ENVIRONMENTAL IMPACT ASSESSMENT (EIA) STUDY OF 151.54 MW COMBINED CYCLE POWER PLANT AHLONE TOWNSHIP, YANGON

(2nd REVISION)

Submitted to

Myanmar Ahlone Power Plant Co., Ltd.

By

Myanmar Survey Research

November 2024

Myanmar Ahlone Power Plant Co., Ltd.

No.20, Sabal Street, Saw Yan Paing Quarter Ahlone Township, Yangon.

To

Director General

Environment Conservation Department

Ministry of Natural Resources and Environmental Conservation.

Subject: **Submission of EIA Report for 151.54MW Ahlone Combined Cycle Power Plant Project.**

1. Myanmar Ahlone Power Plant Company Limited is planning to develop natural gas-fired Combined Cycle Power Plant (CCPP) project on the land of approximately 5.965 acres in Ahlone Township, Yangon Region. This project is being implemented under the guidance and closed supervision of Ministry of Electric Power (MOEP) in accordance to Power Purchase Agreement (PPA).

2. In order to conduct Environmental Impact Assessment (the "EIA") for the 5.965-acre land, the project proponent commissioned a third party, Myanmar Survey Research (MSR). MSR visited project site and the surroundings for the preparation of the EIA report in accordance with the existing laws, regulation, guidelines, and standards of the corresponding Ministries of the Republic of the Union of Myanmar.

3. Myanmar Ahlone Power Plant Company Limited would like to confirm the following aspects related to the EIA report:

   a. The accuracy and completeness of the EIA:
   b. The EIA has been prepared in strict compliance with applicable laws including EIA procedure; and
   c. The project will, at all time, comply fully with the commitments, mitigation measures and plans in the EIA reports.

MYANMAR AHLONE POWER PLANT CO., LTD No..... Date.....

Yours sincerely,

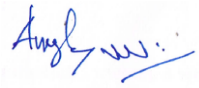
Director

Myanmar Ahlone Power Plant Co., Ltd.

SUBMISSION OF DOCUMENTATION

We, **Myanmar Survey Research (MSR) Co., Ltd**. submit this Environmental and Social Impact Assessment Study Report, for **Implementing 151.54MW Combined Cycle Power Plant Project in Ahlone Township, Yangon.**

To our knowledge all information contained in this report is accurate and truthful representation of all findings as relating to the Project.

Name and designation	Position in team	Signature
U Kyaw Hlaing President	Leader	
Dr. San Tun Aung Senior Adviser, Social Scientist	Dy Leader	
U Ye Nyunt Industrial Analyst and Report Writing	Member	
Engr. U Myint Swe Consultant Engineer, Physical Environment	Member	
U Aung Lin Social Impact Assessment Consultant	Member	
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Name and designation	Position in team	Signature
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U Ye Min Aung Field staff (Operation)	Member	

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Abbreviation

AGI	Above Ground Installation
$AlCl_3$	Aluminium Chloride
AoI	Area of Influence
BAT	Best Available Technology or Techniques
BOD	Biological Oxygen Demand
CO_2	Carbon dioxide
CO	Carbon monoxide
COD	Chemical Oxygen Demand
CEC	Chief Emergency Controller
CFCs	Chlorofluorocarbons
CMB	Chemical Mixing Basin
COPD	Chronic obstructive pulmonary disease
CCCW	Closed Cycle Cooling Water
CCPP	Combined Cycle Power Plant
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CEDAW	Convention on the Elimination of All Forms of Discrimination Against Women
CSR	Corporate Social Responsibility
CIA	Cumulative Impacts Assessment
dB	Decibel
DM	Demineralization
DMH	Department of Metrology and Hydrology
DoP	Department of Population
DWIR	Directorate of Water Resources and Improvement of River Systems
ECC	Emergency Control Centre
ECD	Department of Environmental Conservation
ERP	Emergency Response Plan
EPC	Engineering, Procurement, and Construction
EHS	Environment, Health, and Safety
ESMP	Environmental and Social Management Plan
EIA	Environmental Impact Assessment
EMM	Environmental Management/Mitigation Measures
EMP	Environmental Monitoring Plan
GT	Gas Turbine
GDA	General Administration Department
GEF	Global Environment Facility
GIS	Global Information System
GPS	Global Positioning System
GTG	Gas Turbine Generator
GRC	Grievance Redress Committee
HRSG	Heat Recovery Steam Generator
N_2H_4	Hydrazin Hydrate
IPP	Independent Power Production
INDC	Intended Nationally Determined Contribution
IUCN	International Union for Conservation of Nature
IWMI	International Water Management Institute
Km	Kilometre
LC	Least Concern
LNG	Liquified Natural Gas
LHV	Lower Heating Value
MSL	Mean Sea Level
M&E	Mechanical and Electrical Monitoring and Evaluation
CH_4	Methane
MOEP	Ministry of Electric Power
MOECAF	Ministry of Environmental Conservation and Forestry

MIFER	Ministry of Investment and Foreign Economic Relations
MONREC	Ministry of Natural Resources and Environmental Conservation
MM	Modified Mercalli
MSD	Musculoskeletal Disorders
MIP	Myanmar Industrial Port
MIC	Myanmar Invest commission
NEP	Myanmar National Electrification Plan
MSDP	Myanmar Sustainable Development Plan
NBSAP	National Biodiversity Strategy and Action Plan
NCEA	National Commission for Environmental Affairs
NEQG	National Emission/Effluent Quality Guideline
NEMC	National Energy Management Committee
NOAA	National Oceanic and Atmospheric Administration
NO_2	Nitrogen Dioxide
N_2O	Nitrous Oxide
OSHE	Occupational Safety Health and Environment
O&M	Operation & Maintenance unit
NO_x	Oxides of Nitrogen
O_3	Ozone
PCB	Polychlorinated biphenyls
PM	Particulate Matters
PSH	Probabilistic Seismic Hazard
PD	Project Director
PMU	Project Implementation unit
RC	Reinforced Concrete
SPS	Safeguard Policy Statement Sodium hypochlorite (NaHCl)
ST	Stream Turbine
STG	Stream Turbine Generator
SO_2	Sulphur Dioxide
TDS	Total Dissolved Solid
TSS	Total Suspended Solid
UNCED	UN Conference on Environment and Development
UGI	Underground Installations
CBD	United Nations Convention on Biological Diversity
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
YCDC	Yangon City Development Committee

အစီရင်ခံစာအနှစ်ချုပ်

နိဒါန်း

မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီမှ အကောင်အထည်ဖော်မည့် ဤ ၁၅၁.၅၄ မဂ္ဂါဝပ်အင်အား ယှဉ်တွဲလည်ပတ်စနစ် လျှပ်စစ်ဓါတ်အားထုတ်လုပ်ရေး စီမံကိန်းအတွက် ပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်း အစီရင်ခံစာကို စီမံကိန်းအကောင်အထည်ဖော်မည့်ကုမ္ပဏီကိုယ်စား မြန်မာဆာဗေးရီဆာ့(ချ်) ကုမ္ပဏီက ပြုစုတင်ပြရေးသားပါသည်။ ပတ်ဝန်းကျင်ထိခိုက်ဆန်းစစ်ခြင်း အစီရင်ခံစာနှင့်စပ်လျဉ်းသည့် လုပ်ငန်းစဉ်များကို ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနက ပြဋ္ဌာန်းထားသောစည်းမျဉ်းစည်းကမ်းများနှင့်အညီ ရင်းနှီးမြှုပ်နှံသည့် မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီက လိုက်နာဆောင်ရွက်ရန်သော်လည်းကောင်း၊ စီမံကိန်းကို အပြည့်အဝအကောင်အထည်ဖော်ဆောင်ရန်အတွက် အထောက်အကူပြုစေရန်သော်လည်းကောင်း မြန်မာဆာဗေးရီဆာ့(ချ်)ကုမ္ပဏီသည် ၂၀၂၀ခုနှစ် ဩဂုတ်လ ၁၀ရက်နေ့မှစတင်ပြီး ကွင်းဆင်းလေ့လာမှုနှင့် ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်အလက်များ စစ်တမ်းကောက်ယူမှုများကို ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာက ပြဋ္ဌာန်းထားသောလေ့လာဆန်းစစ်ခြင်းလုပ်ငန်းစဉ်နှင့် လုပ်ထုံးလုပ်နည်းများကို လိုက်နာကျင့်သုံး၍ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာကို ပြုစုရေးသားတင်ပြအပ်ပါသည်။

ရန်ကုန်တိုင်းတွင်းရှိ အိမ်ထောင်စုများ၊ စက်မှုလုပ်ငန်းနှင့် ကုန်ထုတ်လုပ်ငန်းများလိုအပ်သည့် စွမ်းအင်ကို အချိန်နှင့်တပြေးညီ ဖြန့်ဖြူးပေးနိုင်ရန်အတွက် ပြည်ထောင်စုအစိုးရသည် လျှပ်စစ်နှင့် စွမ်းအင်ဝန်ကြီးဌာနကို ဦးဆောင်စေကာ ၂၀၁၁ ခုနှစ်မှစတင်ပြီး ပုဂ္ဂလိက ရင်းနှီးမြှုပ်နှံသူများကို မြန်မာနိုင်ငံ၏ စွမ်းအင်ကဏ္ဍတွင် ဝင်ရောက်ရင်းနှီးမြှုပ်နှံခွင့်ပြုသည့် အစီအစဉ်ကို စတင်အကောင်အထည်ဖော်ခဲ့ပါသည်။ လျှပ်စစ်နှင့် စွမ်းအင်ဝန်ကြီးဌာနသည် ရန်ကုန်တိုင်း၊ အလုံမြို့နယ်ရှိ ဝန်ကြီးဌာနပိုင် ဓါတ်အားထုတ်လုပ်ရေးဝင်းအတွင်း ဓါတ်အားထုတ်လုပ်ရေးစီမံကိန်းသစ်ကို ဖော်ဆောင်ရန် တင်ဒါခေါ်ယူ၍ ပုဂ္ဂလိကလုပ်ငန်းရှင်များကို ဖိတ်ခေါ် ခဲ့ရာတွင် မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီသည် ၁၅၁.၅၄ မဂ္ဂါဝပ်အင်အား သဘာဝဓါတ်ငွေ့နှင့်ရေနွေးငွေ့ ယှဉ်တွဲနည်းပညာအသုံးပြု လျှပ်စစ်ဓါတ်အား ထုတ်လုပ်ရေး စက်ရုံစီမံကိန်းအကောင်အထည်ဖော်ရန် ခွင့်ပြုချက်ရရှိခဲ့ပါသည်။ ၂၀၂၀ ခုနှစ် ဩဂုတ်လတွင် စီမံကိန်း၏တစ်စိတ်တစ်ပိုင်းဖြစ်သော သဘာဝဓါတ်ငွေ့မှ လျှပ်စစ်ထုတ်လုပ်သည့်အစိတ်အပိုင်းသည် လည်ပတ်ရန်အသင့်ဖြစ်သည့်အတွက် စတင်လည်ပတ်နေပြီး ထိုနှစ်အကုန်တွင် ကျန်အစိတ်အပိုင်းဖြစ်သော ရေနွေးငွေ့မှလျှပ်စစ်ထုတ်လုပ်သည့် အစိတ်အပိုင်းကို အပြည့်အဝလည်ပတ်နိုင်ရန် အစဉ်တိုးတက်လာနေသော လျှပ်စစ်ဓါတ်အားလိုအပ်ချက်ကို ဖြည့်ဆည်းပေးနိုင်ရန်နှင့် ဝန်ကြီးဌာန၏ လမ်းညွှန်ချက်မူဖြင့် လျှပ်စစ်ထုတ်လုပ်ရေး သဘောတူညီချက်ကို လိုက်နာဆောင်ရွက်နိုင်ရန် စီမံကိန်းအကောင်အထည်ဖော်သူက အားသွန်ခွန်စိုက်ဆောင်ရွက်ခဲ့ခြင်းလည်းဖြစ်ပါသည်။

မူဝါဒ၊ ဥပဒေ နှင့် အဖွဲ့အစည်းဆိုင်ရာ မူဘောင်

ဤပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာအား သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဝန်ကြီးဌာန (MONREC)၏ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန (ECD) ၏ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း လမ်းညွှန်ချက်များတွင် သတ်မှတ်ထားသည့် လမ်းညွှန်ချက်နှင့် ပြဋ္ဌာန်းချက်နှင့်အညီ ပြင်ဆင်ထားပြီး ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်၏ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး မူဝါဒများ၊ ဥပဒေများ နှင့် အဖွဲ့အစည်းဆိုင်ရာမူဘောင်များနှင့် အခြားဝန်ကြီးဌာနမှ ပြဋ္ဌာန်းထားသည့် ဥပဒေများ၊ လုပ်ထုံးလုပ်နည်းများ နှင့် စည်းမျဉ်းစည်းကမ်းများကို ထည့်သွင်းဆွေးနွေးတင်ပြထားပြီး စီမံကိန်း အကောင်အထည်ဖော်မည့် မြန်မာအလုံပါဝါပလန့် ကုမ္ပဏီလီမိတက်မှ ထိုပြဋ္ဌာန်းထားသည့် ဥပဒေများ၊ နည်းဥပဒေ များနှင့်စည်းမျဉ်းစည်းကမ်းအားလုံးကို လိုက်နာရမည့်တာဝန်ရှိပါသည်။ ထို့အပြင် ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်မှ သဘောတူညီချက်အဖြစ် လက်မှတ်ရေးထိုးထားသည့် နိုင်ငံတကာ သဘောတူစာချုပ်များနှင့် အတည်ပြုချက်များကို လည်း စီမံကိန်းအကောင်အထည်ဖော်မည့် မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီ

လီမိတက်သည် ပတ်ဝန်းကျင်ကာကွယ်ရေးလုပ်ငန်းအဖြစ်သော်လည်းကောင်း စီပွားရေးလုပ်ငန်းများ၏ ပတ်ဝန်းကျင်စောင့်ရှောက်ရေးဝတ္တရားအဖြစ်သော် လည်းကောင်း မဖြစ်မနေ လိုက်နာဆောင်ရွက်ရန် ကတိပြုပါသည်။

စီမံကိန်းဆိုင်ရာအချက်အလက်များ နှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာ ရေးဆွဲခြင်း

တွဲဖက်နည်းပညာအသုံးပြု လျှပ်စစ်ဓါတ်အားထုတ်လုပ်ရေး ဤစီမံကိန်းကို ရန်ကုန်တိုင်း အလုံမြို့နယ်ရှိ လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာနပိုင် လျှပ်စစ်ဓါတ်အားထုတ်လုပ်ရေးအဆောက်အအုံဝန်း၏ ၅.၉၆၅ ကေပေါ်တွင် အကောင်အထည်ဖော်ဆောင်နေပြီး စီမံကိန်းကို အပြည့်အဝလည်ပတ်နိုင်ရန် အောက်ပါအခြေခံကျသည့် အဆောက်အဦများနှင့် အဆောက်အအုံများကို တည်ဆောက်သွားရန် လိုအပ်ပါသည်။ ၄င်းတို့မှာ -

၁။ ဓါတ်ငွေ့ထိန်းချုပ်စီမံရေးအဆောက်အအုံ

၂။ သဘာဝဓါတ်ငွေ့မှ လျှပ်စစ်ဓါတ်အားထုတ်လုပ်ရေး အဆောက်အအုံ
- (က) သဘာဝဓါတ်ငွေ့တာဘိုင်ရုံ
- (ခ) ဂျင်နရေတာရုံ
- (ဂ) အပူကူးပြောင်းရေးလမ်းကြောင်းရုံ

၃။ ရေနွေးငွေ့မှ လျှပ်စစ်ဓါတ်အားထုတ်လုပ်ရေး အဆောက်အအုံ
- (က) အပူပြန်လည်ရယူရေး ဂျင်နရေတာရုံ
- (ခ) ရေနွေးငွေ့တာဘိုင်ရုံ
- (ဂ) ဂျင်နရေတာရုံ

၄။ အအေးခံခြင်း နှင့် ငွေ့ရည်ဖွဲ့ခြင်းစက်ရုံ

၅။ ရေသန့်စင်စက်ရုံ နှင့် ရေတင်စက်ရုံ

၆။ ရေလှောင်ကန် နှင့် ရေသိုလှောင်ရုံ

၇။ ထရန်စဖော်မာ နှင့် ဓါတ်အားခွဲ ဌာန

၈။ ပင်မစနစ်၏ဆက်စပ် အခြေခံအဆောက်အအုံများ ဖြစ်ကြသည်။

သက်ဆိုင်ရာအာဏာပိုင်များက ထုတ်ပြန်ထားသည့် စီမံကိန်းနှင့်စပ်လျဉ်းသည့် ဌာနဆိုင်ရာခွင့်ပြုချက် စာရွက်စာတမ်းများကိုမူ အစီရင်ခံစာ၏ နောက်ဆက်တွဲကဏ္ဍတွင် ပူးတွဲဖော်ပြထားပါသည်။ ပတ်ဝန်းကျင်ထိမ်းသိမ်း စောင့်ရှောက်ရေးဌာန လမ်းညွှန်ချက်များ၊ ဥပဒေနှင့်အညီ ပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ခြင်းလုပ်ငန်းများ မလုပ်ဆောင်မီ နယ်ပယ်အတိုင်းအတာ သတ်မှတ်ခြင်းလုပ်ငန်းနှင့် အစီရင်ခံစာကို လေ့လာဆန်းစစ်မည့် အဖွဲ့အစည်းက စီမံကိန်းအကောင်အထည်ဖော်မှုကြောင့် ဖြစ်ပေါ်လာနိုင်မည့်သက်ရောက်မှုများကို ရေးဆွဲတင်ပြခဲ့ပြီးပါသည်။ ထိုမှတစ်ဆင့် ထိခိုက်မှုဆန်းစစ်ခြင်းကို ကျယ်ကျယ် ပြန့်ပြန့် ဆန်းစစ်မှုပြုနိုင်ရန် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ သဘောထား မှတ်ချက်များကို မဖြစ်မနေထည့်သွင်းပြီး သဘာဝပတ်ဝန်းကျင်သိပ္ပံနယ်ပယ်နှင့် လူမှုစီးပွားနယ်ပယ်အသီးသီးပေါ်တွင် ကျရောက်မည့် ထိခိုက်မှုဆန်းစစ်ချက်များ ပြုလုပ်ခဲ့ပြီး တွေ့ရှိချက်များကို ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း အစီရင်ခံစာတစ်ရပ်အဖြစ် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနသို့ တင်ပြနိုင်ရန် ဤအစီရင်ခံစာကို ပြုစုတင်ပြရခြင်း ဖြစ်ပါသည်။ ဤအစီရင်ခံစာ ဖြစ်မြောက်ရေးအတွက် နယ်ပယ်အသီးသီးမှပညာရှင်များသည် သက်ဆိုင်သူအဖွဲ့အစည်းများနှင့် စီမံကိန်းအကောင်အထည်ဖော်မည့် ရင်းနှီးမြှုပ်နှံသည့် ကုမ္ပဏီကြား ပူးပေါင်းဆောင်ရွက်ခဲ့ပြီး သက်ဆိုင်ရာ ဘာသာရပ်နယ်ပယ်အလိုက် ကွင်းဆင်းလေ့လာမှုများ၊ အပြန်လှန်ဆွေးနွေးပွဲများ၊ ပကတိအချက်အလက်များ ကောက်ယူမှုများကို

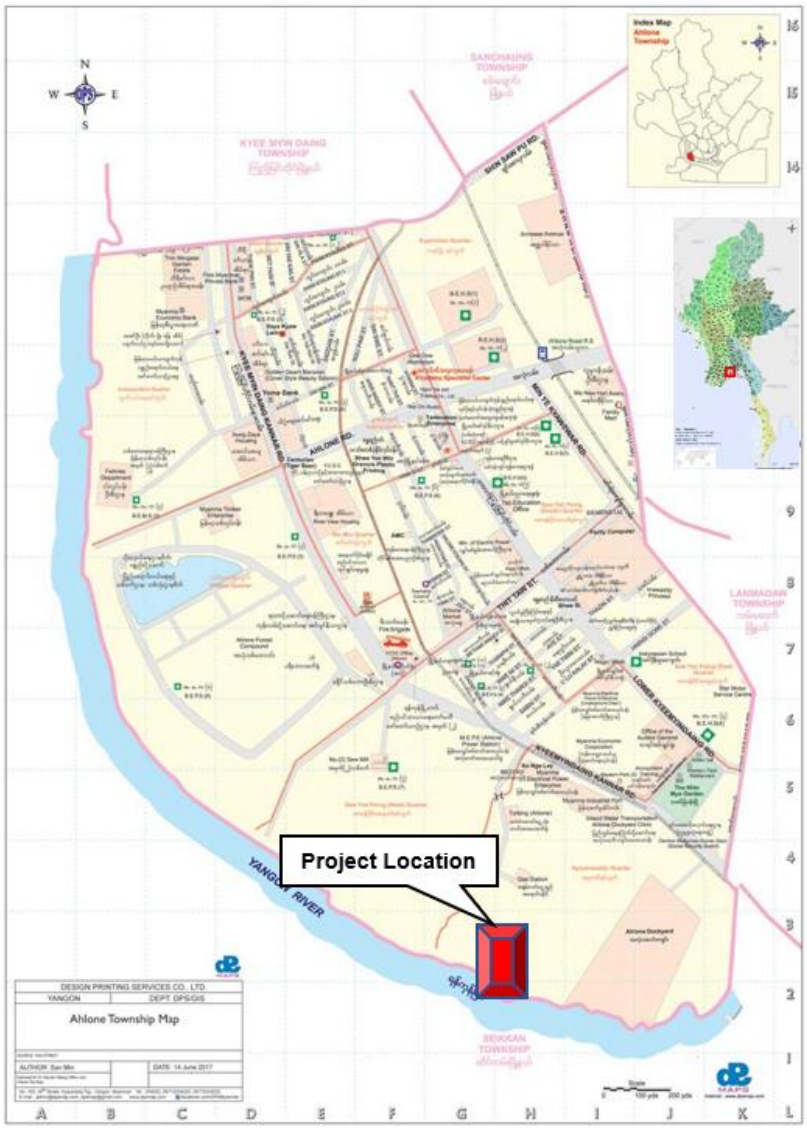
ဆောင်ရွက်ခဲ့ကြပါသည်။ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ရာတွင် အထောက်အကူပြုမည့် စီမံကိန်းနှင့် ပတ်သက်သည့် အချက်လက်များကို အောက်ပါဇယားဖြင့် အနှစ်ချုပ်ဖော်ပြအပ်ပါသည်။

ပုံ ၁ - စီမံကိန်းအပြင်ဆင်ဖော်ပြချက်

စီမံကိန်းအချက်အလက်	**အသေးစိတ်ဖော်ပြချက်**
စီမံကိန်းဧရိယာ	၅.၉၆၅ ကေခန့်
တည်ဆောက်ရေးအတွက်မြေအသုံးချမှုပမာဏ	၈၅ ~ ၉၀%
တပ်ဆင် ဓါတ်ငွေ့သုံးတာဘိုင်အမျိုးအစား	9 E- အဆင့် တာဘိုင် (စက်အညွှန်း - PG9171E) - ၁ လုံး
နေ့စဉ် ဓါတ်ငွေ့လိုအပ်ချက်	တစ်နေ့လျှင် ကုဗပေ ၄၄ သန်း (အပြည့်အဝလည်ပတ်စဉ်)
တပ်ဆင် ဂျင်နရေတာ စွမ်းရည် (ဓါတ်ငွေ့သုံး)	၁၂၃ မဂ္ဂါဝပ် (စက်အညွှန်း- QFR-135-2A).
သဘာဝဓါတ်ငွေ့တာဘိုင်ရုံ အရွယ်အစား	မီတာ (၂၅x၁၀x၄ : လ-န-မ) အရွယ် သံမဏိ အဆောက်အဦ
အပူကူးပြောင်းရေးလမ်းကြောင်းရုံ	မီတာ (၁၀x၂၀x၅၅ : လ-န-မ) အရွယ် သံမဏိ အဆောက်အဦ
စွန့်ထုတ်အပူချိန်	၅၅၀ ဒီဂရီဖာရင်ဟိုက်
တပ်ဆင် ရေနွေးငွေ့တာဘိုင် အမျိုးအစား	စက်အညွှန်း - N60-5.6/0.56/527/255 - ၁ လုံး
တပ်ဆင် ဂျင်နရေတာစွမ်းရည်	၆၅ မဂ္ဂါဝပ် (စကWX18Z-054LLT) - ၁ လုံး
အပူပြန်လည်ရယူရေး ဂျင်နရေတာ	စက်အညွှန်း - Q1089/534-169 (35) -5.9 (0.5) /512 (254)
ခေါင်းတိုင်အမြင့်	၅၈ မီတာ / ထွက်ရှိအပူချိန် : ၉၁ - ၉၈ဒီဂရီ စင်တီဂရိတ်
ရေနွေးငွေ့တာဘိုင်ရုံ အရွယ်အစား	မီတာ (၂၀x၂၀x၁၅ : လ-န-မ) အရွယ် သံမဏိ အဆောက်အဦ
ဓါတ်ငွေ့ထိန်းချုပ်ရေးဝန်လိုအပ်ချက်	MW-45/20-27
ငွေ့ရည်ဖွဲ့ အအေးခံသည့်စနစ်	စက်တပ်ပန်ကာတပ်စင် လေအားဖြင့် အအေးခံသည့်စနစ်

စီမံကိန်းအချက်အလက်	အသေးစိတ်ဖော်ပြချက်
ငွေရည်ဖွဲ့အအေးခံရုံ အရွယ်အစား	မီတာ (၂၀x၁၀x၁၀ : လ-န-မ) အရွယ် သံမဏိ အဆောက်အဦ
လောင်စာ၊ ဓါတုပစ္စည်း သိုလှောင်မှု နှင့် အသုံးပြုခြင်း	• မီတာအနည်းငယ်အတွင်းထောက်ပံ့ပေးထားသော ရေနုံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်းပိုင် ဓါတ်ငွေ့ပိုက်လိုင်းမှ သဘာဝဓါတ်ငွေ့ကို တိုက်ရိုက် သွယ်တန်း ရယူထားပါသည်။ • မီးစက်အတွက် ၁၀၀၀ လီတာဆံ့ မြေအောက်သိုလှောင်ကန်ဖြင့် အရေးပေါ်အသုံးပြုရန် သိုလှောင်ထားပါသည်။ • အခြားအန္တရယ်ရှိဓါတုပစ္စည်းများ ၁။ ယန္တယားများ ချောမွတ်စွာလည်ပတ်နိုင်စေရန် နှင့် ပြင်ဆင်ရန် စက်ဆီချောဆီများ - ၂၅၀ လီတာ (၂ ပေပါ ခန့်) ထက်မပိုသော ၂။ တာဘိုင်ဒလက်များဆေးကြောရန် ဆပ်ပြာဆီ - ၂၅၀ လီတာ (၂ ပေပါ ခန့်) ထက်မပိုသော ၃။ ဓါတုအခြေခံ ရေသန့်စင်ရေးစနစ်အတွက် ကုန်ကြမ်း ပစ္စည်းများ - ၂ ကုဗမီတာထက်မပိုသော ကန့်သတ် သိုလှောင်မှု ၄။ အခြား အန္တရာယ်ရှိသော အရည်နှင့်ဆီများ - လျှပ်သိုပစ္စည်း နှင့် အရန်ပစ္စည်းများတွင် အသုံးပြုရန် (မူလထုတ်ပိုးမှု အတိုင်း - ပမဏအနည်းငယ်သာ အရန်စုဆောင်းရန် ကန့်သတ်ထားသည်)
တပ်ဆင် ပင်မထရန်စဖော်မာ	စက်အညွှန်း - SF10-150000/66 နှင့် SF10-70000/66 အရေအတွက် - ၂ လုံး
ဓါတ်ငွေ့ဖြည့် လျှပ်စီးလမ်းကြောင်း	စက်အညွှန်း ZF-72.5/T2500-40 | ZF-72.5/T2000-40 အရေအတွက် - ၂ လုံး
အရန်ထရန်စဖော်မာ	စက်အညွှန်း - SZ11-6300/10.5 | SZ11-6300/13.8 အရေအတွက် - ၂ လုံး
ဓါတ်အားခွဲရုံ	စီမံကိန်း၏ ဘေးတစ်တဖက်တစ်ချက်ရှိ အစိုးရပိုင် အလုံဓါတ်အား ခွဲရုံသို့ ချိတ်ဆက်ထားသည်။ စီမံကိန်းနှင့် မီတာအနည်းအတွင်းတည်ရှိပါသည်။ သွယ်တန်းမှုစနစ် - လုံခြုံမှုအဆင့်မြင့် မြေအောက် လမ်းကြောင်း ဖြင့် ချိတ်ဆက်သည့်စနစ်။
ရေသန့်စက်	၁ နာရီ တန် ၃၀ ပမာဏ ပြန်လည်ပတ်ဖြတ်သန်းသည့်စနစ်ဖြစ်သည်
ငွေရည်ဖွဲ့ အအေးခံစနစ်အင်အား	တစ်နာရီလျှင် ကုဗမီတာ - ၅၀၀၀
ပင်မရေအရင်းမြစ်	ရန်ကုန်မြစ်
ထုတ်ယူသည့်ပမာဏ	တစ်နေ့လျှင် အများဆုံး ၆၀၀၀ ကုဗမီတာ

စီမံကိန်းအချက်အလက်	**အသေးစိတ်ဖော်ပြချက်**
ပိုလျှံရေထုတ်သည့်နေရာ	ဟာဘိချောင်း (စီမံကိန်း၏ ဘေးတွင် တည်ရှိသည်)
ရေပြန်ထွက်သည့်နှုန်း	ငွေ့ရည်ဖွဲ့ အအေးခံသည့်စနစ်မှ တစ်နေ့လျှင် ကုဗမီတာ ၂၀၀၀ ခန့်ပြန်လည်ထုတ်ယူ၍ ဘွိုင်လာအတွက် ပြန်လည် အသုံးပြုပါသည်။
စီမံကိန်း အတွင်းအပြင် သွားလာနိုင်မှု	၁။ စီမံကိန်းပြင်ပမှ ကျောက်ခင်းလမ်းဖြင့်သော် လည်းကောင်း ကွန်ကရစ်လမ်းဖြင့် သော်လည်းကောင်း ရောက်ရှိနိုင်သည်။ ၂။ စီမံကိန်းဧရိယာတွင်းတွင် အားဖြည့်ကွန်ကရစ်ခင်း စီမံကိန်း ပတ်လမ်း ထည့်သွင်းထားသည်။
စီမံကိန်းအတွက် ပံ့ပိုး/အရန် အခြေခံအဆောက်အဦများ	၁။ ပင်မထိန်းချုပ်ရေးရုံး နှင့် စီမံဌာန ၂။ ဝါယာကြိုးများနှင့်အပိုပစ္စည်းများအတွက် သိုလှောင်ခန်း ၃။ ယာဉ်ရပ်နားရာနေရာ ၄။ လုံခြုံရေးကင်း ၅။ မိလ္လာကန် ၆။ မီးသတ်ရန် ရေသိုလှောင်ကန် ၇။ ဖြတ်သန်းသွားလာရေးလမ်း
စီမံကိန်းအတွက် အဓိကအစိတ်အပိုင်းများ	၁။ တာဘိုင်ခန်း ၂။ ဂျင်နရေတာခန်း ၃။ အပူကူးပြောင်းရုံ ၄။ အပူပြန်လည်ရယူရေး ဂျင်နရေတာရုံ ၅။ ပင်မစနစ်ထိန်းချုပ်ရေးခန်းမ ၆။ လေလမ်းကြောင်း နှင့် ခါတ်ငွေ့လမ်းကြောင်း ၇။ ရေသန့်စင်ရေးစနစ် ၈။ မြစ်ရေသိုလှောင်ကန် ၉။ ငွေ့ရည်ဖွဲ့ရေအအေးခံရေးစနစ် ၁၀။ မီးသတ်ရေ နှင့် စက်ရုံသုံးရေလှောင်ကန် ၁၁။ ရေတင်စက် ၁၂။ မြေအောက် နှင့် စင်မြင့် (ရေ/လေ/ခါတ်ငွေ့ နှင့် ဝါယာကြိုးလမ်းကြောင်း ၁၃။ ပစ္စည်းသိုလှောင်ခန်း ၁၄။ စွန့်ပစ်ပစ္စည်းသိုလှောင်ခန်း ၁၅။ စားသောက်ခန်းနှင့် လုပ်သားများ နားနေဆောင်



ပုံ ၂ - စီမံကိန်းတည်နေရာ

အခြားရွေးချယ်စရာနည်းလမ်းများ ခွဲခြမ်းစိတ်ဖြာခြင်း

အခြားရွေးချယ်စရာနည်းလမ်းများကို ခွဲခြမ်းစိတ်ဖြာမှုများ ပြုလုပ်ရာတွင် ယခုအကောင်အထည်ဖော်မည့် ၁၅၁.၅၄ မဂ္ဂါဝပ် အင်အား တွဲဖက်နည်းပညာအသုံးပြု လျှပ်စစ်ဓါတ်အားထုတ်လုပ်ရေး စက်ရုံစီမံကိန်းနှင့် ပတ်သက်သည့် ထည့်သွင်းစဉ်းစားရမည့်အချက်အလက်များကို ထည့်သွင်းစဉ်းစားပြီး လေ့လာသုံးသပ်မှုများကိုပြုလုပ်ခဲ့ပါသည်။ စီမံကိန်း၏ အနီးပတ်ဝန်းကျင်တွင် အခြားလုပ်ငန်းတူ ပရောဂျက်နှစ်ခုရှိနေသည့်အတွက် ယခုရွေးချယ်ထားသော မြေနေရာမှလွဲ၍ ဓာတ်အားပေး စက်ရုံစီမံကိန်းအတွက် အခြားတည်နေရာအသစ်တွင် အကောင်အထည်ဖော်သွားရန် အတွက် ပိုမိုကောင်းမွန်သော မြေကွက်လွတ်မရှိကြောင်း လေ့လာရပါသည်။ ယခုစီမံကိန်းတွင် ခေတ်မီပြီး ပတ်ဝန်းကျင်နှင့် လိုက်လျောညီထွေဖြစ်သည့် စက်ပစ္စည်းနှင့် တည်ဆောက်မှုများကို ထည့်သွင်းထားသည့်အတွက် ပတ်ဝန်းကျင်ထိန်းသိမ်း စောင့်ရှောက်ရေးအမြင်ဖြင့် လက်ခံနိုင်ဖွယ်ရှိပါသည်။ လျှပ်စစ်နှင့် စွမ်းအင်ဝန်ကြီး ဌာနဝန်း အတွင်း လက်ရှိဓာတ်အားပေးစက်ရုံအချို့ရှိပြီး အဆိုပါ တည်နေရာသည် ဝန်ကြီးဌာနပိုင် ဓာတ်အားခွဲဝန်း (အလုံပင်မ ဓါတ်အားခွဲရုံ) ပါကပ်လျက် တည်ရှိနေသည်။ ထို့ကြောင့် စီမံကိန်းနေရာသည် အဆိုပြုထားသည့် ၁၅၁.၅၄ မဂ္ဂါဝပ်အင်အား အလုံဓာတ်ထုတ်လုပ်ရေး စက်ရုံအကောင်အထည် ဖော်ရန်အတွက် အသင့်လျော်ဆုံး ဖြစ်ပါသည်။

ထို့အပြင် ခါတ်ငွေ့လိုအပ်ချက်ကို အမြင့်ဆုံးထောက်ပံ့ပေးနိုင်ရန်အတွက် ခေတ်မီနည်းပညာသုံး သဘာဝခါတ်ငွေ့ (LNG) ပိုက်လိုင်းကွန်ယက်ကို ဝန်ကြီးဌာနမှ ပံ့ပိုးပေးထားပါသည်။ ထို့ပြင် အခြားရှုထောင့်သီးသီးမှ ဆောင်ရွက်ခဲ့သော ခွဲခြမ်းစိတ်ဖြာမှုများကို အကျဉ်းချုပ်ကို အောက်ဖော်ပြပါဇယားတွင် ဖော်ပြထားသည်။

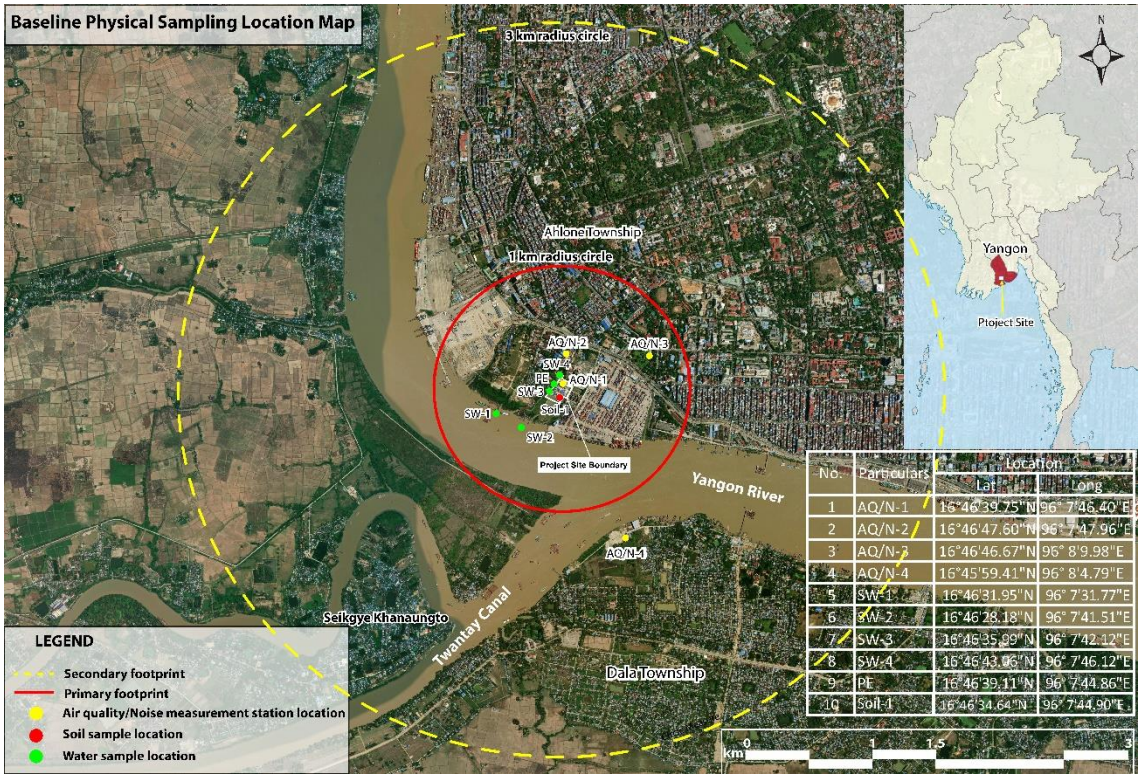
စဉ်	အခြားရွေးချယ်စရာနည်းလမ်းစဉ်းစားမှုများ	ရွေးချယ်ထားမှု			Remarks
		အနှုတ်	ကြားနေ	အပေါင်း	
၁	တည်နေရာကိုက်ညီမှု			☑	ဝန်ကြီးဌာနပိုင်လျှပ်စစ်ခါတ်အား ထုတ်လုပ်ရေးလုပ်ငန်းအတွက် သီးသန့် ရည်ရွယ်ထားသည့် မြေနေရာအပေါ်တွင် တည်ဆောက်ထားခြင်း
၂	မြေအသုံးချမှု			☑	မြေလွတ်မြေရိုင်းအသုံးချမှုမရှိပဲ တည်ဆောက်ရေးမြေအသုံးချပုံစံ မြေအမျိုးအစားပေါ်တွင် အကောင်အထည်ဖော်ထားခြင်း
၃	ဆက်သွယ်ချိတ်ဆက်နိုင်မှု			☑	ဆက်သွယ်ချိတ်ဆက်မည့် လမ်းနှင့် ကွန်ယက်များ အဆင်သင့်ရှိနေခြင်း
၄	လောင်စာရရှိနိုင်မှု			☑	သဘာဝခါတ်ငွေ့ ပိုက်လိုင်းများ အဆင်သင့်ထောက်ပံ့ထားခြင်း
၅	ရေအရင်းအမြစ်ရရှိနိုင်မှု			☑	မြစ်ချောင်းအနီးတွင် တည်ရှိခြင်း
၆	လျှပ်စစ်ခါတ်အား တင်ပို့နိုင်မှု			☑	နိုင်ငံတော်ပိုင် ခါတ်အားခွဲရုံဘေးတွင် တည်ရှိခြင်း
၇	ပြန်လည်နေရာချထားရမှု နှင့် ပြန်လည်ထူထောင်ရေး လုပ်ငန်းအတိုင်းအတာ			☑	ပြန်လည်နေရာချထားရမှု နှင့် ပြန်လည်ထူထောင်ရေး လုပ်ငန်းအတိုင်းအတာ မရှိခြင်း
၈	နည်းပညာရွေးချယ်မှု			☑	စီးပွားရေး နှင့် ပတ်ဝန်းကျင်ထိခိုက်မှု အနည်းဆုံးအတွက်၊ အကောင်းဆုံး ရွေးချယ် မှုဖြစ်ခြင်း
က	ပေါင်းစပ်(ပူးတွဲနည်းလမ်း) စွမ်းအင်ထုတ်လုပ်ရေး			☑	ပို၍ထိရောက်မှုကောင်းခြင်း
ခ	ကွင်းဆက်အအေးခံစနစ်			☑	အပူချိန်ပြန်းတီးမှုမရှိခြင်း
ဂ	အရည်အသွေးနှင့် နည်းပညာမြင့် တာဘိုင်အမျိုးအစားရွေးချယ်မှု			☑	အခြားနည်းပညာဖြင့်ယှဉ်လျှင် ထိရောက်မှုနှင့် စွမ်းရည်သာလွန်ခြင်း

အထက်ပါ စီမံကိန်းနှင့်အချက်အလက်များကို အကောင်အထည်ဖော်ရာတွင် သဘာဝပတ်ဝန်းကျင်အပေါ် အကျိုးသက်ရောက်နိုင်မှုများသည် စီမံကိန်း၏မည်သည့်ကာလအပိုင်းခြားတွင်မဆို ဖြစ်ပေါ်နေနိုင်သည့်အတွက် ဆန်းစစ်မှုပြုလုပ်ရာတွင် စီမံကိန်းရေယာ ၅.၉၆၅ ဧကကို ဗဟိုပြုပြီး အနည်းဆုံး အချင်းဝက် ၁ ကီလိုမီတာ မှ ၃ ကီလိုမီတာတွင်းရှိ နယ်နိမိတ်ကို စီမံကိန်းကြောင့် သဘာဝပတ်ဝန်းကျင်နှင့်ဂေဟစနစ်အပေါ်တိုက်ရိုက်သော် လည်းကောင်း သွယ်ဝိုက်၍

သော်လည်းကောင်း သက်ရောက်မှုရှိသည့် အလေးပေး လေ့လာဆန်းစစ်ရမည့်ဇုန်အဖြစ် မြန်မာဆာဗေးရီဆာ့(ချ်) ကုမ္ပဏီ၏ လေ့လာဆန်းစစ် ရေးအဖွဲ့ဝင်ပညာရှင်များက ဆုံးဖြတ်သတ်မှတ်ခဲ့ပြီး ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းကို ဆောင်ရွက်ခဲ့ပါသည်။ စီမံကိန်းကာလအပိုင်းအခြားလိုက် ပတ်ဝန်းကျင်ပေါ် သက်ရောက်မှု ဆန်းစစ်လေ့လာရာတွင် လည်း (၁) တည်ဆောက်ရေးမတိုင်မီကာလ (၂) တည်ဆောက်ရေးကာလ (၃)လည်ပတ်ကာလ နှင့် ပြုပြင်ထိန်းသိမ်းရေး ကာလ နှင့် (၄) စီမံကိန်းပိတ်သိမ်းရေး ကာလဟူ၍ ၄ ပိုင်းခွဲ၍ သဘာဝပတ်ဝန်းကျင်နှင့်စပ်လျဉ်းသည့် ဆန်းစစ်မှုများကို ရုပ်ပိုင်းဆိုင်ရာရှုထောင့်၊ ဇီဝဆိုင်ရာရှုထောင့်နှင့် လူမှုစီးပွားဆိုင်ရာရှုထောင့်ဟူ၍ ပြန်လည်ခွဲခြားပြီး နေရာနှင့် အချိန်ကိုလိုက်ပြီး ဖြစ်ပေါ်သက်ရောက်မှုကို လေ့လာဆန်းစစ်မှု ပြုလုပ်သွားရန် လိုအပ်သည်ဟု သုံးသပ်ပြီး ဆန်းစစ်မှုများကို ပြုလုပ်ခဲ့ပါသည်။ ထို့နောက် ဆန်းစစ်ကောက်ယူရရှိသည့် ပတ်ဝန်းကျင်နှင့်လူမှုစီးပွားဆိုင်ရာ အချက်အလက်များကို စာရင်းပြုစုသုံးသပ်ပြီးနောက် သက်ဆိုင်သူလူပုဂ္ဂိုလ်နှင့် အစုအဖွဲများ အားလုံးနှင့်ပူးပေါင်းကာ သဘာဝ ပတ်ဝန်းကျင်ထိန်းသိမ်းစောင့်ရှောက်ရေးအစီအမံနှင့် လုပ်ငန်းစဉ်များကို ရေးဆွဲနေပြီး ဤပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်လေ့လာရေးအစီရင်ခံစာဖြင့် အစီရင်ခံတင်ပြပါသည်။

အခြေခံပတ်ဝန်းကျင်ဆိုင်ရာ ဖော်ပြချက်

အခြေခံပတ်ဝန်းကျင်ဆိုင်ရာအရည်သွေးနှင့် စပ်လျဉ်း၍ စီမံကိန်းတည်ဆောက်မည့်ဧရိယာကိုဗဟိုပြု၍ လက်ရှိရုပ်ပိုင်းဆိုင်ရာ၊ ဓာတုနှင့်ဇီဝအခြေအနေများနှင့် သက်ဆိုင်သည့် အခြေခံအချက်အလက်များကို တိုင်းတာမှုများ ပြုလုပ်ခဲ့ပါသည်။ ၎င်းတို့မှာ ရေမျက်နှာပြင်၊ ပတ်ဝန်းကျင်လေထုအရည်အသွေးနှင့် ဆူညံသံအဆင့်တို့ကို စီမံကိန်း ဧရိယာကို အခြေခံ၍ ဆက်စပ်အနီးပတ်ဝန်းကျင်ရှိ ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်အလက်များကို အကဲဖြတ်ရန် ကွင်းဆင်းတိုင်းတာမှုများ ပြုလုပ်၍ ခွဲခြမ်းစိတ်ဖြာမှုများ ပြုလုပ်ထားသည်။ ၁၅၁.၅၄ မဂ္ဂါဝပ်အင်အား ပေါင်းစပ်နည်းပညာသုံး အလုံလျှပ်စစ်ဓါတ်အား ထုတ်လုပ်ရေးစက်ရုံအကောင်အထည်ဖော်ရေး စီမံကိန်းကြောင့် ထိခိုက်နိုင်သူများကို ဂရုတစိုက် ရွေးချယ်ပြီးနောက် စီမံကိန်း တည်နေရာ အတွင်းနှင့် အနီးတစ်ဝိုက်တွင် ၂၀၂၀ ခုနှစ်မှစတင်သည့် သီးခြားရာသီ ၂ ခုတွင် ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်အလက်များကို စုဆောင်းထားပါသည်။ စီမံကိန်းအကောင်အထည်ဖော်မှုကြောင့် ရုပ်ပိုင်းဆိုင်ရာပတ်ဝန်းကျင်ပေါ်သို့ လွှမ်းမိုးမှုဧရိယာကို တိုက်ရိုက် သက်ရောက်မှု ဧရိယာအတွက် ၁ ကီလိုမီတာ အချင်းဝက်ဖြင့်သော်လည်းကောင်း နှင့် ဆင့်ကဲသက်ရောက်မှု ဧရိယာအတွက် ၃ ကီလိုမီတာအချင်းဝက် အဝန်းဝိုင်းဖြင့် သော်လည်းကောင်း ယူဆသတ်မှတ်ပြီး အောက်တွင် ဖော်ပြထားသော မြေပုံတွင် ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေးများကိုကောက်ယူထားသည့် တည်နေရာများကို မြေပုံတွင် ဖော်ပြထားပါသည်။



No.	Particulars	Location	
		Lat	Long
1	AQ/N-1	16°46'39.75"N	96° 7'46.40"E
2	AQ/N-2	16°46'47.60"N	96° 7'47.96"E
3	AQ/N-3	16°46'46.67"N	96° 8'9.98"E
4	AQ/N-4	16°45'59.41"N	96° 8'4.79"E
5	SW-1	16°46'31.95"N	96° 7'31.77"E
6	SW-2	16°46'28.18"N	96° 7'41.51"E
7	SW-3	16°46'35.99"N	96° 7'42.12"E
8	SW-4	16°46'43.96"N	96° 7'46.12"E
9	PE	16°46'39.11"N	96° 7'44.86"E
10	Soil-1	16°46'34.64"N	96° 7'44.90"E

ပုံ ၃ - ရွပ်ပိုင်းဆိုင်ရာပတ်ဝန်းကျင်အတွက် ပတ်ဝန်းကျင်ဆိုရင်အရည်အသွေးကောက်ယူမှုတည်နေရာဖော်ပြချက်

ပတ်ဝန်းကျင်လေထုနှင့် ဆူညံသံအရည်အသွေး

စီမံကိန်းဧရိယာအနီးပတ်ဝန်းကျင်အတွင်း မိုးလေဝသနှင့်ဇလဗေဒ ညွှန်ကြားမှုဦးစီးဌာနမှ စီမံကိန်းအတွက် တိကျသော ပတ်ဝန်းကျင်လေထုနှင့် ဆူညံသံအရည်အသွေးအတွက် သီခြားအချက်အလက်များ မရရှိနိုင်သည့်အတွက် မြန်မာဆာဗေးရီဆာ့(ချ်)ကုမ္ပဏီသည် စီမံကိန်းကို ဗဟိုပြု၍ တည်နေရာ ၄ ခုတွင် မတူညီသော ရာသီဥတု ၂ ခု (ခြောက်သွေ့ရာသီနှင့် စိုစွတ်ရာသီ) အတွက် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနကပြဋ္ဌာန်းထားသည့် ထုတ်လွှတ်မှုအရည်အသွေးလမ်းညွှန်ချက် ပတ်ဝန်းကျင်လေထုနှင့် ဆူညံသံအရည်အသွေးတွင်ဖော်ပြထားသည့် ရည်ညွှန်းချက်များဖြစ်သည့် $PM_{2.5}$, PM_{10}, CO, NO_2, O_3 and SO_2 တို့ကို လုပ်ထုံးလုပ်နည်းအတိုင်း ၂၄ နာရီကြာ ကွင်းဆင်းတိုင်းတာမှုများကို ပြုလုပ်ခဲ့ပါသည်။ ကွင်းဆင်းတိုင်းတာချက်များ၏ရလဒ်များအရ တည်နေရာ ၄ ခုလုံး၏ လေထုအရည်အသွေးသည် ညံ့သည့်အဆင့်တွင် တည်ရှိနေကြောင်းတွေ့ရှိရပါသည်။ လေထုအရည်အသွေး ရည်ညွှန်းချက်အုပ်စုအတွင်းရှိ နိုက်ထရိုဂျင်ဒိုင်အောက်ဆိုဒ်မှလွဲ၍ ဓါတ်ငွေ့များ၏ ရည်ညွှန်းကန့်သတ်ချက်များသည့် အမျိုးသားလေထုအရည်သွေး စံသတ်မှတ်ချက်များ၏ ကန့်သတ်ချက်များထက် မြင့်မားနေကြောင်းတွေ့ရှိရပါသည်။

မြို့ပြဧရိယာတွင်းကျရောက်ခြင်းနှင့် စီးပွားရေးလုပ်ငန်းများ၏ လူသားများ၏အစဉ်တစိုက် နေ့စဉ်ပြုမူ ဆောင်ရွက်လုပ်ဆောင်မှုများကြောင့် ယခုကဲ့သို့ လေထုအရည်သွေးကျဆင်းရသည့် အကြောင်းရင်းများစွာအနက် အကြောင်းရင်းများဖြစ်ကြပါသည်။ ထို့ကြောင့် ယခုစီမံကိန်းအကောင်အထည်ဖော်မှုကြောင့် လက်ရှိကျဆင်းနေသည့် လေထုအရည်အသွေးကျဆင်းမှုကို ပိုမိုဆိုးရွားစေနိုင်မည့် အလားအလာရှိကြောင်း တွေ့ရှိရပါသည်။ ထို့ကြောင့် စီမံကိန်းအကောင်အထည်ဖော်သူသည် လေထုဝန်းကျင်အပေါ်ထိခိုက်မှု ဖြေလျှော့ရေးနည်းလမ်းနှင့် အစီအမံများကို မဖြစ်မနေ ဆောင်ရွက်သွားရန် လိုအပ်ပြီးမဖြစ်မနေ ဆောင်ရွက်အကောင်အထည်ဖော်ရမည့် တာဝန်ဝတ္တရားရှိပါသည်။ လေထုဝန်းကျင်အတွက် ပတ်ဝန်းကျင်ထိခိုက်မှု ဖြေလျှော့ရေးနည်းလမ်း၊ အစီအမံနှင့် စောင့်ကြည့်ရေးအစီအစဉ်၊ အစီအမံအသေးစိတ်ကို အစီရင်ခံစာ၏ နောက်ပိုင်းတွင် အစီရင်ခံတင်ပြထားပါသည်။

တစ်ဖန် အသံဆူညံမှုနှင့်ပတ်သက်၍ ကွင်းဆင်းတိုင်းတာချက်များ၏တွေ့ရှိချက်အရ စီမံကိန်းအတွင်းရှိတည်နေရာ (NQ2) ၏ ပတ်ဝန်းကျင်အသံဆူညံမှုသည် အမျိုးသားအဆင့် ဆူညံသံကန့်သတ်ချက်များထက် နေ့ရောညပါ များစွာမြင့်မားနေ ကြောင်း တွေ့ရှိရပါသည်။ လူနေရပ်ကွက်ဖြစ်သည့် (NQ2) မှလွဲ၍ ကျန်တည်နေရာ ၃ ခု၏ နေ့ချိန် ဆူညံသံများသည် သတ်မှတ်ကန့်သတ်ချက်အောက်တွင် ရှိနေကြောင်းတွေ့ရှိရပါသည်။ ဝန်ထမ်းအိမ်ယာ အများဆုံး ရှိသည့် လူနေရပ်ကွက်တွင် ဆူညံသံများသည် ကန့်သတ်ချက်ထက်မြင့်မားနေရသည့် အကြောင်းအရင်းဇစ်မြစ်မှာ ထိုလူနေရပ်ကွက်၏ ဘေးတစ်ဖက်တွင် တည်ရှိလည်ပတ်နေသည့် အခြားလုပ်ငန်းတူ လျှပ်စစ်ဓါတ်အားထုတ်လုပ်ရေး စီမံကိန်းမှထွက်ပေါ်လာသည့် ဆူညံသံဖြစ်နေကြောင်း ကွင်းဆင်းစစ်ဆေးချက်များအရ တွေ့ရှိရပါသည်။ ဝန်ထမ်း အိမ်ယာတည်နေရာ (NQ2) သည် မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီမှ အကောင်အထည်ဖော်သည့် ၁၅၁.၅၄ မဂ္ဂါဝပ် အင်အား လျှပ်စစ်ဓါတ်အားထုတ်လုပ်ရေး စက်ရုံနှင့် ကီလိုမီတာအနည်းငယ် အကွာအဝေးတွင်တည်ရှိပြီး ယခုစီမံကိန်း နှင့် ထိုလူနေအိမ်ကြားတွင် ဆူညံသံကို ဖြေလျှော့ပေးမည့် လုံလောက်သည့် ကြားခံအကွာအဝေးနှင့် သစ်ပင်များရှိ နေကြောင်းလည်း ကွင်းဆင်းစစ်ဆေးချက်များ အရ တွေ့ရှိရပါသည်။

သို့သော်လည်း ပတ်ဝန်းကျင်လေထုနှင့်ဆူညံသံများကြောင့် ပတ်ဝန်းကျင်ပေါ်သက်ရောက်မှုများသည် စီမံကိန်းဧရိယာ အနီးရှိ စီးပွားရေးလုပ်ငန်း၊ စက်မှုလုပ်ငန်း နှင့် လျှပ်စစ်ဓာတ်အားပေးစက်ရုံများအားလုံး အတူတကွပူးပေါင်းဖြေရှင်းရန် လိုအပ်သည့် ဧရိယာအတွင်း စုစည်းတိုးပွားလာသော ပေါင်းစပ်ပြဿနာများဖြစ်သည်။

အခြေခံမြေဆီလွှာအရည်အသွေး

စီမံကိန်းအတွက် ဆောက်လုပ်ရေးလုပ်ငန်းများ မစတင်မီ ယခုလျှပ်စစ်ဓါတ်အား ထုတ်လုပ်ရေးစက်ရုံအတွင်းရှိ အခြေခံ မြေဆီလွှာ၏ အရည်အသွေးကို စုံစမ်းစစ်ဆေးခြင်းများ ပြုလုပ်ခဲ့ပါသည်။ စီမံကိန်းအဆင့်အသီးသီးတွင် ပါဝင်သည့် ဆောင်ရွက်ချက်များကြောင့်မြေဆီလွှာပေါ်ဆိုးရွားသည့် သက်ရောက်မှုမရှိနိုင်ပါ။ သို့သော်လည်း စီမံကိန်း တည်ဆောက် ရေးလုပ်ငန်းများ ပြီးစီးသောအခါတွင် မြေနေရာ လိုအပ်ချက်အားလုံးကို ကွန်ကရစ်မျက်နှာပြင်အဖြစ် စီမံကိန်း လိုအပ်ချက်ကြောင့် ပြောင်းလဲခဲ့ကြောင်း ကွင်းဆင်းလေ့လာချက်အရ တွေ့ရှိရပါသည်။ ဓာတ်အားပေးစက်ရုံ လည်ပတ်မှုတွင် မြေဆီလွှာအရည်အသွေးနှင့် တိုက်ရိုက်သက်ဆိုင်ခြင်းမရှိသော်လည်း ချောဆီများ၊ ဆီများနှင့် စက်ဆီဟောင်းများကို ကိုင်တွယ်မှုပုံစံမမှန်ပါက မတော်တဆယိုဖိတ်မှုများနှင့် ကိုင်တွယ်ထိန်းချုပ်မှုမရှိသည့် (စည်းကမ်းမဲ့) စွန့်ပစ်မှုအောက်တွင် မြေဆီလွှာပျက်စီးသွားနိုင်သည့် ဖြစ်နိုင်ခြေအနည်းငယ်ရှိသည်။ အဆိုပါပြဿနာ များကို စီမံခန့်ခွဲရေးအစီအစဉ်ဖြင့် ဖြေရှင်းဆောင်ရွက်ရန် ယခုအစီရင်ခံစာတွင် အစီခံရင်တင်ပြထားပါသည်။ ထို့အပြင် စီမံကိန်းပိတ်သိမ်းခြင်းအဆင့်အတွက် မူလသဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေးကိုပြန်ထားရှိပေးရန်ခိုင်ရန် အလို့ငှာ ရည်ညွှန်းပတ်ဝန်းကျင်အရည်အသွေးအဖြစ် မြေဆီလွှာအရည်အသွေးကိုကောက်ယူထားခြင်းအားဖြင့် ပြန်လည်ထားရှိသည့် လုပ်ငန်းကိုအထောက်အကူပြုနိုင်ရန် မြေအရည်အသွေးကောက်ယူမှုကိုပါ ဆောင်ရွက်ခဲ့ပါသည်။

ကောက်ယူရရှိသည့်နမူနာမှ ဓာတ်ခွဲခန်းစမ်းသပ်ချက်ရလဒ်များအရ စီမံကိန်းမြေ၏ မူလမြေသားတွင် သတ္တုအဆိပ် သင့်မှု မရှိစပဲ မြေအနေထားသည် အယ်ကာလိုင်းဂုဏ်သတ္တိ အနည်းငယ်ရှိနေကြောင်း တွေ့ရှိရပါသည်။ စိုက်ပျိုးရေးနှင့် ဆည်မြောင်းဝန်ကြီးဌာန၏ မြေအသုံးချဦးစီးဌာနမှ မြေဆီလွှာဆိုင်ရာပညာရှင်များ၏မှတ်ချက်အရ မြေဆီလွှာအာဟာရ ဓာတ်များနှင့် ဖွဲ့စည်းမှုသည် ဒေသတွင်းမြေဆီလွှာအမျိုးအစားအောက်တွင်ရှိရမည့် ဂုဏ်သတ္တိနှင့် အရည်အသွေး အုပ်စုတွင် ရှိနေကြောင်း မှတ်ချက်ပြုထားပါသည်။

အခြေခံမျက်နှာပြင်ရေ နှင့် ပိုလျှံစွန့်ပစ်ရေ အရည်အသွေး

အနီးပတ်ဝန်းကျင်ရှိ မြေမျက်နှာပြင်ပေါ် ရှိတွေ့ရှိရသော ရေများ၏ အခြေခံအရည်အသွေးကို သိရှိနိုင်ရန်အတွက် စက်ရုံ၏ တစ်ဖက်တစ်ချက်ရှိ ဟာဘိချောင်းနှင့် အနီးပတ်ဝန်းကျင်ရှိ လှိုင်မြစ်တွင်း၏ ရေနမူနာများကို ကောက်ယူ

စစ်ဆေးပြီး ဓါတ်ခွဲစမ်းသပ်ချက်များကို ၂၀၁၉ နှင့် ၂၀၂၁ ကြားကာလအတွင်း မတူညီသည့် ရာသီ ၂ ခု (ခြောက်သွေ့ရာသီ နှင့် စိုစွတ်ရာသီ) တွင် ပြုလုပ်ခဲ့ပါသည်။ ရေနမူနာကောက်ယူရာတွင် စီမံကိန်းတည်နေရာ၏ ပိုလျှံစွန့်ပစ်ရေ၏နေရာကို ဗဟိုပြုပြီး ဟာဘိချောင်း၏ အထာက်အောက် နှင့် စီမံကိန်းတည်နေရာကို ဗဟိုပြုပြီး ရန်ကုန်မြစ်(လှိုင်မြစ်)၏ အထက်အောက် စုစုပေါင်း ၄ နေရာရှိ ရေနမူနာကို စုဆောင်းခဲ့ပြီး ဓါတ်ခွဲစမ်းသပ်ချက်များကို အမျိုးသား စံရေ အရည်အသွေး ကန့်သတ်ချက်နှင့် နှိုင်းယှဉ်စစ်ဆေးခဲ့ပါသည်။ ဓါတ်ခွဲစစ်ဆေးတွေ့ရှိချက်အရ ကောက်ယူရရှိသည့် တည်နေရာ ၄ ခုမှ မြေမျက်နှာပြင်ရေပေါ် ရှိ ရေ၏ အရည်အသွေးများသည် ရှိသင့်ရှိထိုက်သည့် အနေအထားတွင် သာတွေ့ရှိရပြီး ထူးခြားသည့် ညစ်ညမ်းမှုများမရှိကြောင်း တွေ့ရှိရပါသည်။ သို့သော်လည်း ကောက်ယူသည့် ရေများသည် ချောင်းနှင့် မြစ်ရေများဖြစ်သည့်အားလျော်စွာ ကျန်းမာရေးနှင့် သောက်သုံးရေအတွက် တိုက်ရိုက် အသုံးပြုနိုင်သည့် အရည်အသွေးလုံးဝမရှိကြောင်းကို သတိပြုရမည်ဖြစ်သည်။ စက်ရုံ၏ဘိုင်လာငွေ့ရည်ဖွဲ့စနစ်မှ အအေးခံ၍ပိုလျှံထွက်လာသော စွန့်ပစ်ရေ၏ အရည်အသွေးမှာလည်း ညစ်ညမ်းမှု တစ်စုံတစ်ရာမရှိကြောင်း စိစစ်တွေ့ရှိရပါသည်။ မြန်မာအလုံ ပါဝါပလန့်ကုမ္ပဏီ၏ လျှပ်စစ်ဓါတ်အားထုတ်လုပ်ရေးစစ်ရုံအတွက် ရေသန့်စင်စနစ်တွင် နောက်ဆုံးပေါ်နည်းပညာများ နှင့် စက်ပစ္စည်းများကို အသုံးပြုထားသည့် အားလျော်စွာ စက်ရုံမှ ထွက်ရှိလာသော ရေသည် သန့်ရှင်းသည့်ရေ လုပ်ငန်းခွင်သုံးရန်အတွက်သော်လည်းကောင်း စက်ရုံလည်ပတ်ရန်အတွက်သော်လည်းကောင်း ဘေးဥပါဒ်တစ်စုံတစ်ရာ မရှိနိုင်ကြောင်း တွေ့ရှိရပါသည်။

အခြေခံဂေဟဗေဒနှင့် ဇီဝမျိုးစုံမျိုးကွဲများ

စီမံကိန်းအကောင်အထည်ဖော်မည့် ဧရိယာနှင့်အနီးပတ်ဝန်းကျင်အပေါ် ဇီဝဆိုင်ရာစစ်တမ်းနှင့် ကွင်းဆင်းလေ့လာမှုအရ လေ့လာမှုဧရိယာအတွင်းတွင် အပင်မျိုးစိတ် ၉၅ ခုကို မှတ်တမ်းတင်ထားသော်လည်း ကာကွယ်ထားရမည့် မျိုးစိတ်များနှင့် မျိုးသုန်းရန်အန္တရာယ်ရှိသည့် မည်သည့်မျိုးစိတ်များသည် စီမံကိန်းဧရိယာအကျယ်အဝန်းဖြစ်သော ဧက ၅.၉၆၅ တွေ့ရှိရခြင်း မရှိကြောင်း သိရှိရသည်။ အလားတူ သက်ရှိသတ္တဝါများနှင့်ပတ်သက်၍ ကွင်းဆင်းမှတ်တမ်းများအရ IUCN ၏ ရှားပါးတိရစ္ဆာန်မျိုးစိတ်နှင့် ထိန်းသိမ်းစောင့်ရှောက်ရမည့် စာရင်းတွင်ပါဝင်သည့် မျိုးစိတ်များ မရှိကြောင်း သိရှိရပါသည်။ တောရိုင်းတိရစ္ဆာန်များ၊ သဘာဝတောများနှင့် ဒီရေတောများ စီမံကိန်းပတ်ဝန်းကျင်တွင် မျိုးသုဉ်းလုနီးပါးမျိုးစိတ်များ မရှိပါ။ အပင်နေရာအများစုသည် ပိန္နဲသီး၊ သရက်သီး၊ ကုက္ကိုလ်ပင် စသည်တို့ကဲ့သို့သော အပင်အမျိုးအစားများစွာရှိပြီး အပင်နေရာ တစ်ဝိုက်တွင် အခြားချုံပင်အနည်းငယ်ရှိသည်။

အဏ္ဏဝါဗေဒ နှင့်ပတ်ဝန်းကျင်ဆိုင်ရာ လေ့လာရေးအဖွဲ့သည် ၂၀၂၄ ခုနှစ် ဇူလိုင်လ ၂၂ ရက်မှ ၂၅ ရက်အထိ ရန်ကုန်မြစ်အပေါ် သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ စမ်းသပ်မှုတစ်ရပ်ကို ဆောင်ရွက်ခဲ့ပြီး ဤလေ့လာမှုသည် biodiversity and water quality အပေါ်အထူးအလေးထား၍ ဆောင်ရွက်ခဲ့ပါသည်။ ဤလေ့လာမှုတွင် ငါးမျိုးစုံ ၁၈ မျိုးပါဝင်မှုကို တွေ့ရှိခဲ့ပြီး၊ ယင်းတို့အနက် အားနည်းသော (vulnerable species) ငါးအမျိုးအစား ၂ မျိုး (Wallago attu နှင့် Cirrhinus cirrhosis) နှင့် စီးပွားရေးအရအရေး ပါသော ရွှေပြောင်းငါးမျိုးအစား (Tenualosa ilisha) တို့လည်း ပါဝင်ပါသည်။ ထို့အပြင် Phytoplankton မျိုးစုံ ၂၄ မျိုး၊ Zooplankton မျိုးစုံ ၃၀ မျိုးနှင့် Benthos မျိုးစုံ ၁၂ မျိုးကိုလည်း မှတ်တမ်းတင်ခဲ့ပါသည်။ ရန်ကုန်မြစ်သည် ရေတက်၊ ရေကျအခြေအနေများရှိသော မြစ်ကြောင်းတစ်ခုဖြစ်ပြီး၊ ရေတက်ချိန်တွင် ဆားရေ ဝင်ရောက်မှုရှိခြင်းနှင့် ရေကျချိန်တွင် သန့်ရှင်းသောရေ (Fresh water) ဝင်ရောက်မှု ရှိခြင်းတို့ကို သိသာစွာ တွေ့ရှိခဲ့ပါသည်။ အထူးသဖြင့် မိုးရာသီတွင် ရေချိုဝင် ပမာဏများပါသည်။

လေ့လာမှုဧရိယာသည် စီမံကိန်းတည်နေရာမှ ၅ ကီလိုမီတာအဝိုင်းဝန်းကျင်းတွင်ပြုလုပ်ခဲ့ပြီး၊ ၁၀ ကီလိုမီတာခန့် အဝိုင်းကျင်းမှ ငါးမျိုးစုံနှင့်ပတ်သက်သော အချက်အလက်များကို ငါးလုပ်ငန်းဦးစီးဌာနမှ လေ့လာ စုဆောင်းခဲ့ပါသည်။ ရေသန့်စင်မှုအချက်အလက်များအရ လေ့လာမှုလုပ်ဆောင်ချိန်တွင် မိုးရွာသွန်းမှုကြောင့် သန့်ရှင်းသော ရေဖြစ်ခြင်းကို အထူးအားသာစေသည့် အခြေအနေများကို တွေ့ရှိခဲ့ပါသည်။ ရန်ကုန်မြစ်သည် စီးပွားရေးအရ အရေးပါသော

ငါးမျိုးစိတ်များအတွက် ရွှေ့ပြောင်းသွားလာရာလမ်းကြောင်းတစ်ခုဖြစ်ပြီး အထူးသဖြင့် သားပေါက်ရာသီတွင် ငါးမျိုးကွဲများကို ကာကွယ်ရန် လိုအပ်ကြောင်း မီးမောင်းထိုးပြကာ ငါးလုပ်ငန်းဦးစီးဌာနမှ ထိန်းကျောင်းပေးလျက်ရှိပါသည်။

စီမံကိန်းအကျိုးသက်ရောက်မှုများအား ထုတ်ဖော်ခြင်း

သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုဝန်းကျင်ပေါ် သိသာထင်ရှားသော သက်ရောက်မှုများကို (၁) ဆောက်လုပ်ရေးအဆင့် နှင့် (၂) လုပ်ငန်းလည်ပတ်မှုအဆင့်တွင် အများဆုံးဖြစ်ပေါ်နိုင်ကြောင်း သုံးသပ်နိုင်သည်။ ဓာတ်ထုတ်လုပ်ရေးစက်ရုံတည်ဆောက်စဉ်အတွင်း အဓိကသက်ရောက်မှုအချို့မှာ လေထုအရည်အသွေး၊ မြေမျက်နှာပြင်ပေါ်ရှိ ရေအရည်အသွေးနှင့် စီမံကိန်းဧရိယာအတွင်း ရေစီးရေလာပြောင်းလဲခြင်းတို့ဖြစ်သည်။ စီမံကိန်း လည်ပတ်မှုကြောင့် အဓိကဆိုးကျိုးသက်ရောက်မှုများသည် ဖြစ်သည့် (၁) ဖန်လုံအိမ်ဓါတ်ငွေ့ထုတ်လွှတ်မှု (၂) ဆူညံသံ နှင့် (၃) လုပ်ငန်းခွင်ကျန်းမာရေးသည် အနုတ်လက္ခဏာသက်ရောက်မှုများဖြစ်ပြီး စီမံကိန်းအဆင့်တစ်ခုစီတိုင်းတွင် ကြုံတွေ့ရနိုင်သည်။ ပတ်ဝန်းကျင်၊ လူမှုဝန်းကျင် နှင့်စပ်လျဉ်း၍ အောက်ဖော်ပြပါ လုပ်ငန်းခွင်ဘေးကင်းရေး၊ ကျန်းမာရေးနှင့် ပတ်ဝန်းကျင် (OSHE) တို့နှင့်သက်ဆိုင်သည့် သက်ရောက်မှုများသည် သိသာထင်ရှားသည့် သက်ရောက်မှုများဖြစ်သည်။ ၎င်းတို့မှာ

၁။ ဖန်လုံအိမ်ဓါတ်ငွေ့ထုတ်လွှတ်ခြင်း (သို့) ဥတုရာသီပြောင်းလဲခြင်းမြန်ဆန်ခြင်း
၂။ ပတ်ဝန်းကျင် လေထုအရည်အသွေးပေါ်သက်ရောက်မှု
၃။ အနီးပတ်ဝန်းကျင် ဆူညံသံ နှင့် တုန်ခါမှု ဖြစ်ပေါ်ခြင်း
၄။ အပေါ်ယံမြေမျက်နှာပြင်ပေါ်ရှိ ရေအရင်းအမြစ် နှင့် အရည်အသွေးပေါ်သက်ရောက်မှု
၅။ ယာဉ်လမ်းကြောင်းများမြင့်မားတိုးတက်မှု
၆။ ရေဆိုးနှင့် ကူးစက်ရောဂါပြဿနာ
၇။ လုပ်ငန်းခွင် အန္တရာယ်နှင့် ဓါတုပစ္စည်းများအန္တရာယ်
၈။ အသက်ရှူလမ်းကြောင်းဆိုင်ရာ ကျန်းမာရေးပြဿနာ
၉။ မတော်တဆပြုတ်ကျမှု နှင့် ပြုလဲနိုင်မှု
၁၀။ ထိခိုက်ဒဏ်ရာရမှု၊ ကိုယ်လက်အင်္ဂါဆုံးရှုံးမှု နှင့် အသက်ဆုံးရှုံးနိုင်မှု
၁၁။ အလုပ်ကိုင်ပေါ်မူတည်၍ ဖြစ်ပေါ်နိုင်သည့် ဘေးကင်းလုံခြုံရေးပြဿနာ
၁၂။ လုပ်ငန်းခွင်အခြေအနေကြောင့် စိတ်ပိုင်းဆိုင်ကျန်းမာရေး

သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုရေးစီမံခန့်ခွဲမှုအစီအစဉ်

စီမံကိန်းအဆင့်တိုင်းအတွက် သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုစီမံခန့်ခွဲမှုအစီအစဉ်အားဖြင့် ဆိုးရွားသောသက်ရောက်မှုများကို လျော့ချရန်၊ ကိုင်တွယ်ဖြေရှင်းရန်နှင့် အကျိုးပြုသက်ရောက်မှုများကိုမြှင့်တင်ရန် လိုအပ်သောအစီအမံများ စီမံကိန်း အကောင်အထည်ဖော်သူက အကောင်အထည်ဖော်သွားရမည်ဖြစ်သည်။ လျော့ပါးရေးနှင့်အကျိုးကျေးဇူးများတိုးမြှင့်ရေး အစီအမံများကို ESIA တွင် ဖော်ထုတ်ပြီး အပြည့်အဝ အကောင်အထည်မဖော်ပါက ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ် ခြင်းလုပ်ငန်း၏ အဓိကလုပ်ဆောင်ချက်များကို အောင်မြင်နိုင်မည် မဟုတ်ပါ။ သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုရေးစီမံခန့်ခွဲမှု အစီအစဉ်အားလုံးကို စီမံကိန်းအကောင်အထည်ဖော်သူ အကောင်အထည်ဖော်သွားမည့် ဝတ္တရားရှိပြီး အစီအစဉ် အသေးစိတ်ကို အစီရင်ခံစာ၏ အခန်း ၇ တွင် ရေးဆွဲထားပြီး သဘာဝပတ်ဝန်းကျင် ထိန်းသိမ်းရေးနှင့် စီးပွားရေး လုပ်ငန်းများက လိုက်နာရမည့်တာဝန်များ၏ တစ်စိတ်တစ်ပိုင်းအဖြစ် သဘာဝပတ်ဝန်းကျင် ထိန်းသိမ်းရေး ဥပဒေများ၏ စည်းမျဉ်းစည်းကမ်းများတွင်လည်း တာဝန်ရှိကြောင်း နှင့် လမ်းညွှန်ချက်များ ချမှတ်ထားပါသည်။

စီမံကိန်း၏ သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုရေးစီမံခန့်ခွဲမှုအစီအစဉ်ထဲတွင် (၁) စောင့်ကြည့်လေ့လာရေး လိုအပ်ချက်များနှင့် စောင့်ကြည့်လေ့လာရေး အညွှန်းများကို ဖော်ထုတ်ခြင်း၊ (၂) အနုတ်လက္ခဏာသက်ရောက်မှုများကို လျှော့ချရန် သို့မဟုတ် ပပျောက်စေရန် လျော့ပါးရေးအစီအမံများ၊ နှင့် (၃) အပြုသဘောဆောင်သောသက်ရောက်မှုများကို အမြင့်ဆုံးဖြစ်စေရန် မြှင့်တင်ဆောင်ရွက်မှုများ ပါဝင်ပါသည်။ သဘာဝပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်သည် စီမံကိန်းအကောင်အထည်ဖော်သူ၏ စီမံခန့်ခွဲမှု၏အဓိက အစိတ်ပိုင်းအဖြစ် ထည့်သွင်းစဉ်းစားရမည်ဖြစ်ပြီး ၎င်းသည် စက်ရုံလည်ပတ်မှုလမ်းညွှန်များ၏ တစ်စိတ်တစ်ပိုင်းဖြစ်သည်။

ဆောက်လုပ်ရေးအဆင့် စီမံခန့်ခွဲမှု

ဆောက်လုပ်ရေးလုပ်ငန်းခွင်အတွင်း အထွေထွေဆောက်လုပ်ရေးဆိုင်ရာ စီမံခန့်ခွဲမှုနှင့် နည်းပညာဆိုင်ရာ လုပ်ငန်းစဉ်များကို ကြီးကြပ်ကွပ်ကဲရန် ကန်ထရိုက်တာ နှင့် မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီလီမိတက်မှ စီမံကိန်းအဝင် စီမံခန့်ခွဲမှုအား တာဝန်ယူထားပါသည်။ တည်ဆောက်ရေးကန်ထရိုက်တာများ၊ ဆောက်လုပ်ရေးလုပ်ငန်းခွင်တွင် လုပ်ဆောင်နေသော ကန်ထရိုက် လုပ်ငန်းခွဲများသည် စီမံကိန်းအကောင်အထည်ဖော်သူ မြန်မာအလုံပါဝါပလန့် ကုမ္ပဏီ၏ စီမံကိန်းအကောင်အထည်ဖော်ရေးကော်မတီ လက်အောက်တွင်ရှိပြီး ကန်ထရိုက်လုပ်ငန်းခွဲ အဖွဲ့အစည်းများကို ရွေးချယ်ခြင်းနှင့် အကဲဖြတ်ခြင်းအတွက် ဤသဘာဝပတ်ဝန်းကျင်နှင့် လူမှုရေးစီမံခန့်ခွဲမှုအစီအစဉ်ကို အကောင်အထည်ဖော်ခြင်း ရှိ/မရှိ စောင့်ကြပ်စစ်ဆေးရမည့် တာဝန်ရှိပါသည်။ စာချုပ်ထားသောအဖွဲ့အစည်းများ၏ လုပ်ငန်းဆောင်တာများတွင် အလုပ်သမားများ ဘေးကင်းရေး၊ လုပ်ငန်းခွင်ဘေးကင်းရေးနှင့် သဘာဝပတ်ဝန်းကျင် ထိန်းသိမ်းစောင့်ရှောက်ရေး လုပ်ငန်းနယ်ပယ်တွင်လုပ်ငန်းဆောင်တာများကို စီမံကိန်းအကောင်အထည်ဖော်သည့်အဆင့်တိုင်းတွင် ၎င်စီမံချက်ချမှတ် အကောင်အထည်ဖော်ရန်အတွက် ပူးပေါင်းအဖွဲ့ အားတာဝန်ပေးအပ်က ကြပ်ကြပ်မတ်မတ် အကောင်အထည်ဖော်ရမည့် တာဝန်ရှိပါသည်။

စီမံကိန်းလည်ပတ်မှု အဆင့် စီမံခန့်ခွဲမှု

မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီလီမိတက်သည် ဓာတ်အားထုတ်လုပ်သည့်စက်ရုံစီမံကိန်းကို လည်ပတ်ဆောင်ရွက်စဉ်တွင် လုပ်ငန်းလည်ပတ်မှုကို တာဝန်ယူဆောင်ရွက်မည်ဖြစ်ပြီး စီမံကိန်းအတွက် သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုရေး စံနှုန်းများကို ထိန်းသိမ်းရန် တာဝန်ရှိမည်ဖြစ်သည်။

ဖြေလျှော့ရေးနည်းလမ်းများအကောင်အထည်ဖော်ခြင်း

စီမံကိန်းကြောင့်ဖြစ်ပေါ်လာသော သက်ရောက်မှုများကို လျော့ပါသွားရန် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး လုပ်ငန်းများ ဆောင်ရွက်ရာတွင် စီမံကိန်းအဆင့်တိုင်းတွင် လက်တွေ့ကျသောဆောင်ရွက်မှုများ၊ လမ်းညွှန်များနှင့် အကြံပြုချက်များကို ထည့်သွင်းအကောင်အထည်ဖော်သွားရန်လိုအပ်ပါသည်။ ပတ်ဝန်းကျင်နှင့် လူမှုရေးစီမံခန့်ခွဲမှုအစီအစဉ်ကို ရေးဆွဲပြီး သည်နှင့် စီမံကိန်းအကောင်အထည်ဖော်သူသည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုဆိုင်ရာ လုပ်ဆောင်ချက်များကို လုပ်ငန်း၏ လိုအပ်ချက်နှင့်ကိုက်ညီရန် လက်တွေ့ကျသည်ပြုပြင်မွမ်းမံခြင်း သို့မဟုတ် အဆင့်မြှင့်တင်မည့် တာဝန်ရှိပါသည်။ စီမံကိန်းလည်ပတ်ပြီးနောက် တိကျသော လေထုညစ်ညမ်းမှု/ ပတ်ဝန်းကျင်ဆိုင်ရာ ပြဿနာများကို တွေ့ရှိနိုင်သောကြောင့် သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုရေးစီမံခန့်ခွဲမှုအစီအစဉ် ပြန်လည်ပြင်ဆင်ဖြည့်စွက်ရန် လိုအပ်ပါသည်။

စောင့်ကြည့်ရေးအစီအစဉ်

အမျိုးသားသဘာဝပတ်ဝန်းကျင် စံချိန်စံညွှန်းများနှင့်ကိုက်ညီမှုရှိစေရန်အတွက် စီမံကိန်းအကောင်အထည်ဖော်သူသည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲရေးအဖွဲ့(သို့)ကော်မတီကို ဖွဲ့စည်းထားရန် လိုအပ်ပါသည်။ စီမံကိန်းအကောင်အထည်ဖော်သူ၏

သဘာဝပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုနှင့် ဘေးကင်းရေးကော်မတီကို စက်ရုံမန်နေဂျာမှ ဦးဆောင်ကာ အခြားအဖွဲ့ဝင် ၃ - ၄ ဦး ဖြင့် ဖွဲ့စည်းရမည်ဖြစ်သည်။ ကော်မတီအဖွဲ့ဝင်များအားလုံးသည် တစ်လလျှင် အနည်းဆုံးတစ်ကြိမ် တွေ့ဆုံပြီး စက်ရုံ၏ ပတ်ဝန်းကျင်အခြေအနေနှင့် ပတ်သက်၍ ဆွေးနွေးရမည်ဖြစ်သည်။ စက်ရုံမှ အဓိကထုတ်လွှတ်မှု (ဆိုလိုသည် မှာ၊ လေထုတ်လွှတ်မှု၊ ဆူညံသံနှင့် အခြားအရာများ) ကို စောင့်ကြည့်မှုအစီအစဉ်အရ ခွဲခြမ်းစိတ်ဖြာ သုံးသပ်ရမည် ဖြစ်သည်။ သုံးလပတ် အစီရင်ခံစာဖြင့်သော်လည်းကောင်း နှစ်ဝက် အစီရင်ခံစာဖြင့်သော်လည်းကောင်း နှစ်ချုပ် အစီရင်ခံစာဖြင့်သော်လည်းကောင်း ပုံမှန်သဘာဝပတ်ဝန်းကျင် စောင့်ကြည့်ရေး အစီရင်ခံစာများကို ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဦးစီးဌာနသို့ တင်ပြမည်ဖြစ်ပြီး မကျေနပ်ချက်ပြန်လည်ဖြေရှင်းရေး ယန္တရား၏ တစ်စိတ်တစ်ပိုင်း အနေဖြင့် တိုင်းကြားမှုများပြုလုပ်ဖွင့်ဆိုပါက အများသူငှာသိရှိနိုင်ရန် အစီရင်ခံစာထုတ်ပြန်ခြင်းအတွက် ကုမ္ပဏီမှ စနစ်တကျမှတ်တမ်းတင်ကာ လက်ခံထားရှိပြီး ကိုင်တွယ်ဖြေရှင်းရမည်ဖြစ်သည်။

တည်ဆောက်ရေးကာလအတွက် စောင့်ကြည့်စစ်ဆေးခြင်း

သဘာဝပတ်ဝန်းကျင်စောင့်ကြည့်စစ်ဆေးရေးအစီအစဉ်ကို တည်ဆောက်လုပ်ရေးကာလတွင်လည်း စီမံကိန်းရေးဆွဲခြင်းနှင့် အကောင်အထည်ဖော်ခြင်း၏ အဓိကအစိတ်အပိုင်းအဖြစ် ဆောင်ရွက်ခဲ့ပါသည်။ ဆောက်လုပ်ရေးကာလတွင် စောင့် ကြည့်စစ်ဆေးခြင်း နှစ်မျိုးရှိပြီး ၎င်းတို့မှာ (၁) ပုံမှန်ကြပ်မတ်ကြည့်ရှုစောင့်ကြည့်ခြင်းနှင့် (၂) စနစ်တကျ စစ်ဆေး ခြင်းတို့ ဖြစ်ပါသည်။။ မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီလီမိတက်မှာ အောက်ဖော်ပြပါ စောင့်ကြည် စစ်ဆေးခြင်းများကို ၁၅၁.၅၄ မဂ္ဂါဝပ် အင်အားပေါင်းစပ်လျှပ်စစ်ထုတ်လုပ်ရေးစက်ရုံ၏ တည်ဆောက်ရေး ကာလတွင် ဆောင်ရွက်ခဲ့ပါ သည်။

တည်ဆောက်ရေးကာလ ပုံမှန်ကြပ်မတ်ကြည့်ရှုစောင့်ကြည့်ခြင်းနှင့် နှင့် စနစ်တကျစစ်ဆေးခြင်းများ

