc 003 eni spa); Monitoring, reporting and audit activities (opi ssc 004 eni spa); Local Content (opi ssc 005 eni spa); Land Acquisition and Management (opi ssc 006 eni spa) – all issued in July 2015. These guidelines area aimed to ensure that eni Upstream activities are carried out and developed in a sustainable way;

- Eni Upstream Technical Operating Instruction – opi sg hse 012 e&p r01 "Professional Operating Instruction – Noise and Vibration Management". This Technical Operating Instruction sets out the requirements for noise and vibration management which shall be applied during all Eni Upstream activities;
- Eni Upstream Technical Operating Instruction – opi sg hse 028 ups (1/03/2016) "Identification of significant environmental aspects". This document establishes a methodology for the identification and evaluation of the environmental aspects deriving from activities, products and services of the Subsidiaries and Affiliates, in Italy and abroad, belonging to eni Upstream Business Area;
- Eni E&P division- Doc N° 1.3.2.11 MHS 2 "Health Risk Assessment";
- Eni Upstream Technical Operating Instruction- AMTE-TG-010 "Waste Management in Upstream Oil&Gas Activities". This Technical Guideline provides a set of recommendations and treatment options that shall be considered for a correct management of wastes produced during Upstream activities;
- Eni Upstream Operating Technical Guideline – "Air Quality Monitoring in Upstream Oil&Gas Activities" (AMTE-TG-006). It provides a guide or the design, installation and management of Air Quality Monitoring Systems;
- Eni Upstream Operating Technical Guideline – "Sustainable Water Management for the Upstream Sector" (AMTE-TG-012). It defines the procedure for proper and sustainable water management, thus resulting in a usable instrument both for design and operational phases. Moreover it is conceived to be a guideline to develop a Water Management Plan;
- Eni Minimum HSE Requirements in Geophysical Operations (opi sg hse 002 e&p r01). It defines the minimum HSE requirements to apply in geophysical operations (including land seismic acquisition and processing, gravity and magnetic survey) in order to ensure compliance with the commitments of eni spa Policies as well as the requirements of internationally recognized best practices;
- Professional Operating Instruction – Hazard Identification (HAZID) Methodology. This document provides an overall understanding of Hazard Identification (HAZID) process and its effective application within Eni activities (including design and modifications of projects and plants);
- Eni Code of Ethics (Mar 2008): Lays out eni's Code of Ethics for its operations;
- Eni Guidelines on the Protection and Promotion of Human Rights (Apr 2007);
- Eni HSE Policy (pol HSE 001, 2016);
- Eni Driving Policy (pol HSE 002, 2016); and
- Eni Alcohol, Smoking & Drugs Policy (pol HSE 003,2016).

Moreover *Eni Myanmar* refers to some international policies, principles, and standards for its activities; the main of them are listed below:

- OGP/IPIECA – Ecosystem services guidance, 2011;
- International Union for Conservation of Nature (IUCN) Red List;
- International Finance Corporation (IFC) – Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources, 2012;
- International Finance Corporation (IFC) – Performance Standard 7 Indigenous People, 2012;
- International Finance Corporation (IFC) – Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets, 2007;
- WHO – World Health Organization;
- OGP/IPIECA - A Guide to Health Impact Assessment for oil and gas industry, 2007; and

- International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978.

8.2.2 International Agreement and Conventions

In addition to the local regulations presented above, Myanmar is also a signatory to the following international conventions which may have relevance to the proposed exploration activities:

- Asia Least Cost Greenhouse Gas Abatement Strategy (ALGAS) (1998);
- United Nations Framework Convention on Climate Change (1994);
- International Convention on the Prevention of Pollution on Ships 1973 as modified by the protocol of 1978 (MARPOL 73/78 with the exceptions of Annex III (packaged substances, Annex IV (Sewage) and Annex V (Garbage));
- Montreal Protocol on Substances that Deplete the Ozone Layer (1989);
- Vienna Convention for the protection of the Ozone layer (1988);
- United Nations Convention on Law of the Sea (1986); and
- Convention on Biological Diversity (1992).

8.2.3 Good International Industry Practice (GIIP) Guidelines

Eni will undertake the impact assessment study and onshore exploration activities in a manner which is guided by AMTE TG 002 r00 “Environmental, Social and Health Impact Assessment in Exploration” and good international industry practice. Applicable guidelines taken into consideration by Eni will consider in preparing this document include:

- International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012).
- IFC Environmental, Health and Safety (EHS) guidelines, including:
  - General EHS Guidelines (2007);
  - EHS Guidelines for Onshore Oil and Gas Development (2015);
- United Nations Environment Program (UNEP) Guidelines on Environmental Management for Oil and Gas Exploration and Production (1997); and
- Other good international industry practice guidelines from organisations such as the American Petroleum Institute (API), International Petroleum Industry Environmental Conservation Association (IPIECA) and International Association of Oil and Gas Producers (IOGP).

8.2.4 Governing Parameters

Myanmar’s National Environmental Quality (Emission) (NEQ) Guidelines were promulgated on December 29th, 2015. The Guidelines are largely based on International Finance Corporation (IFC) Environmental Health and Safety (EHS) Guidelines, and provide the basis for regulation and control of various environmental parameters, including noise and vibration, air emissions, and effluent discharges, from various sources.

8.2.5 Commitment of Eni

Eni will, at all times, fully comply with the commitments, mitigation measures, and plans that have been presented in this EIA Report.

Eni shall fully implement the EMP and subject specific Management Plans attached in ***Appendix 8*** and all Project commitments, and conditions, and is liable to ensure that all contractors and subcontractors

of the Project comply fully with all applicable Laws, including the Environmental Conservation Law (2012), Environmental Conservation Rules and Environmental Impact Assessment Procedure (2015), as well as the EMP and subject specific Management Plans, Project commitments and conditions.

Eni and ERM hereby confirm that:

- The EIA Report is accurate, consolidated and complete;
- The EIA has been conducted in accordance with relevant laws, including Myanmar's EIA Procedure (December 2015).
- The Project will fully follow the commitments, mitigation measures and plans set out in this EIA Report.

8.3 Summary of Proposed Mitigation Measures

This section presents the proposed mitigation measures that Eni will adopt to manage and control potential adverse impacts associated with the Project, which were discussed in ***Chapter 6***. The proposed mitigation measures are verified to be practical and implementable in operational conditions. Mitigation measures will be taken into account in project implementation and execution such that potential adverse impacts are reduced to As Low As Reasonably Practical (ALARP). The mitigation measures are presented for each phase in ***Table 2.1***, ***Table 2.2***, and ***Table 2.3***.

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Table 8.1: Mitigation Measures for Project during Construction and Site Preparation Phase

	Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
Environmental Impacts						
1.	Air Quality and GHG Emissions	1.1	■ Temporary emissions of nitrogen oxides (NOx), sulphur dioxide (SO_2), dust and particulates (PM10 and PM2.5) from mobile and non-mobile construction-related activities.	■ Regularly inspect and maintain vehicles, engines and generators operating at optimal efficiency. ■ Consider using clean diesel (low sulphur diesel). ■ Shut down generators, compressors, and other equipment when not in use. ■ Where possible, use energy efficient devices and energy conserving technologies (such as LED lighting, and low emission equipment) to reduce overall energy use. ■ Use optimal transport routes (to reduce distance) and if possible, obtain fill material locally to reduce transportation distances (and emissions). ■ Do not overload vehicles. ■ Obtain fill material from as near the well sites as possible to reduce transportation distances (and therefore emissions). ■ Optimization of construction schedule and placement of laydown areas/temporary camp sites to reduce overall traffic movements/distance travelled, thus reducing GHG emissions from transport. ■ Procurement to consider the energy efficiency of all new mobile and fixed equipment.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
		1.2	■ Dust dispersion is expected from: - land preparation activities such as excavating, grading and clearing existing vegetation. - temporary stockpiles during construction access of roads	■ Water sprinkling for dust suppression where dust is being created from works impacting nearby community. ■ Implement a Traffic Management Plan. ■ Only strip and clear areas specifically required for planned Project works. ■ Land clearing/disturbance to be minimized to the extent possible. ■ Reduce vehicle speed when passing nearby communities. ■ Fully cover truck loads during material transportation. ■ Develop and implement Dust suppression activities as part of the EM). ■ All sand and aggregates will be stored in bunded areas and are not allowed to dry out unless specifically required.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor
		1.3	■ Potential emission of GHGs from construction vehicles and equipment.	■ Implement same measures as for Impact 1.1 related to emission of NO_x and SO_2 in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor
2.	Noise and Vibration	2.1	■ Increased noise and vibration from: - construction site vehicles and equipment - transportation of workers, material and waste from and to site - operation of generators	■ Comply with Eni's Noise and Vibration Management - opi-sg-hse-012-ep-r01-Noise-and-Vibration-Management (***Appendix 7***) ■ Equipment to be operated and maintained in accordance with manufacturer specifications.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				■ Where possible, carry out loud[1] construction activities during the daytime. ■ Respond to any noise-related complaints, and make modifications or other agreement with complainants where possible and appropriate. ■ Inform details and schedule of activities to community. ■ Consider installing noise barrier if sensitive receptors nearby [2] well sites. ■ Schedule operation of noisy construction equipment at different times whenever possible. ■ Use mufflers on diesel/gas driven machinery. ■ Reposition noisy equipment to reduce offsite noise impacts. ■ Provide Personal Protective Equipment (PPE) for employee to wear appropriately. ■ Undertake any vibration intensive works during the day-time.		

[1] Any operation that generate noise level greater than 55 dB(A) during day and 45 dB(A) during night. Where the noise baseline level is above 55 dB(A) during the day or 45 dB(A) during the night, operation that increases this baseline by 3 dB(A) is considered as loud.

[2] This is considered base on the noise level measured at the sensitive receptors/receivers whereby if the noise measured is greater than 55 dB(A) during day or 45 dB(A) during night, these are therefore considered as significant impacted receptors.

	Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
3.	Soil and Topography	3.1	■ Earthworks, particularly during contouring works for access road improvement and well pad construction, may cause soil compaction and erosion.	■ Limit construction works only to well pad, storage/accommodation areas, and access roads. ■ Avoid unnecessary vegetation clearance only as required to install the proposed facilities. ■ Check weather daily for the area. Stop earthworks during heavy rain. ■ Consideration of retaining topsoil for reinstatement (during area restoration) where possible. ■ Installation of erosion controls (such as silt fences, gravel, temporary geotextiles, etc.) where embankments are exposed to prevent erosion during heavy rains and provide adequate drainage facilities in the area that might be interested by runoff and flash floods. ■ Install drainage facilities where necessary if compaction and runoff is expected for heavy rain.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor
		3.2	■ Rainfall on earth pad and access road may exacerbate the erosion of soil.	■ Implement same measures as for Impact 3.1 related to earthwork activities that impact soil and topography in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor
		3.3	■ Earthworks and excavation may lead to the removal or creation of landforms.	■ Implement same measures as for Impact 3.1 related to earthwork activities that impact soil and topography in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
		3.4	■ Source of construction fill material could be contaminated, which could impact soil in the Project area and surroundings.	■ Consider validation sampling of imported fill material (same parameters as baseline sampling to check for contamination). ■ Make sure that fill materials are obtained from approved or designated locations/areas.	■ Well Sites ■ Logistics Base ■ Access Roads ■ Fill Material Source	■ Eni ■ EPC Contractor
		3.5	■ Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to surface water quality, soil, and groundwater. Secondary impacts could occur to biodiversity.	■ Implement same measures as for Impact 4.4 related to inappropriate management and disposal of hazardous and non-hazardous waste in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
		3.6	■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact surface water quality, soil, and groundwater. Secondary impacts could occur to biodiversity.	■ Implement same measures as for Impact 4.5 related to wastewater discharge in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
		3.7	■ Hazardous materials (such as fuels, oils, lubricants or solvents), if not managed appropriately, could accidentally spill or leak, directly impacting surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to biodiversity.	■ Implement same measures as for Impact 4.6 related to management of hazardous materials in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
		3.8	■ Flooding of well pad could result in loss of containment of hazardous materials, oils and other harmful substances.	■ Implement same measures as for Impact 4.6, 5.1, 5.2 and 5.3 related to management of hazardous materials (related to soil and topography) and impacts to hydrology in Site Preparation and Construction Phase.	■ Well Sites	■ Eni ■ EPC Contractor

	Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
4.	Surface Water Quality	4.1	■ Earthworks during construction may promote soil erosion and, in turn, increase the sediment loads of nearby streams and rivers.	■ Implement same measures as for impacts to 3.1, 3.4, 4.4, 4.5 and 4.6during Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor
		4.2	■ Earthworks during riverbank landing improvement/construction (if applicable) may promote soil erosion and, in turn, increase the sediment loads of nearby streams and rivers.	■ Implement same measures as for Impact 4.1 related to earthwork that promote soil erosion thus impacting surface water quality, but as applied to vessels and vehicles used for riverbank landing improvement/construction in Site Preparation and Construction Phase.	■ Riverbank Landing	■ Eni ■ EPC Contractor
		4.3	■ Depending on source of water for Project requirements, accidental sedimentation or contamination of waterways could occur.	■ Implement same measures as for Impact 4.1 and 4.2 related to earthwork that promote soil erosion thus impacting surface water quality in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
		4.4	■ Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to biodiversity.	■ All type of waste must be handled, stored, and disposed in accordance with relevant regulations and provision of waste management plan that will be issued. ■ Provide adequate facilities for collection and treatment of wastewater (as required), storage and legal disposal of general waste, solid waste, chemicals etc. ■ Compact well pad to reduce the amount and rate of infiltration of leachates. ■ Do not locate waste management / handling and storage areas near sensitive environments or waterways.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor

Resource/Receptor	Potential Impacts	Mitigation Measures	Location	Responsibility
		■ Segregate and store waste in appropriate, secure, and properly labelled containers and ensure temporary stored wastes are collected and transported to treatment and disposal sites in due time as prescribed by law and best practices. ■ Waste storage areas are to be contained, with a sealed impermeable base. ■ Provide drip pans under engines. ■ Provide bunds around fuel storage tanks. ■ Clean up spills immediately and dispose into appropriate bin for collection. ■ Keep adequate spill kits on site and on waste transport vehicles ■ Conduct regular inspections of waste areas. ■ Designate, confined and label waste collection and waste management area(s) and systems. ■ Waste materials will be managed under Eni's Waste Management Plan. ■ Unload temporary storage areas according to law prescriptions or best practices. ■ Offsite waste receiving facilities must be capable of receiving and processing the amounts of waste from the Project and not be overwhelmed. ■ Use authorized and permitted waste facilities (i.e. DOWA) and services and ensure an		

Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
			adequate waste management hierarchy to be respected.		
	4.5	■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to biodiversity. ■ Oil contaminated wastewater could have the potential to impact surface waters if improperly managed. ■ Sewage could have the potential to temporarily decrease surface water quality at discharge point. ■ Potential eutrophication from sewage/grey water spills	■ Provide adequate facilities for collection and treatment of wastewater (as required), storage and legal disposal of general waste, solid waste, chemicals etc. ■ Compact well pad to reduce the amount and rate of infiltration; ■ Conduct regular inspections of waste and sanitation areas; ■ Conduct monitoring of water and soil quality in order to assess no contamination has occurred; Treat waste from sanitation facilities (i.e. sewage waste) prior to discharge. ■ Conduct regular inspections of waste and sanitation areas. ■ Install sanitation and treatment systems for work personnel at well pad. Pit latrines can be installed short-term, until proper sanitation systems (i.e. septic tanks) are installed, but should not be adopted for long-term use. ■ Where discharge is required, effluent shall be treated to meet water quality standards as per Myanmar's NEQG. ■ Offsite waste receiving facilities must be capable of receiving and processing the amounts of waste from the Project and not be overwhelmed. ■ Potentially contaminated stormwater (falling onto concrete base) will be collected and treated offsite.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
			■ Use authorized and permitted waste facilities and services.		
	4.6	■ Hazardous materials (such as fuels, oils, lubricants or solvents), if not managed appropriately, could accidentally spill or leak, directly impacting surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to biodiversity.	■ Compact well pad to reduce the amount and rate of infiltration. ■ Conduct regular inspections of waste and sanitation areas. ■ Conduct monitoring of water and soil quality in order to assess no contamination has occurred. ■ Provide adequate facilities for collection and treatment of wastewater (as required), storage and legal disposal of general waste, solid waste, chemicals etc. ■ Do not locate waste management / handling and storage areas near waterways. ■ Hazardous waste storage areas are to be contained, with a sealed base, and covered. ■ Maintain spill kits/equipment, and posted spill procedures, on site and with any Project related works. ■ Design well pad to be above known flood levels. ■ All fuel and hazardous substance storage areas to be located above historical flood level. ■ Segregate and store hazardous waste in appropriate, secure, and properly labelled containers. ■ Contain all fuel tanks and other hazardous substances in a fully bunded area with a storage capacity of at least 110% of the total potential storage volume.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				■ Store and handle all hazardous substances in accordance with their SDS. ■ Keep a register for all hazardous substances on site and relevant Safety Data Sheets (SDSs) readily accessible for reference. ■ Develop and implement controls and standard operating procedures for the use of hazardous materials to prevent accidental spills or releases. ■ Refueling and machinery maintenance is to be undertaken in a designated, sealed, bunded area. ■ Appropriate spill contaminant kits are to be made available on site. ■ Clean up all fuel spills immediately.		
		4.7	■ Flooding of well pad could result in loss of containment of hazardous materials, oils and other harmful substances.	■ Implement same measures as for Impact 4.6, 5.1, 5.2 and 5.3 related to management of hazardous materials (related to soil and topography) and impacts to hydrology in Site Preparation and Construction Phase.	■ Well Sites	■ Eni ■ EPC Contractor
5.	Hydrology	5.1	■ Construction activities can result in compaction of soils, vegetation removal, and an increase in impermeable (or slowly permeable) surfaces. The subsequent increase in surface runoff may in turn, increase soil erosion and the risk of flooding. ■ Well pad construction will divert the existing drainage pattern and may potentially impact existing site hydrology.	■ Divert drainage water via artificial drainage ditches with appropriate capacity to maintain existing flow patterns. ■ Implement same measures as for Impact 3, Soil and Topography in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor

Resource/Receptor			Potential Impacts	Mitigation Measures	Location	Responsibility
			■ Alteration of flow patterns and the permeability of the soil due to construction of well pads (and their presence thereafter). ■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact hydrology through erosion or alteration of drainage patterns.			
		5.2	■ Riverbank landing construction/upgrading (if applicable) may divert the existing drainage pattern (either temporarily or permanently) and may potentially impact existing site hydrology. ■ Alteration of flow patterns due to construction of modified riverbank landings (and their presence thereafter).	■ Implement same measures as for Impact 5.1 related to hydrology from construction activities related to soil compaction, but as applied to vessels and vehicles used for riverbank landing improvement/construction in Site Preparation and Construction Phase.	■ Riverbank Landing	■ Eni ■ EPC Contractor
		5.3	■ Project's water use requirements could potentially impact surface water hydrology due to changes in water quantities and flow patterns.	■ Implement same measures as for Impact 4.3 related to accidental sedimentation and contamination to surface water quality in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
6.	Groundwater	6.1	■ The site may need to be drained to enable construction, resulting in the lowering of the water table. ■ Disturbance of contaminated soil by construction activities may lead to subsequent groundwater pollution through leaching.	■ Implement same measures as for impacts to 3. Soil and Topography, 4. Surface Water Quality, and 5. Hydrology in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor
		6.2	■ Draw-down from extraction of onsite groundwater wells could potentially impact groundwater levels.	■ Make sure that groundwater wells are installed to a suitable depth. ■ Only use approved and permitted groundwater wells.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				■ Keep a record of the water consumption and do not exceed the abstraction capacity of the well.		
		6.3	■ Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to biodiversity.	■ Implement same measures for Impact 4.4 related to inappropriate management of hazardous and non-hazardous waste impacting surface water quality in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
		6.4	■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact surface water quality, soil, and groundwater. Depending on project location, indirect impacts could occur to biodiversity.	■ Implement same measures for Impact 4.5 related to wastewater discharge impacting surface water quality in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
		6.5	■ Hazardous materials (such as fuels, oils, lubricants or solvents), if not managed appropriately, could accidentally spill or leak, directly impacting surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to biodiversity.	■ Implement same measures for Impact 4.6 related to inappropriate management of hazardous material impacting surface water quality in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
		6.6	■ Flooding of well pad could result in loss of containment of hazardous materials, oils and other harmful substances.	■ Implement same measures as for Impact 4.6 and 5.1, 5.2, 5.3 related to management of hazardous materials (related to soil and topography) and impacts to hydrology in Site Preparation and Construction Phase.	■ Well Sites	■ Eni ■ EPC Contractor
7.	Biodiversity and Ecosystem Services	7.1	■ Drainage works (e.g. stormwater drainage systems) and use of construction equipment and vehicles may have a negative indirect impact on flora and fauna	■ Implement same measures as for Impact 4.4, 4.5 and 4.6 related to management of hazardous materials (related to soil and topography) and impacts	■ Well Sites ■ Logistics Base ■ Access Roads ■ Riverbank Landing	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
		due to increased sediment loading of streams and rivers. ■ River sediments may be disturbed, resulting in loss of habitat at and around the riverbank landings. This may impact the native flora and fauna through direct clearing and habitat loss, as well as fragmentation of habitat and breeding area disturbance (should these be present).	to hydrology in Site Preparation and Construction Phase. ■ Minimize disturbance to river sediments when constructing/installing riverbank landings.		
	7.2	■ Potential harm to flora and fauna by physical destruction of habitats. ■ Vegetation may be cleared resulting in loss of habitat at and around the well locations and due to the requirement of civil works, e.g. access roads, levelling, laying and compaction for drilling preparation. This may impact the native flora and fauna through direct clearing and habitat loss, as well as fragmentation of habitat and breeding area disturbance.	■ Limit clearing of established vegetation (especially limited clearing of Htan or *Borassus flabellifer*), and other potential habitat areas to only the extent required for gathering fill material. Clearly mark the extent of areas to be cleared. ■ Limit clearance of natural vegetation and interference with natural drainage flows. ■ Minimise clearing of natural vegetation leaving in place smaller vegetation, topsoil, root stock, seeds and endangered or protected species. ■ Induction training for site personnel will include a mandatory segment on biodiversity. In this induction details of key requirements will be provided such as: - Access points, access restrictions, and potentially no-go areas - Ban on foraging, fishing and hunting;	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				- Protected plant and fauna species to be aware of; - Outline of vegetation clearance procedures including species not to cut, and the minimum size of tree that should be felled (20 cm diameter at breast height (dbh) following best practice guidance (Energy & Biodiversity Initiative, 2009); - What to do in the advent of disturbing species (both from an occupational health and biodiversity perspective); - Outline of vegetation clearing protocols (size of trees to be removed etc.); - Waste management system; - Ban on use of forest products; and - Requirements for washing of equipment when accessing or exiting the site.		
		7.3	■ Biodiversity could be impacted by both the destruction of habitat at the fill source location as well as due to deterioration of habitat if contaminated material is imported.	■ Implement same measures as for Impact 7.1 related to drainage work impacting biodiversity in Site Preparation and Construction Phase. ■ Consider validation sampling of imported fill material (same	■ Fill Source Location	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
			parameters as baseline sampling to check for contamination); Make sure that fill materials are obtained from approved or designated locations/areas.		
	7.4	■ Terrestrial fauna could be impacted from vehicle strikes. ■ Natural habitat or feeding ground of terrestrial animals has the potential to be damaged or destroyed due to the movement of project vehicles and equipment.	■ Implement traffic management plan (as discussed under impacts to Public Infrastructure). ■ Prohibit vehicles from moving offsite or off designated transportation routes onto surrounding land. ■ Raise awareness in the personnel and adequately train the drivers.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor
	7.5	■ Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to biodiversity. ■ Management of waste may impact the foraging behaviour of fauna on the site and increase the presence of invasive fauna species (such as rats and mice). ■ Terrestrial animals may be attracted to food wastes	■ Implement same measures as for Impact 4.4 related to inappropriate management of hazardous and non-hazardous waste impacting surface water quality in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base ■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
	7.6	■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact surface water quality, soil, and groundwater. Depending on project location, indirect impacts could occur to biodiversity. ■ Potential eutrophication from sewage/grey water spills.	■ Implement same measures as for Impact 4.5 related to wastewater discharge impacting surface water quality in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor

	Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
		7.7	■ Hazardous materials (such as fuels, oils, lubricants or solvents), if not managed appropriately, could accidentally spill or leak, directly impacting surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to biodiversity.	■ Implement same measures as for Impact 4.6 related to inappropriate management of hazardous material impacting surface water quality in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
		7.8	■ Flooding of well pad could result in loss of containment of hazardous materials, oils and other harmful substances.	■ Implement same measures as for Impact 4.6, 5.1, 5.2 and 5.3 related to management of hazardous materials (related to soil and topography) and impacts to hydrology in Site Preparation and Construction Phase. ■ Compact well pad to reduce the amount and rate of infiltration.	■ Well Sites	■ Eni ■ EPC Contractor
		7.9	■ Unauthorized/illegal fishing and hunting by workers could impact biodiversity. ■ Harvesting of plants and animals by workers.	■ Prohibit workers from foraging, fishing and hunting and raise awareness through training for all the personnel at site.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
Social and Health Impacts						
8.	Land/River Use and Livelihood (incl. Economic Displacement)	8.1	■ Potential disruption to existing land use due to land acquisition. ■ Project development could impact the existing local communities within the area through physical and economical displacement. This could lead to the need for economic compensation as livelihood could also be affected.	■ Undertake land acquisition in accordance with local laws and international best practice (such as International Finance Corporation Performance Standards). ■ Land take and vegetation clearance will be minimised to the extent possible both in terms of size and duration; and as such, when no further activities are planned, land should be returned to land owner; ■ Compensate stakeholders whose land is temporarily or permanently impacted during	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor

Resource/Receptor	Potential Impacts	Mitigation Measures	Location	Responsibility
		construction and operation using market price with a premium to compensate for the change and allow for restoration of the land to its original state for the logistic base area; ■ Prioritized stakeholders whose land is being impacted during construction phase in the recruitment process for unskilled position, in particular those whose land is permanently impacted. Training for these unskilled position should also be proposed to allow people with the lowest level of education/training to be engaged; ■ Engage a third party to develop resettlement action plans and livelihood restoration plans for those whose land is permanently impacted by the Project. ■ Compensate stakeholders whose crops is being impacted during site preparation and construction using market price identify by government led committee (including village heads). Compensation should be paid until land has been restored to its initial productive state; ■ Develop and implement a Stakeholder Engagement Plan that include measures to notify local stakeholders in advance of any particularly activities on land/river use. This will ensure that stakeholders can anticipate and appropriately respond to the change and limitation in their livelihood.		

Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
			■ Develop and implement a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities are affected by the Project activities.		
	8.2	■ Construction of well sites has the potential to change existing land use, including loss of residential land and structures on land, loss of productive land and crops, and loss of other previous land uses, and potential degradation of crops or surrounding land used for agriculture. ■ Potential impacts to land use due to temporary lay-down areas during site preparation and construction. ■ Potential degradation of surrounding water bodies used for fishing or aquaculture.	■ Compensate stakeholders whose crops is being impacted during site preparation and construction using market price identify by government led committee (including village heads). Compensation should be paid until land has been restored to its initial productive state; ■ Limit clearing of established vegetation areas to only the extent required for the Project. ■ Implement same measures as for Impacts 3, 4 and 5 (surface water quality, hydrology, and soil). ■ Land take and vegetation clearance will be minimised to the extent possible in terms of both size and duration; and as such, when no further activities are planned, land should be returned to land owner restoring it at its original status as much as possible. ■ Compensate stakeholders whose land is temporarily or permanently impacted during construction and operation using market price with a premium to compensate for the change and allow for restoration of the land to its original state for the logistic base area.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor

Resource/Receptor	Potential Impacts		Mitigation Measures	Location	Responsibility
			■ Develop and implement a Stakeholder Engagement Plan that include measures to notify local stakeholders in advance of any particularly activities on land/river use. This will ensure that stakeholders can anticipate and appropriately respond to the change and limitation in their livelihood. ■ Develop and implement a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities are affected by the Project activities.		
	8.3	■ Land use at source material site could be affected.	■ Make sure that fill materials are obtained from approved or designated locations/areas.	■ Fill Source Location	■ Eni ■ EPC Contractor
	8.4	■ Potential disruption to farming due to construction activities. ■ Potential impact to soils and agricultural land through compaction from construction activities	■ Limit transportation only to well pad, storage/accommodation area, and access roads, to avoid disturbance to surrounding land. ■ Prioritize impacted stakeholders in the recruitment process for unskilled positions. In particular, prioritize those whose land is permanently impacted. Training for these unskilled position should also be proposed to allow people with the lack of education/training to be engaged. ■ Engage a third party to develop resettlement action plans and livelihood restoration plans for those whose land is permanently impacted by the Project. ■ Develop and implement a Stakeholder Engagement Plan	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor

Resource/Receptor	Potential Impacts		Mitigation Measures	Location	Responsibility
			that include measures to notify local stakeholders in advance of any particularly activities on land/river use. This will ensure that stakeholders can anticipate and appropriately respond to the change and limitation in their livelihood. ■ Develop and implement a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities are affected by the Project activities.		
	8.5	■ Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to fisheries, land and river use, and community health and safety. ■ Additional strain may be placed on existing local waste management infrastructure.	■ Implement same measures as for Impact 4.4 in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
	8.6	■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to fisheries, land and river use, public infrastructure, and community health and safety.	■ Implement same measures as for Impact 4.5 related to wastewater discharge and contamination in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
		8.7	■ Potential impacts to land use and livelihood due to dust generating activities	■ Implement same measures as for Impact 1.1 and 1.2 related to dust, NO_x and SO_2 emission in Site Preparation and Construction Phase. ■ Develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities are affected by the Project activities.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ EPC Contractor
9.	Public Infrastructure and Utilities	9.1	■ Heavy equipment may damage existing roads. ■ Upgrade and construction of access road may disrupt local access for resident and business.	■ Construction equipment to use designated roads and Project area only, avoid traveling off roads and enforce speed limit. ■ Develop and implement a traffic management plan to minimize the impact experienced by road users as a result of the Project. The traffic management plan should be developed in consultation with local stakeholders. Stakeholders should be notified in advance of the Project commencing of traffic routes that will be utilised and, where known, periods of increased traffic volumes. Where possible, traffic movements will be coordinated so as to limit disruptions to local activities in accordance to the Company Traffic Management Plan. ■ Develop and implement a Stakeholder Engagement Plan as part of the Project. The plan should include measures to notify local stakeholders in advance of any particularly	■ Access Roads	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
			activities on public infrastructures. This will ensure that stakeholders can anticipate and appropriately respond to the change and limitation of uses. ■ The Project should also develop a Grievance Mechanism to collect grievances from local stakeholders whose regular use of public infrastructures and utilities is affected by the Project activities.		
	9.2	■ Increase in local road traffic due to presence of Project vehicles. ■ Potential damage to existing roadways due to use of heavy machinery and vehicles during construction. ■ Potential for increased safety risk from increase in traffic due to Project related vehicles (covered under Unplanned Events).	■ For access roads where there is increased traffic, stabilize with compact laterite, gravel, concrete or similar. ■ All Project vehicles shall use designated roads only, and avoid traveling off roads. ■ Implement driving safety standards as part of a Traffic Management Plan, including enforced speed limits. ■ Train the drivers about presence of sensitive traffic areas, e.g. location of schools, shrines, temples, mosques, health clinics, hospitals etc.in the project area and impose and enforce reduced speed limits for these areas. ■ Avoid haulage tasks during peak traffic periods and school drop-off and pick-up times. ■ Maintain pedestrian access wherever possible, including access to any settlements and other facilities. ■ Notify the local communities about proposed changes to local traffic access due to construction	■ Access Roads	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
			activities and clearly signal the changed traffic conditions. ■ Plan heavy traffic activities with local stakeholders to avoid peak hours, start or end of school hours or specific local activities (such as religious festival).		
	9.3	■ Project's water use requirements could potentially reduce the local water supply.	■ Only use approved and permitted water supplier and exploit wells with adequate permit. ■ If communities raise complaints regarding water supply impact, examine and address the issue with effective measures. Additionally, the complaint must be recorded in the grievance mechanism and followed up. ■ Consider using multiple water sources and at further distance if close proximities of project areas might experience water scarcity.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
	9.4	■ Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to fisheries, land and river use, and community health and safety. ■ Additional strain may be placed on existing local waste management infrastructure.	■ Implement same measures as for Impact 4.4 related to inappropriate management and disposal of hazardous or non-hazardous waste in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
		9.5	■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to fisheries, land and river use, public infrastructure, and community health and safety.	■ Implement same measures as for Impact 4.5 related to wastewater discharge and contamination in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ EPC Contractor
		9.6	■ Pressure on local infrastructure such as roads, hospitals, schools and services.	■ Provide trained personal in first aid permanently at well site e.g. supervisor ■ Liaise and coordinate with the nearest hospitals to transport patients in case of injury or accident. ■ Provide ambulance at well site/area of operations to send patients to hospital in case of emergency ■ Ensure that company medical services have sufficient capacity and capability to treat a reasonable amount of workers at the same time. ■ Prioritize the recruitment of unskilled position from Project SAoI to reduce number of transferring workers; ■ Develop and implement a Traffic Management Plan to minimize the impact experienced by road users as a result of the Project. The Traffic Management Plan should be developed in consultation with local stakeholders. Stakeholders should be notified in advance (see next measure) of the Project commencing, of traffic routes	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				that will be utilized and, where known, periods of increased traffic volumes. Where possible, traffic movements will be coordinated so as to limit disruptions to local activities; ■ Develop and implement a Stakeholder Engagement Plan as part of the Project. The plan should include measures to notify local stakeholders in advance of any particularly activities on public infrastructures. This will ensure that stakeholders can anticipate and appropriately respond to the change and limitation of uses; and ■ The Project should also develop a Grievance Mechanism to collect grievances from local stakeholders whose regular use of public infrastructures and utilities is affected by the Project activities.		
10.	Socio-Economy	10.1	■ Increased employment/income and procurement opportunities for people, business and services in surrounding area (positive impact).	■ Hire local labour as much as possible. Unskilled job for local people as a priority. ■ Ensure a fair hiring process. ■ Procurement of goods using local businesses whenever possible. ■ Use local sources of fill material that are obtained from approved or designated locations/areas. ■	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
		10.2	■ Use of local transportation services may have positive impacts to local economy.	■ Use local labour and transport services as much as possible. ■ Train the contractors dealing with transport to perform their activities according to Eni standards.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ EPC Contractor
11.	Cultural Heritage	11.1	■ Potential chance finding or destruction of archaeological sites if present. ■ Potential damage to nearby archaeological, cultural or religious resources from vibration of construction equipment.	■ Construction equipment to use designated roads and Project area only, avoid traveling off roads and enforce speed limit. ■ Implement same measures as for Impact 2.1 related to increase in noise and vibration in Site Preparation and Construction Phase. ■ The contractor during construction will monitor weekly the condition of any cultural heritage closest to the project site. If damage is done to the structure by project activities, compensation should be organised to restore the building to its state before the damage occur. ■ The contractor will develop the construction planning in discussion with the nearest temple/monastery in order to make sure that any Project activity near the monastery (e.g transport of large equipment) do not take place during special religious activities. ■ Develop and implement a Stakeholder Engagement Plan as part of the Project. The Project will also include a Grievance Mechanism to collect grievances	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				from local stakeholder affected by the Project activities. ■ A procedure for chance finds should be issued and training done to workers		
13.	Visual Landscape	13.1	■ Existing visual landscape will be altered due to the changed landforms during site preparation, as well as presence of numerous construction vehicles.	■ Limit the removal of trees and other natural features in the project areas to the strict minimum necessary; ■ Develop and implement a Stakeholder Engagement Plan as part of the Project. The plan should include measures to notify local stakeholders in advance of any particularly activities that would impact visual landscape. This will ensure that stakeholders can anticipate and appropriately respond to the change; and ■ The Project should also develop a Grievance Mechanism to collect grievances from local stakeholder regarding visual impacts.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ EPC Contractor
14.	Community Health and Safety	14.1	■ Potential health impacts due to dust, waste generated from construction activities.	■ Implement same measures as for Impact 1 air quality and Impact 4.4, 4.5 and 4.6 (hazardous and non-hazardous waste, wastewater and hazardous material respectively) in Site Preparation and Construction Phase. ■ Ensure that signs are put up around construction sites advising people of the risks associated with trespass. All signs should be in pictogram form to ensure those with low	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				levels of literacy to understand the signs. ■ Ensure that there is adequate fencing around construction site to minimise the risk of trespass. Fencing will be checked daily to ensure that it is in good condition and to look for any signs of entry. ■ Develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities. ■ A complementary occupational health and safety plan should be developed – to focus on managing potential issues that may affect the Project workforce. The plan should include measures to minimize the potential for the workforce to contract a communicable disease and subsequently introduce the disease in their home village/ community.		
		14.2	■ Increased incidence of traffic or river accidents from construction vehicle or vessel traffic and commuting (which is covered under Unplanned Events in ***Table 2.3***).	■ Refer to Unplanned Events section regarding impacts due to traffic accidents. ■ Plan heavy traffic activities with local stakeholders to avoid peak hours, start or end of school hours or specific local activities (such as religious festival). ■ The Project should develop a Traffic Management Plan covering vehicle safety, speed limits on roads, driver and passenger behaviour, use of drugs and alcohol, hours of	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ EPC Contractor

Resource/Receptor	Potential Impacts	Mitigation Measures	Location	Responsibility
		operation, rest periods and location of rest stops and accident reporting and investigations. ■ Require Project drivers to be trained in defensive driving within the previous 3 years. ■ All vehicles used for the project should be regularly serviced and maintained. ■ Local speed limits should be adhered to when travelling through communities by all Project related traffic. Such speed limits will have the added advantage of reducing dust emissions. ■ Undertake consultation with communities along key transport routes to inform them about the potential for increased traffic movements prior to any changes. ■ Develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities. ■ A complementary occupational health and safety plan should be developed – to focus on managing potential issues that may affect the Project workforce. The plan should include measures to minimize the potential for the workforce to contract a communicable disease and subsequently		

Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
			introduce the disease in their home village/ community. ■ Ensure that there is adequate fencing around construction site to minimise the risk of trespass. Fencing will be checked daily to ensure that it is in good condition and to look for any signs of entry		
	14.3	■ Potential impacts to community health if contaminated fill material affects any water resources.	■ Implement same measures as for impacts to soil, surface water quality waste management under land preparation activities. ■ Develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ EPC Contractor
	14.4	■ Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to fisheries, land and river use, and community health and safety. ■ Additional strain may be placed on existing local waste management infrastructure.	■ Implement same measures as for Impact 4.4 related to inappropriate management of hazardous and non-hazardous waste in Site Preparation and Construction Phase. ■ Develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ EPC Contractor
	14.5	■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to fisheries, land and river use, public infrastructure, and community health and safety.	■ Implement same measures as for Impact 4.5. ■ Develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
		14.6	■ Hazardous materials, if not managed appropriately, could accidentally spill or leak, directly impacting surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to fisheries, land and river use, and community health and safety.	■ Implement same measures as for Impact 4.6 related to management of hazardous material . ■ Develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ EPC Contractor
		14.7	■ Presence of workers from other areas may lead to increased risk of infectious diseases including sexual transmitted diseases. ■ Increase in risk of traffic accident. ■ Depending on location and community relationships, general disturbance and tension within the community due to worker presence.	■ Provide appropriate amenities at the workforce accommodation camp – e.g. recreational opportunities. ■ Develop and implement a Worker Code of Conduct for all employees, contractors and visitors directly related to the Project. This will be a contractual and enforced requirement for all staff and subcontractors. ■ Implement appropriate education on infectious and sexually transmitted diseases. ■ Survey and remove mosquito-breeding sources at camp site weekly or as appropriate (i.e. fog). ■ Training for all workers on the transmission routes and common symptoms of communicable diseases. This can help reduce the potential for workers to unknowingly transmit communicable diseases. This may also help to increase knowledge within Project SAoI – e.g. through the training of workers that have been sourced from the local area.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				■ Ensure proper and adequate health care infrastructure within project sites workers accommodation. ■ Provision of onsite health care and medical facilities, to ensure that basic medical attention and first aid treatment can be sought during the hours that the work is being undertaken at the Project site. This will also help reduce the potential pressure on local health care facilities. ■ Undertake pre-employment screening to ensure fitness for work. It is important that the pre-screening process does not result in discrimination, but instead is used as a tool to minimize the transmission of communicable diseases. ■ Ensure there is access to free condoms (including female condoms) at the worker camp to promote safe sexual practices. ■ Conduct information, education and communication campaigns amongst Project personnel on hygiene and sanitation. ■ Develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities ■ The Project should develop a Traffic Management Plan covering vehicle safety, speed limits on roads, driver and passenger behaviour, use of		