ခေါင်းစဉ်များ	အဓိက စောင့်ကြပ်ကြည့်စစ်ဆေးမှုများ	စောင့်ကြပ်စစ်ဆေးခြင်း (အကြိမ်)	တာဝန်ချထားမှု နှင့် လုပ်ငန်းဌာနများ
ယာဉ်လမ်းကြောင်း	စီမံကိန်းဧရိယာ နှင့် ပတ်ဝန်းကျင် ယာဉ်အဝင်အထွက်	လစဉ်	အင်ဂျင်နီယာ/ ကန်ထရိုက်တာ/ စီမံကိန်းတာဝန်ခံ
စီမံကိန်းလုံခြုံရေး	ခြံစည်းရိုးလုံခြုံရေး၊ လုပ်ငန်းခွင် အဝင်အထွက်၊ လုပ်သား နှင့် ဧည့်အဝင်အထွက်၊ ခွင့်ပြုချက်မရှိသော ဝင်ထွက်မှုများ၊ လုပ်ငန်းခွင် ဘေးကင်းရေး လမ်းညွှန်ချက်များ	လစဉ်	အင်ဂျင်နီယာ/ ကန်ထရိုက်တာ/ စီမံကိန်းတာဝန်ခံ
လုပ်ငန်းခွင်ဘေး အန္တရာယ်ကင်းရှင်းရေး	လုပ်ငန်းခွင်ဝင်ရောက်သည့် မည်သူမဆို ဘေးအန္တရာယ်ကာကွယ်ရေး ပစ္စည်းများ စနစ်တကျ ဝတ်ဆင်ထားခြင်း ရှိ-မရှိ/ လုံလောက် စွာရရှိခြင်းရှိမရှိ	လစဉ်	အင်ဂျင်နီယာ/ ကန်ထရိုက်တာ/ စီမံကိန်းတာဝန်ခံ
မတော်တဆဖြစ်ရပ် နှင့် ထူးခြားဖြစ်စဉ် မှတ်တမ်းတင်ခြင်း	မတော်တဆဖြစ်ရပ် ဖြစ်ပွားမှု မှတ်တမ်း တင်ခြင်း ဖြစ်ပွားနိုင်ခြေမှတ်တမ်း နှင့် ထူးခြား ဖြစ်စဉ်မှတ်တမ်း	လစဉ်	အင်ဂျင်နီယာ/ ကန်ထရိုက်တာ/ စီမံကိန်းတာဝန်ခံ
အမှိုက်သရိုက်စွန့်ထုတ်	အမှိုက်သရိုက်ပမာဏ နှင့် စနစ်တကျ စွန့်ပစ်	လစဉ်	အင်ဂျင်နီယာ/

ခေါင်းစဉ်များ	အဓိက စောင့်ကြပ်ကြည့်စစ်ဆေးမှုများ	စောင့်ကြပ်စစ်ဆေးခြင်း (အကြိမ်)	တာဝန်ချထားမှု နှင့် လုပ်ငန်းဌာနများ
မှု နှင့် ကိုင်တွယ်ဖြေရှင်းမှု	ခြင်း၊ စွန့်ပစ်ခြင်းအဆင့်ဆင့်နှင့် လက်ပြောင်းလက်လွှဲ မှတ်တမ်းတင်ခြင်း		ကန်ထရိုက်တာ/ စီမံကိန်းတာဝန်ခံ
ဆီနှင့်ချောဆီများ ယိုဖိတ်မှု နှင့် စွန့်ပစ်မှု	စက်ဆီချောဆီဟောင်းများ ဖောက် ထုတ် ခြင်း၊ ခြင်တွယ်ခြင်း၊ သိုလှောင်ခြင်း၊ စွန့်ပစ်ခြင်းနှင့် လက်ပြောင်း လက်လွှဲမှတ်တမ်း	လစဉ်	အင်ဂျင်နီယာ/ ကန်ထရိုက်တာ/ စီမံကိန်းတာဝန်ခံ
လုပ်သားများ၏ ကျန်းမာရေး နှင့် အကာအကွယ် အစီအမံ	အချိန်နှင့်တပြေးညီ လုပ်သားများ၏ ကျန်းမာရေးစောင့်ရှောက်မှု စောင့်ကြည့်ခြင်းနှင့် အထောက်အပံ့လုံလောက်မှု ရှိ-မရှိ စစ်ဆေးခြင်း	လစဉ်	အင်ဂျင်နီယာ/ ကန်ထရိုက်တာ/ စီမံကိန်းတာဝန်ခံ
ဒေသခံများ နှင့် ဘေးပတ်ဝန်းကျင်မှ တိုင်တန်းမှုများ	အနီးပတ်ဝန်းကျင် နှင့် ဒေသခံများ၏ မကျေနပ်ချက်နှင့်တိုင်တန်းချက်များ လက်ခံခြင်းနှင့် ကိုင်တွယ်ဖြေရှင်းခြင်း	လစဉ်	အင်ဂျင်နီယာ/ ကန်ထရိုက်တာ/ စီမံကိန်းတာဝန်ခံ
ဘေးအန္တရာယ် ကင်းရှင်းရေးသင်တန်း နှင့် စစ်ဆေးမှု	လုပ်ငန်းသဘော သဘာဝအလိုက် လိုအပ်သည့် သင်တန်းပေးခြင်း၊ အထောက်အပံ့များနှင့် လမ်းညွှန်ချက်များ ပြည်စုံ လုံလောက်မှု ရှိ-မရှိ	လစဉ်	အင်ဂျင်နီယာ/ ကန်ထရိုက်တာ/ စီမံကိန်းတာဝန်ခံ
သောက်သုံးရေ၊ မိလ္လာ နှင့် ကျန်းမာရေး အစီအမံ	သန့်ရှင်းသော သောက်သုံးရေ၊ မိလ္လာစနစ် နှင့် ကျန်းမာရေးအန္တရာယ် ကျရောက်နိုင် ခြေ ရှိ-မရှိ	လစဉ်	အင်ဂျင်နီယာ/ ကန်ထရိုက်တာ/ စီမံကိန်းတာဝန်ခံ
ရေနုတ်မြောင်း နှင့် ရေစီးရေလာ	ရေစီးရေလာကောင်းမွန်မှုရှိမရှိစစ်ဆေးခြင်း ရေဝပ်နေရာများဖော်ထုတ်ခြင်း၊ ရေနုတ်မြောင်းများ စနစ်တကျ ရှိ-မရှိ စစ်ဆေးခြင်း	လစဉ်	အင်ဂျင်နီယာ/ ကန်ထရိုက်တာ/ စီမံကိန်းတာဝန်ခံ

လည်ပတ်ရေးအဆင့်တွင် စောင့်ကြည့်စစ်ဆေးခြင်း

သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုအများစုသည် ဓာတ်အားထုတ်လုပ်ရေးစက်ရုံ စီမံကိန်း၏လည်ပတ်မှုအဆင့်တွင် ကာလအားဖြင့်သော်လည်းကောင်း အကြိမ်ရေအတွက်အားဖြင့်သော် လည်းကောင်း အများဆုံးကြုံတွေ့ဖြစ်ပွားမည် ဖြစ်ပါသည်။ ၁၅.၅၄ မဂ္ဂါဝပ်အင်အား ပေါင်းစပ်စနစ်ဓါတ်အား ထုတ်လုပ်သည့်စက်ရုံ လည်ပတ်နေစဉ်အတွင်း ဓာတ်အားပေးစက်ရုံအတွက် ဆောင်ရွက်သွားမည့် စောင့်ကြည့် စစ်ဆေးမှုဖော်ပြချက်များနှင့် စောင့်ကြည့်ကြိမ်နှုန်း များမှာ အောက်ပါအတိုင်းဖြစ်ပါသည်။

ခေါင်းစဉ်	စောင့်ကြည့်စစ်ဆေးမှု ဖော်ပြချက်များ	စောင့်ကြည့်မှု ကြိမ်နှုန်းများ
မီးခိုးခေါင်းတိုင်မှ ဓါတ်ငွေ့ထုတ်လွှတ်မှု	နိုက်ထရိုဂျင်အောက်ဆိုဒ် ဓါတ်ငွေ့ အုပ်စုများ နှင့် အပူချိန်	အမြဲမပြတ်

ခေါင်းစဉ်	စောင့်ကြည့်စစ်ဆေးမှု ဖော်ပြချက်များ	စောင့်ကြည့်မှု ကြိမ်နှုန်းများ
ပတ်ဝန်းကျင်လေထုဆိုင်ရာ ရည်ညွှန်းဖော်ပြချက်များ	အမျိုးသား လေထုအရည်သွေးဆိုင်ရာ စံသတ်မှတ် ကန့်သတ်ချက်အတိုင်း စိစစ်မည့် လေထုဆိုင်ရာ ရည်ညွှန်း ဖော်ပြချက်ဖြစ်သည့် CO, NO_x, PM_{10}, $PM_{2.5}$, SO_2	နေရာ ၄ နေရာတွင် ၆လ တစ်ကြိမ် စောင့်ကြည့်အစီရင်ခံခြင်း
မြစ်ရေ နှင့် ချောင်းရေ အရည်အသွေး	အမျိုးသား ရေအရည်သွေးဆိုင်ရာ စံသတ်မှတ်ကန့်သတ်ချက်အတိုင်း စိစစ်မည့် ရေအရည်အသွေးဆိုင်ရာ ရည်ညွှန်း ဖော်ပြချက်ဖြစ်သည့် အားလုံး	
စက်ရုံမှ ပိုလျှံစွန့်ပစ်ရေ	လျှပ်စစ်ဓါတ်အားထုတ်လုပ်ရေး စက်ရုံအတွက် အမျိုးသား ရေအရည်အသွေးဆိုင်ရာ စံသတ်မှတ် ကန့်သတ်ချက်အတိုင်း စိစစ်မည့် ရေအရည်အသွေးဆိုင်ရာ ရည်ညွှန်းဖော်ပြချက်ဖြစ်သည့် အားလုံး	နေရာ ၄ နေရာတွင် ၆လ တစ်ကြိမ် စောင့်ကြည့်အစီရင်ခံခြင်း
ဆူညံသံ နှင့် တုန်ခါမှု	ဆူညံသံ နှင့် တုန်ခါမှု အရည်သွေးဆိုင်ရာ စံသတ်မှန်ကန့်သတ်ချက်အတိုင်း စိစစ်မည့် အမျိုးသားအဆင့် ရည်ညွှန်း ဖော်ပြချက်ဖြစ်သည့် အားလုံး	နေရာ ၄ နေရာတွင် ၆ လ တစ်ကြိမ် စောင့်ကြည့်အစီရင်ခံခြင်း
လုပ်ငန်းခွင်ဘေးအန္တရာယ်ကင်းရှင်းရေး နှင့် ကျန်းမာရေးအခြေအနေ	ကတိကဝတ်ပြုထားသည့် လုပ်ငန်းခွင်ဘေးအန္တရာယ်ကင်းရှင်းရေး ဆိုင်ရာ ဆောင်ရွက်ချက်အားလုံး	အမြဲမပြတ်

သဘာဝပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်ကုန်ကျစရိတ်အား စီမံကိန်းအကောင်အထည်ဖော်မည့် မြန်မာအလုံပါဝါပလန့် ကုမ္ပဏီလီမိတက်အနေဖြင့် စီမံကိန်းအဆင့်များနှင့် အဆင့်တစ်ခုစီ၏ လိုအပ်ချက်များကို ထင်ဟပ်စေရန် အထက်ပါ အတိုင်း အပိုင်းများစွာခွဲခြားထားပြီး စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးရန် ကတိပြုပါသည်။ သဘာဝပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အတွက် ကုန်ကျ စရိတ်များကိုလည်း ကျခံသွားပြီး စွမ်းဆောင်ရည်ကုန်ကျစရိတ်များ၊ အများသူငှာညှိနှိုင်းမှုနှင့် စီမံကိန်း သက်တမ်းတစ်လျှောက် သဘာဝပတ်ဝန်းကျင်နှင့်လူမှုပတ်ဝန်းကျင်အတွက် တာဝန်ယူမှုများကို နှစ်စဉ်ကျခံသုံးစွဲသွားရန် ကတိပြုပါ သည်။ စီမံကိန်းအတွက်ခန့်မှန်းခြေဘတ်ဂျက်ဖြင့် နှစ်စဉ်သဘာဝပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအတွက်နှင့် သဘာဝပတ်ဝန်းကျင် နှင့် လူမှုပတ်ဝန်းကျင်အတွက် တာဝန်ယူမှုများကို သီးခွဲဝေ သုံးစွဲသွားရန်လည်း ကတိပြုပါသည်။

အရေးပေါ်တုံ့ပြန်မှု၊ လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးကင်းရေး

စီမံကိန်းအကောင်အထည်ဖော်မည့် မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီလီမိတက်မှ ဖွဲ့စည်းထားသည့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု နှင့် ဘေးကင်းရေးကော်မတီ၏ ကြီးကြပ်မှုအောက်တွင်၊ စက်ရုံဝန်ထမ်းများအားလုံးသည် အရေးပေါ်ကာလတွင် ၎င်းတို့အား တာဝန်ပေးရမည့် တာဝန်များအသီးသီး ရှိကြပါသည်။ ဤအစီရင်ခံစာတွင် ပြုစုထားသော အရေးပေါ် တုံ့ပြန်မှုနှင့် လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးကင်းရေးအစီအမံတွင် ဖော်ပြထားချက်အတိုင်း အစီအမံများနှင့်

အကောင်အထည်ဖော်မှုများကို မှတ်တမ်းပြုစုထားသောတာဝန်ကို စက်ရုံလည်ပတ်မှုလက်စွဲ၏ တစ်စိတ်တစ်ပိုင်းအဖြစ် စက်ရုံစီမံခန့်ခွဲမှု လက်စွဲတွင် ထည့်သွင်းမည်ဖြစ်သည်။ တာဝန်ဝတ္တရားများကိုကော်မတီအဖွဲ့ဝင် သက်ဆိုင်ရာ တာဝန်ရှိသူများမှ လိုက်နာမှုရှိမရှိ စောင့်ကြပ်ကြည့်ရှုသင့်ပြီး ယင်းတို့ကို မည်သည့်အကြောင်းကြောင့်မျှ မဆောင်ရွက်ပါက မှန်ကန်သောအစီအမံများနှင့် အရေးယူမှုကို တင်းကြပ်စွာဆောင်ရွက်သင့်သည်။

ယခုအစီရင်ခံစာတွင် အစီရင်ခံတင်ပြထားသည့်အရေးပေါ်တုံ့ပြန်မှု၊ လုပ်ငန်းခွင်ကျန်းမာရေးနှင့်ဘေးကင်းရေး အစီအမံများကို စက်ရုံစီမံခန့်ခွဲရေးအဖွဲ့သည် အခါအားလျော်စွာ သက်ဆိုင်ရာဒေသအာဏာပိုင်များနှင့်ပူးပေါင်းကာ မွမ်းမံပြင်ဆင်သင့်သည့် အပိုင်းများကို လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးကင်းရေးမူဝါဒ လမ်းညွှန်ချက်များအတိုင်း ပြင်ဆင်မည်ဖြစ်သည်။ မူဝါဒနှင့် စည်းမျဉ်းများအားလုံးကို စီမံကိန်းအကောင်အထည်ဖော်သူမှ ခန့်အပ်ထားသည့် ဘေးကင်းရေးအရာရှိမှ လက်မှတ်ရေးထိုးပြီး ရက်စွဲပြုထားသင့်သည်၊ သို့မဟုတ် စက်ရုံမန်နေဂျာကိုယ်တိုင် ဤတာဝန်များကို ဆောင်ရွက်ရမည်ဖြစ်သည်။ မူဝါဒ နှင့် စည်းမျဉ်းများကိုလည်း စက်ရုံဝန်ထမ်းအားလုံးနားလည်သိရှိရန် ဆွေးနွေးတိုင်ပင် အကြောင်းကြားရမည်ဖြစ်သည်။ လုံခြုံရေး တာဝန်ရှိသူများသည် မူဝါဒကို အခါအားလျော်စွာ ပြန်လည်သုံးသပ်ပြီး မူဝါဒကို ပြန်လည်ထုတ်ပြန်သင့်သည်။

စီမံကိန်းဆိုင်ရာ သက်ဆိုင်သူများနှင့်ဆွေးနွေးတိုင်ပင်ခြင်း၊ အများပြည်သူအား အသိပေးကြေငြာခြင်း

စက်မှုလုပ်ငန်းအသစ်တစ်ခု တည်ထောင်ရန်အတွက် စီမံကိန်းဆိုင်ရာ သက်ဆိုင်သူများအကြား ညှိနှိုင်းဆွေးနွေးခြင်းသည် အလွန်အရေးကြီးပြီး အကဲဆတ်သော ပြဿနာများကို ထည့်သွင်းစဉ်းစားပါသည်။ ဤစီမံကိန်းနှင့်စပ်လျဉ်းသည့် အကောင်အထည်ဖော်မည့် အစီအစဉ်အသေးစိတ်အား အများပြည်သူသိရှိနိုင်ရန်နှင့် ပူးပေါင်းပါဝင်မှုရရှိစေရန် ပွင့်လင်းမြင်သာသော ဆောင်ရွက်ချက်များကို စတင်ဆောင်ရွက်ခဲ့ပါသည်။ စီမံကိန်းကြောင့် ထိခိုက်ခံရနိုင်သည့် လူပုဂ္ဂိုလ်တစ်ဦးချင်းအလိုက် စီမံကိန်းအနီးပတ်ဝန်းကျင်ရှိ ပြည်သူများ၏ ထင်မြင်ယူဆချက်များကို ထည့်သွင်းစဉ်းစားနိုင်ရန်နှင့် အများပြည်သူများ စီမံကိန်းအကြောင်းအရာများကို ပိုမိုသိရှိစေရန်ရည်ရွယ်၍ သက်ဆိုင်သူများနှင့် ဆွေးနွေးတိုင်ပင်ခြင်းနှင့် အများပြည်သူအား အသိပေးကြေငြာခြင်း လုပ်ဆောင်ချက်များကို ဆောင်ရွက်ခဲ့ပါသည်။ သက်ဆိုင်သူများနှင့် တွေ့ဆုံမှုများတွင် ရပ်ရွာညှိနှိုင်းအစည်းအဝေးများ၊ အဖွဲ့လိုက် အလေးထားရမည့်ခေါင်းစဉ်အလိုက် ဆွေးနွေးမှုများ၊ စီမံကိန်းကြောင့် ထိခိုက်နှစ်နာသူများနှင့် တိုက်ရိုက်တွေ့ဆုံမေးမြန်းမှုများ၊ အမျိုးသမီးများနှင့် ထိလွယ်ရှလွယ်အုပ်စုဖွဲ့ ဆွေးနွေးမှုများ ပါဝင် ပါသည်။

အလွတ်သဘော တိုင်ပင်ဆွေးနွေးမှုကဏ္ဍတွင် သက်ဆိုင်သူ အသီးသီးဖြစ်သော ဥပမာ- ဒေသခံလူထု၊ အမျိုးသား၊ အမျိုးသမီးနှင့် ဒေသခံ သက်ကြီးရွယ်အိုများ၊ ဒေသန္တရအစိုးရကိုယ်စားလှယ်များ၊ အရေးကြီးဆုံးသက်ဆိုင်သူ လူပုဂ္ဂိုလ်များနှင့် ဆွေးနွေးတိုင်ပင်မှုများပါဝင်ပြီး အလုံမြို့နယ်တွင်းအလွှာအသီးသီးရှိ ဒေသခံပြည်သူများနှင့်သက်ဆိုင်ရာ အုပ်ချုပ်ရေးပိုင်းမှ ပုဂ္ဂိုလ်များနှင့် တက်ရောက်ညှိနှိုင်းဆွေးနွေးခြင်း ဖြစ်သည်။ အများပြည်သူဆိုင်ရာ ဆွေးနွေးညှိနှိုင်းမှုနှစ်ခုကို အတိုင်းအတာတစ်ခုအထိ အစီရင်ခံစာအတွက် တစ်ကြိမ်နှင့် EIA လူထုညှိနှိုင်းခြင်းအတွက် တစ်ခုပြုလုပ်ခဲ့ပါသည်။ သက်ဆိုင်သူများ အပါအဝင်၊ နယ်ပယ်အသီးသီးမှပညာရှင်များ နှင့် ဧည့်သည်များအားလုံးသည် စီမံကိန်းနှင့် ပတ်သက်၍ ဆွေးနွေးတိုင်ပင်မှုများတွင် အလွန်အပြုသဘောဆောင်ကြပြီး စီမံကိန်းတည်ဆောက်မှု၊ လုပ်ငန်းလည်ပတ်မှုနှင့် ပတ်သက်သည့် ကိစ္စရပ်များ၊ စိုးရိမ်ချက်များကိုပွင့်ပွင့်လင်းလင်း ဆွေးနွေးခဲ့ကြပါသည်။

မြန်မာအလုံသဘာဝဓာတ်ငွေ့သုံး ပေါင်းစပ်ဓာတ်အားထုတ်လုပ်ရေးစက်ရုံ တည်ဆောက်ခြင်းနှင့်လည်ပတ်ခြင်းအပေါ် ကန့်ကွက်ခြင်း မရှိကြောင်း စီမံကိန်းဆိုင်ရာ သက်ဆိုင်သူများနှင့်ဆွေးနွေးတိုင်ပင်ခြင်းနှင့် အများပြည်သူအား မေးမြန်းချက်အရသိရှိရပါသည်။ စီမံကိန်းနှင့်စပ်လျဉ်းသည့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာတွေ့ရှိချက် အစီရင်ခံ တင်ပြခြင်း လုပ်ငန်းစဉ်အတွင်းဆောင်ရွက်ခဲ့သည့် လူထုညှိနှိုင်းဆွေးနွေးမှု အစည်းအဝေး ၂ ခုအပေါ် အခြေခံ၍ ဆွေးနွေး အကြံပြုချက်များကို အောက်ပါအတိုင်းအကျဉ်းချုံးနိုင်သည်။

ဒေသခံများ၏ သဘောထားမှတ်ချက်များ

ဒေသံခံများနှင် ညိနှိုင်းတိုင်ပင်ဆွေးနွေးချက်ရလဒ်အရ လျှပ်စစ်စွမ်းအင်ဖူလုံရေးသည် စီမံကိန်းအကောင်အထည်ဖော်မှု အပေါ် ထောက်ခံကြိုဆိုကြောင်း သဘောထားမှတ်ချက်ပေးခဲ့သည်။ သဘာဝပတ်ဝန်းကျင် နှင့် လူမှုပတ်ဝန်းကျင်အပေါ် စီမံကိန်းအကောင်အထည်ဖော်သူမှ ကျခံသုံးစွဲမည့် လူမှုဖွံ့ဖြိုးရေးရန်ပုံငွေကို အထူးသဖြင့် စီမံကိန်းဧရိယာအနီးရှိ အဓိက ပါဝင်ပတ်သက်သူများကြား မျှမျှတတခွဲဝေပေးသင့်ကြောင်း သဘောထားမှတ်ချက်ပြုခဲ့ပြီး ဤအစီအစဉ်ကို ရည်ရွယ်ချက်များနှင့် ရပ်ရွာဖွံ့ဖြိုးရေး အစီအစဉ်များတွင် သေသေချာချာ သုံးစွဲသွားရန် သဘောထားမှတ်ချက်ပေးထားပါသည်။

ပြည်တွင်းအလုပ်အကိုင်

စီမံကိန်းနယ်မြေအတွင်းရှိ ရပ်ရွာလူထုများသည် ၎င်းတို့၏ ကျွမ်းကျင်မှုအလိုက် စီမံကိန်းဆိုင်ရာ လုပ်ငန်းများနှင့် လုပ်ငန်း ဆောင်တာ အသီးသီးအတွက် လုပ်သားများကို ခန့်အပ်ရာတွင် ဒေသခံ ပြည်သူများကို ဦးစားပေးသင့်ကြောင်း အလေးပေး ပြောကြားခဲ့သည်။ စီမံကိန်းအကောင်အထည်ဖော်သူသည် ဒေသခံများအတွက် အလုပ်အကိုင် အခွင့်အလမ်းများ ပိုမိုဖန်တီးပေးရန်တိုက်တွန်းထားပါသည်။

လူဝင်မှုကြီးကြပ်ရေး

စီမံကိန်းတွင် နိုင်ငံခြားအလုပ်သမားများ ရောက်ရှိလာပါက ဒေသတွင်း ဥပဒေနှင့်စံနှုန်းများကို သတိမပြုမိဘဲ ဒေသခံ လူထုနှင့် ပဋိပက္ခများ ဖြစ်ပေါ်လာနိုင်ပြီး၊ ဒေသ၏ ထိလွယ်ရှလွယ်သော တရားဥပဒေစိုးမိုးရေး အခြေအနေနှင့် ယဉ်ကျေးမှု တို့ကို သတိပြုသင့်သည်။

အလုပ်အကိုင်အခွင့်အလမ်းသစ်များ

အများပြည်သူတိုင်ပင်ဆွေးနွေးခြင်းရလဒ်အရ အနီးနားပတ်ဝန်းကျင်ရှိဒေသခံများအတွက် ဖွံ့ဖြိုးတိုးတက်ရေးနှင့် အလုပ်အကိုင် အခွင့်အလမ်းများ ဖန်တီးပေးနိုင်မည်ဟု မျှော်လင့်ပြီး စီမံကိန်းအကောင်အထည်ဖော်သူမှ ကြိုးပမ်း အားထုတ်မှုကို အစဉ်အကောင်အထည်ဖော်သွားမည်ဟု ကတိပြုပါသည်။

ရပ်ရွာဒေသခံများ၏ အကြံပြုချက်များ

၁။ ပိုမိုကောင်းမွန်သော ပညာရေးနှင့် လူမှုဖူလုံရေး ဝန်ဆောင်မှုများပေးဆောင်ရန် စီမံကိန်းဧရိယာအနီးတစ်ဝိုက် အတွက်ရည်ရွယ်၍ စီမံကိန်းအကောင်အထည်ဖော်သူမှ ပတ်ဝန်းကျင်နှင့်လူမှုစီးပွား ဖွံ့ဖြိုးတိုးတက်ရေး အစီအစဉ် များကို အကောင်အထည်ဖော်ရန် ဒေသခံလူထုကအကြံပြု တောင်းဆိုပါသည်။

၂။ ကျွမ်းကျင်မှုကို မြှင့်တင်နိုင်ရန် နည်းပညာနှင့် အသက်မွေးဝမ်းကြောင်း သင်တန်းများ ပံ့ပိုးပေးရန် အကြံပြု ပါသည်။

၃။ မူလတန်းနှင့် အထက်တန်းကျောင်းများသည် ဒေသခံကလေးငယ်များအတွက် အထောက်အကူပစ္စည်းများနှင့် ပညာသင်ကြားရေး အထောက်အပံ့နှင့် အရင်းအမြစ်များအတွက် ပံ့ပိုးပေးရန်လိုအပ်ပါသည်။

မကျေနပ်ချက် ပြန်လည်ဖြေရှင်းရေးယန္တရား

စီမံကိန်းအကောင်အထည်ဖော်သူသည် စီမံကိန်းနှင့်ပတ်သက်သည့် မေးခွန်းများ/မကြေနပ်ချက်ကိုဖြေကြားရန်နှင့် သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ အကာအကွယ်သက်ရောက်မှုများ လျော့ပါးရေးအတွက် ချမှတ်ထားသော လမ်းညွှန်ချက် များကို ကျင့်သုံးရာတွင် မမှန်မကန်မှုများနှင့် ပတ်သက်၍ တိုင်ကြားမှုများနှင့် နစ်နာမှုများကို ဖြေရှင်းရန် လုပ်ထုံး

လုပ်နည်းကို ချမှတ်ထားသည်။ တိုင်ကြားမည့်သူနှင့်မေးမြန်းစုံစမ်းသူ အဆင်ပြေစေမည့် စက်ရုံလည်ပတ်မှုနှင့် ပတ်သက်သည့် တိုင်ကြားစာများကို ကိုင်တွယ်ဖြေရှင်းသွားမည်ဖြစ်သည်။ ထိုသို့လုပ်ဆောင်ရာတွင် မကျေနပ်ချက် ပြန်လည်ဖြေရှင်းရေး ယန္တရားအတွက် လုပ်ထုံးလုပ်နည်းသည် အကုန်ကျများပြီး အချိန်ကုန်သော ရှုပ်ထွေးသော လုပ်ထုံးလုပ်နည်းများမသုံးဘဲ ပြဿနာများ/ ပဋိပက္ခများကို လျင်မြန်စွာ ဖြေရှင်းရန် ကူညီပေးပါမည်။ သမာသမတ်ကျပြီး ပွင့်လင်းမြင်သာမှုရှိစေရန်အတွက် တိုင်ကြားမှုများအပေါ် ကြားနာမှုများကို အများပြည်သူသို့ ဆက်လက်ဖွင့်ထားမည် ဖြစ်သည်။ မကျေနပ်ချက် ပြန်လည်ဖြေရှင်းရေးကော်မတီသည် တိုင်ကြားမှုများ၏အသေးစိတ်အချက်အလက်များနှင့် သီးခြားကိစ္စရပ်များအား လက်ခံခြင်း သို့မဟုတ် ငြင်းပယ်ခြင်းသို့ မှတ်တမ်းခြင်းနှင့်ဆင့်ကဲအတင်ပြခြင်း၊ အကြောင်းရင်း စုံကို တိုင်ကြားသူထံအစီရင်ခံပြီး တိုင်ကြား မေးမြန်းမှုများကို မှတ်တမ်းတင်ထားမည်ဖြစ်သည်။ မကျေနပ်ချက် ပြန်လည်ဖြေရှင်းရေးကော်မတီသည် ဖြေရှင်းပြီးသော ကိစ္စရပ်သော်လည်းကောင်း ဖြေရှင်းပြီးမရသော တိုင်ကြားစာများကိုသော်လည်းကောင်း မကျေနပ်ချက်များအားလုံး၏ မှတ်တမ်းများကို သိမ်းဆည်းထားမည်ဖြစ်ပြီး သင့်လျော်သော အာဏာပိုင်များက တောင်းဆိုသည့်အခါ ဆက်လက်တင်ပြ ဆွေးနွေးသွားမည်။

နိဂုံးနှင့် အကြံပြုချက်များ

ယခုပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာသည် သဘာဝပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာ ထိခိုက်မှုအကဲဖြတ်ခြင်း၊ ထိခိုက်မှုများလျော့ပါးရေးနည်းလမ်းများဖော်ထုတ်ခြင်းနှင့် စီမံကိန်းအကောင်အထည်ဖော်သူမှ ထိုလျော့ပါးရေးနည်းလမ်းများကို ဆောင်ရွက်သွားရန်နှင့် ကြည့်ရှုလုပ်ဆောင်မှုအစီမံများနှင့် ဆက်လက်လုပ်ဆောင်ရမည့် လုပ်ငန်းစဉ်များကို ဖော်ပြထားခြင်းဖြစ်ပါသည်။ ထိုကြောင့် အစီရင်ခံစာသည် ၁၅၁.၅၄ မဂ္ဂါဝပ်ပေါင်းစပ် လျှပ်စစ်ဓါတ်အားထုတ်လုပ်ရေးစက်ရုံ အကောင်အထည်ဖော်ရေးအတွက် ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာ သက်ရောက်မှုများကို စီမံဖြေရှင်းရန်အတွက် အရေးကြီးသော လက်စွဲလမ်းညွှန်ချက်ဖြစ်ပြီး စီမံကိန်းအကောင်အထည်ဖော်သူ မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီမှ စီမံဆောင်ရွက်မည့် လုပ်ငန်းများကိုအခြေခံ၍ စီမံကိန်းအဆိုပြုသူ လိုက်နာရမည့် တာဝန်ဝတ္တရားများကို တင်ပြအစီရင်ခံထားသည့် အစီရင်ခံစာလည်းဖြစ်ပါသည်။ စီမံကိန်းကို အကောင်အထည်ဖော်ခြင်းကြောင့် ရန်ကုန်မြို့၏ စွမ်းအင်ဖူလုံမှု၊ လူမှုရေးနှင့်စီးပွားရေး ဖွံ့ဖြိုးတိုးတက်မှုကို ဆောင်ကြဉ်းပေးမည်ဟု မျှော်လင့်နိုင်သည်။ ရရှိနိုင်သောအချက်အလက်များဆိုင်ရာ အခြေခံလေ့လာမှုများ၊ ကောက်ယူရရှိသည့် အခြေခံပတ်ဝန်းကျင်ဆိုင်ရာ သုတေသန အချက်အလက်များ၊ ထိခိုက်ဆန်းစစ်ခြင်းရလဒ်နှင့် အများပြည်သူဆိုင်ရာ ညှိနှိုင်းဆွေးနွေးမှုရလဒ်များအရ စီမံကိန်း အကောင်အထည်ဖော်မှုကြောင့် ဒေသခံများအတွက် အငြင်းပွားဖွယ်ရာ လူမှုစီးပွားပြဿနာ၊ ပတ်ဝန်းကျင်အပေါ် ဆိုးရွားသည့်ထိခိုက်မှုများနှင့် စိုးရိမ်ရမည့် ပြဿနာများ မရှိကြောင်း တွေ့ရှိရသည်။

သို့သော်လည်း အောက်ဖော်ပြပါ အကြံပြုချက်များသည် ၎င်း၏ ၁၅၁.၅၄ မဂ္ဂါဝပ်ပေါင်းစပ်ဓာတ်အားထုတ်လုပ်ရေးစက်ရုံ စီမံကိန်းအဆင့်များအားလုံးတွင် စီမံကိန်းအကောင်အထည်ဖော်မည့် မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီမှ အောက်ဖော်ပြပါ အကြံပြုချက်များကို ဆက်လက်ဆောင်ရွက်သင့်ပါသည်။

၁။ ပုံမှန် အနီးပတ်ဝန်းကျင်လေထုနှင့်ဆူညံသံကို စောင့်ကြပ်ကြည့်ရှုခြင်း

စိုစွတ်ရာသီနှင့်ခြောက်သွေ့ရာသီ ၂ ခုအတွက် အနီးပတ်ဝန်းကျင်လေ့ထုနှင့် ဆူညံသံအရည်အသွေး စောင့်ကြပ်ကြည့်ရှုခြင်းကို ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာ၏ လုပ်ထုံးလုပ်နည်းအရ ကွင်းဆင်း တိုင်းတာမှုများ ဆောင်ရွက်ခဲ့သော်လည်း အနီးပတ်ဝန်းကျင်လေထုနှင့် အသံအရည်အသွေးစောင့်ကြည့် လေ့လာခြင်း အစီအစဉ်ကို သုံးလတစ်ကြိမ်ပြုလုပ်သင့်ပြီး ရာသီအလိုက် ရရှိလာသောအချက်အလက် ကွဲပြားမှုများကို သက်ဆိုင်ရာထံ အစီရင်ခံ တင်ပြသင့်ပါသည်။ ထိုသို့ရာသီအလိုက် စောင့်ကြည့်မှုကို နေရာ ၄ ခုအတွက် လေထုအရည်အသွေးကို စောင့်ကြပ်ကြည့်ရှုမှတ်တမ်းတင်ရန် အကြံပြုသည်။

၂။ စီမံကိန်းဆိုင်ရာ သက်ဆိုင်သူများနှင့်ဆွေးနွေးတိုင်ပင်ခြင်း

စီမံကိန်း၏ အကျိုးဆက်များနှင့်တိုးတက်မှုများကိုအကဲဖြတ်ရန်၊ စီမံကိန်းဆိုင်ရာသက်ဆိုင်သူများနှင့် ညှိနှိုင်းဆွေးနွေးမှုများကို ပုံမှန်အချိန်ကာလအပိုင်းအခြားလိုက် စီမံကိန်းတည်ဆောက်ခြင်းနှင့် လုပ်ငန်းလည်ပတ်မှုအတွင်း ဆက်လက်လုပ်ဆောင်သင့်သည်။ အနာဂတ်တွင်ကျင်းပပြုလုပ်သွားမည့် အများပြည်သူပါဝင်သည့် တိုင်ပင် ဆွေးနွေးပွဲများတွင် ပုံမှန်ဆွေးနွေးညှိနှိုင်းမှုများအပြင် စီမံကိန်းကြောင့် ထိခိုက်သူကာယကံရှင်များ၏ ပြဿနာများနှင့် တိုင်ကြားမှုများကို ကိုင်တွယ်ဖြေရှင်းသင့်ပြီး စီမံကိန်းအကောင်အထည်ဖော်သူက ကတိကဝတ်ပြုထားသော ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာ တာဝန်ဝတ္တရားများ အကောင်အထည်ဖော်မှု အခြေအနေနှင့် အစီအစဉ်များကို ထည့်သွင်းအစီရင်ခံတင်ပြသင့်ပါကြောင်း အကြံပြုပါသည်။

Executive Summary

Introduction

This Environmental Impact Assessment (EIA) is prepared by Myanmar Survey Research (MSR) Co., Ltd; the objective of the report it to fulfil EIA requirement to prove environmental conservation for the implementation of 151.54 MW Combined Cycle Power Plant (CCPP) project by Myanmar Ahlone Power Plant Co., Ltd. It is the one of the legal requirements of the project developer prior executing full development activities of the project in full swing for electric power plant development by Myanmar Ahlone Power Plant Co. Ltd. In accordance to the guidelines of the Environmental Conservation Department (ECD) and EIA requirement, MSR carried out site visits, preliminary environmental surveys, baseline data collection and all necessary stakeholder consultation starting 10th August 2020 in compliance with Myanmar EIA procedures, guidelines, and compiled this scoping report.

In order to reinforce energy security of Yangon city and ensure 24/7 power supply to domestic households, services industry, and manufacturing sectors of the region. Independent Power Production (IPP) scheme of the union government of Myanmar, private investors were granted electricity production permit under the agreement win Ministry of Electric Power (MOEP) since 2011. Myanmar Ahlone Power Plant Co., Ltd. is one of the private investors bid the tender and awarded to develop 151.54 MW capable new Combined Cycle Power Plant right next to the existing MOEP's facility. As of August 2020, the facility's gas fired turbine and generator segment is fully in operational and generating power into regional grid. It's been scheduled that by the end of 2020, the combined cycle (natural gas and steam) powered generators can be fully capable to generate its full capacity.

Policy, Legal, and Institutional Framework

This ESIA report has been prepared following the methodology prescribed in the ElA guidelines for industries of Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC) that are the main legislative documents relating to environment protection in the Republic of The Union of Myanmar that the project developer, Myanmar Ahlone Power Plant Company Limited has obligatory right to be committed.

Stated in the policy, legal and institutional framework parts of this EIA report, the project proponent, Myanmar Ahlone Power Plant Company Limited is obliged to adhere all policy, legal and regulatory frameworks of the Ministries of the Republic of the Union of Myanmar in addition to the MONREC. In addition, there are international treaties and ratification for which the Republic of the Union of Myanmar signs as the agreement in conventional to support international guidelines and practices for environmental conservation and protection. The project developer is committed to abide all the acting legal requirements, notifications, and notices issued by the concerned ministries as mandatory actions for environmental protection and corporate compliance.

The Project and Environmental Impact Assessment Reporting

This new combined cycle power plant is being developed on 5.965 acres of MOEP's premises of Ahlone township of Yangon region. The followings are major physical structures involved in construction and installation works of power plant development project.

1. Gas Compressor Block
2. Power Generation Unit 1 - Gas Cycle Block (Gas turbine + Generator+ Thermal by-pass)
3. Power Generation Unit 2 - Steam Cycle Block (HRSG+ Steam Turbine + Generator)
4. Cooling Tower and Condenser Block
5. Water Treatment Plant (Physical and Chemical) and Pump Station
6. Storage Tower
7. Transformers and Gas Insulated Switch Gears (GIS), and
8. Auxiliaries and Ancillaries

Pertinent documents relating license, approvals, and notifications of regional and ministerial authority for power plant development are referred to the appendix. This scoping report strictly intends to fulfil EIA requirements of the ECD. The scoping exercises were undertaken in compliance to EIA procedures 2015 sanctioned by Ministry of Natural Resources and Environmental Conservation (MoNREC) to

identify anticipated both beneficial and detrimental environmental impacts associated to project implementation and operation through site visits, literature reviews, iterative baseline environmental sampling, and consultation among project proponents and immediate social receptors. The project summary is described in the project layout figure and table below.

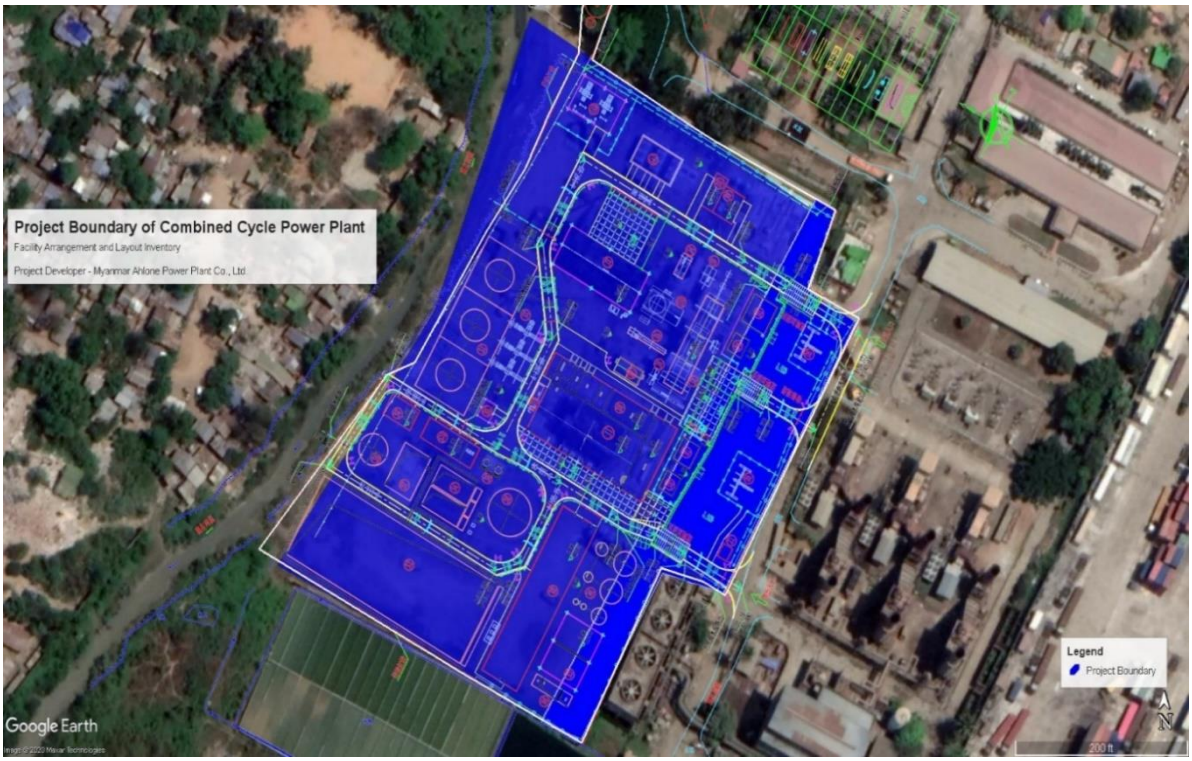


Figure 1 - Project Layout

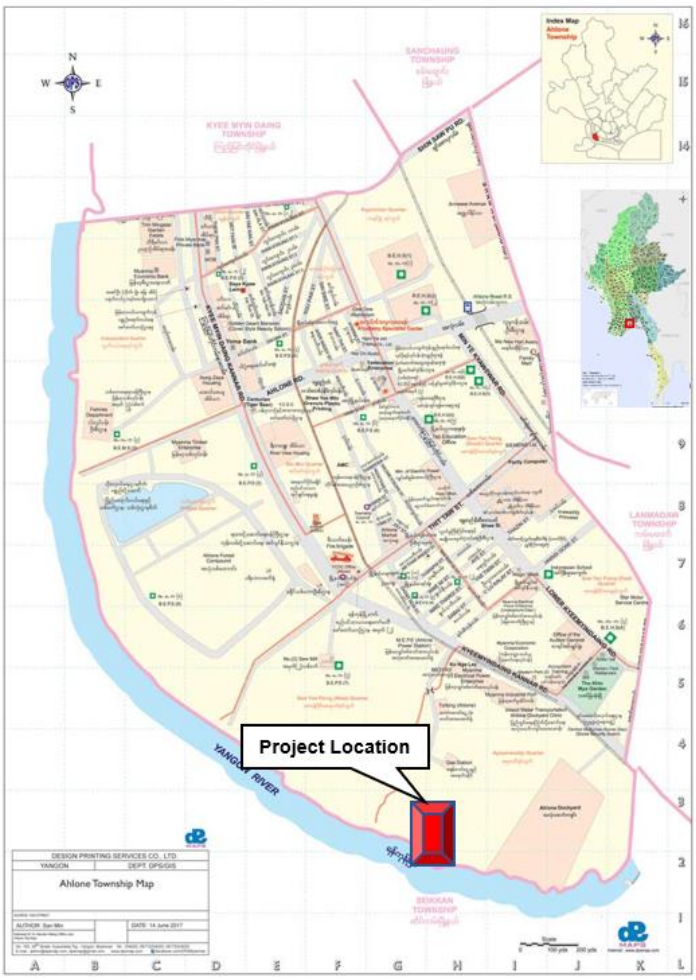


Figure 2 - Project Location

Component	Description and Technical Settings
Land Use Availability	5.965 Acres
Tentative Land Use	85 ~ 90%
Gas Turbine	9 E- class turbine (Model PG9171E)
Daily Consumption	44 million standard cubic feet per day at full efficiency
Generator – Gas Cycle	123 MW (Model - QFR-135-2A).
Gas Cycle Block Structure	Steel Structure Casing Type - (25x10x4) Dimension
Thermal bypass Chamber	(10x20x55) Dimension
Exhaust Temperature	550 °C
Steam Turbine	model- N60-5.6/0.56/527/255
Generator – Steam Cycle	65 MW (WX18Z-054LLT)
HRSG	Q1089/534-169 (35) -5.9 (0.5) /512 (254)
Stack Height	58M / Exhaust Temp.: 91-98 °C
Steam Cycle Block Structure	Steel Structure Casing Type - (20x20x15) Dimension
Gas Compressor	MW-45/20-27
Condensers Fans	Air Cooled Condenser Fans and Mechanical Arrangement
Condenser Facility	Reinforce Cement Concrete Construction (20x10x20) Dimension
Fuel and Hazardous Goods Storage and Application	• Natural Gas (Methane) dispensed by gas pipeline of MOEP

Component	Description and Technical Settings
	• HSD fuel in underground tank (1000 Litres) for backup generator. • List of hazardous goods applied in the CCPP 1. Lubricants, oil and grease for automation and heavy-duty machines. (Max – 250 litres ~ 2 barrels) 2. Cleaning Agents for gas turbine blades (Max – 250 litres ~ 2 barrels) 3. Additives for chemical water treatment processes (Max – 2 m^3 volume) 4. Corrosives and Inflammable solutions for consumables accessories and control devices. (Small storage in batches of manufacturers)
Main Transformers	SF10-150000/66 + SF10-70000/66
GISs	ZF-72.5/T2500-40 | ZF-72.5/T2000-40
Auxiliary Transformers	SZ11-6300/10.5 | SZ11-6300/13.8
Grid Connection	Ahlone Substation in beside project area – State Controlled Connectivity: Underground _ Closed Duct at approx. 200 m away
Chemical Water in water Treatment Plant	30 T/H – Recirculated in Adsorption Process
Cooling Tower	5000 M^3/H
Raw Water Source	Yangon River
Intake Rate	6000 m^3/day (max:)
Outfall / Discharge Channel	Harbi Creek
Discharge Rate	2000 m^3/day **recycled into the combined system**
Site access	External – two direct access roads (one gravel and one rigid paved concrete road) linked to the strand road. Internal – Ring Road in rigid concrete pavement
Auxiliary Infrastructure	1. Central control and admin office 2. Warehouses and storage facilities for peripherals, cables, construction materials, 3. Parking 4. security tents 5. Septic Tanks 6. Water tanks for firefighting 7. Access road
Major Buildings and Structures	1. Turbine houses 2. Generator houses 3. Thermal bypass Chamber 4. Heat Recovery Steam Generator (HRSG) Tower 5. Station control building 6. Air and gas Compressor building 7. Water Treatment Facility 8. Raw Water Storage Reservoir 9. Condenser and Condensate processing facility 10. Firefighting pump house 11. Water pumping station 12. Underground and overhead ducts 13. Warehouses 14. Waste Storage 15. Canteen and Rest Areas

Analysis of Alternatives

The analysis of the alternative revealed there are two other projects adjacent to the site and there is no better ground in sight for the power plant project at this moment. The project aesthetic looks are modern and environment compatible, the site is environmentally acceptable. Currently, there are some existing power plants at the area and the site area has been developed for power hub of MOEP. Therefore, the project site is suitable for the proposed Ahlone Power Plant 151.54 MW Combined Cycle Power Plant. For the project, Myanmar Ahlone Power Plant Company Limited has proposed LNG based combined cycle power generation technique with latest available modern technology to maximize the efficiency of power generation process. The summary of analysis undertaken to other perspective are presented in the table below.

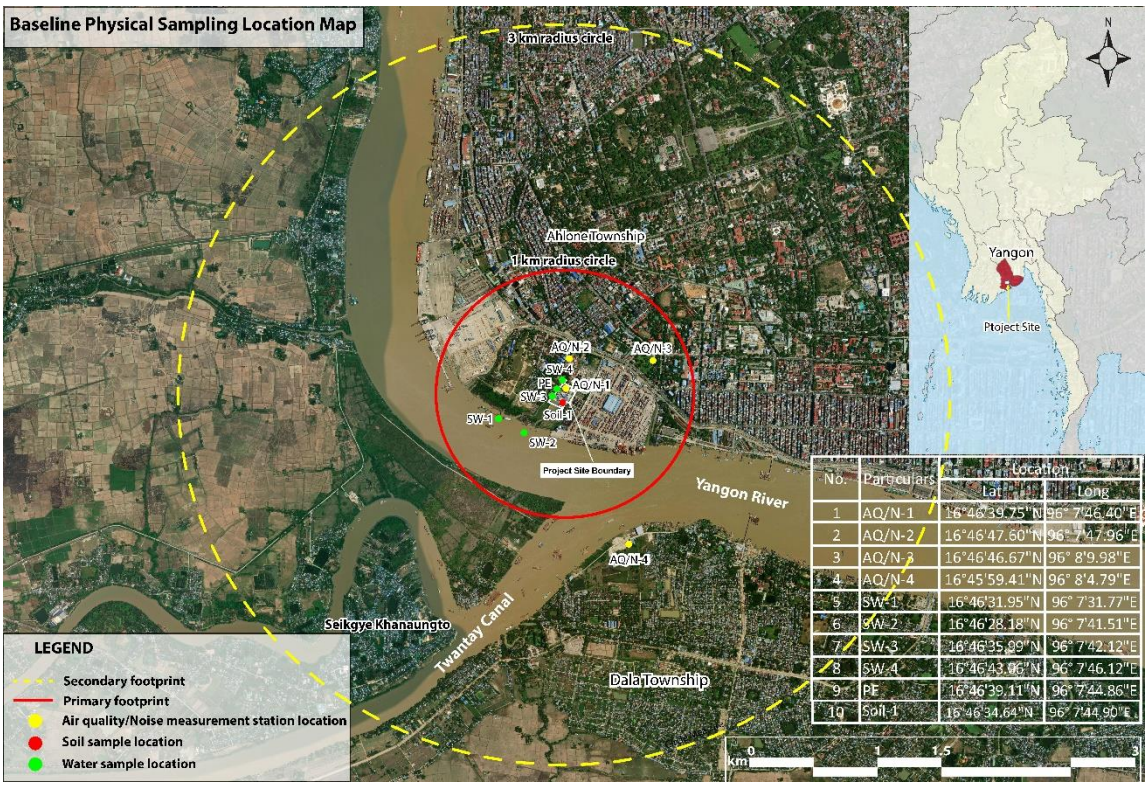
Site selection matrix

Sr. No.	Site Selection options	Selection Criteria			Remarks
		- ve.	Neut.	+ve.	
1.	Site Suitability			☑	Allocated plant in Dedicated Utility Yard
2.	Land			☑	Developed land
3.	Accessibility			☑	Built access road
4.	Fuel			☑	Clean fuel, Natural Gas
5.	Water			☑	Near to river
6.	Electric power Transfer			☑	Built in projects for state Substation
7.	Resettlement & Rehabilitation			☑	Not an issue
8.	Technological options			☑	The best available technology from techno commercial point of view is considered.
a.	Combined cycle operation			☑	More efficient
b.	Close loop cooling			☑	No thermal pollution
c.	Turbine selection of low NOx and H class highly efficient turbine			☑	Highly efficient compared to conventional one.

Since all phase of the project related activities will be the major attributes to the environmental compartments, MSR study team emphasises primary potential environmental impacts within the project area (5.965 acres) is set 1-3 Km radius for surrounding environment study, and conducted the comprehensive environmental and social impact assessment. All possibilities for environmental impacts incidence derived from the project during (1) Pre-Construction (2) Construction, and (3) Operation and Maintenance, and (4) Decommissioning are to be anticipated from spatiotemporal to frequential prospect with regard to physical, biological and social standpoints. Therefore, the eligible inventories within ambient host environment and those concerned parties are contemplated into environmental management and monitoring action of this EIA report.

Baseline Environment

Baseline environment is concerned with existing physical, chemical, and biological conditions of the area where the plant is going to be set up. The surface water, ambient air quality and noise level have been analysed to evaluate the primary baseline of the area. The data from the 2 separate seasons starting 2020 for environmental baseline data was being collected inside and at the vicinity proposed 151.54 MW CCPP Myanmar Ahlone Power Plant after careful selection of potential environmental receptors and project affected person shown in map below.



No.	Particulars	Location	
		Lat	Long
1	AQ/N-1	16°46'39.75"N	96° 7'46.40"E
2	AQ/N-2	16°46'47.60"N	96° 7'47.96"E
3	AQ/N-3	16°46'46.67"N	96° 8'9.98"E
4	AQ/N-4	16°45'59.41"N	96° 8'4.79"E
5	SW-1	16°46'31.95"N	96° 7'31.77"E
6	SW-2	16°46'28.18"N	96° 7'41.51"E
7	SW-3	16°46'35.99"N	96° 7'42.12"E
8	SW-4	16°46'43.96"N	96° 7'46.12"E
9	PE	16°46'39.11"N	96° 7'44.86"E
10	Soil-1	16°46'34.64"N	96° 7'44.90"E

Figure 3 - Scoping Exercise Boundary for ESIA in Physical Environment (1 Km radius for Primary and 3km radius) as Area of Influence

Ambient Air and Noise Quality

With project specific data from the Department of Meteorology and hydrology is not available near the project area. MSR has conducted 24 hours air and noise sampling at 4 locations in two different seasons of the year for ambient air quality indicators as of NEQG guidelines (i.e., $PM_{2.5}$, PM_{10}, CO, NO_2, O_3 and SO_2. The 24 hours long ambient air quality monitoring at all selected points revealed that the air quality of all area is very poor in quality. With the exception NO_2, of All indicators and parameters results were found higher than permissible threshold of NEQG limit. This is due to the fact that the project site and sampling points are inside commercial and urban areas in which anthropogenic sources, and activities are active with respect to time of the day. Thus, inarguably, the presence of proposed project, it is highly likely that these pollutants concentration could increase as long as the project activities are active. Therefore, project developer is obliged to implement adequate and constant mitigation measures and management plan to reduce potential impacts. Comprehensive environmental and social management plans are introduced in management and monitoring plan section of this report.

The background noise levels measured were compared against the noise limits set out in the Myanmar NEQ Guidelines. The noise levels measured at NQ1 exceeded the NEQ Guidelines at all time which is inside the project site and at the vicinity of major noise source. All remaining monitoring stations except for residential areas during the daytime noise monitoring, the noise level is below NEQG guidelines. The high noise levels a NQ2 (Residential Area) may be due to the noise from those other power plants located within the MOEP compound. Field investigation provided with the evidence that day noise of NQ2 doesn't belong to Myanmar Ahlone Power Plant since the residential area is a few kilometres away from proposed project and there is enough vegetation buffer that completely dissipate the noise originated from 151.54 MW combine cycle power plant which is under the study.

However, ambient air and noise impacts are being the cumulative issues in the area that need collaborative efforts need to be addressed by those commercial, industry and power plants located at the vicinity of the project area.

Baseline Soil Quality

Baseline soil quality investigation of parent soil inside project site had been conducted prior to construction activities commenced. Under the project development and needs all space of land had been

transformed into impervious concrete pavement when completion of all construction activities. Although the power plant operation doesn't not involve direct relation to soil quality, there is a slight possibility that improper handling of lubricants, oils and greases could result soil degradation under uncontrolled spills and dumping. Though these issues had been addressed through management plan, the establishment of baseline soil quality assists as reference environmental quality for environmental remediation and restoration for dismantling stage of the project.

The laboratory sampling results uncovered that the parent soil presence no metal toxicity in slightly alkaline conditions in loamy sand formation. The soil scientists of land use division from ministry of agriculture and irrigation department remarked the soil nutrients and composition falls within margins of dominant soil of the area.

Baseline Surface Water and Plant Effluent Quality

Surface water quality surveys in nearby Harbi Creek and Yangon River were carried out in two different seasons of the year during construction stage and operation stage of the project between 2019 - 2021 to set as baseline water quality that will be compared against periodical monitoring. The surface water quality monitoring was conducted near effluent point at two distinct points of upstream and downstream from the Project's planned cooling water intake and discharge points in the Harbi Creek and Yangon River. The results revealed that there is no formidable issues or pollution to surface water (creek and river) and power plant effluent when compared to NEQG permissible limits for power plant effluent and general water quality. However, it should be noted that none of the surface water is fit for direct application for neither domestic and hygiene purpose.

With the project utilize advance water treatment methods for plant operation state in the project description, no safety issues are likely to occur for employees and labours employed in the project at all stages.

Baseline Ecology & Biodiversity

Ecological survey at the study area recorded 95 floral species of which any of them are not vulnerable and threatened but most are invasive inside 5.965 acres wide project site. The number of fauna species recorded during the survey was identified as least concerned under IUCN lists. There are no wildlife, natural forest and vegetation, endangered species of present in and around the plant site. Although the plant site is mostly barren, there are several different types of trees like jack fruit, mango, kok ko etc. along with few other shrubs around the plant site.

A marine environmental team conducted an assessment of the riverine ecosystem on the Yangon River from July 22 to 25, 2024, focusing on biodiversity and water quality. The study identified 18 fish species, including two vulnerable species (Wallago attu and Cirrhinus cirrhosis) and several economically important migratory species like Tenualosa ilisha. Additionally, 24 phytoplankton, 30 zooplankton, and 12 benthos species were recorded. The ecosystem is influenced by tides, with seawater during high tide and freshwater during low tide, particularly impacted by rain during the survey.

The study area covered a 5-kilometer radius of the project site, with fisheries data collected over a 10-kilometer radius. Water quality parameters indicated freshwater dominance due to the rainy season. The Yangon River serves as a migratory route for economically important fish species, highlighting the need for mitigation measures to protect fish diversity, especially during the spawning season, which is regulated by the Department of Fisheries.

Impact Identification of The Proposed Project

The significant environmental and social impacts in majority identified are identified during (i) construction phase and (ii) operation phase. There are some impacts during construction of the power plant are air quality, surface water quality and drainage pattern changes. The impacts due to operation are most important, which are: (i) Air Emissions especially Greenhouse Gas (ii) Noise, and (iii) Occupational health. Having theoretical approach to identified negative impacts, in the scoping exercise the following prospective environmental and social impacts had been identified that are likely to encounter in course of each individual project phases defined. Linked to the Occupational Safety Health and Environment (OSHE) they include;

1. Global Warming Potential or Green House Gas Emission
2. Air Quality
3. Noise

4. Surface Water Quality
5. Traffic Generation
6. Sanitary (domestic wastewater) and communicable diseases
7. Occupational exposure to hazardous chemicals
8. Respiratory protection
9. Fall and Collapse
10. Injury, disability, and fatality
11. Multi-disciplinary safety issues
12. Working ergonomic, and
13. Stress and other mental health issues

Environmental and Social Management Plan (ESMP)

In the context of a project, Environmental and Social Management Plan (ESMP) is concerned with the implementation of the measures necessary to minimize and offset the adverse impacts and to enhance beneficial impacts. Unless the mitigation and benefit enhancement measures are identified in ESIA and fully implemented, the prime function of the ESIA cannot be achieved. The full ESMP is developed in the chapter 7 of the report for which the project developer, Myanmar Ahlone Power Plant Company Limited is liable to be responsible for full implementation as part of environmental conservation and corporate compliance to fulfil legal requirement of environmental conservation laws, rules, and guidelines.

The objectives of ESMP for the project are: (i) Identification of Monitoring requirements and Monitoring indicators; (ii) Mitigation measures to reduce or eliminate negative impacts; and (iii) Enhancement measures to maximize positive impacts. Environmental management plan has to be considered as part of the plant's overall management and it would be part of the plant operational manual.

Management In Construction Phase

General construction management and control over conducting technological process during construction works had been be assigned to the contractor and Myanmar Ahlone Power Plant Company Limited project management. The contractor, in turn, concludes contracts with subcontract organizations performing works at the construction site. The administration and management of Myanmar Ahlone Power Plant company limited bears responsibility under Project Implementation Unit (PMU) for selection and assessment of subcontract organizations. Control functions over contract organizations activity in the field of labour safety, industrial safety and preservation of the environment are also assigned to the Consortium for project development and implementation of successive project stage.

Management in Operation Phase

Myanmar Ahlone Power Plant Management will be responsible to operate the power project under Operation & Maintenance unit (O&M) during the operation phase and will be responsible to maintain the environmental and social standards for the project.

Mitigation Measures

For effective and environment friendly operation of a project, a set for guiding tools and suggestions are necessary which need to be followed at various stages of plant installation, operation, and maintenance. This plan generally has various components of management depending on the type of project or plant activity and types of discharge and their pollution potential. This Environmental and Social Management Plan (ESMP) once prepared forms the basis of environmental management actions from the part of the project authority may need modification or up-gradation because of changes in the plant operation or accurate pollution load/environmental problems detected afterwards.

Monitoring Plan

A management team set up must be created for the environmental monitoring program which can ensure compliance with national environmental standards. A committee (Environmental Management and Safety Committee) will be created with plant manager as head and with 3-4 other members. The committee must meet at least once in a quarter and discuss about the environmental status of the plant. The main emission from the plants (i.e., air emissions, noise and any other) are to be analysed as per monitoring plan. The "the

quarterly and annual environmental monitoring reports will be submitted to ECD and will also be documented on the company document control registry for public disclosure, if scrutiny opens as part of grievance redress mechanism.

Monitoring in Construction Phase

The environmental monitoring program was carried out as an integral part of the planning and execution of the construction phase. It must not be seen merely as an activity limited to monitoring and regulating activities against a pre-determined checklist of required actions. There are two types of monitoring during construction, 1) Visual Monitoring and 2) Analytical Monitoring. The following are the visual monitoring, its parameters and monitoring frequency for the 151.54 MW CCPP developed by Myanmar Ahlone Power Plant Company Limited.

Visual Monitoring and Observation during Construction Phase

Issue	Key aspectes	Monitoring Frequency	Responsibility
Traffic volume	Incoming & outgoing traffic, traffic movement records	Monthly	EPC Contractor
Site Security	Proper fencing, isolation of site from general access, marked passage for workers and visitors	Monthly	EPC Contractor
Personal Protective Equipment	Ensure every single person involved in the construction activity wear proper PPE	Monthly	EPC Contractor
Incident record & reporting	Documented record of all incident, accident, near misses etc. and its remedial process.	Monthly	EPC Contractor
Solid waste	Quantity of solid waste, segregation and disposal process	Monthly	EPC Contractor
Oily waste Generation & disposal system	Quantity of oily waste, storage and disposal process	Monthly	EPC Contractor
Worker's health	Monitoring process of worker's health	Monthly	EPC Contractor
Complain from neighbours	Any significant complain from neighbours and it's remedial procedure	Monthly	EPC Contractor
Safety orientation & training of workers	Frequency of training & orientation of workers for safety	Monthly	EPC Contractor
Sanitation & drinking water facility to workers	Availability of safe drinking water and sanitation to the workers	Monthly	EPC Contractor
Site Drainage	Maintaining proper drainage	Monthly	EPC Contractor

Monitoring in Operation Phase

Most of the environmental parameters will experience beneficial effects during the operation phase of the power plant project. The following are the monitoring parameters and monitoring frequency for the 151.54 MW combined cycle power Plant during operation:

Issue	Parameters	Monitoring Frequency
Stack emissions	NO_x, and temperature	Continuous
Ambient air quality	CO, NO_x, PM_{10}, $PM_{2.5}$, SO_2 and According to NEQG Guidelines	Bi-annually at four locations, seasonal or half yearly monitoring at sensitive receptors and Reporting
River water	Water temperature and DO, PH, COD. BOD, TOC, DO, TSS, oil & grease etc. and According to NEQG Guidelines	
Effluent quality	pH, DO, Water, temperature, Sulphate, TSS, TDS, BOD, COD, Total N, Total P	
Noise level	Noise 4 different locations	Semi-annually at sensitive receptors and Reporting
Occupational health and safety	Health status and safety	Continuous

The cost of the Environmental Management Plan (EMP) is divided into several parts to reflect the different phases of the project and the requirements of each phase. The cost of EMP include the costs of the capacity building, public consultation, the quality control requirements, and CSR annually throughout the operation of the project lifetime. An allocation will be made separately for EMP every year in budget estimated for the project.

Emergency Response and Occupational Health & Safety

Under the supervision of the 'Environment Management and Safety Committee, all plant personnel will have responsibilities assigned to them during emergency. The documented responsibility will be included in a program manual which can constitute a part of the plant's operation manual. Compliance with the responsibilities should be monitored and if these are not carried out for any reason, corrective measures should be taken.

The plant management will prepare an occupational health safety policy manual which should be updated from time to time. The policy should be signed and dated by the Chief Safety Officer or may be the Plant Manager. The policy should be discussed with all the plant personnel. The Chief Safety Officer should periodically review the policy and re- issue the policy.

Stakeholder Consultation and Public Disclosure

Stakeholder consultations are considered very important and sensitive issues for setting up a new industry in any area of in the Republic of the Union of Myanmar. The process was initiated with an open objective to ensure people's participation right from the planning stage of the project. Furthermore, this was aimed at improving the study taking into account opinions from the people of the impacted area. Meetings with stakeholders consisted of community consultation meetings, focus group discussions, and in-depth interviews with project affecter people and limited focus-group discussions with women.

In the series of informal profess of consultation various stakeholders have been consulted e.g., local communities, men, women and local elders, local government representatives. The most important consultation was the consultation of locals and those concern administrative persons across different layers of Ahlone Township. Two formal public consultation has been conducted one for scoping report and one for EIA public consultation. All the speakers and guests including stakeholders were very positive about the project and discussed about various issues related to construction and operation of the project.

The public consultation and stakeholder engagement meeting reveals there was no protest nor dispute against the construction and operation of the Myanmar Ahlone Power Plant. The following concerns and recommendations can be summarized based on 2 public consultation and stakeholder engagement meetings undertaken during EIA process of the project.

Community Concerns

The community consultations demonstrated that goodwill towards the project proponents indeed exists; approval for project activities by the communities is evident. The proponent recognizes that benefits from the project should be distributed equitably especially among primary stakeholders in the project area, and will continue to ensure that this principle is followed in its projects and community development program.

Local Employment

Communities in the project area emphasized that local people should be given priority when employing people for various project-related works and activities according to their skills. They still appreciated project developer's endeavour which will lead to the development of the surrounding area and create more employment opportunities by shifting compositional changes annually to local experts.

Immigration

Foreign workforce coming in the project area that will not be aware of the local customs and norms, may result in conflicts with the local community, keeping in mind the sensitive law and order situation and culture of the area.

Employment Opportunity

The public consultation reveals local appreciated this endeavour which will lead to the development of the surrounding area and create employment opportunities.

Community Recommendations

- They local community recommends and demands implementation of CSR programmes targeting to surrounding the project area to provide better education and welfare services.
- They want to be provided with technical and vocational training to help them build up their skills.
- Primary and high schools need to be supported for facilities and learning resources to ensure educational facility for the local children so that they have better access towards a better future.

Grievance Redress Mechanism

The Project Management has established a procedure to answer to project-related queries and address complaints and grievances about any irregularities in application of the guidelines adopted for assessment and mitigation of environmental safeguards impacts. The complaints related to plant operation that may create in conveniences to agency/individual should be addressed based on consensus, the procedure will help to resolve issues/conflicts amicably and quickly without resorting to expensive, time-consuming legal actions. To ensure impartiality and transparency, hearings on complaints will remain open to the public. The GRC will record the details of the complaints and the reasons that led to acceptance or rejection of the particular cases. The GRC will keep records of all resolved and unresolved complaints and grievances and make them available for review as and when asked for by appropriate authority, WB and any organizations known to be working with urban development issues.

Conclusion and Recommendations

To be concluded, this EIA report highlights the scope of work and terms of reference for the Environmental and Social Impact Assessment (ESIA). The document is the crucial roadmap in tackling environmental and social impacts as a result of the development and its related activities of combined cycle power plant – 151.54 MW that is to be managed and operated by Myanmar Alone Power Plant Co., Ltd. Based on the presenting facts and information provided by the project proponent, it could be expected that the implementation of the project will bring socioeconomic and economic development to Yangon by mean of energy security and sufficiency. The desk-based studies on available information, initial site visits for collecting factsheet, baseline data collection, impact assessment and comprehensive public consultation results indicates that there are no objectionable, complicated, controversial socio-

economic and political issues when weighing in support of the project is to be implemented on currently designated location.

However, the following are the recommendations should be followed by the Myanmar Ahlone Power Plant Company Limited during all of its 151.54 MW Combined Cycle Power Plant project stages.

1. **Continuation of periodical the baseline air and noise monitoring study**

   Since the baseline air monitoring study has been conducted in two different separate seasons (i.e., wet, and dry), a follow up baseline air quality monitoring should be conducted at quarterly so that the proper variances among seasonal data would be reflected and reported to authorities concerned. It is suggested to monitor air quality for 4 locations to get the seasonal monitoring without fail.

2 **Continuation of the Stakeholder Consultation**

   To evaluate the true consequences of the project, the sstakeholder consultations should be continued during the Construction and operation of the project in a regular interval. The stakeholder and public consultation should address any issues and complaints made by stakeholders while doing future regular consultations and reporting full implementation of committed corporate social responsibility programme of project developer.

1. INTRODUCTION

1.1 Project Background and the EIA

Under Independent Power Production (IPP) scheme of the union government of Myanmar, private investors were granted electricity production permit under the agreement with Ministry of Electric Power (MOEP) (formerly known as Ministry of Electricity and Energy) since 2011. The aim of IPP targets expending nationwide electrification coverage to uplifts well beings and boost productivity of the nation. Within Yangon region alone, new power plants are newly set up and existing ones have been upgraded in utility stations such as Hlawga, Ywarma, Thaketa, and Ahlone since 2013. The state run Ahlone 154 MW combined cycle gas turbine power plant commissioned since 1995 is now being undertaken for facility upgrades and overhaul maintenance. It has been targeted that by the end of 2020, new turbines and generators using latest technology of combined cycle single shaft technology will be installed within MOEP's premises through either joint venture or fully private investment and apply decentralization in energy sector adopted by acting government's energy policies. It is; therefore, the government opens tender inviting local and international power generation and utility supply firms to assure steadily increasing energy demand and consumption of Yangon City by upgrading and modernizing utility infrastructure elsewhere in Yangon since recent years.

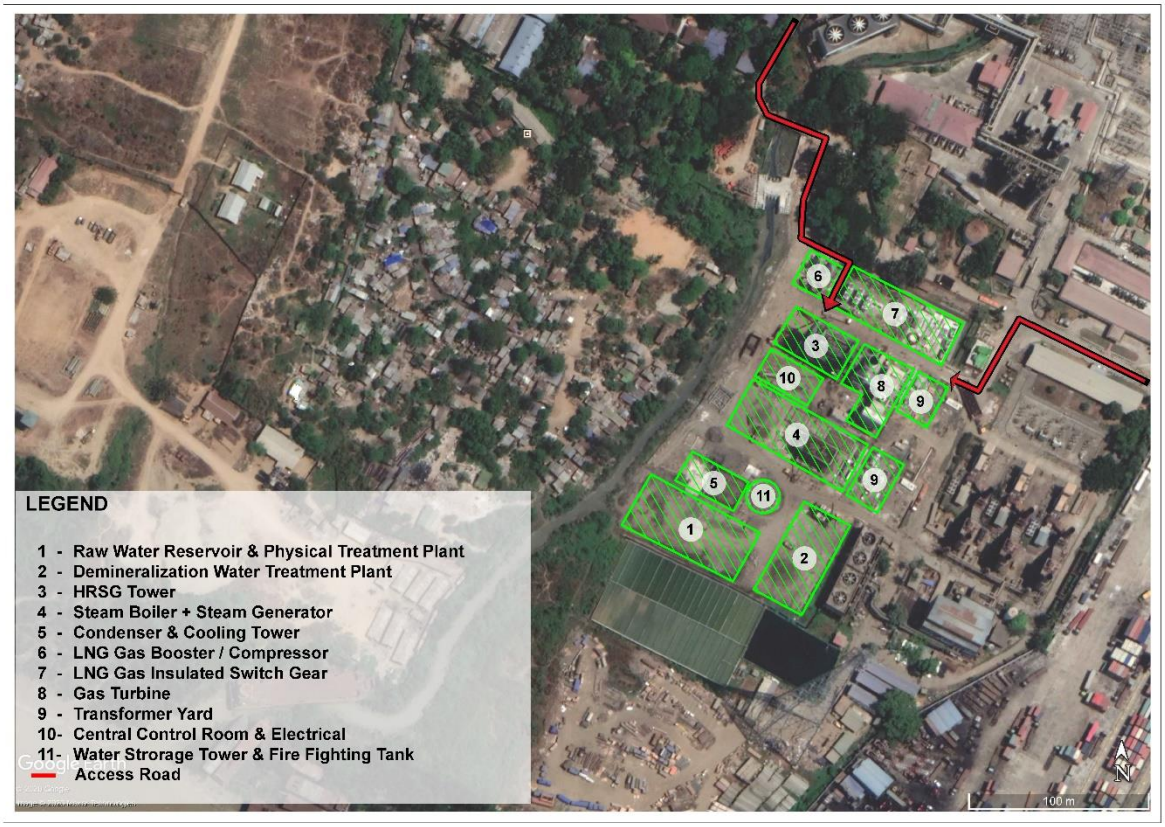


Figure 1-1: Project Layout of Proposed 151.54 MW Combined Cycle Power Plant (Ahlone)

Myanmar Ahlone Power Plant Co., Ltd. (MAPP Co., Ltd) is one of the private investors bid the tender and awarded to develop 151.54 MW capable new Combined Cycle Power Plant right next to the existing MOEP's facility (Figure 1-1). The project output, only with this single entity, will reinforce energy security of Yangon city, then it will uplift from the forester 24/7 power supply to domestic households, services industry, and manufacturing sectors of the region. As of August 2020, the facility's gas fired turbine and generator segment is fully in operational and generating power into regional grid. It's been scheduled that by the end of 2020, the combined cycle (natural gas and steam) powered generators can be fully capable to generate its full capacity.

To sum up, the project is designed to embark and implement energy security and sufficiency initiative launched by the state authority. It is, therefore, the project developer obtained Power Production Agreement (PPA) which is inked among MOEP and Myanmar Ahlone Power Plant Co., Ltd. on 2nd September

2019 and the project has been in implementation since then. The as part of the EIA requirement and complying environmental conservation action, the developer assigned Myanmar Survey Research (MSR) to conduct Environmental Impact Assessment (EIA) study on August 2020 which is to be in conformity with acting EIA law 2012 and procedures 2015.

1.2 Presentation of the project proponent

The following information are pertinent information of project Proponent/Developer.

Investor/Company Name – MYANMAR AHLONE POWER PLANT COMPANY LIMITED

Company Registration No. – 124396107

Status: Foreign

Company Type – Private Company Limited by Shares

Contact Address – No.20, Sabal Street, Saw Yan Paing (West) Quarter, Ahlone Township, Yangon, Myanmar. 11111

Mobile – 09790956010

Email – phyu.kiec@gmail.com

List of Board of Directors

Name	Position	Nationality
Hu Weimin	Director	China
Mou Yi	Director	China
Zhang Qian	Director	China

1.2.1 COMPANY EXTRACT (MYANMAR AHLONE POWER PLANT COMPANY LIMITED)

DIRECTORATE OF INVESTMENT AND COMPANY ADMINISTRATION

Myanmar Companies Online Registry - Company Extract

Company Name (English)	Company Name (Myanmar)
MYANMAR AHLONE POWER PLANT COMPANY LIMITED	မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီလီမိတက်

Company Information

Registration Number	Registration Date	Status
124396107	17/01/2020	Registered
Company Type	**Foreign Company**	**Small Company**
Private Company Limited by Shares	Yes	Yes
Principal Activity	**Date of Last Annual Return**	**Previous Registration Number**
35 - Electricity, gas, steam and air conditioning supply	22/09/2023	-

Addresses

Principal Place Of Business In Union	NO 20, SABAL STREET SAW YAN PAING WEST QTR, AHLONE TOWNSHIP, YANGON REGION, MYANMAR 11111
Registered Office In Union	NO 20, SABAL STREET SAW YAN PAING WEST QTR, AHLONE TOWNSHIP, YANGON REGION, MYANMAR 11111 Email Address: phyu.kiec@gmail.com Telephone Number: 09790956010

Officers

Name:	HU WEIMIN	Type:	DIRECTOR
Date of Appointment:	17/01/2020	Date of Birth:	21/05/1956
Nationality:	CHINA	N.R.C./Passport:	EF-1291239
Gender:	MALE	Business Occupation:	BUSINESS MAN
Name:	MOU YI	Type:	DIRECTOR
Date of Appointment:	27/08/2020	Date of Birth:	03/10/1966
Nationality:	CHINA	N.R.C./Passport:	EJ-4556818
Gender:	MALE	Business Occupation:	-
Name:	ZHANG QIAN	Type:	DIRECTOR
Date of Appointment:	17/01/2020	Date of Birth:	02/11/1958
Nationality:	CHINA	N.R.C./Passport:	EA-3669178
Gender:	MALE	Business Occupation:	BUSINESS MAN

Ultimate Holding Company

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DIRECTORATE OF INVESTMENT AND COMPANY ADMINISTRATION

Myanmar Companies Online Registry - Company Extract

Company Name (English)	Company Name (Myanmar)
MYANMAR AHLONE POWER PLANT COMPANY LIMITED	မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီလီမိတက်

Name of Ultimate Holding Company	Jurisdiction of Incorporation	Registration Number
CHINA ITS (HOLDINGS) CO.,LTD	Cayman Islands	CT 205308

Share Capital Structure

Total Shares Issued by Company	Currency of Share Capital
500,000	USD

Members

Share Bundle 1

Quantity	1,500
Amount Paid	1,500.00
Amount Unpaid	0.00
Share Class	ORD
Share Title	

Members

Name of Company:	SUPER ONE HOLDINGS COMPANY LIMITED		
Registration Number:	181877081	Jurisdiction of Incorporation:	Myanmar

Share Bundle 2

Quantity	498,500
Amount Paid	498,500.00
Amount Unpaid	0.00
Share Class	ORD
Share Title	

Members

Name of Company:	CHINA ITS (HOLDINGS) CO., LTD

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DIRECTORATE OF INVESTMENT AND COMPANY ADMINISTRATION

Myanmar Companies Online Registry - Company Extract

Company Name (English)	Company Name (Myanmar)
MYANMAR AHLONE POWER PLANT COMPANY LIMITED	မြန်မာအလုံပါဝါပလန့်ကုမ္ပဏီလီမိတက်

Registration Number:	CT-205308	Jurisdiction of Incorporation:	Cayman Islands

Mortgages and Charges

Form / Filing Type	Effective Date
H-1 | Registration of mortgage or charge	06/12/2022

Details about all mortgages and charges can be accessed from the Company Profile Filing History at no charge.

Filing History

Form / Filing Type	Effective Date
AR | Annual Return	22/09/2023
C-3 | Change to share capital or register of members	22/09/2023
C-4 | Notice of change of registered office or principal place of business	21/09/2023
AR | Annual Return	03/02/2023
D-1 | Particulars of directors and secretary	03/02/2023
H-1 | Registration of mortgage or charge	06/12/2022
C-4 | Notice of change of registered office or principal place of business	17/10/2022
AR | Annual Return	07/01/2022
I-9D | Application to revoke suspension of company registration	09/04/2021
C-4 | Notice of change of registered office or principal place of business	09/04/2021
AR | Annual Return	09/04/2021
I-9A | Notice of intent to suspend for failure to file annual return	18/02/2021
D-1 | Particulars of directors and secretary	27/08/2020
C-3 | Change to share capital or register of members	02/07/2020
D-1 | Particulars of directors and secretary	29/06/2020
AR | Annual Return	11/05/2020
A-1 | Application for incorporation as a private company limited by shares	17/01/2020

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1.3 Presentation of Environmental and Social experts

Myanmar Survey Research Co., Ltd had organized key experts and consultants from inter-disciplinary areas for conducting EIA for this combined cycle power plant project in Ahlone township of Yangon region with following team members. And, the tables describe information of MSR EIA members and MSR company.

Table 1-1: EIA Team Members

Sr. No.	Full Name	Responsibility for EIA / SIA Consultations	Area of Expertise Covered for EIA / SIA
1.	U Kyaw Hlaing	Project Management and EIA Quality control ESIA Study Impact assessment and mitigation measure Environmental Management Plan	1. Scoping Study 2. EIA Reporting 3. Air Pollution Control; 4. Ecology and Biodiversity; 5. Facilitation of meeting; 6. Geology and Soil; 7. Ground water and Hydrology; 8. Land use; 9. Legal Analysis; 10. Meteorology, Modelling for Air Quality; 11. Noise and Vibration; 12. Risk Assessment and Hazard Management; 13. Socio-Economy; 14. Public consultation 15. Water Pollution Control 16. Waste Management; and 17. Impact assessment and Mitigation measures 18. Environmental Management Plan
2	U San Tun Aung, Ph.D.	Social scientist (socio-economic impact assessment and writing the SIA report)	
3	U Ye Nyunt	Industrial Management Analysis and report writing	
4	Engr. U Myint Swe	Air Pollution Geology and Soil Waste Management Ground Water and Hydrology	
5	U Aung Lin	Social Impact Assessment and Public consultation	
6	U Ko Ko Soe Lwin Thaw	Cartography, photography, designing, and GIS mapping, Facilitator	
7	Dr. Aung Myint Thein	Biological Impact Assessment Specialist Biological Impact Assessment, and Preparation of Written Documentation	
8	U Phone Myint Tun	Soil, Water, Air, Landscaping, Topography and EMP	
9	U Ohn Kyaing	Asst: Sociologist Social Impact Assessment and Public Consultation	
10	Dr. Mon Mon Tin Oo	Community health, social and behavioural consultation, report writing	
11	U Kyan Dyne Aung	Environmental Management Specialist Impact Assessment and Mitigation Measures Environmental Management Plan	
12	U Htay Aung Pyae, Ph.D.	Hazardous Waste Management and Control Environmental Chemistry Data Analysis and Statistics	
13	Oo Kyaw Maung	Environmental Policy Legal and Institutional Analysis Expert	
14	Yel Nyan Lin	Biological Impact Assessment,	
15	Thar Moe Aung	Engineer (Civil) Auto CAD	
16	U Ye Min Aung	Field staff (Operation)	

Photo 1-1: Team discussing on Project Related Matter

Table 1-2: Contact Information and Address of MSR ESIA Team

Company Name:	Myanmar Survey Research Co. Ltd.
Company Address:	**MSR Head Office** Yangon-Central-Railway Station Building, Mingalartaungnyunt Township, Yangon
Country:	Myanmar
Websites:	http://www.myanmarsurveyresearch.com
Tel:	+95-1-8370464
Fax:	+95-1-8254263
E-mail	msr@myanmarsurveyresearch.com
Qualifications and Experience of MSR	Established in 1995, Myanmar Survey Research company has been providing research and consultancy services for more than twenty years to local and international firms including international organizations like UN agencies, World Bank and INGOs in Myanmar. MSR is certified by Department of Environmental Conservation of the Ministry of Natural Resources and Environmental Conservation. Besides ESIA assessment services for different types of projects in Myanmar, MSR also offers market, social and industry research services.

1.4 Project Developer's Commitment and Declaration on The EIA Report

Myanmar Ahlone Power Plant Company Limited commits and declares to the implementation of all measures, including the provision of the necessary funds and human resources.

1.5 Structure of The EIA Report

This EIA Report is structured in conformity to the EIA report preparation guidelines[1] of ECD as recommended in Appendix 5- EIA Table of Contents in the EIA Procedure.

Chapter 1 Introduction, this chapter aims to provide with background information and overview of the EIA report.

Chapter 2 Policy, Legal and Institutional Framework. This chapter presents policy, legal and institutional framework, environmental and social standards, and guidelines that are applicable to this Project. It also presents corporate policies on environmental and social management that the Project Developer is committed to implement during the construction and operational phases of the Project.

Chapter 3 Project Description. This chapter presents technical information on project plan, layout, design, construction approach and plan, and operating plan that are derived based on comparative analysis of various alternatives. Quantitative information on project construction activities and inputs are also given. The information in this chapter is the basis for identification of environmental and social changes that could have impacts on the environment during the construction and operation.

Chapter 4 Description of Environment. This chapter defines the study area and limits of the study, and describes various environmental components of the study area, including physical, biological, socio-economic, cultural, and visual components. The information is the basis for assessing the magnitude and significance of environmental and social impacts of the identified environmental and social changes in Chapter 4.

Chapter 5 Impact and Risk Assessment and Mitigation Measures. This chapter proposes appropriate management and physical measures for mitigating the impacts identified in Chapter 6. Environmental and social compliance risk will be identified and measures will be proposed to manage the risks.

Chapter 6 Cumulative Impact Assessment. This chapter presents an assessment of cumulative impacts, i.e., combined impacts of the Project and other projects, existing and planned projects.

Chapter 7 Environmental Management Plan. This chapter summarizes the conceptual framework and principles of environmental management to be applied in the project construction and operation. The mitigation measures proposed in Chapter 6 will be consolidated into two environmental management plans- Construction Phase EMP and Operational Phase EMP. The two EMPs will be prepared following the basic management cycle.

Chapter 8 Impacts on Health and Safety.

Chapter 9 Public Consultations and Disclosure. This chapter presents results of public consultation and disclosure conducted as part of the scoping study and as part of the EIA study. The presentation is focused on salient findings relevant to the design of mitigation measures proposed in Chapter 6 and development plans proposed in Chapter 8.

Chapter 10 Conclusion and Recommendation

Appendices: The main report has appendix in each chapter containing detailed information to support the presented findings in various chapters in the main text.