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				drugs and alcohol, hours of operation, rest periods and location of rest stops and accident reporting and investigations; ■ Require Project drivers to be trained in defensive driving within the previous 3 years; ■ All vehicles used for the project should be regularly serviced and maintained; ■ Local speed limits should be adhered to when travelling through communities by all Project related traffic. Such speed limits will have the added advantage of reducing dust emissions; ■ Undertake consultation with communities along key transport routes to inform them about the potential for increased traffic movements prior to any changes;		
15.	Occupational Health, Safety and Working Conditions	15.1	■ Construction and operation of any large Project poses health and safety risks to workers. These risks are present at almost every stage of site preparation, construction and drilling.	■ Implement same measure as for Impact 1, 2 and 4 (air quality, noise and surface water quality) in Site Preparation and Construction Phase. ■ Implement Eni's management plans relevant to occupational health and safety. ■ The Project will develop and implement a Construction Occupational Health and Safety Management Plan (OHSMP) in line with good industry practice and corporate policies and specific to the Project AoI and Project activities.	■ All Project Locations	■ Eni ■ EPC Contractor

Resource/Receptor	Potential Impacts	Mitigation Measures	Location	Responsibility
		■ The Contractor will prepare and implement a Health, Safety and Environmental Plan prior to commencing work (and to be approved by Company) that includes method statements for work activities, construction sequence and safety requirements and arrangements to carry out the activities; ■ Measures will be implemented to reduce the likelihood and consequence of the potential hazards. This shall include (but not limited to) the following hazards: - falling from height; - entanglement with machinery; - tripping over permanent obstacles or temporary obstructions; - slipping on greasy walkways; - falling objects; - asphyxiation; - explosion; - contact with dangerous substances; - electric shock; - variable weather conditions; - lifting excessive weights; and - traffic operations. ■ A Permit to Enter system will be established to ensure that only		

Resource/Receptor	Potential Impacts	Mitigation Measures	Location	Responsibility
		authorised persons gain entry to the construction site. Permit To Work (PTW) will be released to workers for each specific job to be performed and based on a risk assessment; ■ All persons working on the construction site will be provided information about risks on Site and arrangements will be made for workers to discuss health and safety with the Contractor. ■ All workers will be properly informed, consulted and trained on health and safety issues. ■ Personal Protective Equipment (PPE) shall be worn at all times on the construction Site. This shall include appropriate safety shoes, safety eyewear, and hard hats. Non-slip or studded boots will be worn to minimize the risk of slips. ■ Before starting work all the appropriate safety equipment and the first-aid kits will be assembled and checked as being in working order. Breathing apparatus if necessary will be tested at regular intervals in the manner specified by the manufacturer. ■ All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will beguarded. ■ All scaffolding will be erected and inspected in conformity with the Factories Act (1951) and the		

Resource/Receptor	Potential Impacts	Mitigation Measures	Location	Responsibility
		appropriate records maintained by the Contractor. ■ Required Personal Protective Equipment and gear (e.g. safety harness) will be provided for the specific job, considering the inherent risk (based on the site risk assessment). ■ Where sound levels cannot be reduced at the source, suitable hearing protection will be provided when noise levels indicate a Leq of more than 85 dB(A). When hearing protection is used, arrangements will be made to ensure the wearers can be warned of other hazards. Zones where the Leq might exceed prescribed limits, must be signalled. ■ The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations. ■ The contractor will comply with the IFC Performance Standard 2, local regulation and ILO conventions signed by Myanmar. ■ to ensure that no child and/or forced labour will be employed by the EPC contractor and its sub-contractors; ■ An Occupational, Health, and Safety (OHS) monitoring programme should be put in place to verify the effectiveness of prevention and control strategies and a workers		

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				grievance mechanism developed and implemented		
	15.2	■ Waste generated from the facility could potentially affect the health and safety conditions of workers if not managed appropriately.	■ Implement same measures as for Impact 4.4 related to inappropriate management of hazardous and non-hazardous material. ■ Implement Eni's management plans relevant to occupational health and safety and working conditions.	■ All Project Locations	■ Eni ■ EPC Contractor
	15.3	■ Wastewater discharge could potentially affect the health and safety conditions of workers if not managed appropriately.	■ Implement same measures as for Impact 4.5 related to wastewater discharge and contamination. ■ Implement Eni's management plans relevant to occupational health and safety and working conditions.	■ All Project Locations	■ Eni ■ EPC Contractor
	15.4	■ Hazardous materials present during construction could potentially affect the health and safety conditions of workers if not managed appropriately.	■ Implement same measures as for Impact 4.6 related to management of hazardous material. ■ Implement Eni's management plans relevant to occupational health and safety and working conditions.	■ All Project Locations	■ Eni ■ EPC Contractor
	15.5	■ Any large scale Project with a requirement for a large workforce, if not managed properly, has a risk of inadvertently supporting or utilizing child labor. ■ Any large scale Project with a requirement for a large workforce, if not managed properly, has a risk of causing unsafe or unfair working conditions.	■ Implement Eni's management plans relevant to occupational health and safety and working conditions. ■ Develop and monitor an internal standard to guide labour practices and apply this to supply chain to ensure that no child and/or forced labour will be employed by the EPC contractor and its sub-contractors.	■ All Project Locations	■ Eni ■ EPC Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				■ An Occupational, Health, and Safety (OHS) monitoring programme should be put in place to verify the effectiveness of prevention and control strategies and a worker grievance mechanism developed and implemented.		

Table 8.2: Mitigation Measures for Project during Drilling Operation Phase

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
Environmental Impacts						
1.	Air Quality and GHG Emissions	1.1	■ Increased combustion of fossil fuels from mobile sources used to transport rig. ■ Increased combustion of fossil fuels from stationary sources used for operation of the drilling rig. ■ Increased combustion of fossil fuels from power generator used on site.	■ Implement same measures as for Impact 1.1, 1.2 and 1.3 related dust, SO_2 and NO_x emission in Site Preparation and Construction Phase	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ Drilling Contractor
2.	Noise and Vibration	2.1	■ Increased noise and vibration from machinery and vehicles used to transport rig. ■ The use of equipment and machinery, particularly generators for the drilling rig, during 24 hour drilling activities will generate noise that may impact nearby residents. ■ Noise associated with the Drilling Operations has the potential to disturb local nocturnal species.	■ Implement same measures as for Impact 2.1 related to increase noise and vibration in Site Preparation and Construction Phase. ■ Ensure that generators of drilling rig are kept in enclosures to reduce sound output.	■ Well Sites	■ Eni ■ Drilling Contractor
3.	Soil and Topography	3.1	■ Solid waste, wastewater and hazardous material management and handling, if not managed appropriately during drilling activities, could directly impact soil as well as secondary receptors such as biodiversity and human that interact with the impacted soil.	■ Limit mixing of drilling fluids on site – pre-mix wherever possible. ■ Treat water used during Drilling Operations prior to any discharge off-site. ■ Store mud and cuttings in adequate containers and ensure appropriate offsite treatment and disposal. ■ Fully contain oil-based mud and recirculate where possible. ■ Regularly monitor cuttings pits to detect any potential loss of containment. ■ Drill cuttings and mud requiring disposal are to be fully contained and transported by authorized and permitted transport Service Company and permitted waste facility; ■ Drilling cuttings containing water-based mud (WBM) will be treated and managed	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				appropriately. The WBM will be temporarily stored in a dedicated pit and transported to the waste management area on the well pad for treatment by dehydration in order to separate the solid fraction from the water. The water can then be reused or discharged. ■ Drilling cuttings containing non-aqueous fluids (NAF) will be collected and treated offsite by an approved waste management facility. ■ Potentially contaminated run-off should be directed to sumps or evaporation pits, and treated prior to any discharge to surroundings. ■ Where discharge is required, effluent should be treated to meet water quality standards as per Myanmar's NEQG. ■ Provide concrete rig pad with drainage gutters to collect runoff to a suitably sized lined or concrete dirty water pit to collect water from rig pad with sediment and oil trap. Test water before discharge and treat or dispose as appropriate. ■ Monitor water level in dirty water pit regularly and maintain at least 0.3 m freeboard (not overflow). ■ Develop and implement controls and standard operating procedures for the use of hazardous substances to prevent spills and accidents. ■ All hazardous materials to be transported, stored and managed according to their SDS. ■ Appropriate spill contaminant kits are to be available on-site. ■ Conduct monitoring of water and soil quality in order to assess whether contamination has occurred.		
	3.2	■ Other impacts are related to drill cuttings being buried on-site which has the potential to contaminate the underlying and surrounding soil.		■ Store mud and cuttings in pits and ensure appropriate offsite treatment and disposal. ■ Drill cuttings and mud requiring disposal are to be fully contained and transported by authorized and permitted transport Service Company and permitted waste facility.	■ Well Sites	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				■ Drilling cuttings containing water-based mud (WBM) will be treated and managed appropriately. The WBM will be temporarily stored in a dedicated pit and transported to the waste management area offsite. ■ Drilling cuttings containing non-aqueous fluids (NAF) will be collected and treated offsite by an approved waste management facility.		
4.	Surface Water Quality	4.1	■ Impacts to surface water may originate from inappropriate management and handling of hazardous, non-hazardous waste, wastewater and hazardous material could contaminate surface water bodies.	■ Implement same measures as for Impact 3.5, 3.6, 3.7 and 3.8 related to impact to soil from inappropriate management of hazardous and non-hazardous waste, wastewater discharge and contamination, management of hazardous material and flooding of well pad during Site Preparation and Construction Phase	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor
5.	Hydrology	5.1	■ Project's water use requirements will impact surface water hydrology due to changes in water quantities and flow patterns.	■ Implement same measures as for Impact 4.3 related to impact to surface water quality from accidental sedimentation and contamination during Site Preparation and Construction Phase	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
		5.2	■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact hydrology through erosion or alteration of drainage patterns.	■ Implement same measures as for Impact 3.5, 3.6 and 3.7 related to impact to soil from inappropriate management of hazardous and non-hazardous waste, wastewater discharge and contamination and management of hazardous material during Site Preparation and Construction Phase	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor
6.	Groundwater	6.1	■ Impacts to groundwater from accidental releases of fluids from drill sleeve.	■ Make sure well design allows for isolation of aquifers and shallow gas from well bore.	■ Well Sites	■ Eni ■ Drilling Contractor
		6.2	■ Impacts to groundwater may be from water use for the project needs, impacting groundwater availability depending on source and quantity of water required during Drilling Operation.	■ Make sure that groundwater wells are installed to a suitable depth (at least 5 m). ■ Only use approved and permitted groundwater wells and keep track of abstraction and of water parameters.	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor
		6.3	■ Drilling operation activities during solid waste, wastewater and hazardous material management and handling, if not managed appropriately, could directly impact soil as well as secondary receptors such as biodiversity and human that interact with the impacted soil. ■ Other impacts are related to drill cuttings being buried on-site which has the potential to contaminate the underlying and surrounding soil and henceforth the associated groundwater bodies.	■ Implement same measures as for Impact 3.5, 3.6, 3.7, 4.4, 4.5 and 4.6 related to impact to soil from inappropriate management of hazardous and non-hazardous waste, wastewater discharge and contamination and management of hazardous material and impact to surface water from inappropriate management of hazardous and non-hazardous material, wastewater discharge and contamination and management of hazardous materials during Site Preparation and Construction Phase. ■ Implement same measures as for Impact 3.1 and 3.2, in Drilling Operation Phase.	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor
7.	Biodiversity and Ecosystem Services	7.1	■ Drilling activities will cause impacts from noise and vibration, as well as light contamination, which may negatively influence the distribution and habits of endemic or endangered fauna, in particular avifauna, which may avoid feeding grounds and usage of certain corridors due to disturbance.	■ Implement directional lighting to reduce light spill to species and keep light intensity as low as possible. ■ Comply with Eni's relevant EHS Policies, including: – AMTE-TG-008_Illumination Assessment Mitigation Measures.	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
	7.2	■ The development of new access roads, as well as increased traffic on existing roads, presents a risk of accidental mortality or injury to fauna as a result of collision with moving vehicles.	■ Work areas will be clearly demarcated and any activities outside these areas will be prohibited. ■ Prohibit vehicles from moving offsite or off the designated transportation routes onto surrounding land. ■ Restrict speed of vehicle to reduce risk of collision. ■ Include in the contract requirement the clause of avoiding works during breeding seasons in areas for which IUCN listed species have been recorded.	■ Access Roads	■ Eni ■ Drilling Contractor
	7.3	■ Actions during the drilling phase can potentially result in accidental releases or spills of contaminated material, including but not limited to NAF drilling fluids or associated drilling wastes, which can be toxic to flora and fauna.	■ Biosecurity during all phases of the Project will be ensured by washing all equipment to remove mud, seeds and other potential pathogens to ensure no invasive species or pathogens are introduced into the area (see IPIECA alien invasive species guidelines (IPIECA, 2010). ■ Limit mixing of drilling fluids on site – pre-mix wherever possible. ■ Store mud and cuttings in pits and ensure appropriate offsite treatment and disposal. ■ Fully contain oil-based mud and recirculate where possible. ■ Regularly monitor cuttings pits to detect any potential loss of containment. ■ Drill cuttings and mud containing non-aqueous fluids (NAF) are to be fully contained and transported by authorized and permitted transport Service Company and permitted waste facility. ■ Drilling cuttings containing water-based mud (WBM) will be treated and managed appropriately. ■ Treat water used during Drilling Operations prior to any discharge off-site, or dispose to licensed waste management contractor (i.e. DOWA, as discussed in ***Section 4***). Where	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
			discharge is required, effluent shall be treated to meet water quality standards as per Myanmar NEQG. ■ Comply with Eni's relevant EHS Policies, including: - AMTE TG 012_Sustainable-Water-Management-for-Upstream-Sector. - AMTE-TG-013_BES. ■ Develop a response plan to ensure that spills into waterways and onto roads are dealt with on a timely basis ■ Implement protective and containment procedures to remediate the spill; and ■ Spill and mitigation efforts are to be reported and well documented.		
	7.4	■ Labour influx and worker accommodation in work camps may lead to unauthorized hunting and harvesting of plants and animals by workers which could impact biodiversity.	■ Prohibit workers from foraging, fishing and hunting.	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor
	7.5	■ Ecosystem services include provisioning services such as use of water, which may be temporarily affected by the project activities.	■ Prohibit workers from foraging, fishing and hunting. ■ Limit interference with natural drainage flows. ■ Implement an Erosion and Sediment Control Plan. ■ Include in the contract requirement to avoid works during breeding seasons in areas for which endangered or endemic IUCN listed species have been recorded.	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor
	7.6	■ Inappropriate management and disposal of hazardous or non-hazardous waste and wastewater could lead to impacts to surface water quality and subsequently impact aquatic receptors in eg	■ Implement same measures as for Impact 3.1, 3.2, 3.3, 3.4, 3.5, 3.6 and 3.7 related to impact to soil and topography from earthworks, soil erosion, excavation, sourcing of fill material, inappropriate management and disposal of hazardous and non-hazardous waste,	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
			nearby river and streams and eutrophication may potentially occur. ■ Other impacts are related to drill cuttings being buried on-site which has the potential to draw in invasive species or disrupt the surrounding habitat.	wastewater discharge and management of hazardous material during Site Preparation and Construction. ■ Limit mixing of drilling fluids on site – pre-mix wherever possible. ■ Treat water used during Drilling Operations prior to any discharge off-site, or dispose to licensed waste management contractor. Where discharge is required, effluent shall be treated to meet water quality standards as per Myanmar NEQG. ■ Store mud and cuttings in pits and ensure appropriate offsite treatment and disposal. ■ Fully contain oil-based mud and recirculate where possible. ■ Drill cuttings and mud containing non-aqueous fluids (NAF) are to be fully contained and transported by authorized and permitted transport Service Company and permitted waste facility. ■ Drilling cuttings containing water-based mud (WBM) will be treated and managed appropriately.		
		7.7	■ Impacts include potentially restricting access to areas and an impact to cultural services due to limited access to nearby habitat.	■ Implement same measures as for Impacts 12.1 during Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni ■ Drilling Contractor
Social and Health Impacts						
8.	Land/River Use and Livelihood (incl. Economic Displacement)	8.1	■ Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to surface water quality, soil, and groundwater. Depending on well location, secondary impacts could occur to fisheries, land and river use, and community health and safety.	■ Implement same measures as for Impact 4.4 related to surface water quality from inappropriate management and disposal of hazardous and non-hazardous material in Site Preparation and Construction Phase. ■ Develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities are affected by the Project activities.	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
			■ Additional strain may be placed on existing local waste management infrastructure.	■ Ensure local licensed facilities for waste management have sufficient excess capacity to be able to handle and manage (both treatment and disposal) the waste produced by the project.		
		8.2	■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact surface water quality, soil, and groundwater. Depending on well location, secondary impacts could occur to fisheries, land and river use, public infrastructure, and community health and safety.	■ Implement same measures as for Impact 4.5 related to surface water quality from wastewater discharge and contamination in Site Preparation and Construction Phase. ■ Develop and implement a Stakeholder Engagement Plan and a Grievance Mechanism to collect grievances from local stakeholder whose agricultural activities are affected by the Project activities.	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor
9.	Public Infrastructure and Utilities	9.1	■ The use of heavy vehicles during rig mobilization will cause vibration which might affect local infrastructure such as roads and bridges.	■ Develop and implement a traffic management plan to minimize the impact experienced by road users as a result of the Project. The traffic management plan should be developed in consultation with local stakeholders. Stakeholders should be notified in advance of the Project commencing about traffic routes that will be utilized and, where known, periods of increased traffic volumes. Where possible, traffic movements will be coordinated so as to limit disruptions to local activities; ■ Regularly check the condition of the roads on planned routes and repair when necessary. ■ Continue to implement the Stakeholder Engagement Plan and Grievance Mechanism developed for the construction phase as part of the Project.	■ Access Roads ■ Surrounding Communities	■ Eni ■ Drilling Contractor
		9.2	■ Additional influx of transport vehicles will increase the road traffic and potential road damages.	■ Develop and implement a traffic management plan to minimize the impact experienced by road users as a result of the Project. The traffic management plan should be developed in consultation with local stakeholders. Stakeholders should be notified in advance of the Project commencing of traffic routes that will be utilised and, where known, periods of	■ Access Roads ■ Surrounding Communities	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				increased traffic volumes. Where possible, traffic movements will be coordinated so as to limit disruptions to local activities; ■ Regularly check the condition of the roads on planned routes and repair when necessary. ■ Continue to implement the Stakeholder Engagement Plan and Grievance Mechanism developed for the construction phase as part of the Project.		
	9.3	■ The water will be extracted from the water wells drilled during construction phase with a potential risk to impact water availability for local stakeholders if the groundwater tables used by the Project are the same as the ones used by local villages.		■ Continue to implement the Stakeholder Engagement Plan and Grievance Mechanism developed for the construction phase as part of the Project. ■ Implement same measures as for Impact 6.2 in Drilling Operation Phase.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ Drilling Contractor
	9.4	■ Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to surface water quality, soil, and groundwater. Depending on well location, secondary impacts could occur to fisheries, land and river use, and community health and safety. ■ Additional strain may be placed on existing local waste management infrastructure.		■ Continue to implement the Stakeholder Engagement Plan and Grievance Mechanism developed for the construction phase as part of the Project. ■ Implement same measures as for Impact 4.4 related to surface water quality from inappropriate management and disposal of hazardous and non-hazardous material in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ Drilling Contractor
	9.5	■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact surface water quality, soil, and groundwater. Depending on project location, secondary impacts could occur to fisheries, land and river use, public infrastructure, and community health and safety.		■ Continue to implement the Stakeholder Engagement Plan and Grievance Mechanism developed for the construction phase as part of the Project. ■ Implement same measures as for Impact 4.5 related to surface water quality from wastewater discharge and contamination in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
		9.6	■ Increase of labour influx and worker accommodation will put a greater pressure on the existing public infrastructures and utilities.	■ Ensure that company medical services have sufficient capacity and capability to treat a reasonable amount of workers at the same time; ■ Prioritize the recruitment of unskilled position from Project SAoI to reduce number of transferring workers. Workers recruited during construction phase should be retained in the work force when possible. ■ Continue to implement the Stakeholder Engagement Plan and Grievance Mechanism developed for the construction phase as part of the Project. ■ Regularly check the condition of the roads on planned routes and repair when necessary. ■ Ensure water well have the adequate capacity to supply water to the project without any lack of the availability to the community or worsening of the water quality; perform a monitoring of the wells and other water sources to verify it.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ Drilling Contractor
		9.7	■ Positive Impact from new constructed road	■ To maximize the positive impact the road should set up proper traffic signs and equipment to ensure traffic safety on the new road; and ■ Enforce speed limits in the project area ■ Cooperate with the local authority to determine the local speed limited on the new road.	■ Access roads ■ Surrounding Communities	■ Eni ■ Drilling Contractor
10.	Socio-Economy	10.1	■ A number of potential positive impacts, including: - Provides training opportunities. - Provides job opportunities. - Increased demand for services and logistics. - Improved capacity of local human resources (training etc.).	■ N/A – positive measure.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
			- Improvement in local economic structure.			
		10.2	■ Increased local employment (positive impact) ■ Increased local businesses activities (purchase of goods and services by workers).	■ Hire local labour as much as possible for the cleaning, maintenance and security of the worker accommodations. ■ Procure goods and equipment for the worker accommodation and drilling site from local businesses as much as possible.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ EPC Contractor
11.	Cultural Heritage	11.1	■ Rig transportation and mobilization to site will cause vibration through the transport route which might impact the nearby local cultural heritage sites. ■ Drilling and casing activities will cause vibration which similarly to construction phase might affect nearby local cultural heritage sites.	■ The Project staff will monitor weekly the condition of any cultural heritage closest to the project site. If any damage is done to the structure of the site by project activities, compensation should be organised to restore the building to its condition before the damage occur. ■ Develop the operation planning in discussion with the nearest temple/monastery in order to make sure that any Project activity (in particular the rig mobilization) near the monastery (e.g transport of large equipment) do not take place during special religious activities. ■ Eni will develop and implement a Stakeholder Engagement Plan as part of the Project. The Project will also include a Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities	■ Access Roads ■ Well Sites	■ Eni ■ Drilling Contractor
12.	Visual Landscape	12.1	■ Potential impacts to visual envelope and landscape due to the presence of the rig and lighting at night time.	■ Illuminate the area as necessary, keeping the intensity as low as possible and direct/focus lighting on well pad areas only.	■ Well Sites ■ Surrounding Communities	■ Eni ■ Drilling Contractor
13.	Community Health and Safety	13.1	■ Potential impacts from operation of transportation vehicles during rig mobilization to site concerning safety of the surrounding community along the transport route.	■ Ensure that signs are put up around the site advising people of the risks associated with trespass. All signs should be in diagram form to ensure those with low levels of literacy understand the signs. ■ Fencing will be checked daily to ensure that it is in good condition and to look for any signs of entry.	■ Access Roads ■ Surrounding Communities	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
				■ Keep the Stakeholder Engagement Plan and the Grievance Mechanism to collect grievances from local stakeholder affected by the Project activities ■ Ensure that signs are put up around the site advising people of the risks associated with trespass. All signs should be in diagram form to ensure those with low levels of literacy understand the signs.		
		13.2	■ Nuisance lighting from night operations may disturb local residents.	■ Implement same measures as for Impact 12.1 related to visual landscape from night time lighting impacting the visual landscape in Drilling Operation Phase.	■ Well Sites ■ Surrounding Communities	■ Eni ■ Drilling Contractor
		13.3	■ Personnel movements to and from location (crew changes, etc.) throughout the day will require multiple trips by minibuses or vans which may increase the likelihood of accidents.	■ Implement same measures as for Impact 13.1 related to community and safety from operation of transportation vehicles in Drilling Operation Phase.	■ Access Roads	■ Eni ■ Drilling Contractor
		14.4	■ The water will be extracted from the water wells drilled during construction phase with a potential risk to impact water availability for local stakeholders if the groundwater tables used by the Project are the same as the ones used by local villages.	■ Implement same measures as for Impact 9.3 (groundwater use) in Drilling Operation Phase.	■ Well Sites ■ Surrounding Communities	■ Eni ■ Drilling Contractor
		14.5	■ Potential risks to community health and safety due to deterioration of air quality from power generators.	■ Regularly inspect and maintain vehicles, engines and generators operating at optimal efficiency. ■ Consider using clean diesel (low sulphur diesel). ■ Shut down generators, compressors, and other equipment when not in use. ■ Where possible, use energy efficient devices and energy conserving technologies to reduce overall energy use.	■ Well Sites ■ Logistics Base ■ Access Roads ■ Surrounding Communities	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
	14.6	■ Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to surface water quality, soil, and groundwater. ■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact surface water quality, soil, and groundwater.	■ Implement same measures as for Impact 3.1 and 3.2 (impacts to soil and topography) in Drilling Operation Phase.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ Drilling Contractor
	14.7	■ Presence of workers from other areas may lead to increased risk of infectious diseases including sexual transmitted diseases.	■ Training for all workers on the transmission routes and common symptoms of communicable diseases. This can help reducing the potential for workers to unconsciously be transmitting communicable diseases. This may also help to increase knowledge within Project SAoI – e.g. through the training of workers that have been sourced from the local area. ■ Undertake pre-employment screening to ensure fitness for work. It is important that the pre-screening process does not result in discrimination, but instead is used as a tool to minimize the transmission of communicable diseases. ■ Develop and implement a Workforce Code of Conduct with specific measures that target anti-social behaviour, such as becoming involved with commercial sex workers. Any employee or Contractor found in violation of the Code shall face disciplinary measures. ■ Keep the Stakeholder Engagement Plan and the Grievance Mechanism updated to collect grievances from local stakeholder affected by the Project activities.	■ Well Sites ■ Logistics Base ■ Surrounding Communities	■ Eni ■ Drilling Contractor
	14.8	■ Environmental releases (dust and noise) may affect community health.	■ Implement same measures as for impacts to air quality and noise.	■ Well Sites ■ Logistics Base	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
					■ Access Roads	
		14.9	■ Depending on location and community relationships, general disturbance and tension within the community due to worker presence.	■ Develop and implement a Workforce Code of Conduct with specific measures that target anti-social behaviour, such as becoming involved with commercial sex workers. Any employee or Contractor found in violation of the Code shall face disciplinary measures. ■ Keep the Stakeholder Engagement Plan and the Grievance Mechanism updated to collect grievances from local stakeholder affected by the Project activities.	■ Surrounding Communities	■ Eni ■ Drilling Contractor
15.	Occupational Health, Safety and Working Conditions	15.1	■ Potential impacts from the operations of transportation during rig mobilization to site concerning safety of the operators.	■ Implement same measures as for Impact 15 in Site Preparation and Construction Phase. ■ The Occupational Health and Safety Management Plan (OHSMP) will be updated to integrate the new potential risks of the drilling operation and be linked to the Emergency Response Plan for unplanned event. ■ Maintained the grievance mechanism for workers.	■ All Project Locations	■ Eni ■ Drilling Contractor
		15.2	■ Potential impacts from drilling operations concerning safety of the operators.	■ Implement same measures as for Impact 15.1 related to occupational health, safety and working condition from operations of transportation vehicles in Drilling Operation Phase.	■ All Project Locations	■ Eni ■ Drilling Contractor
		15.3	■ Personnel movements to and from location (crew changes, etc.) throughout the day will require multiple trips by minibuses or vans which may increase the likelihood of accidents.	■ Implement same measures as for Impact 15.1 related to occupational health, safety and working condition from operations of transportation vehicles in Drilling Operation Phase.	■ All Project Locations	■ Eni ■ Drilling Contractor
		15.4	■ Potential risks to community health and safety due to deterioration of air quality from power generators.	■ Implement same measures as for Impact 15.1 related to occupational health, safety and working condition from operations of transportation vehicles in Drilling Operation Phase.	■ All Project Locations	■ Eni ■ Drilling Contractor