[1] Investigation and review process of EIA type project – ECD

2. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 Aim and Objectives of the Chapter

This section states the legislative framework concerning Energy Sector Develop Development Project like 151.54 MW Combined Cycle Power Plant project. This section mainly focuses on pertinent policies, applicable laws, enforced regulations and guidelines that are compulsory to comply by the project developer, herein Myanmar Ahlone Power Plant Co., Ltd. when executing the project in all phases. In addition, Corporate Environmental and Social policies, Compliance industrial standards and commitments are distinctly presented.

The laws described in this chapter are not limited to the content highlighted only: but it is ultimate obligation that like other project developers, it is mandatory to respect and follow every acting law and by-law endorsed according to the decree conferred to concerned ministries of the republic of the union of Myanmar as long as project actions and activities are either directly or indirectly in connected with the effect of the laws and rules.

Myanmar Ahlone Power Plant Co., Ltd., hereby, commit to obey and follow all acting laws, rules, notifications, and directives endorsed and issued according to the decree conferred to concerned ministries and departments of the republic of the union of Myanmar.

2.2 National Administrative Framework

Since National League for Democracy Party's government has taken the executive power, there are 25 ministries under the Office of the President as of November 2017. Regarding environmental, natural resources and social issues related to investment businesses, one of the focal agencies is the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC), which the Ministry of Environmental Conservation and Forestry (MOECAF) were merged in April 2016.

Ministry of Electricity and Energy (MoEE) is the merger of Ministry of Electric Power (MoEP) and Ministry of Energy (MoE). The bureau is responsible for managing and directing electric power and energy related policies, plans, implementation, and legislation across the union of Myanmar. Since the business areas of this project links to power generation and supply, and natural gas acquisition from state control gas pipeline, it is compulsory to have collaboration and cooperation among with all departments and enterprises of ministerial office, and project proponent.

While ECD is the focal institute and granted ultimate authority to rule environmental conservations and regulating those independent group or investment companies according to the environmental conservation law, 2012 enacted by the parliament and presidential power, the following institutional consideration, regulatory setting, and policies are equally essential for the project developer to comply with in doing investment business in Myanmar.

2.3 Institutional Framework, Strategy and Plan

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

The acting constitution of Myanmar came into effect in 2008. According the constitution, the Union government has put special consideration and obligation to the critical role of natural environment for sustainable development and economic growth. Meanwhile, the constitution also states the commitment of the Union and its government in:

- Preservation and safeguarding of cultural heritage.
- Environmental conservation.
- Striving for development of human resources; and
- Protection and preservation of public property.

2.3.2 National Sustainable Development Strategy (2009) and Plan (2018 – 2030)

The National Sustainable Development Strategy (NSDS) is part of a broader program of the UN Sustainable Development Commission set up after the World Summit on Sustainable Development in 2002.Every country, including Myanmar, that signed Agenda 21 at the Earth Summit in Rio de Janeiro

in 1992, agreed to develop an NSDS by 2010 in line with the Millennium Development Goals (MDGs). United Nations Environment Program (UNEP) provided funding for Myanmar to develop an NSDS. The main aim of the process was to develop an NSDS in line with international standards by meeting the MDGs and ensure that environmental and social impacts are mitigated when implementing development projects. Myanmar's NSDS was published in August 2009.

The major three goals that are designated in Myanmar's NSDS expressed in the executive summary are (1) sustainable management of natural resources, (2) integrated economic development and (3) sustainable social development. In additional to these goals, specific strategies are outlined under each goal. For example, the goal for Sustainable Management of Natural Resources suggests strategies for forest resource management, sustainable energy production and consumption, biodiversity conservation, sustainable freshwater resources management, sustainable management of land resources, sustainable management for mineral resources utilization, and so on.

In august 2018, the government of the republic of the union of Myanmar launched concrete plan named The National Sustainable Development plan (2018 – 2030). Based on the strategies, the plant covers and set the objectives to the followings.

(I) Pillar 1: Peace and Stability

a) Goal I: peace, national reconciliation, security & good governance
b) Goal II: economic stability & strengthened macroeconomic management

(II) Pillar 2: Prosperity & partnership

c) Goal III: job creation & private sector-led growth

(III) Pillar 3: People & planet

d) Goal IV: Human resources & social development for a 21st century society
e) Goal V: Natural resources & the environment for posterity of the nation.

In the Myanmar Sustainable Development Plan (MSDP) (2018 -2030) set by the Ministry of Planning and Finance asserts that "**all sources of development finance are harmonised, coordinated and complementary**". It is; therefore, the business and project development principles are imperative to comply acting rules and regulation by embracing sustainability, peace, prosperity and partnerships towards people and planet.

2.3.3 Myanmar National Environment Policy (1994)

With the distinctive purposes to establish sound environmental policies, utilization of water, land, forests, mineral, marine and other mineral resources to conserve the environment and prevent environmental degradation, the National Commission for Environmental Affairs (NCEA) draft the National Environmental Policy in 1994. To meet with emerging challenges a new multifaceted national environmental policy, based on this National Environmental Policy, has finalized the final stage of drafting national environment policy by the Ministry of Natural Resources and Environmental Conservation (MoNREC). This new national environmental policy is intended to "complement the national economic policy." The policy objectives also include "achieving harmony and balance between its people, their cultural heritage, the environment and its national resource". Principally, this policy states that it is the obligation of the government to take "environmental considerations into account when developing anything that may enhance the quality of the life of all its citizens" and environmental projection should always be "primary objectives in seeking development". In addition, the policy also emphasizes "not to exceed its jurisdiction or infringe upon the interests of the other nation" while it has the sovereignty right to utilize its natural resource.

2.3.4 Myanmar Agenda 21

The development of the environmental policy was followed by the drafting of 'Myanmar Agenda 21' in 1997, which follows a UN framework for a multi-pronged approach to sustainable development. Agenda 21 is a non-binding, voluntarily implemented action plan of the United Nations with regard to sustainable development. It is a product of the UN Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, in 1992. Agenda 21 – a global programme of action for achieving sustainable development to which countries are 'politically committed' rather than legally obligated.

The Myanmar Agenda 21 recognizes the need for Environmental Impact Assessments. Myanmar, in its Agenda 21, calls for integrated management of natural resources and provides a blueprint for achieving sustainable development.

2.3.5 National Biodiversity Strategy and Action Plan (NBSAP)

The **United Nations Convention on Biological Diversity** (CBD) is a framework for national action for the conservation of biodiversity, the sustainable use of its components, and the equitable sharing of benefits arising from the utilization of genetic resources. To fulfil this commitment to the Conservation, the government meeting No.17/2006 of the Republic of the Union of Myanmar, held on 25th May 2006, approved to formulate National Biodiversity Strategy and Action Plan (NBSAP), for which the funding is provided by the United Nations Environment Program (UNEP) and Global Environment Facility (GEF) .On the third of May 2012, the Government of the Republic of the Union of Myanmar adopted the Myanmar National Biodiversity Strategy and Action Plan by the Government Meeting No. 16/2012.

The fundamental objectives of the NBSAP are to provide “a strategic planning framework for the effective and efficient conservation and management of biodiversity and natural resources with greater transparency, accountability and equity”. In addition to this objective, the National Biodiversity Strategy and Action Plan is designed based on the five grounded guided principles. Two of these five principles recognize that it is the indispensable right of indigenous and ethnic people in conserving biodiversity and for their coexistence with ecosystem. Also, the highest consideration is put to secure the access to common resources by economically disadvantaged groups.

2.3.6 Myanmar National Electrification Plan (NEP)

By 2030, Myanmar National Electrification Plan (NEP) targets 100% access to electricity. Therefore, electrification rate is stunningly increasing annually. According to 2013 MOEP’s figure, nationwide electrification coverage was noted only around 38%. The major source of energy for this sum was from hydropower, coal, natural gas, and diesel at 70.13%, 2.99%, 24.83% and 28% respectively for nationwide generation around 3890 MW.

To achieve the targets, it has been planned that the capacity will be increased to more than 15,000 MW by utilizing mixed projection from concerted and synergetic potentials of hydropower, natural gas, coal, diesel, and biomass. According to recent figure of MOEP, 50.55% of households has been electrified in which remote areas (outside Yangon Electricity Supply Corporation and Mandalay Electricity Supply Corporation) accounted for 39.60%. The installed hydropower, coal-fired, and gas fired power plants number are 62, 1 and 20 numbers respectively. To make sure the target capacity (MW) generation, dozens of power plants from different alternatives are being planned and approved; among which 7 hydropower, 1 coal-fired and 2 gas-fired power plants are under construction some of them are partially in operation.

2.3.7 Myanmar Energy Master Plan (2015)

In December 2015, the National Energy Management Committee (NEMC) launched Myanmar Energy Master Plan. The plan involves switching into 15% - 20% share of renewable energy in 2020 in the total installed capacity, most of which will be used to advance rural renewable energy purposes. The projection for energy generation matrix includes 57% hydropower, 30% coal, 8% natural gas and 5% solar and wind respectively by 2030. This plan is one of several strategies to ensure growing annual energy demand of 15%. Therefore, implementation is not limited to this plan as it is not a compelling plan adopted by the ministry. There are contra figures each year among projected and completion.

2.3.8 Myanmar Industrial Policy

In February 27, 2016, Industrial Policy was laid down by the Ministry of Industry, the Government of the Republic of the Union of Myanmar. In order to accomplishing the vision of the State “to establish the peaceful and modern developed new democratic nation”, the industrial policy implicitly states to accomplish the specific missions in 2020, which includes “to restore eternal peace and all-round improvement through country”.

In the preamble of the policy – chapter I article (5a and 5b), electricity power and petroleum and natural gas are among the top priorities that is to be developed to meet other goals and vision. In the chapter IV – Current Situations and Opportunities of Myanmar Industrial Sector, it states inadequate electricity

and energy supply being current issues in industrial sector (see article 21). Therefore, with great aspiration, strategies and plans had been set and implement to ensure energy security and sufficiency by year 2030. It is the Ministry of Electric Power's mission to generate up to 22720 MW from 2012-2013 fiscal year to 2030-2031 fiscal year (see article 24).

2.4 Legal Framework: Pertinent Laws and Regulations Related to the Proposed Project

The following table 2-1 highlights compulsory list of laws and regulations that are pertinent to the proposed project – 151.54 MW Combined Cycle Power Plant (Ahlone) throughout the whole project cycle (i.e., pre-construction, construction, operation and maintenance, and transfer or closure) but not limited to the article numbers, laws, and regulations presented in the table. It is mandatory to exercise all legal notifications, directives and compliances issued to project proponent by concerned authorities.

Table 2-1: Pertinent Laws and Regulations Related to the Proposed Project

Laws and Regulations	Year Enacted	Quoting: Purposes and Relevance
Constitution of the Republic of the Union of Myanmar[2] (Articles 24,45,349, & 359)	2008	✓ To conserve the natural environment, ✓ To prevent and upgrade the rights and lives of the workers.
Environmental Conservation Law[3] (Law No.7(o), 14,15,24,25, & 29)	2012	✓ To enable to implement the Myanmar National Environmental Policy; ✓ To enable to lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process;
Environmental Conservation Rules (Rule 55, 69 (a), (b))	2014	✓ To implement correctly according to the environmental management plan.
EIA Procedures[4] (Article 102 to 110, 113, 115, 117)	2015	✓ To develop the environmental impacts and to draw the environmental management plan;
National Environmental Quality (Emission) Guidelines[5] (Section 2.1.9)	2015	✓ These national Environmental Quality (Emission) Guidelines (hereafter referred to as Guidelines) provide the basis for regulation and control of noise and vibration, air emissions, and liquid discharges from various sources in order to prevent pollution for purposes of protection of human and ecosystem health.
Myanmar Investment Law (Law No. 36, 50(d), 51, 66, 67, 73) Myanmar Investment Rule (2017) (section 190, 202, 203, 206, 212) Myanmar Investment Regulations	2016 2017	✓ To develop responsible investment businesses which do not cause harm to the natural environment and the society for the benefit of the Union and its citizens.
Myanmar Company Law (Law No. 29)	2017	✓ To comply with regulatory framework governing how a company is run and governed, bringing it in line with current practices in other countries.
Myanmar Industrial Policy Chapter 1 Article 5a and 5b	2016	✓ To develop in obtaining goals and vision of national energy security. ✓ To ensure energy security and sufficiency by year 2030
Oil and Petroleum Product Law Section 2c and Chapter VI	2017	✓ proposed combined cycle power plant applies natural gas, it satisfies under the petroleum product category ✓ license holder must strictly comply with for not compromising objectives set by the ministry
Electricity Law and Rules Section 8a and Section 13 – 68.	2014	✓ relevant Union ministry will have the right to carry out large-scale projects of investigation, construction, generation, transmission, distribution, and trade which are reserved to be managed by the Union with the consent of the Union government

[2] https://edc.moe.edu.mm/en/resource/constitution-of-the-republic-of-the-union-myanmar
[3] https://www.dica.gov.mm/en/environmental-regulation
[4] https://www.ecd.gov.mm/wp-content/uploads/2020/12/Myanmar-EIA-Procedure_Main-Text_English.pdf
[5] https://www.ecd.gov.mm/national-environmental-quality-emission-guidelines-final/

Laws and Regulations	Year Enacted	Quoting: Purposes and Relevance
		✓ to comply with the notifications and procedures imposed by the ministry
Labour Organization Law, (Law No. 1,7 to 11)	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 labour organizations systematically and independently.
The Settlement of Labour Dispute Law, (Law No. 38, 39, 40, 51)	2012	✓ The Pyidaungsu Hluttaw hereby had enacted this Law for safe-guarding the right of workers or having good relationship between employer and workers and making peaceful workplace.
Employment and Skill Development Law, (Law No. 5, 14, 30(a, b))	2013	✓ To facilitate employment which is appropriate to the age and ability of the job seeker. ✓ To help workers obtain employment and to provide stability of employment and skills development for employees. ✓ To help employers obtain appropriate employees.
The Leave and Holiday Act, 1951 (Law Amended July, 2014)	2014	✓ To allow worker for leave and holiday allowances, religious or social activities with earn allowance, and benefits for Health allowances. ✓ Concerned workers: Daily wage workers/ temporary workers/permanent workers.
Minimum Wages Law (Law No. 12, 13 (a to g)	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,
Payment of Wages Act (Law No. 3,4, 5, 14, 8 with 7,10)	2016	✓ Pay in local currency or foreign currency recognized by the Central Bank of Myanmar. This may be in cash, check or deposit into the bank account of Employee. ✓ Moreover, pay can be in the means of Totally in cash or half the cash and half in things set according to the local price to those employees working in trade, manufacturing, and service sectors. ✓ Totally in cash or half the cash and half in things set as local price according to local traditions or common agreement to those working in agriculture and livestock sectors. But this must be for the sake of the employees and their families. And, it also must be reasonable/fair. ✓ An employee shall receive the payment for 60 days when he/she is in Alternative Civil Service.
The Myanmar Insurance Law (Law No. 15, 16)	1993	✓ To overcome financial difficulties by effecting mutual agreement of insurance against social and economic losses which the people may encounter, due to common perils; ✓ To promote the habit of savings individually by effecting life assurance, thus contributing to the accumulation of resources of the State; ✓ To win the trust and confidence of the people in the insurance system by providing effective insurance safeguards which may become necessary in view of the social and economic developments.
The Social Security Law (Law No. 11(a), 15(a), 18(b), 48, 49, 75)	2012	✓ The employers and workers shall co-ordinate with the Social Security Board or insurance agency in respect of keeping plans for safety and health to prevent employment injury, contracting disease and decease owing to occupation and in addition to safety and educational work of the workers and accident at the establishment.
Workman Compensation Act	1951	✓ To protect personal injury caused to a workman by accident arising out of and in the course of his employment and to compensate in accordance with the provisions of Workman Compensation Act
Myanmar Fire Force Law, (Law No. 25)	2015	✓ To take precautionary and preventive measure and loss of state own property, private property, cultural heritage and the lives and property of public due to fire and other natural disasters ✓ To organize fire brigade systemically and to train the fire brigade

Laws and Regulations	Year Enacted	Quoting: Purposes and Relevance
		✓ To prevent from fire and to conduct release work when fire disaster, natural disaster, epidemic disease, or any kind of certain danger occurs ✓ To educate, organize an inside extensively so as to achieve public corporation ✓ To participate if in need for national security, peace for the citizens and law and order
National Food Law,	1997	✓ Recommendation on imported and exported food ✓ Post market surveillance (risk assessment) ✓ HACCO along with general practice for food inspectors and manufactures ✓ Food safety training for restaurants, street, vendors, etc.
Public Health Law (Law No. 3, 5)	1972	✓ To promote and safeguard public health and to take necessary measures in respect of environmental health.
Private Industrial Enterprise Law	1990	✓ To narrow down the gap between rural development and urban development by the development and improvement of industrial enterprises; to avoid or reduce the use of technical know-how which cause environmental pollution; ✓ To cause the use of energy in the most economical manner.
Protection and Preservation of Cultural Heritage Regions Laws (Law No. 15, 16)	1998	✓ To implement the protection and preservation policy with respect to perpetuation of cultural heritage that has existed for many years; to protect and preserve the cultural heritage regions and the cultural heritage.
Prevention and Control of Communicable Diseases Law (Law No. 3, 4, 9, 11)	1995	✓ To prevent the outbreak of Communicable Diseases, by implementing following project activities: - a. immunization of children by injection or orally; b. immunization of those who have attained majority, by injection or orally, when necessary; c. carrying out health educative activities relating to Communicable Disease.
The Control of Smoking and Consumption of Tobacco Product Law (Law No. 9)	2006	✓ To convince the public that health can be adversely affected due to smoking and consumption of tobacco product and to cause refraining from the use of the same; ✓ To protect from the danger which affects public health adversely by creating tobacco smoke-free environment; To obtain a healthy living style of the public including child and youth by preventing the habit of smoking and consumption of tobacco product;
Conservation of Water Resources and Rivers Law (Law No. 8, 11(a), 13, 19, 24(b), 30)	2006	✓ To conserve and protect the water resources and rivers system for beneficial utilization by the public; to prevent environmental impact.
Myanmar Port Authority Law	2015	✓ “Any person who by himself or another so casts or throws any ballast or rubbish or any such other thing or so discharges any oil or water mixed with oil, or the master of any vessel from which the same is so cast, thrown or discharged, shall be punishable with fine not exceeding fifty thousand kyats, and shall pay any reasonable expenses which may be incurred in removing the same”.
The Prevention of Hazard from Chemical and Related Substances Law 2013 Rules (Law No. 8,15,16,17, 20, 22, 23, & 27)	2013 2016	✓ Performing the sticking pictogram for being least the health impacts and accident injuries in the occupational area according to the prescribed standards and norms of the Globally Harmonized System GHS); ✓ Making the necessary arrangements to be safety of the occupational area and issuing orders and directives for preventing and decreasing the accident; ✓ Laying down the proliferation plans on knowledge, and safety of chemical and related substances to administrators, license holders, public and workers; ✓ Cooperating with local and foreign governmental departments, organizations, and non-governmental organizations in respect of safety management for chemicals hazard.

Laws and Regulations	Year Enacted	Quoting: Purposes and Relevance
The Freshwater Fisheries Law (Law No. 36,40,41)	1991	✓ To further develop the fisheries; To prevent the extinction of fish; ✓ To safeguard and prevent the destruction of freshwater fisheries waters; ✓ To obtain duties and fees payable to the State; ✓ To manage the fisheries and to act in accordance with the Law.
(The Pyidaungsu Hluttaw Law No.14, 2017) Myanmar Territorial Sea and Maritime Zones Law (Law No.8 (g), (h), (i))	2017	✓ To have security, rule of law and tranquillity for the interests of the State in the territorial sea, contiguous zone, exclusive economic zone, and continental shelf; ✓ To protect and conserve, and excavate natural resources systematically for long-term in the territorial sea and maritime zones of the State and to do marine scientific researches; ✓ To protect and conserve from the pollutions on the sea, airspace, and impact on marine environment through the territorial sea and maritime zones of the State.
Ethnic Rights Protection Rules (2019), Rule 20	2019	✓ To explain fully and accurately in advance about the advantages and disadvantages of the project to all ethnic groups in the project area in their language ✓ Project development procedures must implement according to Myanmar sustainable development plan (MSDP). ✓ The relevant departments shall assess whether the project development is impacted and made changes in the environment and socioeconomic development. ✓ Discussion and negotiation with local ethnic peoples
Ethnic Rights Protection Rules (2019), Rule 21		✓ A complete report is to submit to the Ministry of Finance to obtain opinions before the project starts ✓ Project planning and completion conditions should be submitted to the Ministry when the project implementation is complete.

2.4.1 The Environmental Conservation Laws and Rules

The Pyidaungsu Hluttaw enacted Environmental Conservation Law in law No. 9 of 2012 on the date of 30th March 2012. The key objectives of this law stated on the chapter II are:

- To enable to implement the Myanmar National Environmental Policy.
- To enable to lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process.
- To enable to emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefit of present and future generations.
- To reclaim ecosystems as may be possible which are starting to degenerate and disappear.
- To enable to manage and implement for decrease and loss of natural resources and for enabling the sustainable use beneficially.
- To enable to implement for promoting public awareness and cooperation in educational program for dissemination of environmental perception.
- To enable to promote international, regional, and bilateral cooperation in the matters of environmental conservation.
- To enable to cooperate with Government Departments, Government Organizations, International organizations, non-government organizations and individuals in matters of environmental conservation.

Subsequently, the Environmental Conservation Rules were enacted in June 2014 as the detailed enforcement regulations for the Environmental Conservation Law. The rule stipulates MONREC's responsibility for environmental policy and administration, formulation of environmental management plan, implementation of environmental monitoring, setting of environmental standards, management of hazardous waste, and formulation and implementation of EIA, among others (see section 14 – 16). The Environmental Conservation Law (2012) and Rules (2014) both have implications for domestic and foreign investors in Myanmar. Article 7 of the rule states the duties and powers of the Ministry of Natural Resources and Environmental Conservation (MONREC), which include:

- Prescribing environmental quality standards on emissions, effluents, solid waste, production procedures, processes, and products (see section 38)
- Facilitating the settlement of environmental disputes
- Specifying categories and classes of hazardous wastes generated from the production and use of chemicals or other hazardous substances used in industry, agriculture, mineral production, sanitation, and other activities (see Chapter IX).
- Prescribing categories of hazardous substances that may significantly affect the environment.
- Prescribing the terms and conditions for effluent treatment in industrial estates, buildings, and other sites and emissions of machines, vehicles, and mechanisms.
- Developing and implementing a system of environmental impact assessment (EIA) and social impact assessment (SIA) (see Chapter XI).
- Enforcing compensation by polluters for environmental impacts; collecting funds from organizations which benefit from natural ecosystems and revenues from businesses which explore, trade, and use natural resources, in order to support environmental conservation works (see Chapter XII to XIV).

The following matrix summarizes major legal requirements related to Environmental Impact Assessment regardless of type of development in Myanmar.

Law, Act or Regulation	Section	Requirement by the Law
Environmental Conservation Law 2012	14	All the pollution sources in the project to be treated, discharged, deposited as per the requirements of Environmental emission quality guideline Dec 2015
	15	Install onsite facilities to monitor, control, manage, reduce, and eliminate pollution resulting from the project
Environmental Conservation Rules 2014	63	Project owner has to apply for prior permission to the ministry
	67	Project owner has to get approval from the ministry regarding environmental Impacts.
	69 (a)	Project owner should not emit, ask to emit, dispose, ask to dispose, pile up, ask to pile up hazardous substances that may affect the public directly or indirectly
	69 (b)	Project owner shall not carry out any activity which can damage the ecosystem and the natural environment except for the permission of the Ministry for the interests of the people.
EIA Procedure 2015	44 to 70	Environmental Impact assessments – Chapter V
	47 to 54	Scoping phase for the EIA SIA of the project
	55 to 61	EIA Investigation for the Project
	62 to 63	EIA reporting requirements for the Project
	64 to 66	Submission of EIA report
	67 to 70	Review and Approval of the EIA report
Environmental Emission quality guidelines 2015	1.1	Air emission limits for the project
	1.2	Wastewater discharge limits during construction phase
	1.3	Noise Levels for the Project
	1.4	Odor levels for the Project
	2.6.4	Effluent limits for Tourism and Hospitality Development

2.4.2 Myanmar Investment Law (2016) and Myanmar Investment Rule (2017)

The project developer commits to comply with Myanmar Investment Law (2016) and Myanmar Investment Rule (2017). The Myanmar investment law (Law No. 40/2016) is enacted by the Pyidaungsu Hlutaw in 2016. The foreign investment law (the Pyidaungsu Hluttaw Law No.221/2012) and the

Myanmar Citizens Investment Law (the Pyidaungsu Hluttaw Law No.18/2013) are repealed with this Law. However, the Myanmar Investment Commission which was formed by that Law is still given the power to perform its duties. Any decisions made by the commission under this power conferred by this law is the final and conclusive. The Ministry of Planning and Finance undertakes the office-work of the commission and bear the expenditures of the Commission.

The following objectives of this law are essential to comply with for this proposed investment project.

- To develop responsible investment business which do not cause harm to the natural environment and the social environment for the interest of the Union and its citizens
- To protect the investors and their investment businesses in accordance with the law
- To enable the citizens to be able to work alongside with the international community
- To develop business and investment businesses that meet international standards

Under the Myanmar Investment Law (2016), the Myanmar Investment Commission (MIC) have been organized and the department has legal to issue company incorporation licence and classified type of investment allowed for local and foreign investors by means of Notification No. 15 /2017. The notification states the need of relevant ministries' approval in investing certain type of investments of each sector. The commission has been issuing timely notification, laws, and rules to supervise and controlling whether the investing companies comply regulations endorsed and sanctioned by the regional and union government.

2.4.3 Electricity Law (2014)

In every respect of merit for the electric power generation, distribution, consumption, the Pyidaundsu Hluttaw enacted electricity law in October of 2014. It is also an attempt to evaluation and modernization of its predecessor, the 1984 electricity law. News objectives had been added, reaching up to 12 objectives in this law (see Chapter II).

Section 8(a) – Chapter IV of the law asserts "relevant Union ministry will have the right to carry out large-scale projects of investigation, construction, generation, transmission, distribution and trade which are reserved to be managed by the Union with the consent of the Union government". Also, the ministry has been given authorities and right to issue and revoke to whosoever engaged in electricity related work.

In chapter V – section 11 to 20, the compliance, framework, and procedures for those whosoever engaged in electricity have been promulgated.

Following the electricity law (2014), electricity rules (2015) had been stipulated by the Ministry of Electric Power in 2015. By means of this electricity rules (2015), the ministry declares it responsibilities and obligation regarding electricity generation, supply, consumption, and electrical appliance trade (see chapter II and III).

As long as the electricity developers are in compliance with rules enforced by the ministry, they are given right to generate and supply electricity in either wholesale or in retail according to the terms and conditions stipulated by the ministry (Section 13 – 68). Since the ministry had been given ultimate authority, it is crucial to comply with the notifications and procedures imposed by the ministry (see Chapter IV – Licenses, permits and contracts Issuance). Hence, chapter IV of the Law is directly related to the project developer where it affirms application for license, Issue of permit, determining conditioning to be abided by and ministry's role in supervision.

2.4.4 Oil and Petroleum Product Law (2017)

Enacted in 2017, the oil and petroleum product law aim at regulating petroleum and petroleum product business activities for ensuring safety, free and fair competition market, energy security and generate union tax (see Chapter II – Objective). Since proposed combined cycle power plant applies natural gas, it satisfies under the petroleum product category (section 2c).

There are certain prohibitions and directions that the license holder must strictly comply with for not compromising objectives set by the ministry (see chapter VI).

2.4.5 The Prevention of Hazard from Chemical and Related Substances Law (2013)

The Prevention of Hazard from Chemical and Related Substances Law, the central law of chemicals management in Myanmar enacted in 2013, stipulates that when chemical and related substances is to be transferred, stored, used, or disposed, operating approval certificate should be obtained in accordance with the regulations based on the international treaties.

Chaired by the union minister of the ministry of industry, the central leading board has the legal duties and powers to stipulate regulations, restriction, and prohibitions for the use of toxic chemicals (Chapter III and IV). In the chapter V of the law, the central supervisory board will perform inspection, investigation, and interrogation the businesses and individual for abuse use of prohibited or restricted chemicals in the absence of the approval and permit of the board. The law describes comprehensively guide and define the procedures to apply license and registration certificates in later Chapter of that Law. Therefore, whosoever needs to use toxic and hazardous chemicals in their business functions and activities are obliged to abide strictly to the Prevention of Hazard from Chemical and Related Substances Law (2013) (see section 13 – 19).

2.4.6 Labor related Laws and Regulations

Myanmar employment law is governed by both old and new laws and regulations, as well as internal policies and practices of the Department of Labour of the Ministry of Labour, Immigration and Population (Ministry of Labour). So far, the following laws and rules is being applied when dealing with labour related concerns and their implications related to the project are briefly described. They are:

1. Overseas Employment Law (1999)
2. The Amended Law for Plant Act (2016)
3. The Amended Law for Leave and Holiday Law 1951(July 2014)
4. The Amended Law for Shop and Workplace (2016)
5. The Edited Settlement of Dispute Law (September 2014)
6. The Employment and Skill Development Law (Aug 2013)
7. The Labour Organization Law (2011)
8. The Labour Organization Rule
9. The Leave and Holiday Act (1951)
10. The Minimum Wages Law (2013)
11. The Minimum Wages Rule (2013)
12. The Payment of Wages Law 2016(Jan 2016)
13. The Settlement of Labour Dispute Law & Rules (2012)
14. The Social Security Law (2012)
15. The Social Security Rule (2012)

2.4.6.1 The Worker's Compensation Act

This law stipulates that employer is required to make payments to employees who become injured or who die in any accidents arising during and in consequence of their employment. Such compensation also must be made for diseases which arise as a direct consequence of employment, such as carpal tunnel syndrome.

2.4.6.2 The Payment of Wages Act

The Payment of Wage Act defines the payment obligation to the workers employed in the factories or railway administration. It stipulates the method of payment stating that the payment should be made in cash on a regular payday and allows legal action against delayed payment or un-agreeable deduction.

2.4.6.3 The Leave and Holidays Act (1951, revised in 2014)

This act has been used as the basic framework for leaves and holidays for workers with minor amendment in 2006 and 2014. This defines the public holidays that every employee will be granted with full payment. It also defines the rules of leaves for workers including medical leave, earned leave and maternity leave.

2.4.6.4 The Labour Organization Law

The Labour organization law replaced the Trade Union Act enacted in 1927 for protecting the rights of the workers, having good relations among the workers of between the employer and the work, and for forming and carrying out the labour organization systematically and independently. Under this law, the labour organization has the right to carry out freely in drawing up their constitution and rules. It has the right to negotiate and settle with the employer if the workers are unable to obtain the right of the workers contained in the labour laws. On the one hand, the employer will recognize the labour organizations and assist as much as possible if the labour organizations request for help for the interest of his workers.

2.4.6.5 The Social Security Law

The Social Security Law, enacted in 2012, was amended the Social Security Act in 1954. It stipulates the formation and implementation of social security systems. Through social Security Board, it will carry out wide ranging social security of workers and ensuring the workers benefits social security specified in the lay. (Chapter III). Clearly, In the Chapter V, the law establishes applicable and inapplicable social security regarding type of job, industries, and organization.

2.4.6.6 The Labour Dispute Settlement Law

This law was enacted 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. It stipulates that employer in which more than 30 workers are employed will form the workplace coordinating committee consisting of the representatives of workers and the representatives of employer (see Chapter II).

While settling the dispute, in Chapter III, the region or state government will form conciliation body to resolve the dispute. Be means of the section 23 – 33 of the Chapter VI, the employer or worker have the right to seek legal procedures till the dispute settled.

2.4.6.7 The Minimum Wage Law

The minimum wage law, passed in March 2013, was replaced the 1949 Minimum Wage Act. The law provides a framework for minimum wage determination: the presidential office establishing a tripartite minimum wage committee will decide minimum wage with industrial variation based on a survey on living costs of workers possibly every two years. This also stipulates equal payment.

2.4.7 Miscellaneous

In addition to the above-mentioned laws and policies, there are certain laws, procedures and policies that are related to this project. These laws are as follows.

- Environmental Impact Assessment Procedures (EIA), 2015
- National Environmental Quality (Emission Guidelines, (NEQG), 2015
- Public Health Law 1972
- Occupational Safety and Health Law 2019
- The Conservation of Water Resources and Rivers Law, 2017
- Myanmar National Water Policy (2015)
- The City of Yangon Development Law (1990), etc.

2.4.8 The Boiler Law (2015)

The Boiler Law was enacted for protection of the accidents related to the boiler, building up skill resources, and mitigation of the long-term environmental and health impacts generated from boilers. It is described that the boiler that is to be used should meet international requirements.

2.4.9 Ethnic Rights Protection Law (2019)

The project developer commits to comply with the sections (5)

Section 5. The matters of projects shall completely be informed, coordinated, and performed with the relevant local ethnic people in the case of development works, major projects, businesses, and extraction of natural resources will be implemented within the area of ethnic people.

The project developer will be undertaking to comply with Rule 20, and 21 in accordance with recommendations Ministry of Legal Affair.

2.5 International Conventions, Treaties and Agreements

Myanmar has signed several international treaties related to the environment which may have implications for the project. These include:

Environmental Related

- ASEAN Agreement on the Conservation of Nature and Natural Resources: Catagena Protocol on Biosafety
- Convention Concerning the Protection of the World Cultural and Natural Heritage
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Copenhagen Amendment to Montreal Protocol on Substances that deplete the Ozone Layer
- International Civil Aviation Organization: ANNEX 16 Annex to the Convention on International Civil Aviation Environmental Protection Vol. I, II, Aircraft Noise
- International Tropical Timber Agreement (ITTA)
- Kyoto Protocol to the United Nations Framework Convention on Climate Change;
- London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer
- Montreal Protocol on Substances that Deplete the Ozone Layer
- Plant Protection Agreement for the Asia and Pacific Region; Vienna Convention for the Protection of the Ozone Layer; Montreal Protocol on Substances that Deplete the Ozone Layer
- Ramsar Convention on Wetlands, 1982 (a.k.a Convention on Wetlands of International Importance especially as Waterfowl Habitat)
- Stockholm Convention on Persistent Organic Pollutants, 2001
- United Nations Convention on Biological Diversity (CBD)
- United Nations Framework Convention on Climate Change (UNFCCC); United Nations Convention to Combat Desertification

Social Related

- United Nations Declaration on the Rights of Ethnic People and Ethnic Group
- UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972 (World Heritage Convention)
- Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) 1979
- International Covenant on Economic, Social and Cultural Rights (ICESCR)
- Intended Nationally Determined Contribution (INDC) to the UNFCCC.

2.6 Pertinent Administrative and Regulatory Authorities

The following table summarizes regulatory and administrative bodies involved either completely or partially in parallel with EIA process while commissioning proposed project in each phase. The project developer is obliged to closely coordinate with the following administrative framework, but not limited to, for successful implementation of the 151.54 MW combined cycle power plant development Project. The processes and functions among administrative departments of Myanmar at different levels are also briefly specified in the following table (2-2) and inferential matrix at Table (2-3).

Table 2-2: Ministry and Administration Bodies and inter-coordination

Ministries / Commissioner Offices / Committee	Regulatory/Administrative function for the project	Coordination Departments	Coordination Level
Ministry of Natural Resources and Environmental Conservation	▪ Governing body to oversee, review and exercise the decree in relationship with environmental law, rules, procedures, and guidelines.	1. Environmental Conservation Department 2. Department of Forestry 3. Survey Department	Union Level
Ministry of Electric Power	▪ Granting permit for electricity production for domestic and commercial use ▪ Applying and Granting approval for natural gas acquisition for electricity generation ▪ Supervising and Regulating utility network and distribution lines	1. Department of Electric Power and Planning 2. Electricity Generation Enterprise 3. Electricity Supply Enterprise 4. Yangon Electric Supply Corporation 5. Oil and Gas Planning Department 6. Myanmar Oil and Gas Enterprise	Union and Regional Level
Ministry of Construction	▪ Granting Building and Construction Permits ▪ Access road layout development and permits ▪ Supervising and Regulating Construction Company	1. Building Department 2. Road Management Department	Regional Level
Ministry of Labour, Immigration and Population	▪ ensuring workers' rights and protection granted under the various labour laws ▪ ensuring social services for the workers ▪ registering employed foreign workers and technicians	1. Department of Labour 2. Department of Labour Relations 3. Plant and General Labour Laws Inspection Department	Regional Level
Regional Administration Offices	▪ township administration ▪ providing and supporting the coordination efforts across regional and state level relating the project	1. Secretariat office	Regional level
Regional Development Committee	▪ monitoring and supervising systematic implementation of project ▪ examining project implementation and operation whether adhering existing laws	1. Office of Township Development Committee	Regional Level

Ministries / Commissioner Offices / Committee	Regulatory/Administrative function for the project	Coordination Departments	Coordination Level
Regional Ministerial Offices	▪ reporting the progress and monitor project implementation and operation ▪ facilitating coordination works among regional and union level of different ministers	1. Regional Ministerial Offices	Union/Regional Level
Myanmar Investment Commission	▪ coordinating with union level ministries and other commissions to facilitate investment ▪ enabling the permits for promoting further investment	1. Commissioner offices	Union level
Ministry of Ethnic Affairs	▪ promoting socioeconomic development, of ethnic groups ▪ protecting of ethnic rights ▪ obtaining the rights prescribed in the Ethnic Right Protection Laws	1. Department of Ethnic Rights	Union/Regional Level

For full detail information of Ministries described and other relevant administration department of the Republic of the Union of Myanmar, the information courtesy is due to Myanmar National Portal at https://myanmar.gov.mm/ministries.

Table 2-3: Inferential Matrix of Governmental Organizations and Relevant Environmental Issues

Environmental Issues / Governmental Organizations	Air Pollution	Water Pollution	Banned Pesticides	Environment in Plant	Toxic chemicals	Solid Waste	Energy	Water Supply	Waste Water Treatment	Forest and Desert	Biodiversity	Natural Resources	Natural Disaster	Environmental Education
Ministry of Natural Resources and Environmental Conservation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ministry of Industry	✓	✓	NA	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗
Ministry of Health	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✗	✗	✗	✓
Ministry of Electric Power	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✗	✗
Ministry of Transport	NA	✗	✗	✓	✓	✗	✗	✓	✓	✗	✓	✗	✗	✗
Ministry of Home Affairs	✗	NA	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗
Ministry of Labour	✓	✓	✗	✓	✓	✓	✗	✓	✓	✗	✗	✗	✗	✓
Ministry of Science and Technology	NA	NA	NA	✗	✓	✓	✓	✗	✗	✗	✗	✗	✗	✓
Myanmar Investment Commission	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
National commission for Water and Sanitation	✗	✓	✓	✓	✓	✓	✗	✓	✓	✗	✗	✗	✗	✗
Industrial Development Central Committee	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Yangon City Development Committee	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✗	✓	✓	✓

Note: 1): ✓ → Relevant Organization; Not responsible, NA → Lack of information

2.7 National and International Standards and Guideline

Environmental management of the Project during construction and operation will comply with the national or international environmental guidelines and standards as appropriate. The international guidelines and standards will be adopted as appropriate only when the national guidelines and standards do not exist.

2.7.1 National Environmental Quality Guideline by Environmental Conservation Department

(a) Air emission

Ambient air emission

Myanmar Ahlone Power Plant Co., Ltd will follow the National Environmental (Emission) Quality Guideline values (General) for air emission as prescribed by the Environmental Conservation Department (Notification No.615/2015, December 2015, by ECD, Ministry of Natural Resources and Environmental Conservation (MONREC)).

Parameter	Averaging Period	Guideline Value µg/m³
Nitrogen dioxide	1-year 1-hour	40 200
Ozone	8-hour daily maximum	100
Particulate matter PM_{10}[a]	1-year 24-hour	20 50
Particulate matter $PM_{2.5}$ [b]	1-year 24-hour	10 25
Sulfur dioxide	24-hour 10-minute	20 500

[a] *Particulate matter 10 micrometers or less in diameter*

[b] *Particulate matter 2.5 micrometers or less in diameter*

Air emission levels for Thermal Power (applicable to non-degraded air sheds)

Myanmar Ahlone Power Plant Co., Ltd will arrange for stack emissions monitoring system. Stack emissions monitoring results will be compared with the standards air emission level for thermal power plant of energy sector development provided by National Environmental Quality (Emission) Guidelines for Thermal Power, NEQ(E)G-2.1.1.

Combustion Technology / Fuel	Parameter / Guideline Values		
	Particulate matter PM_{10} [a]	Sulfur dioxide	Nitrogen oxides
Combustion turbine			
Natural gas (all turbine types; unit > 50 MW[c])	-	-	100 mg/Nm³ [b]
Boiler			
Natural gas	-	-	240 mg/Nm³

[a] *Particulate matter 10 micrometres or less in diameter*

[b] *Milligrams per normal cubic meter at specified temperature and pressure*

[c] *Megawatt*

(b) Effluent

Myanmar Ahlone Power Plant Co., Ltd will follow the National Environmental (Emission) Quality Guideline values for Thermal Power effluent levels, NEQ(E)G-2.1.1.

Sr	Parameter	Unit	NEQG guideline values
1	Arsenic,	mg/l	0.5
2	Cadmium	mg/l	0.1
3	Chromium (total),	mg/l	0.5
4	Copper	mg/l	0.5
5	Iron	mg/l	1
6	Lead	mg/l	0.5
7	Mercury	mg/l	0.005
8	Oil and grease	mg/l	10
9	pH	S.U[a]	6 - 9
10	Temperature increase	°C	<3[b]
11	Total residual chlorine	mg/l	0.2
12	Total suspended solids	mg/l	50
13	Zinc	mg/l	1

[a] *Standard unit*

[b] *Temperature increases due to discharge of once-through cooling water*

(c) Noise level

National Environmental (Emission) Quality Guideline values (General) for noise as prescribed by the Environmental Conservation Department (Notification No.615/2015, December 2015, by ECD, Ministry of Natural Resources and Environmental Conservation (MONREC)), NEQ(E)G-1.3.

Receptor	One Hour LAeq (dBA)[a]	
	Daytime 07:00 - 22:00 (10:00 - 22:00 for public holidays)	Nighttime 22:00 - 07:00 (22:00 - 10:00 for public holidays)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

[a] *Equivalent continuous sound level in decibels*

Indoor noise level should not exceed 90dB according to Standing Order 2/95 enacted by Ministry of Industry.

(d) Odour

National Environmental (Emission) Quality Guideline values (General) for odorant unit is between 5 and 10. NEQ(E)G-1.4.

2.7.2 Applicable Standards and Guidelines

The followings are list of standards, plans and policies that are applicable to plant operation and management principles as pro-active measure for waste minimization, environmental compliance, and risk and hazards containment. They are-

(a) For Power Plant Operation

1. Emergency plan for natural gas leakage accident
2. Disposal plan for explosion and leakage of pressure-bearing parts of boiler pressure vessel and pressure pipeline
3. On-site handling plan for fire accident in hazardous chemical warehouse
4. Cable fire accident action plan
5. Disposal plan for fire accident in centralized control room
6. On-site treatment plan for hazardous chemical leakage accident
7. On-site disposal plan for waste oil sewage incident
8. Safety management standards for confined space operations
9. Natural Gas Safety Management Standard
10. Fire safety management standards
11. Major accident prevention measures management standards
12. Major hazard safety management standards, and
13. Safety work standards to prevent personal injury and death accidents

(b) For Power Plant structural integrity

1. Building and Engineering work.
2. ISO.91. Construction materials and building.
3. Guidelines for structural engineering.
4. IBC. International building code.
5. IFC Construction and infrastructure guideline

(c) International Guidelines and Practices

1. World bank International Finance Corporation General Environment, Health, and Safety Guidelines

2. International Finance Corporation Environment, Health, and Safety Guidelines for Thermal Power Plants
3. World Back Operational Manual OP 4.01
4. International Finance Corporation Performance Standards (IFC PSs)

The above-mentioned standards and guidelines are intended for both developed and developing countries. Myanmar Ahlone Power Plant Co., Ltd will do its best to follow these guidelines and standards as practical as possible.

2.8 International Standards

In addition to the applicable host Country Laws, the project Company is required to comply with all relevant national, WBG and IFC guidelines and standards, with the main applicable WBG guidelines summarised below.

2.8.1 Air Emissions Guidelines

The Company shall ensure that the project complies with the combustion emission limits set out in the WBG EHS Guidelines for Thermal Power Plants, as specified in Table 6 (B) Emissions Guidelines for Combustion Turbine.

Combustion Technology/Fuel	Nitrogen Oxide (NOx)	Reference Oxygen Content
Natural gas (all turbine types of Unit >50MWth)	51 mg/Nm^3 (25 ppm)	15%, dry gas

Source: Table 6(B), WBG EHS Guidelines for Thermal Power Plants

For the control of NOx, the gas turbines shall be equipped with dry low NOx burners. The required minimum stack height for the Project has been set at 30 meters (HRSG and bypass stack), although this is subject to a stack height determination study, based on air dispersion modelling, that will be undertaken by the Company as part of the EIA/ESIA and could result in an increase to the stack height. As per the WBG EHS General Guidelines, the stack height for all point sources of emissions, whether 'significant' or not, should be designed according to GIIP to avoid excessive ground level concentrations due to downwash, wakes, and eddy effects, and to ensure reasonable diffusion to minimize impacts. For projects where there are multiple sources of emissions, stack heights should be established with due consideration to emissions from all other project sources, both point and fugitive

Ambient Air Quality Guidelines

In the absence of national legislated ambient air quality standards in Myanmar, the Company shall demonstrate, through air dispersion modelling, plant compliance with the World Health Organization (WHO) Ambient Air Quality Guidelines as specified in WBG EHS General Guidelines.

Parameter	Averaging Period	Guideline Value in µg/m^3
Sulphur dioxide (SO_2)	24-hour 10 minutes	20 500
Nitrogen dioxide (NO_2)	1-year 1-hour	40 200
Particulate matter (PM10)	1-year 24-hour	20 50
Particulate matter (PM2.5)	1-year 24-hour	10 25

Source: Table 1.1.1, WBG EHS General Guidelines

2.8.2 Noise Levels Guidelines

Working environments (worker exposure): The Facility shall be designed to achieve the noise limits for working environments set out in the WBG EHS General Guidelines.

Location/Activity	Equivalent Level (LAeq, 8 hour)
Heavy Industry (no demand for oral communication)	85 dB(A)
Open offices, control rooms, service counters or similar	45-50 dB(A)

Source: Table 2.3.1, WBG EHS General Guidelines.

No employees should be exposed to a noise level greater than the guideline limits detailed above without hearing protection. Noise levels shall be measured according to appropriate International Electrotechnical Commission (IEC) standards.

Ambient conditions (beyond the facility boundary): the Company shall also comply with the back-ground noise level guidelines indicated in the WBG EHS General Guidelines, as set out below.

Receptor	One Hour LAeq (dBA)	
	Daytime (07:00 – 22:00)	Nighttime (22:00 – 07:00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Source: Table 1.7.1, WBG EHS General Guidelines

The WBG EHS General Guidelines require that noise impacts should not exceed the levels presented in Table 1.7.1 or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site. Measurements are to be taken at noise receptors located outside the site. The actual permissible noise pressure levels will be confirmed in the EIA/ESIA.

2.8.3 Effluent Guidelines

The Company shall ensure that applicable environmental regulations, standards and guidelines for wastewater discharge and re-use are complied with as well as national and international standards for water quality and effluent management. The table below lists the effluent discharge guideline limits applicable to the Facility as per the WBG EHS Guidelines for Thermal Power Plants. These standards apply to the discharge of effluent at the end of the outlet prior to release into the receiving waters. The following table provides indicative values for treated sanitary sewage discharges.

Parameter	Unit	Concentration (except pH and temperature)
pH	S.U	6-9
TSS	mg/L	50
Oil and grease	mg/L	10
Total residual chlorine	mg/L	0.2
Chromium – Total (Cr)	mg/L	0.5
Copper (Cu)	mg/L	0.5
Iron (Fe)	mg/L	1.0
Zinc (Zn)	mg/L	1.0
Lead (Pb)	mg/L	0.5
Cadmium (Cd)	mg/L	0.1
Mercury (Hg)	mg/L	0.005
Arsenic (As)	mg/L	0.5
Temperature increase by thermal discharge from cooling system	˚C	Site specific requirement to be established by the Environmental Assessment (EA). Elevated temperature areas due to discharge of once-through cooling water (e.g., 1 Celsius above, 2 Celsius above, 3 Celsius above ambient water temperature) should be minimised by adjusting intake and outfall design through the project specific EA depending on the sensitive aquatic ecosystem around the discharge point.

Source: Table 5, WBG EHS Guidelines for Thermal Power Plants.

2.8.4 Labour Requirements

The Company will ensure that all relevant Myanmar labor laws are complied with, including but not limited to:

- Employment Restriction Act (1959)
- Employment Statistics Act (1948)
- Factories Act (1951)
- Labour Organization Law (2011)
- Leave and Holidays Act (1951)
- Payment of Wages Act (1936)
- Workmen's Compensation Act (1923)
- Minimum Wage Law (2013)
- Settlement of Labour Dispute Law (2012)
- Social Security Law (2012)
- Employment and Skill Development Law (2013)

Myanmar has been a member of the International Labor Organization (ILO) since 1948, therefore, the Company shall comply with the following ILO conventions:

- C029 - Forced Labour Convention, 1930 (No. 29) - 04 Mar 1955
- C087 - Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87) - 04 Mar 1955
- C001 - Hours of Work (Industry) Convention, 1919 (No. 1) - 14 Jul 1921
- C002 - Unemployment Convention, 1919 (No. 2) - 14 Jul 1921
- C006 - Night Work of Young Persons (Industry) Convention, 1919 (No. 6) - 14 Jul 1921
- C011 - Right of Association (Agriculture) Convention, 1921 (No. 11) - 11 May 1923
- C014 - Weekly Rest (Industry) Convention, 1921 (No. 14) - 11 May 1923
- C015 - Minimum Age (Trimmers and Stokers) Convention, 1921 (No. 15) - 20 Nov 1922
- C016 - Medical Examination of Young Persons (Sea) Convention, 1921 (No. 16) - 20 Nov 1922
- C017 - Workmen's Compensation (Accidents) Convention, 1925 (No. 17) - 16 Feb 1956
- C018 - Workmen's Compensation (Occupational Diseases) Convention, 1925 (No. 18) - 30 Sep 1927
- C019 - Equality of Treatment (Accident Compensation) Convention, 1925 (No. 19) - 30 Sep 1927
- C021 - Inspection of Emigrants Convention, 1926 (No. 21) - 14 Jan 1928
- C022 - Seamen's Articles of Agreement Convention, 1926 (No. 22) - 31 Oct 1932
- C026 - Minimum Wage-Fixing Machinery Convention, 1928 (No. 26) - 21 May 1954
- C027 - Marking of Weight (Packages Transported by Vessels) Convention, 1929 (No. 27) - 07 Sep 1931
- C042 - Workmen's Compensation (Occupational Diseases) Convention (Revised), 1934 (No. 42) - 17 May 1957
- C052 - Holidays with Pay Convention, 1936 (No. 52) - 21 May 1954
- C063 - Convention concerning Statistics of Wages and Hours of Work, 1938 (No. 63) Excluding Parts III and IV -24 Nov 1961

The Company shall also comply with the provisions of IFC Performance Standard 2 Labour and Working Conditions, which includes provisions relating to general working conditions, workers organizations, non-discrimination and equal opportunity, retrenchment, the provision of a grievance mechanism, and the prohibition of child labour and forced labour.

2.8.5 International Finance Corporation Performance Standards

IFC, a member of the WB Group, has published the IFC Performance Standards (PS) on Environmental and Social

Sustainability (2012) which defines clients' responsibilities for managing their environmental and social risks.

IFC uses a process of environmental and social categorization to reflect the magnitude of risk and impacts of the Project it finances, as summarized below:

- category A: business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented;
- category B: business activities with potential limited adverse environmental or social risks and/or impacts that are few, generally site-specific, largely reversible, and readily addressed through mitigation measures; and
- category C: business activities with minimal or no adverse environmental or social risks and/or impacts.

The IFC PSs on Environmental and Social Sustainability are made of eight components, which provide guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way. The PS establishes standards that the client is to meet throughout the life of an investment. IFC PSs are listed below:

- PS 1: Assessment and Management of Environmental and Social Risks and Impacts;
- PS 2: Labour and Working Conditions;
- PS 3: Resource Efficiency and Pollution Prevention;
- PS 4: Community Health, Safety, and Security;
- PS 5: Land Acquisition and Involuntary Resettlement;
- PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- PS 7: Indigenous Peoples (Ethnic Minorities) and
- PS 8: Cultural Heritage.

IFC PSs are in turn supported by Guidance Notes that explain the means to achieve compliance with the PSs. A brief description of each IFC PS is listed below:

- PS 1: Assessment and Management of Social and Environmental Risks and Impacts. The principle states the importance of managing environmental and social performance throughout the life of a project. PS 1 requires the client to conduct a process of environmental and social assessment and to establish and maintain an Environmental and Social Management System (ESMS), appropriate to the nature and scale of the project and commensurate with the level of its environmental and social risks and impacts. PS1 aims at:
  - identifying and evaluating environmental and social risks and impacts of the project[1],
  - adopting a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, affected communities, and the environment,
  - promoting improved environmental and social performance of clients through the effective use of management systems,
  - ensuring that grievances from affected communities and external communications from other stakeholders are responded to and managed appropriately,
  - promoting and providing means for adequate engagement with affected communities throughout the project cycle on issues that could potentially affect them, and
  - ensuring that relevant environmental and social information is disclosed and disseminated;
- PS 2: Labour and Working Conditions. The principle recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by

protection of the fundamental rights of workers. PS2 aims at:

- promoting fair treatment, non-discrimination, and equal opportunity of workers,
- establishing, maintaining, and improving the worker-management relationship,
- promoting compliance with national employment and labour laws,
- protecting workers, including vulnerable categories of workers such as children, migrant workers,
- workers engaged by third parties and workers in the client's supply chain, and
- promoting safe and healthy working conditions and the health of workers; and avoiding the use of forced labour;

- PS 3: Resource Efficiency and Pollution Prevention. The principle recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. Thus, PS3 aims at:
  - avoiding or minimizing pollution from project activities,
  - promoting more sustainable use of resources (including energy and water), and
  - reducing project-related Greenhouse Gas (GHG) emissions.
- PS 4: Community Health, Safety and Security. The principle recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. PS4 aims at:
  - anticipating and avoiding adverse impacts on the health and safety of affected communities during the project life from both routine and non-routine circumstances, and
  - ensuring that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the affected communities.
- PS 5: Land Acquisition and Involuntary Resettlement. The principle recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. PS5 thus aims at:
  - avoiding, and when avoidance is not possible, minimizing displacement by exploring alternative project designs,
  - avoiding forced eviction,
  - anticipating and avoiding, or where avoidance is not possible, minimizing adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost, and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected, and
  - improving or restoring, the livelihoods and standards of living of displaced persons;
- PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. The principle recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. PS6 aims at:
  - protecting and conserving biodiversity,
  - maintaining the benefits from ecosystem services, and
  - promoting the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities;
- PS 7: Indigenous Peoples (Ethnic Minorities) Peoples. The principle recognizes that Ethnic Minorities, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. PS7 thus aims at:

  - ensuring that the development process fosters full respect for human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples,
  - anticipating and avoiding adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, minimizing and/or compensating for such impacts,
  - promoting sustainable development benefits and opportunities for Ethnic Minorities in a culturally appropriate manner,
  - establishing and maintaining an ongoing relationship based on informed consultation and participation with the Indigenous Peoples (Ethnic Minorities) affected by a project throughout the project's life-cycle,
  - ensuring the Free, Prior and Informed Consent of the affected communities of Ethnic Minorities when the circumstances described in this Performance Standard are present, and
  - respecting and preserving the culture, knowledge, and practices of Indigenous Peoples;

- PS 8: Cultural Heritage. The principle recognizes the importance of cultural heritage for current and future generations. As such, PS8 aims at:
  - protecting cultural heritage from the adverse impacts of project activities and supporting its preservation, and
  - promoting the equitable sharing of benefits from the use of cultural heritage. In conclusion, PS 1 thus establishes the importance of:
- integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects;
- effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and the client's management of environmental and social performance throughout the life of the project.

IFC PS's 2 through 8 present requirements to avoid, reduce, mitigate, or compensate for impacts on people and the environment, and to improve conditions where appropriate. Where social or environmental impacts are anticipated, the client is required to manage them through its ESMS consistent with PS1.

The IFC PSs are matched with corresponding Guidance Notes that provide guidance on the requirements contained

in the standards and on good sustainability practices to help clients improve project performance.

2.8.6 International Finance Corporation Environmental, Health, and Safety Guidelines

The IFC EHS Guidelines are technical reference documents with general and industry-specific examples of good international industry practice.

Table 2-4: Organization of the IFC EHS General Guidelines

Main area	Topic
Environmental	• Air Emissions and Ambient Air Quality • Energy Conservation • Wastewater and Ambient Water Quality • Water Conservation • Hazardous Materials Management • Waste Management • Noise • Contaminated Land

Main area	Topic
Occupational Health and Safety	• General Facility Design and Operation • Communication and Training • Physical Hazards • Chemical Hazards • Biological Hazards • Radiological Hazards • Personal Protective Equipment (PPE) • Special Hazard Environments • Monitoring
Community Health and Safety	• Water Quality and Availability • Structural Safety of Project Infrastructure • Life and Fire Safety • Traffic Safety • Transport of Hazardous Materials • Disease Prevention • Emergency Preparedness and Response
Construction and Decommissioning	• Environment • Occupational Health & Safety • Community Health & Safety

The General EHS Guidelines are designed to be used together with the relevant industry sector EHS guidelines that provide guidance to users on EHS issues in specific industry sectors. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent.

The EHS Guidelines for cement and lime manufacturing include information relevant to cement and lime manufacturing projects. Extraction of raw materials, which is a common activity associated with cement manufacturing projects, is covered in the EHS Guidelines for Construction Materials Extraction. The contents of both sector EHS Guidelines will be described in the following sections, after a brief presentation of the general EHS Guidelines.

2.9 General EHS Guidelines

The General EHS Guidelines are organized as reported in the following Table.

With respect to the environmental issues, IFC Guidelines refer to World Health Organization (WHO) standards that include the following:

- WHO Ambient Air Quality Standards;
- WHO Guidelines for Community Noise;
- WHO Drinking Water Quality; and
- WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater. In addition, the following guidelines and standards may be applicable:
- Dutch Intervention Values for Soil Quality;
- International Union for Conservation of Nature (IUCN) Red Data Book for protected species (fauna and flora);
- Occupational Health and Safety Administration (OHSA) standards – United States Department of Labour; and
- United Nations Framework Convention on Climate Change (UNFCCC) Baseline and Monitoring Methodologies for Large Scale Clean Development Mechanism (CDM) Project Activities.

According to IFC requirements, air emissions should not result in pollutant concentrations higher than the relevant national ambient quality guidelines and standards. In their absence, the current WHO Air Quality Guidelines or other internationally recognized sources, such as the United State Environmental Protection Agency (USEPA), National Ambient Air Quality Standards (NAAQS) and the relevant European Council Directives can be also referred to.

In the following Table, Ambient Air Quality values outlined in the IFC EHS General Guidelines are reported.

Table 2-5: Ambient Air Quality Values – IFC EHS General Guidelines

Pollutant	Averaging Period	Maximum Limit Value (µg/m^3)
Sulphur Dioxide (SO_2)	10 min	500 (guideline)
	24 hours	125 (interim target 1)
		50 (interim target 2)
	Year	20 (guideline)
Nitrogen Dioxide (NO_2)	1 hour	200 (guideline)
	Year	40 (guideline)
Ozone (O_3)	8 hour daily maximum	160 (interim target 1)
		100 (guideline)
Particular Matter (PM_{10})	24 hours	150 (interim target 1) 100 (interim target 2) 75 (interim target 3) 50 (guideline)
	1 Year	70 (interim target 1) 50 (interim target 2) 30 (interim target 3) 20 (guideline)
Particular Matter ($PM_{2.5}$)	24 hours	75 (interim target 1) 50 (interim target 2) 37.5 (interim target 3) 25 (guideline)
	1 Year	35 (interim target 1) 25 (interim target 2) 15 (interim target 3) 10 (guideline)

In addition, IFC EHS General Guidelines require as a rule that Project specific ground concentration does not contribute more than 25% of the above-mentioned applicable air quality standard to allow additional, future sustainable development in the same airshed.

As outlined in the IFC EHS General Guidelines, noise impacts should be estimated using baseline noise assessments for developments close to local human populations to verify that the levels presented in the following

Table are not exceeded or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

Table 2-6: Noise Level Guidelines – IFC EHS General Guidelines

Noise Level Guidelines		
Receptor	**IFC - One Hour L_{Aeq} (dBA)**	
	Day-time 07:00 - 22:00	**Night-time 22:00 – 07:00**
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Noise monitoring programs should be designed and conducted by trained specialists. Typical monitoring periods should be sufficient for statistical analysis and may last 48 hours with the use of noise monitors that should be capable of logging data continuously over this time, or hourly, or more frequently, as appropriate (or else cover differing time periods within several days, including weekday and weekend workdays). The type of acoustic indices recorded depends on the type of noise being monitored, as established by a noise expert. Monitors should be located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface (e.g., wall). In general, the noise level limit is represented by the background or ambient noise levels that would be present in the absence of the facility or noise source(s) under investigation.

In terms of Occupational Health and Safety (OHS) aspects, IFC noise limits for different working environments are provided in the following Table.

Table 2-7: Noise Limits for Different Working Environments – IFC EHS General Guidelines

Noise Limits for Various Working Environments		
Location / Activity	**Equivalent Level LA_{eq}, 8h**	**Maximum LA_{max}, fast**
Heavy Industry (no demand for oral communication)	85 dB(A)	110 dB(A)
Light industry (decreasing demand for oral communication)	50-65 dB(A)	110 dB(A)
Open offices, control rooms, service counters or similar	45-50 dB(A)	-
Individual officers (no disturbing noise)	40-45 dB(A)	-
Classrooms lecture halls	35-40 dB(A)	-
Hospitals	35-40 dB(A)	B(A)

Discharges of process wastewater, sanitary wastewater, wastewater from utility operations or storm water to surface water should not result in contaminant concentrations more than local ambient water quality criteria or, in the absence of local criteria, other sources of ambient water quality. Receiving water use and assimilative capacity, taking other sources of discharges to the receiving water into consideration, should also influence the acceptable pollution loadings and effluent discharge quality.

Waste management should be addressed through a waste management system that addresses issues linked to waste minimization, generation, transport, disposal, and monitoring.

Land is considered contaminated when it contains hazardous materials or oil concentrations above background or naturally occurring levels. Contaminated lands may involve surficial soils or subsurface soils that, through leaching and transport, may affect groundwater, surface water, and adjacent sites. Where subsurface contaminant sources include volatile substances, soil vapor may also become a transport and exposure medium and create potential for contaminant infiltration of indoor air spaces of buildings. Contamination of land should be avoided by preventing or controlling the release of hazardous materials, hazardous waste, or oil to the environment. When contamination of land is suspected or confirmed during any project phase, the cause of the uncontrolled release should be identified and corrected to avoid further releases and associated adverse impacts. Contaminated lands should be managed to avoid the risk to human health and ecological receptors. The preferred strategy for land decontamination is to reduce the level of contamination at the site while preventing the human exposure to contamination.

With respect to the OHS field, the General EHS Guidelines state that employers and supervisors are obliged to implement all reasonable precautions to protect the health and safety of workers. The

guidelines provide guidance and examples of reasonable precautions to implement in managing principal risks to occupational health and safety. Although, the focus is placed on the operational phase of projects, much of the guidance also applies to construction and decommissioning activities.

The General EHS Guidelines on Community Health and Safety complement the guidance provided for the environmental and occupational health and safety topics, specifically addressing some aspects of project activities taking place outside of the traditional project boundaries, but nonetheless related to the project operations, as may be applicable on a project basis. These issues may arise at any stage of a project life cycle and can have an impact beyond the life of the Project.

Finally, the General EHS Guidelines provide additional, specific guidance on prevention and control of community health and safety impacts that may occur during new project development, at the end of the project life-cycle, or due to expansion or modification of existing project facilities.

2.10 Contractual and other commitments

Myanmar Ahlone Power Plant Co., Ltd has contracted Engineering, Procurement, and Construction (EPC) contractors during construction stage of the project development. According to the agreement the construction will be completed within two years (at the end of 2020).

Commitment made by the project proponent

(a) The project proponent declares that the information in the report is, to the best of its knowledge, true, accurate, and complete.

(b) The EIA report has been prepared in strict compliance with applicable laws, rules, regulations, guidelines, and procedures.

(c) The project proponent will always comply fully with the commitments, mitigation measures, and plans in the EIA Report. (Re: EIA Procedure; Notification No.616/2015; Section 62, a-c)

Myanmar Ahlone Power Plant Co., Ltd commits to create a healthy and safe working place and working condition. Priority will be given to the Occupational Health and Safety of the workers and the Environmental, Health and Safety of all workers and the community. All EPC contractors will strictly follow the National Environmental Quality (air emission and effluent) Guidelines prescribed by ECD.

The company pledges not to pollute the air, water, and land environment as practical as possible throughout the entire life of the project from the Construction Phase through the Operation Phase to the Decommissioning and Rehabilitation Phase. The Company will monitor and adopt suitable measures for environmental protection. And the company will follow all at the mitigation measures to be taken and the EMP implemented as prescribed in this EIA report.

The company pledges to spend 2% of its net profit for the implementation of CSR. The company will continue to implement the CSR programme and continue to pledge annual CSR works for community development.

2.11 Corporate Environmental and Social Policies

The 151.54 MW Combined Cycle Power Plant Project (the Project) will be developed by an international consortium of developers led by Myanmar Ahlone Power Plant Company Limited in collaboration with the Ministry of Electric Power (MOEP). Myanmar Ahlone Power Plant Company Limited has the following policy statement on power plant development. The company is strongly committed to the sustained protection of the environment in parallel with economic growth and social progress.

2.11.1 Workplace Health and Safety Policy

The Company's philosophy is that the well-being of our company and clients is dependent on the health and safety or his workface. Every precaution reasonable in all circumstances shall be taken for the protection of all workers.

The welfare of the individual is his greatest concern. The Company is committed to providing a healthy and safe working environment for his employees and any visitors to his work sites, in order to protect people and property/physical assets, in accordance with industry standards and in compliance with legislative requirements.

The core principles of the Project Occupational Health and Safety Administration (OHSA) are;

1. All workers have rights and employers must ensure that: work should take place is a safe and health working environment; condition of work should be consistent with worker's well-being and human dignity;
2. Occupational safety and health policy must be established
3. Social partners (employers and employees) and other stakeholders must be consulted
4. OHS programmes and policies must aim at both prevention and protection
5. Continuous improvement of OHS must be promoted
6. Health promotion is a central element of OHS practices
7. Compensation, rehabilitation, and curative services must be made available to workers who suffer occupational injuries, accidents, and work-related diseases
8. Education and training are vital components of safe, healthy working environment
9. OHS policy must be enforced.

2.11.2 Community and Environment; Sustainability Policy

Sustainability has always been at the core of the Company's strategy. His activities are guided by his corporate vision "Inspiring Lives. Sustaining Progress" Myanmar Ahlone Power Plant company limited is committed to being a good Corporate Citizen, contributing to the development of Myanmar. The Company's aim is to create value for stakeholders, while conducting sustainable business practices, caring for his community, and protecting his environment. Through or wide ranging corporate social responsibility (CSR) engagement, the project developer aims to become a catalyst of positive change that will enhance the lives of Myanmar citizens.

3. PROJECT DESCRIPTION

Introduction

This chapter presents project actions and activities that will be undertaking in course of each project phase. The scope of the descriptions relates to the extent by the time project developer, Myanmar Alone Power Plant Co., Ltd. commissions Myanmar Survey Research (MSR) for undertaking Environmental Impact Assessment. Knowing the magnitude and coverage of the project actions, it helps tracking any environmental and social impacts (i.e., both positive and negative) and potential measures to address them to advert adverse impacts and eliminate residual/cumulative impacts. And, it also assists in validating crucial parameters and indicators that is functional for impact assessment methods.

3.1 Project System Boundary

Power plant project involves intricate segment starting from sourcing essential fuels to power transmission. They contain legal proceedings and environmental obligation. Hence, it's important to set and define clear system boundaries for effective mapping environmental impacts lest controversies emerge even with sequential failure in certain promissory treaty. In short, Myanmar Ahlone Power Plant Co., Ltd. focuses strictly at electric power generation by using state supplied natural gas and transfer generated electricity into the transformer grids only. The following figure beset clear cut system boundary of proposed 151.54 MW Combined Cycle Power Plant (CCPP) that the project developer is authorized for undertaking power generation and for that they are liable for taking any accountabilities that is linked to the environmental issues raised within the project system boundary (Figure 3-1).

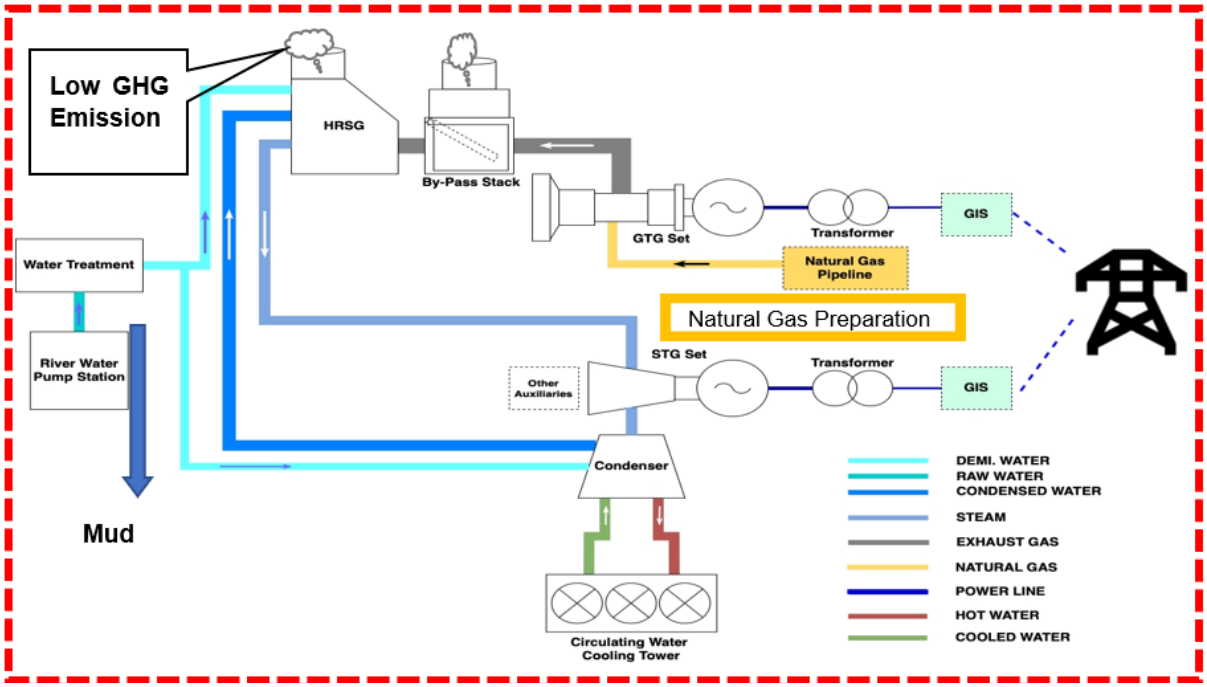


Figure 3-1: Project system boundary

3.2 Project Justification

In order to ensure 24/7 electricity supply with regard to increasing demand of Yangon city, the state needs concerted efforts of Independent Power Producer (IPP) and its own to address the issue. Therefore, MOEP has been fostering the emergence of modern power plants without compromising environmental norms and standards set. Because of the characteristic of combined cycle power plant being more environmentally friendly to its counterparts (i.e., cogeneration and mono-combustion technologies), the combined cycle technology is more favourable in term of eco-friendly and financially viability.

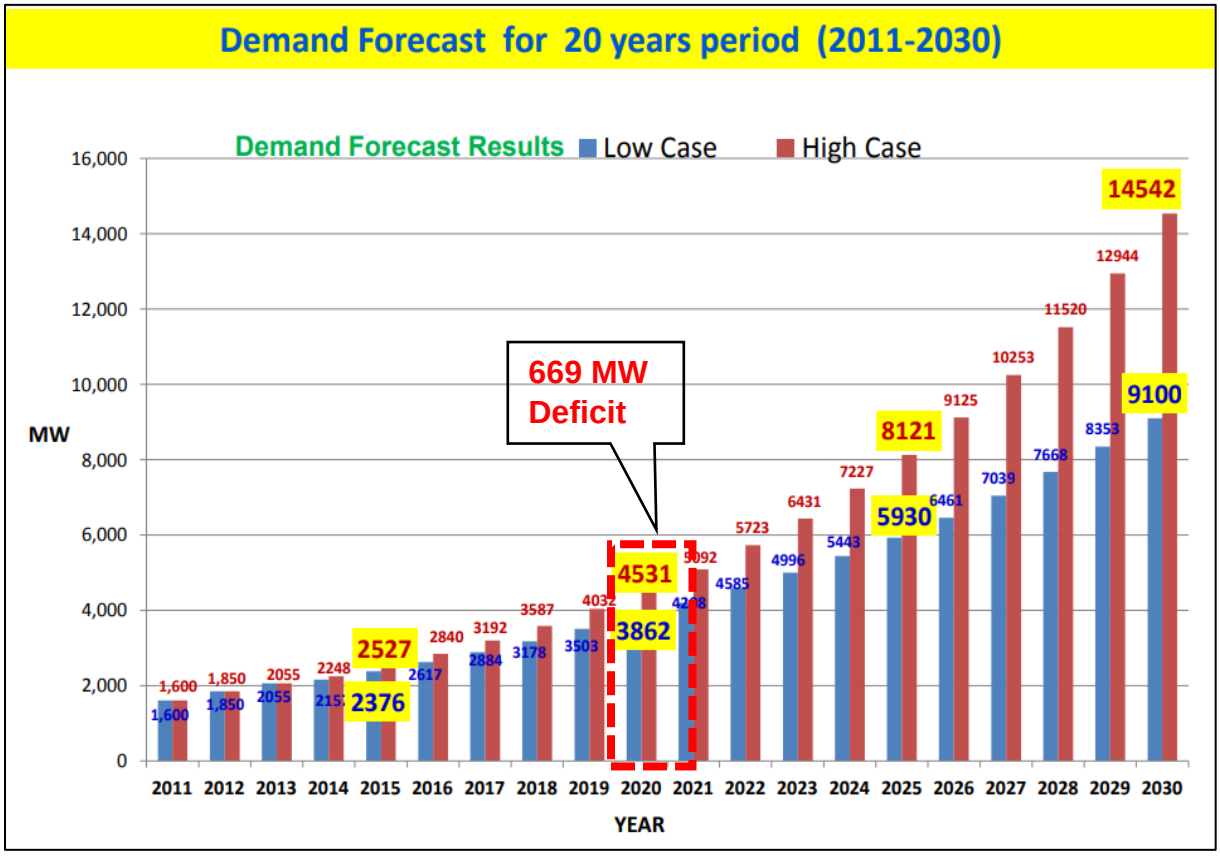


Figure 3-2: Annual Demand Forecast (source: MOEP and IPPs)

According to the forecast base on the annual demand 15 % increase, the nationwide electric power deficit is about 660 MW. Since Yangon is the commercial capital of the nation, the power shortage means cutting growth and productivity (Figure 3-2). With existing power plants soon to be expired its cycle-life, the development of modern power plants needs to replace them to ensure stable power supply and pledge growing demand.

Therefore, this 151.54MW capable combined cycle power plant operated by Myanmar Ahlone Power Plant Co. Ltd., assists meeting government's initiative for electricity sufficiency of Yangon region.

Furthermore, the global warming potential of combined cycle technology is significantly lower than other GHG intensive coal and diesel thermal power plants and they offers more longevity of project lifecycle, it could be said the cleanest technology in comparison against alternatives available under the detriment of location, sources, and feasibility for Yangon region.

3.3 Project Location, Site and Salient Features

This 151.54 MW Combined Cycle Power Plant (CCPP) is being implemented inside the premises of Ministry of Electric Power, Ahlone Township of Yangon Region. It is few kilometres away (about 3~4 km) away from the city centre. This utility compound belongs to the ministry which exists since Yangon city established. Strategically, it is on the bank of Yangon River, is therefore accessible land and maritime transport (Figure 3-3 to Figure 3-8). Exact location and prominent features of the project is stated in the figure and layout and their respective components are enlisted in the table below (Table 3-1 and Table 3-2).

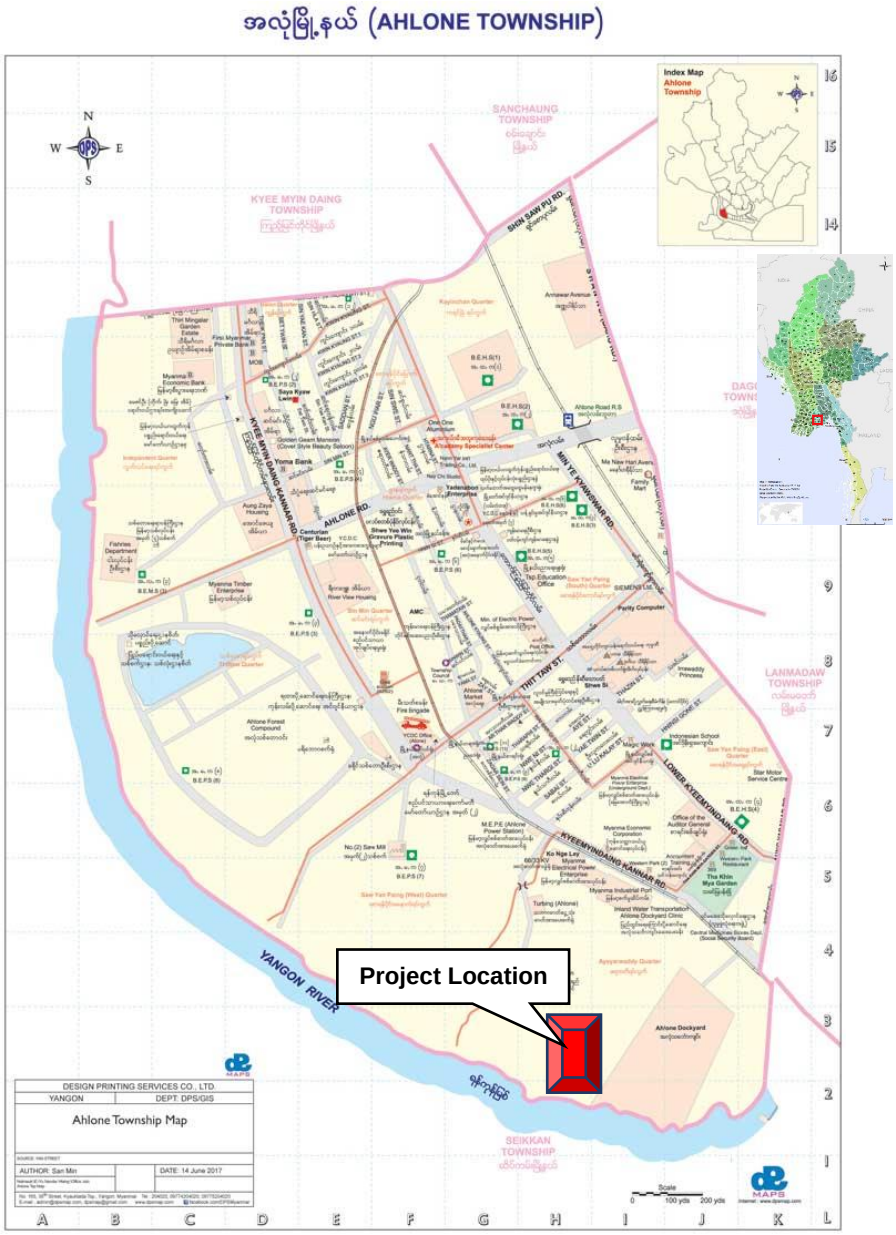


Figure 3-3: Project Location

Table 3-1: Project related Salient Features Description

Particulars	Characteristics │ Description
Project Name	Combined Cycle Power Plant (Ahlone)
Sector and affiliation	Energy │ **Ministry of Electric Power – Electric Power Generation Enterprise**
Power Plant Capacity	151.54 MW
Plant Location	Inside MOEP compound next to state run 151.54 MW Ahlone Power Plant
Land Concession	5.965 acres
Plant Location	16°46’38.20” N │ 96° 7”46.95” E
Technology	Combined Cycle [Co-generation between Natural and Steam Turbines]
Gas Turbine Configurations	1 GT set + 1 HRSG + 1 ST on separate axel shafts
Fuel and Source	Natural gas from MOEP Gas Supply Pipeline

Particulars	Characteristics ⎪ Description
Gas Supply Pipeline Configuration	Approx. 30 Meter away right beside Project Site in 14" diameter carbon steel seamless material.
Condenser cooling Type	Mechanical Draft – Forced air- and water-cooling system
Raw Water	Extract from Yangon River
Process Water – Boiler	Treated raw water is fetched to boiler through storage and distribution system
Power Generation Principles	1. Direct Gas Combustion in gas Turbine 2. Steam extraction from Heat Recovery Steam Generator of exhaust heat – Co-power generation in steam turbine
Theoretical Noise attenuation	85 dB(A) at 1 metre distance outside environment of project site
Service life or project life Cycle of the power block (GT, ST and HRSG)	Minimum 25 years ~ maximum 30 years
Water Storage Towers (Processing and firefighting)	350 m^3 (detailed in process diagram) 70x30x3.3 m^3 + 25x60x45 m^3 + 2500 m^3 +600 m^3
Water Treatment Plant Capacity	348 m^3/hr for Treatment (detailed in process diagram)
Raw Water Requirement	350 m^3/hr (detailed in process diagram) 6000 m^3/day (max:)
Raw Water Source and Permission	Yangon River - Permit obtained from Yangon Port Authority
Processed Water Discharge	3000 m^3 /day as steam into atmosphere
Project Cost	85 million USD (approx..)
Management	Administration – Myanmar Ahlone Power Plant Company Limited Production / Operation – Ahlone Myanmar Power Plant Company Limited

Table 3-2: Technical Information for installed power utilities

Sr. No.	List of Utilities	Technical Specifications / Capacities / Performances
1	Gas Turbine	PG9171E
2	Gt Generator	QFR-135-2A
3	HSG	Q1089/534-169 (35) -5.9 (0.5) /512 (254)
4	Stack Height	58M / Exhaust Temp.: 91 - 98 °C
5	Steam Turbine	N60-5.6/0.56/527/255
6	St Generator	WX18Z-054LLT
7	Main Transformer	SF10-150000/66
8	Main Transformer	SF10-70000/66
9	Gas Compressor	MW-45/20-27
10	GISS	ZF-72.5/T2500-40 ⎪ ZF-72.5/T2000-40
11	Auxiliary Transformers	SZ11-6300/10.5 ⎪ SZ11-6300/13.8
12	Chemical Water	30 T/H
13	Cooling Tower	5000 M^3/H
14	Hp Steam Flow	122.3 T/H
15	Hp Steam Pressure	6.726MPa (a)
16	Hp Steam Temp	514.5 °C
17	LP Steam Flow	11.21 t/h
18	LP Steam Pressure	0.76 MPa(a)
19	LP Steam Temp	201.8 °C
20	Exhaust Temp	86.2 °C

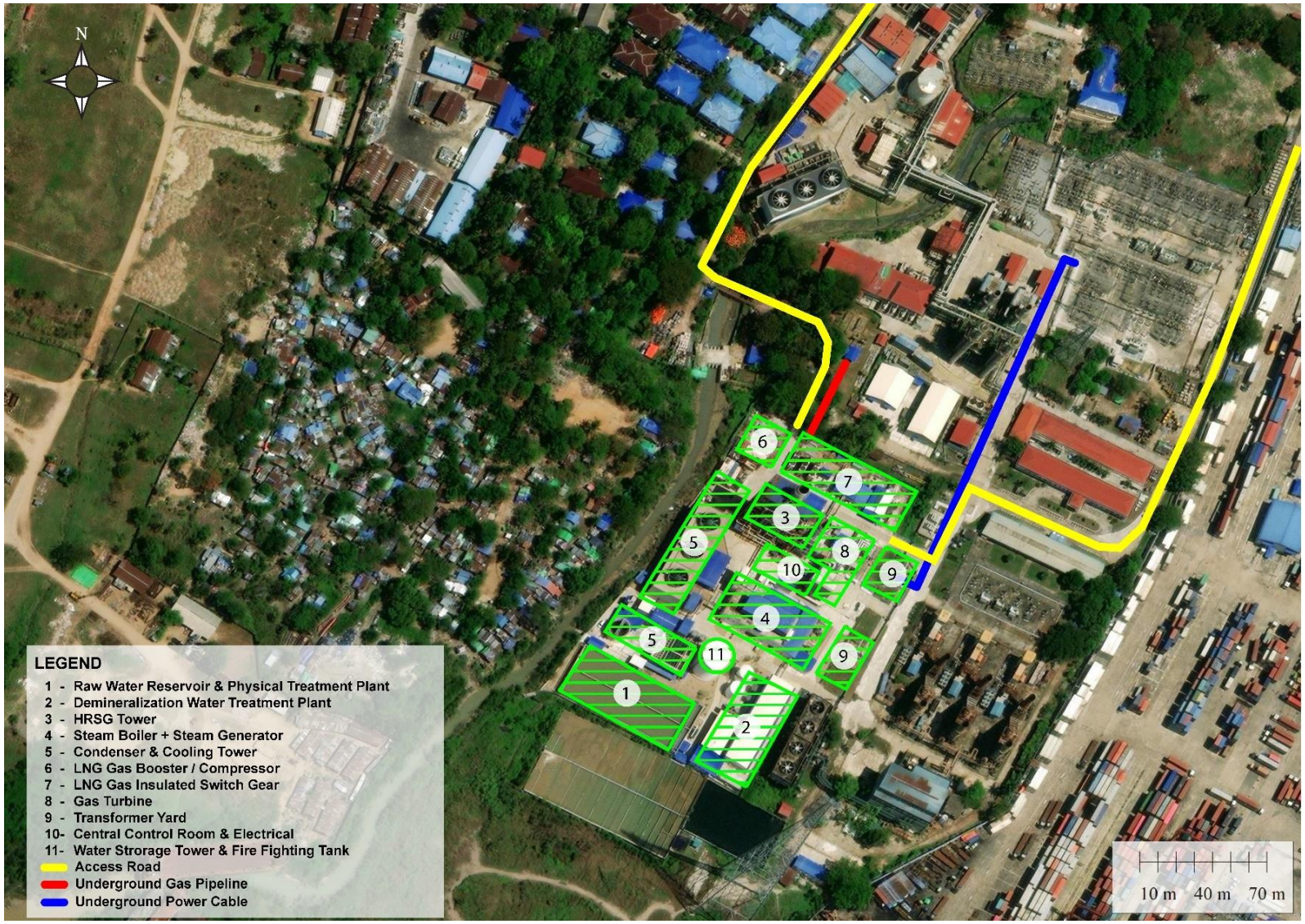


Figure 3-4: Aerial Map: Description for Gas Supply and Power Output

Figure 3-5: Aerial Map: Description for Inlet Water Supply and Surplus Water Effluent

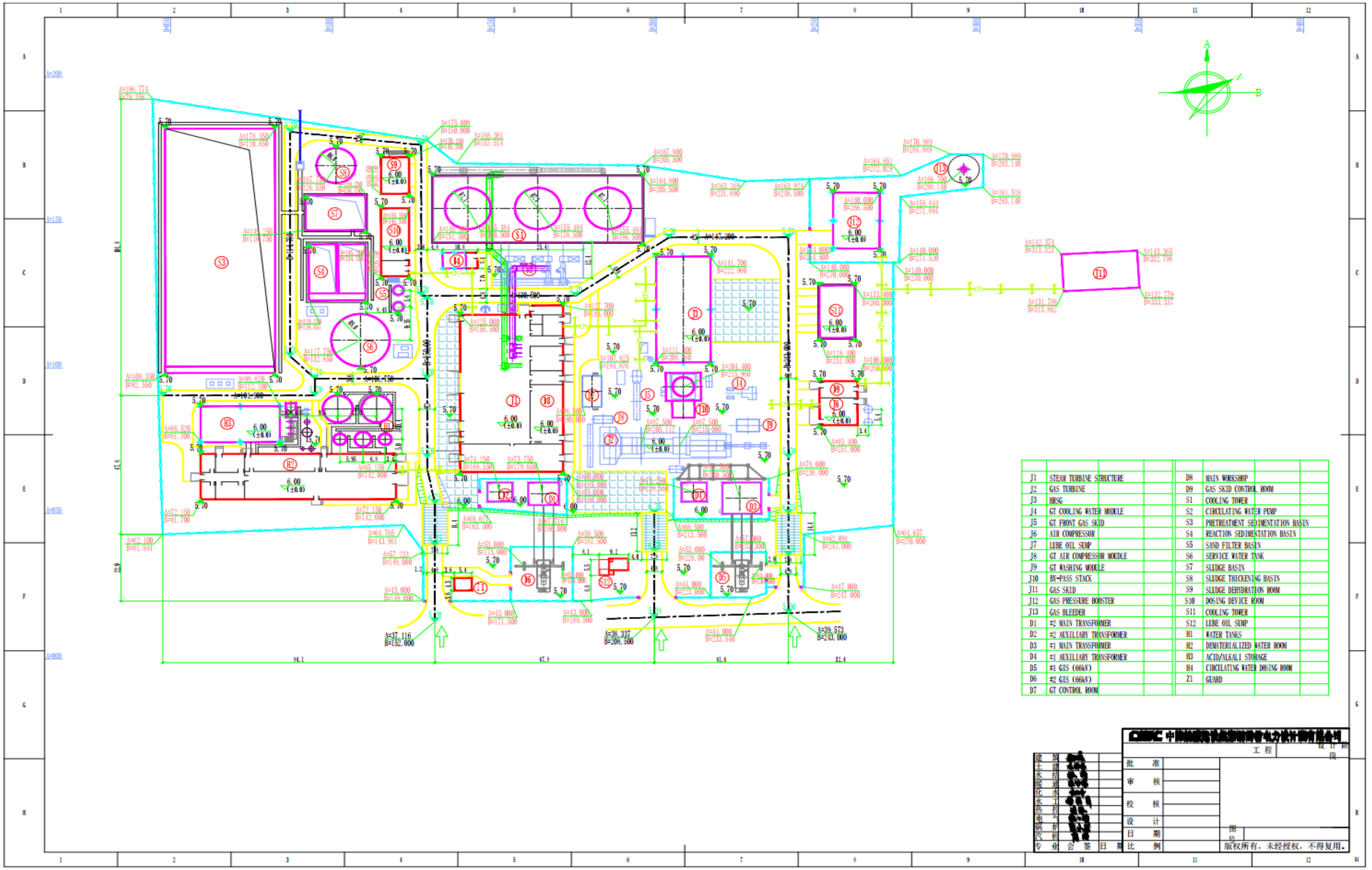


Figure 3-6: Plant Project Layout

Figure 3-7: Project Boundary and Facility Arrangement Setting

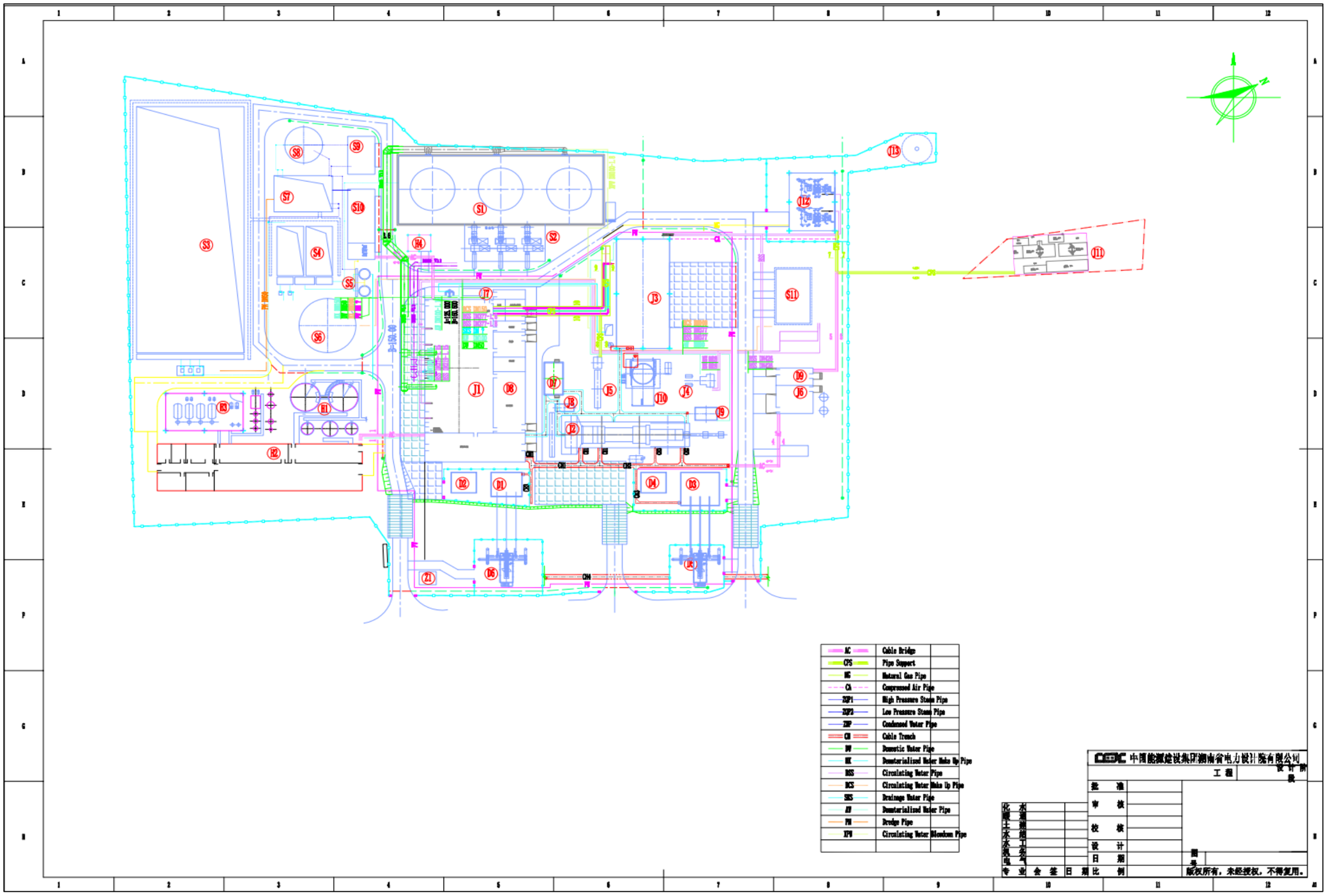


Figure 3-8: Internal pipeline Networks

3.4 Project Components and Design

This section presents detailed components involved under proposed scheme. For the development of operational power plant, it needs construction for the following enlisted structures which will emerged on existing barren land. They are intricately interconnected with respective to functions of input and output (I/O) of each process integrated into combined cycle power plant system. To clarify and more informative comprehension, the whole power plant facility can be divided into 5 segments into one combined cycle power plant operation to generate 151.54 MW. The project components for essential civil construction for commissioning the plant are as the followings.