Resource/Receptor		Potential Impacts		Mitigation Measures	Location	Responsibility
		15.5	■ Inappropriate management and disposal of hazardous or non-hazardous waste could lead to impacts to surface water quality, soil, and groundwater. ■ Wastewater discharge and site runoff, if not managed appropriately, could directly impact surface water quality, soil, and groundwater.	■ Implement same measures as for Impact 15.1 related to occupational health, safety and working condition from operations of transportation vehicles in Drilling Operation Phase.	■ All Project Locations	■ Eni ■ Drilling Contractor

Table 8.3: Mitigation Measures for Project during Well Testing and Abandonment Phase

	Resource/Receptor		Potential Impacts	Mitigation Measures	Location	Responsibility
Environmental Impacts						
1.	Air Quality and GHG Emissions	1.1	■ Emission of air pollutants and GHG due to flaring and well testing. ■ Emissions during well abandonment, which would be similar to those during Site Preparation and Construction, but on a smaller scale.	■ Implement same measures as for Impact 1.1, 1.2 and 1.3 related to air quality from dust, SO_2 and NO_x emission in Site Preparation and Construction Phase. ■ Monitor flare performance to maximise efficiency of flaring operation. ■ Ensure sufficient compressed air provided to oil burner for efficient flaring. ■ Flare equipment appropriately inspected, certified and tested prior to operations. ■ Flare equipment appropriately maintained and monitored throughout well testing operations. ■ The equipment is designed, built and operated in compliance to appropriate codes and standards and appropriately certified. ■ Keep appropriate emergency stop mechanisms in place to stop testing in case of emergency.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni
2.	Noise and Vibration	2.1	■ Potential impacts from noise to surrounding receptors from well testing and abandonment	■ Implement same measures as for Impact 2.1 related to impact from noise and vibration in Site Preparation and Construction Phase.	■ Well Sites ■ Logistics Base ■ Access Roads	■ Eni

Table 8.4: Mitigation Measures for Impacts due to Unplanned Events

Event	Potential Impacts	Mitigation Measures	Location	Responsibility
Vehicle Collision	■ Increased traffic volume in Project area may potentially increase risk of accidents with local community. ■ Secondary impact from the spill of oil or hazardous materials from vessel entering to watercourses or coming into contact with habitat. ■ Potential obstructions to traffic due to collisions or accidents. ■ Vehicle collision could affect the community health and safety. ■ All accidents for the Project pose health and safety risks to workers.	■ Implement driving safety standards and enforced speed limits; ■ Provide training to drivers, including training the drivers about presence of sensitive traffic areas, e.g. location of schools, shrines, pagodas, temples, mosques, health clinics, hospitals etc. in the Project Area and impose and enforce reduced speed limits for these areas; ■ Avoid haulage tasks during peak traffic periods and school drop-off and pick-up times. ■ Maintain pedestrian access wherever possible, including access to any settlements and other facilities. ■ Notify the local communities about proposed changes to local traffic access due to construction activities and providing clear signage of changed traffic conditions. ■ Use only properly licensed drivers and transport companies. ■ Vehicles operating in the area on behalf of the company must be fitted with In Vehicle Monitoring Systems (IVMS); ■ Implement “No Night Driving Policy” and foresee breaks for long travels. ■ All Project vehicles shall use designated roads only, and avoid traveling off roads. ■ Implement driving safety standards as part of a Traffic Management Plan, including enforced speed limits. ■ Implement Eni’s relevant policies and procedures, including: - Emergency Response Plan and Strategy; - pol HSE 001 Eni Myanmar r02 - HSE Policy; - pol HSE 002 Eni Myanmar r02 - Driving Policy; - pol HSE 003 Eni Myanmar r02 - Alcohol, Smoking and Drugs Policy - pro HSE 017 2016 r00 - Land Transportation; and - Any other applicable management plans relevant to occupational health and safety and working conditions.	■ All Project Locations	■ Eni

Event	Potential Impacts	Mitigation Measures	Location	Responsibility
Accidental Fuel and Chemicals Spills and Leaks	■ Accidental leaks or spills of oil, fuel, or other hazardous materials could potentially pollute surface waters. ■ Soil may be contaminated by pollution from spills or leaks of fuel, oil and other hazardous materials. ■ Leaching of contaminated soil may lead to subsequent groundwater pollution. ■ Potential harm to aquatic and terrestrial flora and fauna due to spills of oil, fuel, cement or other hazardous substances entering watercourses or coming into contact with habitat. ■ Potential secondary impacts to fisheries due to reduction in fish population from pollution of rivers. ■ Accidental spills or leaks of hazardous materials from the Project could result in indirect impacts to community health and safety due to contamination of drinking water or food. ■ All accidents for the Project pose health and safety risks to workers. ■ Accidents, exposure to air pollutants, dust, or noise, water contaminated by accidental spills,. ■ Increased stress on local health care facilities.	■ Store chemicals, fuels, and lubricating oil in a secured storage area with impervious (cement or plastic sheet) floor and bund wall and according to SDS. ■ Handle all chemicals according to their SDS. ■ Comply with Eni's Guidelines-for-Oil-Spill-Contingency-Planning; ■ Provide training and conduct spill exercises. ■ Provide appropriate medical care, clean-up, and file incident or accident reports. ■ Provide spill kits onsite and adequate PPEs to workforce for minor spills ■ Implement Eni's management plans relevant to occupational health and safety and working conditions. ■ Implement Eni's Emergency Response Plan. ■ Use a Shipboard Oil Pollution Emergency Plan (SOPEP) and/ or Oil Spill Response Plan in place for all barges/vessels involved in the project activities.	■ All Project Locations	■ Eni
Wellhead Blowout	■ An uncontrolled well event could result in heat, fire or explosion, potentially impacting flora and fauna surrounding the Project site, as well as posing risks to public health and worker health and safety.	■ Carefully plan Drilling Operation by identifying shallow gas hazards, using high quality materials for well construction, using standard drilling and well control standard operating procedures, and using proper drilling mud formulation with additives if necessary (well kill fluids, loss control and weighting agents). ■ Install blowout preventer (BOP) stacks and shear rams; ■ Test safety devices prior to start-up for function and integrity. ■ Continuously monitor pressure in the well and recycled mud during drilling. ■ Provide high-pressure water-spray dousing system on drilling rig. ■ Provide blow out response procedure plan in addition workers will be trained about this plan before start Drilling Operation.	■ All Project Locations	■ Eni

Event	Potential Impacts	Mitigation Measures	Location	Responsibility
		■ Provide warning sign and firefighting equipment during Drilling Operation. ■ Provide fire/muster drill plan and conduct regular drills. ■ Implement Eni's Emergency Response Plan and Strategy. ■ Comply with opi_sg_hse_040-ups-r01-HSE Unsafe Condition and Unsafe Act. ■ Undertake drilling with international best practice safety procedures as per API and all applicable ENIs policies and standards. ■ Install a valve system (Christmas Tree) around the mount of the well in order to maintain petroleum pressure of the well at a suitable level. ■ Train employees on emergency procedures and induct all who are accessing the site. ■ Install alarms and windsocks (to be audible and visible from whole site). ■ Always check the pressure in the well and recycled mud. ■ Implement applicable Eni Standards and Guidelines.		
Fire and Explosion (other than wellhead blowout)	■ Potential gas release and/or ignition could result in fire or explosion, potentially impacting flora and fauna surrounding the Project site, as well as posing risks to public health and worker health and safety. ■ A fire or explosion could result in the unplanned or uncontrolled release of gases from the wells, potentially impacting air quality. ■ A fire or explosion could result in the unplanned or uncontrolled release of greenhouse gases from the wells. ■ A fire or explosion could be a source of significant noise, vibration and light, and may also cause secondary impacts through destruction or damage to facilities at the well site. ■ Potential for secondary impacts to surface water quality due to damage of infrastructure, resulting in releases of hazardous substances to waterways. ■ Potential for secondary impacts to soil or groundwater due to damage of infrastructure,	■ Provide warning signage. ■ Provide medic, first aid kit and first aid room at well site. ■ Pre-communicate and coordinate with local firefighting brigade/station. ■ Implement Eni's Emergency Response Plan and Strategy. ■ Implement applicable Eni Standards and Guidelines. ■ Undertake all testing and commissioning, as well as abandonment works as required to applicable API international standards. ■ Implement the recommended mitigation measures for Well Blowouts. ■ Restrict smoking to controlled areas only. ■ Conduct fire training and response drills. ■ Obtain map and route of existing gas pipelines along proposed access routes (if applicable). ■ Multiple mechanical barriers and bridge plugs shall be set into the abandoned well.	■ All Project Locations	■ Eni

Event	Potential Impacts	Mitigation Measures	Location	Responsibility
	■ resulting in releases of hazardous substances to soil (and subsequent leaching to groundwater). ■ A fire or explosion could result in intense heat, smoke, and unplanned or uncontrolled release of gases, potentially impacting flora and fauna surrounding the Project site. ■ Potential secondary impacts to fisheries due to reduction in fish population from pollution of rivers. ■ A fire or explosion could result in intense heat, smoke, and unplanned or uncontrolled release of gases, potentially impacting community health and safety.	■ Hydraulic barrier(s) should be incorporated into the design of the abandonment. ■ The well should be sealed and capped at the surface.		
Natural Disasters	■ Summer thunderstorm may impact to worker in project area, damage structure and/or project's property ■ Flooding has potential to disrupt land translation and ultimately stop construction activities ■ Potential risk of earthquakes throughout certain areas of Myanmar.	■ Eni's Emergency Response Plan (described further in ***Appendix 7***) should collaborate/integrate with the Disaster Management Plan of Magway Province during emergency situation; ■ The neighborhood communities should be made aware of the evacuation plan and should prepare ward level disaster response plans; ■ Mitigation measures for other Unplanned Events (including blowout and fire and explosion) are also applicable; ■ Drilling pad structure and equipment design must be durable for heavy summer thunderstorm. ■ Build up well pad and access roads higher than historical flood. ■ Avoid construction of well site and access roads in areas that may flood. ■ Check weather forecast daily to ensure there are no major storms or weather events foreseen which could affect the safety of Project activities. ■ Implement applicable Eni Standards and Guidelines, including any relevant to sever weather plans.	■ All Project Locations	■ Eni

8.4 Monitoring Program

As detailed in the Myanmar's Environmental Quality Guidelines, *"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."*

Monitoring will be required in order to demonstrate compliance with legal limits (i.e. Myanmar's Environmental Quality (Emission) Guidelines), and Eni's Project requirements, and will also provide verification of the overall design and effectiveness of the implemented mitigation/control measures. Details of the recommended environmental monitoring program are presented in ***Table 8.5***.

The monitoring program is based on comparison of physical environmental quality parameters with those captured during the environmental baseline sampling program of the EIA Study. Therefore, the locations and parameters are aligned with those from the baseline sampling program from the Project's Scoping Report, and complemented with any additional requirements as per Myanmar's Environmental Quality Guidelines.

Note that this section focuses solely on monitoring of environmental quality. Compliance monitoring (such as auditing and reporting requirements) are discussed in ***Section 8.5*** of the EIA Report.

Table 8.5: Recommended Environmental Monitoring throughout the Project

Resource	Location	Proposed Parameters	Monitoring Frequency
Air Quality (Ambient)	■ Sampling should be conducted at the same locations as for baseline sampling, in order to provide direct comparison. ■ In the case of community complaints, at the location of complaint.	**Parameters:** ■ Nitrogen dioxide ■ Ozone ■ Particulate matter PM10 ■ Particulate matter PM 2.5 ■ Sulfur dioxide ■ Wind Speed, Wind Direction, Relative Humidity, Temperature	■ Once after completion of Construction and Site Preparation ■ Once after completion of Drilling Operations ■ Once after completion of all Project site clearance and demobilization ■ In the event of any community complaints
Noise (Ambient)	■ Sampling should be conducted at the same locations as for baseline sampling, in order to provide direct comparison. ■ In the case of community complaints, at the location of complaint.	**Parameters:** ■ One Hour LAeq (dBA)	■ Once after completion of Construction and Site Preparation ■ Once after completion of Drilling Operations ■ Once after completion of all Project site clearance and demobilization ■ In the event of any community complaints
Surface Water Quality (Ambient)	■ Sampling should be conducted at the same locations as for baseline sampling, in order to provide direct comparison. ■ In the case of community complaints, at the location of complaint.	**Parameters:** ■ 5-day Biochemical oxygen demand ■ Ammonia ■ Arsenic ■ Cadmium ■ Chemical oxygen demand ■ Chlorine (total residual) ■ Chromium (hexavalent) ■ Chromium (total) ■ Copper ■ Cyanide (free) ■ Cyanide (total) ■ Fluoride ■ Iron ■ Lead ■ Mercury ■ Nickel	■ Once after completion of Construction and Site Preparation ■ Once after completion of Drilling Operations ■ Once after completion of all Project site clearance and demobilization ■ In the event of any community complaints

Resource	Location	Proposed Parameters	Monitoring Frequency
		■ Oil and grease ■ pH ■ Phenols ■ Selenium ■ Silver ■ Sulphide ■ Temperature ■ Total coliform bacteria ■ Total phosphorus ■ Total suspended solids ■ Zinc ■ Total nitrogen ■ In Situ Test (pH DO, ORP, EC, TDS, Temperature)	
Groundwater Quality (Ambient)	■ Sampling should be conducted at the same locations as for baseline sampling, in order to provide direct comparison. ■ In the case of community complaints, at the location of complaint.	**Parameters:** ■ 5-day Biochemical oxygen demand ■ Ammonia ■ Arsenic ■ Cadmium ■ Chemical oxygen demand ■ Chlorine (total residual) ■ Chromium (hexavalent) ■ Chromium (total) ■ Copper ■ Cyanide (free) ■ Cyanide (total) ■ Fluoride ■ Iron ■ Lead ■ Mercury ■ Nickel ■ Oil and grease ■ pH ■ Phenols ■ Selenium ■ Silver	■ Once after completion of Construction and Site Preparation ■ Once after completion of Drilling Operations ■ Once after completion of all Project site clearance and demobilization ■ In the event of any community complaints

Resource	Location	Proposed Parameters	Monitoring Frequency
		■ Sulphide ■ Temperature ■ Total coliform bacteria ■ Total phosphorus ■ Total suspended solids ■ Zinc ■ Total nitrogen ■ In Situ Test (pH DO, ORP, EC, TDS, Temperature)	
Soil Quality (Ambient)	■ Sampling should be conducted at the same locations as for baseline sampling, in order to provide direct comparison. ■ In the case of community complaints, at the location of complaint.	**Parameters:** ■ Physical parameters: - pH - Soil texture - Salinity - Conductivity ■ Chemical Parameters: - Chloride - Total Petroleum Hydrocarbon (TPH) - Total PAH - Total DDT - Toal PCBs ■ Heavy Metals - Arsenic (As) - Cadmium (Cd) - Chromium (Cr) - Copper (Cu) - Lead (Pb) - Mercury (Hg) - Nickel (Ni) - Silver(Ag) - Vanadium - Zinc (Zn)	■ Once after completion of Construction and Site Preparation ■ Once after completion of Drilling Operations ■ Once after completion of all Project site clearance and demobilization ■ In the event of any community complaints

Resource	Location	Proposed Parameters	Monitoring Frequency
Stormwater Drainage Release or Discharge	■ Storm water discharge locations. ■ In the case of community complaints, at the location of complaint.	**Required by Myanmar's NEQG:** ■ Oil & Grease	■ Once after completion of Construction and Site Preparation ■ Once after completion of Drilling Operations ■ Once after completion of all Project site clearance and demobilization ■ In the event of any community complaintsIn event of accidental spillage or leakage
Sewage Release or Discharge	■ Wastewater discharge locations. ■ In the case of community complaints, at the location of complaint.	**Required by NEQG:** ■ BOD ■ COD ■ Oil and Grease ■ pH ■ Total coliform bacteria ■ Total nitrogen ■ Total phosphorus ■ Total suspended solids	■ Once after completion of Construction and Site Preparation ■ Once after completion of Drilling Operations ■ Once after completion of all Project site clearance and demobilization ■ In the event of any community complaintsIn event of accidental spillage or leakage

8.5 Reporting Requirements

This section outlines the reporting frequencies and types of reports to be prepared for the Project with regards to environmental management, monitoring, and compliance.

A robust reporting system will provide the Project with the necessary feedback mechanisms to ensure quality and timely implementation of the works. The reporting system will ensure regular flow of information from the Project site to the Project headquarters and, as necessary, to regulatory authorities. The reporting system will provide a mechanism to ensure that the measures proposed in the Project's EMP are implemented.

8.5.1 Reporting Requirements to Myanmar Authorities

There are a number of reporting requirements to Myanmar Authorities, as per the EIA Procedures and Administrative Instruction of Environmental Impact Assessment Procedure. These are summarized in ***Table 8.5***.

8.5.2 Eni's Internal Monitoring and Inspection

Eni also has a number of internal monitoring and inspection requirements. These are primarily covered within the following polices and procedures, which are summarized below:

pla hse 001 Eni Myanmar r00 - 4 Year Plan

- As part of Eni's HSE 4 Year Plan, a number of initiatives and strategies will be implemented. In preparation of the operations start in 2019, the main activities that started in the second half of 2018 is a complete revamping of the Integrated Management System, focusing especially in the day-by-day activities (e.g. reporting, management review, general company plans etc.).
- The strategic objectives from this plan for all activities planned in the near future and in general terms aim at:
  - Ensuring No Incidents/Accidents, harm to people and Communities, the Environment or assets
  - Improvement of the HSE Integrated Management System;
  - Implementation of a risk assessment and mitigation approach;
  - Maintenance of a high management commitment and leadership programme throughout operations;
  - Assuring proper Contractor Management through dedicated HSE procedures.
- As per the HSE IMS system requirements, report on the progress on the performance indicators to the Management shall take place periodically for which HSE department has set up and will gather a set of reactive and proactive fit-for-purpose indicators and data on a monthly basis and will communicates them internally and externally as required.
- HSE Management Review is the official tool to report to the management, the performance versus each indicator and agree about the future plans and required actions.

pro HSE 002 Eni Myanmar r01 - HSE Objectives Planning Monitoring and Reporting

- The purpose of this procedure is to define operating modalities and associated responsibilities for setting HSE objectives, implementing HSE programs, monitoring and report the HSE performances in the framework of Eni Myanmar activities.
- This procedure is applicable to the planning of HSE objectives, associated monitoring and HSE data reporting activities carried out by Eni Myanmar, at offices and operational sites.

- This procedure defines also the modalities for measuring and monitoring the main characteristics of Eni Myanmar activities having potential effects on the Health, Safety and Environment at the workplaces, including:

  - The management and final reporting of expenditure commitments, in order to specifically include the conditions for defining and approving cost budgets related to the expenses incurred for health, safety and environment.

  - To govern roles, responsibilities and operating conditions for reporting to Management of expenses incurred and enhancements achieved in relation to said expenses.

pro hse 005 2015 Eni Myanmar r00 - Risk Management and Risk Reporting

- The purpose of this document is to provide guidance for definition of the risk management process and risk tolerability criteria, in particular how HSE risks shall be reported at periodical interval to eni Upstream division.
- Risk management criteria shall be used in accordance with Myanmar legislative prescriptions; where Myanmar regulatory requirements exist, the most stringent requirements shall be applied.

pro HSE 007 Eni Myanmar r02 - Incident Notification, Investigation and Reporting

- The primary scope of the procedure is to define operating modalities and associated responsibilities for the effective and methodical investigations conducted for all incidents, accidents and near-misses associated with eni Myanmar
- The results of the process of analysis of accidents, incidents and near-misses contribute to supply reviews/integrations to the HSE management system adopted, including the risk assessment process.
- The procedure defines operating modalities of the following:

  - detection, recording, classification and investigation and analysis of accidents, incidents and near-misses (using dedicated software tools, INDACO);

  - notification and reporting to the appropriate and/or competent authorities, eni Upstream and in case of significant cross-eni corporate event.;

  - implementing appropriate improvement actions and lessons learned to prevent the recurrence of similar events and spread them within eni Myanmar (including contractors/subcontractors);

  - monitoring the events occurred and follow-up of the improvement actions undertaken, verifying their effectiveness.

Table 8.6: Reporting Requirements to Myanmar Authorities

Report	Requirements	Frequency	Reference
Monitoring Report	■ Submit monitoring reports to MONREC not less frequently than every six (6) months, as provided in a schedule in the EMP, or periodically as prescribed by the Ministry. ■ Within ten (10) days of completing monitoring report, 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. ■ 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.	Not less than every 6 months	EIA Procedure, Article 108 and 109
Report in Case of Breach of ECC or EMP	■ 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	In case of any breach which would have a serious impact or where the urgent attention of the Ministry is or may be required, not later than twenty-four (24) hours of Eni becoming aware of such incident. In all other cases: within seven (7) days of Eni becoming aware of such incident.	EIA Procedure, Article 107

Report	Requirements	Frequency	Reference
Report of Any Accident or Incident	■ Inform appropriate authorities as soon as practicably in the event of any accident or incident. ■ As per conditions of ECC	As per conditions of ECC	Administrative Instruction of Environmental Impact Assessment Procedure, Annex 5, Page 3
Additional Reporting Requirements as per ECC	■ The Ministry may prescribe conditions in the ECC. Such conditions may include additional reporting requirements, such as: 1.4. General management documentation, reporting and information disclosure procedures 1.5. Monitoring documentation and reporting ■ Documentation and reporting on (i) parameters and issues that must be documented and reported; (ii) types and methods; (iii) frequency and timing; (iv) quality controls; and (v) recipients;	As per conditions of ECC	EIA Procedure, Article 91

8.6 Emergency Plan

Eni Myanmar, as part of its Integrated HSE Management System, has a number of documents dedicated to the Emergency Response, primarily:

- opi sg hse 005 ups r03 – Emergency Response Strategy (This document is included in ***Appendix 7***).
- opi sg hse 008 ups r01 – Emergency Response Plan (This document is included in ***Appendix 7***).
- pla hse 003 2016 Eni Myanmar r00 – MERP (This document is included in ***Appendix 7***).
- In addition to the above documents, Site-specific Emergency Response Plan will be available to define the arrangements and resources necessary to guarantee a proper communication and coverage at site.

The above documents constitute a guidance for the development of an Emergency Response Strategy and Emergency Response for the Eni Myanmar activities in particular by:

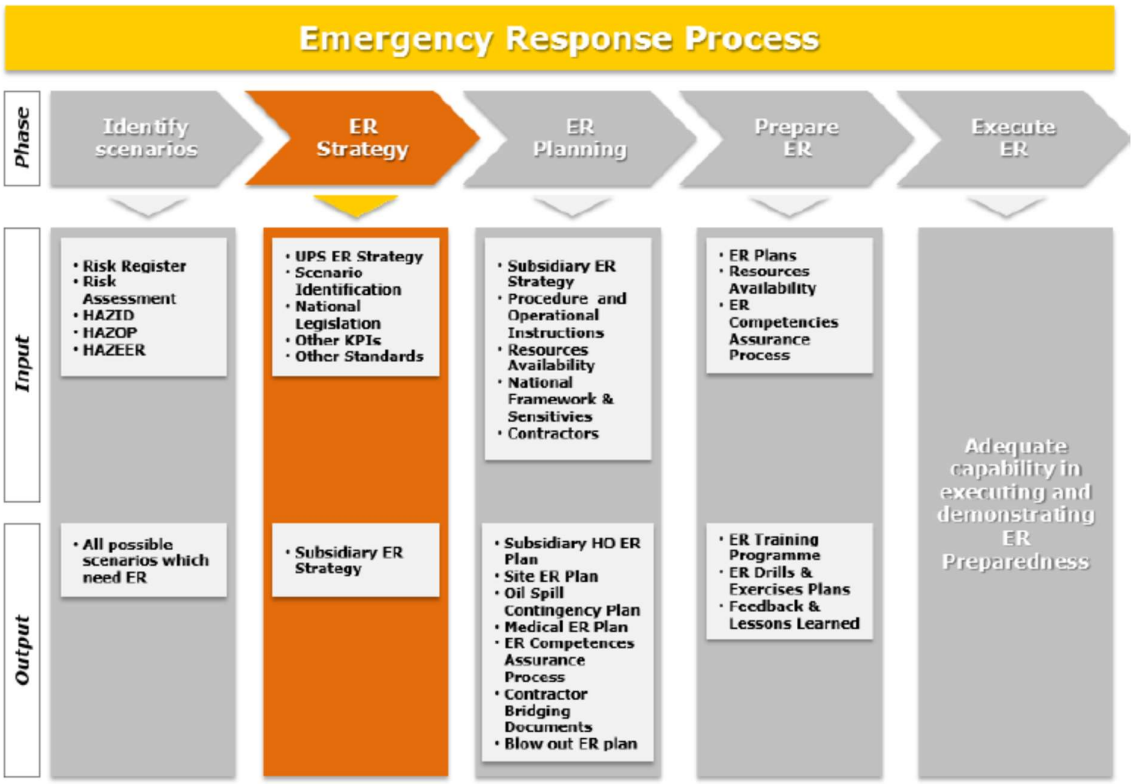
- *identifying in broad terms the means and organizational structure to be used to secure an adequate Emergency Response;*
- *to provide a guideline which will permit monitoring of the adequacy of the emergency response measures so that they can be modified when necessary.*

The Emergency Response Documentation shall address the issues of organization, resources, procedures, information, training and the role of any other measures that are necessary to achieve a successful Emergency Response.

The Emergency Response Documentation shall be periodically reviewed to confirm that selected measures are appropriate, and updated whenever there is a change to the Company operations or external situation which may significantly affect the content of the strategy."

An overview of the overall process is shown in ***Figure 8.1***. An overview of the emergency level classifications is shown in ***Figure 8.2***.

Figure 8.1: Emergency Response Process



Source: Eni, 2019

"The resources that typically are involved in Emergency Response can be divided into three categories:

1. Site resources (Tier 1)

Resources that are immediately available for response, stored on site and don't need for any mobilization time.

2. National resources (Tier 2)

Resources that are available inside the Country or in the same geographical area, generally stored at marine/ logistic base, that need for a short mobilization time prior to be put in place. Shared resources (e.g. Mutual Aid Agreements) shall be considered as Tier 2.

3. International resources (Tier 3)

Resources that are located outside the Country and can be mobilized and effectively imported in a time window coherent with response needs considering logistic and custom clearance issues. International resources (e.g. Specialist providers) shall be considered as Tier 3.

Personnel appointed to implement emergency measures shall have the appropriate skills and a sufficient level of training to carry out the duties related to emergency management.

As part of the process, regular emergency drills shall be performed in order to maintain a high level of readiness for the emergency response, checking the effectiveness of the measures in place to prepare for and respond to emergencies.

The results of the drills shall be analyzed to assess the adequacy of the emergency response system and, where necessary, to make improvements.

Figure 8.2: Emergency Level Categories and Responsibilities

LEVEL	DEFINITION
PRE-ALARM	Any event, strictly defined as a process safety event or event generated on the equipment/plant by natural risks, which does not lead to an emergency but is visible, audible or in any case noticeable by the population, Institutions, Administrations and Bodies responsible for health, safety and the environment and which may have a significant media impact at local or national level
LEVEL 1 EMERGENCY	An event managed at site level with the personnel and equipment available on site, under the responsibility of the Employer/Managing Director (HO ERM); divided into "not noticeable outside" and "noticeable outside".
LEVEL 1 EMERGENCY NOT NOTICEABLE OUTSIDE	Examples: - spill confined to within the site, which can be managed and remedied using the SITE's own resources and equipment; - fire that can be managed and remedied using the site's own resources and equipment, without the smoke developed becoming visible outside the SITE.
LEVEL 1 EMERGENCY NOTICEABLE OUTSIDE	Example: - small fire that can be managed and remedied using the SITE's own resources and equipment, but for which the smoke developed becomes visible outside the SITE.
LEVEL 2 EMERGENCY	An event that can be managed at Eni Myanmar level under the responsibility of the Employer/Managing Director (HO ERM), with assistance from the Eni Myanmar Head Office Emergency Response Team (HO ERT) and from Authorities and public administrations at a local and regional level
LEVEL 3 EMERGENCY	An event that can be managed at Eni Myanmar level under the responsibility of the Employer/Managing Director (HO ERM), with assistance from the Eni Myanmar Head Office Emergency Response Team (HO ERT), Eni Upstream Head Quarter Emergency Response Team (HQ ERT) and from Authorities and public administrations at a local, regional and national level
CRISIS	In the event of a level 3 emergency of significant impact, prolonged over time and capable of having serious repercussions on corporate integrity at an international level, Eni supports the management of the emergency through the Crisis Unit.

Source: Eni, 2019

8.7 Capacity Development and Training

Eni has strict policies regarding HSE Training, Information and Competence Skills. HSE activities and particularly those involving HSE risks are always and only carried out by personnel with the necessary know-how and expertise, constantly kept up to date by training activities. For that purpose, the HSE department defines and keeps up to date a document outlining the roles and skills of the professionals working specifically in the HSE area.

On a yearly basis, Eni Myanmar prepares/updates a specific HSE training plan, specifying:

- the responsibilities for providing training activities;
- the personnel involved in the training activities;
- the scope, contents and procedures of training on HSE risks, hazards, measures, procedures, roles and instructions;
- the schedule for training courses.

The plan is updated when significant changes/modifications of a technical, organisational and regulatory nature occur or following non-compliances that come to light (e.g. investigation teams, audits and/or control bodies). The training needs are communicated to the respective human resource functions, which work out a training plan in cooperation with the human resource function.

The HSE department of Eni shall guarantee that personnel are informed on:

- the HSE impacts of their job and behaviour;
- their role and responsibilities in order to comply with HSE policy, with procedures and requirements set by Eni's HSE Management System Guideline;
- the potential consequences deriving from deviations in operating instructions.

8.8 Overall Budget for Implementing the EMP

The costs for implementation of the EMP, including mitigation measures, training, engineering alternatives, waste management, area restoration, etc., are included within Eni's operation costs and are split amongst numerous contractors. The costs are therefore not possible to individually quantify at this time.

The estimated costs for implementation of the monitoring program, based on previous experience with monitoring for similar types and scope of project, are 150,000 USD per year.

9. PUBLIC CONSULTATION AND DISCLOSURE

This section summarises the methodology and approach for stakeholder identification and analysis undertaken as part of the Project. An overview of the scoping and draft EIA consultations undertaken to date and recommendations for following steps is also included.

9.1 Public Consultation Approach

Public consultation is a very important aspect of conducting an effective impact assessment. As part of the social impact assessment study, Eni Myanmar has engaged with a number of stakeholder's state/ region, township and village level during consultations as per Myanmar's *EIA Procedure.*

Eni Myanmar and ERM have developed a robust plan for public disclosure and public consultation. Public consultation has been undertaken according to the requirement of Myanmar law and in line with *EIA Procedure* and included two different public participation phases, described as follows:

- **Scoping Phase**: this first round of consultation meeting was done with local communities, potential Project Affected Peoples (PAPs), local authorities, community based organisation, civil societies and other related parties. The objective of the first round of public participation was to provide the public with Project information which included some of the important aspects such as the Project Proponent, and status of the EIA study, the contact details of public relation agents to take in complaints/ feedbacks of the public and a "Questions and Answers" session as well as take in comments from the public.
- **EIA Phase**: this second round of consultation meeting was arranged at the national, regional, state and local levels with important local communities and authorities, PAPs, community based organisation and civil society. The objective of the second public consultation was to present preliminary findings from the EIA study with emphasis on potential impacts, and proposed mitigation measures and a Question and Answer session.