1. Gas Compressor Block
2. Gas Cycle Block
   - A set of Gas Turbine (GT) unit + Generator + Thermal by-pass
3. Steam Cycle Block
   - A set of Heat Recovery System Generator (HRSG)
   - A Steam Turbine generating unit with associated auxiliary equipment + Generator + Condenser
4. Cooling Water System
5. Demineralised Water System [Water Treatment Plant (Physical and Chemical), Storage Tower and Pump Station]
6. Auxiliaries and Ancillaries

The schematic setup of combined cycle power plant is shown in the following Figure 3-9. Each individual function and segment involved in the system are also explained accordingly.

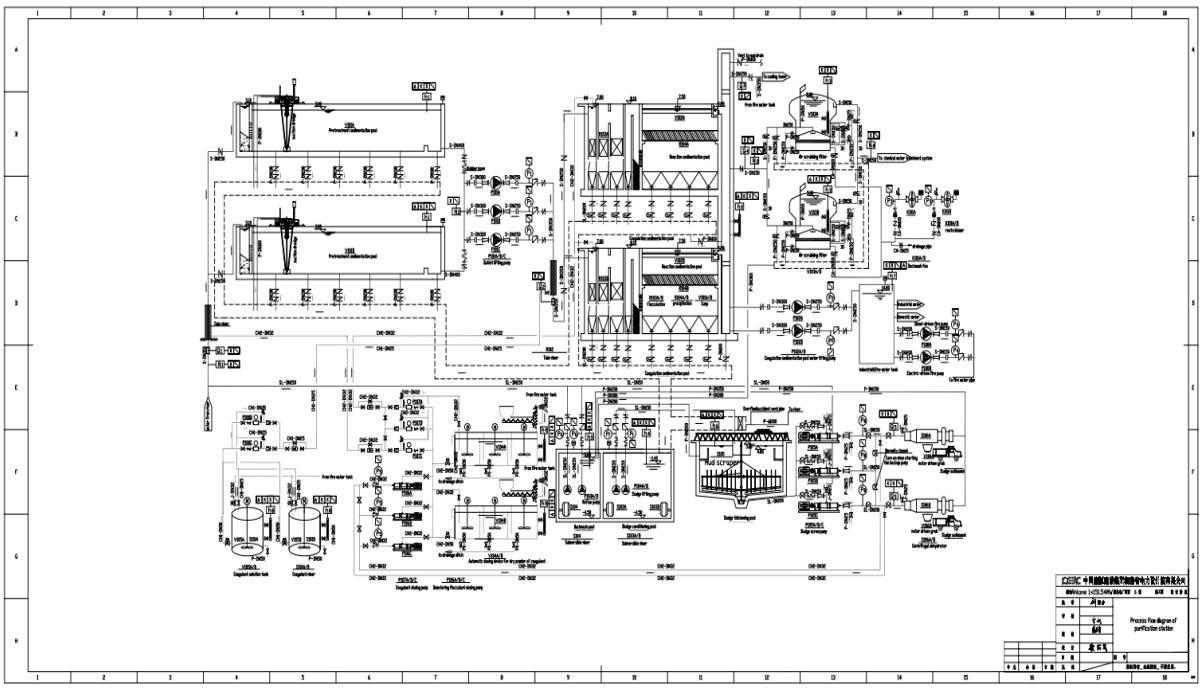


Figure 3-9: Schematic for entire combined cycle power plant

(Source: Myanmar Ahlone Power Plant Co., Ltd.)

3.4.1 Gas Compressor Block

Natural gas system

This system consists of inlet unit, metering unit, refine infiltration unit, pressure boost station, final filtration skid (in GE package) and other axillary equipment such as pressure relief valves, purge connection, manual vent, drain connection, maintenance plat, stairs and necessary pressure and temperature instrument etc. Natural gas comes from NG station inlet pressure is 300 psi. With pressure booster it can be raised to 400 psi. NG firstly goes to inlet unit. This unit consist of an insulation joint, an emergency shutdown valve, temperature gauge/ transmitter and pressure gauge/ transmitter.

In metering unit, the gas volumetric flow rate (both of instantaneous and accumulate) will be measured by gas flow meter, also the total fuel consumption for the plant with compensation of temperature and pressure. Composition (%mol basis) will be analysed by a gas chromatograph, and these data will be sent to one flow computer which is employed to calculate total energy (total kcal), specific gravity and density in kg/m^3, lower heating value LHV on volume basis in (kcal/Nm^3) and mas basis in (kcal/kg) these signal will be sent to DSC. Then the gas enters pre-separation unit for buffering and removing 99% of solids and liquid particles 50 µm and larger.

In order to avoid damage due to dust or liquids, natural gas enter refined filtration unit which includes two filters, one working one standby. In these filters the big particles, such as dust, solid and droplet etc., will be removed firstly at the lower part of filter vessels. Then, they will be filtered finely through filtration medium to remove tiny condensate droplets and dust. The filters are completed with level switch to indicate the residual liquid. Two differential pressure sensors should be mounted in order to monitor filtration.

For each gas turbine, there is one gas flow meter shall be provided to measure the fuel consumption by individual gas turbines (in GE's package). The entire gas piping system will have provision for nitrogen purging. All vent gases containing hydrocarbon vapor, during stream purge or shut down operation, will be piped to vent.

Gas Supply Pipeline

Natural gas for the plant is sourced from MoGE natural gas station located just beside the Project site approximately 30 meters away from the project boundary. Fourteen inches diameter carbon steel seamless material pipeline is laid for gas supply from off-take point to project site.

Photo 3-1: Gas pipeline from MOEP off-take

Gas compressor block

Prior natural gas from main pipeline of national gas network is fetched into gas turbines (Figure 3-10), it needs to be adjusted and prepared in terms of physical, thermodynamic specifications and channel number recommended by the turbines manufacturer to ensure optimal plant efficiency. This process involved complicated engineering processes and mechanisms which are operated inside this block. It is housed in steel structure building in (25x25x3) m size dimension to accommodate all pumping machines and compressors, pipelines, pneumatic apparatus, fittings, and automation units.

Figure 3-10: Schematic for Gas Compressor Block

3.4.2 Gas Cycle Block

In this block, chemical energy is turned into mechanical energy, then electrical energy is produced by applying in combination of air and natural gas supplied from gas compressors block. While gas turbine is responsible for dynamic – rotation of blades for the generator up to 3000 RPM (Revolution Per Minute) that generates electrical energy through mechanical action attached in shaft or axle of the generator (Model - QFR-135-2A). The burning of natural gas in 1 E- class turbine (Model PG9171E) also produces thermal energy up to 450 °C in exhaust chamber as a by-product of the process along with combusted gas while electrical energy is being generator by induction. This thermal energy - heat is recuperated for generating steam energy through thermal by-pass. In summary, there are three separate components (i.e., gas turbine unit, generator unit, and thermal by-pass chamber) involved in the gas cycle block. They are enclosed inside steel structure with proper insulation and barricade to withstand weather stresses, ensure occupational health and safety against mechanical and thermal hazards, and minimized adverse environmental impacts. The dimension of the bloc is approximately (25x10x4) meter which is attached to HRSG.

There are complicated duct and rack channels for proper running of the gas turbine – generator and their control system for supervision and monitoring heavy-duty gas inlet in switches and valves and high voltage electrical power in alternators and regulators equipment. They are linked to the central control rooms where technician and engineers direct and troubleshoot impending technical issues and manage the gas cycle block at maximized efficiency.

Under the arrangement of gas cycle block, it includes installation for intricate alarms and firefighting system to counter any possible emergency. Therefore, storage chambers for chemical fire extinguishers / gas canisters have to be integrated inside gas cycle block. For initializing gas turbine system, it needs presumptive power to turbine start-up and backup for control room. These side-line structures are also incorporated inside the gas cycle block of the typical combined cycle power plant (Figure 3-11).

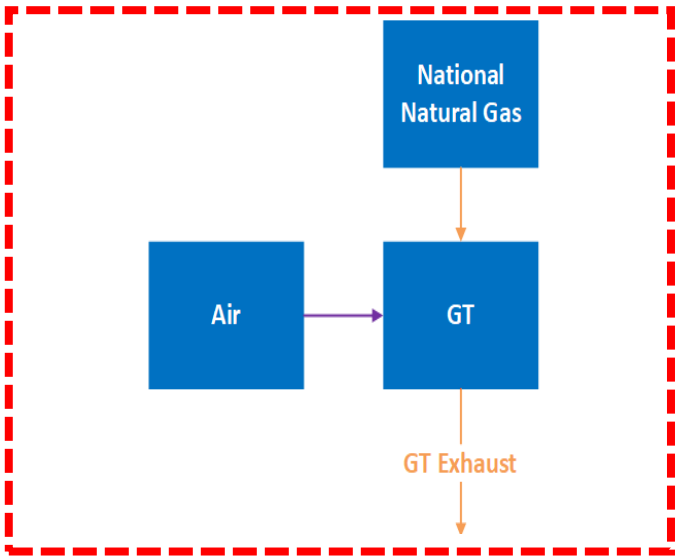


Figure 3-11: Schematic for Gas Cycle Block

3.4.3 Steam Cycle Block

The strength of combined cycle technology is utilizing all energy source for maximizing energy generation with utmost potential with least waste production. Therefore, heat is salvaged for another steam cycle for additional energy generation in the system. The exhaust of gas turbine which is the combination of combusted gas and extreme heat is split in thermal by-pass chamber.

The steam cycle block starts from the edge of thermal bypass chamber and ends at air condensers.

While exhaust gas is conveyed into gas flue, heat is directed to Heat Recovery Steam Generator System [HRSG – Model: Q1089/534-169 (35) -5.9 (0.5)/512 (254)] for steam cycle electricity generation. For this cycle, demineralized water act as major driver for steam turbine. Then, steam is pressurized for turbine activity, then cooled in condensers for another cycle and liberating pressurized vapor back into liquid phase. The schematic flow of steam cycle is shown in the figure below.

The distinct of feature of the steam cycle, unlike gas cycle, is HRSG and condenser structures which emerges as physical structure at noticeable height, shape, and size within project land. Though steam turbine and generator does not take space for electrical power generation, HRSG and air-cooled condenser and its auxiliaries require significant land use and civil construction. With the steam cycle includes HRSG, steam turbines, condensers, and plumbing networks, it takes up to approximately 20% land use of the project area. The dimension of the condenser facility and HRSG is about (20x10x10) meter and (20x30x65) meter respectively. Since, the steam pressure activation from thermal energy to high pressure system and deactivation of pressurized steam back into water at ambient temperature and pressure contain inter – disciplinary kinetics and engineering process, the construction of structure for those processes under steam cycle block takes longer duration than those of the gas cycle block (Figure 3-12).

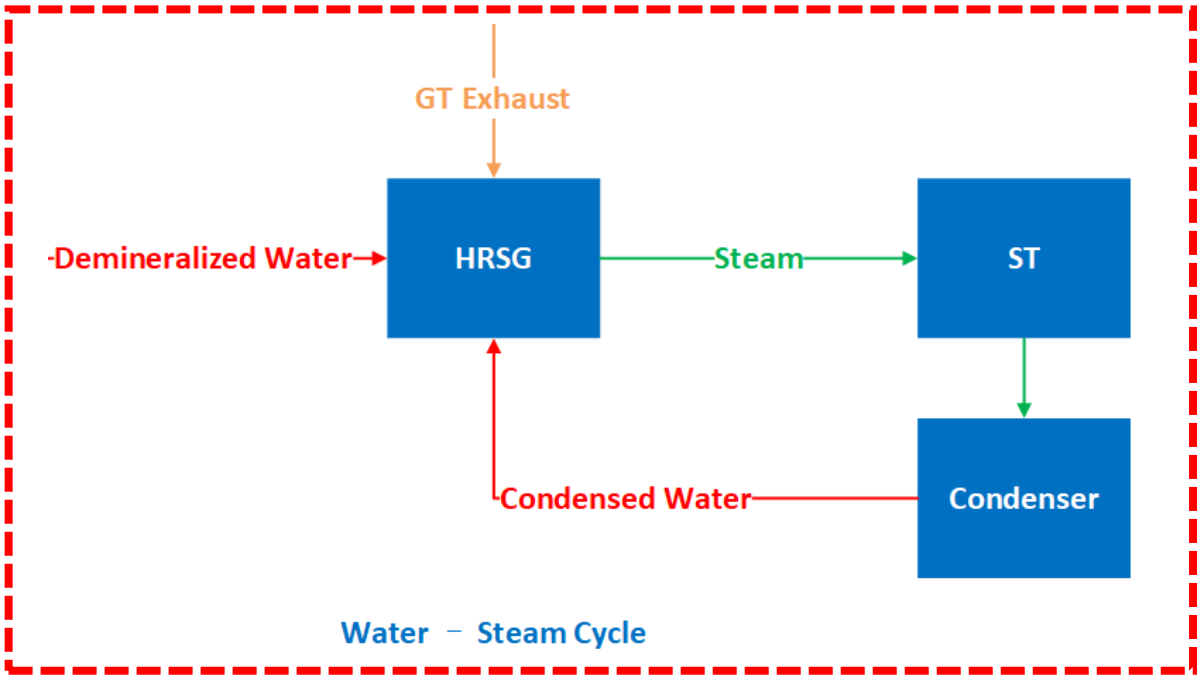


Figure 3-12: Schematic for Gas Cycle Block

3.4.4 Cooling Water System

The cooling water system through the condenser is a recirculating system. The cooling tower type in this Project is mechanical draft cooling tower using induced draft fan located at the top of the towers.

Water is pumped from the source and flows through large pipes. Cooling towers remove heat from the warmed cooling water and return the water to the condenser. A recirculating system only requires the small amount of additional cooling water approximately 5 to 10% to replace any losses that occur during the cooling operation. In the towers, air is blown up through the tower while the warm water from condenser is sprayed at the top of the tower. The water temperature decreases as water evaporates and heat transferred to the air. A pump in the basin returns cooled water back to the condenser.

Cooling systems control the level of dissolved solids (mineral salts) by discharging part of the recirculating water in the system and replenishing this volume with freshly make up water. Cooling towers can cycle water numerous times before the water becomes saturated and must be discharged out of the system.

Changing of water quality and effects

In the cooling towers, the dissolved solid concentration increases as the cooling water evaporates. The buildup of minerals calcium, magnesium, and carbonate in the water can cause scale, corrosion, plugging in the condensers, pumps and piping. Hard scaling deposits on the heat transfer surfaces, reducing heat transfer efficiency.

Scale formation can be reduced by adding phosphates to the water. Phosphates react with scale formation impurities precipitating them into sludge. The sludge settles in the tower basin and is removed during blowdown. Phosphates can cause algae to grow, however, the algae growth can be controlled by adding chlorine.

Microorganisms, such as bacteria, algae, and fungi, thrive in the warm and moist environment of cooling towers. If left unchecked, they can form biofilms, leading to biofouling. Biofouling reduces heat transfer, restricts water flow, and promotes corrosion.

Particles such as dust, debris, and rust can enter the cooling system and clogging pipes can lead to increased pressure drop.

The pH of cooling water can be adjusted by adding sulfuric acid. Dissolved oxygen in the cooling water can be reduced by adding corrosion inhibitors.

Monitoring to ensure water quality

Water samples are collected from different points within the cooling tower system. These samples are then analysed determine parameters such as total suspended solids, microbiological activity, and chemical concentrations. According to the guidelines the sample water is tested daily in a mini laboratory of Power Plant to ensure that turbidity must NTU <20, and pH is between 7.9 - 8.8. If there are changes in water quality, chemical dosing is adjusted as needed.

Photo 3-2: Cooling Tower

3.4.5 Demineralized Water System

3.4.5.1 Water requirement

It is calculated that about 1098 cubic meters of fresh water per hour flow is required for power plant mainly for closed cooling water system. The source of water for the project is Yangon River which is considered as perennial. Major source of water required in the CCPP are:

i. Cooling water for steam condenser is the part of heat sink for the thermodynamic cycle. This system in a power station is the largest consumer of water.
ii. Cooling water for STG and HRSG auxiliaries, compressors, A.C. System etc.
iii. Cooling of Gas Turbine auxiliary equipment.
iv. Make-up water for power cycle (HRSG make-up).
v. Other auxiliaries like service and make up water.

The water requirement for project operation is described in Table 3-3.

Table 3-3: The water requirement for project operation

Variable	Value (m^3/hr)
Water consumptive requirement for cooling	990
Demineralized water	25
Service water	40
Plant potable	10
Others	33
Total	1098

Circulating Water System

The estimated cooling water requirement for the condenser and auxiliary cooling system is 990 m^3/hr. A closed-cycle recirculating type CW system is envisaged for the CCPP, featuring an adequately sized multicell induced draft cooling tower. A closed-cycle recirculating cooling system with induced draft cooling towers is commonly used in power plants to reduce water consumption by recirculating the same water rather than continuously using fresh water. It is also environmentally preferable compared to once-through cooling systems. Make-up to the cooling tower is 20 m^3/hr to compensate for evaporation loss and blowdown requirements in the system. The CCCW system meets the cooling water requirements of all the auxiliary equipment of the GTG, STG, and HRSG units, including turbine lube oil coolers, generator coolers, BFP auxiliaries, condensate pump bearings, sample coolers, and air compressor auxiliaries. As a closed-loop cooling system with cooling towers will be adopted in this project, the majority of water will be recirculated for further use.

Demineralized Water Make-up Cycle

To compensate for the losses incurred in water-steam cycle due to evaporation, start up and shut down venting, valve passing and blow downs mainly for making up the HRSG, demineralized water make-up is required 20 m^3/hr back wash and others.

Power Cycle Make-up

The concentration of dissolved solids in the HRSG drum water gradually gets increased due to the evaporation process. To control the 'carry over' by steam, this concentration level has to be maintained by 'blow down' of drum water. Power cycle makeup is mainly for making up the HRSG (20 m^3/hr) back wash and others.

Service water, potable water and others

The miscellaneous plant services include washing, cleaning, drinking as well as hydrant fire water protection system.

3.4.6 Water Treatment Plant

Water treatment plant is indispensable process of power plant since raw water from source water could not be fed directly into the steam generation process. Water from Yangon River will be extracted as primary water source since it is amply available for all season. To withdraw water safely from the river, intake structure is constructed on the Riverbank which is to convey water flow to the power plant.

3.4.6.1 Intake structure

Type of intake structure: Among the various types of intakes, Ahlone power plant has constructed Movable and Floating intake. In this type, intake arrangements are fixed on a movable platform. The floating intake type is for handling variable water levels consisting of flexible pipe connected to a float.

Entry ports or Inlets or Penstocks: In this intake structure there are three inlets or entry ports provide at different elevations to ensure water flow during all seasons. The lowest inlet is placed below the lowest water level of the river so that water is available during dry season.

Screen: To prevent aquatic animals from entering the pipeline

Photo 3-3: Water Intake Screen[6]

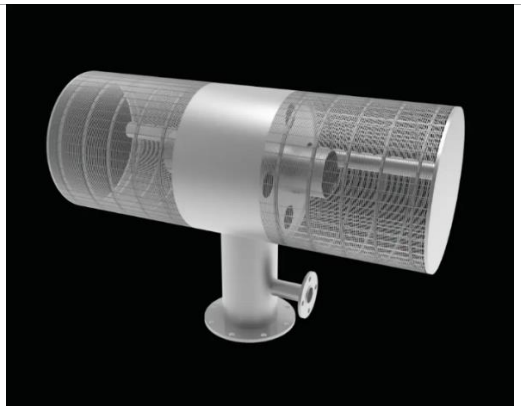


Photo 3-4: Water Intake Screen[7]

The infiltration inlet is inclined along the reservoir slope or dam slope, and both horizontal tube type and leaning tower type are divided into two types along the dam surface or slope.

Photo 3-5: Intake structure

6 https://hengshui-guangxing.en.made-in-china.com/product-group/NorEutlKJghA/Water-Intake-Screen-catalog-1.html

7 https://www.wedgewire-screen.com/wedgewirescreen/intake-screens.html

Intake towers: There are both wet intake tower and dry intake tower (vertical tower) are constructed at the Riverbank. The water enters directly into the wet tower through entry ports is then enters the conduit pipe through separate gate-controlled opening. Then conveys water flow to the power plant. In a dry intake tower, the water is directly drawn into withdrawal conduit through the gate entry ports. Vertical tower water inlet is a closed water inlet tower and it has two types of water inlet, fixed and movable. A vertical intake tower will have no water inside when the gates are closed. In a float-type water inlet structure which includes a water intake tray and pipe that stores the float to raise the water level as the water level changes. The intake towers are built of concrete.

Conduits: They are pipelines through which water is conveyed from intake tower to the treatment plant. The piping is placed above the ground cradled in strong supporting structures.

Area of the structure: The area of the factory structure is around 809.371 square meter. The spot water intake structure located is identified as not in primary spawning and/or nursery areas or mussel beds. An inspection/monitoring and maintenance plan for intakes is required to ensure proper operation.

Photo 3-6: Place of Intake structure

3.4.6.2 Water treatment system

The physical and chemical properties and characteristics of river water are too compromised that it could be subjected to steam generation and the plant application needs to be demineralized for the merit of longevity and sustainability of pipelines and utilities installed in the steam cycle. Clean clear water is the key to power generation. Therefore, it is mandatory to set up water treatment plant that could support necessary demineralized water in sizable quantity for power plant operation. Along with water treatment, it needs to develop storage tower and pump stations as supporting units of the water treatment plant. Process Flow Diagram of Water treatment plant and their application is shown in the figure 3-13.

Figure 3-13: Schematic for Demineralized Water

In general, the proposed project physical and mechanical treatment process for preliminary refining system to filtered settled and colloidal impurities present in the river water. Then it is further processed under chemical and mechanical process for further purification and demineralization.

Finally, treated water are stored inside large water tank farms as standby source for steam generation in HRSG system. The environment on the inside of HRSG tubing is an important factor in maintaining tube integrity. The chemical environment in the cooling water and steam is generally termed the 'Water Chemistry' of the unit. Under the scope of water treatment plant, it consists of settling reservoir,

chemical and mechanical treatment facility, and tank farm. The dimension of these structure is (100x50154) metre respectively.

According to set up guideline purification capacity of water treatment plant of MAPP is 98 -99%. Water treatment plant can lower the conductance level of the river water from 200 µS/cm to 0.2 µS/cm. Adjusting pH level, agglomeration, dismantling can be done with the reference of water quality. Purification capacity and water chemistry meet the quality requirements of boilers feed water depending on the effectiveness of removing contaminants. Water purification by chemical treatment is generally consisted of several steps before use in the HRSG.

1) Sedimentation

Sedimentation step is preceded chemical process as first step of water treatment coagulation and flocculation of river water. After flocculation the water flows into the sedimentation tanks. In this process suspended particles in the water will be settled out of water in a sedimentation tank. Sediment filters will also trap some of the larger contaminant particles that will damage because of mineral buildup. Then the water will pass through the sand filter to raw tank.

Photo 3-7: Collection of river water

Photo 3-8: Clearing water layer by layer

Photo 3-9: Clear water

Photo 3-10: Sedimentation tank and water enter line

Photo 3-11: Sedimentation tank and exit pipe

Photo 3-12: Exit pipe from sedimentation tank

Photo 3-13: Sand filters and enter pipes

Photo 3-14: Sand filters and exit pipes

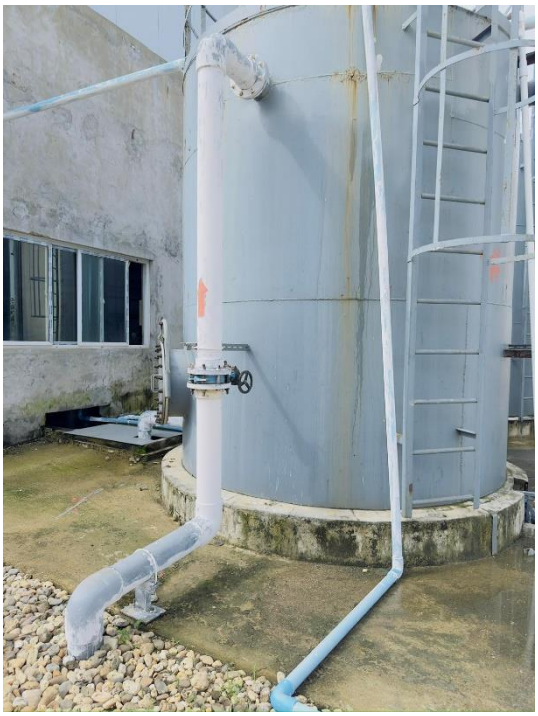


Photo 3-15: Enter pipe to raw tank

Photo 3-16: Exit pipes from raw tank connected with pumps

Photo 3-17: Pipelines from raw tank to enter Ultrafiltration system

2) Ultrafiltration system

In an ultrafiltration system, any particles that remained in the water following the sedimentation stage are filtered out using a hollow fibre or a sheet membrane to mechanically filter water containing minute particulate. The system will filter particulate down to 0.025 microns using super fine membrane technology.

Photo 3-18: Enter and exit pipelines at ultrafiltration tank

Photo 3-19: Ultrafiltration system

3) Reverse osmosis system and reverse osmosis tank

Before water is able to be completely purified, it is sent through a reverse osmosis system. Reverse Osmosis is a technology used to remove most contaminants from water by forcing the water under pressure through a semi-permeable membrane. Treated water from a reverse osmosis system is stored in a hydroneumatric pressure tank. Known as a reverse osmosis tank.

Photo 3-20: Reverse Osmosis System (1)

Photo 3-21: Reverse Osmosis System (2)

4) Ion exchangers and demineralization water

After the reverse osmosis stage is followed by Electro-deionisation (EDI) where the feed water enters the demineralization process that uses electricity and ion exchange membranes to sperate dissolved impurities (ions) from water. Demineralized water is often used for boiler feed water and steam generation. In MAPP ion-exchangers by using acids and alkalis is rare. These ion-exchangers that can affect the environment. Moreover, acids are hard to purchase. Thus, power plant uses an electro-deionization (EDI) which is a continuous, chemical-free process of removing ions.

Photo 3-22: Pipe lines enter demineralization tank

The hard water first passes through the cation exchange column subsequently passes through anion exchange column.

Photo 3-23: Entering pipe to cation column

Photo 3-24: Exit pipe from cation column and enter pipe to anion column

Water flowing out of the anion exchange column passes through the mix-ion / mixed bed (mixture of cation and anion exchange resins).

Photo 3-25: Exit pipelines from mix-ion column

The water produced meets a high level of purity, ideal for high pressure boiler water feed.

In this process, a portion of the water evaporates, while the remaining water is returned to the sedimentation tank within the water treatment system. To prevent liquid discharge from the Combined Cycle Power Plant (CCPP) into the environment and to minimize the consumption of raw water, the wastewater generated is continuously recirculated, starting from the sedimentation tank. The entire water treatment system requires 1,135 m^3 of water per day. However, due to the recirculation process, the system only needs to extract 401 m^3 of water from the river each week.

3.4.7 Water Treatment Chemicals

Power plants rely of several important chemicals to generate energy and operate at peak efficiency. The most sensitive application areas are cooling and boiler water treatment. A failure in either of these areas directly impacts the operation of the facility. A chemical storage tank is one of the most important systems in a power plant. The entire production system could shut down if the tank fails.

Chemicals use in power plant are for neutralization, removing solid particles, odour control, inhibition of corrosion and scaling, and chemical cleaning. The following are chemicals using in Ahlone CCPP.

1. Sodium Hypochloride (NaOClO)
2. Hydrochloric acid (HCl)
3. Sodium hydroxide (NaOH)

4. Sodium Hydrogen Sulfite ($NaHSO_3$)
5. RO Antiscalant (RO191)
6. PAC (Aluminium Chloride)
7. Sodium Phosphate (Na_3PO_4)
8. Ammonia (NH_3)
9. Hydrazin Hydrate (N_2Hy)
10. Corrosion and scale inhibitor (Cl 340)

3.4.7.1 Storage of Chemicals

Improperly transporting or containing chemicals can cause injuries. According to OSHA guidelines workers should be aware of unsafe practices, such as improper handling and not using proper protective gears.

OSHA's chemical storage requirements include the following basic legal guidelines

- Employees must receive a written plan and training sessions to work with chemicals
- Chemicals must be accompanied by a Safety Data Sheet (SDS)
- SDSs must be readily available

OSHA recommends workers follow certain steps to prevent hazards when storing chemicals[8]

- Keep storage areas free from clutter, explosives, and flammable conditions
- Prevent chemical storage conditions that may encourage rats or pests
- Place stored materials at least six feet from hoist ways and at least 10 feet from exterior walls
- Separate chemicals that cannot be stored together

All chemicals are stored in a safe, secure location. Hazardous chemicals are stored below eye level. Chemicals are not kept direct on the floor or window ledges or balconies. All containers are closed unless dispensing a chemical or adding to the container.

Storage of chemical

[8] https://www.osha.gov/Publications/osha2236.pdf

Photo 3-26: Storage of some of chemical

3.4.8 Effluent (wastewater) Characteristics, Treatment and Discharge

The power plant will generate effluents from various system. These include cooling water blow down, neutralized regeneration waste from HRSG blowdown, floor drains from the gas turbine and steam turbine buildings, contaminated yard drains from the transformer area, rejection from DM water etc.

Sewage and sanitary wastewater are disposed to underground septic tank and soak well system.

Floor drains from the gas turbine and steam turbine building and contaminated yard drains from the transformer area shall be treated in wastewater treatment plant before discharge.

Neutralized waste from DM Plant, cooling tower blow down and boiler blow down do not need any treatment except only dilution and retention of effluent in CMB is required before discharging outside the plant boundary.

3.4.8.1 Effluent (wastewater) Treatment Plant (ETP)

Water from occasional equipment and floor wash, service water, rejection from DM water etc. will be collected in a system of floor drains, hub drains, sumps, and piping, and routed to the facility wastewater collection system. Treated effluents are equalized in Guard Pond before reuse and recycling within the plant. Excess treated and equalized effluent will be disposed-off through plant's effluent outfall. This discharge will thus meet the permissible standards

Treated Effluent quality shall be as per the following:

pH : 6.0 – 9.0

Suspended solids : 50 mg/l

Oil and grease : <10mg/

The Effluent Treatment Plant (ETP) conceived will handle effluent from the following facilities-

- Neutralized waste from DM plant
- Cooling tower blow down
- Boiler blow down
- Waste water from the plant wash

Neutralized waste from DM Plant, Cooling tower blow down and Boiler blow down do not need any treatment except only dilution and retention of effluent in CMB is envisaged before discharging outside the plant boundary.

For wastewater from the plant wash, Treatment plant is envisaged with suitable capacity before discharging through CMB. The capacity envisaged is 20 cum/hr. The following treatment will be done in

the ETP (Figure 3-14). The process involves several stages, including neutralization, flocculation, sedimentation, and final treatment. The followings are k**ey components and steps**

- **Influent:** Contaminated wastewater enters the system.
- **Neutralization Tanks:** Chemicals are added to adjust the pH level of the wastewater to a neutral range.
- **Flocculation Tanks:** Chemicals (coagulants and flocculants) are introduced to clump together suspended particles, forming larger, heavier flocs.
- **Reaction Tank:** Additional chemical reactions might occur here, depending on the specific contaminants present.
- **Sedimentation Tank:** The heavier flocs settle to the bottom, forming sludge, while the clarified water moves to the next stage.
- **Final Neutralization Tank:** A final pH adjustment might be necessary.
- **Inclined Plate Sedimentation Tank:** Further clarification and sedimentation occur.
- **Treated Water Tank:** Clean water is stored before final discharge or reuse.
- **Sludge:** The settled solids are removed and treated separately.

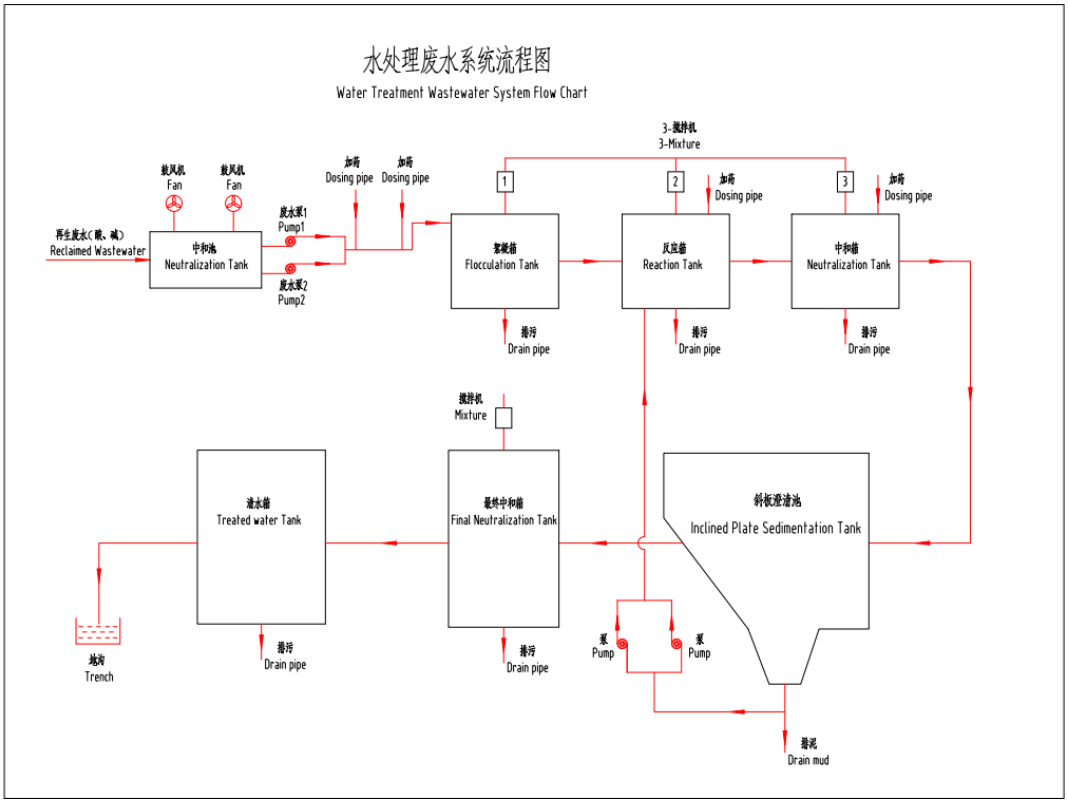


Figure 3-14: the Water Treatment Wastewater System

Additional Components and Considerations

- **Pumps:** Used to transfer wastewater between different stages.
- **Fans:** Potentially for aeration or mixing purposes.
- **Dosing Pipes:** For introducing chemicals into the system.
- **Drain Pipes:** For removing wastewater or sludge. The amount of wastewater generated from this system is anticipated to be minimal.

Potential Limitations and Areas for Improvement

Without more specific information, it's challenging to assess the system's efficiency and identify potential issues. However, some general considerations include:

- **Chemical Usage**: The type and quantity of chemicals used can impact treatment effectiveness and environmental impact.

- **Sludge Management:** Proper handling and disposal of sludge are essential. Sludge generated from Treatment plant shall be treated suitably and solid waste generated shall be disposed outside plant.
- **Energy Consumption:** Optimizing pump and fan operation can reduce energy usage.
- **Monitoring and Control:** Implementing a robust monitoring system to track water quality parameters and adjust treatment processes accordingly is crucial.

Neutralized waste from DM Plant, Cooling tower blow down and Boiler blow down do not need any treatment except only dilution and retention of effluent in CMB is envisaged before discharging outside the plant boundary.

3.4.8.2 Close Circuit Cooling System

A recirculating cooling system with induced draft cooling towers using fresh water has been adopted, which is considered environmentally friendly due to its significant reduction in water consumption. The Closed Cycle Cooling Water (CCCW) system effectively meets the cooling water needs of all auxiliary equipment for the GTG, STG, and HRSG units, including turbine lube oil coolers, generator coolers, BFP auxiliaries, condensate pump bearings, sample coolers, and air compressor auxiliaries.

While the system is designed to minimize fresh water intake and wastewater generation, a controlled discharge of approximately 206 m^3/hr of treated water is expected to flow into Harbi Creek. This discharge is carefully managed to maintain the water temperature within ±3°C of the ambient river surface temperature at the inlet, ensuring minimal thermal impact. The rigorous treatment process before discharge and the controlled temperature limit ensure that the overall impact on the river's water quality remains minimal. Therefore, the system remains environmentally sound, balancing efficient water use with responsible management of discharge.

The minimum flow in Yangon River was 2050 m3/sec, considering this mean flow. The abstraction of this project is 0.00014% of the river mean flow and the discharge is 0.00002% of the river flow. Thus, there will not be any impact on water quality and temperature from discharge. Proper care will be taken in the design of water circulation system for the Combined Cycle power plant that no contamination or waste is carried to the river via Harbi Creek. Thus, the river water will remain free from any sort of negative impact originated from the power plant.

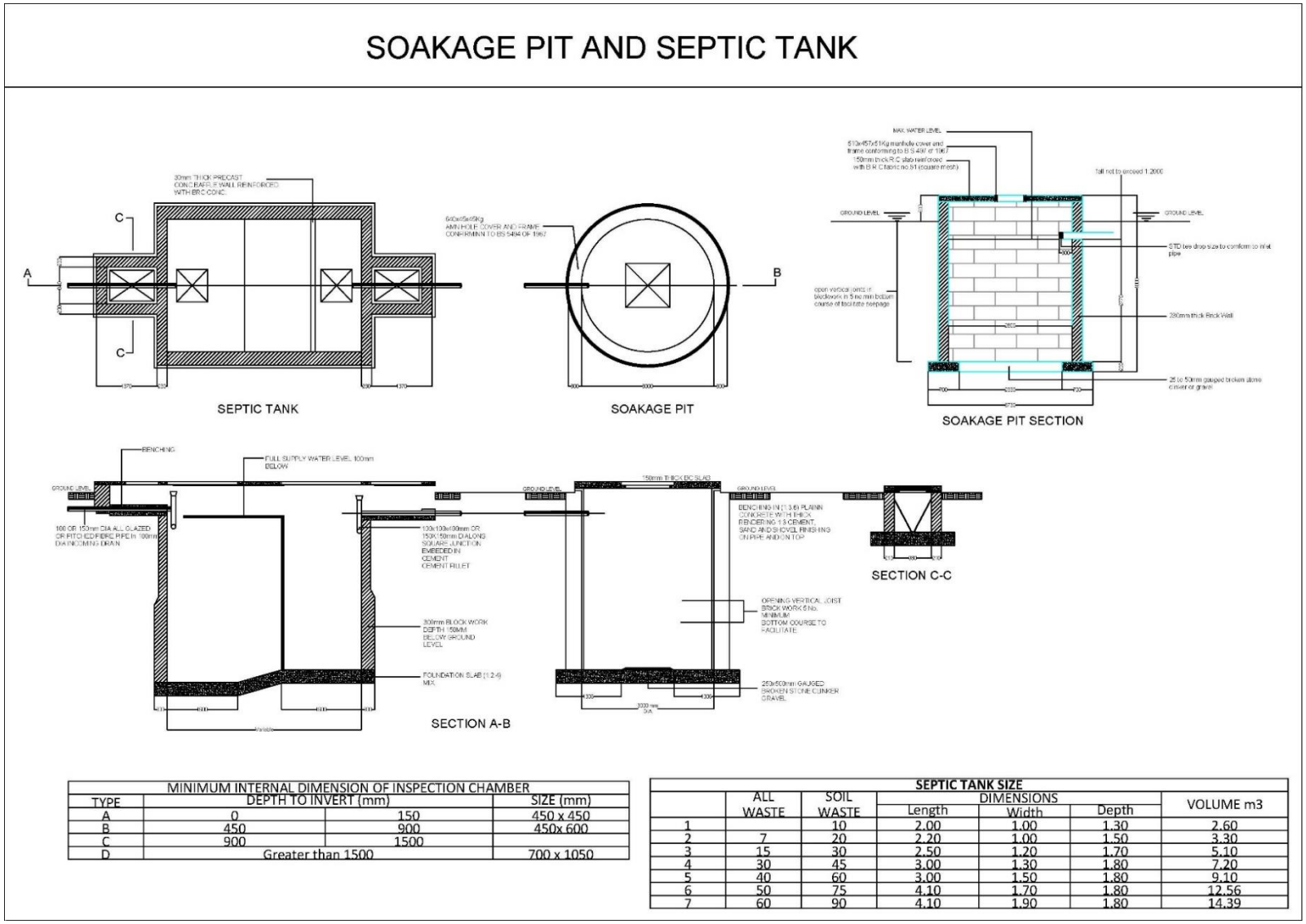
Impacts on water quality are assessed as moderate in nature and shall further be reduced to minor after implementation of Management Plan.

3.4.8.3 Domestic wastewater

The wastewater collection system will collect sanitary wastewater from sinks, and toilets facilities will be managed by the septic tank. The waste water generated from the above sources will be disposed to underground septic tank and soak well system. Proposed septic tank and soak well details are shown in Figure 3-15.

It is estimated that 15 kld (kiloliters/day) wastewater will flow from the building sewer line to the septic tank where both heavy and light solids are separated from the wastewater. Solids that are heavier than water settle out forming a sludge layer on the bottom of the septic tank. Solids lighter than water float to the top of the wastewater forming a scum layer. A liquid layer of water with suspended solids, nutrients, microorganisms, and other pollutants separates the sludge and scum. Anaerobic bacteria — those that can live without oxygen — begin to break down waste in the septic tank. As wastewater flows into the septic tank, an equal volume of the liquid layer, called effluent, flows out of the septic tank into the effluent treatment system. In a properly designed, functioning, and maintained septic tank, scum and sludge will not flow out with the effluent. While septic tank effluent may appear clear, microorganisms such as bacteria and viruses, nutrients such as nitrate and phosphorous, dissolved materials and very small particles of suspended solids are present. To protect the environment and human health, effluent must receive additional treatment as soak well system.

Solid waste is removed from septic tank every five years interval. This anaerobically digested septic tanks solid waste/sludge will be used as a soil conditioner or fertilizer provided it first tested to confirm suitability per national requirements. If the septic tank will not be constructed 100 m away than any river or tube well then, the package sewage treatment plan will be the best option to protect ground water contamination. However, the inclusion of package sewage treatment plant shall be explored during detailed engineering to be used during plant operation phase.



MINIMUM INTERNAL DIMENSION OF INSPECTION CHAMBER			
TYPE	DEPTH TO INVERT (mm)		SIZE (mm)
A	0	150	450 x 450
B	450	900	450x 600
C	900	1500	
D	Greater than 1500		700 x 1050

SEPTIC TANK SIZE						
	ALL WASTE	SOIL WASTE	DIMENSIONS			VOLUME m3
			Length	Width	Depth	
1		10	2.00	1.00	1.30	2.60
2	7	20	2.20	1.00	1.50	3.30
3	15	30	2.50	1.20	1.70	5.10
4	30	45	3.00	1.30	1.80	7.20
5	40	60	3.00	1.50	1.80	9.10
6	50	75	4.10	1.70	1.80	12.56
7	60	90	4.10	1.90	1.80	14.39

Figure 3-15: Soakage Pit and Septic Tank

3.4.9 Auxiliaries and Ancillaries

Under this project actions, it includes supporting physical structures, electrical and mechanical modules (i.e., transformers, firefighting vessel lots, fixtures, etc.), and buildings that is integrated peripherals and apparatus that is essential; for proper operation and safety of the project mission – power plant operation. They include access road, admin office, control units, parking, fences, and other infrastructure related facilities.

3.5 System Configuration and Technical Settings

Following the project components and design, this section describes major system configuration and technical settings employed in the proposed 151.54 MW capable combined cycle power plant. It involves two power generation systems operated in parallel operation inside power plant. They are –

1. Gas to Electrical Energy Technology
2. Steam to Electrical Energy Technology

3.5.1 Gas to Electrical Energy Technology

Under this scheme, the primary automation includes gas turbine, generator, and transformer. They in encased under gas compressor and gas cycle block, then generated electrical power are transmitted into power grid of MOEP for subsequent distribution to the consumers.

Gas Turbine

Figure 3-16: Gas Turbine

The project utilizes 1 e-class t gas turbine (PG9171E) along with 1 GENERATOR (QFR-135-2A) arrangement which is designed to produce up to 145 MW under maximum efficiency. The gas turbine unit is installed within an acoustic, ventilated enclosure with fire detection and protection systems. The gas turbine has all associated ancillary equipment and systems required for the safe, efficient and reliable operation of the unit under simple and combined cycle operation. PG9171E model by General Electric (GE), incorporates several noise combustion technologies and strategies aimed at reducing the

noise produced during its operation. These technologies are designed to optimize performance while minimizing environmental impact and improving operational conditions.

The gas turbine consists of a starter motor with a rated power of 1000KW, a 17-stage axial compressor, a combustion system consisting of 14 combustion chambers, and a 3-stage turbine rotor. Axial compressor rotor and turbine rotor are connected by flange and have 3 supporting bearings. The generator of the gas turbine is a synchronous generator with air cooling, three-phase, two-pole, alternating current of 3000rpm, frequency of 50HZ and solid cast iron rotor. The output power of the generator is 120MW (running at base load). The exciter is an AC exciter with rotating diode rectification, and the excitation method is brushless excitation.[9]

With Lower Heating Value (LHV) in natural gas, the turbine's efficiency could be subjected to change as shown in the table 3-4 that varies according to the product series. The full technical specification of installed turbine for proposed gas fired power plant segment is attached in the appendix.

Table 3-4: Product Specifications of E-class PG9171E turbine

9E	9E.03	9E.04
50/60	50 HZ	50 HZ
SC Output (MW)	132	145
SC Net Heat Rate (Btu/kWh, LHV)	9860	9210
SC Net Heat Rate (kJ/kWh, LHV)	10403	9717
SC Efficiency (%, LHV)	34.6%	37.0%

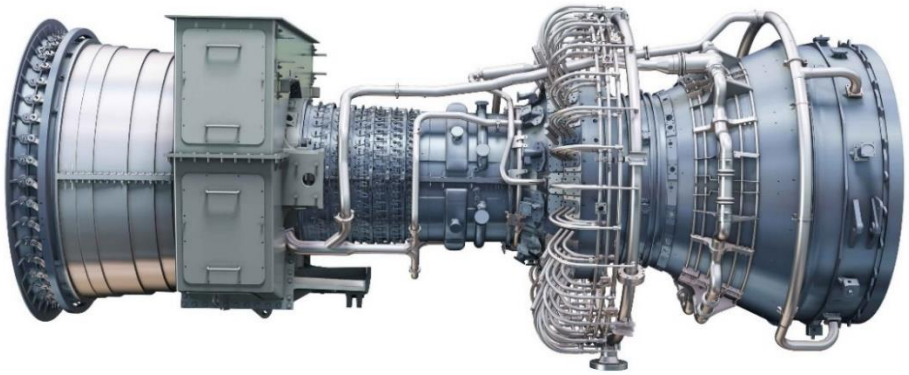


Photo 3-27: 9E.03/9E.04 Gas Turbine (50 Hz) (Source: GE)

The turbine of the shaft is attached to the QFR-135-2 Gas Turbine Generator manufactured by Shenzen Nanguang Power Co., Ltd. By means of this arrangement, 135000 KW electrical power in 60Hz 6645 Ampere is generated (photo 3-28). It has been noted that the basic power of QFR-135-2gas turbine generator is 135 MW. It will be increased by increasing of GT power when GT burning different fuel and changeable ambient temperature. Therefore, the composition of energy calorific value in natural gas plays vital roles which is fed into the system after processing it prior direct gas stream from the gas pipeline in the gas compressor block. The block enables phase separation into required channels and pressures to enhance process efficiency of the turbine in transforming chemical energy to mechanical energy. In doing so, heat evolves in the exhaust of the gas turbine during entropy of gas combustion insides (photo 3-28). The gas turbine generator is capable of operation with its exhaust gases passing into the associated heat recovery steam generator, or as simple open cycle turbine generators,

[9] https://saintwah.en.made-in-china.com/product/XQqUfDprIYRb/China-Ge-Pg9171e-9e-180MW-Ccgt-Used-in-China.html

exhausting directly to atmosphere via an exhaust gas damper and the bypass stack associated with gas turbine (30 m in height), located on the exhaust ducting upstream of the heat recovery boiler. The main technical parameters of turbine-generator arrangement are described in the table 3-5 below.

Table 3-5: Technical Parameter of QFR-135-2Gas Turbine-Generator

Generator							
Type	Power kW	Voltage V	Current A	Seed r/min	P.F	Frequency HZ	Efficiency %
QFR-135-2	135000	13.8	6645	3000	0.85	50	98.69

Exciter				Cooler		GW t
Type	Power kW	Voltage V	Current A	Capacity kW	Flow M^3/s	
TFLW459-3000A	459	435	1055	1800	41	207

Photo 3-28: QFR-135-2Gas Turbine-Generator (Specimen)

Reduction of noise

Generally, the PG9171E gas turbine, an E-class unit, is designed with noise-reducing technologies such as specialized linings and barriers within the combustion chamber and exhaust section. These materials are engineered to absorb or deflect sound waves, effectively reducing the overall noise levels.

In this project, noise primarily arises from mechanical sources during operation, including generators like the QFR-135-2A, main transformers, and other equipment. The objective of noise control is not to completely eliminate noise but to manage it so that gas turbine noise levels are compliant with regulatory standards and harmonize with the existing or estimated ambient noise levels of the surrounding area. For this project, noise levels from the turbine, generator, and other sources are targeted to be below 85 dB(A).

To mitigate noise effectively, a high-performance Critical Type Silencer were installed in the stack, offering a cost-effective solution for significant noise reduction. Additionally, the gas turbine sets, and other major noisy components were housed in acoustically designed buildings. These structures were featuring 50 mm Styrofoam insulation between 300 mm thick brick walls, providing substantial sound attenuation. Thick doors were installed, and any potential sound leakage points were sealed with soundproof materials to further minimize noise pollution.

3.5.2 Steam to Electrical Energy Technology

Heat Recovery Steam Generator (HRSG)

The steam turbine installed in the proposed projected (model- N60-5.6/0.56/527/255) offers stunning performance and efficiency for high steam powered enable combined cycle power plant and commercial applications for electric power generation, using responsive reaction propelling blades. Thus, this model set up for combined cycle steam turbines deliver performance, reliability, and high shaft efficiency for today's 50 Hz and 60 Hz applications.

HRSG consist of a casing that houses super heaters - high pressure (HP), intermediate pressure (IP) and low pressure (LP). evaporators (HP, IP and LP), economizers (HP, IP and LP), reheater sections, mounted steam drums (HP, IP and LP) and internal insulation and lagging. Gas flow leaving the gas turbine passes through diffuser and transition duct to the HRSG where the available energy converts water to superheated steam. The relatively cool gases leaving the HRSG pass through the outlet duct, stack breeching and exhaust stack to the atmosphere. Deaerated feed water enters the HRSG unit via the inlet header in the economizer sections. The economizers, consisting of fin tubes, add heat to the feed water prior to entering the steam drum. Sufficient heat is absorbed in the steam drum to raise the incoming feed water temperature to essentially saturated temperature at the steam drum pressure. Saturated water is drawn from the steam drum by natural circulation to the evaporator sections. The water and steam formed in the evaporators is then returned to the steam drum for separation. It is the function of the super heater to take the saturated steam formed in the drum and raise its temperature level as required to meet the operating conditions. The reheater utilizes the available energy to raise the steam temperature to the level required to meet the operating conditions

Steam Turbine

Steam generated by the HRSG is entering the steam turbine. The steam turbine will receive the steam supply through HP, IP and LP emergency stop valves and governing valves. The steam turbine consists of a combined HP/IP section with either one or two dual flow LP sections. The steam turbine is two casing design with a single shell, opposed flow combined high (HP) and intermediate pressure (IP) section and a two-flow low pressure (LP) section. The HP and IP sections are on one rotor, supported by two journal bearings, and utilizes impulse staging. The Generator is on the LP end of the turbine. The steam turbine has a down flow exhaust. Single shell construction is used for the combined HP/IP section. The shell is horizontally split with bolted joint flanges, and the diaphragms are directly supported in the outer shell. The HP end is supported by the front standard and the LP section rests on and is keyed to the foundation. The nozzle plate bolted in the shell and diaphragms are centre-line supported. The LP section includes a fabricated, carbon steel (like ASTM A36) hood with centre-line supported carbon steel inner casing. The low-pressure diaphragms are centre-line supported in the inner casings. Atmospheric relief diaphragms are located on the upper half to prevent over pressurization of the LP section and condenser.

Gas flow leaving the gas turbine passes through diffuser and transition duct to the HRSG where the available energy converts water to superheated steam. The relatively cool gases leaving the HRSG pass through the outlet duct, stack breeching and exhaust stack to the atmosphere.

Applying high steam pressure of the HRSG system, the turbine is capable to operate from 2180 MW to 500 MW capable generator. The technical specification of the steam turbine assemble in the proposed project is shown below figure 3-17.

Technical specifications	STF-D600
Main steam	Up to 2610 psi (180 bar) Up to 1,112°F (600°C)
Reheat temperature	Up to 1,112°F (600°C)
Frequency	50 Hz and 60 Hz
Output	180 MW - 700 MW

Figure 3-17: Technical Specification of the Steam turbine for Combined Cycle Power Plant (Specimen)

Generator

Generator Model: WX18Z-054LLT attached to the steam turbine is capable to produced 65 MW capacity in 75 MVA to 4124A in 3000 RPM for 50 Hz (photo 3-29). In stable condition, the generator has the efficiency of 80% generation capacity. The technical specification of the generator is described below accordingly. The system block diagrams are stated below sections.

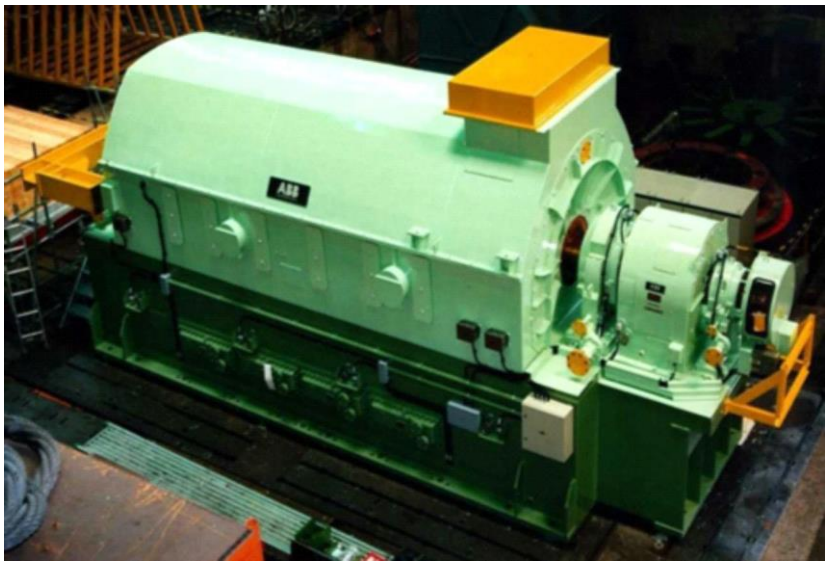


Photo 3-29: Generator Model: WX18Z-054LLT Steam Turbine-Generator (Specimen)

(1) Generator Technical Specification

1.	Model:	**WX18Z-054LLT**
2.	Rated power:	**65 MW**
3.	Rated rotary velocity:	**3000 rpm**
4.	Rotor's rotary direction:	**Clockwise**
5.	Rated power factor:	**0.85（lag）**
6.	Rated voltage:	**10.5 KV**
7.	Rated current:	**3881.3A**
8.	Frequency:	**50 Hz**
9.	Phase count:	**3**
10.	Stage count:	**2**
11.	Stator's wiring type:	**Y**
12.	Efficiency (guarantee value):	**98.42%**
13.	Short-circuit ratio (guarantee value):	**0.62**
14.	Stable I2/In	**10%**
15.	Temporary（I2/In）2t	**8s**
16.	Peak voltage	**2 times the rated excitation voltage**
17.	Allowed duration for strong excitation	**50s**
18.	Noise (1m away from outer cover)	**less than 90 dB**
19.	Cooling type	**by air**
20.	Count of terminal outgoing lines	**6**
21.	Cooling water temperature	**Temperature in design 25℃** **Maximum temperature 33℃**
22.	Temperature of cooled air	**＜ 40℃**

Photo 3-30: HRSG

Photo 3-31: Steam turbine

3.5.3 Stack and Emission Design

Environmental Protection Design Criteria

In addressing environmental concerns, the following criteria have been established for the protection and mitigation of air pollution within this project:

1. Sulphur Dioxide Pollution Control

   Given the low hydrogen sulphide content (2x10-5 mol/mol), leading to minimal sulphur dioxide emissions, the installation of a gas desulphurization system *may not be deemed necessary*.

2. Smoke Pollution Control

   The project adopts purified natural gas in the gas turbine, effectively eliminating smoke generation post-combustion. Consequently, the need for a flue gas dust removal system may be obviated.

3. NOx Pollution Control Measures

   Utilizing ultra-low carbon burners and DLN combustion technology, the project ensures that NOx emission concentrations remain below 15 ppm during the combustion of natural gas.

4. Chimney Stack for Air Pollutant Emission

   To minimize ground pollution, a chimney stack with a provisional height of Min. 40m is designated for Project Phase as of Good International Industrial Practice (GIIP)[10], accompanied by a bypass chimney of 58 m. height with necessary environmental safety benchmark provisions.

By adhering to these environmental protection design criteria, it is anticipated that the project's emissions of smoke pollutants will align with the stipulations outlined in the Emission Standard of Air Pollutants for Thermal Power Plants (GB13223-2011). The stack height is illustrated below.

Emission Load and Limit Value of Smoke Pollutants

Given the absence of nationally legislated ambient air quality standards in Myanmar, the Myanmar Ahlone Power Plant Co., Ltd is mandated to illustrate, utilizing air dispersion modelling, the plant's adherence to the World Health Organization (WHO) Ambient Air Quality Guidelines as delineated in the WBG EHS General Guidelines. The utilization of natural gas for power generation remains consistent. The air emission data, identical for the project, is detailed below, encompassing both total emissions and the limit values for air pollutants within the project.

Emission Level

Item	Unit	Values
NO_x	ppmvd@15%O_2 or mg/Nm^3, dry@15O_2	2 5
CO	ppmvd@15%O_2 or mg/Nm^3, dry@15O_2	2 5

Table 3-6: Permissible Emission and Limit Value of Air Pollutant in CCPP Project

Parameter	Averaging Period	Guideline Value	Project Gas Emission Data
Sulphur dioxide (SO_2)	24-hour	20µg/m^3	0
	10 minute	500µg/m^3	0
Nitrogen dioxide (NO_2)	1-year	40µg/m^3	-
	1-hour	200µg/m^3	50µg/ m^3
Particulate matter (PM_{10})	1-year	20µg/ m^3	-
	24-hour	50µg/ m^3	25µg/ m^3
Particulate matter ($PM_{2.5}$)	1-year	10µg/ m^3	-
	24-hour	25µg/ m^3	10µg/ m^3

[10] https://www.ifc.org/content/dam/ifc/doc/2000/2008-thermal-power-ehs-guidelines-en.pdf

Parameter	Averaging Period	Guideline Value	Project Gas Emission Data
NO_x	-	51 mg/ m^3	35 mg/N m^3
CO	-	51 mg/N m^3	35 mg/N m^3
Greenhouse gas emission	-	-	Estimate : **380,000 – 400,000** tCO_2/year

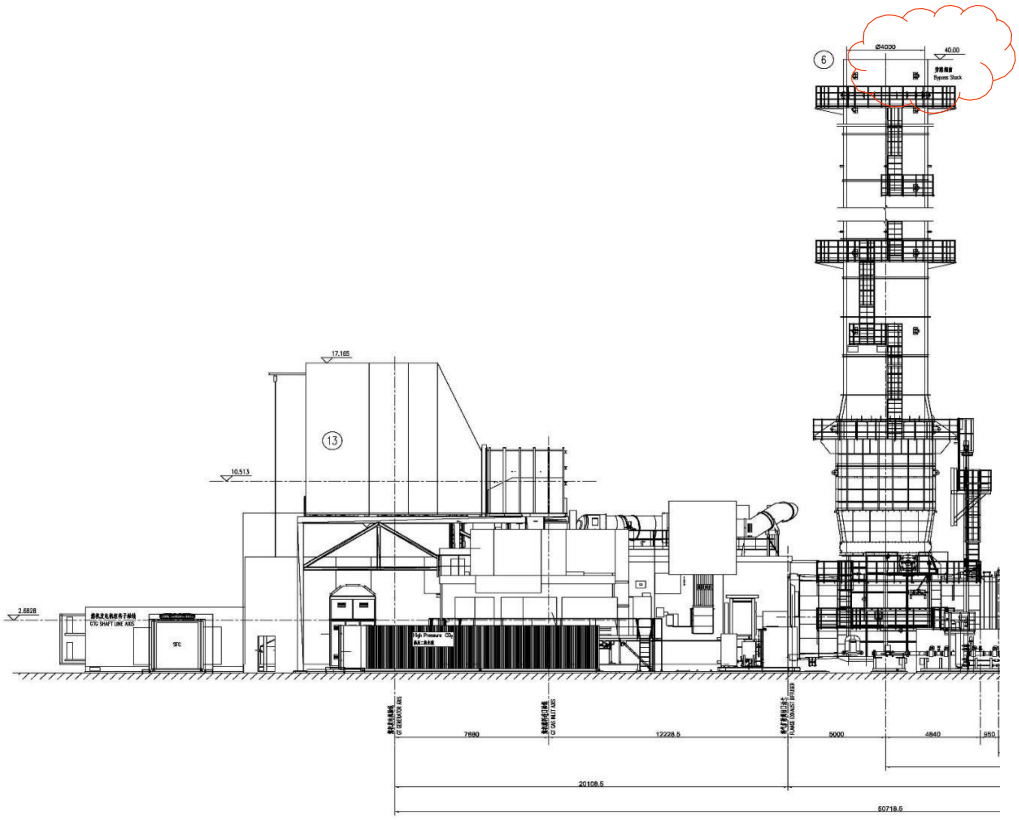


Figure 3-18: Stack Emission from Gas Generator Sets

The Compositions of Natural Gas

The project strategically employs clean natural gas for combustion, a fuel source devoid of ash generation. This conscious decision contributes significantly to the mitigation of environmental impact. As a result, the absence of ash emissions aligns with sustainable practices and underscores the project's commitment to minimizing particulate matter in the air.

This environmentally conscious approach ensures that the combustion process remains clean and in adherence to ecological standards, fostering a more sustainable and eco-friendly operation. The compositions of natural gas which is the major resource input for power generation and the molarity of gas is reported as follows.

Table 3-7: The compositions of natural gas and Molar concentration

Analysis of Natural Gas		
Composition	**Molar Concentration**	
C1 (Methane)	mol%	69.938
C2 (Ethane)	mol%	1.000
C3 (Propane)	mol%	0.168
iC4 (Isobutane)	mol%	0.018
nC4 (Normal butane)	mol%	0.031

Analysis of Natural Gas		
Composition	**Molar Concentration**	
iC5 [a volatile flammable liquid hydrocarbon $(CH_3)_2CHC_2H_5$ and one of three isomers of pentane]	mol%	0.07
nC5 (Normal pentane)	mol%	0.004
neoC5 (Neopentane)	mol%	0.003
C6+ (hexanes, and heavier components heptane, octane, nonane)	mol%	0.023
CO_2 (Carbon dioxide)	mol%	4.048
N_2 (Nitrogen)	mol%	24.756
H_2O (Dihydrogen oxide)	mol%	0.002
H_2S (Hydrogen sulfide)	mol%	0.002

With hydro-carbons compounds and nitrogen are major constituents of the gas composition, Different oxides of carbon and nitrogen are considered major concentration in emission after combustion in gas generators. Air pollutants dispersion modelling is compulsory for comprehensive impact analysis to inform potential contribution for climate change and air pollution.

Stack Height Calculation

Applying Good International Industry Practice (GIIP), stack height calculation is as follow;

$$HG = H + 1.5L$$

Where;

HG = GEP stack height measured from the ground level elevation at the base of the stack

H = Height of nearby structure(s) above the base of the stack

L = Lesser dimension, height (h) or width (w), of nearby structures

“Nearby structures” = Structures within/touching a radius of 5L but less than 800 m. Based on the section drawing show stack height in previous section.

$$HG = H + 1.5L = 25\ m + 1.5 \times 20\ m. = 55\ m.\ (min.\ requirement)$$

$$[\ Final\ selected\ stack\ height = 58\ m.\ > 55\ m.]$$

$$Environmental\ Safety\ for\ Pollutant\ Dispersion\ Threshold = 58\ m. - 55\ m. = 3m$$

Since the nearest buildings are in the north-east of the CCPP which height and lesser dimension (height or width) of the building are estimated to be 25 m and 20 m respectively, the minimum stack height should be 55 m based on the GIIP stack height emission calculation. Moreover, according to Atmospheric Impact Report of a Proposed CCPP and associated infrastructure[11], the height of main stacks and by-pass are 60m where the height of stacks above nearby building is 50m, meaning there are no high-rise buildings around the power plant which is similar to this project site.

Control of NO_x Emission

Atmospheric pollutant discharged from the natural gas generation engineering mainly is NO_x. Controlling NO_x emissions in a combined cycle power plant involves using advanced burner technologies and additional emission control systems to reduce the formation of NO_x during combustion. In this Project the multi-stage NO_x burners are used to regulate the flame temperature so as to control the NO_x emission. Such indicator is of world advance level, and satisfies the standard requirement for environmental protection.

[11] Atmospheric Impact Report on Proposed CCPP and associated infrastructure, near Richards Bay, KwaZulu-Natal Province

Multi-stage burner

Multi-stage burners reduce NOx emissions by altering the combustion process to minimize the conditions that favour NOx formation. This is achieved through several key strategies:

1. Staged Combustion

- Primary Stage: Combustion begins in a fuel-rich environment where there is less oxygen available. This limits the temperature and prevents the formation of thermal NOx.
- Secondary Stage: Additional air is introduced downstream of the initial combustion zone. This allows for complete combustion of the fuel but occurs at a lower temperature, further reducing NOx formation.
- Tertiary Stage (Optional): Some systems introduce even more air or reburn fuel in a third stage to further optimize combustion and minimize emissions.

2. Flue Gas Recirculation (FGR)

- A portion of the flue gas is recycled back into the combustion chamber. This reduces peak flame temperatures by diluting the oxygen concentration and increasing the heat capacity of the gas mixture.

3. Low Excess Air

- Using minimal excess air ensures that the combustion process remains fuel-rich in the initial stage, preventing the formation of high-temperature zones where thermal NOx is produced.

4. Burner Design

- Swirl Burners: Create a swirling motion to improve mixing of air and fuel, ensuring complete combustion at lower temperatures.
- Flat Flame Burners: Spread the flame over a larger area, reducing peak temperatures and thus minimizing NOx formation.

Photo 3-32: Ahlone Power Plant and nearest infrastructure in vicinity

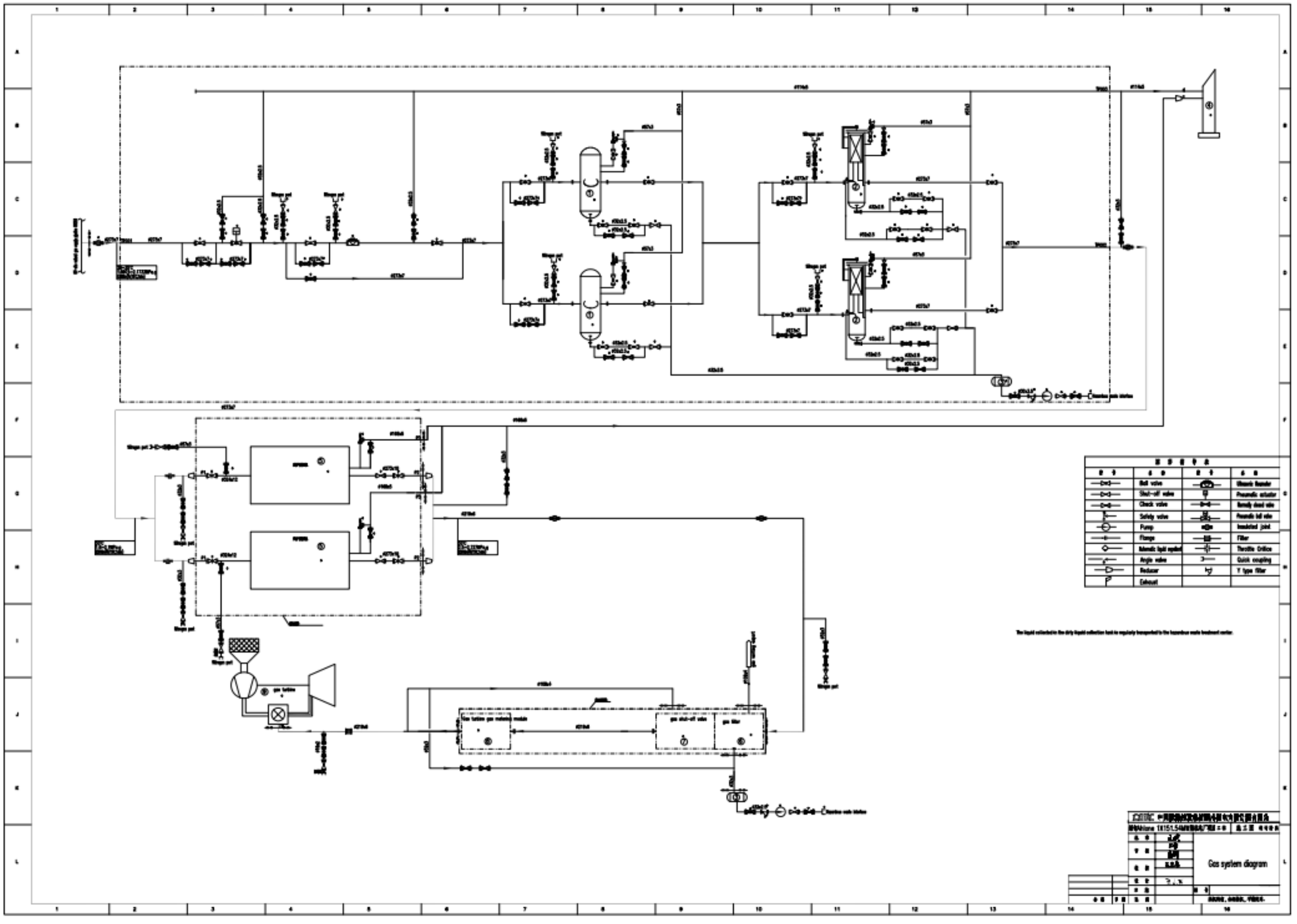


Figure 3-19: Gas System Diagram (Source: Project Developer- Myanmar Ahlone Power Plant Co., Ltd.)

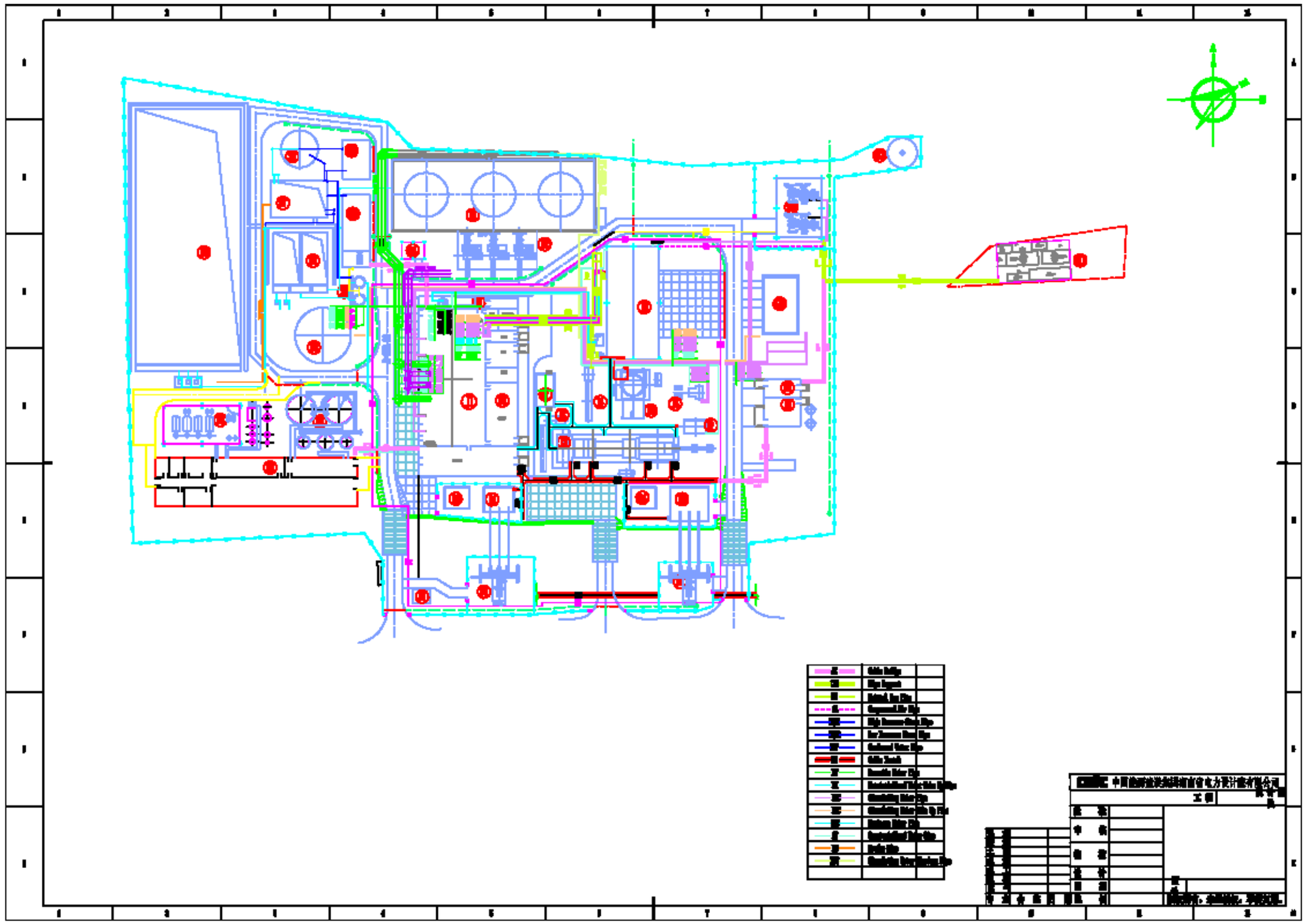


Figure 3-20: Gas pipeline Diagram (Source: Project Developer- Myanmar Ahlone Power Plant Co., Ltd.)

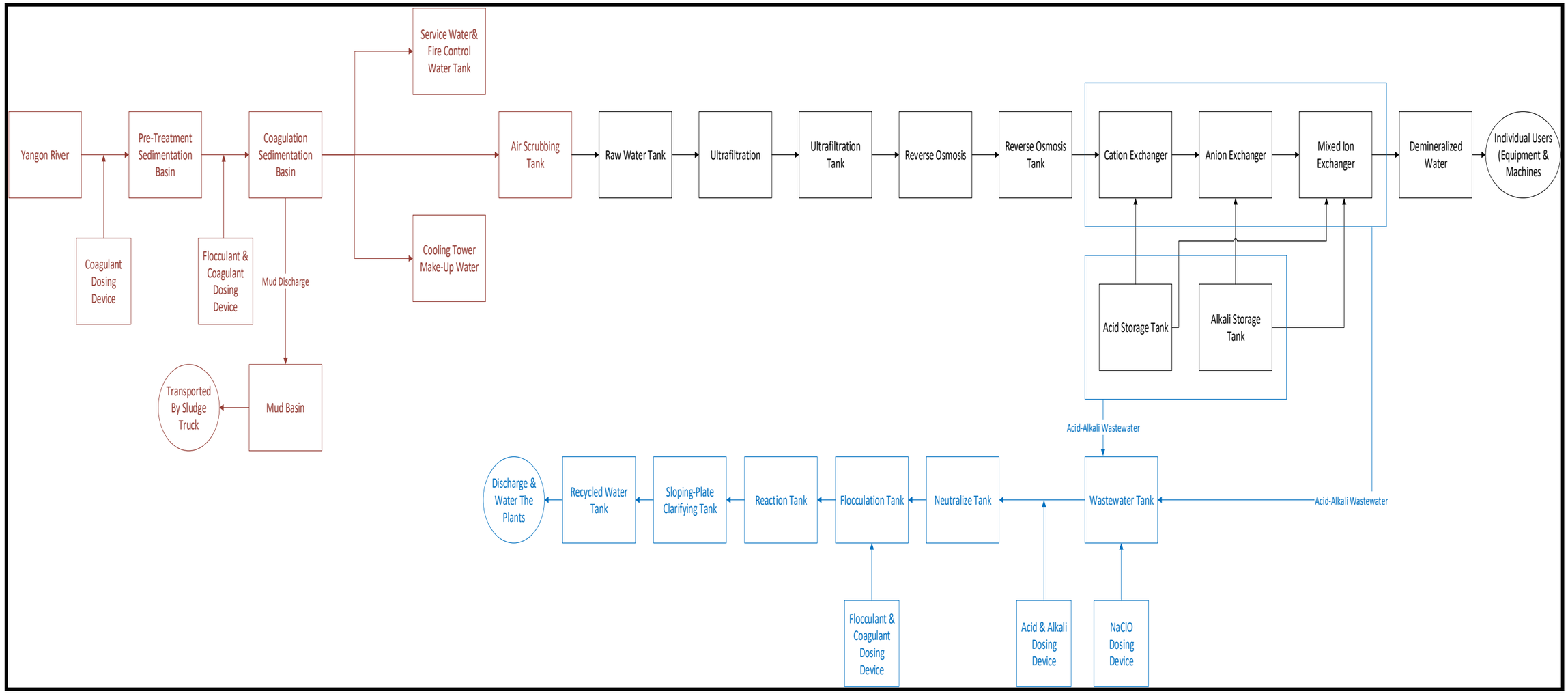


Figure 3-21: Process Flow Diagram of Water Application for Combined Cycle Power Plant (Source: Project Developer- Myanmar Ahlone Power Plant Co., Ltd.)

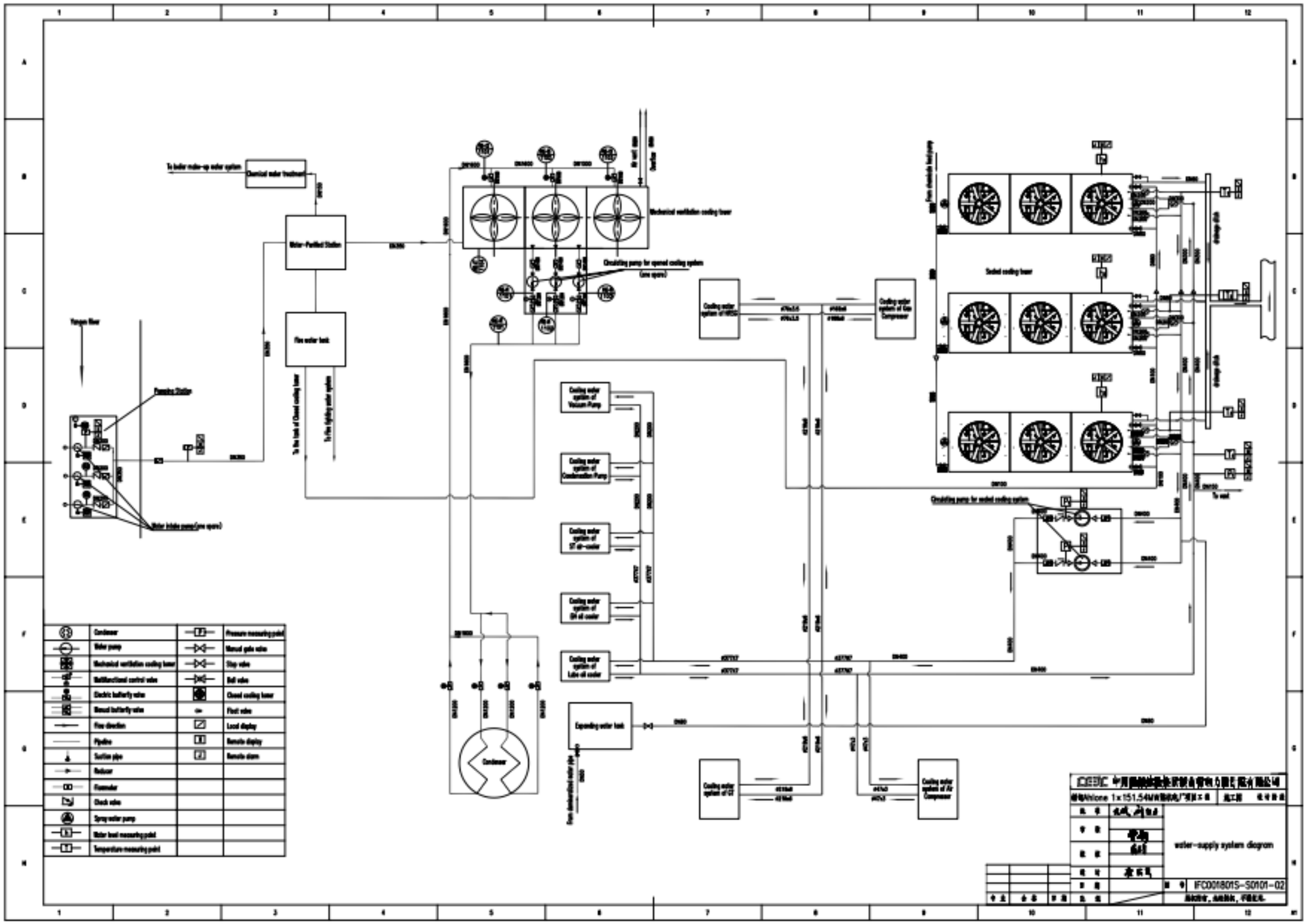


Figure 3-22: Water Supply System (Source: Project Developer- Myanmar Ahlone Power Plant Co., Ltd.)

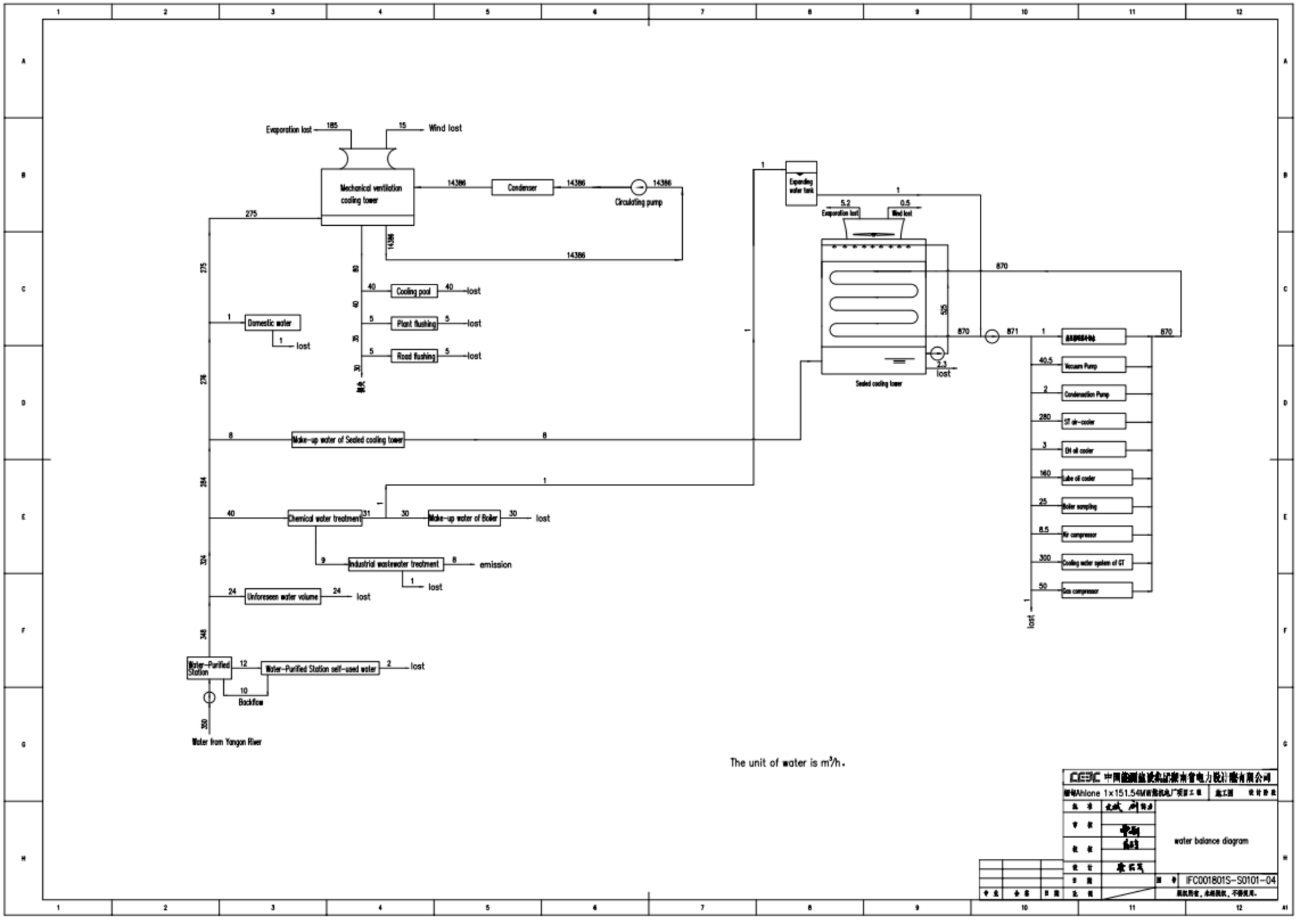


Figure 3-23: Process Water Balance Diagram (Source: Project Developer- Myanmar Ahlone Power Plant Co., Ltd.)

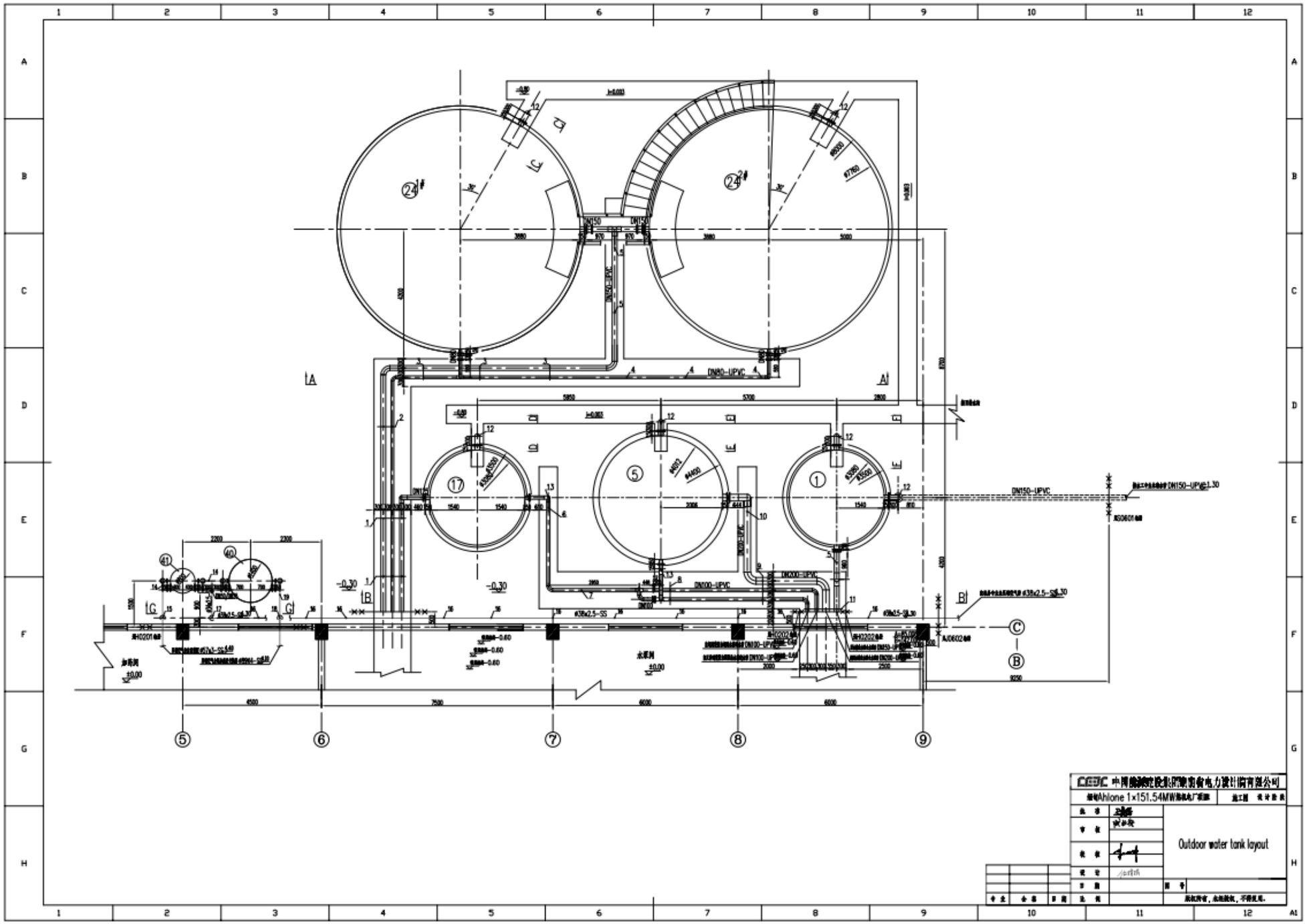


Figure 3-24: Outdoor Water Tank Layout (Source: Project Developer- Myanmar Ahlone Power Plant Co., Ltd.)

3.5.4 Continuous Emissions Monitoring System CEMS

3.5.4.1 Monitoring System for Gas Analyzer

Monitoring Device (YX-CEMS)

Gas Analyzer Control Room

Figure 3-25: Monitoring System for Gas Analyzer

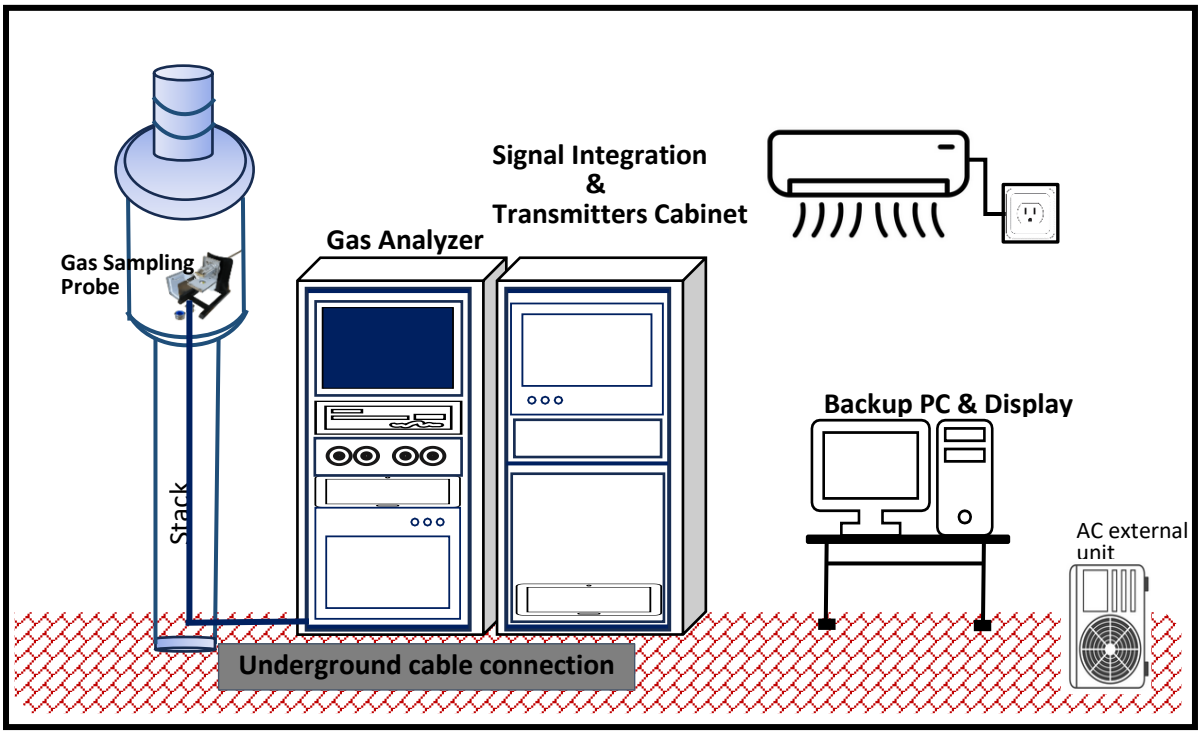


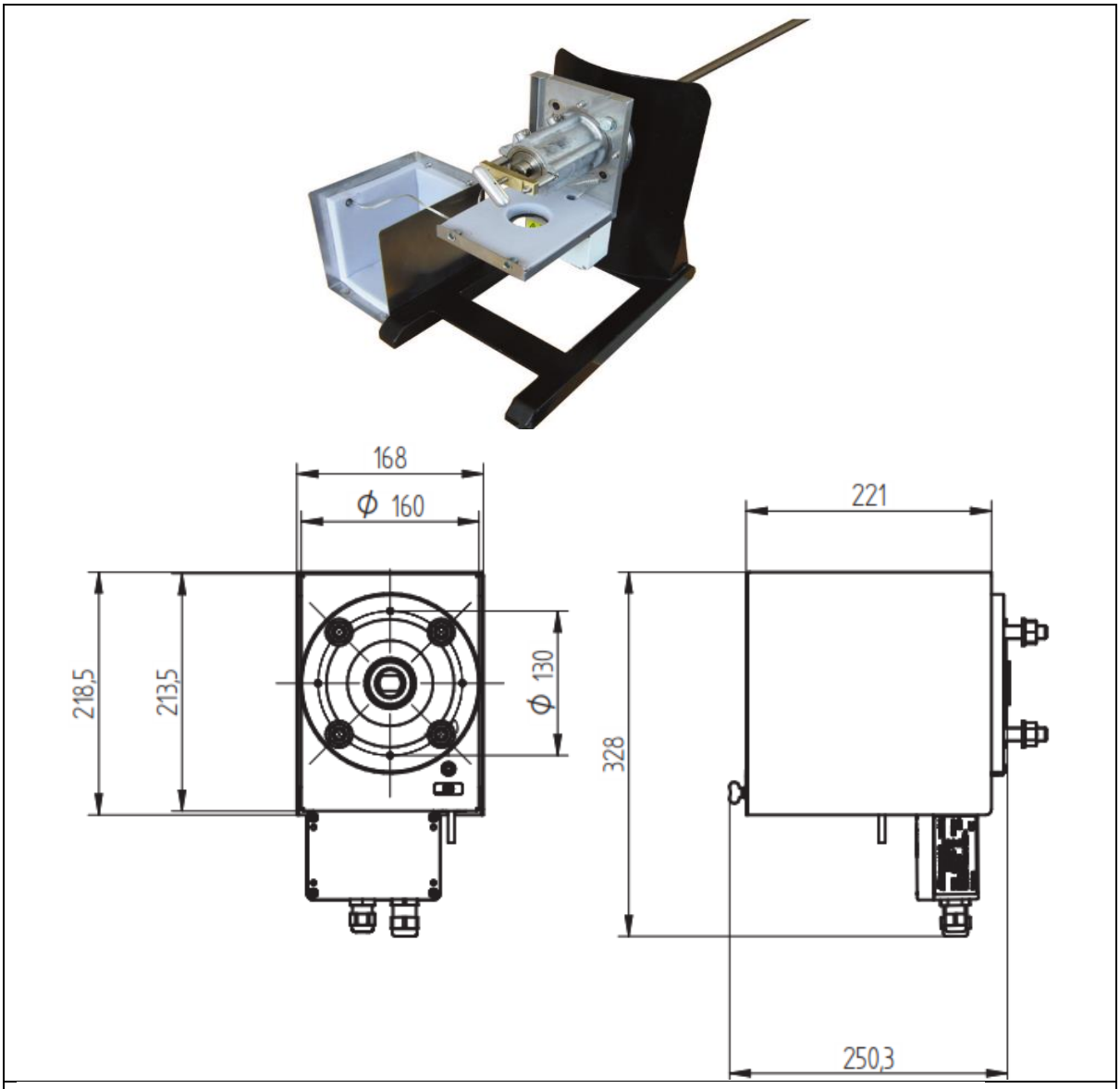
Figure 3-26: Schematic Layout Diagram of Continuous Emission Monitoring System (CEMS)

The image shows a control panel for a continuous emission monitoring system (CEMS) and gas analyzer control room which were used in CCPP. This system is designed to continuously measure and record the levels of various pollutants emitted into the atmosphere by the plant.

The YX-CEMS system comprises several key components to ensure accurate monitoring and reporting of emissions. First, flue gas is extracted from the plant's exhaust stack and delivered to the Continuous Emission Monitoring System (CEMS) analyzer. Before analysis, the extracted gas undergoes a conditioning process to remove moisture, particulate matter, and other potential interferences. Once conditioned, the gas is analyzed for various pollutants, including sulfur dioxide (SO_2), nitrogen oxides (NOx), particulate matter (PM), carbon monoxide (CO), and oxygen (O_2), with the inclusion of other pollutants as required by local regulations. The system continuously records pollutant concentrations and transmits this data to a central control room. If pollutant levels exceed regulatory limits, the system activates an alarm to alert plant operators. Additionally, the CEMS data is used to generate compliance reports for submission to regulatory agencies. By continuously monitoring emissions, CEMS systems play a crucial role in helping power plants comply with environmental regulations and mitigate their impact on air quality.

3.5.4.2 Air quality monitoring sampling system JES-301L: Overview of the system's components, processes, and procedures

The JES-301L Air Quality Monitoring Sampling System is designed to ensure accurate measurement of air pollutants through its integrated components, including sampling pumps, filter holders, and analytical sensors. The system operates by collecting air samples over specified time intervals, allowing for real-time analysis of contaminants. Procedures involve calibrating instruments, maintaining sample integrity, and following standardized protocols for data collection and reporting. This comprehensive approach ensures reliable air quality assessment, supporting compliance with environmental regulations and enhancing public health monitoring.



APPLICATION

- Representative continuous gas sampling in processes containing dust and humidity
- Extractive gas analysis
- Emission (CEMS) and process monitoring
- Removal of dust from the sample gas

BENEFITS

- No condensation or chemical reactions of sample gas
- Convenient filter replacement
- Low maintenance
- Easy start-up
- Reliable protection of the analyzer system

FEATURES

- Homogeneous heating without cold spots
- Filtration from outside to inside
- Filter element change without tools
- Self limiting PTC heater
- Temperature status contact
- Weather protection housing
- Wide range of accessories
- Calibration port (option)

Figure 3-27: Sampling System JES-301L

3.5.4.3 Gas Analyzer Emerson Rosemount X-STREAM Enhanced XEGP

The Emerson Rosemount X-STREAM Enhanced XEGP is an advanced gas flow measurement device tailored for Continuous Emissions Monitoring Systems (CEMS) in Combined Cycle Power Plant (CCPP) projects. It offers high accuracy and reliability in measuring emissions, ensuring compliance with environmental regulations. Equipped with enhanced diagnostic features and an intuitive interface, the XEGP integrates effortlessly into CEMS, delivering real-time data for improved monitoring and operational efficiency. Its robust design and cutting-edge technology make it an essential tool for effective emissions management in modern power generation facilities.

Figure 3-28: Gas Analyzer Emerson Rosemount X-STREAM Enhanced XEGP

3.5.4.3 Stack Emission

Table 3-8: The atmospheric pollution emission concentration and emission monitoring results in 2022 and 2023 in 151.54 MW CCPP (Ahlone)

Monitoring Time	Frequency	Flue Gas Volume (MMCF)	Oxygen Content (%)	Measured emission concentration(mg/m³)			Emission concentration(mg/m³) coverted to excess air coefficient of 3.5(mg/m³)			Emission (kg/h)			Chimney outlet smoke Air Blackness (Ringer the Man black Degree, Level)
				smoke	sulfur dioxide	nitrogen oxide	smoke	sulfur dioxide	nitrogen oxide	smoke	sulfur dioxide	nitrogen oxide	
2022-11-24	1st	1.576	16.0	0.9	0.298	35	1.1	0.358	42	0.79	0.25	9.7	<1
	2nd	1.563	15.7	1.0	0.267	40	1.2	0.302	45	0.84	0.22	33.2	<1
	3rd	1.567	15.7	1.0	0.333	40	1.1	0.377	45	0.83	0.28	33.4	<1
2023-12-12	1st	1.562	15.4	1.4	0.314	38	1.5	0.336	41	1.22	0.27	32.2	<1
	2nd	1.567	15.4	1.3	0.218	35	1.4	0.234	38	1.06	0.10	29.0	<1
	3rd	1.578	15.3	1.3	0.197	40	1.3	0.207	42	1.08	0.17	33.7	<1
Compliance							Reaching the standard						Reaching the standard

Results and Discussion:

Smoke Emissions: The plant's smoke emissions in 2022 ranged between 0.9 mg/m³ and 1.0 mg/m³, and in 2023 between 1.3 mg/m³ and 1.4 mg/m³. These values are significantly below the NEQ(E)G limit for Ambient air emission of 50 mg/m³, demonstrating the plant's strong performance in particulate matter control. However, a slight increase in 2023 indicates the need for continuous monitoring to ensure that emissions remain low.

Sulfur Dioxide (SO_2) Emissions: The SO_2 emissions in 2022 ranged from 0.267 mg/m³ to 0.333 mg/m³, and in 2023 from 0.197 mg/m³ to 0.314 mg/m³. These values are well below the NEQ(E)G limit for Ambient air emission of 20 mg/m³, showing that the plant effectively minimizes SO_2 emissions, potentially due to the use of natural gas, which contains minimal sulfur content.

Nitrogen Oxides (NO_x) Emissions: The NO_x emissions in 2022 and 2023 were consistent, ranging between 35 mg/m³ and 40 mg/m³, far below the NEQ(E)G limit for Thermal Power plant of 100 mg/m³. The plant's efficient combustion processes and nitrogen oxide control measures are responsible for these low emissions.

Flue Gas Volume and Oxygen Content: The flue gas volume and oxygen content in 2022 and 2023 remained consistent, with flue gas volume between 1.562 (MMCF) and 1.578 (MMCF)and oxygen content between 15.3% and 16.0%. These values reflect stable combustion conditions within the plant.

Overall Compliance: The plant's emissions for smoke, SO_2, and NO_x in both 2022 and 2023 were all significantly below the NEQG limits. This demonstrates the plant's commitment to maintaining low levels of atmospheric pollution, indicating high operational efficiency and compliance with Myanmar's regulatory framework.

The 151.54 MW Combined Cycle Power Plant in Ahlone has performed exceptionally well in controlling atmospheric pollution emissions. The emission concentrations of smoke, sulfur dioxide, and nitrogen oxides were well within the limits set by Myanmar's National Emission Quality Guidelines for natural gas-fired power plants in both 2022 and 2023. While there was a slight increase in smoke emissions in 2023, the overall emissions remained very low, suggesting that the plant is implementing effective control technologies. Continuous monitoring and proactive management will ensure sustained compliance with national environmental standards.

3.5.4.4 Monitoring, Maintenance Plan and Data Collecting Procedure for CEMS Program

Table 3-9: Monitoring, Maintenance Plan and Data Collecting Procedure for CEMS Program

No	Description		Duration Plan
1.	Monitoring Plan	Monitoring conducted by control room operator	24/7 continuous real-time emissions monitoring
		Data Collection	Twice a year Data collection will be conducted at random. The collected data will be submitted to the ECD in accordance with the requirements specified in the EIA report.
2.	Maintenance Plan	Preventive Maintenance	Per Month [testing, checking record data, cleaning, troubleshooting(if)]
		Corrective Maintenance	Foreign Technician and In-house Maintenance Team are stand by position
		Minor Maintenance	According to the requirement of Power Plant Maintenance, at that time all the system will be checked.
		Major Maintenance	after 48,000 hours machine running time major maintenace has to be proceed. At that time all the system will be maintained.
		Emergency Maintenance	When the system is breakdown not by the user fault, the CEMS system will be restarted, check and maintain.
3	QA/QC Checklist		Monthly

3.6 Project Cost

The estimated investment is 85 million USD. The sum will be to allocated on the followings;

1. Civil and structural costs
2. Mechanical equipment supplies and installation
3. Electrical and instrumentation and controls
4. Project indirect costs (labours, auxiliaries, etc.)
5. Feasibility, Engineering Studies, and compliances.

3.7 Project Summary

The following table 3-10 explains summary of the project for which project developer plans to implement for proposed scheme – 151.54 MW Combined Cycle Power Plant (Ahlone).

Table 3-10: Project Summary

Components	Description and Technical Settings
Land Use Availability	5.965 Acres
Tentative Land Use	85 ~ 90%
Gas Turbine	9 E- class turbine (Model PG9171E)
Daily Consumption	44 million standard cubic feet per day at full efficiency
Generator – Gas Cycle	123 MW (Model - QFR-135-2A).
Gas Cycle Block Structure	Steel Structure Casing Type - (25x10x4) Dimension
Thermal bypass Chamber	(10x20x55) Dimension
Exhaust Temperature	550 °C
Steam Turbine	model- N60-5.6/0.56/527/255
Generator – Steam Cycle	65 MW (WX18Z-054LLT)
HRSG	Q1089/534-169 (35) -5.9 (0.5) /512 (254)
Stack Height	58M / Exhaust Temp.: 91-98 °C
Steam Cycle Block Structure	Steel Structure Casing Type - (20x20x15) Dimension
Gas Compressor	MW-45/20-27
Condensers Fans	Air Cooled Condenser Fans and Machinal Arrangement
Condenser Facility	Reinforce Cement Concrete Construction (20x10x20) Dimension
Fuel and Hazardous Goods Storage and Application	▪ Natural Gas (Methane) dispensed by gas pipeline of MOEP ▪ HSD fuel in underground tank (1000 Litres) for backup generator. ▪ List of hazardous goods applied in the CCPP 1. Lubricants, oil and grease for automation and heavy-duty machines 2. Cleaning Agents for gas turbine blades 3. Additives for chemical water treatment processes 4. Corrosives and Inflammable solutions for consumables accessories and control devices 5. Refrigerants for air-conditioning and condensers
Main Transformers	SF10-150000/66 + SF10-70000/66
GISs	ZF-72.5/T2500-40 | ZF-72.5/T2000-40
Auxiliary Transformers	SZ11-6300/10.5 | SZ11-6300/13.8
Grid Connection	Ahlone Substation in beside project area via Underground insulated duct 200 m. away.
Chemical Water	30 T/H
Cooling Tower	5000 M^3/H
Raw Water Source	Yangon River
Pipeline Length	300 m.
Raw Water Conveyance System	GI Pipe in River water pumping system arrangement

Components	Description and Technical Settings
Intake Rate	6000 m^3/day (max:)
Outfall / Discharge Channel	Harbi Creek
Discharge Rate	2000 m^3/day **recycled into the combined system**
Site access	External – two direct access roads (one gravel and one rigid paved concrete road) linked to the strand road. Internal – Ring Road in rigid concrete pavement
Auxiliary Infrastructure	1. Central control and admin office 2. Warehouses and storage facilities for peripherals, cables, construction materials, 3. Parking Lot 4. security tents 5. Septic Tanks 6. Water tanks for firefighting 7. Access road
Major Buildings and Structures	1. Turbine houses 2. Generator houses 3. Thermal bypass Chamber 4. Heat Recovery Steam Generator (HRSG) Tower 5. Station control building 6. Air and gas Compressor building 7. Water Treatment Facility 8. Raw Water Storage Reservoir 9. Condenser and Condensate processing facility 10. Firefighting pump house 11. Water pumping station 12. Underground and overhead ducts 13. Warehouses 14. Waste Storage 15. Canteen and Rest Areas

3.8 Major Buildings and Structures

The following list of buildings and structures are to be constructed on 5.965 Acres (Approx. 24,000 m^2) project land.

Table 3-11: Major Buildings and Structures

No.	Buildings and constructions : Description	# of levels	Approx. Area (m^2)	Story height (m)	Structural Construction type
1	Steam turbine hall	1	1200	25	Steel Frame
2	Central control building	2	1800	13.5	Reinforced concrete structure
3	Natural gas treatment station	1	700	6	Steel Frame
4	Supercharged transducer room & natural gas regulating station control room	1	150	5	Reinforced concrete structure
5	Chemical water treatment plant	2	2500	7/5/9.6	Steel Frame

No.	Buildings and constructions : Description	# of levels	Approx. Area (m^2)	Story height (m)	Structural Construction type
6	Employee Wellfare Centre	5	3000	16.65	Reinforced concrete frame-shear wall structure
7	Material storage and workshop	1	800	9/4	Steel Frame
8	Administration office building	2	1800	9.25	Reinforced concrete structure
9	66kV switchyard electric building	2	150	5	Reinforced concrete structure
10	Main guard house	1	50	4	masonry structure
11	Side guard house	1	20	4	masonry structure
12.	Condenser and Condensate processing facility	1	3000	20	Reinforced concrete structure

3.9 Resources Inventories

Quantity Surveying Sheet for During Power Plant Construction

1. List of Main Construction Mechanical Equipment for Proposed Project

No.	Item name	Specifications	Max Qty
1	Air compressor	/	2
2	Bulldozer	/	3
3	Crawler crane	50t/65t/120t/250t	4
4	Electric Power generator	/	6
5	Excavator	220hp	2
6	Hydraulic static probe	/	2
7	Mixing machine	/	2
8	Static pressure machine	800t	2
9	Transportation truck	/	6
10	Truck crane	25t/50t	5

Quantity Surveying for Human Resources

1. Developer and all subcontractors Construction Management workforce

No.	Task Forces	Labor Forces
1	Administration	5
2	Commercial	3
3	Engineering	120
4	Financial	3
5	LAB	4
6	Leadership members	5
7	Others	30
8	Procurement	5
9	QA/QC	10
	Subtotal	**185**

2. Developer and all subcontractors Construction Labour (Site workforce)

No.	Sections	Workforces
1	Bar Setter	50
2	Carpenter	40
3	Concrete Worker	25
4	Helper	50
5	Operator	80
6	Others	80
7	Site Manager	5
8	Supervisor	15
9	Welder	60
	Subtotal	405

Quantity Surveying Sheet for During Power Plant Operation

1. Manpower Across Operation and Management Units

No	Depart-ments	Position	Local Employee	Foreign Employee	Working Day		Total Working Hour
					Working Day	Off Day	
1	Operation & Mainte-nance	Technicians	-	2	6	1	8
2		Skilled Engineer	2	-	6	1	8
3		Maintenance	10	-	6	1	8
4		Control Room Engineer	17	8	4	2	9.5
5		Chemical Controller	6	-	4	2	9.5
6	Manage-ment Team	BOD	-	3	5	2	8
7		CEO	-	1	5	2	8
8		Project Manager	-	1	5	2	8
9		Business Development Manager	1	-	5	2	8
10		Finance Manager	1	-	5	2	8
11		Chief Account	1	-	5	2	8
12		Accounting	1	-	5	2	8
13		HR & Admin	1	-	5	2	8
14		Translators	1	-	5	2	8
15	Operation	Drivers	2	-	5	2	8
16		Security	11	-	6	1	9.5
17		Housekeepers	3	-	6	1	8
18		Kitchen	3	-	6	1	9

2. Consumables and Raw Materials for Plant Processes

	Name	Physical State	Application(s)	Monthly dosage
Chemical for Water treatment	NaClO	Liquid	Ultrafiltration(fungicide)	220 kg
	NaHSO3	Solid	Reverse Osmosis (Reducing agent)	125 kg
	RO inhibitor	Liquid	Reverse Osmosis (inhibitor)	**150 kg**
	Na3PO4	Solid	Prevent scaling	75 kg
	NH3	Liquid	PH adjust	240 kg
	N2H4	Liquid	Oxygen removal	250 kg
	Non-Oxidizing agent (C9HCN4)	Solid	Circulation Water (fungicide)	575 kg
	Circulation Water inhibitor (LD-ZG001)	Liquid	Circulation Water	1000 kg
	PAC	Solid	Dosing sedimentation tank(coagulant)	3000 kg
	PAM	Solid	Dosing sedimentation tank(coagulant)	250 kg

3.10 Project Tenure and Schedules

The proposed project follows independent Power Purchase Agreement (PPA) model, encompassing various stages such as design, engineering, inspection, testing, supervision, commissioning, and performance testing at the project site are solely administered by project developer which is to be aligned with specified requirements and conditions. This comprehensive approach is isn adherence to the PPA Contract.

Proposed 151.54 MW Combined Cycle Power Plant (CCPP) had been designed to accomplished for fully operational at the end of November 2020. According to the presenting project scheduled provided by the project developer, the early process of pre-construction and construction activities commenced since September 2019 under the concession of Power Production Agreement (PPA) among MOEP and Myanmar Ahlone Power Plant Co., Ltd. The project is one part of energy security and sufficiency initiative launched by the state authority. The detail project action and activities are presented in the table 3-12 below.

Table 3-12: Project Implementation Schedule

151.54 MW CCGT (Ahlone) Power Plant					Qtr3 2019	Qtr4 2019			Qtr1 2020			Qtr2 2020			Qtr3 2020			Qtr4 2020		
Sr. No.	Activity Name	Start	Finish	Project Duration (days)	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	TOTAL	15-Sep-19	10-Nov-20	422																
1	Sign LOA		15-Sep-19	1																
2	Survey	15-Sep-19	15-Oct-19	31																
3	Design	30-Sep-19	05-Jul-20	279																
4	Switch cabinetand other electrical control equipment procurement	30-Sep-19	31-Jan-20	124																
5	DCS equipment procurement	19-Nov-19	10-Jan-20	53																
6	GT dismantle & packaging	05-Oct-19	28-Nov-19	55																
7	ST dismantle & packaging	08-Nov-19	27-Dec-19	50																
8	HRSG dismantle & packaging	09-Nov-19	13-Feb-20	97																
9	Transformer dismantle & packaging	12-Nov-19	26-Dec-19	45																
10	Auxiliary System dismantle & packaging	12-Nov-19	25-Dec-19	44																
11	Equipment transportation & customs clearance	20-Dec-19	15-Aug-20	239																
12	Civil work	01-Nov-19	24-Oct-20	358																
13	Installation	30-Jan-20	31-Oct-20	275																
14	Commissioning	09-Sep-20	05-Nov-20	57																
15	COD		10-Nov-20	0																
16	**EIA processs Comissioned date***	10-Aug-20	Apr-Aug-21	180																

N.B*: EIA process subjected to change based on processing time and peer review processes.

3.11 Project Alternatives

The consideration for alternatives plays as an important role when weighing among environmental cost and sustainability of the projects. Regarding the energy sector, there three major categories (i.e., location/site, technology, and No-project) associated to current project.

3.11.1 Location Alternatives

Since gas is supplied from offshore oil field, Yadana block located in the gulf of Martaban, the gas pipeline traverses through Pyapon, Dedayae, Kawhmu, Twante townships of Ayeyarwady and northern and western districts of Yangon region. It is; therefore, an option is available to develop new power plant within these districts where the gas pipeline passes through. The state gas pipeline network is presented in the figure 3-29 below.

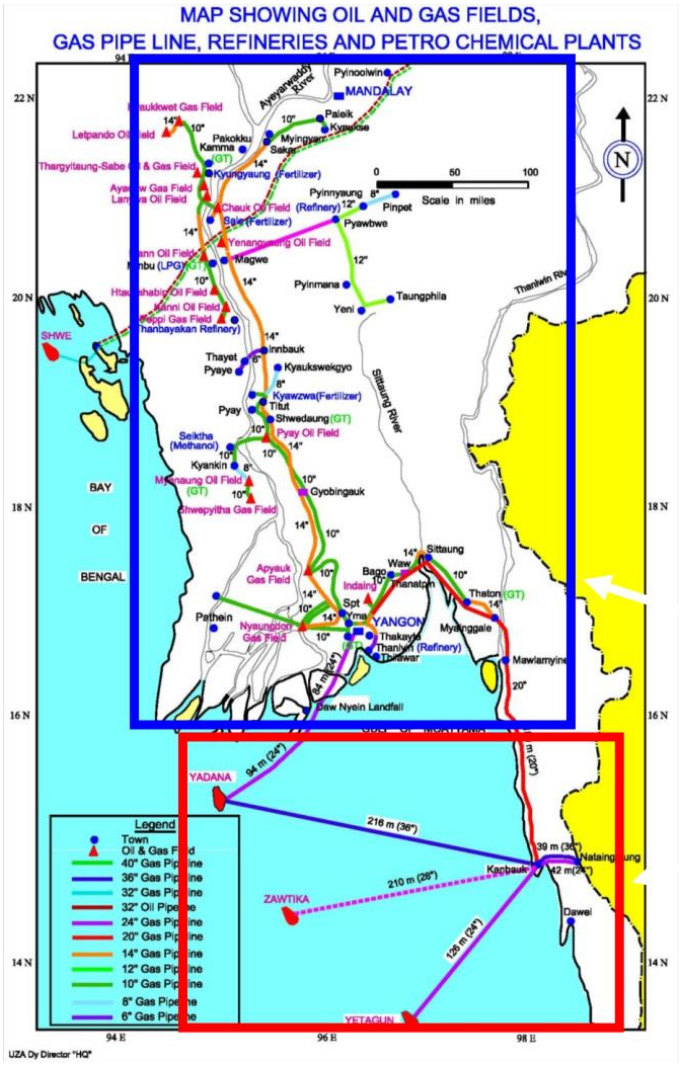


Figure 3-29: Nationwide State Gas pipeline (Source: MOEP)

Since Ministry of Electric Power (MOEP) leased its land to project developer for project implementation inside ministry's Ahlone power plant and utility premises. And natural gas supply is easily accessible from state gas pipeline and network. Land acquisition and new pipeline development is eliminated. These advantages further assist project developers with the burden of land acquisition and project related issues if project site is positioned even favourable location where gas pipeline exits in the vicinity.

Moreover, with the designated plant site is located on the bank on Yangon River (Hlaing), natural gas could be supplied by means of maritime transport in Liquified Natural Gas (LNG) ships and tankers. This creates added option to deliver resource input and logistic for power plant development and operation.

However, there is the limitation to the project land. On current land areas 5.965 acres, future extension is impossible as the expanse of the land is only applicable and allowable for maximum 151.54 MW. The neighbourhood is fully saturated with commercial and industrial zone. The location of proposed project inside Yangon region is stated in the figure 3-30 below.

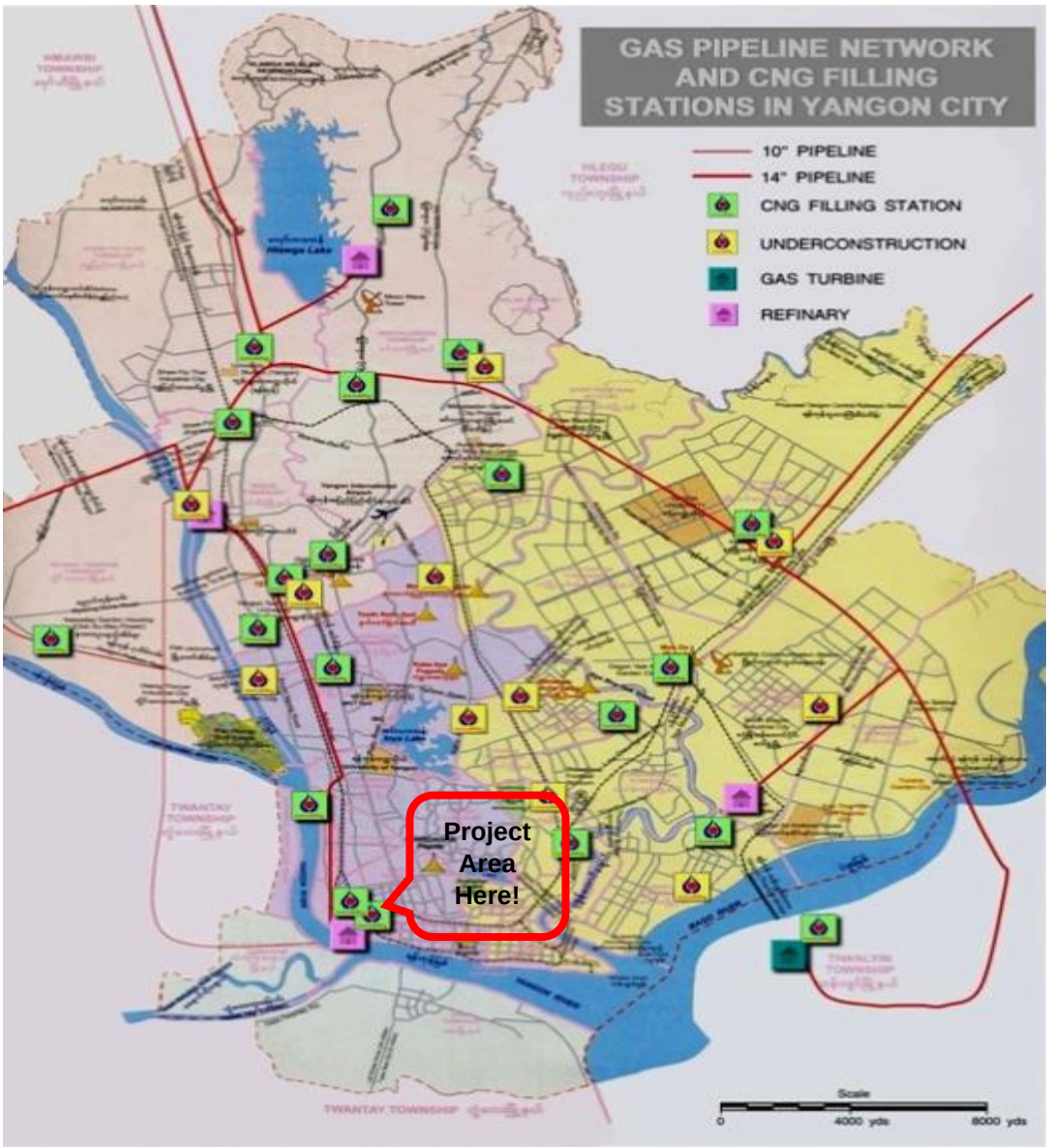


Figure 3-30: Natural Gas outlet and Pipeline network inside Yangon Region (MOEP)

3.11.2 Technology Alternatives

There are several options available for project developer with regard to technology applied for electricity generation from natural gas. The strength and weakness of each respective mode is presented in the table 3-13. The followings are major technologies applied in energy generation.

1. Combined cycle gas turbines
2. Conventional gas boilers with steam turbines
3. Open cycle gas turbines, and
4. Reciprocating gas engines.

Based on evaluation upon these 4 technologies, combined cycle process is Best Available Technology (BAT) that offers highest efficiencies with minimal drawbacks for electricity generation in power plant. The arrangement system for heat recovery, cooling, gas preparation, and stack is also subjected to change based on technology choice.

Table 3-13: Comparison of Technology for Electricity Generation from Natural Gas

No.	Comparison of Technology for Electricity Generation from Natural Gas			
	Technology	**Principles**	**Strength**	**Weakness**
1.	Combined Cycle Gas Turbines *[Selected in this Project because of eco-friendly and cost effective].*	Two E-class gas turbines with heat recovery steam generators and steam turbines	Currently Best Available Technology (BAT). Highest efficiency in thermodynamic results Moderate flexibility and system configuration.	High maintenances costs. Complexity control in thermal and gas.
2.	Conventional Gas Boilers with Steam Turbines *[Avoid because of Obsolete Technology]*	Single gas combustion and steam activation	Traditional technology Economy in capital and running cost.	Poor thermodynamic efficiency and high emission. Needs more staffs in operation. Slow Start-up time
3.	Open Cycle Gas Turbines *[Avoid because of Inefficiency for Cost- Benefit Analysis]*	Multiple F-Class Turbines F-class: Aeroderivative with cross feed technology	Minimal operating staff High start-up and flexibility Minimal stable generation Low emission	Expensive High maintenance cost High fuel consumption with low efficiency
4.	Reciprocating Engines *[Avoid because of Inefficiency for Cost- Benefit Analysis]*	Multiple Slow Speed Engines Integration	Highest flexibility and start-up time Lowest minimum stable generation Low operation and maintenance costs.	Waste heat energy for Boilers Very high exhaust emission. Poor combustion efficiency Low engine lifespan High space required.

3.11.3 No project – Alternatives

Under this scenario, there will not be both beneficial and detrimental impacts associated to the project. When sustainability and energy security to pledge 15% annually increasing electricity demand is concerned, the commissioning state run 151.54 MW Ahlone power plant in 3 sets - GE Frame 6 and ABB C 63 steam turbine is soon to be expired and power deficit encounters in the region. The consequence would slash economy and productivity in the region. With proposed project implemented on vacant land for expansion, project benefits are optimized, and adverse environmental impacts are realistically minimized.

3.12 Analysis of Alternatives

Site Description

Apart from fulfilling the existing environmental guidelines as per ECD of MONREC, one of the utmost priorities is to identify the potential alternatives for the site(s) as well as technological aspects.

Selection of potential sites for power plant operations depends on availability of land, transmission facilities, accessibility in transportation, and proximity to fuel, water sources, and infrastructural and power evacuation facilities.

The present land for the proposed 151.54 MW gas base CCPP has been allotted by MOEP. The present land is owned by MOEP and has been earmarked for development of power plant only. The site has distinct advantages in respect of the following:

- ✓ Availability of land
- ✓ Rail/road accessibility
- ✓ Availability of fuel and proximity to source
- ✓ Availability of water and proximity to source
- ✓ Proximity to the grid for evacuation of power
- ✓ Environmental consideration
- ✓ Rehabilitation & Resettlement issues

3.12.1 Site Suitability

No major impact on environmental conditions around the Site location. Myanmar Ahlone Power Plant Co., Ltd finally decided to establish the Power plant at State owned Ahlone Utility compound where already other power projects are in operation, Project Location is suitable for the proposed LNG based CCPP at Ahlone township. Site suitability has been described in following section.

3.12.2 Land

Land is acquired by the MOEP for the Power projects. Ahlone Township is a densely populated country due to which land cost is generally very high and acquisition is a serious concern if the land is inhabitable. No other land area in this district is suitable for the setup of power plant since it is away from the urban setting.

3.12.3 Accessibility

The site location is 0.3 km away from the heavy container corridors beside strand road of Yangon city. But since accessibility of the road network from the regional road network to the project site requires much of strengthening of roads and bridges, transportation of the heavy equipment through construction jetty is an alternate cost-effective option.

3.12.4 Fuel

The fuel proposed for this project is primarily Natural gas and RLNG. The gas requirement for 151.54 MW CCPP is about 130 mmsc fd at 100% loads & 110 mmscfd at 85% load respectively. The fuel (LNG) will be brought to the site through existing gas pipeline network. It is found that natural gas to the existing power project site consists of pipelines with gas supply from State gas pipeline.

3.12.5 Water

The main source of water is from Yangon River. For the project operations, water will be needed for Cooling water system for steam condenser. This system in a power station is the largest consumer of water.

Cooling water for STG & HRSG auxiliaries, compressors, A.C. System etc. Cooling of Gas Turbine auxiliary equipment. Make-up water for power cycle (HRSG make-up). Other auxiliaries like service and make up water. The fresh water requirement envisaged for the project is around about 300 – 350 cum/hr with closed cooling water system. It is identified that the demand of water will be fulfilled through Yangon River adjacent to the site location.

3.12.6 Resettlement and Rehabilitation

The project site is located on a government land which has pre-existing power plants. The land doesn't belong to any individual or personal owner; hence requires no R&R consultation or component.

There are two other projects adjacent to the site and there is no better ground in sight for the power plant project at this moment. The project aesthetic looks are modern and environment compatible, the site is environmentally acceptable. Currently, there are some existing power plants at the area and the site area has been developed for power hub of MOEP. Therefore, the project site is suitable for the proposed Ahlone Power Plant 151.54 MW Combined Cycle Power Plant. For the project, Myanmar Ahlone Power Plant Company Limited has proposed LNG based combined cycle power generation technique with latest available modern technology to maximize the efficiency of power generation process. So, there is no logical need to investigate alternative sites or alternative technology. The summary of analysis undertaken to other perspective are presented in the table 3-14 below.

Table 3-14: Alternative Selection

Sr. No.	Site Selection options	Selection Criteria			Remarks
		-ve.	Neut.	+ve.	
1.	Site Suitability			☑	Allocated plant for power
2.	Land			☑	Developed land
3.	Accessibility			☑	Built access road
4.	Fuel			☑	Clean fuel, Natural Gas
5.	Water			☑	Near to river
6.	Electric power Transfer			☑	Built in projects for other
7.	Resettlement & Rehabilitation			☑	Not an issue
8.	Technological options			☑	The best available technology from techno commercial point of view is considered.
a.	Combined cycle operation			☑	More efficient
b.	Close loop cooling			☑	No thermal pollution highly
c.	Turbine selection of low NO_x and H class highly efficient turbine			☑	Efficient compared to conventional one.

4. DESCRIPTION OF THE SURROUNDING ENVIRONMENT

Introduction

This Chapter presents environmental settings (i.e., immediate surrounding and ambient atmosphere) pertinent to proposed project site. The context includes existing secondary data and information applicable to the project and newly collected primary data from multiple site visits, consultation meetings and interviews. The understanding to the description of the environment assists in effective scoping to conductive compressive and insightful assessment for environmental impact assessment report. Table 4-1 summarizes major characteristics of existing environmental settings divided into key environmental compartments and source of information.

Table 4-1: Environmental Data Source and References

No.	Characteristic	References/ Sources
1.	Climate	Dept. of Meteorology/ Weather-data.org/Meteoblue
2.	Topography	Dept. of Geology
3.	Geology and Hydrogeology	Dept. of Geology
4.	Land Use	YCDC & IGC (Myanmar)
5.	Water Quality	MSR, YCDC & IWMI
6.	Ambient Air Quality	MSR
7.	Noise	MSR
8.	Soil	MSR
9	Flora and Fauna	MSR
10.	Socioeconomic Profiles	MSR

4.1 Study Limit of the project

An area, covering a 3-km radial distance from the Project Site, is considered as the study area for the purpose of the baseline studies in which area of influence is taken for radial distance for *1 km as immediate or primary* target and *3 km is as secondary* concerns as environmental impact assessment. A study limit area is shown in google map (figure 4-1).

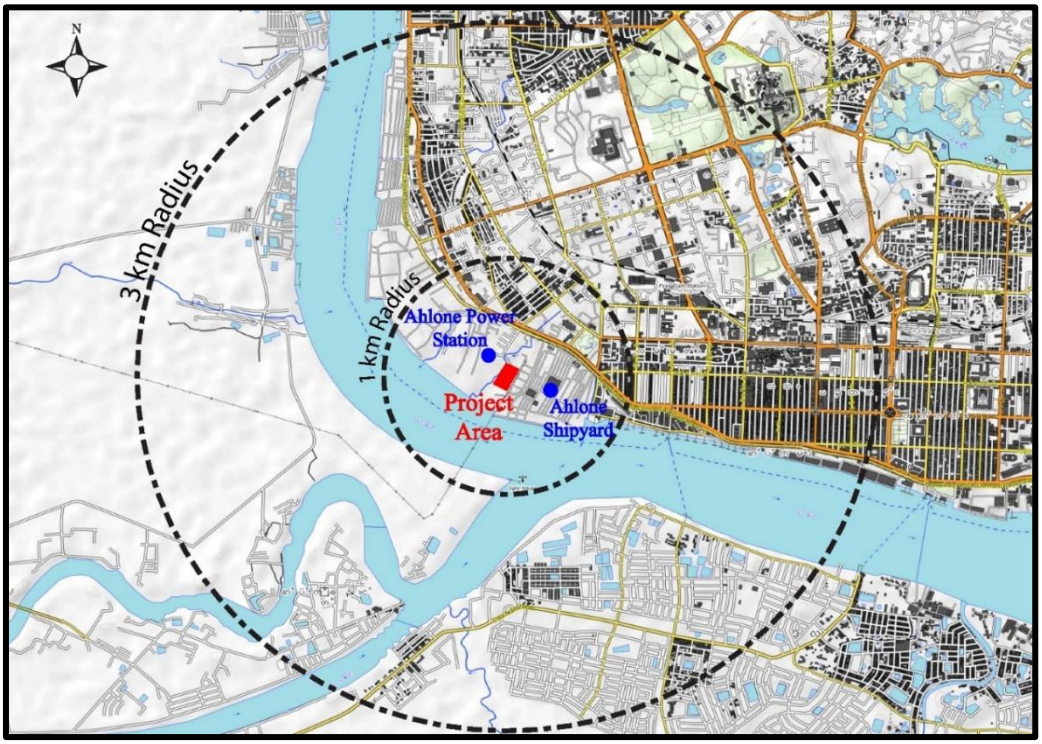


Figure 4-1: Google Earth Map Description for 1km and 3 km radial distance from the Project Site

Since all phase of the project related activities will be the major attributes to the environmental compartments, MSR study team emphasises primary potential environmental impacts within the project area (5.965 acres) is set 1-3 Km radius for surrounding environment study. All possibilities for environmental impacts incidence derived from the project during (1) Pre-Construction (2) Construction, and (3) Operation and Maintenance are to be anticipated from spatiotemporal to frequential prospect with regard to physical, biological and social standpoints. The delineation of boundary limit discloses the potential receptors that could either directly or indirectly confront with the environmental and social consequences of the project. Therefore, the eligible inventories within ambient host environment and those concerned parties are to be contemplated into environmental management and monitoring action of the full EIA report. At the meanwhile, the scoping exercises is the result of:

(1) Site visit and landscape evaluation
(2) Accessible Secondary data (desktop study)
(3) Project proponent's corporate data
(4) Regional and Provincial Indices or indicators, and
(5) Presumptive risk assessment (both human and ecological risks)

The socioeconomic impact study involves township profiles to both Ahlone and satellite townships of Ahlone; immediate receptor nearby which exist inside 1 km. radius envelop. For the scoping and further EIA report, the preliminary meetings had been held with the inclusion of stakeholders and residence living nearby and concerned authority. Their feedbacks and consent to the proposed project is stated in the later part of this scoping report.

The physical and biological probe concentrates within the primary project boundary and on its resultant study limit from the project site of 1-3 Km radius as area of influence. Nevertheless, the combination of the impacts triggered by the social and anthropogenic sources of the project is not limited to project area only. Thus, the provisional measure as an addition to the elevated scope is integrated in the scoping exercises and EIA for the gesture of upholding environmental conservation and eco-tourism concepts.

Beside underlining environmental impacts arisen from project implementation and operation, the study considers the air pollutants dispersion scenarios and hydrological features (i.e., creeks and stream) that will be potentially subjected to alter surface runoff pattern, flow regime and retention of the stream catchment as the result of land use changes and emission from the stack of the power plant alike. The design for drainage system for the conveyance of storm and domestic wastewater is also taken into account of water budget issue. Furthermore, the waste production, containment, and abatement from each stage of the project implementation is also to be considered in this scoping process.

4.2 Description of Surrounding Physical Environment

Designated combined cycle power plant is located inside state utility power plant facility of Ahlone township of Yangon Region. Leased and positioned within 6.5 acres site compound of Ministry of Electric Power (MOEP) which is at No. 39, Kanar Road, Saw Yan Paing Quarter, Ahlone Township, Yangon, Myanmar. In the immediate vicinity, it is encompassed by 230 KV Primary Substation, existing 154.2 MW capable state-run power plant and 121 MW capable Combined Cycle Gas Turbine (CCGT) power plant operated by Independent Power Producer (IPP), TOYO THAI Power Myanmar Co., Ltd., water treatment plants for boilers, and sparsely populated slums and staff's housings.

To the farther distance extent, there exists Myanmar Industrial Port (MIP) in the east, warehouses, and newly emerging ports of Myanmar Economic Corporation (MEC) in the west, densely populated Ahlone township in the north and Yangon River in the south. To sum up, the project site is in adjacent of state-run power plant on its vacant land in which this proposed 151.54 MW capable combined cycle power plant of Myanmar Ahlone Power Plant Co., Ltd. emerges as another Independent Power Producer (IPP) in parallel to TOYO THAI's plant. Location map of project site is shown in the aerial photo 4-1 below.

Photo 4-1: Surrounding Physical Environment of Projected CCPP (Aerial Photo)

4.3 Description of Ambient Atmospheric Physical Environment

This section presents atmospheric and meteorological conditions that is relevant to the project. Although they are wide-ranging to relate with the specific site of the proposed project, the understanding to these information helps to pinpoint crucial environmental issues associated with the project actions and activities that are in closed relationship with ambient atmospheric conditions.

4.3.1 Climate

Yangon region has a tropical monsoon climate under the Koppen climate classification system. The city typically experiences a distinct rainy season from the month of May through to October when a substantial amount of precipitation occurs; and dry season which commences from November and ends in April. During a year, average temperature is 27.3 °C/ 81.1 °F. The hottest days are between February and May, with little or no rain. At the end of this season, generally from March to April, the average monthly temperature reaches the upper 30°C. The average temperatures in Yangon region range from 24°C to 36°C in April during the hot season and it ranges from 18°C to 32°C in January during the cooler season.

4.3.2 Rainfall and Relative Humidity

The seasonal and annual rainfall patterns in Yangon, Myanmar exhibit distinct variations throughout the year. The data provided by Worldbank Climate Central repository indicates that the region experiences a notable wet season, with the highest precipitation occurring from May to September. This period corresponds to the southwest monsoon season, during which Yangon receives substantial rainfall, reaching its peak in July and August. Conversely, the dry season, spanning from November to April, is characterized by significantly lower precipitation levels. The annual rainfall in Yangon demonstrates a clear seasonal contrast, with a pronounced concentration of rainfall in the wet season and notably drier conditions during the dry season. This pattern aligns with the typical monsoonal climate experienced in many parts of Southeast Asia, contributing to the distinct seasonal variations in rainfall observed in Yangon, Myanmar. The illustration for Yangon Climate and Precipitation are described below.

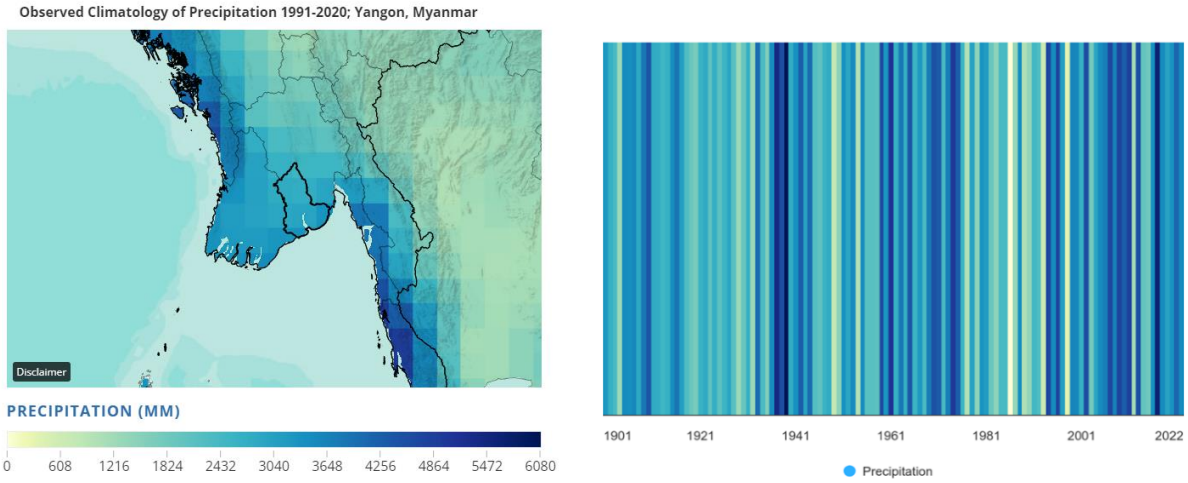


Figure 4-2: Climatology of Precipitation 1991-2020 Yangon, Myanmar (Source: data.worldbank.org)

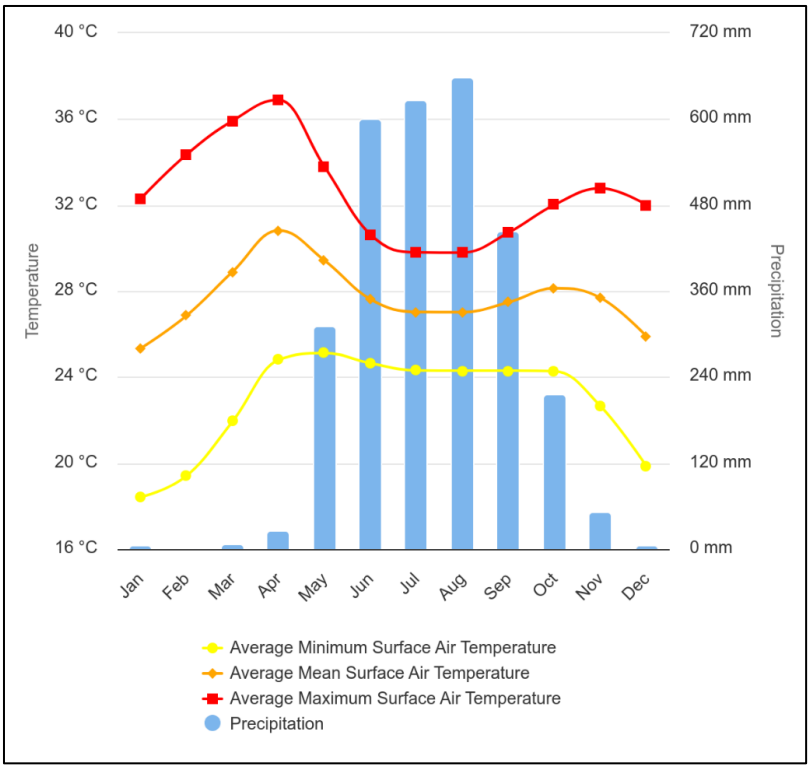


Figure 4-3: Precipitation and Humidity Correlation (1991–2020) of Yangon, Myanmar (Source: World bank)

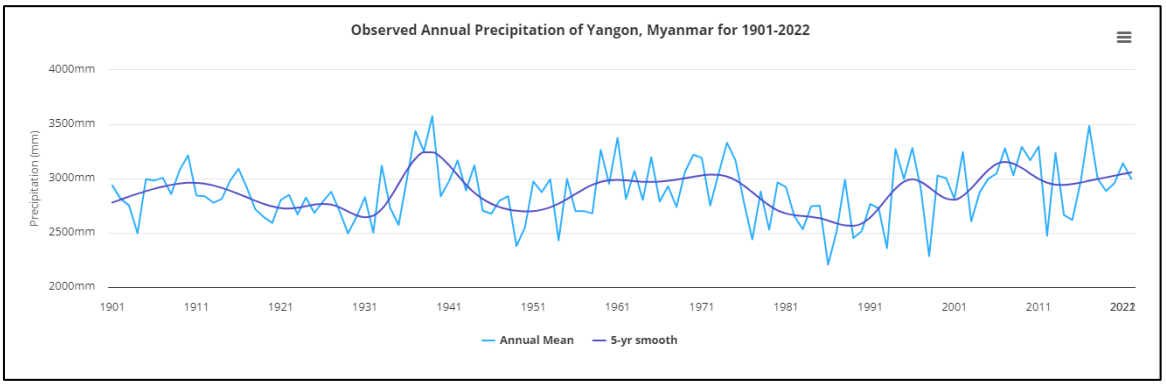


Figure 4-4: Line graph of monthly Climatology of Yangon, Myanmar. (Source: World bank)

The recent most climate information of climate-data.org and climate change knowledge portal are also quite resembling those accessible year Meteorology data of Department of Meteorology and Hydrology of Myanmar. Knowing these climatic data, the possibility of extreme precipitation (torrential rain) could be envisaged lest inundation and flash flood could be eliminated. The monthly ambient temperature variation is illustrated below.

Table 4-2: Monthly Temperature and Climate Variation of Yangon Myanmar (climate-data.org)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Nov	Oct	Dec	Year
Record high °C (°F)	37.0 (98.6)	41.0 (105.8)	42.0 (107.6)	43.0 (109.4)	42.0 (107.6)	37.0 (98.6)	35.0 (95.0)	35.0 (95.0)	34.0 (93.2)	36.0 (96.8)	35.0 (95.0)	35.0 (95.0)	43.0 (109.4)
Average high °C (°F)	31.34 (88.41)	33.98 (93.16)	35.99 (96.78)	37.57 (99.63)	35.16 (95.29)	31.38 (88.48)	30.27 (86.49)	29.94 (85.89)	30.48 (86.86)	31.03 (87.85)	31.33 (88.39)	31.05 (87.89)	32.46 (90.43)
Daily mean °C (°F)	26.96 (80.53)	29.04 (84.27)	31.28 (88.3)	33.45 (92.21)	32.34 (90.21)	29.55 (85.19)	28.45 (83.21)	28.07 (82.53)	28.29 (82.92)	28.54 (83.37)	28.12 (82.62)	27.23 (81.01)	29.28 (84.7)
Average low °C (°F)	20.48 (68.86)	21.3 (70.34)	23.56 (74.41)	26.77 (80.19)	28.21 (82.78)	26.82 (80.28)	25.87 (78.57)	25.45 (77.81)	25.15 (77.27)	24.79 (76.62)	23.38 (74.08)	21.55 (70.79)	24.44 (75.99)
Record low °C (°F)	15.0 (59.0)	16.0 (60.8)	17.0 (62.6)	22.0 (71.6)	23.0 (73.4)	15.0 (59.0)	17.0 (62.6)	17.0 (62.6)	19.0 (66.2)	15.0 (59.0)	18.0 (64.4)	15.0 (59.0)	15.0 (59.0)
Average precipitation mm (inches)	4.45 (0.18)	0.3 (0.01)	2.71 (0.11)	8.25 (0.32)	110.45 (4.35)	278.51 (10.96)	319.3 (12.57)	357.73 (14.08)	276.78 (10.9)	127.35 (5.01)	34.58 (1.36)	2.9 (0.11)	126.94 (5.0)
Average precipitation days (≥ 1.0 mm)	0.73	0.09	0.82	2.36	17.64	27.09	29.73	30.0	25.73	18.55	3.82	0.55	13.09
Average relative humidity (%)	52.21	46.23	50.13	53.55	63.37	77.16	81.9	83.51	84.1	80.19	72.12	60.37	67.07
Mean monthly sunshine hours	8.83	11.58	11.49	12.61	12.4	11.24	10.77	10.81	11.0	9.94	8.41	8.58	10.64

Highest and Lowest Temperatures

In long-term analysis, the maximum mean daily temperature of Yangon Region is 38.0ºC (in March, April 2014), 38.1ºC (in April 2015), 38.5 ºC (in April 2016), and 36.7 º C (in March 2017) and the minimum is 16.5ºC (in January 2014), 18.8ºC (in February 2015), 15.7ºC (in January 2016), 18.1ºC (in December 2017). Average yearly maximum temperature is 33ºC and minimum temperature is 22.7ºC in four years. The long-term monthly average of mean daily maximum and minimum temperatures of Yangon Region is shown in below table 4-3 and table 4-4.

Table 4-3: Mean Maximum Temperature (°C) in 2014 - 2017. (Source: DMH)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	33.2	36.4	38.0	38.0	35.5	33.0	31.0	33.0	30.8	33.0	32.5	34.0
2015	32.7	35.0	37.8	38.1	35.9	32.3	31.7	31.2	32.2	32.4	34.1	33.3
2016	31.6	34.4	36.7	38.5	37.1	31.7	31.8	31.3	31.9	24.0	22.8	21.4
2017	33.0	34.8	36.7	36.1	35.0	31.4	30.1	30.7	32.2	31.9	33.1	32.0

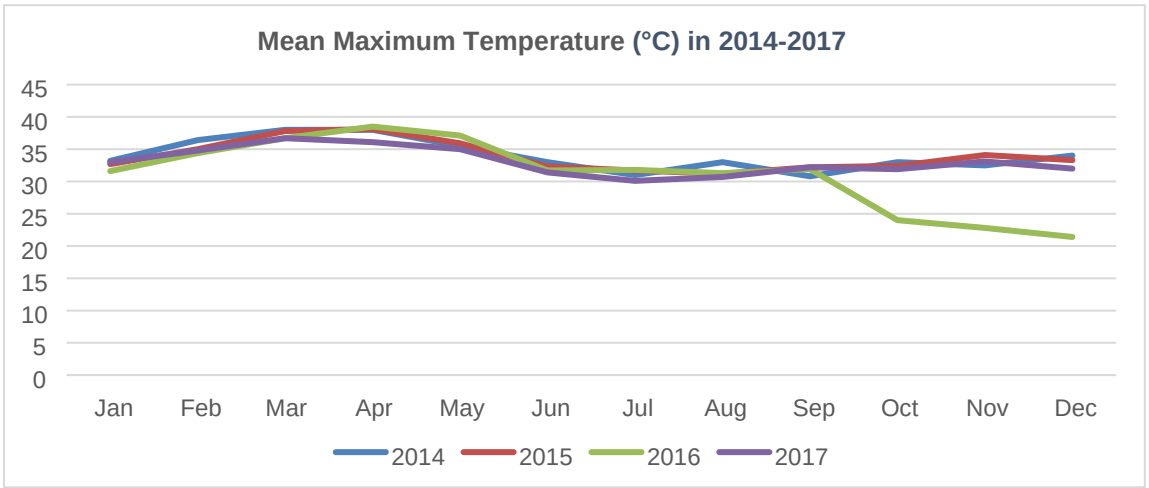


Figure 4-5: Line graph of monthly maximum temperature chart in 2014-2017. (Source: DMH)

Table 4-4: Mean Minimum Temperature (°C) in 2014-2017. (Source: DMH)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	16.5	18.5	19.5	24.5	22.5	23.5	21.5	21.5	21.0	22.6	23.0	19.8
2015	18.9	18.8	21.8	23.9	24.9	24.5	24.4	24.3	23.9	23.5	22.0	19.3
2016	15.7	18.8	22.1	24.1	24.2	31.7	31.8	31.3	31.9	24	22.8	21.4
2017	19.9	19.6	21.6	24.3	25.2	23.9	23.2	23.0	23.0	22.2	21.7	18.1

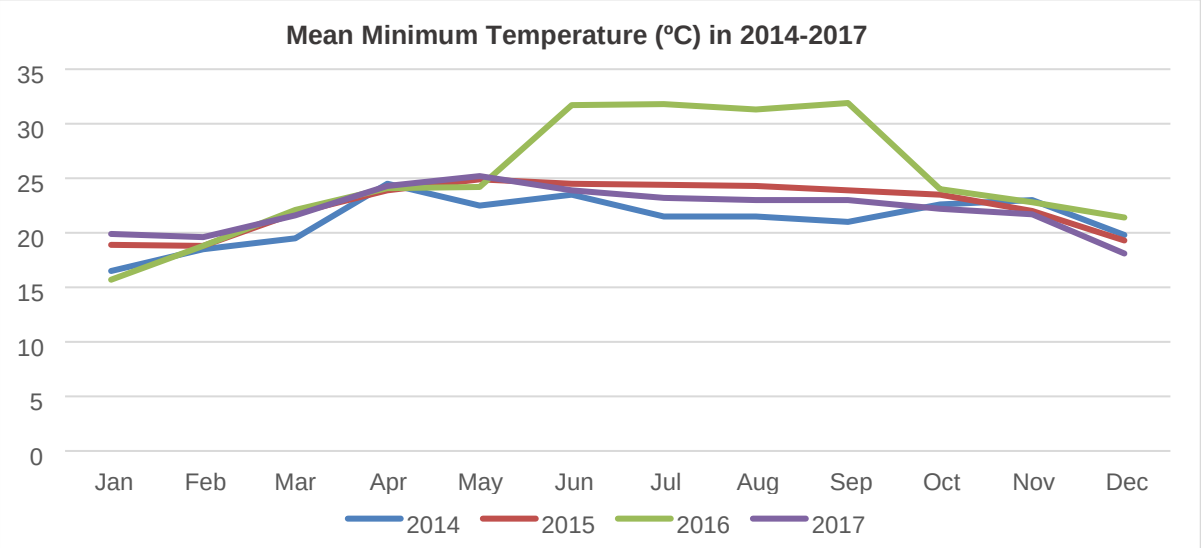


Figure 4-6: Line graph of minimum temperature (°C) in 2014-2017. (Source: DMH

Based on the averaging and retrospective analysis to the temporal variation, the minimum and maximum ambient temperature of Yangon region was recorded as in the table 4-5 below. The hottest climate spells happened during February and April. It is, therefore, drought and fire outbreak related environmental consequences could be envisaged during these periods.

Table 4-5: Yangon Weather Conditions by Month 2019 (Source: Climate-data.org)

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	24.8	26.2	28.3	30.3	29.4	27.3	26.9	26.8	27.2	27.7	27.2	25.1
Min. Temperature (°C)	18	18.9	21.3	24.1	25.2	24.5	24.3	24.2	24.3	24.1	22.6	19.2
Max. Temperature (°C)	31.6	33.6	35.4	36.6	33.6	30.2	29.5	29.4	30.1	31.3	31.8	31
Avg. Temperature (°F)	76.6	79.2	82.9	86.5	84.9	81.1	80.4	80.2	81.0	81.9	81.0	77.2
Min. Temperature (°F)	64.4	66.0	70.3	75.4	77.4	76.1	75.7	75.6	75.7	75.4	72.7	66.6
Max. Temperature (°F)	88.9	92.5	95.7	97.9	92.5	86.4	85.1	84.9	86.2	88.3	89.2	87.8
Precipitation / Rainfall (mm)	3	4	19	24	302	516	468	503	305	172	50	12

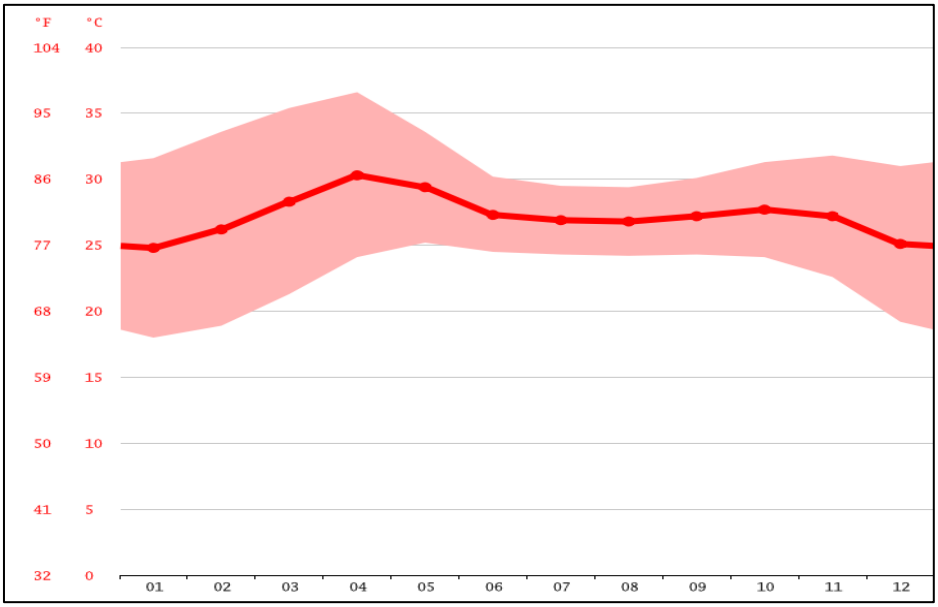


Figure 4-7: Temperature variation margin of Yangon region 2019. (Source: Climate-data.org)

4.3.3 Relative Humidity

The relative humidity was generally higher from May to October. The relative humidity plays an important role in the amount of evaporation and evapotranspiration. The mean monthly values of relative humidity are relatively similar throughout the year and relatively high during the summer period. The annual mean of daily relative humidity is on the range of 69-75% (2013-2017). The monthly mean values of relative humidity for the whole year are presented in table 4-6.

Table 4-6: Monthly Mean Relative Humidity (%) at (09:30) Hr in 2013 to 2017. (Source: DMH)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	71	70	68	67	78	89	89	90	89	81	75	74
2014	71	70	66	71	75	87	91	89	83	76	77	66
2015	65	66	64	64	73	84	88	89	87	84	76	72
2016	67	71	70	68	72	85	88	89	87	86	74	73
2017	67	65	64	67	78	85	93	89	86	86	76	68

Source: Meteorology and Hydrology Department

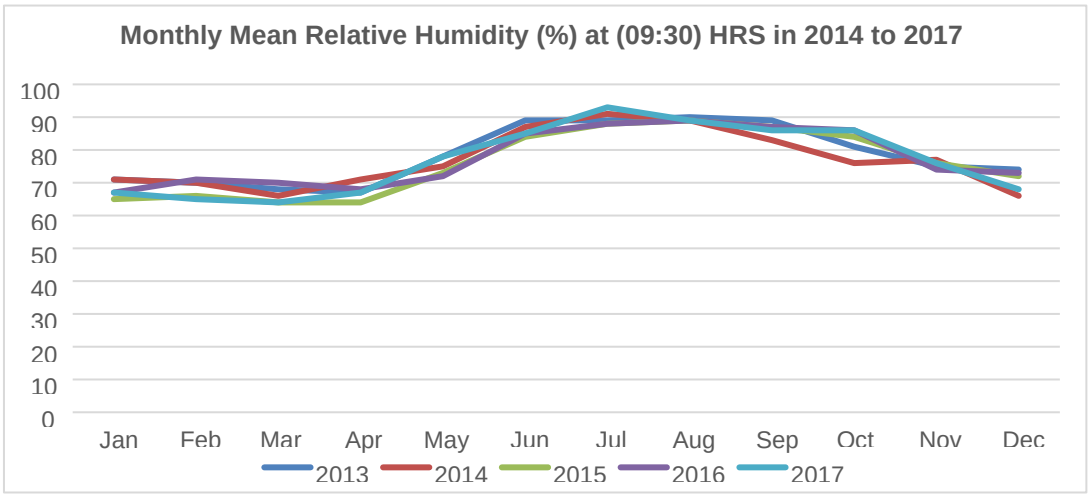


Figure 4-8: Line graph of monthly mean relative humidity (%) at (09:30) hr in 2014 to 2017. (Source: DMH)

In closed relationship with the precipitation and locational properties of Yangon region which is situated at the proximity of water courses (i.e., Yangon River) and gulf of Martaban, the humidity of the region is at all time higher than 60% across the year. During wet weather months such as Jun, July, August, and September), the humidity reaches higher than 80% threshold in the ambient atmosphere. The following figure 4-9 presents relative humidity of Yangon region in each month.

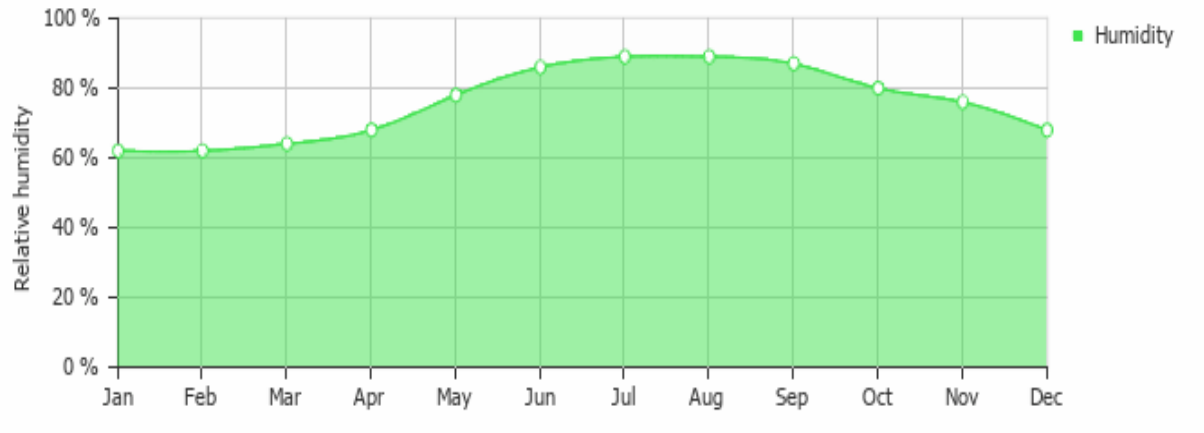


Figure 4-9: Monthly average humidity of Yangon Region 2019 (Courtesy: weather-data.org)

4.3.4 Electric Power Transfer

The power generated by the proposed plant will be transmitted via SF10-150000KVA/66 and SF10 70000KVA/66 transmission lines and connected to the Ahlone Sub-station, located within a short distance. Ahlone Sub-station is managed by the Ministry of Electric Power, Myanmar. The electricity produced at the 151.54 MW Ahlone power plant will be distributed to Yangon through the 230KV Ahlone main power station, with any surplus power directed to the national grid.

For a plant with a capacity of 151.54 MW, two double circuit lines at 66 kV will be used for regular power transmission. For backup power, it is proposed to connect the plant's substation to the 400 kV lines leading to the nearby Ahlone substation using a Line in Line Out (LILO) connection as a temporary measure. It is proposed to facilitate the initial integration of the new power plant into the existing trans mission network ensuring a reliable and continuous power supply.

4.3.5 Wind Direction and Wind Speed

Data of wind direction and wind speed reported by Meteorology and Hydrology Department, Kabar Aye Station are collected and shown as below:

Normal wind direction is from north-east, starts from October to February. South-east and southwest winds are from January to November throughout the year of 2013 to 2017. Notable highest and lowest wind speeds are 6.0 mph in 2015, 1.2 mph in 2014. Average wind speed 2.6 mph between 2013 and 2017. It was reported that the month with the highest wind speed is April.

Table 4-7: Monthly Mean Wind Direction (mph) in 2014 - 2017. (Source: DMH)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	SE	NE	SE	SW	NW	N	SW	SE	SE	NE	SW	NE
2015	SE	NE	SE	SW	NW	N	SW	SE	SE	NE	SW	NE
2016	SE	SE	SE	SW	SW	SE	SE	SW	SW	SE	SE	NE
2017	NE	SE	SW	SW	SW	SW	SW	SW	SE	SE	NE	NE

Table 4-8: Monthly Mean Wind Speed (mph) in 2014 - 2017. (Source: DMH)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	2.4	1.2	2.4	1.2	2.4	1.2	1.2	2.4	2.4	2.4	1.2	1.2
2015	4.8	4.8	6.0	3.6	3.6	3.6	3.6	3.6	4.8	6.0	4.6	4.6
2016	2.7	2.1	1.6	2.1	2.3	2.1	2.1	2.4	2.4	2.3	2.7	2.3
2017	2.4	2.0	1.7	1.7	2.0	2.5	1.9	1.7	2.0	2.2	1.9	2.4

In recent publishing status of meteoblue (leading global metrological data centre), Yangon region receives mostly steady strong winds (< 19 km/h) during December to April from Tibetan Plateau. However, calm-rush winds (> 19 km/h) are usually expected during wet weather period from June to October. Nevertheless, the average windspeed in normal weather ranges between 4 km/h to 12 km/h across the year see figure (4-10).

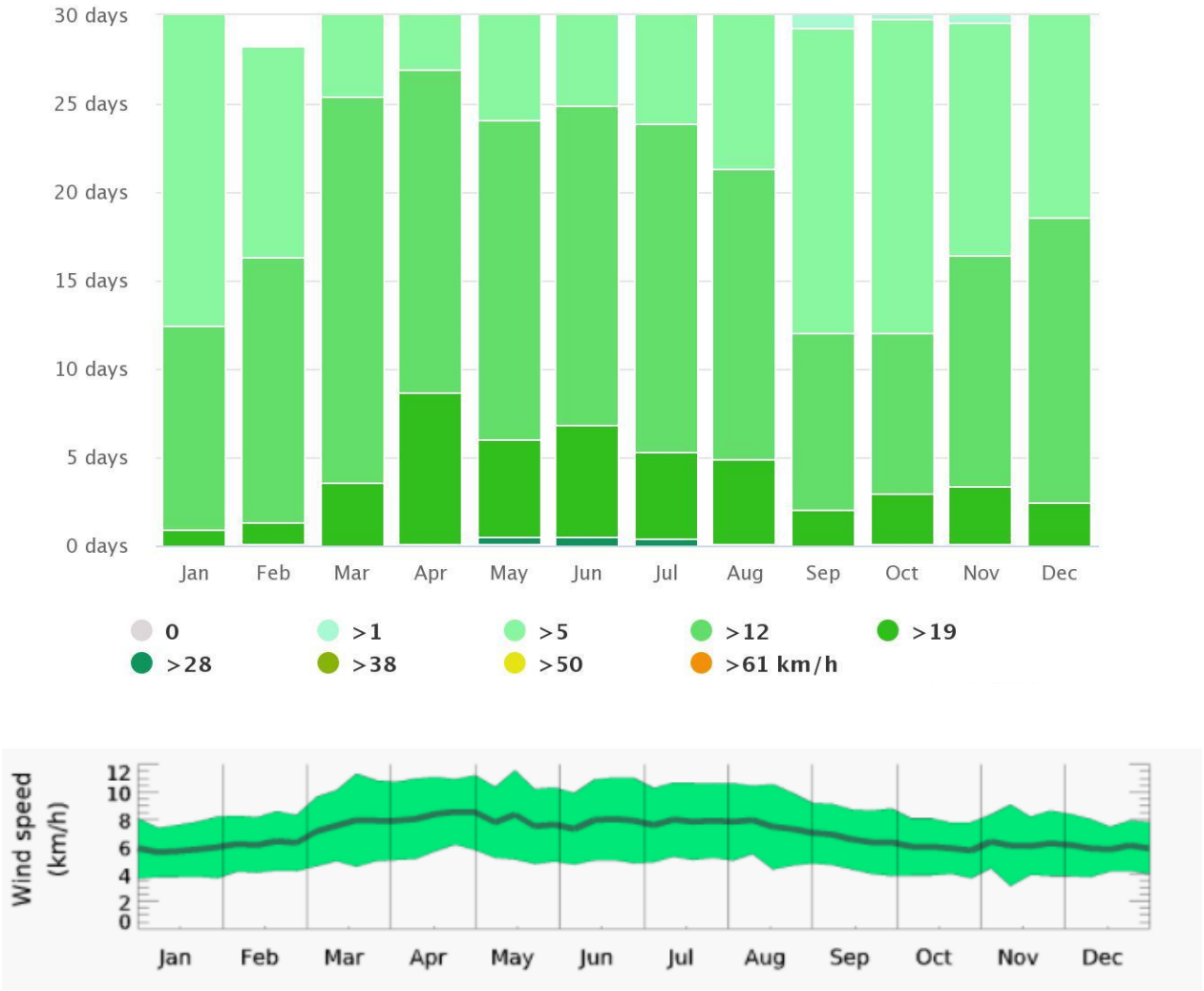


Figure 4-10: Monthly Windspeed of Yangon Region. (Source: Meteoblue)

In term of directional distribution, most of the winds are prevailing form Indian sea and gulf of Martaban which is located at South-west and South-East location. Therefore, the trend of the wind rose is mostly concentrated between SW to SE direction. The presumptive wind rose diagram is stated in the figure below 4-11.