9.1.1 Stakeholder Identification

A stakeholder is a person, group, or organization that has a direct or indirect stake in a project/organisation because it can affect or be affected by the Project/organization's actions, objectives, and policies. The process of stakeholder identification and analysis shall allow for the formulation of a robust engagement strategy, which will provide opportunity for the concerned stakeholders to be involved in the process of identification of areas of concerns as well as formulation of mitigation strategies for the same. This in turn should allow for the stakeholders to develop an understanding of the Project operations as well as the maintenance of positive relations between stakeholders and the Project Proponent.

For the purpose of stakeholder consultation, an Area of Influence for stakeholders has been defined. The criteria used to demarcate the Area of Influence are:

- The concession block (RSF-5) allocated to Eni;
- The major townships and village tracts around the block that might be involved with the exploration drilling activities (including community areas near the potential riverbank landing); and
- Location of decision making centres and location of the key government agencies.

The list of stakeholders identified that could be potentially impacted by the Projects activities are shown in ***Table 9.1***.

Table 9.1: Stakeholder Groups

Stakeholder Category	Stakeholder Group	Connection to the Proposed Project	Stakeholder
Government	Union Government	Regulator	ECD MOGE
	Region Government and Authorities	Regulator and Support	Magway Region Chief Minister, Magway ECD Regional Office, Magway region Parliament
	Township Authorities	Support	**Magway Township** (GAD officers of Industrial Supervision & Inspection, Education, Water Resources and Improvement of water system, Forest, Health, Fire, Planning, Agricultural Land Management and Statistics, Fisheries, Agriculture, Livestock Breeding & Veterinary, Cooperative, and Electricity Department, Township Education Office, Township Police officer, Myanmar Posts and Telecommunications Engineer) **Minhla Township** (GAD officers of Forest, Planning, Fire, Public Health, Dry Zone Greening, Highways, Rural Road Development, Livestock Breeding & Veterinary, City Development, Immigration, Information and Public Relation, Internal Revenue, Law, Archaeology, and Medical Services Department, Myanmar Railways, Inland Water Transport, Lower Divisional Clerk for villages in the township, Township Education Officer, Township Traditional Health Centre personnel, Post Office Officer, Local Water Transport Manager, Electricity Supply Enterprise (ESE) engineer, Police, and Myanmar Posts and Telecommunications Officer) **Minbu Township** (GAD officers of Fire, Forest, Agricultural Land Management and Statistics, Water Resources and Improvement of River Systems, Education, Health, Dry Zone Greening, Township co-operation, Fishery, Livestock Breeding & Veterinary, Information and Public Relation, Sport and Physical, Post and Telecommunications, Agricultural Mechanization, Religious Affairs, Irrigation and Water Utilization Management, Consumer Affair, and Planning Department, Electricity Supply Enterprise(ESE) Engineer, and Myanmar Posts and Telecommunications Officer)
Directly Affected stakeholders	Community Members including women, men and youth.	Directly Affected	**Magway Township** (Aung Myay Gone, Pay Pin San, Ohn Twe, Awzar Kone, Mi Kyaung Ye, Yin Gway Chaung, Sue Kauk San, Ge Gyi Gone, and Shar Pin Hla village) **Minhla Township** (See, Sin Ma Kya, Shan Tat, Sit Sa Noet, Kyauk Pa Tung, San Kan, Nyaunt Pin Tha,

			Kone Gyi, Sat Pyar, Kanyin Gyi, Ban Pyin, Sann Le, Nagar Eike, Myae Char, Pin Ga, Bweit, Sin Ma Taung, San Aing, Nyaung Waing, Lin Kei, Kyauk Lat Khat, Pan Taw Pyin, Let Pan Ta Gar, Daung Boke, Pa Ni Son, Ye Kyaw, Myo Ma, Myo Thit, Ma Lun, Htan Kaing, Yae Khar, Nwar Le, Yone Yat, San Gyi, Yae Ngan, Ywar Taw, Lar Aing, Mi Laung Kone, Lel Hla, Pay Taw Kone, Kwat Thit, Yae Nan Ma, Yaw Twin Gyi, Daung Boke, Dee Doke Kan, Sa Line, Ooe Bo Kone, Auk Kaing, Linn Kae, Kan Toke, Kani, Malunsam, Kyauk Pon, Ka Daung Kyin, Sam, Thakhut Kwin, Tha Pyay Taw, Min Tal Gyi, Ma Lun San, Ye Twin, Pay Yinn, Yae, Nyaunt Wine, Kyauk Padaung, Yae Ngan Ma, Ka Line, Let Khoke Pin, Lae Pin Kyin, Lel Hla, Taung Oo and Ta Lote Yin village) **Minbu Township** (Bayar, Hluttaw, Pan Taung, Min Hal Kyin, Myoe Hpayar and Min Hla Khing village)
Vulnerable groups	Women headed households, Elderly, physically or mentally disabled, orphans, low-incomes households.	Directly Affected	**Magway Township** (Aung Myay Gone, Pay Pin San, Ohn Twe, Awzar Kone, Mi Kyaung Ye, Yin Gway Chaung, Sue Kauk San, Ge Gyi Gone, and Shar Pin Hla village) **Minhla Township** (See, Sin Ma Kya, Shan Tat, Sit Sa Noet, Kyauk Pa Tung, San Kan, Nyaunt Pin Tha, Kone Gyi, Sat Pyar, Kanyin Gyi, Ban Pyin, Sann Le, Nagar Eike, Myae Char, Pin Ga, Bweit, Sin Ma Taung, San Aing, Nyaung Waing, Lin Kei, Kyauk Lat Khat, Pan Taw Pyin, Let Pan Ta Gar, Daung Boke, Pa Ni Son, Ye Kyaw, Myo Ma, Myo Thit, Ma Lun, Htan Kaing, Yae Khar, Nwar Le, Yone Yat, San Gyi, Yae Ngan, Ywar Taw, Lar Aing, Mi Laung Kone, Lel Hla, Pay Taw Kone, Kwat Thit, Yae Nan Ma, Yaw Twin Gyi, Daung Boke, Dee Doke Kan, Sa Line, Ooe Bo Kone, Auk Kaing, Linn Kae, Kan Toke, Kani, Malunsam, Kyauk Pon, Ka Daung Kyin, Sam, Thakhut Kwin, Tha Pyay Taw, Min Tal Gyi, Ma Lun San, Ye Twin, Pay Yinn, Yae, Nyaunt Wine, Kyauk Padaung, Yae Ngan Ma, Ka Line, Let Khoke Pin, Lae Pin Kyin, Lel Hla, Taung Oo and Ta Lote Yin village) **Minbu Township** (Bayar, Hluttaw, Pan Taung, Min Hal Kyin, Myoe Hpayar and Min Hla Khing village)
Civil Society, Academic, Development agency	CBO, NGO, Business Cooperatives, Universities	Interest group	**Magway Township** (CSO) **Minhla Township** (Yin Kwin Mae Organization, Maternal & Child Welfare Association, Women Association, Myanmar Economic Bank, Cooperative Bank, Agricultural Development Bank) **Minbu Township** (Maternal & Child Welfare Association, Women Association, Myanmar Agriculture Development Bank, and Yadanarbon Daily Newspaper reporter)

Source: SEM, 2019; modified by ERM, 2019

9.1.2 Stakeholder Mapping

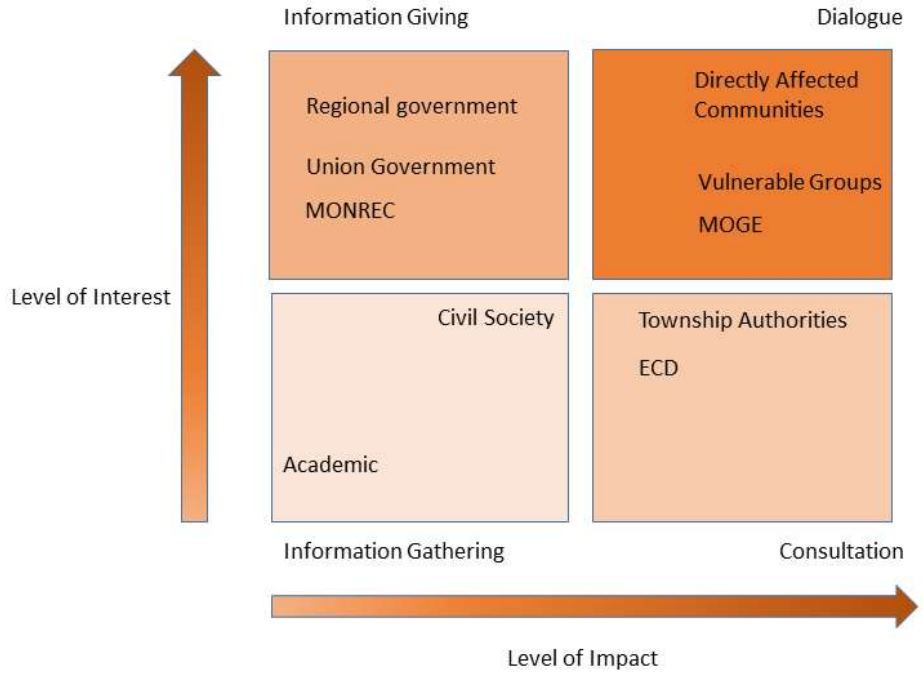
Stakeholder mapping enables engagement to be tailored to each stakeholder group to ensure that their views and concerns are addressed in an appropriate manner. The process of stakeholder identification and mapping will continue throughout the Project life and results have been incorporated into this EIA report.

The first mapping of the stakeholder, used to develop the first round of engagement for this project, was established based on previous Project conducted by Eni in the area (including seismic survey for block RSF-5). It included all known stakeholders of these previous projects and how to engage with them. The final mapping included below was established following the first round of Public Participation between the 19th and 23rd of March 2019.

This mapping established the best way to engage with stakeholders, what are their level of expectation for engagement and what are their main interest when being engaged.

Engagement has been organised so that a dialogue could be established with the stakeholders listed in ***Table 9.1*** through public consultation meetings and information collected from Directly Affected Stakeholders using Focus Group Discussion, Key Informant Interviews and Household Survey. The public consultations held in March for the scoping stage of the EIA were the first such engagement where stakeholders have received information about the Project and could raise concern or ask questions. This resulted in the stakeholder matrix (***Figure 9.1***) that inform of the level of engagement that has been implemented with each group of stakeholders.

Figure 9.1: Stakeholder Matrix



Source: ERM, 2019

Stakeholders listed above are mainly interested or concerned with impacts on agricultural production and potential risk of chemical waste discharge. There were also other concerns regarding job opportunities, compensation, social benefits, and infrastructural damages.

9.2 Scoping Phase Consultations

9.2.1 Methodology and Purpose

9.2.1.1 Meeting Structure

The meetings have been structured in a town-hall style, with various stakeholders invited, including Magway Regional Government, General Administration Department (GAD) – Township Level, Regional Environmental Conservation Department, Regional Parliament Members, Township Technical department (Agricultural Land management and Statistics, Urban and Housing Development, Building, Highways, Bridges, Electrical Power Transmission & System Control, Public Health, Water Resources and Improvement of River Systems, Myanmar Port Authority, Basic Education) as well as interested NGO/CSO, Myanmar Woman Affairs Federation, Myanmar Maternal and Child Welfare Association.

All village Tract /Ward Leaders from the Project area, Local Communities, Medias and other relevant/interested stakeholders were also invited to the meetings organised at township and village tract level. Not all the stakeholders invited to the meetings attended. In order to ensure they could still have access to information provided during these meetings, a brochure with a summary of information presented was left at each meeting location.

The meetings were structured as follows:

- Introduction by local authorities, MOGE;
- Presentation of Project and Project Proponent (in Myanmar language);
- Question and Answer Session; and
- Focus Group Discussions; break out groups with key stakeholders such as Fisherman, farmers, women, Village Tract Leaders etc.

9.2.1.2 Techniques

In addition to the town-hall style meeting other techniques were used to engage stakeholders:

- **Interviews:** Interviews have been conducted with Government officials (e.g. GAD officials) and key informants (e.g. education of health officers). These have been guided by a list of questions, both open ended and close ended.
- **Focus Group Discussion (FGDs):** refers to a discussion carried out amongst a group of people (4-6) from a similar background/profile on a specific topic. The primary purpose of such discussions is to gather an insight into the thought process of the group in regards to a particular issue. These discussion have been conducted with women groups, farmers and fishermen groups.

9.2.1.3 Tools

Tools used during scoping stage engagement to support and document the engagement process are shown in ***Table 9.2***.

Table 9.2: Tools Used for Stakeholder Consultation for Scoping Phase

Checklists/Tools	Purpose
Presentation (see ***Appendix 9***)	Presentation that includes information on Eni, information on the Project activities and timeline, potential impacts and mitigation, and contacts details.
Flyer/Brochure (see ***Appendix 10***)	A handout containing a summary of the information provided in the presentation.
Focus Group Discussion and Key Informant Interviews	A list of questions has been prepared for the following groups: ■ Farmers ■ Fishermen ■ Women groups ■ Community leaders ■ Health service providers ■ Ecosystem Services specialist
Maps and other visual tools	A large map that shows the Project location and the surrounding area has been used during the meetings to discuss project activities.

9.2.2 Summary of Meetings during Scoping Phase

The first round of engagement has been conducted between the 19th and the 23rd of March 2019 to provide the public with Project information and gather their feedback on the Project and the EIA schedule. These public consultation meetings were held with various relevant stakeholders at the regional level in Magway Region. The consultation helped the Project to gather information on potentially affected people, and on potential data gaps and how these can be closed out in the EIA Report. The date, time, location, and stakeholder of each meeting is provided in ***Table 9.3***.

Table 9.3: Consultation Activities Undertaken during Scoping Phase

Date, Time, Location	Stakeholder Groups	Number of Participants
Magway Township **Date:** 19th March 2019 **Venue:** Meeting Hall, General Administrative Department, Magway Town, Magway Region. **Time:** 10:25 am	1.Directorate of Industrial Supervision & Inspection 2.General Administrative Department (GAD) officers 3.Myanmar Posts and Telecommunications 4.MOGE 5.Department of Education 6.Directorate of Water Resources and Improvement of River System 7.Department of Forestry 8.Department of Health 9.Fire Services Department (Regional) 10.Department of Planning 11.Department of Electricity 12.CSO 13.Villagers 14.Farmers	24

Date, Time, Location	Stakeholder Groups	Number of Participants
Minbu Township **Date:** 19th March 2019 **Venue:** Meeting Hall, General Administrative Department, Magway Town, Magway Region. **Time:** 02:05 pm	1.Fire Services Department 2.Department of Forestry 3.Department of Agricultural Land Management and Statistics 4.GAD officers 5.Electricity Supply Enterprise (ESE) 6.Maternal & Child Welfare Association 7.Women Association 8.Directorate of Water Resources and Improvement of River System 9.Myanmar Posts and Telecommunications 10.Department of Education 11. Department of Planning 12. Reporters 13. Villagers	30
Minhla Township **Date:** 21st March 2019 **Venue:** Meeting Hall, General Administrative Department, Minhla Town, Magway Region. **Time:** 09:30 am	1.GAD officers and clerks 2.Magway Region Parliament 3.Department of Forestry 4.DWRI 5.TEO 6. Department of Planning 7. Myanmar Post office 8.Local Water Transportation 9.Electricity Supply Enterprise (ESE) 10.Fire Service Department 11.Police Station 12.Department of Public Health and Medical Services 13. Myanmar Posts and Telecommunications 14. Villagers	142
Mi Kyaung Ye Village **Date:** 21st March 2019 **Venue:** Meeting Hall, Village Administrative Office, Mi Kyaung Ye Village, Magway Township, Magway Region. **Time:** 01:45 pm	1.Villagers 2.Farmers 3.Fire Service Department 4.BEHS 5.Rural Health Centre 6.Business Owners 7.Local Phone service	39
Ohn Twe Village **Date:** 22nd March 2019 **Venue:** Religious Building, Ohn Twe Village, Magway Township, Magway Region. **Time:** 09:25 am	1.Villagers 2.Farmers 3.Students 4.Business Owners	147

Date, Time, Location	Stakeholder Groups	Number of Participants
Aung Myay Kone Village **Date:** 22nd March 2019 **Venue:** Village Head's House, Aung Myay Gone Village, Magway Township, Magway Region. **Time:** 12.15 pm	1.Farmers 2.Villagers	77
Yin Gway Chaung Village **Date:** 23rd March 2019 **Venue:** Village Head's Home, Yin Gway Chaung Village, Magway Township, Magway Region. **Time:** 10:45 am	1.Farmers 2.Villagers	109
Saik Kya Village **Date:** 23rd March 2019 **Venue:** Village Head's Home, Saik Kya Village, Magway Township, Magway Region. **Time:** 02:30 pm	1.Farmers	24

Source: SEM, 2019; modified by ERM, 2019

For this Project, the meetings were undertaken to disclose information on the Project at the regional level and to confirm our baseline understanding of the Study Area. The meetings also helped the Project to confirm the scope of the next engagement for the EIA Phase.

The minutes of the meetings, list of participants, and photos from the consultation are provided in ***Appendix 11***.

9.2.3 Key Questions and Outcomes from Meetings during Scoping Phase

Key questions, concerns and outcomes that were raised across the various meetings conducted to date are presented in ***Table 9.4***.