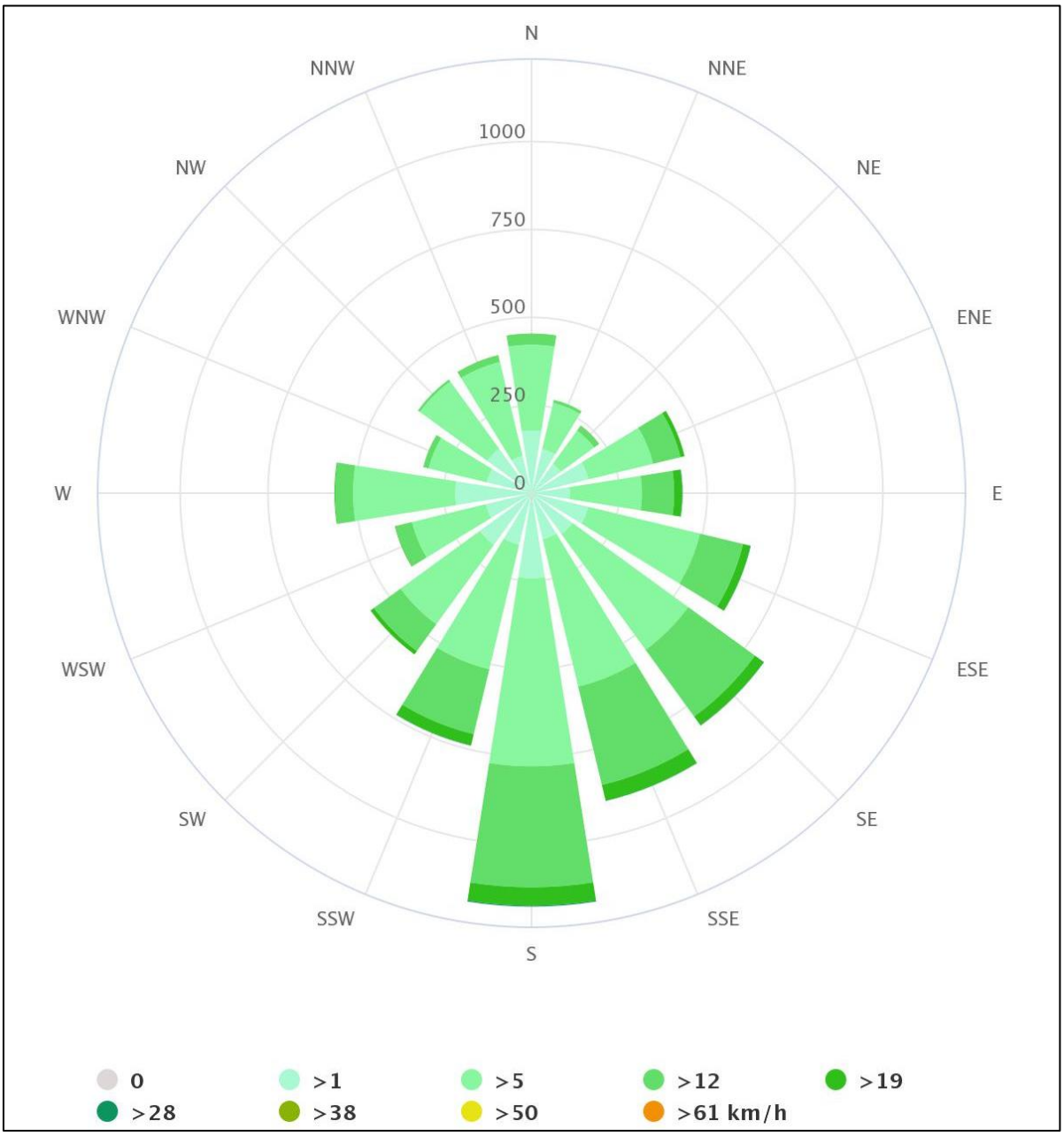


Figure 4-11: Generalized Windrose diagram of Yangon Region (Source: Meteoblue)

4.3.6 Topography

Located at the closed proximity of Bay of Bengal, the surface feature of Yangon is rich in topographical features. The city exists on the junction of Hlaing and Bago River, thus most of the area is prone to flash flood and inundation during tropical storm. Since the designated site lies on the bank of Yangon River, the project site is prone to flash flood by torrential both rain and tidal action. The following illustration highlights topographic location of project site in Yangon Region.

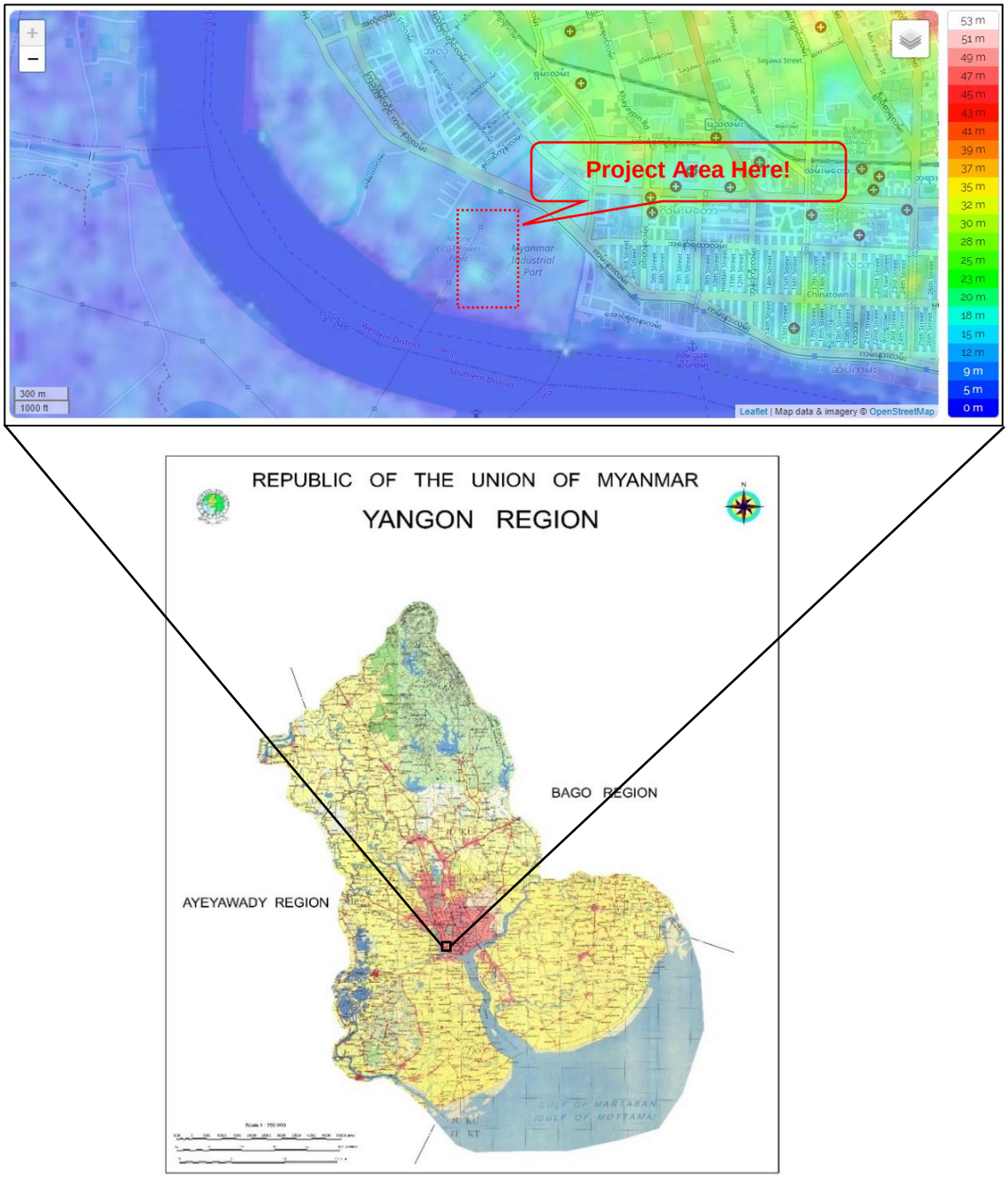


Figure 4-12: Topographic feature of Project Site and Yangon. (Source: en-ca.topographic-map.com)

4.3.7 Geology and Hydrogeology

Surface Geology

Since Yangon region is under the influence of Ayeyarwady and Sittaung river basin, the topsoil in most of the Yangon region is of meadow and Meadow alluvial soil which characteristic is resemble to deltaic. Since the water table exists just only few meters below ground level, water saturation and storage capacity are high. Generally, it has grey colour containing high humus and inorganic colloid content. Thus, the cultivation and agriculture are highly favourable in the region. The distribution of topsoil - surface geology of Yangon is presented in the figure 4-13.

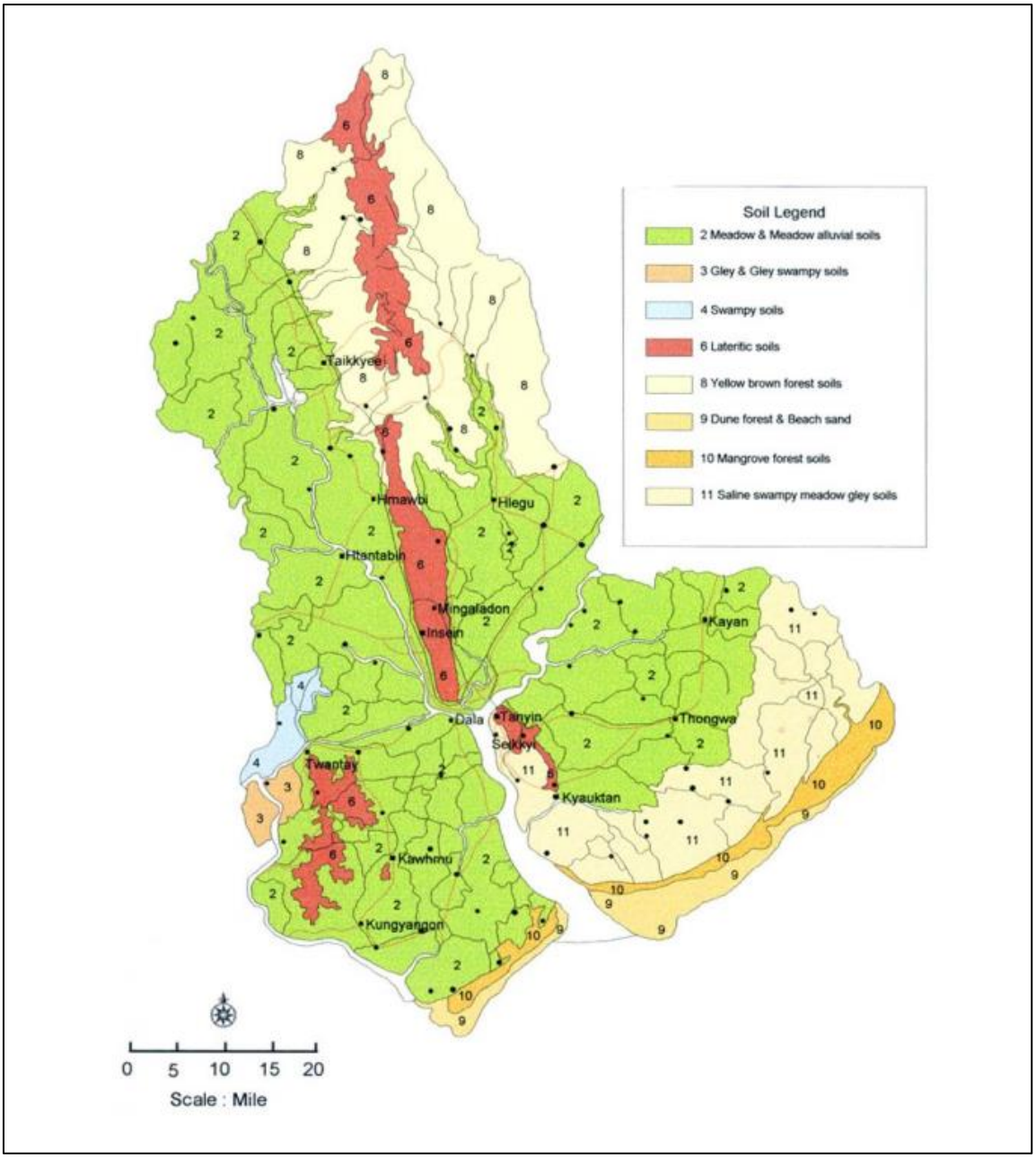


Figure 4-13: Surface Geology of Yangon Region

Sub-surface Geology

The Yangon City lies on the intersection of rivers and creeks (i.e., Hlaing, Bago, Pun Hlaing, Pa-zuntaung, etc.). Likewise, Ayeyarwady and Bago region of deltaic characteristic, most of the formation of Yangon region is of recent Pleistocene type with alluvium layers. These types of formation are prone to soil settlement because of water saturation and water table fluctuation. Thus, the hardness to structural stability is inferior than those of Pliocene, Miocene Oligocene in which hard sand rocks shale and clay found under this category. Therefore, it needs careful attention for high-rise building structure to withstand impact and dynamic loads in construction of considerable size and height for ideal foundation since hard bedrock could only reach under substantial depth from the surface layer. The underlying geologic formation of Yangon City is presented in the figure 4-14.

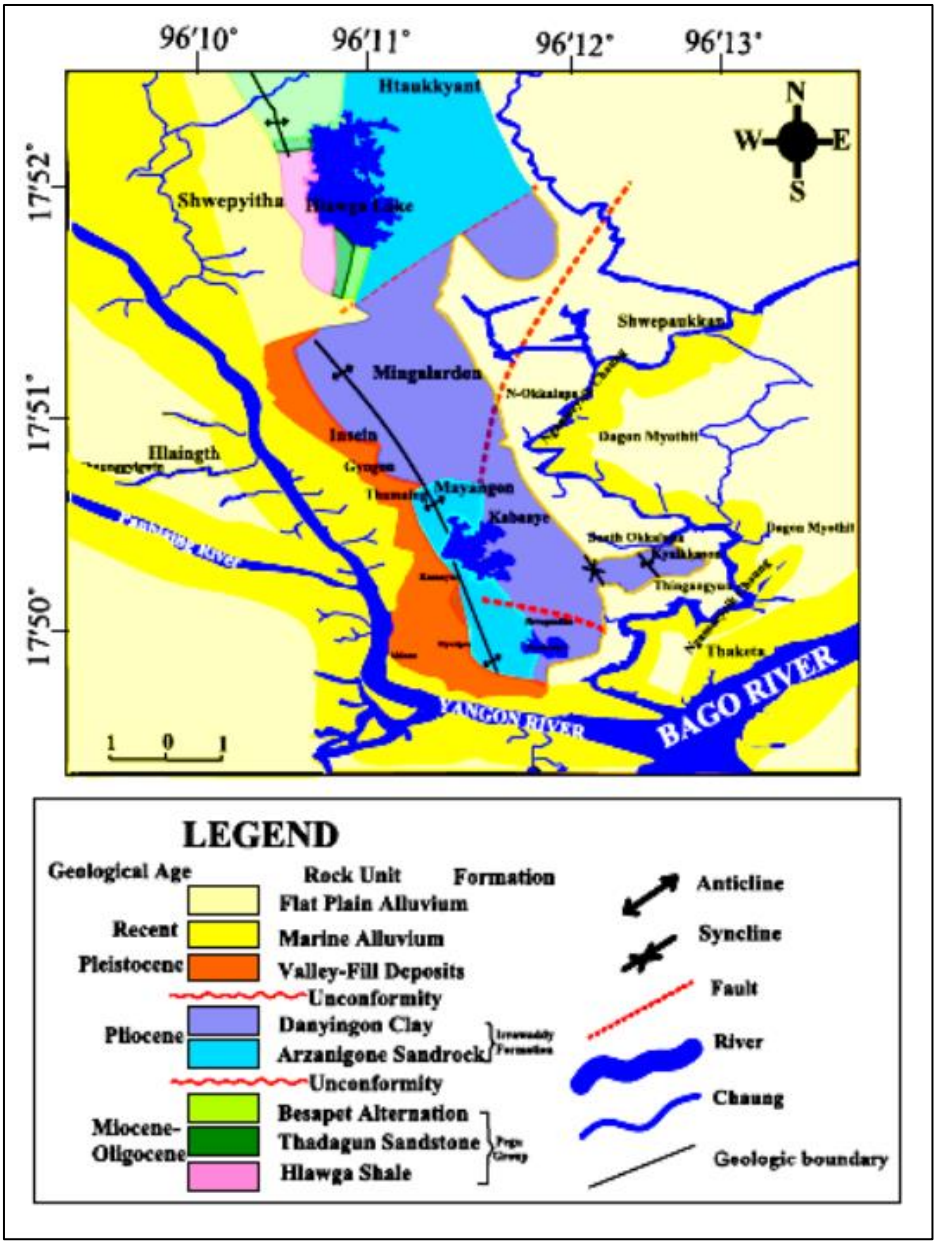


Figure 4-14: Sub-surface Geologic Formation of Yangon Region

4.3.8 Hydrogeology – Water Resource Potential

Although Yangon city has advantage to tap water sources from its closed proximity surface water bodies (i.e., rivers, creeks, and lakes), most of them are not suitable for potable and domestic purposes since the surface water quality has inadequate physical, chemical, and biological quality. In addition, even in the deep tube well for tapping dependable water source, the water quality in most of the township has extremely high iron content (<10 mg/L). unless proper treatment introduced or bored to extremely depth layers, the ground water source of Yangon could not be used for portable application.

Therefore, the city depends its water supply on reservoirs and dams located north of the city. Major water surface bodies for city water supply are Gyophyu, Hlawga, Phugyi, Ngamoeyeik reservoir. The Kandawgyi and Innya lake of Yangon city is only designed for recreational and storm water retention purpose at this day. For commercial application for mass quantity, it needs extraordinary measures and means to get dependable source reliably.

According to the ground water vulnerability assessment conducted by the department of geology in 2015, Yangon has medium to high vulnerability index. Hence, setting groundwater as primary source for multiple purpose is unfeasible in Yangon city. The figures (4-15 and 4-16) illustrate hydrogeology map of Yangon City. According to the illustration, the project falls inside medium to high venerability index zone. Thus, water resource conservation becomes one of the prime importance for impact identification when surface water source in to be utilized for plant operation.

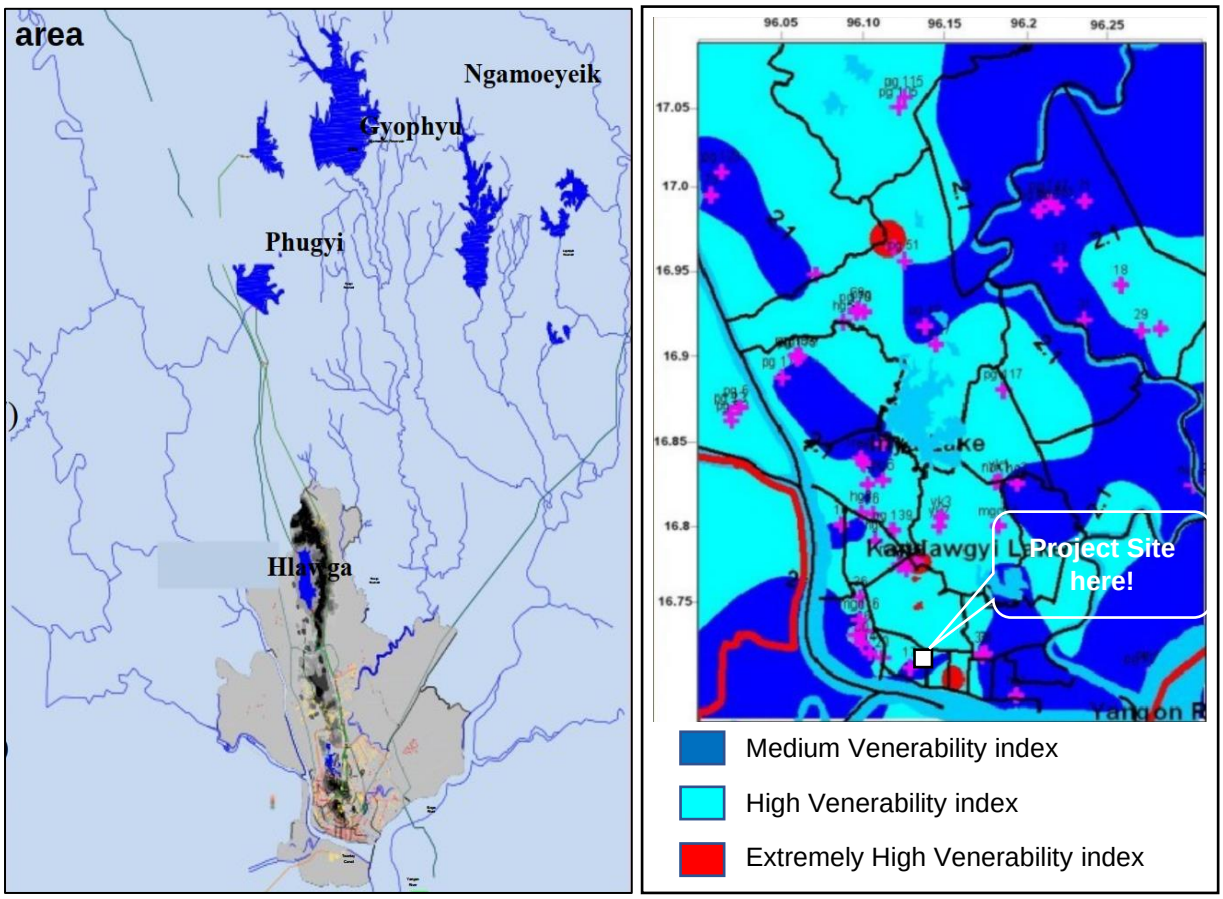


Figure 4-15: Hydrogeology Map of Yangon Region

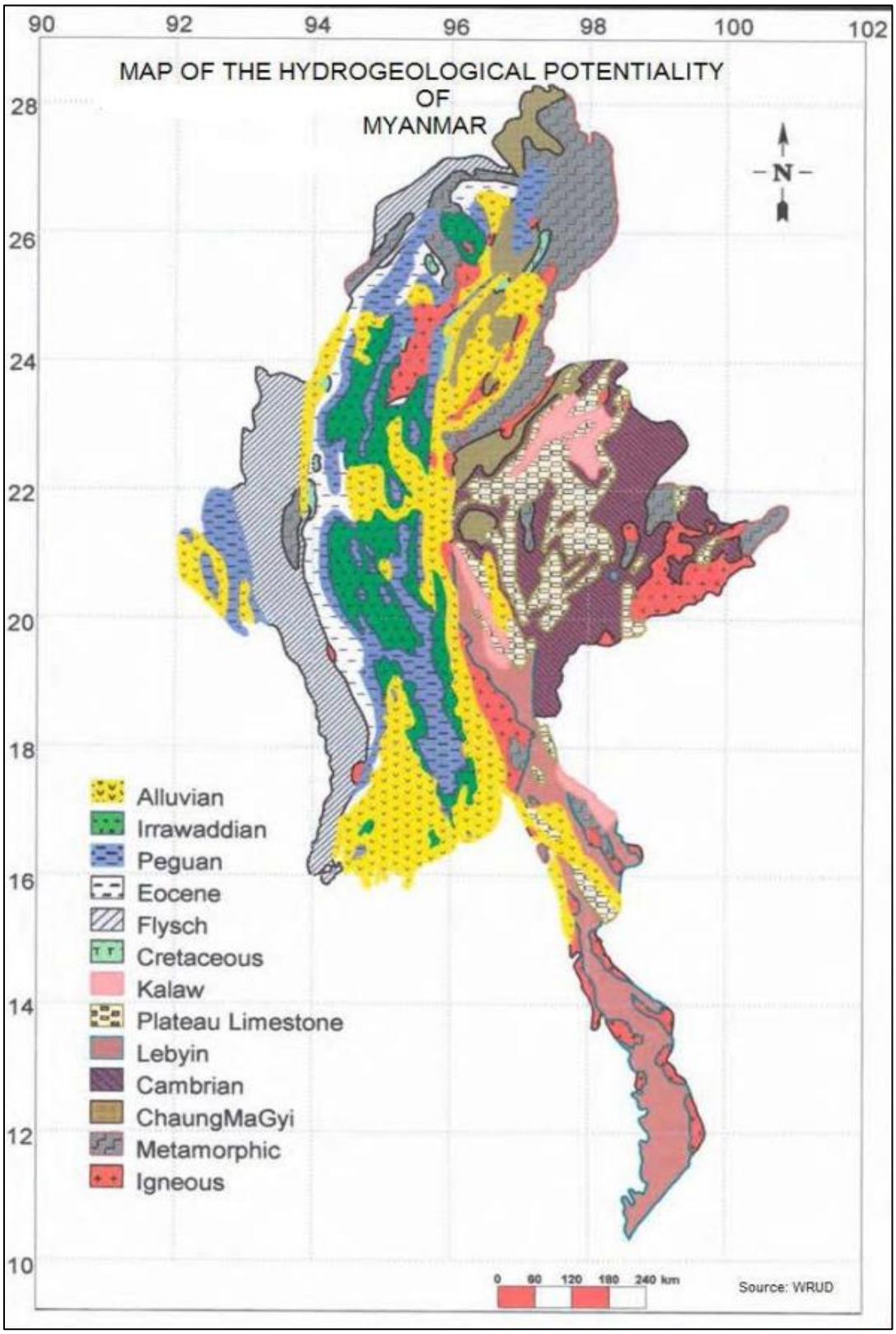


Figure 4-16: Hydrogeology Influence of Myanmar. (Source: WRUD)

4.3.9 Land Use

The pattern of land use in Yangon city is being subjected to substantial change as a result of urbanization, economic development, and infrastructure upgrades since recent decades across its satellite towns and within municipality itself. The situation is more rampant in suburban areas where green/vacant and arable lands turn into residential quarters and new housing plots. Within Yangon downtown areas itself, the multi-unit dwellings are being developed into condominium and office towers. Plant lots are in expended or extended to increase capacity and production. By 2040, the state plans to increase new housing units to prepare Yangon is a liveable city to for up to 10 million inhabitants through new urban development master plans. As consequence, the transformation of land use category changes accordingly. The comparison of land use change in recent years and the trend is presented in the figure (4-17 and 4-18).

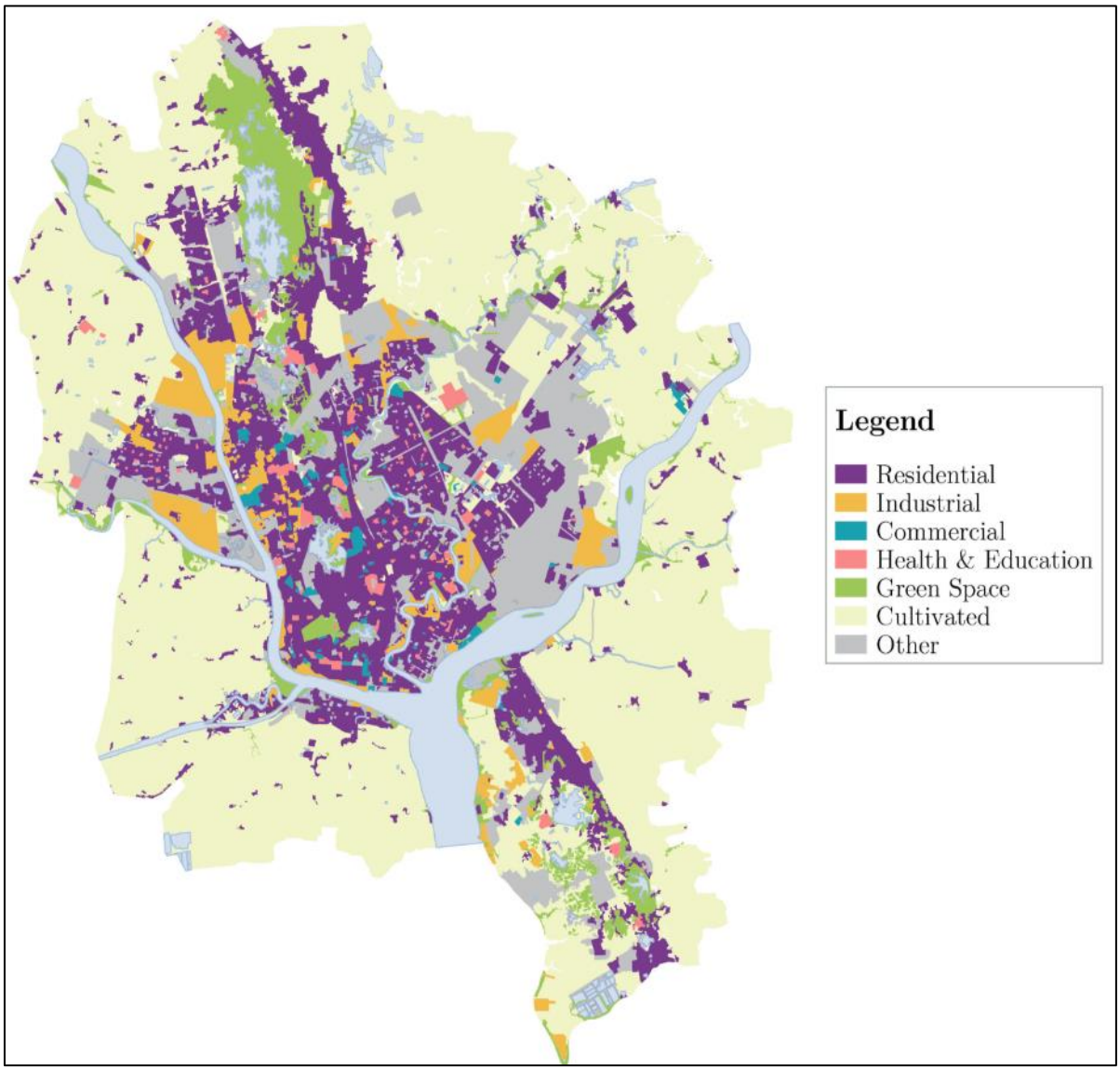


Figure 4-17: Yangon Land use Map in 2012. (Source: international Growth Centre Myanmar)

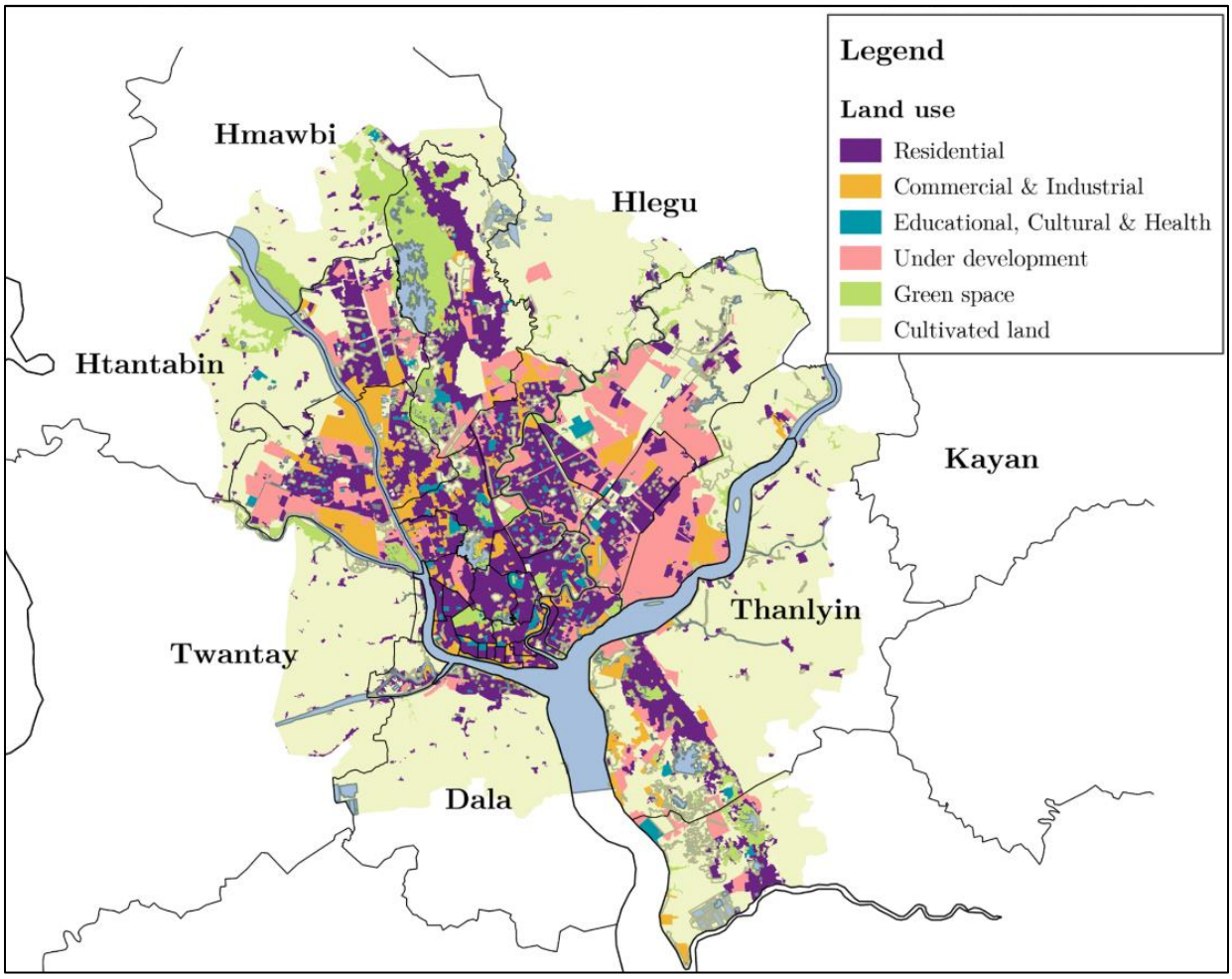


Figure 4-18: Yangon Land use Map in 2016. (Source: International Growth Centre Myanmar)

4.3.10 Water Environment

Since proposed project site is located inside Yangon region, the underlying water aquifer of the area is predominantly on alluvial soil thus water table to extract raw water is easily accessible. However, the zone is under the influence of Yangon River. The Yangon River is about 40 km long (25 miles) and flows from southern Myanmar as an outlet of the Irrawaddy (Ayeyarwady) River in the Ayeyarwady delta.

Waterways of Yangon River

Prior to converging into a single channel that empties into the Gulf of Martaban, the Yangon River is fed by numerous tributaries and minor rivers that contribute to its flow. These tributaries play a crucial role in the hydrology of the river's basins and the catchment areas of the estuaries. The Yangon River can be geographically divided into two segments: the upper and lower sections. The upper segment includes the Pun Hlaing River, the Hlaing River, Pazundaung Creek, and the Twantay Canal. Pazundaung Creek, also known upstream as Ngamoeyeik Creek, is a significant contributor to the upper Yangon River. Upon merging with the Bago River, the river transitions into the lower Yangon River, which ultimately flows into the Gulf of Martaban. On the west bank, the Twantay Canal—a 34 km artificial waterway—connects the Yangon River with the Ayeyarwady Delta.

There are four main river outlets that enhance water flow within Yangon City:

- Ywa Thit Creek, located at New Kannar Road, Mawtin temporary market ward, Lanmadaw Township

- Bo Myat Tun River outlet, situated between Marchant Street and Kannar Road, Botahtaung Township
- Hantharwaddy River outlet, between Kamaryut Township and Kyeemyindaing Township
- Harbi Creek, positioned at the Moe Kaung electricity housing complex, Irrawaddy Ward, Ahlone Township

The water supply network of Yangon City is illustrated in Figure 4-19.

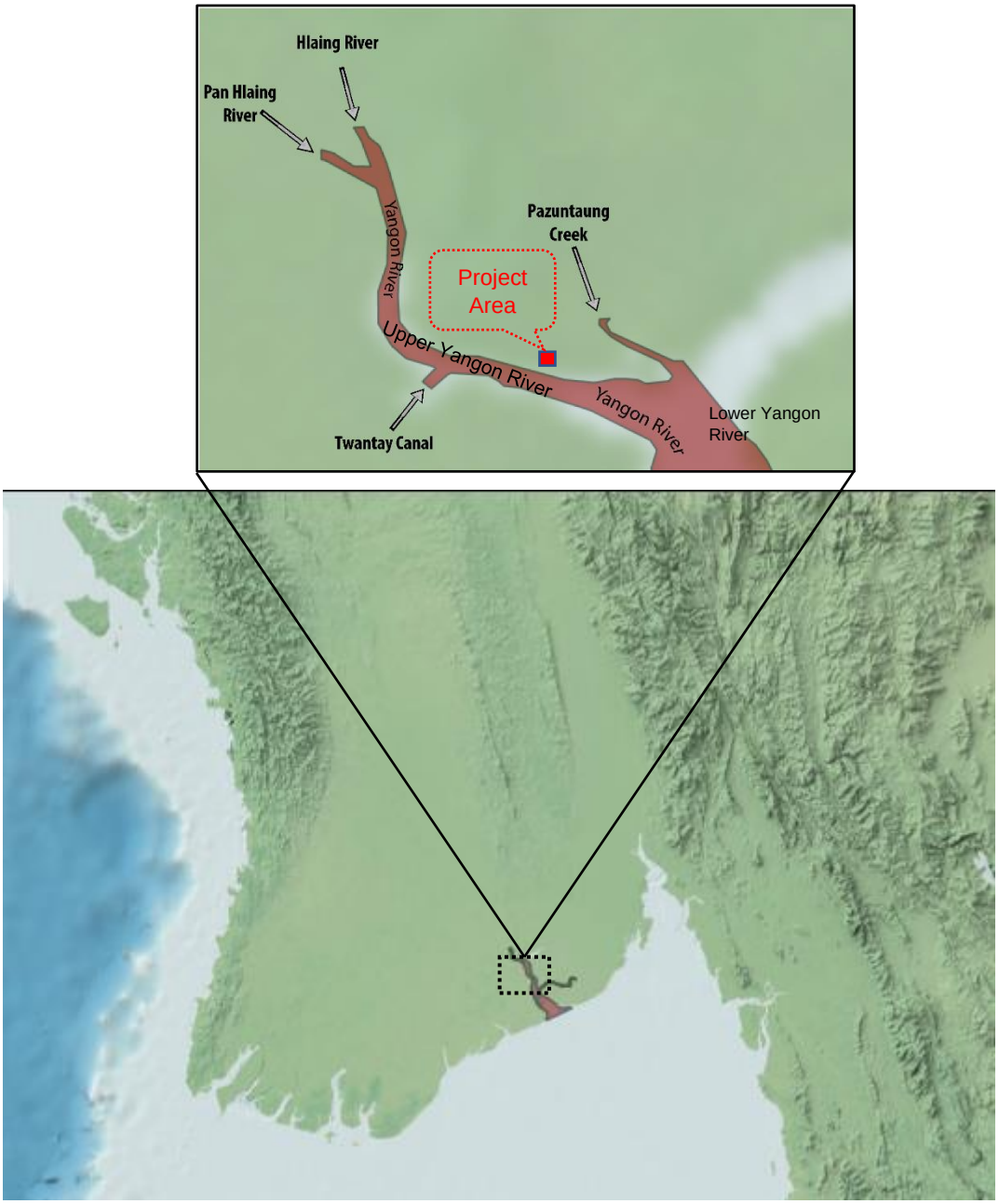


Figure 4-19: Major Estuaries of Yangon River (source: marineregion.org)

Water Source – The Quantity

Yangon River is constantly subjected to salinity by tidal influence thus the physical water quality is too compromised. In addition, because of the scale of water needs for plant operation, the city administration could not manage and allow to source required water for consumption for industrial purposes mainly from the surface water bodies of Yangon (i.e., reservoirs and dams) located at the north of the city (figure 4-20). below. Since willow ground water quality is objectionable and inaccessible in most part of Yangon City, the costlier deep groundwater extraction is not a favourable option for steam turbines of

combined cycle power plant. Nevertheless, thanks to the location advantage, the project developer can tap required water from Yangon River under the permission of Directorate of Water Resources and Improvement of River Systems (DWIR) and Department of Marine Administration. The major estuary of Yangon River and its connecting tributaries is shown in the figure below. Despite the fact that the water quality is too compromised in term of quality for plant operation, the river could support ample water supply throughout the year. And, it is only an available option for the developers to use it after applying services of water treatment system.

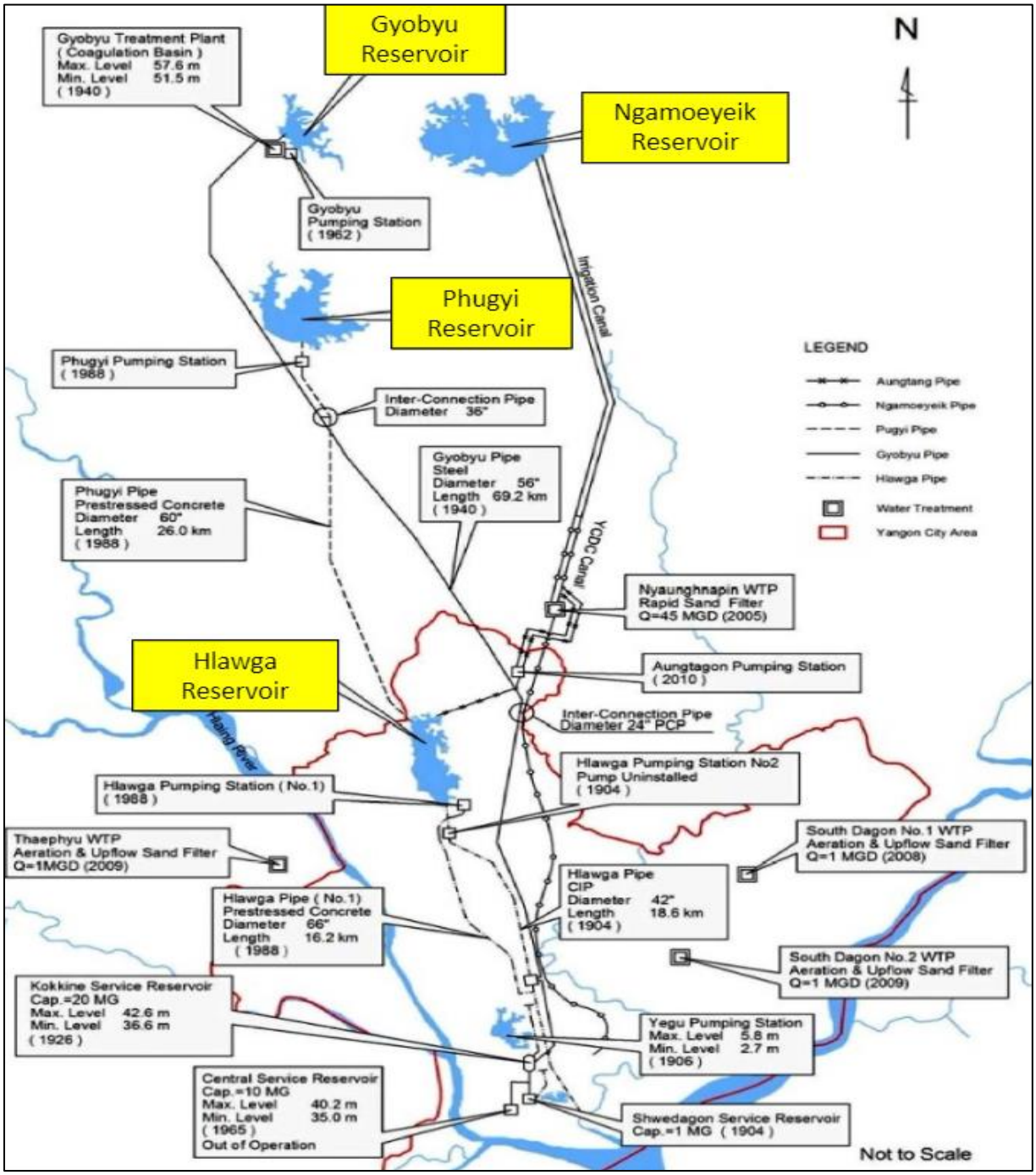


Figure 4-20: Major Surface Water Source for Yangon City

In all the tributaries and estuaries of Yangon River, there exists active tidal action by lunar attraction. Since Yangon River is important for maritime transports and intercommunal communication, it is vital to significance of stream flow with respect to tidal and seasonal variation. In addition, the proposed project will extract required water is mass quantity from the Yangon River, the pipelines, and pumping needs not to have compromises to inland water transport and navigation.

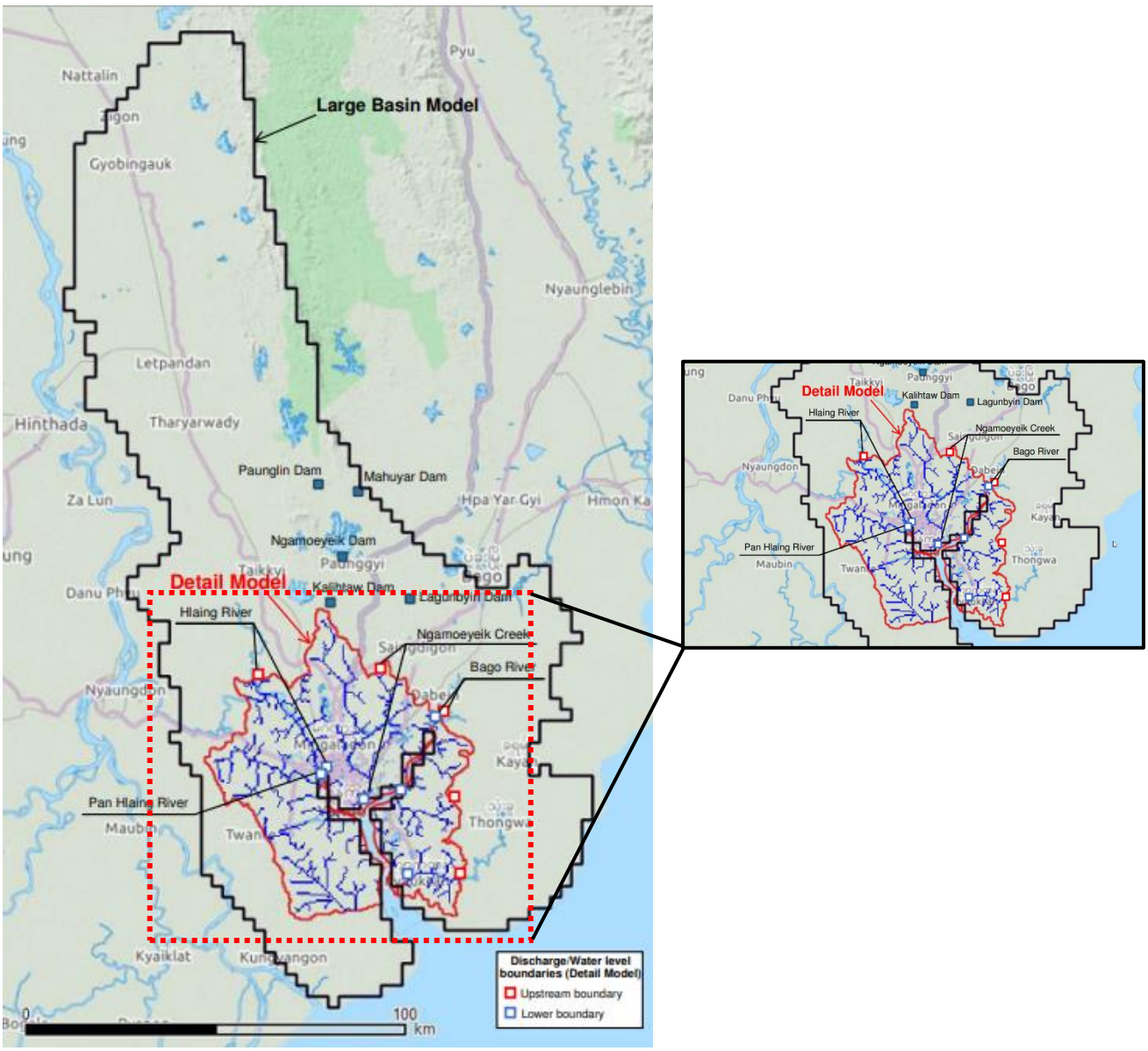


Figure 4-21: Major tributaries and basin of Yangon River

Before Yangon River become into single entity that flow into gulf of Martaban, there are dozens on tributaries, minor rivers that flows into channel. It is, therefore, important to the basins and catchment of the estuaries. The figure 4-21 above illustrates, the catchment areas and basin delineation that is directly corresponding to the Yangon River. Knowing the basins of each tributary, trace and tracking could be easily made where there emerge environmental problems and troubleshooting the culprit of incidence to address resource sharing issues and environmental monitoring.

Open drain channels

There are open drain channels that drain off rain water and domestic wastewater from wards generated from residences, shops, and markets etc into the river. Example Kwin Kyaung channel in Lower Kyee Myindyne Road collects water from Wards and receives wastewater flows from Aung Chan Thar open channel from Wards of San Chaung Township then flows into Yangon River.

Watersheds

A watershed also known as catchment area is the land where all water drains into common waterway such as a stream, lake, or wetland. As the water runs through the watershed, it will pick up and carry with it all materials, like sediment or nutrients from the soil, present in the drainage basin. Watersheds significantly influence the quality of water in rivers and lakes. Natural elements within watersheds such as soil and vegetation act as filters, purifying water. Rainfall and runoff within a watershed can carry sediments, chemicals, and contaminants into water bodies impacting their quality. Additionally, human

activities such as construction of building, extraction of resources, and encroachments can disrupt ecological system of watershed area.

Wetlands

There are no wetlands within 1 km radius from the Project area. Wetlands are land areas that saturated or flooded with water either permanently or seasonally. Inland wetlands include marshes, ponds, lakes, fens, rivers, floodplains, and swamps. Coastal wetlands include saltwater marshes, estuaries, mangroves, lagoons, and even coral reefs. Fish ponds, rice paddies, and salt pans are human-made wetlands. Wetlands serve as links between watersheds and the water to which they drain. Urban wetlands are essential habitats and provide range of benefits, including reducing urban flooding during monsoon or rainy seasons, securing water supply, safeguarding biodiversity, and locking away carbon. The degradation of wetlands can lead to loss of biodiversity habitat, reduces water supply, increased risk of flooding, waterlogging, and carbon emissions – it also limits the capacity to absorb heat and regulate local climates. No wetlands are present nearby Project area.

Swamps

A swamp is an area of land permanently saturated, or filled with water. Swamps can be seen at Dala, and Twantay Canal which are at the west bank of Yangon River. Within the 1km radius from the Project site, the east bank of the Yangon River is encompassing Yangon International Gateway, Asia World Terminal, and Ahlone Shipyard and swamps are not existed. Instead, vegetation and muddy flat siltation are found at the Project area. These mudflats are flooded at high tide and exposed at low tide.

4.3.11 Natural Hazards

The geographic feature of Myanmar is prone to multiple natural hazards such as cyclones, earthquakes, floods, landslide, and forest fire. While anthropogenic disaster could be eliminated by the help of technologies and facilities in related disciplines, the occurrence of natural disasters except tropical storms is unpredictably. Therefore, it is crucial to consider natural disasters related risk and hazards. Following are brief description of common natural disasters predominant inside Yangon region, Myanmar.

4.3.11.1 Cyclones

Cyclones and associated storm surges from the Bay of Bengal. Annually, there are approximately 10 tropical storms in the Bay of Bengal from April to December. Severe cyclones usually occur during the pre-monsoon months of mid-April to mid-May and post-monsoon months of October to December.

The threat of flooding usually occurs in three waves each year: June, August, and late September to October.

4.3.11.2 Earthquakes and Seismicity

The Yangon District is in the vicinity of the southern section of the Sagaing Fault which has not been active in the past 50 to 75 years indicating that the faults may be under accumulating stress increasing the potential for an earthquake to occur. The Sagaing Fault is the most prominent active fault in Myanmar trending roughly north to south. It has been the originator of a large proportion of destructive earthquakes in Myanmar.

The proposed site is located at approximately 37 kilometres at the west of Sagaing fault which it 1,200-kilometre long Sagaing fault line that stretches from the northern corner of the country to the Martaban Gulf. A 7.0 Richter Scale quake killed 500 people from Bago and 50 people from Yangon in 1930. At that time, Yangon population was about 400,000. Summary record of earthquakes which struck Myanmar starting 19th Century is listed in Table below (4-9).

Table 4-9: The record list of earthquakes in Myanmar (Source: Myanmar Geoscience Society)

Date	Location	Magnitude and/or brief description
6 Mar 1913	Bago	Shwemawdaw Pagoda lost its final
5 July 1917	Bago	Shwemawdaw Pagoda fell
10 Sep 1927	Yangon	-
17 Dec 1927	Yangon	M-7 RS: extended to Dedaye
8 Aug 1929	Near Taungoo	Bent railroad tracks, bridges and culver is collapsed, and loaded trucks overturned (Swa Earthquake)

Date	Location	Magnitude and/or brief description
5 May 1930	Near Khayan	M-7.3 RS. 1mix-IX; in a zone tending north-south for 37km south of Bago (on the Sagaing Fault line) about 500 persons in Bago and about 50 persons in Yangon killed
3 Dec 1930	Nyaunglebin	M-7.3 RS: railroad tracks twisted (Pyu Earthquake): about 30 persons killed
27 Jan 1931	East of Indawgyi	M-7.6 RS: 1 mix-IX: numerous fissures and cracks (Myitkyina Earthquake)
10 Aug 1931	Pyinmana	-
27 Mar 1931	Yangon	-
16 May 1931	Yangon	-
21 May 1931	Yangon	-
12 Sep 1946	Tagaung	M-7.5 RS
12 Sep 1946	Tagaung	M-7.75 RS
16 July 1956	Sagaing	M-7.0 RS: Several pagodas severely damaged (40to50 persons killed)
8 July 1976	Bagan	M-6.8 RS: Several pagodas in Bagan Ancient City were severely damaged (only 1 person killed)
22 Sep 2003	Taundwingyi	M-6.8 RS: Severe damaged to rural houses and religious buildings (7 persons killed)
24 Mar 2011	Tarlay	Mw 6.8, Myanmar, Thailand, Laos, China, and Vietnam border areas were affected and about 150 persons were killed when 130 houses collapsed.
24 Aug 2016	Chauk	Mw 6.8, several temples in the nearby ancient city of Bagan were damaged and four people were reported dead

According to the seismic zone map of Myanmar (revised version, 2005), the Ahlone township falls under the category of seismic zone (II) – moderate zone and the probable range of ground acceleration is between 0.1 and 0.15 g (the acceleration due to Earth's gravity, equivalent to g-force). The equivalent modified Mercalli scale class is VII. The Project Site is in moderate earthquake zone and therefore the building construction design needs to cater for this hazard with adequate planning on emergency response procedures. The following figure 4-22 and 4-23 are the summary of Modified Mercalli (MM) Scale and the level of probable damage and destruction.

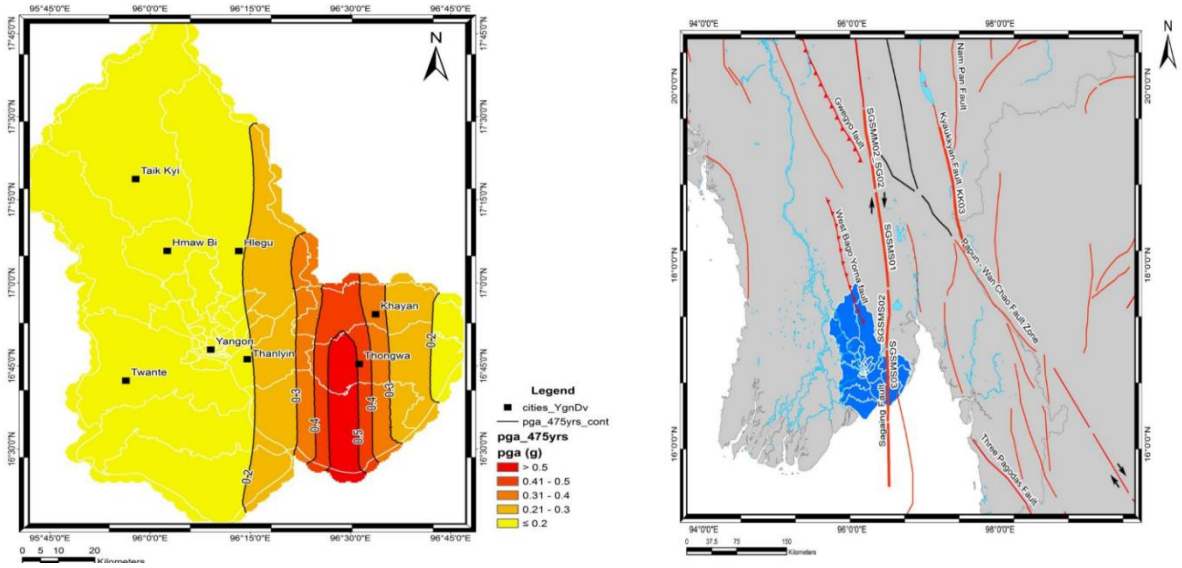


Figure 4-22: Probabilistic seismic hazard (PGA) map of Yangon region with 10% probability of exceedance in 50 years. (Source: Department of Geology)

Figure 4-23: Summary of Modified Mercalli (MM) Scale and the level of probable damage and destruction

Zone	MM Classes	Probable Damage	Examples of Damage
V	IX	Major damage	Considerable damage in specially designed structures Major damage in good RC buildings
IV	VIII–IX	Considerable damage	Considerable damage in good R.C buildings Major damage in ordinary brick buildings
III	VIII	Moderate damage	Moderate damage in good RC buildings Considerable damage in ordinary brick buildings
II	VII	Minor damage	Minor damage in good RC buildings Moderate damage in ordinary brick buildings
I	VI	Slight damage	Minor damage in ordinary brick buildings

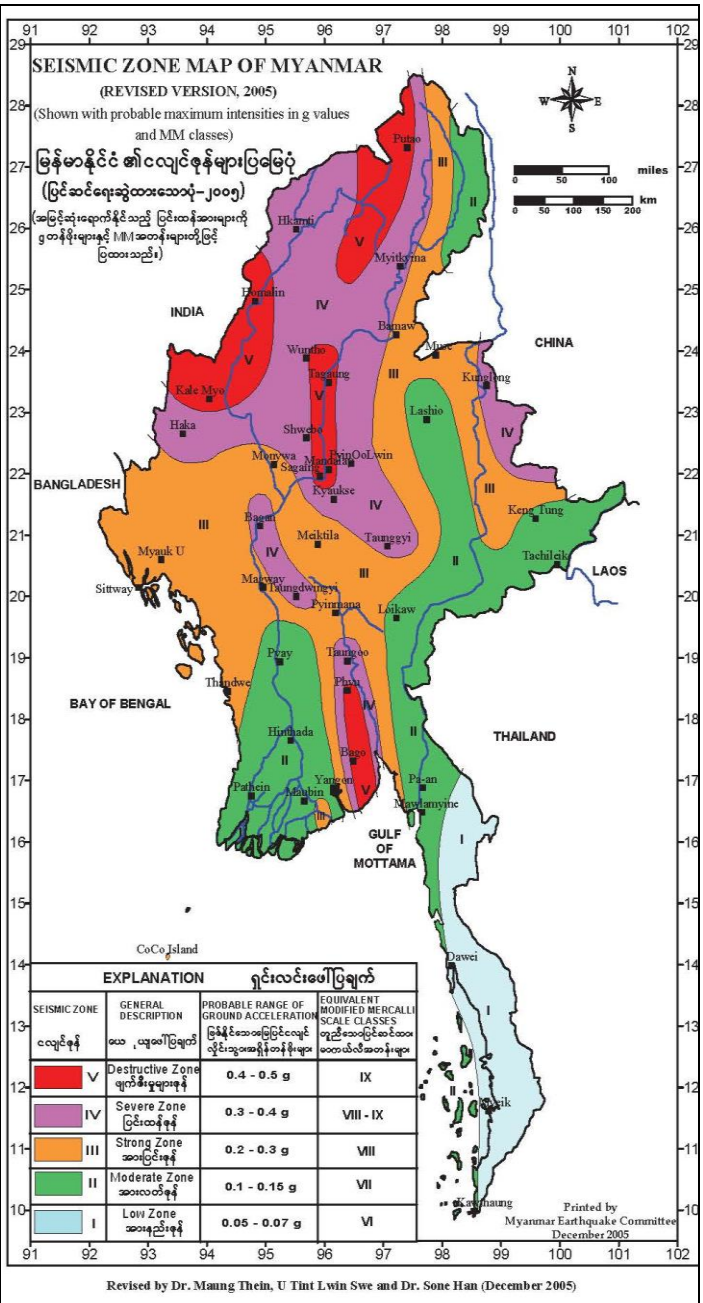


Figure 4-24: Seismic Map of Myanmar

4.3.11.3 Flood Risks

Because of the geographical features of Yangon region, the flood risks potential and incidence are long established issues being encountered. Under the circumstance of high tidal action and heavy torrential time, most of low-lying area of the city is reported temporary flood and inundation.

In addition, with the project location stands on the bank of Yangon River, it is crucial flood risk assessment to be made. Based on the Global Information System (GIS) mapping and numerical modelling input. The flood significance and potential severity of forecasted swelling river water body is stated in the following figures. The datum point – initial geodetic station for reference point is Kyaikami base station. According to the NOAA calibration, the Mean Sea Level (MSL) trend at Moulmein, Myanmar is - 4.40 mm/year with a 95% confidence interval of ± 7.63 mm/year, based on monthly mean sea level data from 1954/1 to 1964/9. That is equivalent to a change of -1.44 feet in 100 years. Based on these presenting reference datum line, flooding assessment is made according to increasing trend 0, 1, 2, 3, and 5 m respectively. Flood map modelling result reveals only with 3 – 5 m sea level rises, the project could face massive flooding. The situation could be worsening when sea level, tidal action and torrential downpour are in combination. The data sources for simulation are based on leading GIS flood mapping Inc. (i.e., Mazpzen, TNM, SRTM, GMTED, and ETOPO1) (photo 4-2 to photo 4-6).

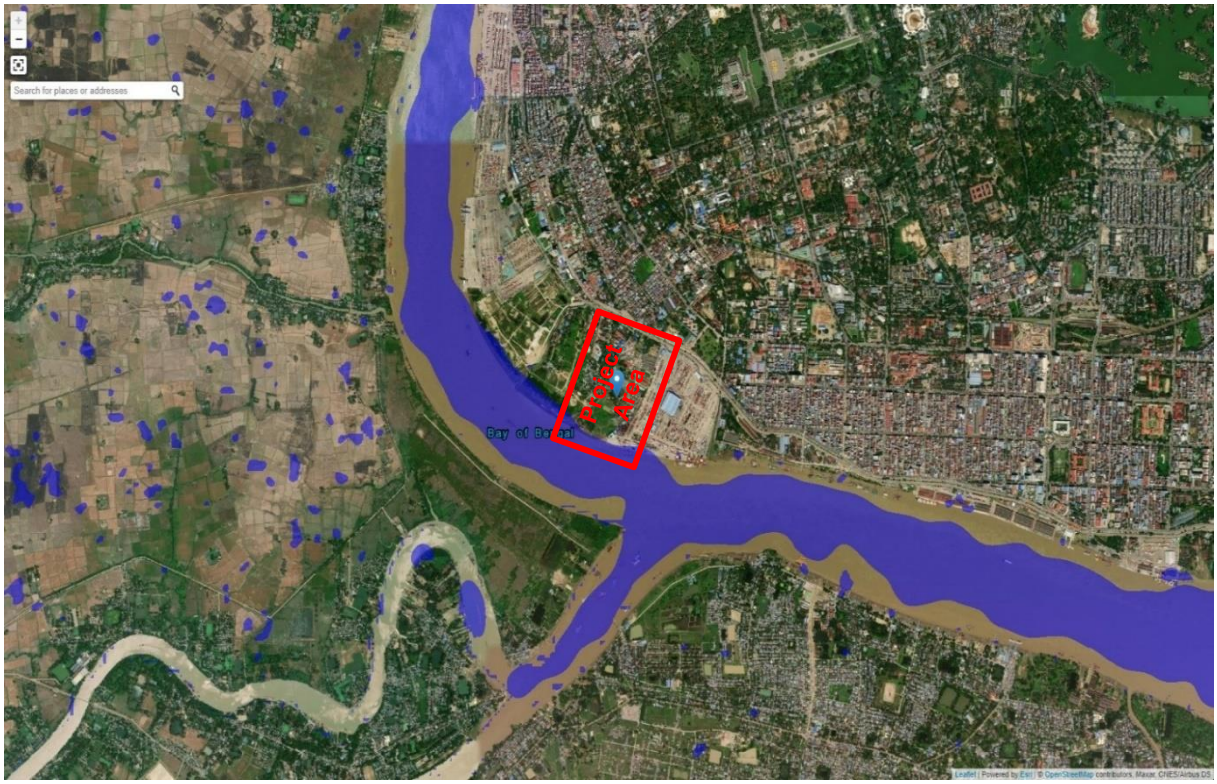


Photo 4-2: Flood and inundation at 0 m sea level increase (Aerial Photo)

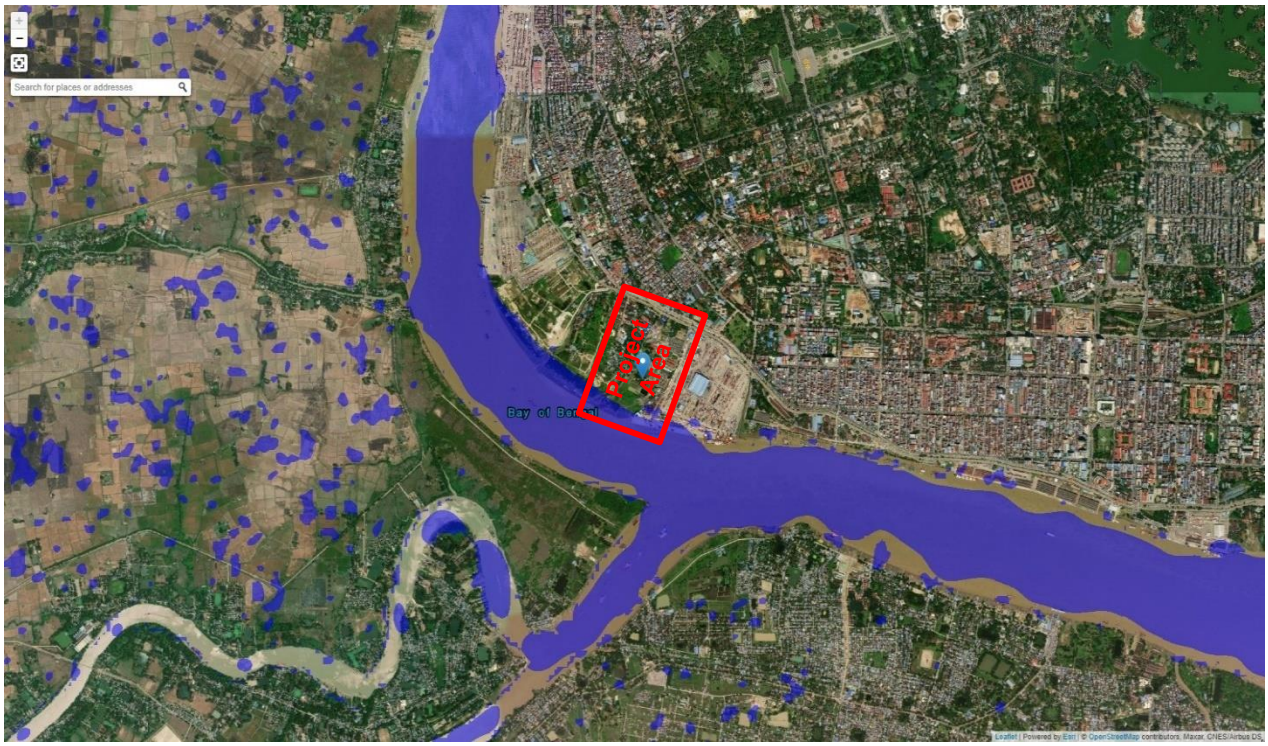


Photo 4-3: Flood and inundation at 1 m sea level increase (Aerial Photo)

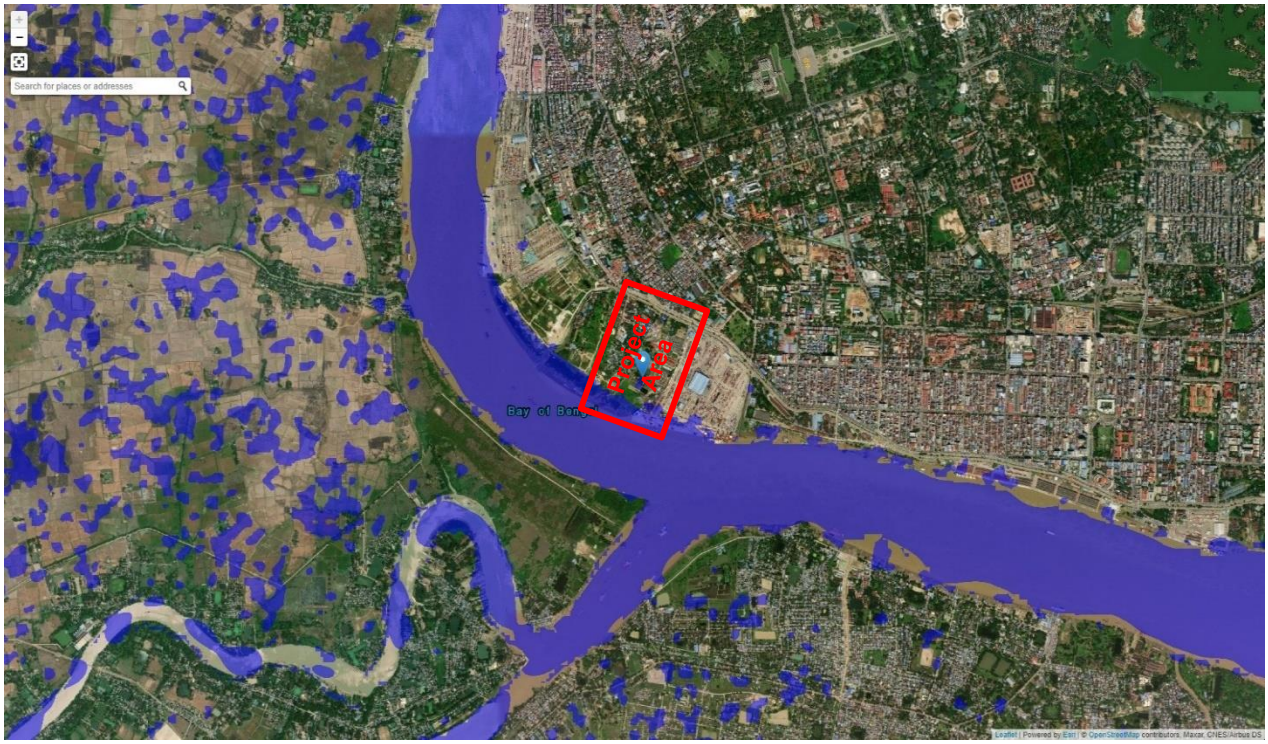


Photo 4-4: Flood and inundation at 2 m sea level increase (Aerial Photo)

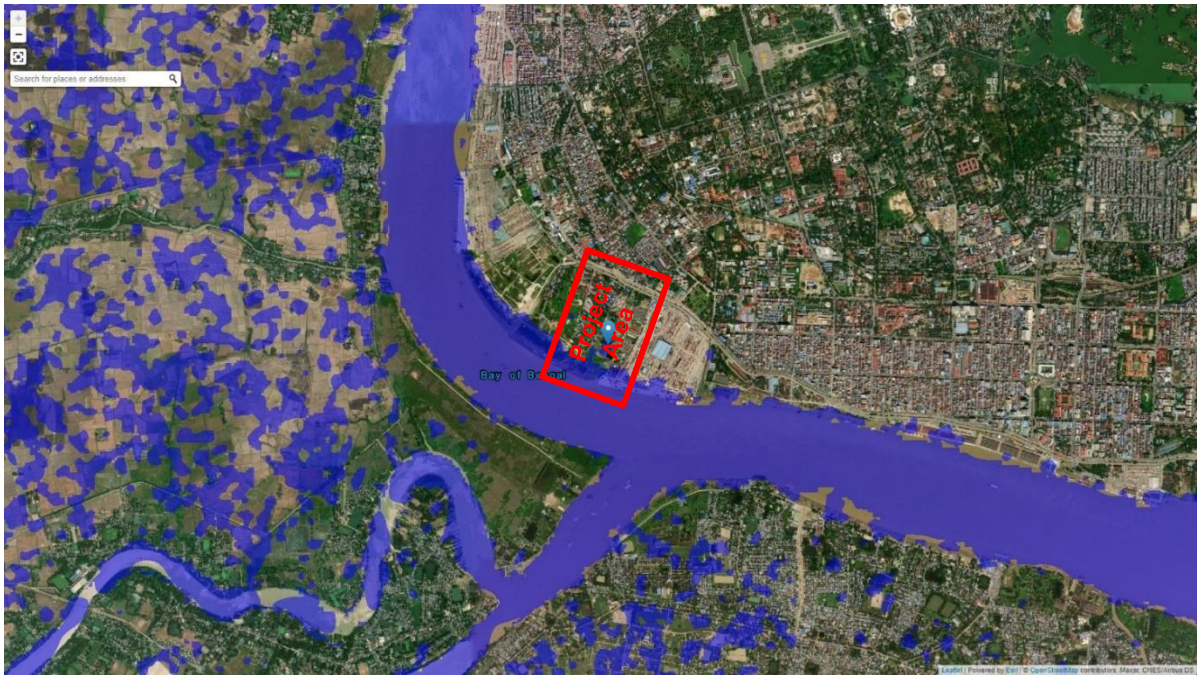


Photo 4-5: Flood and inundation at 3 m sea level increase (Aerial Photo)

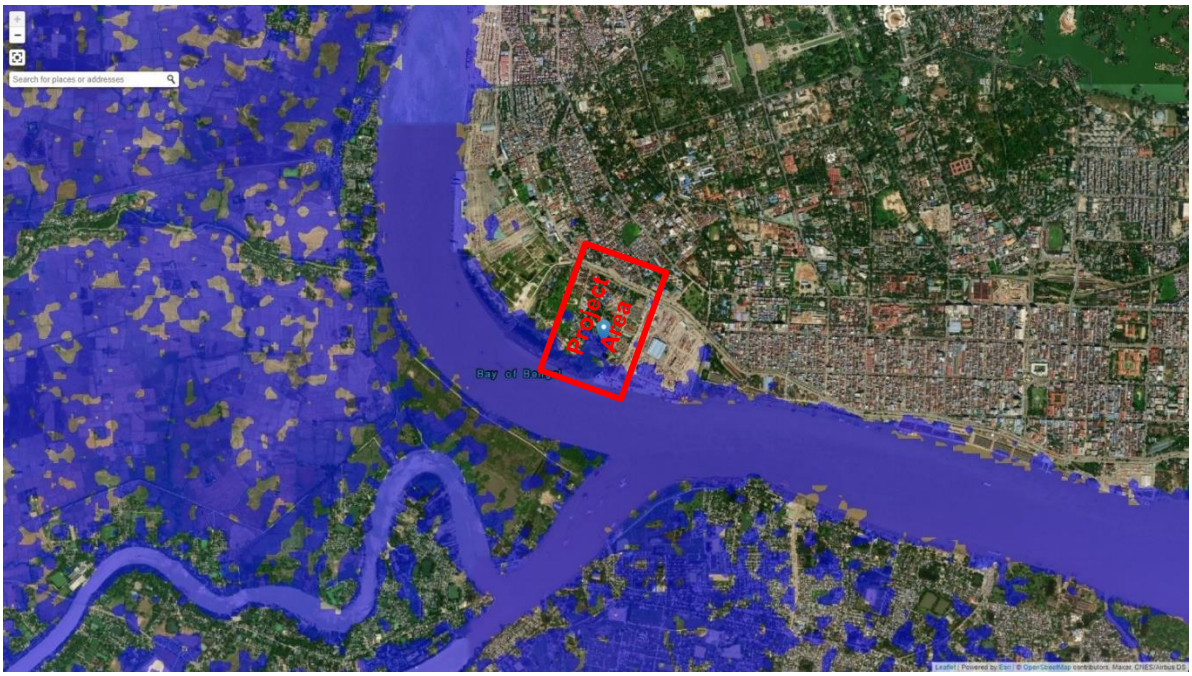


Photo 4-6: Flood and inundation at 5 m sea level increase (Aerial Photo)

4.3.11.4 Landslide and Forest fire

The risks associated to landslide and forest fire is not relevant for proposed project since it is located inside neither covered forest and farmland nor inclined slope of hilly areas.

4.4 Environmental Baseline Data

This section highlights detail scope of work that is going to be conducted for full Environmental Impact Assessment (EIA). Baseline data collection includes 3 separate major compartments of the environment which could be classified as follows:

a) Physical data
b) Biological data, and
c) Social data

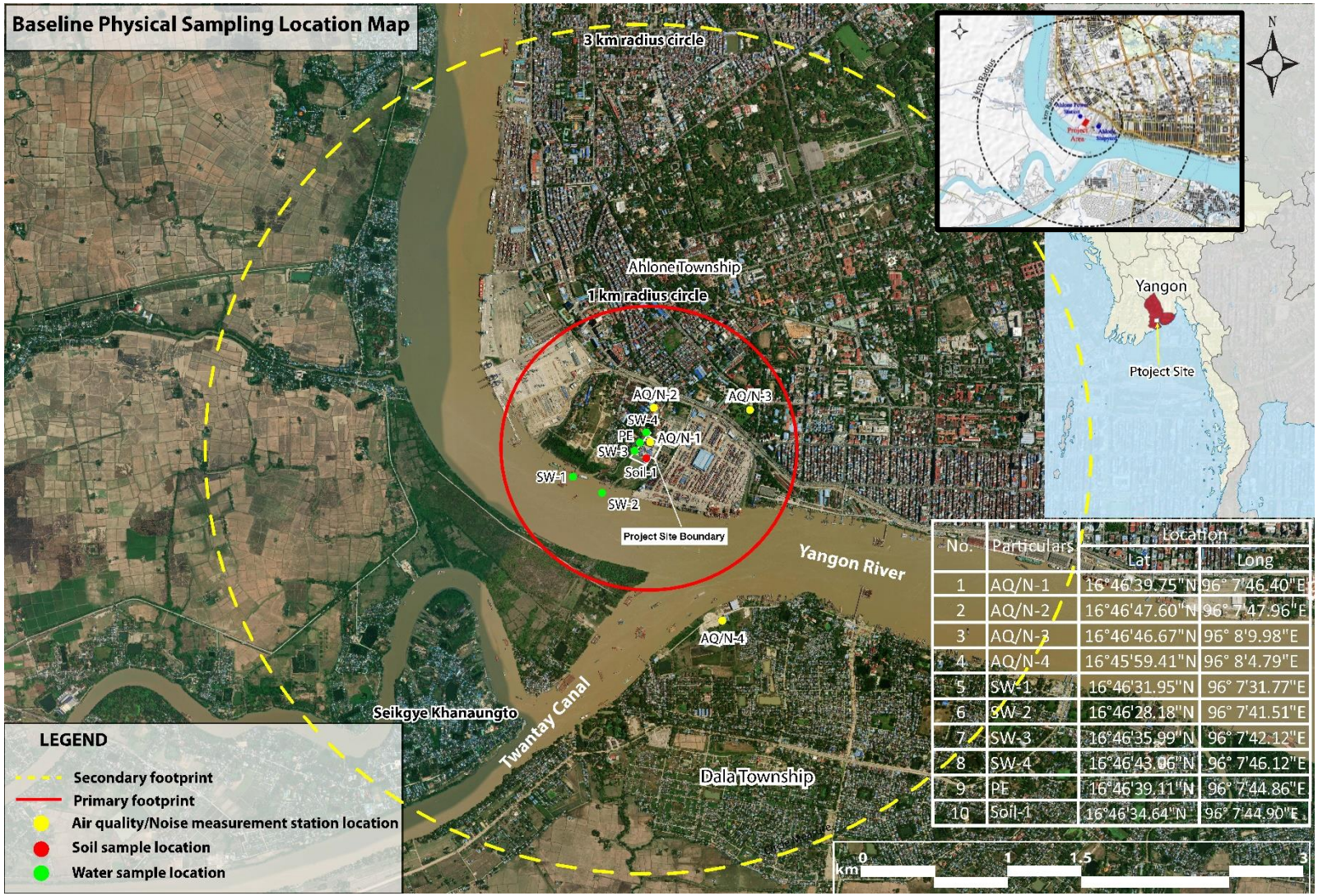
4.4.1 Physical Environment

Data collection for physical environmental impact assessment is to be carried out specified in the table. The selection of sample location is based on detailed site visits conducted during August 2020 and presenting characteristic of physical environmental settings. The location of sampling points, methodology and the parameters are described in the following table (4-10). In order to make comprehensive assessment and prepare functional and effective environmental management plan, data collection will be managed by experts in relevant environmental disciplines of MSR team and supervised carefully and closely to have ultimate data validity. The data collection includes measurement on the soil, water, and air quality stated below table 4-10 and figure 4-25.

Table 4-10: Items to be conducted by the Field Survey and Actual Sampling /Analysis

Field Survey	Location(s)	Methodology / Duration	Items of Survey Items/Parameters
Air Quality Analysis	4 points at the centre of project area, immediate vicinity, and potential receptors. (See aerial photo below)	• Ambient air sampling will be conducted at specified sites. • Sampling period is set 24-hour measurement level of $PM_{2.5}$ and PM_{10} using EPAS air sampler and other gases are also measured by auto sensors of the EPAS Haz-scanner.	• PM_{10}, • $PM_{2.5}$, • NO_2, • SO_2, • CO, • O_3
Stack Emission	Stack of power plant	• CEMS • Every 6 month	• SO2 • NOx • PM/ Smoke
Noise Level Analysis	4 points at the centre of project area, immediate vicinity, and potential receptors. (See aerial photo below)	The sound level monitoring was performed in accordance with standard procedures adopted by American Conference of Governmental Industrial Hygienist (ACGIH) which is authoritatively and currently used in Myanmar.	• 24 hours • (1-hour average noise level (Leq in dBA) and • (Lmax in dBA)
Soil Quality Analysis	1 sample of Topsoil (Nutrient) 1 samples of Heavy metal soil (Toxic) must be collected at designated locations. (At the centre of project site)	Soil survey on the base of applicable and recognized soil scientist and soil analysis. Accredited standard method will be applied for analysis. When soil survey was conducted physical properties of soil such as soil colour, texture, structure, moisture, hardness, drainage, inclusion, and new formation were recorded and gave the soil name by using Russian soil classification, F.A.O soil classification method.	• pHsoil: water (1:2.5), • ECsoil: water (1:5), • Texture, • Organic Carbon, • Total N, • CEC, • P, • K_2O, • Moisture, • Humus, • F_e,

Field Survey	Location(s)	Methodology / Duration	Items of Survey Items/Parameters
		When classified the soil types, soil horizontally characteristics were based and identified the soil type. Soil properties are formed according to the soil forming process and it is not possible to give nomenclature on the base of site seeing different norms of the soil characteristics.	• Ca, • Mg, • K, • Na, • H, • Al, • TDS, • SAR. • RSC, • Dominant • Sault, • CO_3, • CL, • HCO3
Water Quality Analysis	5 samples of water base on occurrence and geographic settings of water bodies. They include, 1. Upstream and downstream of Harbi Creek 2. Up Stream and Downstream of Yangon River. 3. PE (power plant effluent water) (See aerial photo below)	• Standard method of wastewater analysis, APHA 2015 • Atomic absorption spectrophotometer (graphite furnace method) • Spectrophotometers	• pH, • BOD, • COD, • Total Dissolved Solid, • Nitrate, • Arsenic, • Oil and Grease, • Phenol, • Sulphate, • Chloride, • Electro Conductivity, • Lead, • Turbidity, • Alkalinity, • Iron, • Dissolved Oxygen, • Copper, • Phosphate, • Color, • Hardness, • Fluoride, • Magnesium, • Zinc



No.	Particulars	Location	
		Lat	Long
1	AQ/N-1	16°46'39.75"N	96° 7'46.40"E
2	AQ/N-2	16°46'47.60"N	96° 7'47.96"E
3	AQ/N-3	16°46'46.67"N	96° 8'9.98"E
4	AQ/N-4	16°45'59.41"N	96° 8'4.79"E
5	SW-1	16°46'31.95"N	96° 7'31.77"E
6	SW-2	16°46'28.18"N	96° 7'41.51"E
7	SW-3	16°46'35.99"N	96° 7'42.12"E
8	SW-4	16°46'43.06"N	96° 7'46.12"E
9	PE	16°46'39.11"N	96° 7'44.86"E
10	Soil-1	16°46'34.64"N	96° 7'44.90"E

Figure 4-25: Scoping Exercise Boundary for ESIA in Physical Environment (1 Km radius for Primary and 3km radius) as Area of Influence

4.4.1.1 Baseline Surface Water and Plant Effluent Quality

Surface water quality surveys in nearby Harbi Creek and Yangon River were carried out in two different seasons of the year during construction stage and operation stage of the project between 2019 - 2021 to set as baseline water quality that will be compared against periodical monitoring. The surface water quality monitoring was conducted near effluent point at two distinct points of upstream and downstream from the Project's planned cooling water intake and discharge points in the Harbi Creek and Yangon River as shown in Table 4-11 and the laboratory sampling results is attached in the appendix.

Table 4-11: Laboratory Sampling Results of Surface Water in Selected Locations and Power Plant Effluent Quality

Sr. No	Quality Parameters	Unit	SW-1 Yangon (Up Stream)		SW-2 Yangon (Down Stream)		SW-3 Harbi Creek (Down Stream)		SW-4 Harbi Creek (Up Stream)		Power Plant Effluent	NEQG Guideline Value
			1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd		
1	Amonia	mg/L	<0.02	1.2	<0.02	1.3	<0.02	7.4	0.14	18.9	<0.4	10
2	Arsenic	mg/L	0	0.01	0	0.01	0	0.01	0	0.01	0.01	0.1
3	BOD	mg/L	4	64.27	7	62.18	6	19.4	5	47.62	2.07	50
4	Cadmiun	mg/L	ND	<0.02	ND	<0.02	ND	<0.02	ND	<0.02	<0.02	0.1
5	Chromiun (Hexavalent)	mg/L	0	<0.01	0	<0.01	0	<0.01	0	<0.01	<0.01	0.1
6	COD	mg/L	<30	191	<30	142	<30	38	<30	74	5	250
7	Colour	TCU/PCU	200	5925	240	5357	80	640	10	1245	20	-
8	Copper	mg/L	ND	4.88		4.71	ND	0.591	ND	0.968	<0.1	0.5
9	Fecal coloform count	mg/L	10	222.5	20	85	10	50	8	300	-	-
10	Fluoride	mg/L	0	<0.02		<0.02	0	0.17	0	0.07	0.33	20
11	Free chlorine	mg/L	Nil	0.06	Nil	0.04	Nil	0.08	Nil	0.03	Nil	-
12	Free Cyanide	mg/L	0.01	<0.02	<0.01	<0.02	<0.01	<0.02	<0.01	<0.02	0.002	0.1
13	Iron	mg/L	1.89	36.63	2.05	36.63	1.47	2.25	0.75	4.08	Nil	3.5
14	Lead	mg/L	ND	ND	ND	ND	ND	0.1	ND	ND	ND	0.1
15	Nickel	mg/L	2	0.263	ND	0.286	ND	0.049	ND	0.091	0.013	0.5
16	Oil & Grease	mg/L	2	1	3	2	3	5	2	2	3	10
17	pH	S.U [a]	7.7	7.18	7.8	6.83	7.3	7.24	7.5	6.82	8.11	6 to 9
18	Phenol	mg/L	Nil	0.08	ND	<0.5	ND	0.04	ND	0.08	0.05	0.5
19	Total Chlorione	mg/L	Nil	0.14	Nil	0.05	Nil	0.11	Nill	0.14	0.01	0.2
20	Total coloform count	mg/L	40	295	80	190	30	55	20	600	-	400
21	Total Nitrogen	mg/L	<0.5	9	<0.5	4	2	5	3.4	20	<2	40
22	Total Phosphorous	mg/L	0.05	12.9	0.02	18.6	0.1	2.3	0.2	6.1	0.7	2

Sr. No	Quality Parameters	Unit	SW-1 Yangon (Up Stream)		SW-2 Yangon (Down Stream)		SW-3 Harbi Creek (Down Stream)		SW-4 Harbi Creek (Up Stream)		Power Plant Effluent	NEQG Guideline Value
			1 st	2 nd	1 st	2 nd	1 st	2 nd	1 st	2 nd		
23	**Total Suspended Solids**	mg/L	132	720	127	700	28	40	7	Nil	Nil	50
24	**Turbidity**	NTU	416	942	432	924	135	46.59	20	105	1.9	-
25	**Zinc**		<0.02	<0.01	<0.02	<0.02	0.06	<0.02		0.04	0.08	2
26	**Temperature**	°C	28.3	28.4	28.3	28.5	28.3	28.4	28.3	28.4	28	<3[b]

[a] Standard unit, [b] Temperature increase due to discharge of once-through cooling water

The results revealed that there is no formidable issues or pollution to surface water (creek and river) and power plant effluent when compared to NEQG permissible limits for power plant effluent and general water quality. Quality of all the parameter values is higher than effluent of power plant. It is obvious that that wastewater from the Power Plant is not only the discharge water drain into the Harbi Creek from it into the Yangon River. Harbi Creek is actually just a drain. Waste water from residents and all sorts of business that using water of Saw Yan Paing Wards flow into the drain. Moreover, there is a large community of squatters situated along downstream of Harbi Creek till Yango River. Sanitation, sewage system, does not employ in these squatters.

Photo 4-7: 1. Squatters along Harbi Creek. 2 The drain where waste water flow without treatment that can cause water pollution

However, it should be noted that none of the surface water is fit for direct application for neither domestic and hygiene purpose. With the project utilize advance water treatment methods for plant operation state in the project description, no safety issues are likely to occur for employees and labours employed in the project at all stages. Water temperature was measured using Combo meter while taking water sample in the Yangon River and Harbi Creek. River water temperature varies at the range of 25 to 28 °C.

Photo 4-8: Combo Meter

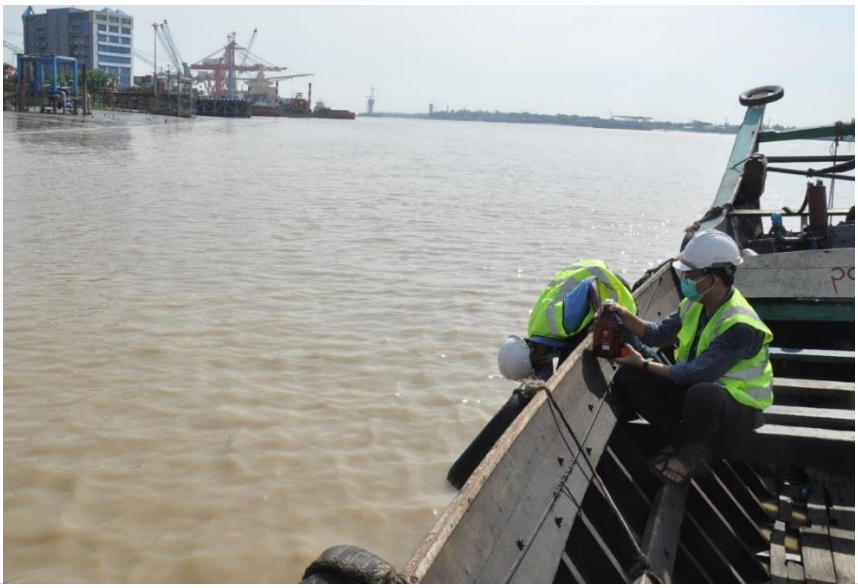


Photo 4-9: water sample collecting from river

Sampling and Laboratory Analysis Procedures

The water samples were collected by batch sample collection and laboratory sampling techniques at certified agents. The samples were preserved and sent to the laboratory for chemical analysis. The American Public Health Association (APHA) Standard Methods for the Examination of Water and Wastewater (22nd Edition) were applied in the analysis. The description of sampling methods is also described along with sampling results stated in the appendix.

4.4.1.2 Baseline Ambient Air Quality

The baseline ambient air quality monitoring was undertaken at four (4) selected baseline air monitoring points (potential receptors), located in the vicinity of the proposed Ahlone CCPP site and along the cooling water pipeline route. The ambient air pollutants monitored included Sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), Ozone (O_3), particulate matter 10 micrometres or less in diameter (PM_{10}) and particulate matter 2.5 micrometres or less in diameter ($PM_{2.5}$). The measurement data were then processed to obtain relevant averaging periods of each air pollutant for comparison with the respective Myanmar NEQ Guidelines (2015). Four (4) baseline air sampling locations are shown in Figure 4-26 and 4-27. A description of the selected sampling locations is presented in Table 4-12.

Figure 4-26: Wet season Air and Noise Quality Measurement Station Location

Figure 4-27: Dry season Air and Noise Quality Measurement Station Location

Table 4-12: Baseline air sampling Results in 4 Potential Receptors

Sr. No	Parameter	AQ-1 Inside of project site		AQ – 2 Ahlone Power Plant Compound, Near staff housing		AQ – 3 Thakin Mya Park in Ahlone Township		AQ – 4 Yarzathingyan St, Mhawsat Ward, Dala Township		NEQG Guideline Values	Guidelines
		First time 17, Oct 2020	Second time 22, July 2022	First time 28, Jan 2021	Second time 20, July 2022	First time 29, Jan 2021	Second time 21, July 2022	First time 15, Jan 2021	Second time 13, Dec 2022		
1	PM_{10} (24Hrs) µg/m^3	111.212	31.4	101.9	54.6	91.5	42	324.1	59.8	50 µg/m^3	WHO
2	$PM_{2.5}$ (24Hrs) µg/m^3	23.0799	27.1	66.7	39.4	61.9	22	184.5	55.4	25 µg/m^3	WHO
3	CO (8Hrs) ppb	512.396	100	924.9	210	724.7	127.6	1090.3	221.3	900 ppb	US.EPA
4	NO_2 (1Hr) µg/m^3	73.7273	2	152.4	6.8	177.8	4.6	128.7	4.1	200 µg/m^3	WHO
5	SO_2 (24Hrs) µg/m^3	55.6445	1	225.6	11.4	82.1	1	199.7	13.5	20 µg/m^3	WHO
6	O_3 (8Hrs) µg/m^3	98.1886	8.8	69.2	21.4	128.3	24.8	55.3	11.9	100 µg/m^3	WHO

The 24 hours long ambient air quality monitoring at all selected points revealed that the air quality of all area is very poor in quality. With the exception NO_2, of All indicators and parameters results were found higher than permissible threshold of NEQG limit. This is due to the fact that the project site and sampling points are inside commercial and urban areas in which anthropogenic sources, and activities are active with respect to time of the day. Thus, inarguably, the presence of proposed project, it is highly likely that these pollutants concentration could increase as long as the project activities are active. Therefore, project developer is obliged to implement adequate and constant mitigation measures and management plan to reduce potential impacts. Comprehensive environmental and social management plant is being developed in next section of this report.

4.4.1.2.1 Air Quality Modelling

Air quality modelling study was conducted based on the measurement data. In the appendix (1), details of air quality modelling procedures using AERMOD dispersion modelling system are presented. In this section, brief explanations of objectives, methodology are stated.

The objectives of the Modeling aim;

i. To estimate emission from the operation of Ahlone CCPP
ii. To study the dispersion pattern of air pollutants from the operation of Ahlone CCPP
iii. To assess the potential impacts of the operation of Ahlone CCPP on ambient air quality
iv. To consider the modelling results in evaluating impacts significance on ambient air quality.

Methodology

The overall methodological framework is presented in following Figure. In this study, emission from CCPP operation is estimated for the base year 2022. The spatial extent of the modelling study will be 10 km radius from the centre point of the CCPP. The site activity data is collected from the CCPP operation team and site-specific meteorological data (surface and profile data of AERMOD-ready inputs) are purchased from Met Data Services of Lakes Environmental Software.

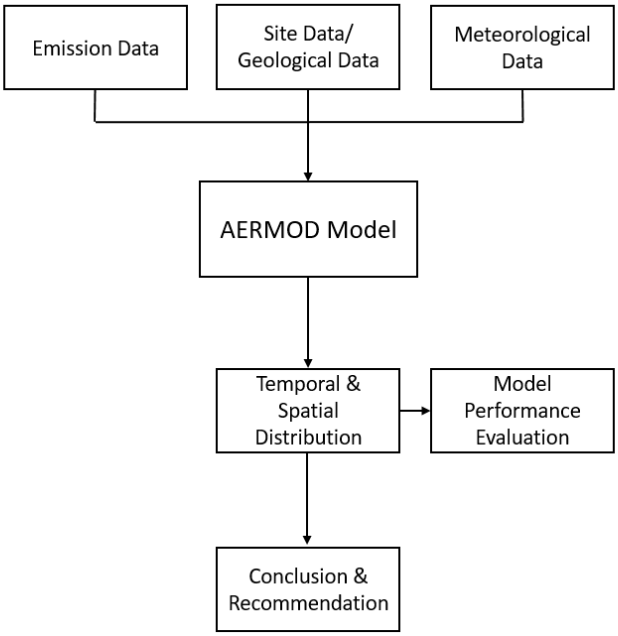


Figure 4-28: Methodological Framework for Air Quality Modeling

The findings of the study indicate that, overall, the concentration of pollutants emitted from the power plant is within the NEQEG limits, aligning with the emission targets set by the power plant. However, a comparison with field measurement data from four locations reveals that concentrations of pollutants exceed the guideline limits. This might be due to external factors such as emissions from nearby port terminals, sand piles, on-road vehicles, and vessels navigation in Yangon River.

A comparison between field measurement data from four locations and air modelling results are shown in following table.

Sampling Procedures and Quality Control

The ambient air quality sampling events were conducted on two separate seasons of during 2020 – 2022 by using EPAS HAZ scanner air quality monitoring system. The equipment and system configuration are calibrated periodical as of manufacturer guidance. Sampling drills were undertaken for 24 hours continuously, then data obtained are further processes by using SPSS software for averaging and weighting reference period specified by NEQG. Though, the monitoring system operate in programming for automatic logging and data register, one air quality expert and field technician were assigned for verifying and examining data trends and validity.

Table 4-13: Comparison of Emission with Measurement Data

Location	1-hr NO_2 (µg/m^3)				24-hr SO_2 (µg/m^3)				24-hr PM_{10} (µg/m^3)				24-hr $PM_{2.5}$ (µg/m^3)			
	M1	M2	MR	GL	M1	M2	MR	GL	M1	M2	MR	GL	M1	M2	MR	GL
AQ1	2	80.2	7.2	200	1	55.6	0.000001	20	31.4	111.2	0.08	50	27.1	23.1	0.08	25
AQ2	6.8	152.4	6.1		11.4	225.6	0.000004		54.6	101.9	0.18		39.4	66.7	0.18	
AQ3	4.6	177.8	3.7		1	82.1	0.000009		42	91.5	0.37		22	61.9	0.37	
AQ4	4.1	128.7	3.5		13.5	199.7	0.000008		59.8	324.1	0.28		55.4	184.5	0.28	

M1, measurement results from 1st time 1, 15, 28-29 January 2021

M2, measurement results from 2nd time 1, 21-22 July 2022

MR, model results

GL, National Environmental Quality (Emission) Guidelines

4.4.1.3 Baseline Ambient Noise Quality

Noise level monitoring was conducted simultaneously with the ambient air quality sampling exercise to establish background noise levels. The locations of the four (4) noise level monitoring stations are described in Table 4-14 and their locations are shown in Figure 4-26 and 4-27.

The noise monitoring results in terms of the average 1-hour measurements for the daytime (0700H to 2200H) and night-time (2200H to 0700H) periods at the four (4) sampling locations. The background noise levels measured were compared against the noise limits set out in the Myanmar NEQ Guidelines. The noise levels measured at NQ1 exceeded the NEQG Guidelines at all time which is inside the project site and at the vicinity of major noise source. All remaining monitoring stations except for residential areas during the daytime noise monitoring, the noise level is below NEQG guidelines. However, the noise levels during night-time at NQ2 and NQ3 exceeded the allowable limits of NEQ Guideline for residential area. The high noise levels a NQ2 may be due to the noise from those other power plants located within the MOEP compound. Field investigation provided with the evidence that day noise of NQ2 doesn't belong to Myanmar Ahlone Power Plant since the residential area is a few kilometres away from proposed project and there is enough vegetation buffer that completely dissipate the noise originated from 151.54 MW combine cycle power plant which is under the study.

Table 4-14: Baseline noise sampling Results in 4 Potential Receptors

Noise Level		NQ–1 Inside of project site		NQ – 2 Ahlone Power Plant Compound, Near staff housing		AQ – 3 Thakin Mya Park in Ahlone Township		AQ – 4 Yarzathingyan St, Mhawsat Ward, Dala Township	
		First time 17, Oct 2020	Second time 22, July 2022	First time 28, Jan 2021	Second time 20, July 2022	First time 29, Jan 2021	Second time 21, July 2022	First time 15, Jan 2021	Second time 13, Dec 2022
Leq in dBA	Leq Day	84.2	83.3	74.1	79.5	70.6	77.3	71.4	69.1
	Leq Night	82.6	80.7	70.4	80.3	70.4	75.9	65.3	60.7
	Leq Total	83.7	82.5	73	79.8	70.5	76.8	70	67.4
Lmax in dBA	Lmax Day	72.3	71.5	62.1	66.8	58.7	63.7	57.9	54.7
	Lmax Night	72.7	71.2	60.9	66.1	60.6	63.1	54.3	47.3
	Lmax Toal	72.4	71.4	61.6	66.5	59.4	63.5	56.5	52.1
Level of Noise in 24 Hrs dBA	Average	72.4	71.4	61.6	66.4	59.4	63.3	56.4	51.7
	Maximum	75.7	72.2	65.4	78.4	63.0	71.3	66.0	64.3
	Minimum	70.0	70.8	59.7	61.9	57.2	57.2	49.5	42.7
	Median	72.2	71.4	61.6	64.5	59.3	61.6	56.2	51.52

4.4.1.4 Baseline Soil Quality

Baseline soil quality investigation of parent soil inside project site had been conducted prior to construction activities commenced. Under the project development and needs all space of land had been transformed into impervious concrete pavement when completion of all construction activities. Although the power plant operation doesn't not involve direct relation to soil quality, there is a slight possibility that improper handling of lubricants, oils and greases could result soil degradation under uncontrolled spills and dumping. Though these issues had been addressed through management plan, the establishment of baseline soil quality assists as reference environmental quality for environmental remediation and restoration for dismantling stage of the project.

The laboratory sampling results uncovered that the parent soil presence no metal toxicity in slightly alkaline conditions in loamy sand formation. The soil scientists of land use division from ministry of agriculture and irrigation department remarked the soil nutrients and composition falls within margins of

dominant soil of the area. The result of analytical soil samplings is described below and the full report is attached in the appendix.

Table 4-15: Analytical Sampling Results for Heavy Metals

Sr. No.	Sample	Lead (Pb) ppm	Nickel (Ni) ppm	Chromium (Cr) ppm	Cadmium (Cd) ppm	Iron (Fe) ppm
1	Soil	1.0	Not detected	Not detected	Not detected	12.81

Table 4-16: Analytical Sampling Results for soil nutrients and composition

Sr. No.	Sample	pH Soil-Water 1:2:5	EC	Texture	Organic Carbon	Total N	Available Nutrients	
							P	K_2O
1	Soil	Slightly alkaline	Very Low	Loamy sand	Very low	High	Low	Low

Sr No	Sample	Moisture %	pH Soil-Water 1:2:5	EC Soil-Water 1:5 mS/cm	Texture				Organic Carbon %	Humus 1%	Total N %	Exchangeable Cations meq/100gm			Available Nutrients	
					Sand %	Silt %	Clay %	Total %				Ca^{++}	Mg^{++}	K^{+}	P ppm	K_2O Mg/ 100gm
1	Soil	0.66	7.24	0.14	85.70	6.70	7.60	100.00	0.44	0.76	0.11	10.06	2.01	0.17	6.45	7.85

O = Olsen Method

Soil Sample collection and Analytical Sampling

The soil samples were collected with a stainless-steel soil auger with sampling tube. Soil samples were collected between 0.3 to 1 m depth below the ground surface. Samples were stored in sample plastic bags and preserved at a low temperature prior to the transfer to the laboratory for analysis. The time of sampling and Global Positioning System (GPS) coordinates of the sampling location were recorded. A chain of custody for each sample was prepared.

4.4.2 Biological Environment

The biological environment could expect lesser risk of environmental degradation and adverse impact by the consequence of the proposed project in all its project stages among which construction stage creates highest transformation and degradation to biological compartments of the environment (i.e., biodiversity – zoological and botanical resources). Apparently, for site clearing alone, loss of vegetation and habitant could be forecasted over its project areas. The anthropogenic activities and plant operation could have lasting and strong impact to the climate and ambient temperature rather than the natural habitats and host species. The impact during dismantling (decommissioning) phase is minimal by means of compulsory environmental remediation. The environmental settings can be restored since resultant of project operation is reversible and rehabilitated by certain measures and protection efforts.

4.4.2.1 Methodology Approach and Strategies

The combination of desk base literature review and collecting baseline survey for the information of terrestrial and aquatic fauna, flora and land use had been recorded and presented the updates by means of field investigating and surveys (i.e., qualitatively, and quantitative).

The biodiversity experts (both zoologist and botanist) had been deployed for proper classification and verification to the taxonomy of host habitats. The interview with residents was made for getting information of the history of the area and presence and absence of flora and fauna in the past and present time.

A site visits consists of conducting the taxonomic strategy and observe the currently existing situation of flora, fauna and habitats of project site and its surroundings. Two baseline data collection in different weather had been collected with field survey works in covering project boundary, primary and secondary study limit for 0.5 - 1 km radius.

Both terrestrial and aquatic ecosystems had been examined. Majority of habitats on sites are generally considered to be of limited ecological value, comprising of flourishing tropical trees and shrubs. Trees and plants occurring along with succession through time offer important urban ecosystem in balance and preserving stability of topsoil against surface runoff.

Terrestrial flora, fauna and natural habitats records based on secondary information and direct observation was thoroughly examined and compared. The tree, plant, and shrub and species composition of plant and their distribution near the project site were enlisted and further taken as reference for future revision and comparison.

Regarding zoological (i.e., wildlife and insects) related investigation, the presence of other animals such as snakes, frogs, birds, and mammals were expected to examine. Bird watching (ornithological survey) were undertaken within the habitats of the study area, then try to build up a true picture of species-habitat relationship. Distribution and presence of some mammals had been examined by conducting track and sign surveys. Collection of butterflies will be made along the transect lines by setting up traps and cages at various habitats in the proposed project area. The specimens were to be photographed, then release them back.

Although trees, plants, shrubs, and grasses were not dominating on the land surface inside project site, some drainage channels, and waterways (rivers) maintain water providing shelter for aquatic organisms and means for maritime transporting vessels alike. Despite the fact that lakes, marshes, and swamps were not found, the estuaries and creeks does provide refuge for fish and some aquatic animals to let them continue year-round living in nearby area including commercial and recreational fishing therein. Therefore, two separate baseline data collection in different climate is mandatory to compare against summertime vs wet seasons.

Therefore, relevant water bodies such as rivers and drainage channels (Harbi creek) have been included under consideration that are observed in and around the project sites as far as 1 km radius of the project surrounding where aquatic lives can thrive in naturally existing aquatic environment. Fishes would be collected from the small creek and tributaries. The presence and absence of other aquatic organisms were examined from the local inhabitants at the time of baseline study.

Land use pattern would be sort out based on interviews with residents and drone photographs.

4.4.2.2 Baseline Biological Data and Resources

In the former survey, there were sixty-four plant species recorded during the survey period at Myanmar Ahlone Power Plant compound and its surroundings and then in the secondary survey, there were twenty-three plant species recorded once again. Tidal forest has occurred at the Yangon Riverbank back of the Power Plant. The collected tree, small tree, shrub, herb, and climber species composition were studied, identified, and classified taxonomically. Interview with staff and security guard during power plant visit and other interviews with officials at semi- official meeting were made to get information of the background history of the existence of flora. The visual observation and identification method and interview method were used for the population of plant density.

The zoological studies were carried out together with the botanical studies. The recorded lists of the animals, (1) squirrel (Chordata), (19) birds (Chordata), (1) crab (Arthropoda) and (1) butterfly (Arthropoda) was present in the zoological survey.

4.4.2.3 Study sites

Myanmar Ahlone Power Plant compound, in Ahlone Township, Yangon Region, covers in an area of about 6 acres, at the near the Yangon Riverbank within GPS position16’46”38.04N and 96’7”46.63E, is presented in aerial Photo 4-10.

The first study visit was conducted on 12-10-2021 inside the plant compound and Saw Yan Pai (West) Ward, Ahlone Township. The second study visit was conducted on 16-11-2021 the inside the plant compound, the back of plant and Yangon Riverbank. The third study visit was conducted on 6-12-2021 at the in front of and within the plant compound, and from back of the plant to Yangon Riverbank. The fourth study visit was conducted on 25-3-2022 at the back of the plant to Yangon Riverbank. Walk transect survey done area was shown in google earth photo.

Photo 4-10: The whole project area with the GPS positions of biological study done

Photo 4-11: Biological Survey Area for Flora and Fauna

4.4.2.4 Types of habitats

Two types of habitats namely terrestrial habitat and aquatic habitat have occurred at the survey area. Terrestrial habitat that are found on land and aquatic habitat that are related to water and includes areas that are permanently covered by water such as ponds rivers and oceans. Interviewees reported that the tidal forest is located at the back of the Power Plant on Yangon Riverbank.

Tidal forest (Mangrove)

Mangroves protect against natural disasters caused by the sea and prevent the intrusion of salty seawater into farmland, thereby reducing the risk of crop damage. Moreover, mangroves are extremely productive and are important for large number of aquatic faunas. According to the site-visit interviews the respondents reported that there were mangroves grown at 1.6 Km away from the Project site. In 2008, Cyclone Nargis was seriously damaged to mangrove area and its biodiversity system in and around of Yangon River terraces. Previously grown 16,800 hectares of mangrove forest (about 30%) and 20,999 hectares of forest plantation in Yangon and the Irrawaddy delta were mostly destroyed. Department of Forest claimed that mangroves area presented around the Project area were not recorded in the Department. Furthermore, replantation of mangrove in this area is also not feasible due to development of National Projects.

Mangrove forest was found along the bank of Khanaungto Creek and Twante canal at the west bank of Yangon River. Mangrove are also presents in sub-coastal areas along river valleys and across watersheds. According to the Ministry of Natural Resources and Environmental Conservation, seven protected public mangrove forests have been established along the coast of Yangon Region as a green belt and will continue to be expanded. The ministry encourages local people to maintain and increase the planting of plants for strong carbon absorption and being an ecosystem that is important for the socioeconomic development of local people.

As part of the green belt initiative, total 30,000 mangroves trees have been planted in Thamada Beach mangroves plantations in Dala Township. In the rainy season of 2023, 10 acres of Lamu trees were planted[12].

4.4.2.5 Flora

Plants form the critical base of food chains in nearly all ecosystems. Through photosynthesis, plants harvest the energy of the sun, providing both food and habitat for other organisms. In general, native plants support other native species more effectively than non-native plants. Plants are the most important producers; Plants use energy from sunlight to convert CO_2 into glucose (or other sugars). Plants with roles in the ecosystem are called ecological services. They keep us and the rest of the ecosystem alive.

The botanical surveys were undertaken three-day investigation in (12-10-2021), 16-11-2021 and 6-12-2021. The direct visual investigation was done by walking inside the power plant compound according to quadrat method. Materials used for recording and identification were digital camera, and field notebook. The main study sites were inside the Power Plant compound, in front of Power Plant, Saw-Yan-Paing Quarter, Ahlone Township, Yangon Region, back of Power Plant and Yangon Riverbank. This survey was mainly based on field studies and involved interviews with staffs of Power Plant and on direct observations. All species observed were recorded by taking photos. The species identification was carried out by using key to the families of the plants and appropriate literature. In this study, the direct visual observation and identification method by walking for the existent plants and interview method were used. In this study, two types of habitats such as terrestrial and wetland (along the Yangon riverbank and Harbi Creek) have investigated. The two habitats are closely related to each other.

The aim and objectives of this survey were to collect, identify, classify, and list the plant species for the existent plants from the project area and to determine the habitat type. The location of the project area was situated within Ahlone Township, Yangon Region and mentioned with GPS position (Photo 4-10).

[12] https://www.monrec.gov.mm/news/1515

In first time study, the study area, inside the Power Plant compound and Saw-Yan-Pai Quarter, Ahlone Township, Yangon Region, a total of (64) plant species of (61) genera belong to (38) families were collected and recorded (Table 4-17).

Plants observed in the project area including IUCN Red List (VU one species) and 16 invasive species were classified and recorded under the relevant taxonomic categories of the flora in table 4-18. A protected species *Pterocarpus,* which is State banned to cut tree was found.

In second time study, surveyed on foot starting from the Power Plant compound, at the back of the compound, and traversed Yangon Riverbank. Areas with different vegetation communities were strategically targeted to ensure that as many of the species present were recorded. A total of 23 plant species of 21 genera belong to 15 families were collected and recorded.

Plants observed in the project area including IUCN Red List (LC seven species) and 5 invasive species were classified and recorded under the relevant taxonomic categories of the flora. A total of families 15 including genera 23 and types of habit recorded were also shown in table 4-19.

The third survey was undertaken on Monday in 6-12-2021. The vegetation at the back of the plant was changed because of climate (temperature, rainfall) whilst the tidal forest was not changed. Unidentified aquatic plants and bean family of herbaceous climbers were found. These plants have no flowers and fruits yet.

In third time survey, eight plant species were collected. The collected plant species were identified and classified. In third time study, the study area, inside the Power Plant and back of the plant to Yangon Riverbank, a total of 8 plant species of 8 genera belong to 7 families were collected and recorded (Table 4-21). One out of eight species was invasive species.

The third time survey was carried out after overall (first and second collection, then biological environmental impact assessment) preparation. The recorded plants genera inside the Power Plant compound and Saw-Yan-Pai Quarter, Ahlone Township, Yangon Region area is arranged by alphabetically.

Table 4-17: The lists of plant species including List of IUCN Red List Status and Invasive Species Lists found in Myanmar Ahlone Power Plant compound and its surroundings (inside the Power Plant Compound and Saw-Yan-Pai Quarter, Ahlone Township, Yangon Reg

No.	Scientific Name	Common Name	Family Name	Habit	Red List Status	Invasive species
1	*Achras zapota* L.	Thagya, sapota	Sapotaceae	T	-	-
2	*Albizia lebbek* (L.) Benth.	Kokko	Mimosaceae	T	-	-
3	*Aloe* sp	Shazaung-letpat	Aloaceae	H	-	-
4	*Ananas comosus* (L.) Merr.	Nanat, pineapple	Bromeliaceae	H	-	-
5	*Annona squamosa* L.	Awzar, Custard apple	Annonaceae	ST	-	-
6	*Areca catechu* L.	Kunthi-pin	Arecaceae	ST	-	-
7	*Artocarpus heterophyllus* Lam.	Peinne	Moraceae	T	-	-
8	*Averrhoa carambala* L.	Zaung-yar	Oxilidaceae	ST	-	-
9	*Azadirachta indica* A. Juss.	Tama	Meliaceae	T	-	-
10	*Benincasa hispida* (Thunb.) Cogn.	Kyauk-pha-yon, white gourd	Cucurbitaceae	C	-	-
11	*Calophyllum inophyllum* L.	Pon-nyet	Hypericaceae	T	-	-
12	*Cananga odorata* (Lam.) Hook. F & Thomson	Saga-sein	Annonaceae	T	-	-
13	*Canna* sp	Canna, Indian shot	Cannaceae	H	-	Invasive
14	*Carica papaya* L.	Thin-baw	Caricaceae	ST	-	-
15	*Ceiba pentandra* (L.) Gaertn.	Thinbaw-letpan	Bombacaceae	T	-	-
16	*Cinnamomum verum* presl	Thit-kya-bo	Lauraceae	T	-	-
17	*Citrus aurantiifolia* (Christm) Sw.	Thanbaya	Rutaceae	SH	-	-
18	*Cleome burmanii* Wight & Arn	Taw-hingala	Capparaceae	H	-	-
19	*Cocos nucifera* L.	Ohn	Arecaceae	T	-	-

No.	Scientific Name	Common Name	Family Name	Habit	Red List Status	Invasive species
20	*Codiaeum variegatum* (L.) Blume	Garden croton	Euphorbiaceae	H	-	Invasive
21	*Colocasia esculenta* (L.) Schott.	Pein	Araceae	H	-	Invasive
22	*Costus speciosus* Sm.	Phalanx-taung-hmwe	Costaceae	H	-	-
23	*Durio zibethinus* Murray	Durian	Bombacaceae	T	-	-
24	*Dypsis lutescens* (H. Wendl.) Beentje & Dransfield	Cane palm	Arecaceae	ST	-	-
25	*Eclipta alba* (L.) Hassk	Kyeik-hman	Asteraceae	H	-	-
26	*Elaeis guineensis* Jacq.	Si-htan, Si-ohn	Arecaceae	T	-	-
27	*Ficus glomerata* Roxb.	Ye-Thapan	Moraceae	T	-	-
28	*Ficus hispida* L.f.	Country fig	Moraceae	ST	-	-
29	*Ficus religiosa* L.	Bawdi-nyaung	Moraceae	T	-	Invasive
30	*Ficus* sp.	Naung	Moraceae	T	-	Invasive
31	*Ipomoea aquatic* Forssk.	Ye-kazun, Chinese water spinach	Convolulaceae	C	-	Invasive
32	*Laportea interrupta* (L.) Chew	Phet-yar- pho, kyet-phet-yar	Urticaceae	H	-	-
33	*Leucaena leucocephala* (Lam.) Dewit.	Aweya	Fabaceae	T	-	Invasive
34	*Leuenbergeria bleo;* (Kunth) Lodé	Rose cactus, Seven Star Needle,	Cactaceae	SH	-	Invasive
35	*Livistona* sp	Taung-htan	Arecaceae	T	-	-
36	*Mangifera indica* L.	Thayet	Anacardiaceae	T	-	-
37	*Michilia champaca* L.	Saga-wa	Magnoliaceae	T	-	-
38	*Millingtonia hortensis* L.f.	Egayit	bignoniaceae	T	-	-
39	*Mimosa* sp	Giant sensitive plant	Mimosaceae	C	-	Invasive
40	*Mimusops elengi* L.	Khayay	Sapotaceae	T	-	-
41	*Morinda angustifolia* Roxb.	Yeyo	Rubiaceae	ST	-	-
42	*Moringa oleifera* Lam.	Dan-da-lun	Moringaceae	T	-	-
43	*Muntingia calabura* L.	Hnget-thagya,	(Tiliaceae) Muntingiaceae	ST	-	Invasive
44	*Musa* sp	Nget-pyaw	Musaceae	H	-	-
45	*Mussaenda* sp	Pwintu-ywettu	Rubiaceae	SH		Invasive
46	*Nauclea* sp.	Ma-u	Rubiaceae	T	-	
47	*Operculina turpethum* (L.) Silva Manso.	Kyahin-bin	Convolulaceae	C	-	-
48	*Oroxylum indicum* (L.) Kurz.	Kyaung-sha	Bignoniaceae	T	-	-
49	*Pandanus* sp	Pandan, screwpine	Pandanadeae	SH	-	-
50	*Plumeria rubra* L.	Tayoksaga-ani	Apocynaceae	ST	-	-
51	*Polyalthia longifolia* (Lam.) Benth. & Hook.f.	Thinbaw-te	Annonaceae	T	-	-
52	*Psidium guajava* L.	Malaka	Myrtaceae	ST	-	-
53	*Pterocarpus* sp	Padauk	Fabaceae	T	VU	-
54	*Sansivieria* sp	Snake plant	Dracaenaceae	H	-	-
55	*Sauropus* sp	Kyet-tha-hin	Euphorbia-ceae/Phyl-lanthaceae	SH	-	-
56	*Senna siamea* (Lam.) Irwin & Barneby	Mezali	Fabaceae	T	-	-
57	*Spondias dulcis* Forst.f.	Gwe-cho	Anacardiaceae	ST	-	Invasive
58	*Streblus asper* Lour.	Okhne	Moraceae	ST	-	-

No.	Scientific Name	Common Name	Family Name	Habit	Red List Status	Invasive species
59	*Syngonium phodophyllum* Schott	Sitton-sein	Aracea	H		Invasive
60	*Syzygium cumini* (L.) Skeels	Thabye-phyu	Myrtaceae	T	-	Invasive
61	*Tabernaemontana divaricate* (L.) R. Br. ex Roem. & Schult.	Zalat-set-kya (dwarf)	Apocynaceae	SH	-	-
62	*Tamarindus indica* L.	Magyi	Caesalpiniaceae	T	-	-
63	*Terminalia catappa* L.	Banda, Badan	Combretaceae	T	-	Invasive
64	*Wrightia antidysenterica* (L.) R.Br.	Unknown	Apocynaceae	SH	-	Invasive

Notes:

C = Climber/creeper
H = Herb
SH = Shrub
ST = Small Tree
T = Tree

Plant Species of IUCN Red List in Myanmar

VU = Vulnerable

Status of forest invasive species in Myanmar

Global invasive species database

Plants A to Z - California Invasive Plant Council

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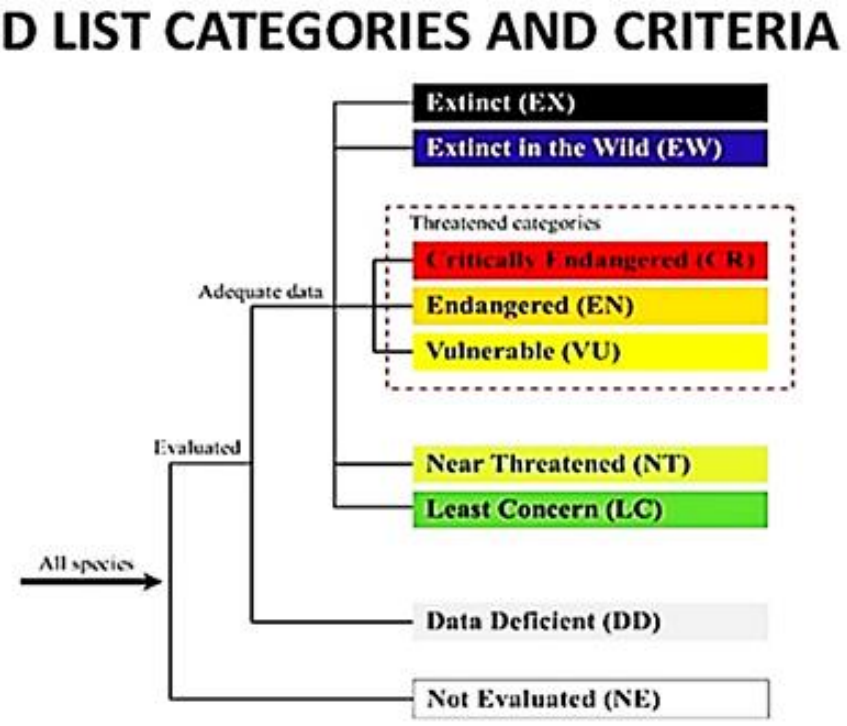


During the interviews interviewees named and showed the most seen plants around the Project site. The six plants and unknown bushes were recorded and recognized and presented in table 4-18. Plants mentioned by interviewees are also stated alphabetically.

Table 4-18: The list of plant species, including the IUCN Red List Status and Invasive Species Lists, was recorded through interviews prior to the construction of the Ahlone Power Plant

No.	Scientific Name	Common Name	Family Name	Habit	Red List Status	Invasive species
1	*Albizia lebbek* (L.) Benth.	Kokko	Mimosaceae	T	-	-
2	*Cocos nucifera* L.	Ohn	Arecaceae	T	-	Invasive
3	*Dypsis lutescens* (H. Wendl.) Beentje & Dransfield	Cane palm, Areca palm, kyein-htan	Arecaceae	ST	-	Invasive
4	*Ficus* sp	Nyaung	Moraceae	T	-	Invasive
5	*Mangifera indica* L.	Thayet	Anacardiaceae	T	-	-

The recorded plants families including genera inside the Power Plant compound and in Saw-Yan-Pai Quarter, Ahlone Township, are shown in graph.

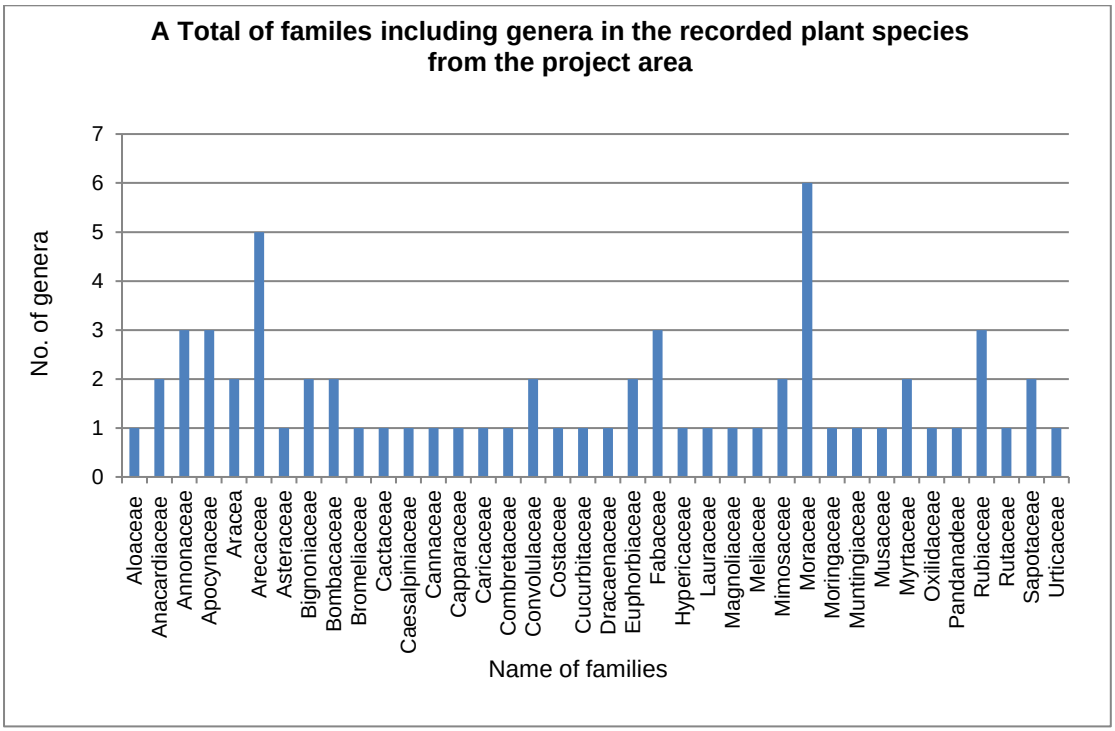


Figure 4-29: Showing a total number of families including genera in the recorded plant species for the first-time collection from the project area

The recorded plants according to habit types inside the Power Plant compound and Saw-Yan-Pai Quarter, Ahlone Township, Yangon Region areas are shown in graph figure 4-30.

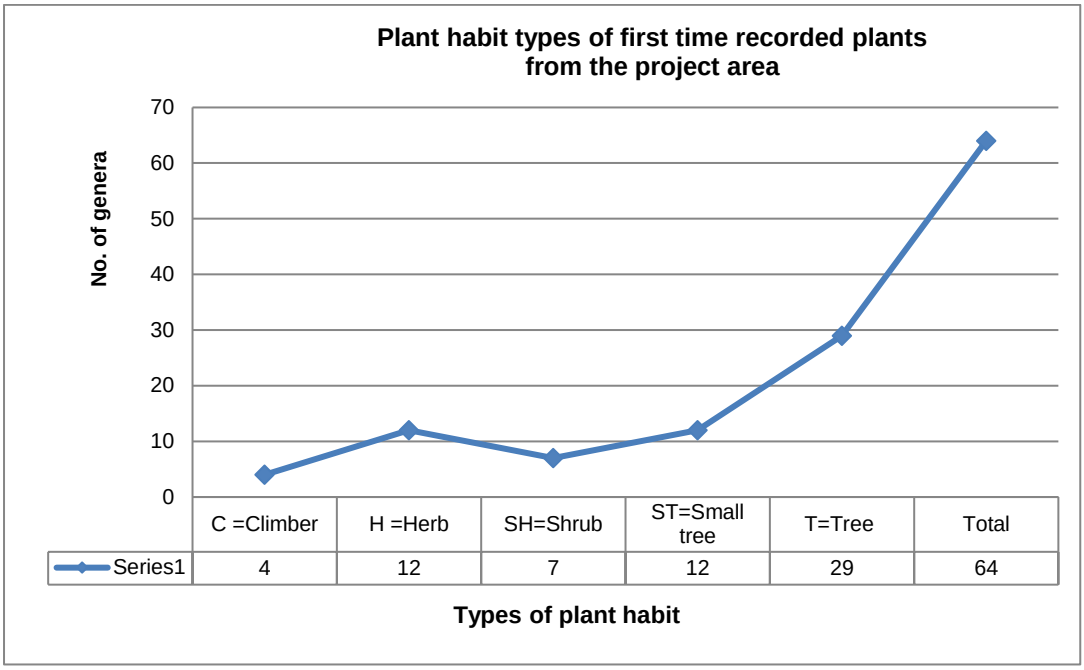


Figure 4-30: Showing a total of types of plant habit in the first-time recorded plant species from the project area

Interviewees and interviewer

U Aung Aung, Staff
Myanmar Ahlone Power Plant
12-10-2021

U Pho Kyaw, Security guard
Myanmar Ahlone Power Plant
16-11-2021

U Ye Htut Pai, Security guard
Myanmar Ahlone Power Plant
6-12-2021

U Pyone Cho, Security guard
Myanmar Ahlone Power Plant
6-12-2021

Daw Khin Myo Thant
Finance Manager

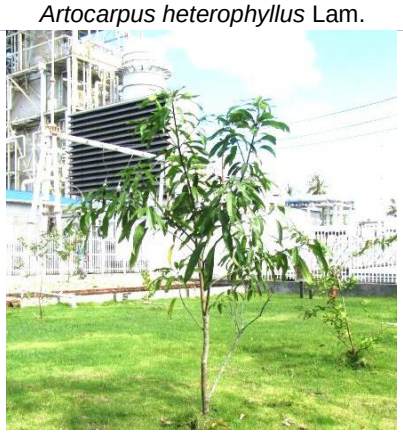
Photo 4-12: The recorded interview in field visit

Some recorded plant species (first time survey) are mentioned in photo logs under.

Terminalia catappa L.

Artocarpus heterophyllus Lam.

Elaeis guineensis Jacq.



Mangifera indica L.

Plumeria rubra L.

Michilia champaca L.

Aloe sp

Achras zapota L.

Photo 4-13: Showing the recorded species inside the Power Plant Compound

Tabernaemontana divaricate (L.) R. Br. ex Roem. & Schult.

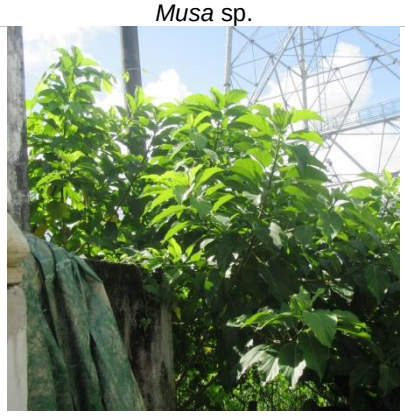
Cananga odorata (Lam.) Hook. F.&nThomson

Sansivieria sp

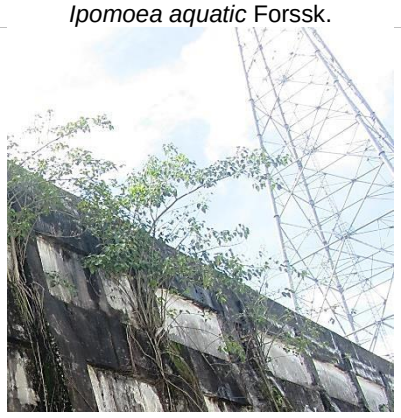
Benincasa hispida (Thunb.) Cogn.

Musa sp.

Ipomoea aquatic Forssk.



Ficus hispida L.f.



Ficus sp.

Photo 4-14: Showing the recorded species inside the Power Plant Compound

	
Operculina turpethum (L.) Silva Manso.	*Miomosa* sp
	
Muntingia calabura L.	*Averrhoa carambala* L.
	
Eclipta alba (L.) Hassk	*Laportea interrupta* (L.) Chew
	
Colocasia esculenta (L.) Schott.	*Ananas comosus* (L.) Merr.

Photo 4-15: Showing the recorded species inside the Power Plant Compound

 *Mangifera indica L.*	 *Pandanus* sp
 *Durio zibethinus* Murray	 *Cleome burmanii* Wight & Arn
 *Wrightia antidysenterica* (L.) R.Br.	 *Psidium guajava* L.
 *Ficus religiosa* L.	 *Mussaenda* sp

Photo 4-16: Showing the recorded species inside the Power Plant Compound

Spondias dulcis Forst.f.

Syzygium cumini (L.) Skeels

Albizia lebbek (L.) Benth.

Terminalia catappa L.

Photo 4-17: Showing the recorded species inside and in front of the Power Plant Compound

	
Nauclea sp.	*Carica papaya* L.
	
Ceiba pentandra (L.) Gaertn.	*Moringa oleifera* Lam.
	
Oroxylum indicum (L.) Kurz.	*Livistona* sp

Photo 4-18: Showing the recorded species in front of the Power Plant and Saw-Yan-Pai Quarter

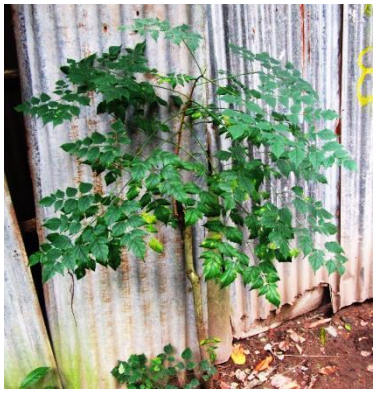
 *Millingtonia hortensis* L.f.	 *Costus speciosus* Sm
 *Syngonium phodophyllum* Schott	 *Sauropus* sp
 *Annona squamosa* L.	 *Codiaeum variegatum* (L.) Blume
 *Leuenbergeria bleo;* (Kunth) Lodé	 *Polyalthia longifolia* (Lam.) Benth. & Hook.f.

Photo 4-19: Showing the recorded species from Saw-Yan-Pai Quarter

The recorded plant genera of second time survey from inside the Power Plant compound to Yangon Riverbank area are arranged by alphabetically (Table 4-19).

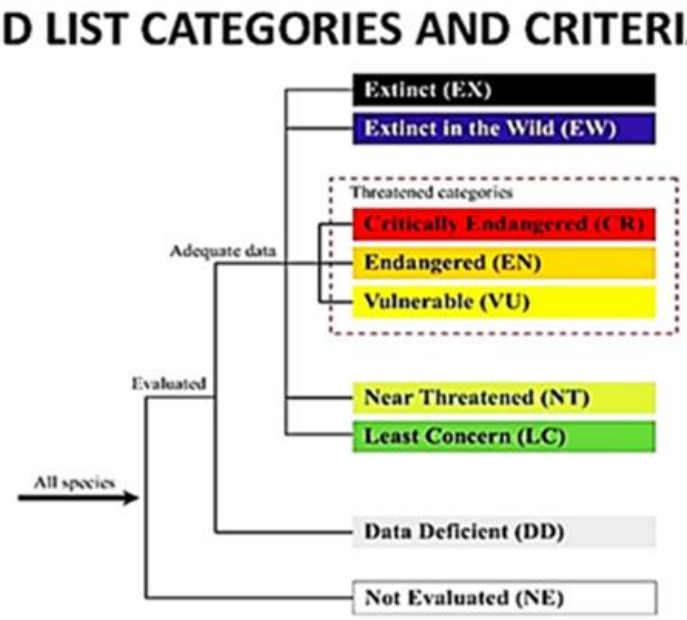
Table 4-19: Showing the lists of plant species, including List of IUCN Red List Status and Invasive Species Lists, found in inside the plant and at its back (from inside the Power Plant to Yangon Riverbank area)

No.	Scientific Name	Common Name	Family Name	Habit	Red List Status	Invasive species
1	*Abelmoschus* sp	Wild okra	Malvaceae	H	-	-
2	*Acanthus* sp	Khaya	Acanthaceae	SH	LC	-
3	*Alopecurus* sp.	foxtail grass	Poaceae	G	-	-
4	*Cassia angustifolia* Vahl.	Pwe-gaing	Caesalpinia-ceae	SH	-	-
5	*Crotalaria retusa* L.	Tawpeiksan	Fabaceae	SH	LC	-
6	*Cynodon* sp	Mye-sa	Poaceae	G	-	-
7	*Cyperus* sp	Myet	Cyeraceae	G	LC	-
8	*Euphorbia hirta* L.	Asthma-plant	Euphorbia-ceae	H	-	Invasive
9	*Euphorbia milii* Moutins.	Crown of Thorns,	Euphorbia-ceae	SH	-	-
10	*Ipomoea aquatic* Forssk.	Kazun	Convolu-laceae	C	LC	-
11	*Ipomoea* sp	Small wild yellow morning glory	Convolu-laceae	C	-	-
12	*Leucaena leucocephala* (Lam.) Dewit.	Aweya	Fabaceae	T	-	Invasive
13	*Ludwigia octovalvis* (Jacq.) Raven	Lay-nyin-gyi	Onagraceae	H	LC	
14	*Mikania cordata* (Burm. f.) B.L. Rob. *Mikania micrantha* H.B.K.	Heartleaf hempvine, [English] mile-a-minute vine	Asteraceae	C	-	Invasive
15	*Nypa fruticans* Wurmb.	Dani	Arecaceae	ST	LC	-
16	*Phyllanthus* sp	Taungziphyu	Phyl-lathaceae	H	-	-
17	*Physalis minima* L.	Baukpin	Solanaceae	H	-	-
18	*Ricinus communis* L.	Castor oil plant	Euphorbia-ceae	ST	-	Invasive
19	*Roystonea regia* (Kunth) O.F.Cook.	Cuban royal palm or Flor-ida royal palm	Arecaceae	T	-	Invasive
20	*Sesbania* sp.	Nyan	Fabaceae	SH		-
21	*Sonneratia* sp	Lamu, lame, kame	Lythraceae	T	LC	-
22	*Sphagneticola calendu-lacea* (L.) Pruski	Nay-kyar-gale	Asteraceae	H	-	-
23	*Tradescantia spathacea* (Sw.) Stream	Mi-gwin-gamon	Comme-linaceae	H	-	-

C = Climber/creeper
H = Herb
SH = Shrub
ST = Small Tree
T = Tree
Plant Species of IUCN Red List in Myanmar
LC =Least concern
Status of forest invasive species in Myanmar
Global invasive species database

Plants A to Z- California Invasive Plant Council
https://www.google.com

တားမြစ်သစ်ပင်သတ်မှတ်ကြေညာခြင်း၊ ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ၊ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဝန်ကြီးဌာနအရ



The recorded plants families including genera from inside the Power Plant compound to Yangon Riverbank area are showing in graph (Figure 4-31).

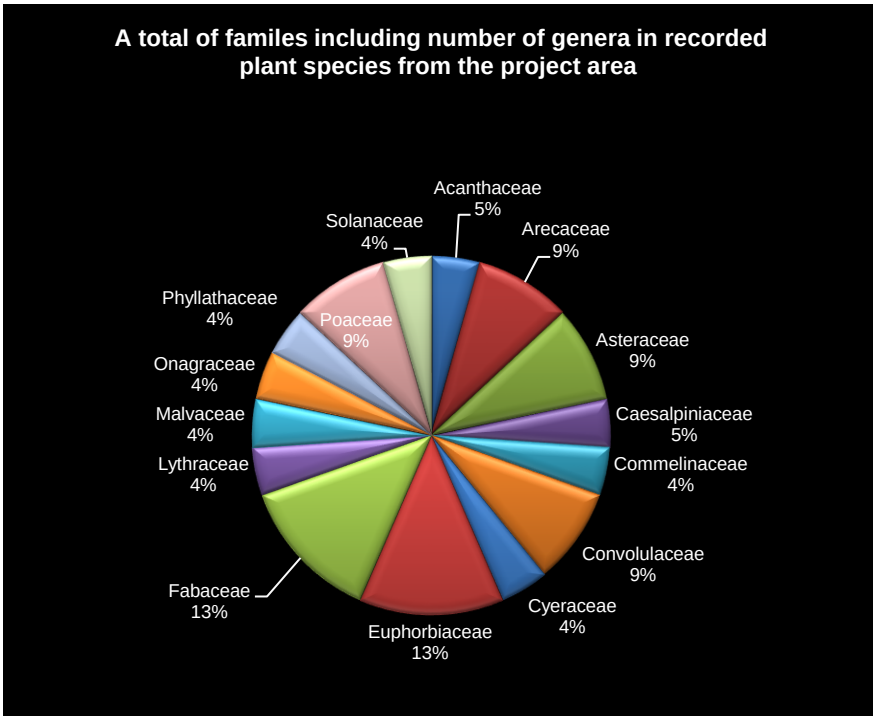


Figure 4-31: Showing a total number of families including genera in the recorded plant species for the second time collection from the project area

The recorded plants habit types from inside the Power Plant compound to Yangon Riverbank area are showing in graph (figure 4-32).

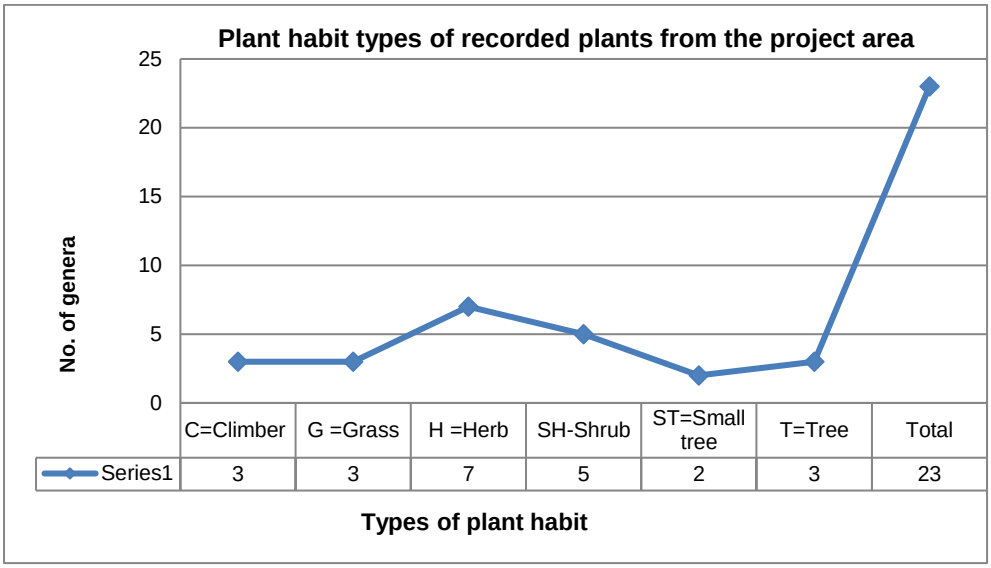


Figure 4-32: Showing a total of types of plant habit in the second time recorded plant species from the project area

Some second time recorded plant species are mentioned in following photo logs

Ludwigia octovalvis (Jacq.) Raven

Phyllanthus sp

Tradescantia spathacea (Sw.) Stream

Euphorbia milii Moutins.

Physalis minima L.

Mikania cordata (Burm. f.) B.L. Rob.

Photo 4-20: Showing the recorded species inside the Power Plant Compound

Sesbania sp.

Cassia angustifolia Vahl.

Ricinus communis L.

Leucaena leucocephala (Lam.) Dewit.

Sonneratia sp

Acanthus sp

Photo 4-21: Showing the recorded species back of the Power Plant Compound

Nypa fruticans Wurmb.

Abelmoschus sp

Ipomoea sp

crotalaria retusa L.

Euphorbia hirta L.

Cyperus sp

Photo 4-22: Showing the recorded species inside the Power Plant Compound, back of it and Yangon Riverbank

 *Cynodon* sp	 *Alopecurus* sp.
 *Ipomoea aquatic* Forssk.	 *Roystonea regia* · (Kunth) O.F.Cook.

Photo 4-23: Showing the recorded species inside and back of the Power Plant Compound

Photo 4-24: Showing the vegetation of the back View of Power Plant

Photo 4-25: Tidal Forest and mud-flat at Yangon Riverbank

A total of the lists of the recorded plant species two days (12-10-2021 and 16-11-2021) collection found in Myanmar Ahlone Power Plant compound and its surroundings including List of IUCN Red List Status and Invasive Species Lists are also mentioned in Table 4-20.

Table 4-20: The list of the recorded plant species including List of IUCN Red List Status and Invasive Species Lists found in Myanmar Ahlone Power Plant and its surroundings (12-10-2021 and 16-11-2021)

No.	Scientific Name	Common Name	Family Name	Habit	Red List Status	Invasive species
1	*Abelmoschus* sp	Wild okra	Malvaceae	H	-	-
2	*Acanthus* sp	Khaya	Acanthaceae	SH	LC	-
3	*Achras zapota* L.	Thagya, sapota	Sapotaceae	T	-	-
4	*Albizia lebbek* (L.) Benth.	Kokko	Mimosaceae	T	-	-
5	*Aloe* sp	Shazaung-letpat	Aloaceae	H	-	-
6	*Alopecurus* sp.	foxtail grass	Poaceae	G	-	-
7	*Ananas comosus* (L.) Merr.	Nanat, pineapple	Bromeliaceae	H	-	-
8	*Annona squamosa* L.	Awzar, Custard apple	Annonaceae	ST	-	-
9	*Areca catechu* L.	Kunthi-pin	Arecaceae	ST	-	-
10	*Artocarpus heterophyllus* Lam.	Peinne	Moraceae	T	-	-
11	*Averrhoa carambala* L.	Zaung-yar	Oxilidaceae	ST	-	-
12	*Azadirachta indica* A. Juss.	Tama	Meliaceae	T	-	-
13	*Benincasa hispida* (Thunb.) Cogn.	Kyauk-pha-yon, white gourd	Cucurbitaceae	C	-	-
14	*Calophyllum inophyllum* L.	Pon-nyet	Hypericaceae	T	-	-
15	*Cananga odorata* (Lam.) Hook. F.&nThomson	Saga-sein	Annonaceae	T	-	-
16	*Canna* sp	Canna, Indian shot	Cannaceae	H	-	Invasive
17	*Carica papaya* L.	Thin-baw	Caricaceae		-	-
18	*Cassia angustifolia* Vahl.	Pwe-gaing	Caesalpiniaceae	SH	-	-
19	*Ceiba pentandra* (L.) Gaertn.	Thinbaw-letpan	Bombacaceae	T	-	-
20	*Cinnamomum verum* presl	Thit-kya-bo	Lauraceae	T	-	-
21	*Citrus aurantiifolia* (Christm) Sw.	Thanbaya	Rutaceae	SH	-	-
22	*Cleome burmanii* Wight & Arn	Taw-hingala	Capparaceae	H	-	-
23	*Cocos nucifera* L.	Ohn	Arecaceae	T	-	-
24	*Codiaeum variegatum* (L.) Blume	Garden croton	Euphorbiaceae	H		Invasive
25	*C26olocasia esculenta* (L.) Schott.	Pein	Araceae	H	-	Invasive
26	*Costus speciosus* Sm.12	Phalanx-taung-hmwe	Costaceae	H	-	-
27	*Crotalaria retusa* L.	Tawpeiksan	Fabaceae	SH	LC	-

No.	Scientific Name	Common Name	Family Name	Habit	Red List Status	Invasive species
28	*Cynodon* sp	Mye-sa	Poaceae	G	-	-
29	*Cyperus* sp	Myet	Cyeraceae	G	LC	-
30	*Durio zibethinus* Murray	Durian	Bombacaceae	T	-	-
31	*Dypsis lutescens* (H. Wendl.) Beentje & Dransfield	Cane palm	Arecaceae	ST	-	-
32	*Eclipta alba* (L.) Hassk	Kyeik-hman	Asteraceae	H	-	-
33	*Elaeis guineensis* Jacq.	Si-htan, Si-ohn	Arecaceae	T	-	-
34	*Euphorbia hirta* L.	Asthma-plant	Euphorbiaceae	H	-	Invasive
35	*Euphorbia milii* Moutins.	Crown of Thorns,	Euphorbiaceae	SH	-	-
36	*Ficus glomerata* Roxb.	Ye-Thapan	Moraceae	T	-	-
37	*Ficus hispida* L.f.	Country fig	Moraceae	ST	-	-
38	*Ficus religiosa* L.	Bawdi-nyaung	Moraceae	T	-	Invasive
39	*Ficus* sp.	Naung	Moraceae	T	-	Invasive
40	*Ipomoea aquatic* Forssk.	Ye-kazun, Chinese water spinach	Convolulaceae	C	-	Invasive
41	*Ipomoea aquatic* Forssk.	Kazun	Convolulaceae	C	LC	-
42	*Ipomoea* sp	Small wild yellow morning glory	Convolulaceae	C	-	-
43	*Laportea interrupta* (L.) Chew	Phet-yar- pho, kyet-phet-yar	Urticaceae	H	-	-
44	*Leucaena leucocephala* (Lam.) Dewit.	Aweya	Fabaceae	T	-	Invasive
45	*Leuenbergeria bleo;* (Kunth) Lodé	Rose cactus, Seven Star Needle,	Cactaceae	SH	-	Invasive
46	*Livistona* sp	Taung-htan	Arecaceae	T	-	-
47	*Ludwigia octovalvis* (Jacq.) Raven	Lay-nyin-gyi	Onagraceae	H	LC	
48	*Mangifera indica* L.	Thayet	Anacardiaceae	T	-	-
49	*Michilia champaca* L.	Saga-wa	Magnoliaceae	T	-	-
50	*Mikania cordata* (Burm. f.) B.L. Rob. *Mikania micrantha* H.B.K.	Heartleaf hempvine, [English] mile-a-minute vine	Asteraceae	C	-	Invasive
51	*Millingtonia hortensis* L.f.	Egayit	bignoniaceae	T	-	-
52	*Mimosa* sp	Giant sensitive plant	Mimosaceae	C	-	Invasive
53	*Mimusops elengi* L.	Khayay	Sapotaceae	T	-	-
54	*Morinda angustifolia* Roxb.	Yeyo	Rubiaceae	ST	-	-

No.	Scientific Name	Common Name	Family Name	Habit	Red List Status	Invasive species
55	*Moringa oleifera* Lam.	Dan-da-lun	Moringaceae	T	-	-
56	*Muntingia calabura* L.	Hnget-thagya,	(Tiliaceae) Muntingiaceae	ST	-	Invasive
57	*Musa* sp	Nget-pyaw	Musaceae	H	-	-
58	*Mussaenda* sp	Pwintu-ywettu	Rubiaceae	SH		Invasive
59	*Nauclea* sp.	Ma-u	Rubiaceae	T	-	
60	*Nypa fruticans* Wurmb.	Dani	Arecaceae	ST	LC	-
61	*Operculina turpethum* (L.) Silva Manso.	Kyahin-bin	Convolulaceae	C	-	-
62	*Oroxylum indicum* (L.) Kurz.	Kyaung-sha	Bignoniaceae	T	-	-
63	*Pandanus* sp	Pandan, screwpine	Pandanadeae	SH	-	-
64	*Phyllanthus* sp	Taungziphyu	Phyllathaceae	H	-	-
65	*Physalis minima* L.	Baukpin	Solanaceae	H	-	-
66	*Plumeria rubra* L.	Tayoksaga-ani	Apocynaceae	ST	-	-
67	*Polyalthia longifolia* (Lam.) Benth. & Hook.f.	Thinbaw-te	Annonaceae	T	-	-
68	*Psidium guajava* L.	Malaka	Myrtaceae	ST	-	-
69	*Pterocarpus* sp	Padauk	Fabaceae	T	VU	-
70	*Ricinus communis* L.	Castor oil plant	Euphorbiaceae	ST	-	Invasive
71	*Roystonea regia* (Kunth) O.F.Cook.	Cuban royal palm or Florida royal palm	Arecaceae	T	-	Invasive
72	*Sansivieria* sp	Snake plant	Dracaenaceae	H	-	-
73	*Sauropus* sp	Kyet-tha-hin	Euphorbia-ceae/Phyl-lanthaceae	SH	-	-
74	*Senna siamea* (Lam.) Irwin & Barneby	Mezali	Fabaceae	T	-	-
75	*Sesbania* sp.	Nyan	Fabaceae	SH		-
76	*Sonneratia* sp	Lamu, lame, kame	Lythraceae	T	LC	-
77	*Sphagneticola calendu-lacea* (L.) Pruski	Nay-kyar-gale	Asteraceae	H	-	-
78	*Spondias dulcis* Forst.f.	Gwe-cho	Anacardiaceae	ST	-	Invasive
79	*Streblus asper* Lour.	Okhne	Moraceae	ST	-	-
80	*Syngonium phodophyllum* Schott	Sitton-sein	Aracea	H		Invasive
81	*Syzygium cumini* (L.) Skeels	Thabye-phyu	Myrtaceae	T	-	Invasive
82	*Tabernaemontana divari-cate* (L.) R. Br. ex Roem. & Schult.	Zalat-set-kya (dwarf)	Apocynaceae	SH	-	-

No.	Scientific Name	Common Name	Family Name	Habit	Red List Status	Invasive species
83	*Tamarindus indica* L.	Magyi	Caesalpiniaceae	T	-	-
84	*Terminalia catappa* L.	Banda, Badan	Combretaceae	T	-	Invasive
85	*Tradescantia spathacea* (Sw.) Stream	Mi-gwin-gamon	Commelinaceae	H	-	-
86	*Wrightia antidysenterica* (L.) R.Br.	Unknown	Apocynaceae	SH	-	Invasive

A total of 53 families including 86 genera recorded during the two-day study in the Myanmar Ahlone Power Plant compound and its surrounding area are mentioned in photos above and their plant habit types are shown in the table above.

The recorded plants families including genera in the Myanmar Ahlone Power Plant compound and its surrounding area are showing in graph (Figure 4-33).

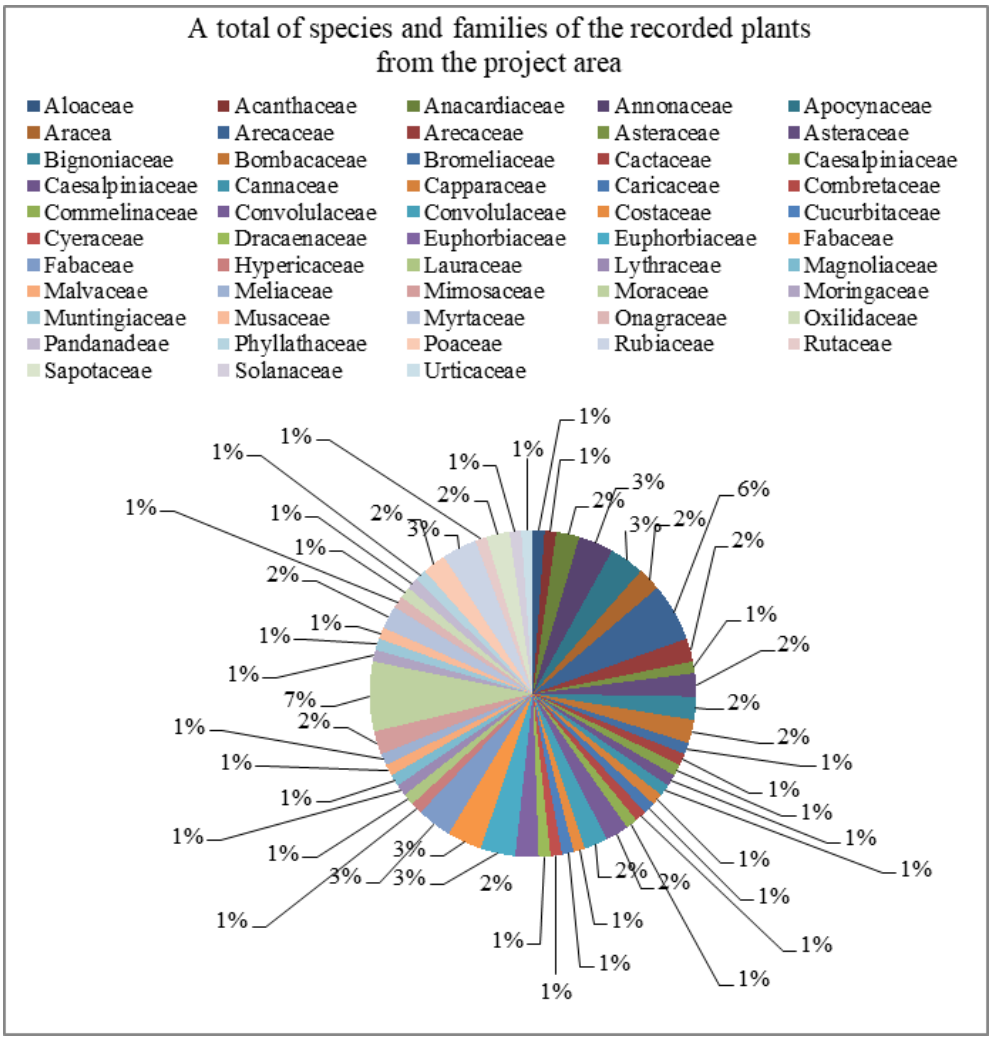


Figure 4-33: Showing a total of families including genera recorded during the two-day study in the project area

The recorded plants habit types are showing in graph.

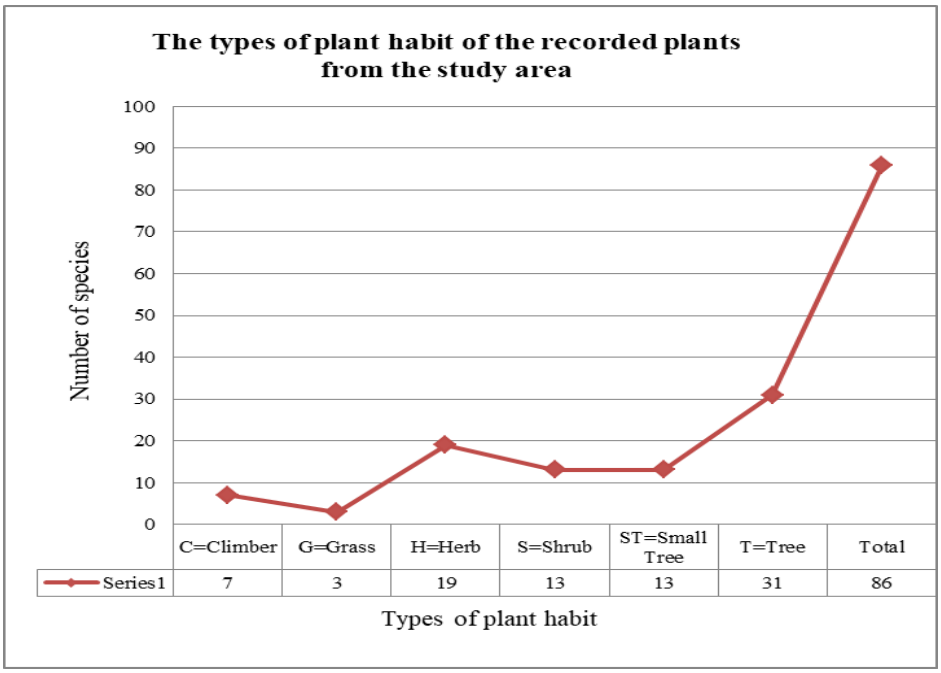


Figure 4-34: Showing a total of plant habit types recorded during the two-days study in the project area

Unknown aquatic plant

Unknown aquatic plant

Unknown bean family plant

Photo 4-26: Showing unidentified plants of tidal forest

In third time survey, eight plant species were collected. The collected plant species were identified and classified. In third time study, the study area, inside the Power Plant and back of the plant to Yangon Riverbank, a total of (8) plant species of (8) genera belong to (7) families were collected and recorded

(Photo 4-27 and 4-28). One out of eight species was invasive species. A total of plant habit types recorded were (3) shrubs, (3) herbs and (2) climbers.

The recorded plants are arranged by alphabetically (Table 4-21).

Table 4-21: The lists of plant species including List of IUCN Red List Status, and Invasive Species Lists, found in within the plant and its surroundings (from inside the Power Plant, and back of the plant to Yangon Riverbank)

No.	Scientific Name	Common Name	Family Name	Habit	Red List Status	Invasive species
1	*Achyranthes aspera* L.	Kyet-mauk-sue-pyan	Amaranthaceae	H	-	-
2	*Coccinia grandis* (L.) Voigt	Ivy Gourd	Cucurbitaceae	C	-	-
3	*Hygrophila phlomoides* Nees	Sage Swampweed	Acanthaceae	H	-	-
4	*Ipomoea* sp	Morning glory	Convolulaceae	C	-	-
5	*Senna occidentalis* (L.) link	Kazaw-bok	Fabaceae	SH	-	-
6	*Sida spinosa* L.	Thabyetsi-bin	Malvaceae	SH	-	Invasive
7	*Sphagneticola calendulacea* (L.) Pruski	Nay-kyar-gale	Asteraceae	H	-	-
8	*Urena lobata* L.	Kat-sine	Malvaceae	SH	-	-

The recorded plant species (third time survey) are mentioned in Photo (4-27 and 4-28).

Sphagneticola calendulacea (L.) Pruski

Coccinia grandis (L.) Voigt

Achyranthes aspera L.

Hygrophila phlomoides Nees

Sida spinosa L.

Ipomoea sp

Photo 4-27: Showing the recorded species found in, third time survey, at the back of the plant and tidal forest

Urena lobata L.

Senna occidentalis (L.) link

Photo 4-28: Showing the recorded species found in, third time survey, at the back of the plant

A total of (95) plant species of (90) genera belong to (60) families including (8) Red List Status, (22) Invasive Species and (1) State Banned Tree/ Protected Species in the Myanmar Ahlone Power Plant compound and its surrounding area were collected and recorded.

Table 4-22: Summary of botanical survey on project area including date, study area, families, genera, species, RS, IS, PS, and a total recorded plant

No.	Date	Survey area	Family	Genus	Species	RS	IS	PS
1	12-10-2021	SA1	38	61	64	1	16	1
2	16-11-2021	SA2	15	21	23	7	5	0
3	6-12-2021	SA3	7	8	8	0	1	0
		Total	60	90	95	8	22	1

Abbreviation:

SA = Survey area
SA1 = within the plant compound, and Saw-Yan-Paing Quarter
SA2 = within the plant compound, and back of the plant to Yangon Riverbank
SA3 = In front of and within the plant compound, and back of the plant to Yangon Riverbank
RS = IUCN Red List Status
IS = Invasive Species
PS = State Banned Tree/Protected Species

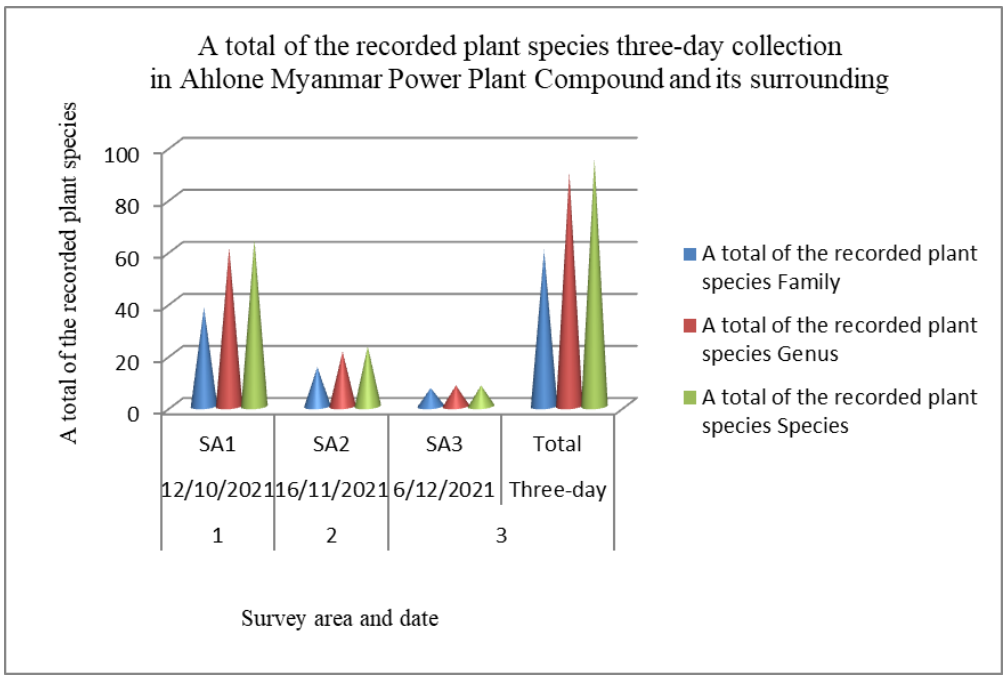


Figure 4-35: Showing a total of the recorded plant species three-day collection in Ahlone Myanmar Power Plant Compound and its surrounding

The recorded plant species (fourth time survey) are mentioned in Photo 4-29.

The fourth and final survey was undertaken on Friday 25-3-2022. In fourth time survey, four plant species were collected. The collected plant species were identified and classified. In fourth time study, the study areas were front of plant compound and back of it's to Yangon Riverbank. The vegetation of the back of the plant and the tidal forest were changed because of climate and manmade. Unidentified some of aquatic herbaceous plants and some bean families were lost. These aquatic herbaceous plants have no flowers and fruits yet. A total of (4) plant species of (4) genera belong to (3) families were collected and recorded. These species were all invasive.

The recorded plants are arranged by alphabetically (Table 4-23).

Table 4-23: The lists of plant species including List of IUCN Red List Status, and Invasive Species Lists, found in front of plant compound and back of the plant to Yangon Riverbank)

No.	Scientific Name	Common Name	Family Name	Habit	Red List Status	Invasive species
1	*Cleome viscosa* L.	Le-hingalar	Cleomaceae	H	-	Invasive
2	*Derris* sp	Unknown	Fabaceae	C	-	Invasive
3	*Lippia alba* (Mikk.) N.E.Br.ex Britton &P.Wilson	Bushy Lippia	Verbenaceae	Sh	-	Invasive
4	*Tetragonolobus* sp	Wild Tom Thumbs / Dragon's teeth	Fabaceae	H	-	Invasive

Tetragonolobus sp

Cleome viscosa L.

Lippia alba (Mikk.)N.E.Br.ex Britton &P.Wilson

***Derris* sp**

Photo 4-29: The species found in fourth time survey at the back of the plant

A total of the recorded plant species found in Ahlone Myanmar Power Plant were ninety-nine species including family and genera.

Table 4-24: Summary of botanical survey on project area including date, survey area, families, genera recorded plant species, IUCN Red List Status, Invasive Species, and State Banned Tree/Protected Species

No.	Date	Survey area	Family	Genus	Species	RS	IS	PS
1	12-10-2021	SA1	38	61	64	1	16	1
2	16-11-2021	SA2	15	21	23	7	5	0
3	6-12-2021	SA3	7	8	8	0	1	0
4	7-1-2022	SA4	3	4	4	0	4	0
		Total	63	94	99	8	26	1

Abbreviation

SA = Survey area
SA1 = within the plant compound, and Saw-Yan-Paing Quarter
SA2 = within the plant compound, and back of the plant to Yangon Riverbank
SA3 = in front of and within the plant compound, and back of the plant to Yangon Riverbank
SA4 = back of the plant to Yangon Riverbank
RS = IUCN Red List Status
IS = Invasive Species
PS = State Banned Tree/Protected Species

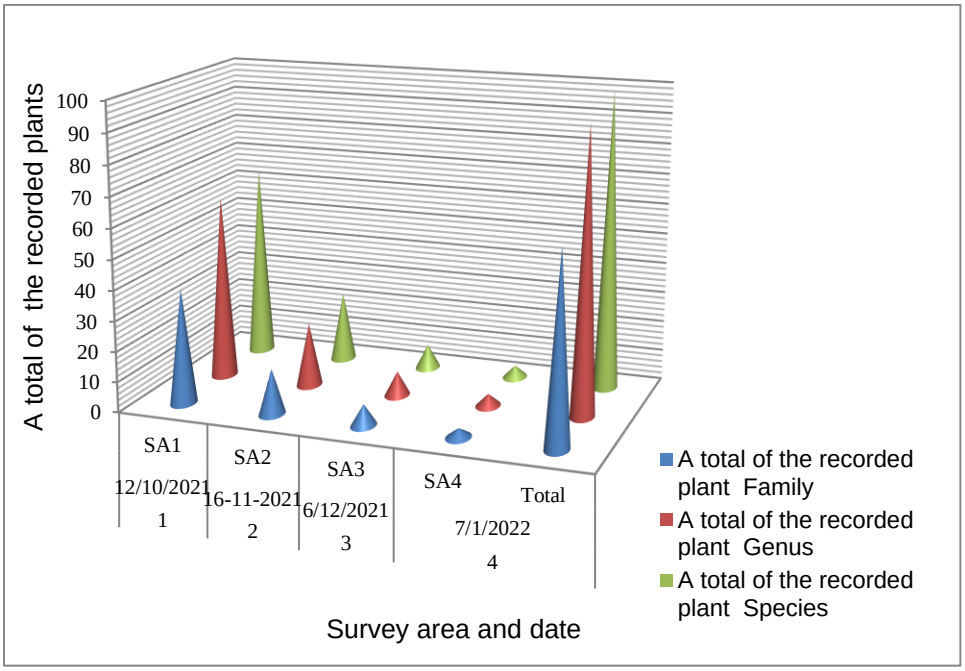


Figure 4-36: Showing a total of the recorded plant species four-day collection in Ahlone Myanmar Power Plant

4.4.2.6 Fauna

The zoological data recorded from field visit are reported by the zoologist. The recorded data are mentioned in Tables (4-25), (4-26) and (4-27), then in Photos 4-30 to 4-36. Due to their accessibility and ubiquity, birds are a useful tool for environmental education and awareness on environmental issues. Birds easily transmit values on respect to nature and the fragility of ecosystems. Animals help plants reproduce by carrying pollen from plant-to-plant and by spreading seeds. Natural communities are named after plants, but animals play a crucial role in maintaining the health of natural communities. Plants and animals need each other in order to survive and thrive.

Study Area

It is in Ahlone Township and total area is about 6 acres.

Material and Method

Field surveys were made three times in the morning from 9:30 hrs to 12:00 hrs. On the following days: (12.10.2021), (16.11.2021) and (6.12.2021). The observations were made both terrestrial and wetland (along the Yangon riverbank and Harbi Creek). The study was based on field study interviewing with local people and stuff of Myanmar Ahlone Power Plant. Sony Video camera HDR-CX 625, GPS (Garmin 78S), (Binocular 20 x 50) and Field Guide Books. Point Count Method was used during the survey period. Some bird species were recorded by interview surveys with local people and staff of Myanmar Ahlone power plant.

Mammal

Only one mammal species *Callosciums pygrethus* of Family scicuridae under Order Rodentia was recorded. It is a native species of Myanmar.

Birds

The total of 19 bird's species under 14 families and 9 orders were recorded during the study period. *Amaurornis phoenicurus*, *Centropus sinensis* and *Streptopelia chinensis* were recorded by interview surveys with staff. The conservational status of most of the bird species were listed as Least Concern (LC) except *Pycnonotus conradi*.

Butterfly and Crab

One butterfly species *Junonia atlites* of family Nymphalidae and crab species *Tubuca acuata* of family Ocypodidae were recorded in the study area of Myanmar Ahlone Power Plant and its environs.