Table 9.4: Key Questions and Concerns during 1st Public Consultation Meetings

Stakeholder	Questions / Comment	Response	Location of Potential Mitigation Measure or Response in EIA
Environmental Aspect			
■ Department of Public Health and Medical Services officer in Minhla Township	Will there be an assessment of impact for earthquakes risks due to seismic survey included?	■ The seismic survey was conducted in Beikthanoe Ancient at the Seismic stage and found no impact from seismic activities. This report has also been reviewed by the ECD. ■ Even though earthquakes causes by seismic survey has never occurred in Myanmar, all relevant potential Impacts will be assessed in EIA	Unplanned Event Chapter
■ Government official in Minbu Township	It was suggested that the air quality impacts should be minimize and assessment conducted due to high level of dust in the area from traffic on unpaved roads	■ N/A	Air Quality Impact Assessment Chapter
Social Aspect			
■ Parliament members in Minbu Township ■ Parliament members in Minhla Township	Are there any Agreements with government or any profit sharing plan?	■ There is a “Product Sharing Contact”. If the project leads to the production of petroleum, the profits will be shared directly with the Central Government who can decide further distribution.	Project Description Chapter
■ Parliament members in Minbu Township ■ Department of Public Health and Medical Services officer in Minhla Township	Will there be any job opportunities for the locals?	■ There will be approximately 100 job opportunities available. Eni will prioritise those who are impacted by the project.	Project Description and Social Impact Assessment (SIA) chapters
■ Villager in Mi Kyaung Ye Village ■ GAD in Magway Township ■ Villagers in Aung Myay Gone village	What are the policies for damages to Agricultural lands and crops?	■ Appropriated compensation will be provide for any damages to agricultural land or crops during the project operation. ■ In the compensation process, Department of land records, village heads and related farmers will be included and informed.	SIA chapter

Stakeholder	Questions / Comment	Response	Location of Potential Mitigation Measure or Response in EIA
		■ All grievances should be notified to Eni and relevant government agencies. ■ It was suggested that impacted local farmers should verify and agree on the damage and compensation.	
■ Villagers in Aung Myay Gone village	-What are the policies for infrastructure (roads) damage? -Will there be any construction of new roads?	■ All the roads to be used by the project will be well maintained and repaired if necessary. ■ The project will use existing roads. However, some roads may need be upgraded or expanded for heavy machinery and large trucks. Therefore some land clearance may be required. ■ All affected sites will be assessed against pre-project condition (using photo documentation).	SIA Chapter Project Description Chapter
■ Parliament members in Minhla Township	Are any CSR (Corporate Social Responsibility) activities planned?	■ Yes, if the project is successful	Environmental Management Plans (EMP) Chapter
■ Department of Education officer in Minhla Township	Any support for the Education sector planned?	■ Through CSR activities, if the production is successful. There is also Eni Foundation that provide local training programs.	EMP Chapter
■ Villagers in Magway Township	During the previous project, there have been issues with the compensation and job application process. How will Eni avoid the same issues?	■ Village heads are responsible for the following of the compensation process. ■ All grievances should be reported accordingly to the grievance mechanism. ■ In the case that villagers did not receive the compensation from the project, they will have to submit an official letter to MOGE with evidences and in line with the official procedures (Village to Township to District to MOGE). ■ It was suggested that villagers who feel they have been impacted and should be compensated should participate in the communication process and attend meetings in the villages that related to the grievances in order to provide the documentation regarding potential compensation claims.	SIA Chapter
■ GAD officer in Minbu Township	It was suggested that villages that are impacted affected by	■ N/A	All Impact Assessment Chapters

Stakeholder	Questions / Comment	Response	Location of Potential Mitigation Measure or Response in EIA
	Project transportation activities should be considered in the impact assessment, and impacts mitigated appropriately		
Project Description Aspect			
■ Villagers in Aung Myay Gone village	Will the drilling and transportation activities occur during the harvest season?	■ Operation phase is unlikely to take place during the harvesting period. Any impact will be mitigated.	Project Description Chapter
■ Villagers in Minbu Township ■ Medical officer in Magway Township	What is the waste management and risk prevention policy?	■ Drilling process will be monitored by MOGE ■ Drilling fluids will be treated using three sedimentation pools. These sediments will be managed and transported by a waste management specialist (DOWA) to a treatment plant at Yangon. ■ Discharged water will be treated before discharge in the environment. ■ If any discharge water or chemical waste are found outside the project site, it should be immediately reported to MOGE and Eni for clean-up process.	Surface Water, Soil and Topography Impact Assessment and SIA chapters
■ Parliament members in Minhla Township	■ Where is the location of RSF-5 and project sites? ■ What is the depth of the well?	■ Block RSF-5 is located in Magway region referred as shown on the map (a map was presented during each meeting to explain project location). ■ Approximately 3,000 meters	Project Description Chapter
■ Parliament members in Minbu Township ■ Planning Department officer in Magway Township	It was suggested that the project should cooperate with the government departments such as Department of Agricultural Land Management and Statistic, and Department of Water Resources and Improvement of River System	■ N/A	Public Consultation Chapter

Source: SEM, 2019; modified by ERM, 2019

Note: N/A = Not Applicable

9.3 Draft EIA Presentation Phase

9.3.1 Methodology and Purpose

9.3.1.1 Meeting Structure

The meetings have been structured in a town-hall style, with various stakeholders invited, including Magway Regional Government, General Administration Department (GAD) – Township Level, Regional Environmental Conservation Department, Regional Parliament Members, Township Technical department (Agricultural Land management and Statistics, Urban and Housing Development, Building, Highways, Bridges, Electrical Power Transmission & System Control, Public Health, Water Resources and Improvement of River Systems, Myanmar Port Authority, Basic Education) as well as interested NGO/CSO, Myanmar Woman Affairs Federation, Myanmar Maternal and Child Welfare Association.

All village Tract /Ward Leaders from the Project area, Local Communities, Medias and other relevant/interested stakeholders were also invited to the meetings organised at township and village tract level. As during scoping engagement, not all the stakeholders invited attended the meetings. Hard-copies of the presentation were left at each meeting location to ensure they could access the information shared during the meetings.

The meetings were structured as follows:

- Introduction by local authorities, MOGE;
- Presentation of Project and Project Proponent (in Myanmar language);
- Presentation of the result of the draft EIA; and
- Feedback, Question and Answer Session.

9.3.1.2 Tools

Tools used during Draft EIA stage engagement to support and document the engagement process are shown in ***Table 9.5***.

Table 9.5: Tools Used for Stakeholder Consultation for Draft EIA Presentation Phase

Checklists/Tools	Purpose
Presentation (see ***Appendix 12***)	Presentation that includes information on Eni, information on the Project activities and timeline, potential impacts and mitigation, and contacts details.
Maps and other visual tools	A large map that shows the Project location and the surrounding area has been used during the meetings to discuss project activities and left at each consultation location.

Source: ERM, 2019

9.3.2 Summary of Meetings during EIA Phase

The second round of engagement have been conducted between the 27th and the 31st of May 2019 to provide the public with Project information, impacts, and mitigation measures, and gather their feedback on the Project, impacts, mitigation measures, and the EIA schedule to submission. These public consultation meetings were held with various relevant stakeholders at the regional and domestic level in Magway Region. The consultation helped the Project to gather information on further concerns and

requests regarding the Project and mitigation measures. The date, time, location, and stakeholder of each meeting is provided in ***Table 9.6.***

Table 9.6: Consultation Activities Undertaken during EIA Phase

Date, Time, Location	Stakeholder Groups	Number of Participants
Magway Town **Date:** 27th May 2019 **Venue:** Meeting Hall, General Administrative Department, Magway Town, Magway Region. **Time:** 02:00 pm	1. Farmers 2. Villagers 3. Local Organization 4. Township Police Station 5. Department of Agricultural Land Management and Statistics 6. Department of Fisheries 7. Township Education Office 8. Department of Agriculture 9. Livestock Breeding & Veterinary Department 10. Department of Planning 11. Cooperative Department	35
Minhla Town **Date:** 28th May 2019 **Venue:** Meeting Hall, General Administrative Department, Minhla Town, Magway Region. **Time:** 09:30 am	1. Parliament members 2. Dry Zone Greening Department 3. Department of Highways 4. Department of Rural Road Development 5. Electricity Supply Enterprise (ESE) 6. Fire Services Department 7. Livestock Breeding & Veterinary Department 8. City Development 9. Department of Immigration 10. Women Association 11. Department of Public Health and Medical Services 12. Office of the Union Judiciary Supervision 13. Internal Revenue Department 14. Township Traditional Health Centre 15. Law Offices 16. Myanmar Post Office 17. Department of Archaeology 18. Forest Department 19. Government Administrative Department 20. Township Education Office 21. Department of Information and Public Relations 22. Audit Office 23. Department of Agriculture 24. Myanmar Posts and Telecommunications 25. Agricultural Development Bank 26. Myanmar Economic Bank 27. Cooperative Bank 28. Myanmar Railways	87

Date, Time, Location	Stakeholder Groups	Number of Participants
	29. Department of Sport and Physical Education 30. Department of Planning 31. Department of Agricultural Land Management and Statistics 32. Local Organizations 33. Maternal & Child Welfare Association 34. General Administration Department (GAD) officers	
Minbu Town **Date:** 28th May 2019 **Venue:** Meeting Hall, General Administrative Department, Minbu Town, Magway Region **Time:** 01:15 pm	1. GAD officers 2. Dry Zone Greening Department 3. Township Co-operation Department 4. ESE 5. Fishery Department 6. Livestock Breeding & Veterinary Department 7. Forest Department 8. Department of Information and Public Relations 9. Department of Sport and Physical Education 10. Myanmar Agriculture Development Bank 11. Department of Post and Telecommunications 12. Department of Agricultural Mechanization 13. Department of Religious Affairs 14. Department of Irrigation and Water Utilization Management 15. Department of Consumer affair 16. Maternal & Child Welfare Association 17. Women Association 18. City Development	36
Ohn Twe Village **Date:** 29th May 2019 **Venue:** Religious Building, Ohn Twe Village, Magway Township, Magway Region **Time:** 09:35 am	1.Villagers 2.Farmers	65
Aung Myay Kone Village **Date:** 29th May 2019 **Venue:** Village Head's House, Aung Myay Gone Village, Magway Township **Time:** 12:35 pm	1.Villagers 2.Farmers	103

Date, Time, Location	Stakeholder Groups	Number of Participants
Mi Kyaung Ye Village **Date:** 30th May 2019 **Venue:** Religious Building, Mi Kyaung Ye Village, Magway Township, Magway Region **Time:** 09.45 am	1. Farmers 2. Villagers 3. Local Police Station 4. Rural Health Centre	29
Saik Kya Village **Date:** 30th May 2019 **Venue:** Village Head's Home, Saik Kya Village, Magway Township, Magway Region **Time:** 01:05 pm	1. Farmers 2. Villagers 3. Students	72
Yin Gway Chaung Village **Date:** 31st May 2019 **Venue:** Village Head's Home, Yin Gway Chaung Village, Magway Township, Magway Region **Time:** 09:50 am	1.Farmers	53

Source: SEM, 2019 (Modified by ERM, 2019).

The minutes of the meetings, list of participants, and photos from the consultation are provided in ***Appendix 13***.

9.3.3 Key Questions and Outcomes from Meetings during Scoping Phase

Key questions, concerns and outcomes that were raised across the various meetings conducted during the draft EIA engagement are presented in ***Table 9.7***

Table 9.7: Key Questions and Concerns during 2nd Public Consultation Meetings

Stakeholder	Questions / Comment	Response	Potential Mitigation Measure or Response in EIA
Environmental Aspect			
Farmer from Aung Myay Kone Village	■ What are the potential impacts from the project (especially vibration impact)? ■ Concerned about impacts to farm.	■ No significant impacts from the vibration will occur to the surrounding farms near the project site.	Noise and Vibration Impact Assessment Chapter
Farmer from Aung Myay Kone Village	■ Concerned about light impact to crops. ■ Concerned that cattle might be frightened by the project. ■ The community welcomes the Project.	■ There will be no significant impacts from lighting to agriculture activities. ■ Myanmar Agricultural Department will decide if there are any impacts to crop productivity. If so, adequate compensation will be considered, according to land laws 2012. ■ Lighting is necessary for the operation process and occupational health and safety of the Project.	Visual and Landscape Impact Assessment section in SIA Chapter
Medical personnel from Minbu Town	■ In case of drilling mud spills, what is the potential impact to the environment?	■ Waste Management procedures were explained in detail with emphasised on Public Health and Safety. ■ If any spills are spotted, it is to be immediately communicated to ENI to activate the related procedures	Unplanned Event Chapter
Villagers from Magway Town	■ What are the impacts to agriculture activities from Air pollution? ■ There is currently a big loss of aquatic resources potentially due to the transit of heavy vehicles, which pollute a lot, and I am concerned that the projects activities' may in turn impact aquatic resources cumulatively? ■ Suggested that Eni should focus on noise impacts on public health ■ Suggested Eni to restore land after the Project is finalized, and properly dispose project waste. ■ Suggested Eni to focus on mitigating the impacts on air, soil, and water.	■ No significant impacts from air pollution will occur to the surrounding environment and agricultural activities near the project site.	Air Quality Impact Assessment Chapter Surface Water Impact Assessment Chapter Noise and Vibration Impact Assessment Chapter SIA Chapter Soil and Topography Impact Assessment Chapter

Stakeholder	Questions / Comment	Response	Potential Mitigation Measure or Response in EIA
Social Aspect			
Farmer from Saik Kya Village	■ Eni was requested to provide water pipelines distribution for the village.	■ Eni will consider this request as possible social project and later update the community.	NA
Villager from Aung Myay Kone Village	■ Will the fencing affect the cattle feeding grounds? Can animals cross to the feeding grounds?	■ Eni will evaluate the alternative routes for the activity and communicate back to the community.	NA
Villagers from Aung Myay Kone Village	■ Requested to improve the road to the monastery	■ Eni will evaluate the potential of road enlargement and update the community.	NA
Farmer from Ohn Twe village	■ Commented that Eni should inform and negotiate with the stakeholder before operating. ■ Comment that there was no compensation during seismic survey.	■ Land acquisition and access process were explained in detail. ■ During seismic survey, specific measures were agreed upon, before the Project implementation. ■ Suggested to the villagers to join the meeting with landowners/MOGE and land department.	NA
Farmer from Ge Gyi Kone Village, Governmental Staff from Su Kauk San, and Village Head from Ohn Twe Village	■ Concerned about the impacts to infrastructure (bridges) in the villages. ■ What are the plans for bridge usage and upgrades? ■ What are the mitigation measures for roads damage from Project activities?	■ Bridges and roads will be inspected and, if necessary, upgraded before use where necessary. ■ Transportation routes are in the process of being finalized. ■ Eni will be responsible for reparation of any roads damage from the Project activities.	Project Description Chapter SIA Chapter
Farmers from Pay Pin San Village, and Governmental Staff from Su Kauk San	■ Concerned about decrease of yield rates from road enlargement and transportation of heavy vehicles (farmers received 1 year of compensation for damaged crops but the road will be used for 3 years) ■ Commented that the yield rates has already decreased from heavy traffic and large vehicles, and could be further impacted from the drilling activities.	■ All compensation will be according to the Land Laws 2012. ■ Compensation procedure was explained ■ The acquired land for road enlargement will become the government land. ■ Since the land acquisition is long term, the future yield should be accounted for. ■ Eni will clarify farmers understanding on the duration for each acquired land (long-term or short-term).	Project Description Chapter SIA Chapter

Stakeholder	Questions / Comment	Response	Potential Mitigation Measure or Response in EIA
Medical Supervisor from Mi Kyaung Ye Village	■ What are the side effects of coliform bacteria and at what depth can it be found?	■ Explained the potential risk of bacteria to health. ■ Explained the risk of bacterial contamination in ground water. ■ Bacteria can be found at 9m.	Surface Water Impact Assessment Chapter
Villagers from Magway Town	■ High level of E coli in ground water and surface water could result from inadequate sewage systems.	■ N/A	NA
Medical personnel from Minbu Town	■ What are the environmental and social impacts to public health and safety?	■ Explained about the impacts and management measures.	SIA Chapter
Township Administrator from Minbu Town	■ Emphasized about villagers' concern on land acquisition. ■ Urged Eni to follow the given commitments to the community especially those with potential local development.	■ N/A	EMP Chapter
Parliament member from Magway Town, and Villagers from Magway Town	■ Would like to know about the Project cost and ratio of profits between MOGE and Eni. ■ Will more information about shared profits be shared with the community?	■ The profit will be shared with the government (citizens). The ratio will be decided when if the outcome of drilling is successful. ■ N/A	NA
Villagers from Magway Town	■ How the Project assessed impacts and mitigation measures for cultural heritage sites?	■ All the potential impacts to cultural heritage were properly addressed during seismic survey. The same approach will be applied before the drilling activity.	SIA Chapter
Project Description Aspect			
Township administrator from Minbu Town	■ Will more wells be drilled if the campaign is successful?	■ Yes. In turn, it can provide profit for Myanmar.	Project Description Chapter

Stakeholder	Questions / Comment	Response	Potential Mitigation Measure or Response in EIA
Medical personnel from Minbu Town	■ How will Eni manage the mud? ■ How will the mud be transported to the waste treatment plant?	■ Waste Management procedures were explained in detail emphasising on Public Health and Safety. In addition, details about Eni's waste management system and third party subcontractor were also highlighted.	Project Description Chapter
Governmental staff from Minhla Town	■ Where are the project sites? ■ Which part of Minhla will be impacted?	■ Well locations and Area of Influence in the EIA document (AoI) were shown ■ Explained about the previous plan of involving Minhla for its river transportation routes and the change of plan to no longer use the river routes.	Project Description Chapter
Villagers from Magway Town	■ Where does Eni comes from? ■ What does Eni stands for?	■ Explained about the company, Eni Myanmar's history, and Eni blocks in Myanmar.	Introduction Chapter
Villagers from Magway Town	■ What is the depth of the wells? ■ If the oil is found, how it will be transport? ■ Suggested that Eni should operate according to international standard for reliable result and share with the communities.	■ The estimate drilling depth is about 3,000 m and 4,000 m. ■ The transportation will be according to the Myanmar guideline and procedures.	Project Description Chapter

Source: SEM, 2019; modified by ERM, 2019

Note: N/A = Not Applicable

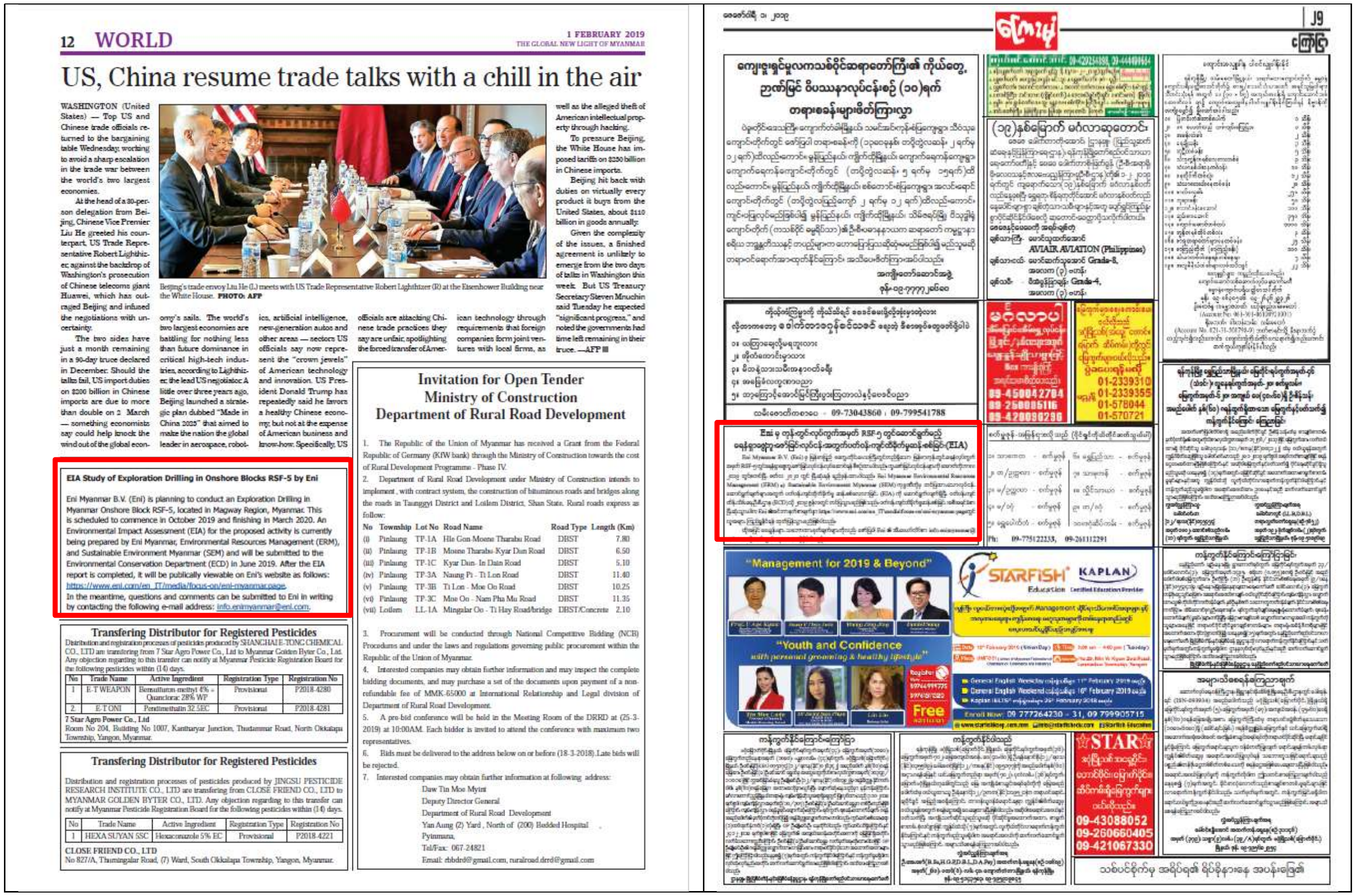
9.4 Project Disclosure

Information disclosure is one of the most important aspects of any engagement process. The process of disclosure involves the provisioning of information in an accessible manner (a manner which allows easy understanding, such as in the local language or using visual aids) to the various stakeholders in a Project. This disclosure not only allows for trust to be built amongst the stakeholders through the sharing of information but also allows for more constructive participation in the other processes of consultation and resolution of grievances due to availability of accurate and timely information.

As per the requirements of the EIA Procedure, disclosure activities are required at three separate places throughout the Project, as follows:

1. As part of Scoping, Eni has disclosed information about the proposed Project to the public and civil society through placing advertisements in two local media (Newspapers). The advertisements were published in The Global New Light of Myanmar (English) and The Mirror (Myanmar Language) on February 1, 2019 as shown in ***Table 9.8***. Eni has also disclosed information on the Project on the Eni website.
2. As part of the EIA study, Eni has disclosed all relevant information about the proposed Project and its likely adverse impacts to the public and civil society through local media on May 20, 2019 as shown in ***Table 9.8***.
3. The last public disclosure was submitted on 17th July 2019, not later than fifteen (15) days after submission of the EIA Report to ECD; to public and civil society through placing advertisements in two local media (Newspapers). The advertisements were published in The Global New Light of Myanmar (English) and The Mirror (Myanmar Language) as shown in ***Table 9.8***.

Table 9.8: Newspaper Advertisements



12 WORLD

1 FEBRUARY 2019
THE GLOBAL NEW LIGHT OF MYANMAR

US, China resume trade talks with a chill in the air

EIA Study of Exploration Drilling in Onshore Blocks RSF-5 by Eni

Eni Myanmar B.V. (Eni) is planning to conduct an Exploration Drilling in Myanmar Onshore Block RSF-5, located in Magway Region, Myanmar. This is scheduled to commence in October 2019 and finishing in March 2020. An Environmental Impact Assessment (EIA) for the proposed activity is currently being prepared by Eni Myanmar, Environmental Resources Management (ERM), and Sustainable Environment Myanmar (SEM) and will be submitted to the Environmental Conservation Department (ECD) in June 2019. After the EIA report is completed, it will be publically viewable on Eni's website as follows: https://www.eni.com/en_IT/media/focus-on/eni-myanmar.page.
In the meantime, questions and comments can be submitted to Eni in writing by contacting the following e-mail address: info.enimyanmar@eni.com.

Transfering Distributor for Registered Pesticides

Invitation for Open Tender
Ministry of Construction
Department of Rural Road Development

20 MAY 2019
THE GLOBAL NEW LIGHT OF MYANMAR

SCIENCE 13

Take this app: tech firms tackle opioid crisis with software

WASHINGTON (United States)—Technology firms are taking aim at the opioid crisis and related health problems with a new class of treatments—digital therapeutics—delivered by smartphone.

These new treatments, backed by medical research and offered by prescription, are seen as potential ways to supplement, and in some cases replace, pharmaceuticals to treat addiction and an array of other mental and physical health issues.

Smartphone technology may be well-suited to behavioral therapy for addiction, depression and other disorders by making treatment more accessible and trackable by medical professionals, researchers say. "Digital therapeutics are validated scientific treatments delivered in the form of software, which can increase access and provide an immediacy,"

Software delivered by smartphone for medical treatment – digital therapeutics –is being used for opioid addiction and other health conditions. PHOTO: AFP

said Yuri Maricich, head of the clinical and regulatory team at Pear Therapeutics.

The company has received approval in the United States for apps to treat opioid addiction and other kinds of substance abuse.

"It's the same level of rigor (as pharmaceuticals) in terms of how the products are manufactured. We've run randomized clinic trials to make sure it produces the desired outcome and that it is safe," Maricich said.

In January, Pear launched in coordination with Novartis unit Sandoz the reSET-O prescription digital therapeutic 12-week cognitive behavioral therapy to treat opioid addiction after receiving approval by the US Food and Drug Administration.

It is offered with the commonly used medication buprenorphine for adults under the care of a therapist. —AFP

Soil heavy metal cadmium makes plants more sensitive to ozone pollution: research

SHENYANG—Chinese researchers have discovered that a high density of metal cadmium in soil makes plants more sensitive to ozone pollution.Heavy metal and ground-level ozone pollution have been steadily increasing, especially in cities with heavy industry, said the research paper published on the journal Ecotoxicology and Environmental Safety.

Researchers from the Institute of Applied Ecology of the Chinese Academy of Sciences used the Urban Field Experiment Platform to conduct research on the effects of elevated ozone concentration and a high density of heavy metal on plants in northeast China.The results showed that high cadmium content in soil increased the susceptibility and toxicity of plants, such as a hybrid poplar mentioned in their study, to ozone pollution, meanwhile the ozone exacerbated cadmium accumulation in above-ground parts of the plants grown on cadmium-polluted soil.The researchers did not find a significant effect of low cadmium soil on photosynthesis and above-ground biomass.The research results may be consulted when selecting plants for urban afforestation and ecological soil restoration in ozone-polluted and high soil heavy metal areas.—Xinhua

EIA Study of Exploration Drilling in Onshore Block RSF-5 by Eni

Eni Myanmar B.V. (Eni) is planning to conduct an Exploration Drilling in Myanmar Onshore Block RSF-5, located in Magway Region, Myanmar, scheduled to commence between November and December 2019 and finishing in June 2020. Eni Myanmar, Environmental Resources Management (ERM), and Sustainable Environment Myanmar (SEM) have prepared an Environmental Impact Assessment (EIA) for the proposed activity. The EIA study will be submitted to the Environmental Conservation Department (ECD) and be made publicly available in June 2019. Eni will be meeting with stakeholders in Magway during May 2019 to present the preliminary findings of the EIA and collect feedback. After the EIA report is completed, it will be publically available on Eni's website as follows: https://www.eni.com/en_IT/media/focus-on/eni-myanmar.page. In the meantime, questions and comments can be submitted to Eni in writing by contacting the following e-mail address: info.enimyanmar@eni.com.

EIA Study for Exploration Drilling Campaign in Offshore Block MD-7 by PTTEP SA

PTTEP South Asia Limited (PTTEP SA), successfully completed 2D and 3D Seismic Acquisition in 2014 and 2016 respectively. PTTEP SA is now planning to conduct a drilling campaign in order to explore petroleum potential in Block MD-7. This drilling campaign consists of 1 exploration drilling well located Block MD-7 in Andaman Sea, Myanmar. The tentative plan for commencement of drilling will be end of 2019.

Regarding the Scoping Report which was submitted to Environmental Conservation Department (ECD), PTTEP SA with third party EIA/SIA consultants Environmental Resources Management (ERM) and Sustainable Environment Myanmar (SEM) are currently undertaking an EIA Study which includes associated stakeholder engagement. The EIA will be conducted in accordance with the Myanmar EIA Procedure (2015).

More information about the proposed activity can be found on PTTEP's website as follows: www.pttep.com.

Questions and comments can also be submitted to PTTEPI in writing by contacting the following e-mail address: TinNilarSoe@pttep.com

KOICA

NOTICE OF TENDER
For Consulting Services

KF

Date: 20 May 2018

1. The Korea International Cooperation Agency (KOICA)'s Project Management Consultant (hereinafter referred to as the "PMC") for the Project for "Establishment of Integrated Agriculture and Irrigation Master Plan (EIAIDMP), Ayeyarwady Delta Region" invites prospective bidders for Consulting services for the "Data Survey on Agriculture and Rural Area" (hereinafter referred to as the "Services"). The EIAIDMP is being implemented with the grant aid of the Government of Korea.

Brief of Bidding
- **Bid Title:** Data Survey on Agriculture and Rural Area for the "Establishment of Integrated Agriculture and Irrigation Master Plan (EIAIDMP), Ayeyarwady Delta Region"
- **Contract Duration:** 120 days from the commencement date
- **Estimated Budget: USD100,000 (Inclusive of Taxes)**
- **Summary of Consulting Services**
  - Type: Data collection and Analysis
  - Survey area: Ayeyarwady Region
  - Services/Survey Items: Specified in the Request For Proposals (RFP)

① Employer: KOICA PMC for the Project for "Establishment of Integrated Agriculture and Irrigation Master Plan (EIAIDMP), Ayeyarwady Delta Region"
② Bid Type: International Open Competitive Bidding
③ Selection of the Successful Bidder:
- Evaluation consists of Bid Financial Evaluation of Twenty (20) Points and Technical Evaluation of Eighty (80) Points. Total of One hundred (100) points
- Details of Selection of the Successful Bidder is specified in the RFP

④ The RFP will be provided upon applicants' request by emails or written letters to the PMC.
⑤ **Instructions and Schedule:**
[Clarification]
- The Consultants may request clarification of RFP not later than **3 June 2019**

[Bid]
- Place for Bid Submission: **at PMC Office**
- Bid Closing (Submission): 10 June, 2019, 14:00 at **PMC**
- Financial Proposal Opening: 18 June 2019, 10:00 **at PMC Office**

⑥ Currency of Financial Proposal (Bid Price): **United States Dollar**
⑦ Currency of Contract: **United States Dollar**
⑧ Consortium or Joint Venture is allowed.

2. Bid price of Financial proposal shall be equal or less than the 'Estimated Budget'. Any bid exceeding the above limitation may result in rejection of its bid.

3. The RFP includes following documents but not limited to:
① Letter of Invitation
② Instructions to Consultants
③ Technical Proposal – Standard Forms
④ Financial Proposal – Standard Forms
⑤ Terms of Reference
⑥ Standard Forms of Contract

4. Language of Proposal: All documents shall be in English. If the other languages documents delivered by the government administration, bank, educational, professional organizations and others for the proof of Bid Evaluation Criteria, the NOTARIZED English documents shall be attached.

5. PMC shall not be responsible for any costs or expenses incurred by Bidders in connection with the preparation or delivery of bids

6. All bidders are expected to examine all instructions, forms, terms and specifications of the bidding documents. Failure to furnish all information required by the bidding documents or submission of a bid not substantially responsive to the bidding documents in every respect shall be at the Bidder's risk and may result in the rejection of the bid.

7. Contact Information

PMC Office
Address: 1F, Extension Building, Design Branch, Irrigation and Water Utilization management Department, Thitsar Road, Yankin Township, Yangon, Myanmar
Tel: 95-94 28460701
E-mail: EMAIL & elaidmpkoica@gmail.com
Attention: KOEI Gyoung Tae, Project Manager, EIAIDMP

12 BUSINESS

17 JULY 2019
THE GLOBAL NEW LIGHT OF MYANMAR

Daiwa House launches 1st logistics base in Viet Nam

HO CHI MINH CITY — Japanese homebuilder Daiwa House Industry Co. has opened its first logistics base in Vietnam for the rental of warehousing space to forwarders as part of investment in Asia to meet rising Japanese demand for local products.

Daiwa House on Monday launched the base in LocAnBinh Son Industrial Parkin Dong Nai Province, some 40 kilometers east of Ho Chi Minh City, and expects to open another by February 2020, with a total investment of up to 8.8 billion yen ($80.6 million), Tatsuya Urakawa, the company's managing executive director, told NNA.

According to Urakawa, the new base, having a total floor space of 86,000 square meters, maintains the temperature as low as minus 60 ˚C, which is adjustable to other ranges such as 10-25 ˚C or 0-10 ˚C according to customer needs. Daiwa House said it hopes the completion of the new facilities with freezers would contribute to expanding the cold-chain network in the region and help increase transportation of frozen food to Japan. The Daiwa House group has so far developed logistics facilities in Thailand, Indonesia and Malaysia, and "is planning (another) in Singapore and Australia," Urakawa said, adding that he expects the expansion of the logistics network to help Japan cope with falling food self-sufficiency. The group placed member countries of the Association of Southeast Asian Nations, better known as ASEAN, as a core area of its overseas business and expects to expand its foreign sales to 400 billion yen by fiscal 2021 from 278 billion yen in fiscal 2018 ended last March, according to Daiwa's sixth medium-term management plan released in May. —Kyodo News

Daiwa House Industry Co launches on 15 July, 2019, its first logistics base in LocAnBinh Son Industrial Park in Dong Nai province, 40 kilometers east of Ho Chi Minh. PHOTO: KYODO NEWS

About 50,000 Bitpoint Japan customers had cryptocurrency stolen

TOKYO — Cryptocurrency exchange operator Bitpoint Japan Co said Tuesday that around half of its 110,000 customers have been victimized by the recent hacking in which digital currencies worth 8.02 billion yen ($37 million) were stolen.

Bitpoint Japan President GenbiOda apologized for the incident at a Tokyo press conference and vowed to fully return the stolen assets in virtual currencies after the company resumes services that were suspended following Thursday's hacking.

But he said the timing of restarting the suspended services and transactions remains unclear as the theft is still being investigated.

In addition to the 8.02 billion yen hacked in Japan, Bitpoint has said an additional 250 million yen worth of digital currencies have been stolen at overseas exchanges that use its trading system.

The company said it reported the initial theft to police on Friday morning.—Kyodo News

Submission of EIA Study of Exploration Drilling in Onshore Block RSF-5 by Eni

Eni Myanmar B.V. (Eni) is planning to conduct Exploration Drilling in Myanmar Onshore Block RSF-5, located in Magway Region, Myanmar, scheduled to commence between November and December 2019 and finishing in June 2020. Eni Myanmar, Environmental Resources Management (ERM), and Sustainable Environment Myanmar (SEM) have prepared an Environmental Impact Assessment (EIA) for the proposed activity. The EIA study was submitted to the Environmental Conservation Department (ECD) on 1st July, 2019. The report is publically available at the following locations:

- Eni's office in Yangon: Sakura Tower, 6th floor - Offices 0602, 339 Bogyoke Aung San Road Kyauktada Township, Yangon, Myanmar
- Magway District General Administrative Department Office, Magway Region
- Yangon Region ECD office
- Magway Region ECD office
- On Eni's website as follows: https://www.eni.com/enipedia/en_IT/international-presence/asia-oceania/eni-activities-in-myanmar.page

Feedback on the report can be submitted to Eni in writing by contacting the following e-mail address: info.onimyanmar@eni.com

CLAIM'S DAY NOTICE
M.V KOTA HADIAH VOY. NO. (KHAD 0119 N/S)

Consignees of cargo carried on M.V KOTA HADIAH VOY. NO. (KHAD 0119 N/S) are hereby notified that the vessel will be arriving on 17-07-2019 and cargo will be discharged into the premises of H.P.T where it will lie at the consignee's risk and expenses and subject to the byelaws and conditions of the Port of Yangon.

Damaged cargo will be surveyed daily from 8 am to 11:20 am and 12 noon to 4 pm to Claim's Day now declared as the third day after final discharge of cargo from the Vessel.

No claims against this vessel will be admitted after the Claims Day.

SHIPPING AGENCY DEPARTMENT
MYANMA PORT AUTHORITY
AGENT FOR: M/S ADVANCE CONTAINER LINES
Phone No: 2301185

CLAIM'S DAY NOTICE
M.V ISEACO GENESIS VOY. NO. (025 N/S)

Consignees of cargo carried on M.V ISEACO GENESIS VOY. NO. (025 N/S) are hereby notified that the vessel will be arriving on 17-07-2019 and cargo will be discharged into the premises of A.W.P.T where it will lie at the consignee's risk and expenses and subject to the byelaws and conditions of the Port of Yangon.

Damaged cargo will be surveyed daily from 8 am to 11:20 am and 12 noon to 4 pm to Claim's Day now declared as the third day after final discharge of cargo from the Vessel.

No claims against this vessel will be admitted after the Claims Day.

SHIPPING AGENCY DEPARTMENT
MYANMA PORT AUTHORITY
AGENT FOR: M/S NEW GOLDEN SEA LINES
Phone No: 2301185

CLAIM'S DAY NOTICE
M.V OLYMPIA VOY. NO. (027S)

Consignees of cargo carried on M.V OLYMPIA VOY. NO. (027S) are hereby notified that the vessel will be arriving on 17-07-2019 and cargo will be discharged into the premises of M.I.T.T/M.I.P where it will lie at the consignee's risk and expenses and subject to the byelaws and conditions of the Port of Yangon.

Damaged cargo will be surveyed daily from 8 am to 11:20 am and 12 noon to 4 pm to Claim's Day now declared as the third day after final discharge of cargo from the Vessel.

No claims against this vessel will be admitted after the Claims Day.

SHIPPING AGENCY DEPARTMENT
MYANMA PORT AUTHORITY
AGENT FOR: M/S MCC TRANSPORT (S'PORE) PTE LTD
Phone No: 2301185

CLAIM'S DAY NOTICE
M.V BOX ENDEAVOUR VOY. NO. (028W)

Consignees of cargo carried on M.V BOX ENDEAVOUR VOY. NO. (028W) are hereby notified that the vessel will be arriving on 17-07-2019 and cargo will be discharged into the premises of M.I.T.T/T.M.T where it will lie at the consignee's risk and expenses and subject to the byelaws and conditions of the Port of Yangon.

Damaged cargo will be surveyed daily from 8 am to 11:20 am and 12 noon to 4 pm to Claim's Day now declared as the third day after final discharge of cargo from the Vessel.

No claims against this vessel will be admitted after the Claims Day.

SHIPPING AGENCY DEPARTMENT
MYANMA PORT AUTHORITY
AGENT FOR: M/S MCC TRANSPORT (S'PORE) PTE LTD
Phone No: 2301185

CLAIM'S DAY NOTICE
M.V PACITA VOY. NO. (042 W/E)

Consignees of cargo carried on M.V PACITA VOY. NO. (042 W/E) are hereby notified that the vessel will be arriving on 17-07-2019 and cargo will be discharged into the premises of H.P.T where it will lie at the consignee's risk and expenses and subject to the byelaws and conditions of the Port of Yangon.

Damaged cargo will be surveyed daily from 8 am to 11:20 am and 12 noon to 4 pm to Claim's Day now declared as the third day after final discharge of cargo from the Vessel.

No claims against this vessel will be admitted after the Claims Day.

SHIPPING AGENCY DEPARTMENT
MYANMA PORT AUTHORITY
AGENT FOR: M/S NEW GOLDEN SEA LINES
Phone No: 2301185

Source: ERM, 2019

9.5 Future Engagement and Disclosure

9.5.1 Engagement

During the Project, there will be additional engagement as per the recommendation in the impact assessment chapter of this report. It is expected that the meetings will be held on an ad-hoc basis with the relevant stakeholder. The format of these meetings will vary based on the type of information that needs to be shared with the stakeholders.

10. CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

This EIA Study for the proposed Exploration Drilling in Block RSF-5 has been prepared as a Company effort to adequately identify potential impacts associated with its activities and to address them through mitigation actions that can minimize any negative effects on people, environment or assets. Furthermore, the study has been developed to comply with the requirements of the MONREC EIA Procedures and in line with applicable international standards. The EIA demonstrates that Eni understands the environmental, social and health setting in which they are operating and has properly assessed the key potential environmental, social and health impacts associated with the proposed Project. A project-specific, dedicated EMP has been developed and presented as a tool to manage impacts associated with the Project and ensure legislative compliance and standards of good practice during the execution of the Project in Block RSF-5. Provided that the recommended mitigation measures are properly implemented, it is expected that the environmental and social impacts of the proposed Project can be managed by Eni in a professional and acceptable manner. As such, the EIA concludes that no Major residual impacts on the environment or communities are anticipated from this Project, and all impacts will be mitigated to be as low as reasonably practicable.

10.2 Recommendations

The Project's EMP (***Section 8***) and subject specific management plans detail the required mitigation measures and all reporting and monitoring activities to be implemented during the Project. As stated in ***Section 2.6 (Statement of Commitments),*** Eni will fully implement the EMP, and all the subject specific management plans, all Project commitments, and conditions, and is liable to ensure that all contractors and subcontractors of the Project comply fully with all applicable Laws, including the Environmental Conservation Law (2012), Environmental Conservation Rules and Environmental Impact Assessment Procedure (2015), as well as the EMP, Project commitments and conditions.

The EIA Report disclosure process will include disclosure of the executive summary of the EIA study in Myanmar language in the townships visited: Magway, Minhla and Minbu Townships in Magway Region. The EIA Report disclosure will be advertised in national and local newspapers and published in the Company website.

A number of public consultation activities have also been undertaken as part of the EIA process in line with Myanmar law. However, stakeholder engagement is a continuous process to be undertaken throughout the life of the Project and, as such, Eni will implement and manage this ongoing consultation, address stakeholder concerns if they emerge, and regularly monitor stakeholder feedback.

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