Table 4-25: Recorded mammal species of Myanmar Ahlone Power Plant and its environment

No.	Order	Family	Scientific name	Common name	Habitat		ICUN status	Total No.
					T	W		
1	Rodentia	Sciuridae	*Callosciurus Pygenythrus*	Irrawaddy squirred	✓		LC	1

T: Terrestrial

W: Wetland
LC: Least Concern

Table 4-26: Recorded bird species of Myanmar Ahlone Power Plant and its environment

No.	Order	Family	Scientific name	Common name	Habitat		IUCN status	Total No.
					T	W		
1	CHARADRIFORMES	Lanidae	*Chroicocephalus ridibundus*	Black-headed gull		✓	LC	3
2	GRUIIFORMES	Rallidae	*Amaurornis phoenicurus*	White-breasted Waterhen		✓	LC	2
3	CORACIFORMES	Meropidae	*Merops orientalis*	Green Bee-eater	✓		LC	2
4	CUCULIFORMES	Cuculidae	*Centropus Sinensis*	Greater Coucal	✓		LC	1
5	ACCIPITRIFORMES	Accipitridae	*Milvus migrans*	Black kite	✓		LC	1
6	COLUMBIFORMES	Columbidae	*Columba livia*	Rock pigeon	✓		LC	5
7			*Streptopelia chinensis*	Spotted dove	✓		LC	4
8	SULIFORMES	Phalacrocoracidae	*Microcarbo niger*	Little commarant		✓	LC	1
9	PELECANIFORMES	Ardeiidae	*Bubulcus ibis*	Cattle-egret	✓	✓	LC	2
10			*Ardeola grayii*	Indian pond heron		✓	LC	2
11	PASSERIFORMES	Lanidae	*Lanius cristatus*	Brown shrike	✓		LC	1
12		Corvidae	*Corvus splendens*	House crow	✓	✓	LC	10
13		Sturnidae	*Acridotheres tristis*	Common myna	✓		LC	15
14			*Stunus fuscus*	Jungle myna	✓		LC	5
15		Hirudinidae	*Hirurdo rustica*	Barn swallow	✓		LC	5
16		Pycnonotidae	*Pycnonotus cafer*	Red-vented bulbul	✓		LC	1
17			*Pycnonotus conradi*	Streak-eared Bulbul	✓			1
18		Passeridae	*Passer montanus*	Eurasian Tree Sprrow	✓		LC	2

T: Terrestrial
W: Wetland
LC: Least Concern

Table 4-27: Recorded Butterfly and Crab species of Myanmar Ahlone Power Plant and its environment

No.	Order	Family	Scientific name	Common name	Habitat		ICUN status	Total No.
					T	W		
1	Lepidoptera	Nymphatidae	*Junonia atlites*		✓			1
2	Decapoda	Ocypodidae	*Tuhuca acuata*		✓			1

T: Terrestrial
W: Wetland

Photo 4-30: Callosciurus pygerythus

(a) *Chroicocephalus ridibundus*

(b) *Merops orientalis*

(c) *Milvus migrans*

(d) *Columba livia*

Photo 4-31: (a) Chroicocephalus ridibundus, (b) Merops orientalis, (c) Milvus migrans and (d) Columba livia

(a) *Microcarbo niger*

(b) *Bubulcus ibis*

(c) *Arodela grayii*

(d) *Corvus splendens*

Photo 4-32: (a) Microcarbo niger, (b) Bubulcus ibis, (c) Arodela grayii, and (d) Corvus splendens

(a) *Acridotheres tristis*

(b) *Stunus fuscus*

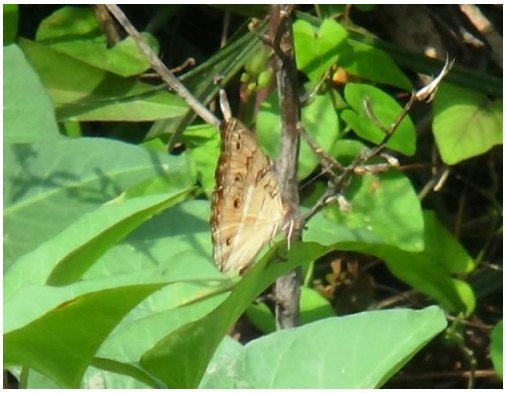
(c) *Pycnonotus cafer*

(d) *Pycnonotus conradi*

Photo 4-33: (a) Acridotheres tristis, (b) Stunus fuscus, (c) Pycnonotus cafer and (d) Pycnonotus conradi

Passer montanus

Photo 4-34: Passer montanus

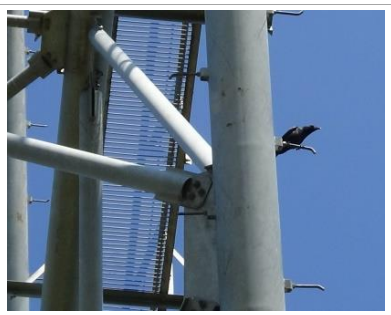


(a) *Junonia atlites*

(b) *Tubuca acuata*

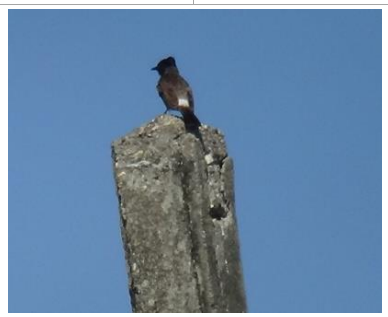
Photo 4-35: (a) Junonia atlites and (b) Tubuca acuata

In fourth time zoological survey, the former observed birds such as *Pycnonotus cafer, Bubulcus ibis,* and *Corvus splendens* were observed only.



Corvus splendens

Bubulcus ibis



Pycnonotus cafer

Photo 4-36: showing the recorded birds on fourth time zoological survey

Table 4-28: The recorded mammal, birds, butterfly and crab species of Myanmar Ahlone Power Plant and its environment

No.	Mammal	Birds	Butterfly	Crab
1	1	18	1	1

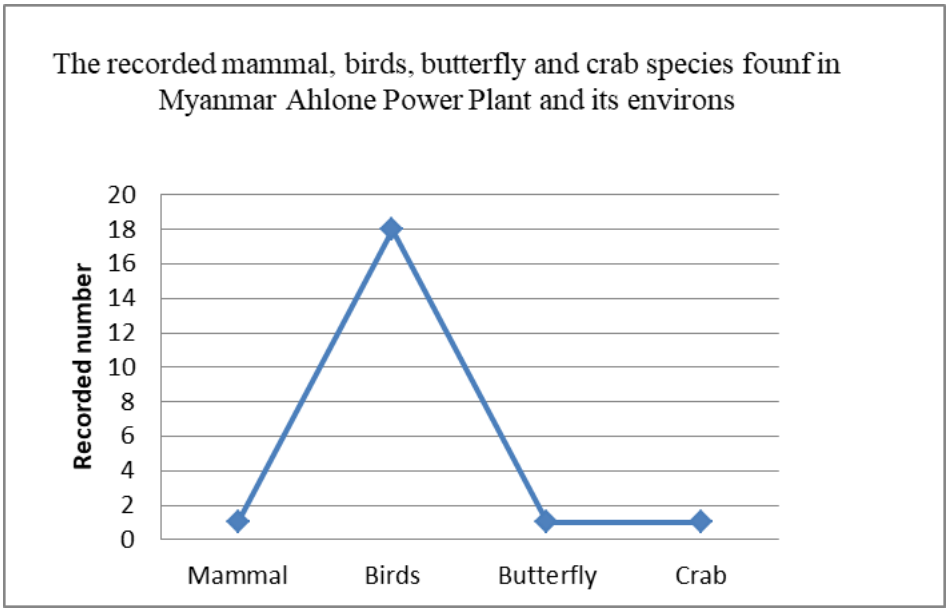


Figure 4-37: A total of the recorded mammal, birds, butterfly and crab species of Myanmar Ahlone Power Plant and its environs

According to the biological studies, the recorded plants were mentioned in Table and photologs above and the recorded mammal, birds, butterfly and crab species of Myanmar Ahlone Power Plant and its environs were also mentioned in table and photologs above.

4.4.2.7 Aquatic Life

The quick assessment of the Yangon riverine ecosystem to support the Environmental Impact Assessment (EIA) aims to understand the potential impacts of the “Ahlone Gas Turbine Project” on the aquatic ecosystem of the Yangon River System during its future operational phase. This assessment also aims to propose mitigation measures for potential impacts on the riverine biodiversity and the fisher communities dependent on the Yangon River System.

4.4.2.7.1 Overview of the project

The project will use the Yangon River as a water source to run the gas turbines for electricity production. The estimated volume of water to be used in the cooling system of the turbines is about 100,500 gallons per week. This water will be discharged weekly into the Herbi tidal creek, which joins the Yangon River 0.4 kilometres downstream of the project. Upstream of the project, the tidal creek is closed with a sluice gate to prevent from the tide entering the city. According to the information, three power plant projects, including “Ahlone Gas Turbine Project” will be operating in the same area in the future.

4.4.2.7.2 Description of existing environmental conditions

The aquatic environmental condition of the project area is influenced by the tide, seawater in the high tide, and freshwater in the low tide. Because of the rain on the sampling day, all water quality parameters were influenced by the freshwater. The tidal water control sluice gate constructed in the upstream of project site in the Herbi tidal creek will control the project waste effluent considerably from entering Yangon City public waste canal system.

4.4.2.7.3 Materials and methods

4.4.2.7.3.1 Study area

The study area covered about 5-kilometers radius of the project site (16° 46' 37.65" N, 96° 07' 45.44" E) in the Yangon River system (Figure 4-38). The fisheries data were collected through the interviews covered about 10-kilometers radius of the project site.

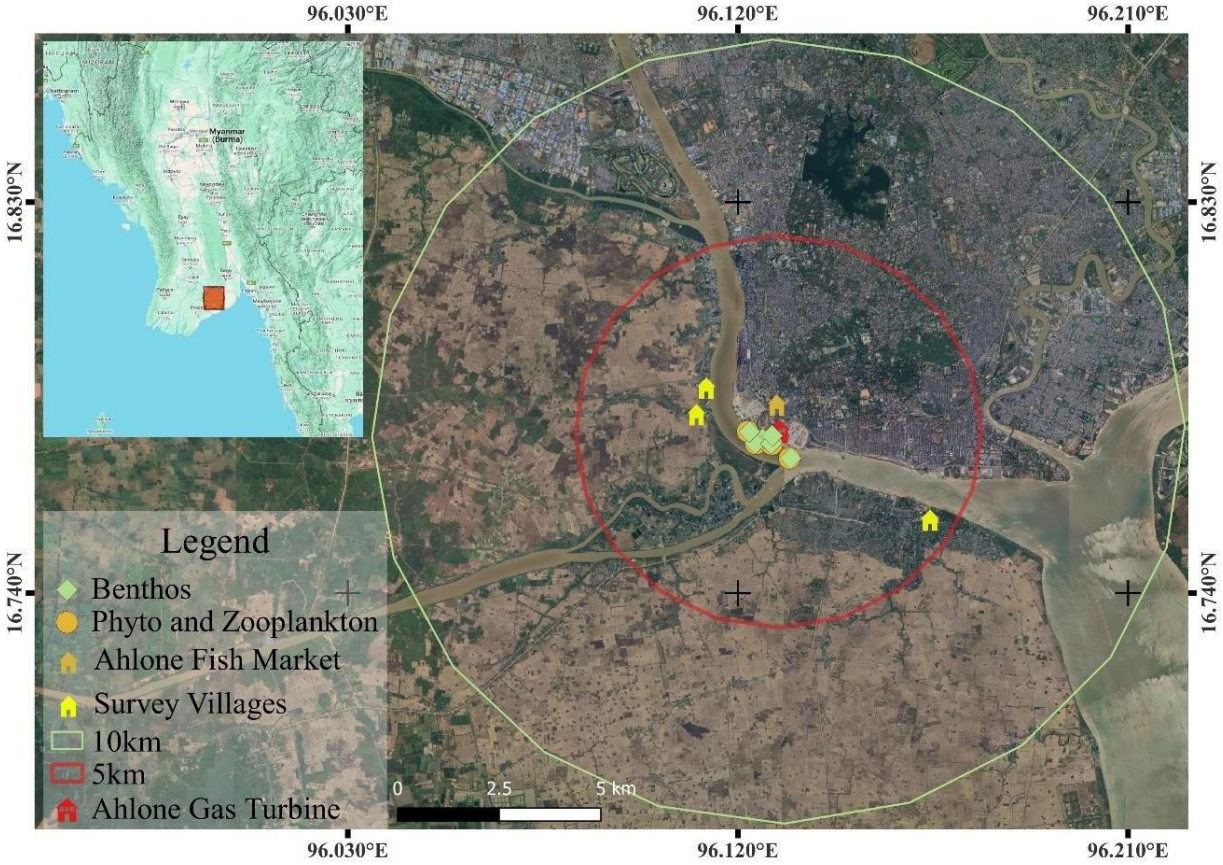


Figure 4-38: Yangon River Ecological Environment baseline data survey area cover map

4.4.2.7.3.2 Survey stations

The survey stations of the water quality parameters and each biodiversity value are shown in figures 4-39 to 4-41. Benthos specimens were collected from three stations as the same stations of the water quality parameters, except stations 4, 5 and 6.

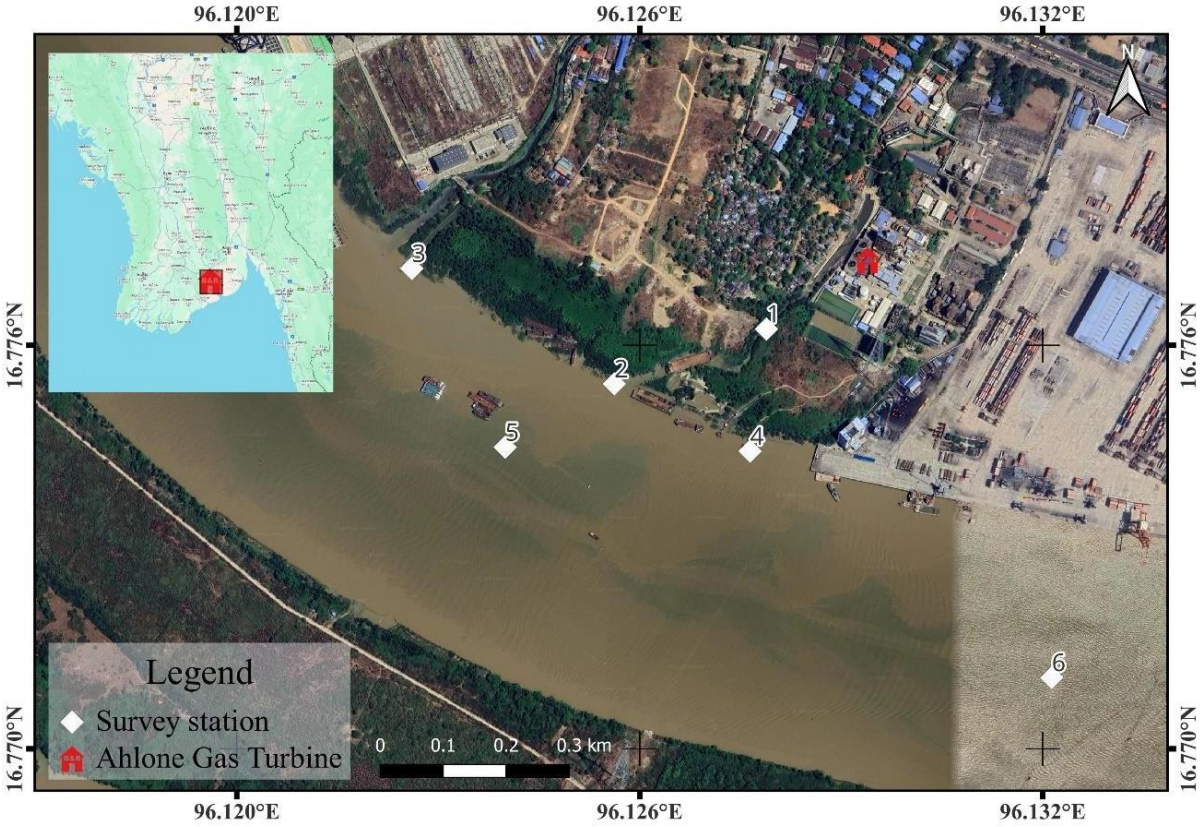


Figure 4-39: The stations of taking water quality parameters and benthos specimens

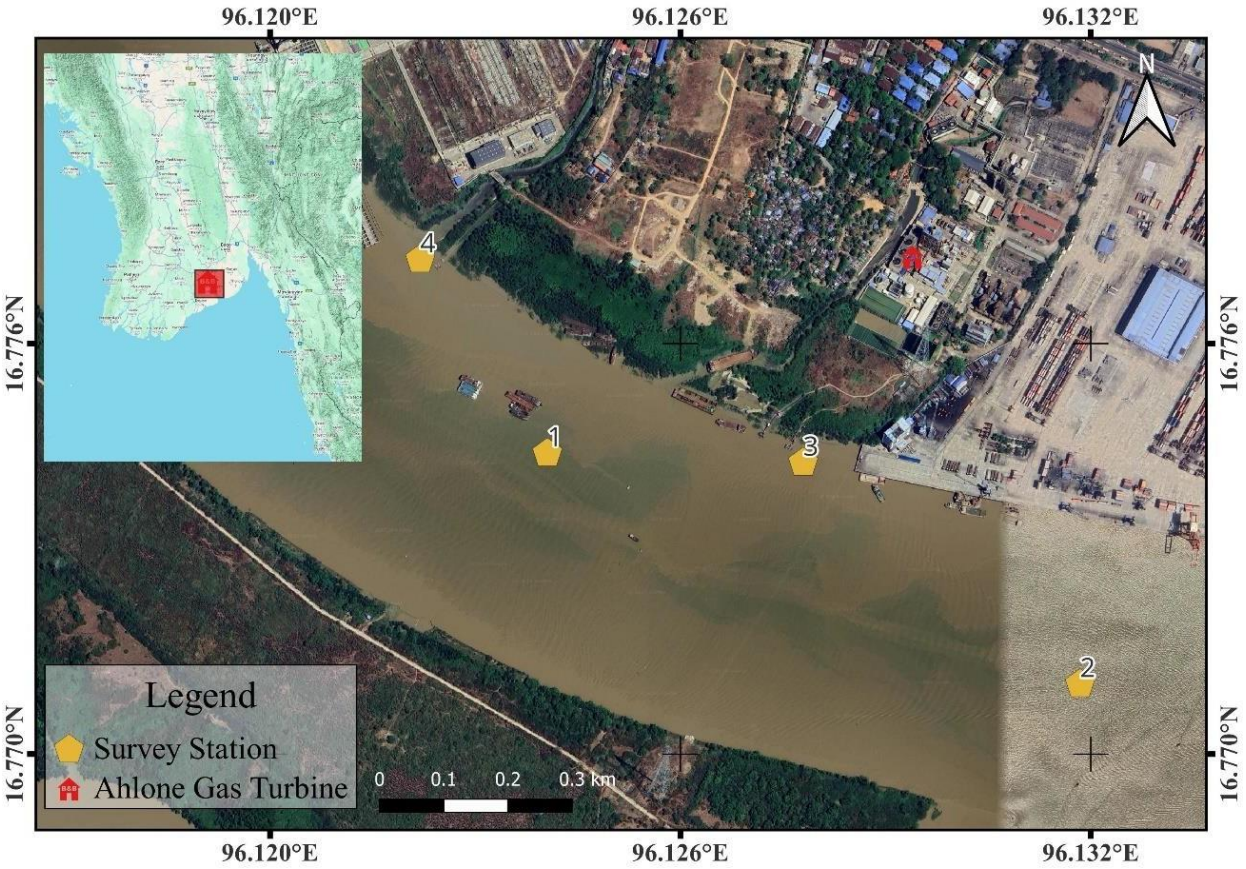


Figure 4-40: Phytoplankton and zooplankton specimens taking stations

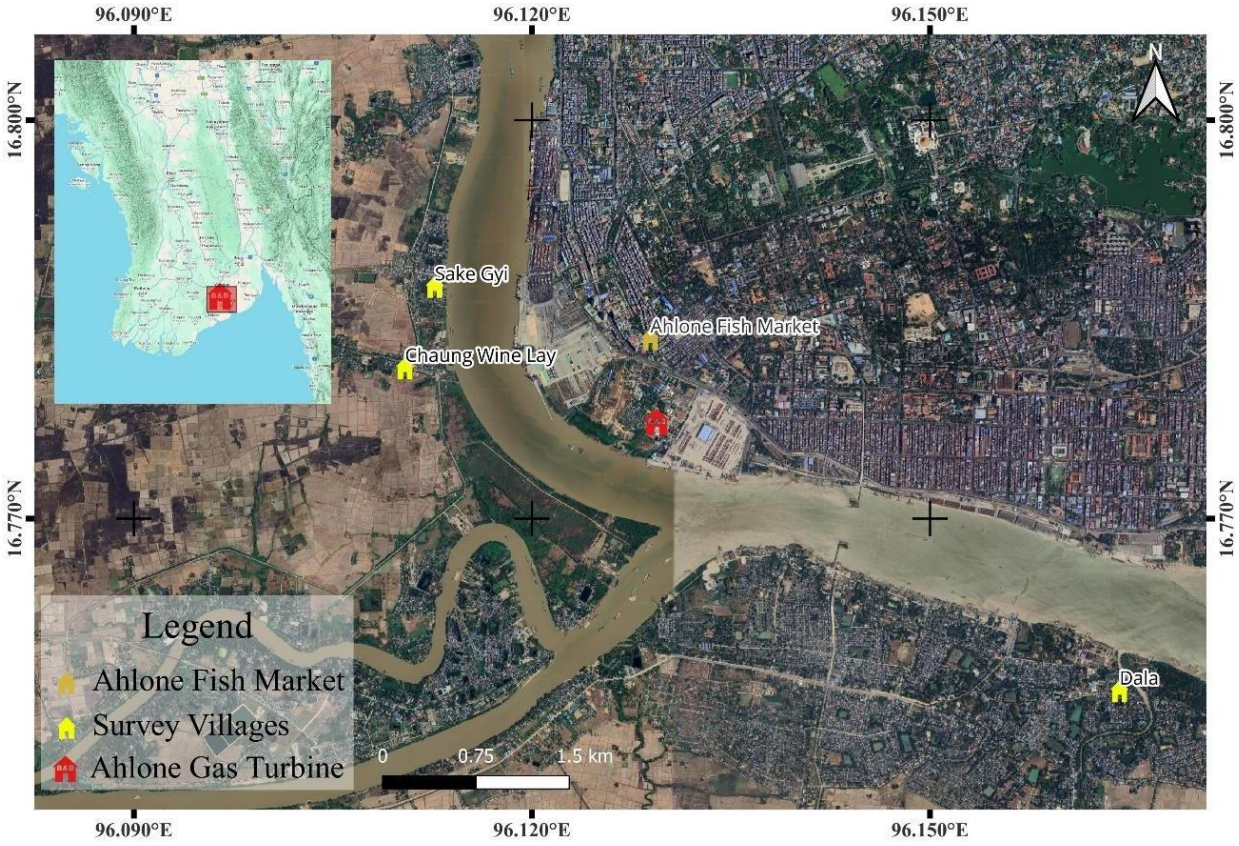


Figure 4-41: Fisheries data collection stations

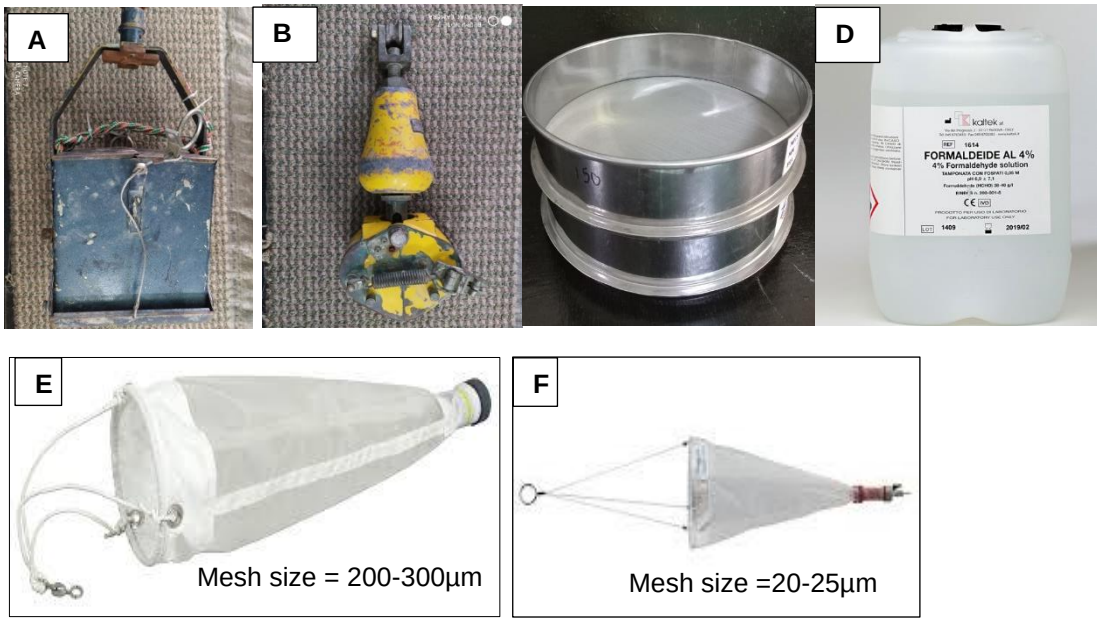
4.4.2.7.3.3 Survey Methodology

The survey team conducted the aquatic biodiversity and water quality surveys with a combination of in situ and quick interviews with local fishers in three villages and fish sellers in the Ahlone fish market.

The water samples were collected from the surface and bottom using the Nansen Reversing water sampler. The temperature value (degree Celsius) was measured with the Nansen Reversing thermometer attached to the Nansen Reversing water sampler. The salinity was recorded by the Refractometer (Agato, Japan). Dissolved Oxygen (DO) (mg/L) values were measured using AQUA D.O. test kit, Total Dissolved Solid (TDS) (ppm) values and Conductivity (mS/m) values were measured using the KEDID handheld digital meter, and pH values were recorded using the HANNA handheld digital pH meter.

The phytoplankton specimens were collected using plankton net mesh size 20-25 µm. Zooplanktons were collected using the net mesh size 200-300 µm. Benthos specimens were collected and sieved with the 500 µm mesh size. The collected biodiversity specimens were preserved with formalin for further identification.

The quick fish assessments were done at three fishing villages and Ahlone fish market. The interviews with the fishers were conducted at three fishing villages, Seik Gyi, Chaung Wine Lay, and Dala to understand the fish species caught in the Yangon River. The fish specimens were taken photos in the fishing villages, and fish vendors and collectors in the Ahlone fish market.



A) Ekman benthos sampler
B) T.S.K. Snapper grab
C) the sieves (100 & 150 US mash size)
D) 4% Formaldehyde Solution
E) Zooplankton sampler
F) Phytoplankton sampler
G) Core benthos sampler
H) Quadrat benthos sampler

Figure 4-42: Survey sampler

4.4.2.7.4 Water quality parameters

The water quality parameters, i.e., temperature, salinity, pH, conductivity, and TDS are shown in Table 4-29.

Table 4-29: Water quality Parameters

Parameter		Station					
		1	2	3	4	5	6
		16.776242 E 96.127887 N	16.775427 E 96.125621 N	16.777143 E 96.122607 N	16.774426 E 96.127643 N	16.774485 E 96.123997 N	16.771059 E 96.132135 N
Date		**23/7/2024**					
Time		15:50	16:10	16:30	16:50	17:10	17:30
Depth (m)		0	2.0	4.0	5.0	15.0	22.2
Weather		**Raining**					
Temperature °C	Air	27.0	27.0	27.1	27.8	26.8	26.8
Temperature °C	Water	27.0	28.5	28.5	28.3	28.4	28.3
Salinity (ppt)	Surface	0	0	0	0	0	0
Dissolved Oxygen (mg/L)	Surface	4.5	4.5	4.5	4.0	5.0	5.0
pH	Surface Bottom	7.8 7.8	7.8 7.8	7.8 7.8	7.8 7.8	7.5 7.8	7.8 7.8

Parameter		Station					
		1	2	3	4	5	6
		16.776242 E 96.127887 N	16.775427 E 96.125621 N	16.777143 E 96.122607 N	16.774426 E 96.127643 N	16.774485 E 96.123997 N	16.771059 E 96.132135 N
Total dissolved (ppm)	Surface	37	37	37	37	37	37
Conductivity (mS/m)	Surface	75	75	76	76	75	76

4.4.2.7.5 Existing aquatic ecosystems and ecosystem services

The aquatic ecosystem environment of the power plant project is a Yangon riverine ecosystem. The Yangon River system serves the transportation for the public, and fishing livelihood opportunities for the fisher communities along the riverbank. Additionally, the Yangon River system provides a connecting channel for migratory fish species between the Andaman Sea downstream and the Ayeyarwady River upstream (Figure 4-43). Ayeyarwady River is known as the life-blood of Myanmar because it serves as a water source for agriculture, habitats for fisheries resources, and drinking water for people along the river system. Among them, serving as a connecting channel for the migratory fish species is crucial for the fisher communities along the Yangon River system.

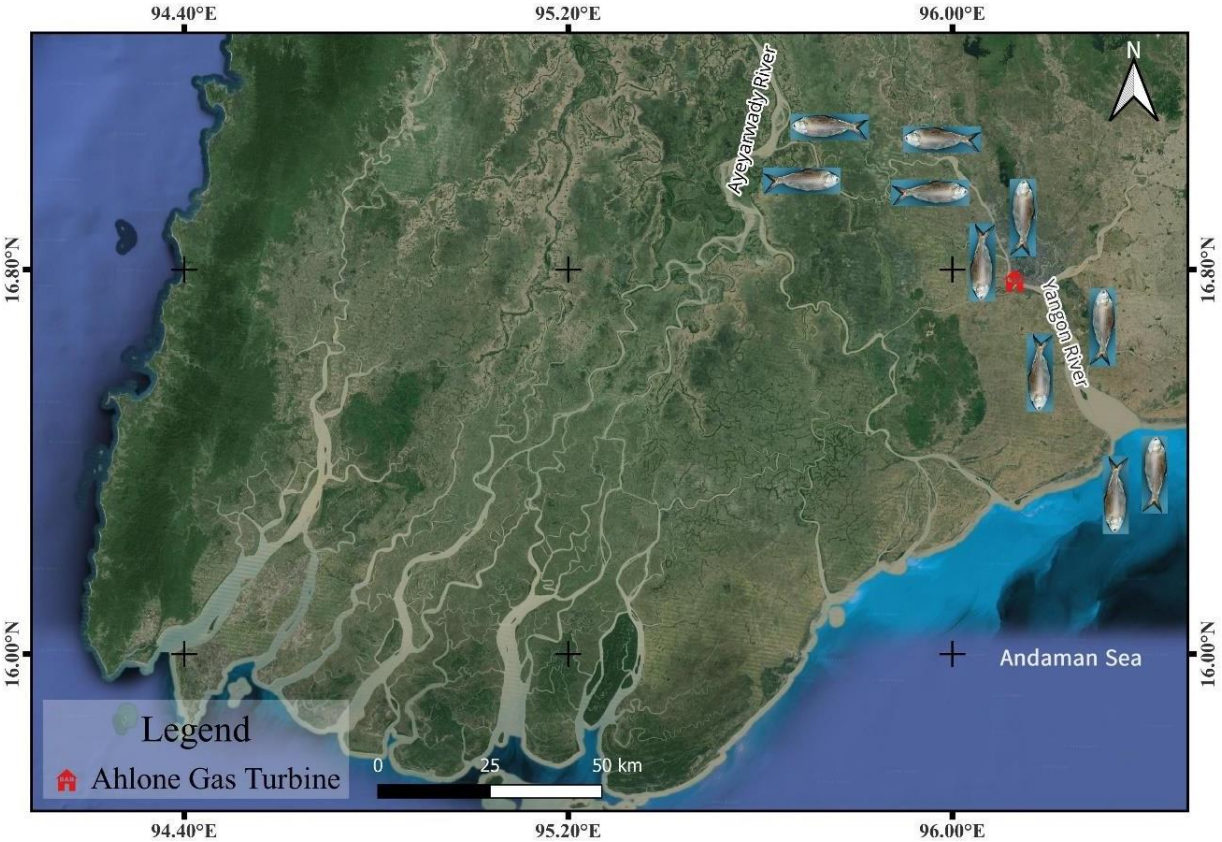


Figure 4-43: Migratory route of the migratory fish species, i.e., Tenualosa Ilisha (Nga Tha Lauk) along the Yangon River system

4.4.2.7.6 Aquatic Biodiversity

4.4.2.7.6.1 Fish species

The fish diversity surveys were conducted through interviews with fishers in three fishing villages situated along the riverbank and fish sellers in the Ahlone fish market. The survey was focused the economically important species caught by the fishers and sold in the fish market. 18 fish species and 1 shrimp specie were recorded in the quick assessment (Table 4-30). The survey results explained that Vulnerable (VU) species *Wallago attu* (Wallago) juveniles were caught in the 10-kilometer radius of the project site. The other VU species, *Cirrihinus cirrohosus* (Mringal) was also informed by the fishers, and recorded in the

Ahlone fish market. The economically important migratory fish species, such as anadromous fish species *Tenualosa Ilisha* (Hilsa shad) were caught by the fishers. Several species of ichthyoplankton were recorded in the zooplankton samples.

Table 4-30: Fish species recorded in the aquatic ecosystem assessment

No.	Scientific name	English name (FAO name)	Local name	IUCN Red List Status		CITES	CMS
1	*Lates calcarifer* (Bloch, 1790)	Asian sea bass	ကကတစ်	Least Concern (LC)	15 Feb '19	Not Evaluated	Not Evaluated
2	*Otolithoides pama* (Hamilton, 1822)	Pama croaker	ငါးပုတ်သင်	Data Deficient (DD)	27 Sep '18	Not Evaluated	Not Evaluated
3	*Wallago attu* (Bloch & Schneider, 1801)	Wallago	ငါးဘတ်	Vulnerable (VU)	12 Aug '19	Not Evaluated	Not Evaluated
4	*Labeo rohita* (Hamilton, 1822)	Roho labeo	ငါးမြစ်ချင်း	Least Concern (LC)	20 Mar '10	Not Evaluated	Not Evaluated
5	*Rhinomugil corsula* (Hamilton, 1822)	Corsula	ငါးဇင်းလုံး	Least Concern (LC)	20 Mar '10	Not Evaluated	Not Evaluated
6	*Systomus sarana* (Hamilton, 1822)	Olive barb	ငါးခုံးမ	Least Concern (LC)	29 Oct '19	Not Evaluated	Not Evaluated
7	*Tenualosa ilisha* (Hamilton, 1822)	Hilsa shad	ငါးသလောက်	Least Concern (LC)	23 Jan 13	Not Evaluated	Not Evaluated
8	*Rita sacerdotum* (Anderson, 1879)	Salween rita	ငါးထွေ	Least Concern (LC)	30 Oct 09	Not Evaluated	Not Evaluated
9	*Polynemus paradiseus* (Linnaeus, 1758)	Paradise threadfin	ငါးပုဇွန်း	Least Concern (LC)	21 Jun 18	Not Evaluated	Not Evaluated
10	*Osteobrama belangeri* (Valenciennes,1844)	-	ငါးဖယ်အောင်း	Near Threatened (NT)	24 Jan 10	Not Evaluated	Not Evaluated
11	*Amblypharyngodon atkinsonii* (Blyth, 1860)	Burmese carplet	ငါးဘဲဖြူ	Least Concern (LC)	22 Feb 11	Not Evaluated	Not Evaluated
12	*Oreochromis niloticus* (Linnaeus, 1758)	Tilapia	တီလာပီးယား	Least Concern (LC)	06 Apr 20	Not Evaluated	Not Evaluated
13	*Macrognathus siamensis* (Günther, 1861)	Peacock eel	ငါးမြွေထိုး	Least Concern (LC)	24 Feb 11	Not Evaluated	Not Evaluated
14	*Mystus seengtee* (Sykes, 1839)	-	ငါးဇင်ရိုင်း	Least Concern (LC)	30 Sep 10	Not Evaluated	Not Evaluated
15	*Notopterus notopterus* (Pallas, 1769)	Bronze featherback	ငါးဖယ်	Least Concern (LC)	30 Aug 19	Not Evaluated	Not Evaluated

No.	Scientific name	English name (FAO name)	Local name	IUCN Red List Status		CITES	CMS
16	*Cirrhinus cirrhosus (Bloch, 1795)*	Mrigal carp	ငါးကြင်းဖြူ	Vulnerable (VU)	17 Mar 11	Not Evaluated	Not Evaluated
17	*Clupisoma prateri (Hora, 1937)*	-	ကွန်းမံ	Least Concern (LC)	13 Oct 09	Not Evaluated	Not Evaluated
18	*Labeo catla (Hamilton, 1822)*	Catla	ဟင်းငံ	Least Concern (LC)	8 Oct 09	Not Evaluated	Not Evaluated
19	*Metapenaes monoceros (Fabricius, 1798)*	Speckled shrimp	ကျောပုဇွန်	Not Evaluated	-	Not Evaluated	Not Evaluated

Photo specimen of fishes found during the survey are as follow.

Lates calcarifer

Otolithoides pama

Wallago attu

Labeo rohita

	
Rhinomugil corsula	*Systomus sarana*
	
Tenualosa ilisha	*Rita sacerdotum*
	
Polynemus paradiseus	*Osteobrama belangeri*
	
Amblypharyngodon atkinsonii	*Oreochromis niloticus*

	
Macrognathus siamensis	*Mystus seengtee*
	
Notopterus notopterus	*Cirrhinus cirrhosus*
	
Clupisoma prateri	*Labeo catla*

4.4.2.7.6.2 Phytoplankton

Primary productivity indicator phytoplankton were collected from 4 stations around the project site (Table 4-31). Total 24 phytoplankton species were identified (Table 4-32). Tables 4-33 and Table 4-34 show the abundance of the phytoplankton in the assessment.

Table 4-31: Phytoplankton and zooplankton sampling stations

Station	GPS	
	Latitude (E)	Longitude (N)
1	16.774397	96.124056
2	16.771023	96.131845
3	16.77426	96.127797
4	16.777231	96.122197

Table 4-32: Identified list of phytoplankton species

Phylum	Class	Order	Family	No.	Species
Heterokonto phyta (Bacillariophyta)	Bacillariophyceae	Thalassiosirales	Thalassiosiraceae	1	*Cyclotella striata*
				2	*Thalassiosira eccentric*
		Corethrales	Corethronaceae	3	*Corethron pelagicum*
		Fragilariales	Fragilariaceae	4	*Asterionellopsis glacialis*
		Coscinodiscales	Coscinodiscaceae	5	*Coscinodiscus centralis*
				6	*C. granii*
				7	*C. oculusiridis*
		Hemiaulales	Hemiaulaceae	8	*Cerataulina pelagica*
				9	*Hemiaulus sinensis*
		Chaetocerotane	Chaetocerotaceae	10	*Bacteriastrum hyalinum*
		Triceratiales	Triceratiaceae	11	*Odontella mobiliensis*
				12	*O. sinensis*
				13	*Triceratium reticulum*
		Thalassionemaales	Thalassionemataceae	14	*Thalassionema frauenfeldii*
		Naviculales	Pinnulariaceae	15	*Pinnularia* sp
			Diploneidaceae	16	*Diploneis carbo*
			Pleurosigmataceae	17	*Pleurosigma fasiola*
				18	*P. elongatum*
		Thalassiophysales	Catenulaceae	19	*Amphora* sp
		Bacillariales	Bacillariaceae	20	*Bacillaria paxillifera*
		Surirellales	Surirellaceae	21	*Surirella* sp.
Myzozoa	Dinophyceae	Prorocentrales	Prorocentraceae	22	*Prorocentrum micans*
Cyanobacteria	Cyanophyceae	Oscillatoriales	Oscillatoriaceae	23	*Oscillatoria* sp.
			Microcoleaceae	24	*Trichodesmium* sp.

Table 4-33: Abundance of collected phytoplankton species in each station

No.	Species	Station			
		1	2	3	4
1	*Cyclotella striata*	480	700	689	0
2	*Thalassiosira eccentric*	612	0	1200	483
3	*Corethron pelagicum*	120	120	35	59
4	*Asterionellopsis glacialis*	0	290	70	312
5	*Coscinodiscus centralis*	850	1200	950	1400
6	*C. granii*	186	842	0	852
7	*C. oculus-iridis*	900	930	675	850
8	*Cerataulina pelagica*	210	54	450	205
9	*Hemiaulus sinensis*	278	860	210	1450
10	*Bacteriastrum hyalinum*	420	740	380	1900
11	*Odontella mobiliensis*	0	76	45	325
12	*O. sinensis*	130	170	120	178
13	*Triceratium reticulum*	58	100	100	210

No.	Species	Station			
		1	2	3	4
14	*Thalassionema frauenfeldii*	795	215	174	350
15	*Pinnularia* sp	76	125	64	89
16	*Diploneis carbo*	210	46	150	120
17	*Pleurosigma fasiola*	150	0	39	71
18	*P. elongatum*	156	34	90	0
19	*Amphora* sp.	0	350	85	114
20	*Bacillaria paxillifera*	230	442	55	350
21	*Surirella* sp.	87	315	44	0
22	*Prorocentrum micans*	185	259	76	160
23	*Oscillatoria* sp.	860	1150	610	550
24	*Trichodesmium* sp.	1290	1530	810	1150

Table 4-34: Species abundance calculation of each station

Stations	S	N	H´	D´	E´
1	21	8253	-2.70	-0.89	2.22
2	22	10548	-2.69	-0.87	2.27
3	23	7121	-2.61	-0.83	2.48
4	21	11178	-2.62	-0.86	2.15

S = total number of species

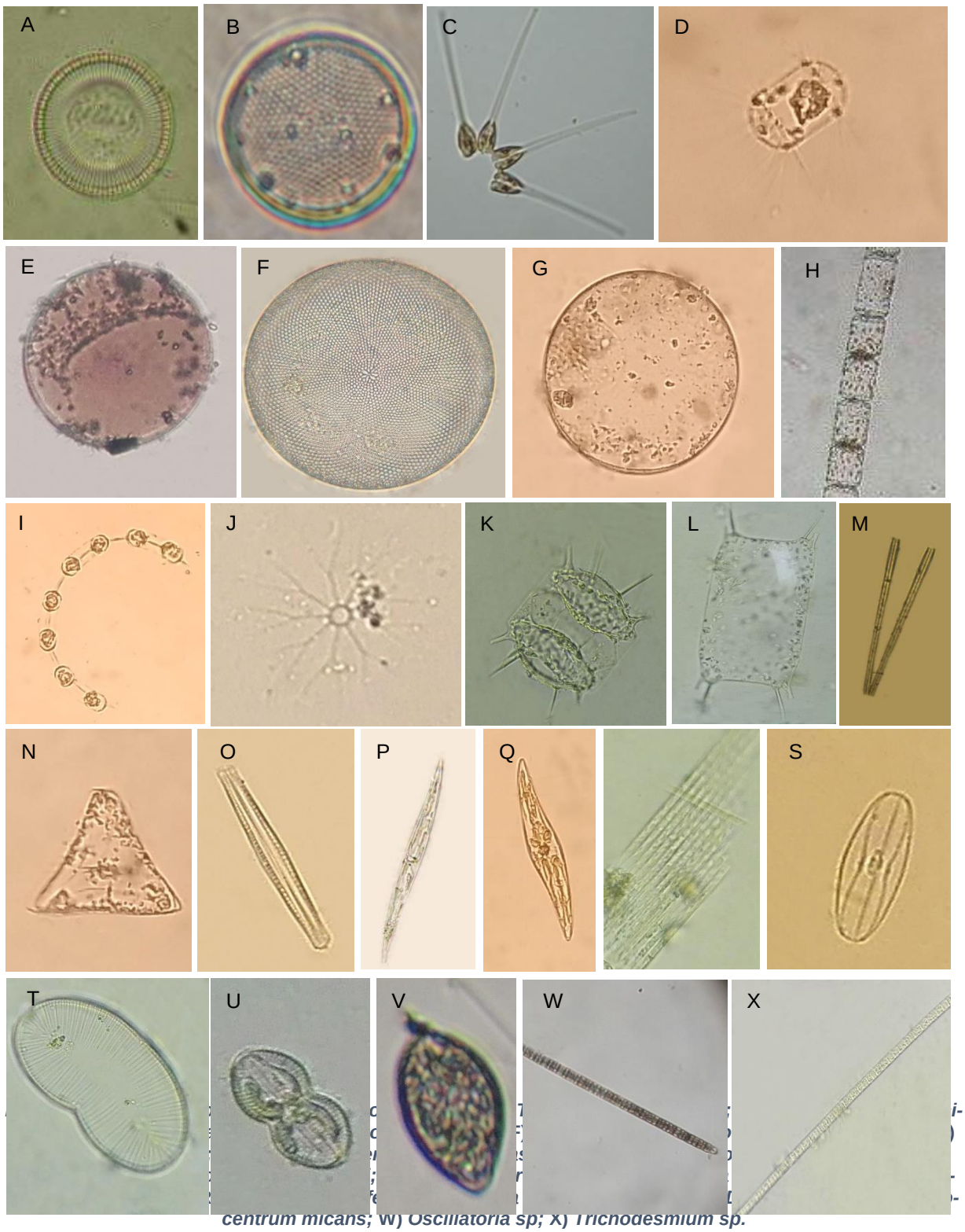
N = total number of individuals

H´ = diversity index

D´ = richness index

E´ = evenness index

Microscopic features of Phytoplankton collected from each station are shown as follow.



centrum micans; W) Oscillatoria sp; X) Trichodesmium sp.

4.4.2.7.6.3 Zooplankton

The secondary productivity indicator zooplankton were collected from 4 stations around the project site (Table 4-31). Total 30 species, including unidentified ichthyoplankton, were recorded (Table 4-35). Because of the fish spawning season, the shrimp, crab, and fish larvae were abundant and shared 33% to 46% of the total zooplankton count. The abundance of the zooplankton in the assessment is shown in Tables 4-36 and 4-37.

Table 4-35: Identified list of zooplankton species

Phylum	Class	Order	Family	No.	Species
Coelenterata	Hydrozoa	Hydroida	Rhopalonematidae	1	*Aglaura hemistoma*
Rotifera	Eurotatoria	Ploima	Brachionidae	2	*Brachionus calyciflorus*
				3	*Keratella tropica*
Arthropoda	Crustacea	Copepoda	Eucalanidae	4	*Eucalanus subcrassus*
				5	*E. monachus*
			Paracalanidae	6	*Paracalanus crassirostris*
				7	*P. aculeatus*
			Pseudodiaptomidae	8	*Pseudodiaptomus annandalei*
				9	*Pseudodiaptomus smithi*
			Diaptomidae	10	*Tropodiaptomus australis*
			Pontellidae	11	*Labidocera* sp
			Acartiidae	12	*Acartia* sp
			Cyclopidae	13	*Cyclops scutifer*
				14	*Mesocyclops leuckarti*
				15	*Ectocyclops sp*
			Harpacticoidae	16	*Harpacticoid copepod*
			Eucalanidae	17	*Eucalanus* nauplius
			Acartiidae	18	*Acartia* nauplius
	Branchiopoda	Anomopoda	Moinidae	19	*Moina micrura*
			Daphniidae	20	*Daphnia* sp
	Ostracoda			21	*Ostracod* sp
	Insecta	Diptera	Culicidae	22	*Aedes* larva
		Amphipoda	Oxycephalidae	23	*Tulbergella* sp
Annelida	Polychaeta			24	Polychaete larva
Mollusca	Gastropoda			25	Gastropod larvae I
				26	Gastropod larvae II
				27	Gastropod larvae III
	Crustacea	Decapoda		28	Shrimp larvae
			Brachyuridae	29	Brachyuran Crab larva
Chordata	Osteichthyes			30	Fish larvae (Ichthyoplankton)

Table 4-36: Abundance of collected zooplankton species in each station

No.	Species	Station			
		1	2	3	4
1	*Aglaura hemistoma*	40	85	48	70
2	*Brachionus calyciflorus*	100	152	390	730
3	*Keratella tropica*	1005	840	280	440
4	*Eucalanus subcrassus*	0	290	700	312
5	*E. monachus*	86	310	350	801
6	*Paracalanus crassirostris*	120	115	420	351
7	*P. aculeatus*	300	290	325	412
8	*Pseudodiaptomus annandalei*	1053	1172	856	2590
9	*P. smithi*	1452	893	1466	850
10	*Tropodiaptomus australis*	130	520	463	703
11	*Labidocera* sp	1302	1700	845	908
12	*Acartia* sp	2014	1623	1420	945
13	*Cyclops scutifer*	0	745	0	0
14	*Mesocyclops leuckarti*	320	130	652	550
15	*Ectocyclops sp*	190	205	500	380

No.	Species	Station			
		1	2	3	4
16	*Harpacticoid copepod*	150	0	345	608
17	*Eucalanus* nauplius	100	95	207	88
18	*Acartia* nauplius	208	245	94	158
19	*Moina micrura*	120	220	241	500
20	*Daphnia* sp	360	289	478	500
21	*Ostracod* sp	171	320	90	214
22	*Aedes* larva	42	0	0	0
23	*Tulbergella* sp	142	287	480	708
24	Polychaete larva	0	0	0	121
25	Gastropod larvae I	0	450	0	0
26	Gastropod larvae II	240	0	0	0
27	Gastropod larvae III	303	0	0	0
28	Shrimp larvae	2100	890	788	1860
29	Brachyuran Crab larva	6000	4500	8007	9050
30	Fish larvae	40	58	105	86
	Total larvae percentage (%)	**45**	**33**	**46**	**46**

Table 4-37: Species abundance calculation of each station

Stations	S	N	H´	D´	E´
1	26	18088	-2.37	-0.73	2.55
2	25	16424	-2.63	-0.82	2.47
3	24	19550	-2.38	-0.75	2.33
4	25	23935	-2.43	-0.76	2.38

S = total number of species
N = total number of individuals
H´ = diversity index
D´ = richness index
E´ = evenness index

Microscopic features of *collected zooplankton species collected in each station are shown as follow.*

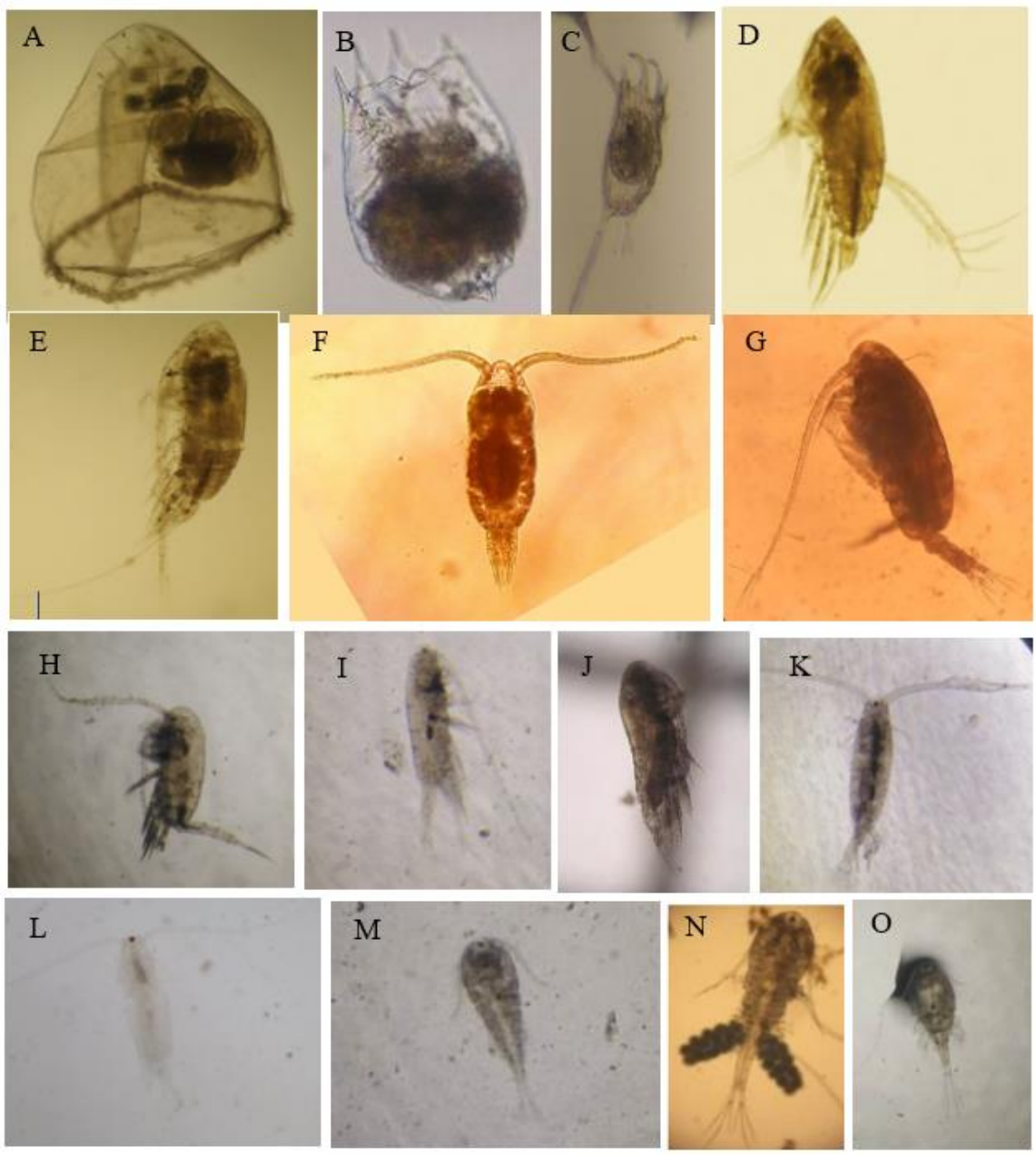


Figure 4-45: A-O: Zooplankton: A) *Aglaura hemistoma;* B) *Brachionus calyciflorus;* C) *Keratella tropica;* D) *Eucalanus subcrassus.;* E) *E. monachus;* F) *Paracalanus crassirostris;* G) *P. aculeatus;* H) *Pseudodiaptomus annandalei;* I) *P. smithi;* J) *Tropodiaptomus australis;* K) *Labidocera sp;* L) *Acartia sp;* M) *Cyclops scutifer;* N) *Mesocyclops leuckarti;* O) *Ectocyclops sp*

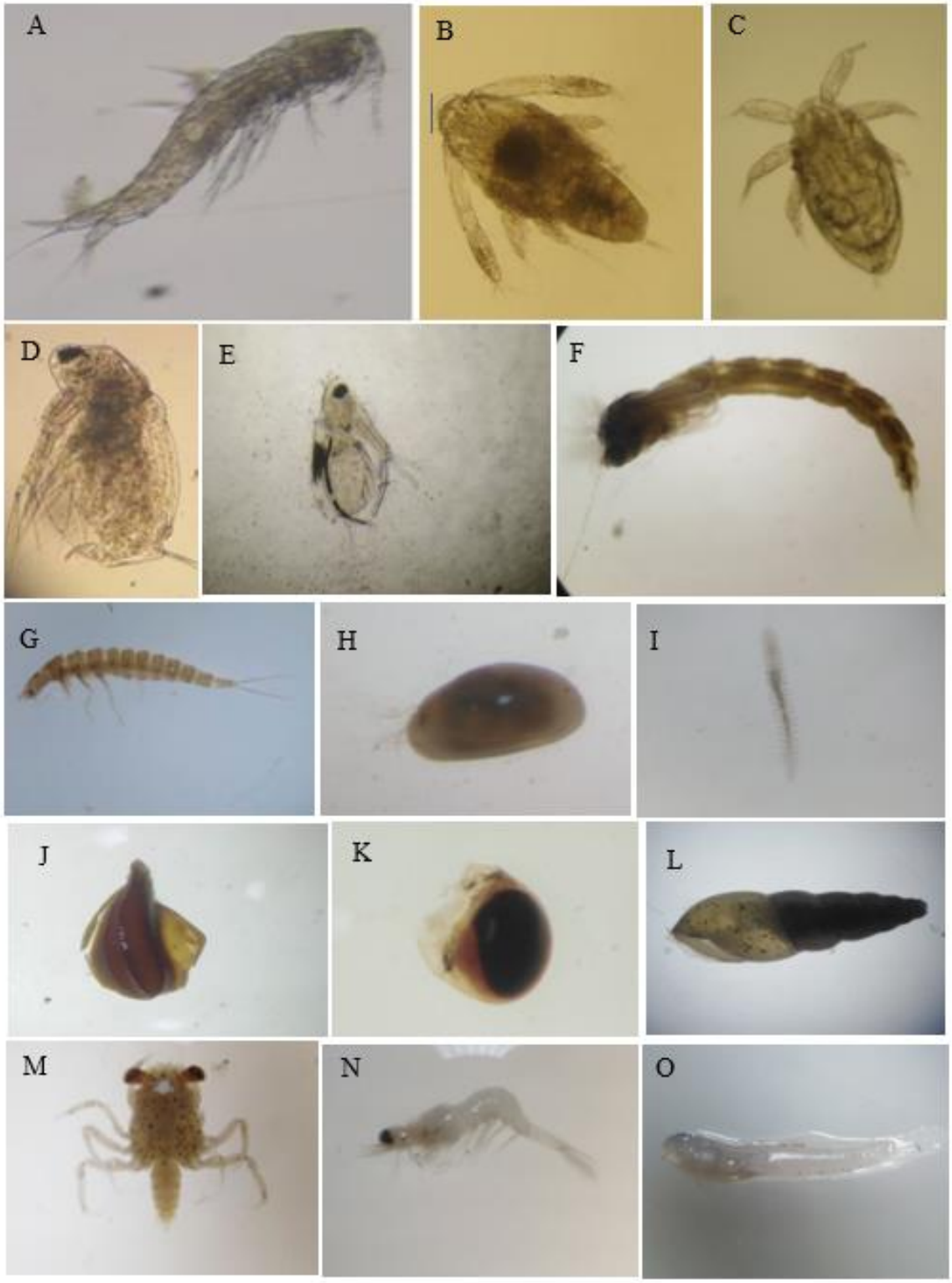


Figure 4-46: A-O: Zooplankton: A) *Harpacticoid copepod;* B) *Eucalanus nauplius;* C) *Acartia nauplius;* D) *Moina micrura.;* E) *Daphnia sp;* F) *Aedes larva;* G) *Tulbergella sp;* H) *Ostracod sp;* I) *Polychaete larva;* J) *Gastropod larvae I;* K) *Gastropod larvae II;* L) *Gastropod larvae III;* M) *Shrimp larvae;* N) *Brachyuran Shrimp larva;* O) *Fish larvae*

4.4.2.7.6.4 Benthos

The benthos specimens were collected from four stations in upstream and downstream of the project site (Table 4-38). Total 12 species, including unidentified crab juveniles, were recorded (Table 4-39). Crab juveniles were recorded in station 2, located at the mouth of the Herbi tidal creek, and 6.67% of the total collected benthos specimens. The abundance of the benthos is shown in Tables 4-40 and 4-41.

Table 4-38: Benthos sampling stations

Station	GPS	
	Latitude (E)	Longitude (N)
1	16.776242	96.127887
2	16.775427	96.125621
3	16.777143	96.122607

Table 4-39: Identified list of benthos species

No.	Phylum	Class	Family	Species
1	Annelida	Polychaeta	Nereididae	*Nereis* sp. 1
2				*Nereis* sp. 2
3				*Nereis* sp. 3
4			Paraonidae	*Cirrophorus* sp.
5	Nemertea	Pilidiophora	Lineidae	*Proborlasia* sp.
6	Mollusca	Gastropoda	Neritidae	*Neripteron violaceum*
7			Naticidae	*Natica fasciata*
8			Cerithiidae	*Cerithium coralium*
9	Arthropoda	Malacostraca	Grapsidae	*Grapsus tenuicrustatus*
10				*Grapsus albolineatuss*
11			Camptandriidae	*Paracleistostoma* sp.
12				Crab juvenile

Table 4-40: Abundance of collected benthos species in each station

No.	Species	Station				
		1	2	3	Total number	Dominance Index %
1	*Nereis* sp. 1			1	1	6.67
2	*Nereis* sp. 2			1	1	6.67
3	*Nereis* sp. 3			1	1	6.67
4	*Cirrophorus* sp.			1	1	6.67
5	*Proborlasia* sp.			1	1	6.67
6	*Neripteron violaceum*	1			1	6.67
7	*Natica fasciata*	1			1	6.67
8	*Cerithium coralium*	4			4	26.67
9	*Grapsus tenuicrustatus*	1			1	6.67
10	*Grapsus albolineatuss*		1		1	6.67
11	*Paracleistostoma* sp.		1		1	6.67
12	Crab juvenile		1		1	6.67
	Total number	**7**	**3**	**5**	**15**	

Table 4-41: Species abundance calculation of each station

No.	Description	Values
1	Diversity Index	H´=-2.34
2	Species Evenness	E´= -0.94
3	Species Richness	D´=4.06

Benthos collected on each station are shown as follow.

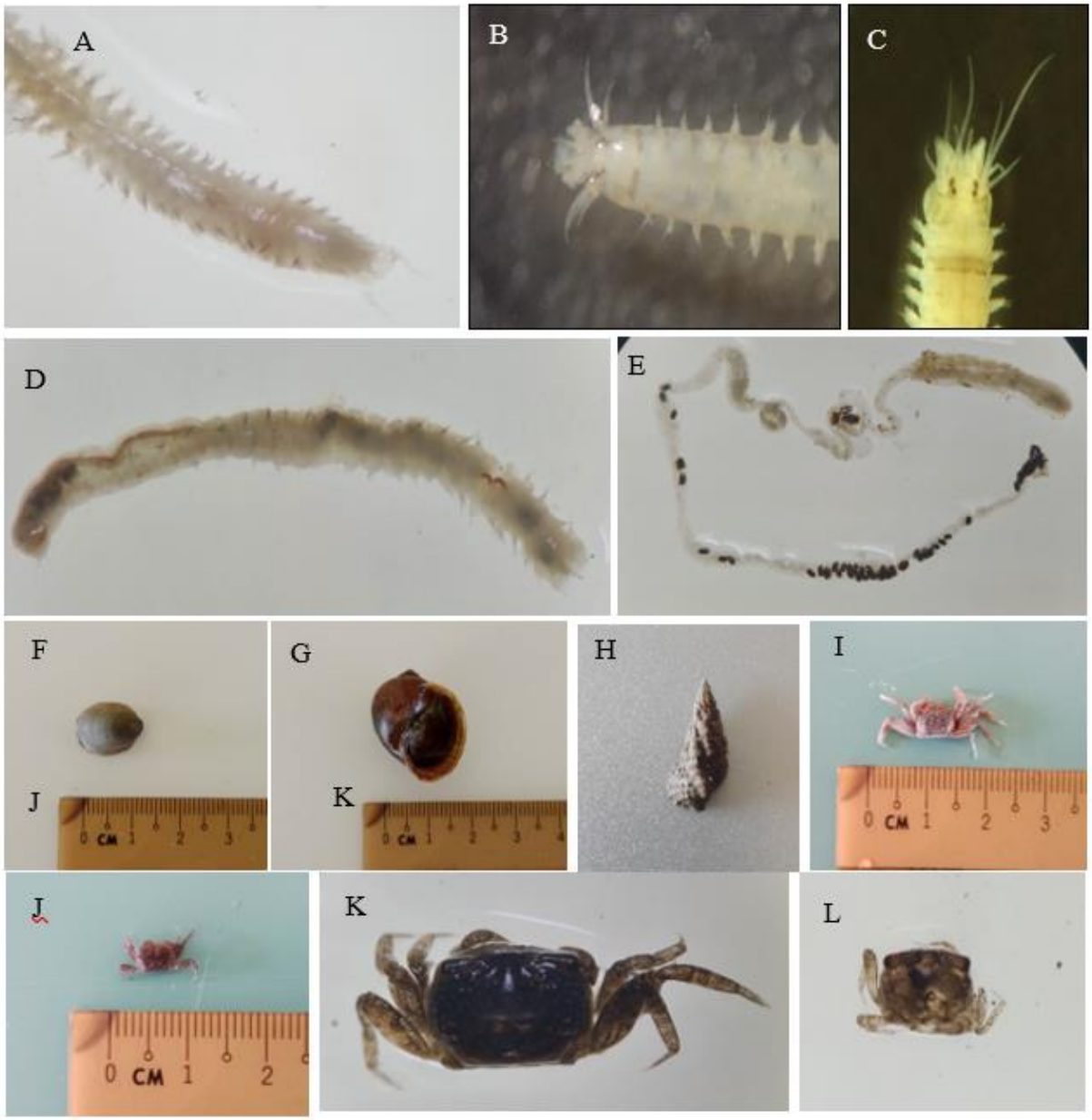


Figure 4-47: Benthos: A) *Nereis sp 1;* B) *Nereis sp 2;* C) *Nereis sp 3;* D) *Cirrophorus sp.;* E) *Proboscis sp.;* F) *Neripteron violaceum;* G) *Natica fasciata;* H) *Cerithium coralium;* I) *Grapsus tenuicrustatus;* J) *Grapsus albolineatuss;* K) *Paracleistostoma sp.;* L) *Crab juvenile*

Summary of findings

1. Total 18 fish species, including two vulnerable (VU) species, *Wallago attu* (Nga Bat), and *Cirrhinus cirrhosis* (Nga Gyin Phyu), and several economically important migratory species like *Tenualosa ilisha* (Nga Tha Lauk) and *Rita sacerdotum* (Nga Htway)
2. Total 24 phytoplankton species (Figure 4-44)
3. Total 30 zooplankton species, including ichthyoplankton species (Figure 4-45 and 4-46)
4. Total 12 benthos species, including crab juvenile (Figure 4-47)

Survey activity photos


Photo 4-37: Fishery survey at the local market


Photo 4-38: Planktons survey at the project impact area


Photo 4-39: Water quality survey at the project impact area

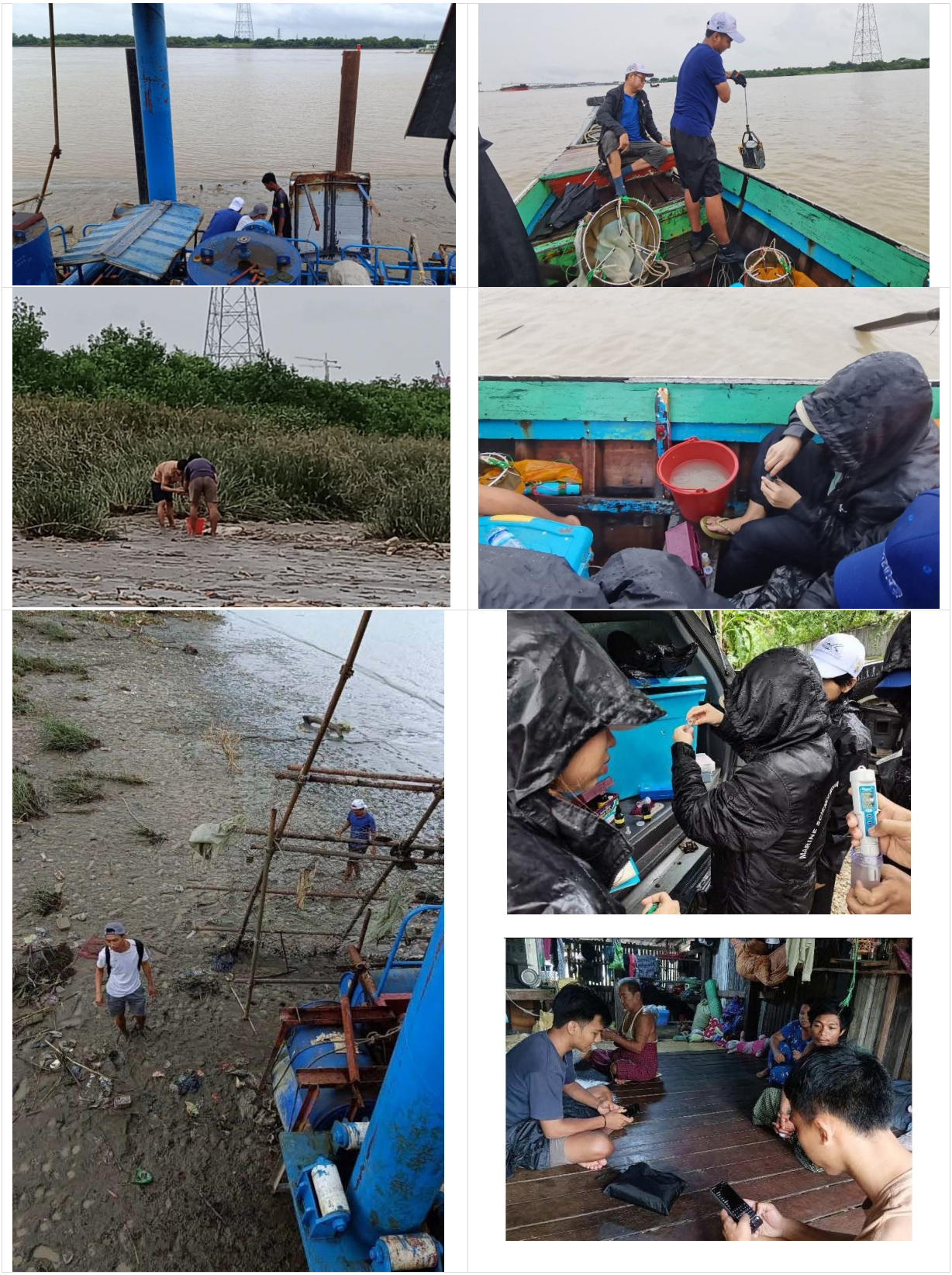


Photo 4-40: Benthos survey at the project impact area

4.4.3 Social Environment

The study on social environment is indispensable task of EIA process. Without having it properly untaken in all phases of the EIA procedures, it could result in social disputes leading temporary and permanent project suspension. Lest stumbling blocks emerge from the consequence both social and environmental related issues, it is important to set social environment scoping at highest priority. The social environment for scoping includes following key activities.

1. Public disclosure (key informant interview) and consultation
2. Stakeholders' engagement
3. Preliminary social baseline survey, and
4. Social Impact Assessment

Early public disclosure (a.k.a. key informant interviews) and consultation with all interested and concerned parties is a crucial part of scoping. Thus, the study limit and methodology for treating social environment issues is described in this section. The preliminary findings are to be comprehensively stated in separated Chapter.

The approach and objective of scoping exercise that will be applied to conduct for collecting social environment those resides neighbouring to the project include following.

1. Baseline socioeconomic profiles of project affected areas either directly or indirectly
2. Compulsory obligation in addressing public concerns
3. Disclosing project related information and consequences in transparent manners,
4. Actions to be undertaken base on the results of public consultation and stakeholder's engagement.

4.4.3.1 Setting Study Limit

As designated in the examination for physical and biological environment section, within 0.5 – 1 km radius, there are densely populated human settlement and commercial district have been identified. With future expansion for plant facility had been provided enough and that will be leased by the agreement of MOEP, there is no additional land acquisition is necessary, nor the land issues exist. However, since proposed new facility – 151.54 MW capable combined cycle power plant is encircled by residential quarters and parallel power plants, it is crucial to anticipate and take into account for the concerns and complaints in addressing social issues

However, social impact assessments are to be conducted covering following townships profiles – Ahlone township and concerned authorities of both local and regional level to represent and interpret wider and more comprehensive public sentiment towards this project. Key informant interview, stakeholder engagement meetings and public consultation meeting is to be conducted in separate locations and venue according to social layers and receptors category. They cover residents from the following communities and business operations which are located within 2 km (Approx. 1.25 miles) distance from the centre of the project site (Figure 4-48).

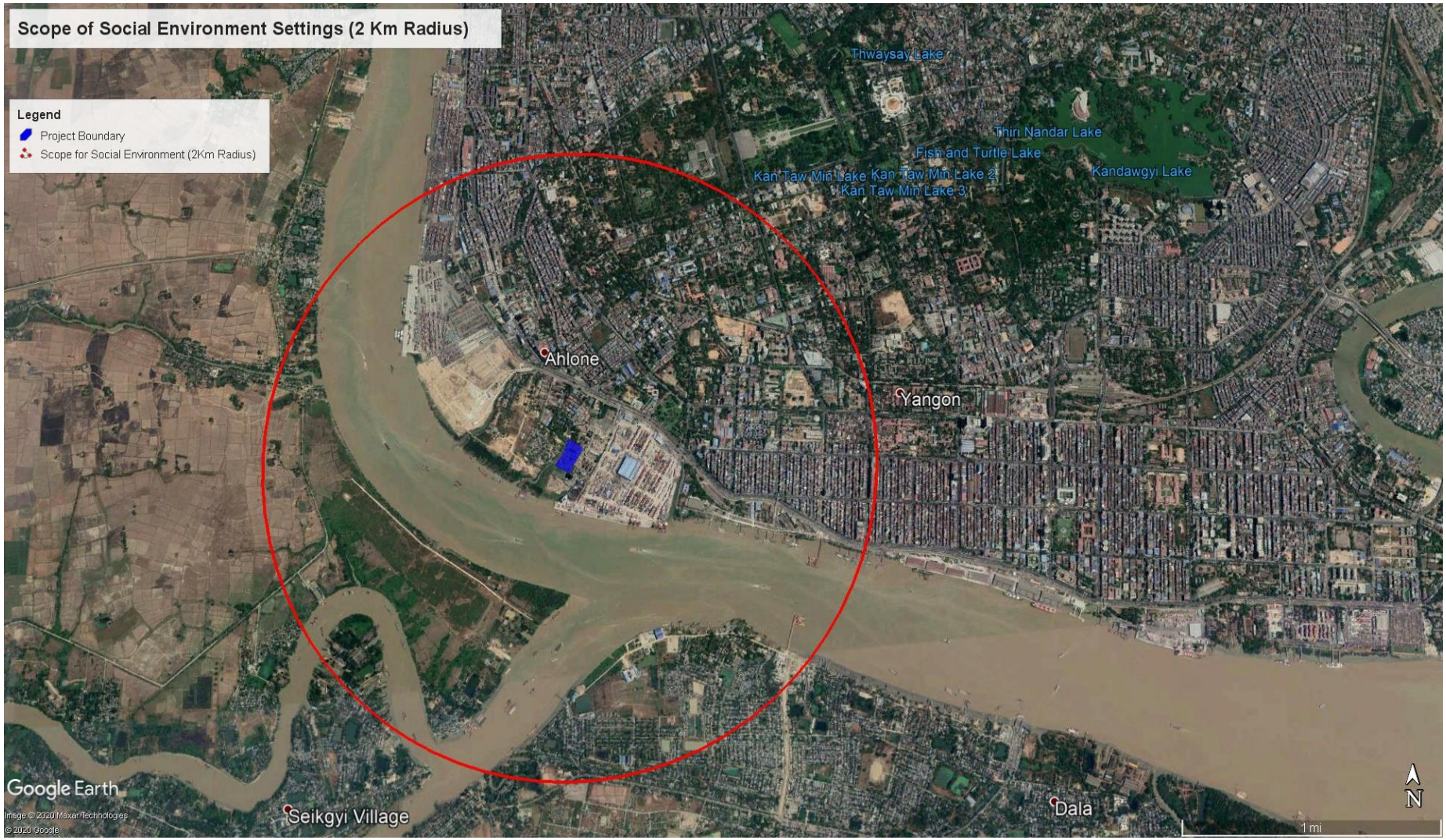


Figure 4-48: Project Boundary and Social Scope Definition for ESIA assessment

Although proposed power plant is inside the premises of Ministry of Electric Power, there exist mixed communities which befall within the scope of 2 km radius boundary of focused social environment assessment. In term of township, they are Ahlone, Lamadaw, Seikkan and part of Sanchaung, Dagon, Kyee Myin Daing, Sei Gyi Kanaungto, and Dala township.

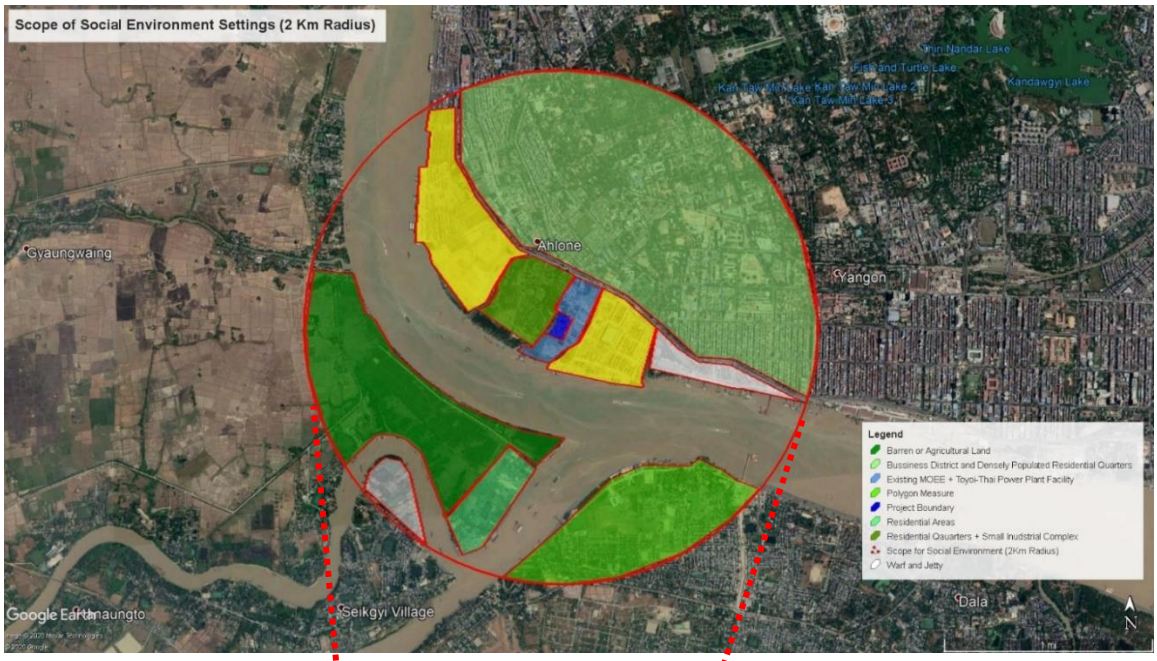


Figure 4-49: Existence of communities neighboring to the Project Location

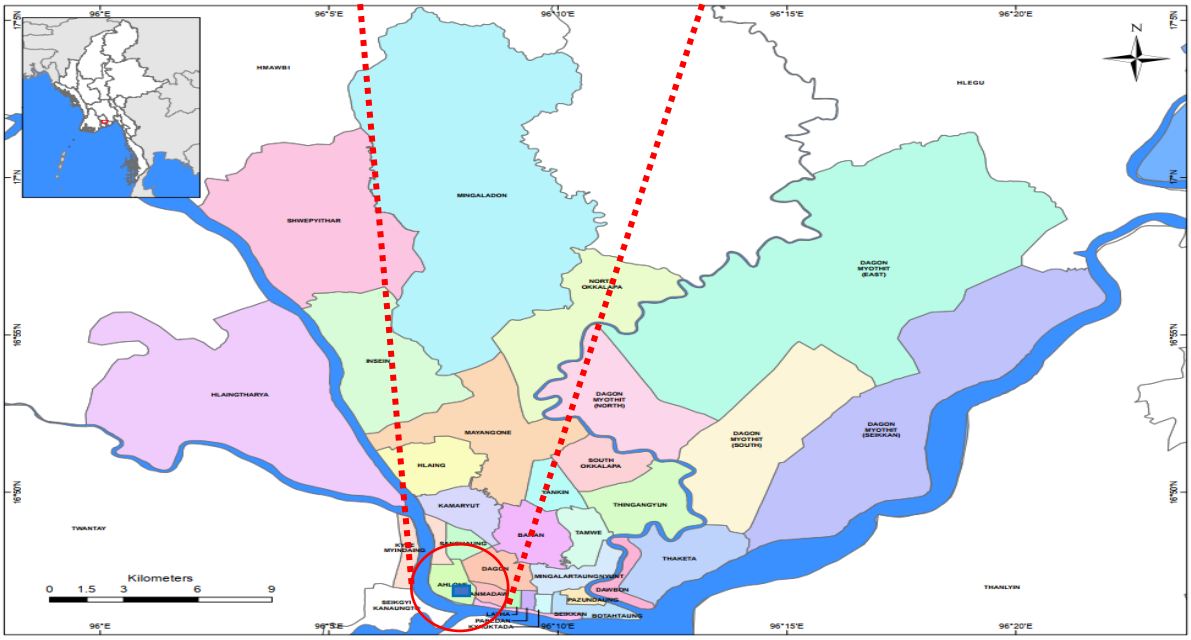


Figure 4-50: Distribution of Townships inside Yangon County

4.4.3.2 Methodology

The social impact methodology applied for full social impact assessment could be briefly summarized into following strategies and approaches.

Table 4-42: Applied Strategies for Public Consultation for Social Related Impact Assessments

Status	EIA Process Requirements / Procedures	Consultation Objectives	Strategies Considered
Fully Completed	Validate applicable social & legal procedures and standards	Review national laws and practices relevant to directly/indirectly affected community.	Highlight the needs and opportunities for capacity building and compensation.
Fully Completed	Screening: decide and assign EIA category	Identify all stakeholder groups. Secure project developer's commitment to consultation works. Agree an extent and mode of consultation.	Participation of relevant authority and all legal and regulatory cases.
Fully Completed	Scoping exercises conducted as of EIA TORs and schedules	Ascertain and find out all stakeholders at different levels. Disclose relevant project information: cost and benefit to the communities. Investigate and resolve stakeholders' concerns and enlist them in the project's TORs.	Evaluate available resources that the project will exploit from the community. Set implementation program for resource extraction, monitoring, and evaluation. Predicts potential conflicts among host communities and project developer.
Fully Completed	In-depth Impact Assessments	Disclosure for the findings and methods applied to all of stakeholders. Invite opinions and approval for proposed mitigation measures.	Hold meetings and workshop for reaching the compromises. Opens channel for reporting and information. exchange among stakeholders.
Fully Completed	Final Report Preparation	Let stakeholders satisfy with the mitigation and monitoring plan conducted by developer.	Set a mechanism to oversee and supervise consultation and compliance with agreements and pledges.
Fully Completed	Implement monitoring and Management plans	Inform public about the progress and measures undertaken. Disclose results of environmental monitoring. Maintain effective complaints procedures.	Organize supervision and implementation committee including all stakeholders.
Fully Completed	Final evaluation	Assess effectiveness of consultation processes. Evaluate feedback of stakeholders. Revise efficiency of applied EMMP.	Voluntarily invite environmental audit team including all stakeholders and concerned entities.

4.4.3.3 Identifying Project Affected Persons

In connection with social issues, a mechanism to resolve individual and communal social concerns are set high significance and importance in this scoping report and further measures. A public relation channel (information centre) to facilitate project proponent (i.e., Myanmar Alone Power Plant Co., Ltd.) and each individual or community has been launched. The centre collects any concerns raised by affected people and distribute information related to the project proposal and implementation processes as early as possible and provided them the feedback in timely manner. In case of collective or group participation needed, the project developer holds.

- Consultation meeting with all stakeholders
- Public and community meetings

In order to reflect to all the concerned individual, MSR will perform following procedures to advocate the scoping at highest ECD's guided social integrity.

- Inform the public about the proposal and the project mission and objectives
- Identify the main stakeholders and their concerns and values
- Define reasonable and practical alternatives to the proposal
- Focus the important issues and significant impacts to be addressed by and EIA
- Define the boundaries for and EIA in time, space, and subject matter
- Set requirements for the collection of baseline and other information, and
- Establish the Terms of Reference for an EIA study.

4.4.3.4 Social Environment Baseline

Demographic Profile Wards Profile

The demographic profile of ward and township profiles surveyed are described in the tables below.

Table 4-43: Demographic Data of West Sawyanpie ward of Ahlone Township

Specification	
Population	8000
Household	1600
House	360
Races	Bamar, Rakhine, Kayin, Mon, Chin,
Religion	Buddhism
Education	
State Prime School	2
Total Student	6
Teachers	6
Other staff	1
State Middle School	1
Total Student	4
Teachers	9
Other staff	3
Health	
Hospital	-
Region Health Center	1
Private Clinic	5
Doctors	10
Nurses	5
Midwives	2
Auxiliary Midwives	-

Health Assistant	2
Indigenous	-
Untrained midwife	-
Health Officer	-
Business	
Shop (commodity, food)	100
Rented vehicle service	50
Agriculture	-
Livestock Breeding	2 (pig)
Hotel, Lodge	-
Real Estate Service	-
Fuel shop	4
Broker Service	-
Trading	200
Skilled Labour (carpenter, mason)	-
Company	5
Social	
Ward Administrator Office	1
Fire Brigade	5
Library	-
Recreation	-
Market	1
Football Ground	-
Monastery	1
Pagoda	1
Ordination Hall	1
Community Hall	1
Resthouse	
Day Care Center	-
Other Religious Buildings	-
Loan center	1
Political Party	-
Natural Disaster	Storm
Cemetery	
Security	
Police Station	-
Military	-
Transportation	
Private car	150
Bus	-
Rented car	10
Rented Motorcycle	30
Private motorcycle	-
3-Wheel motorcycle	-
Tractor-Trailer	-
Trishaw	50
Bicycle	15

Bullock cart	-
Communication	
Landline Phone	100
Mobile Phone	5000
TV	Every House
Satellite Dish	400
Radio	50
Access of Electricity	
Electricity	1450
No Electricity	150
Candle Light	-
Battery	145
Solar Pane	5
Private Generator	3
Access of Water	
Pond (earth)	-
Rain Water Tank	-
Tube Well	350
Hand Dug Well	-
Drinking Water	Every House
Spring Water	-
River Water/Creek Water	-
Others (pond water)	-
Types of Toilet	
Flush	Every House
Pit (traditional pit latrine)	-
Open defecation	-
Public Toilet	3
Dispose of Rubbish	
Burn	-
Throw in Forest	-
Throw in pit	-
Throw in Drum	Every House
Housing Conditions	
Own House	260
Living in other's compound	-
Rent House	100
4. 1St class house	330
5. 2nd class house	10
6. 3rd class house	120

4.4.3.5 Demographic Data Ahlone Township of Yangon Region

Table 4-44: Demographic Data Ahlone Township of Yangon Region

Population	55,172
Household	10,997
House	3,238
Town	1
Ward	11
Village Tract	-
Village	-
Ethnicity	Kachin, Kayah, Kayin, Chin, Mon, Bamar, Rakhine, Shan and others
Religion	Buddhism, Christian, Hindu, and Islam
Township Area	1.04 sq. mile
Township Boundary	Dagon Township in east, Yangon River in west, Lanmadaw Township in south and Kyimyindine Township in north.
Use of land	
1. (a) paddy farmland	-
(b) fields for crops	-
(c) Kaing land	-
(d) garden land	-
(e) Dahni Land	-
(f) Hill	-
1. Unused Land	-
2. Pasture Land	-
3. Industrial Land	-
4. Town Land	610.69 acre
5. Village Land	-
6. Other Land	55.04 acre
7. Reserve Forest Land	-
8. Virgin Soil	-
9. Wild Land	-
10. Incurable Land	-
Total	**666 acres**
Education	
1. Nursery School	2
2. Number of students	450
3.Number of teachers	29
4. Other staff	-
1. Primary School	6
2. Number of students	353
3.Number of teachers	27
4. Other staff	-
1. Middle School	1
2. Number of students	143
3.Number of teachers	11

4. Other staff	-
1. High School	7
2. Number of students	5119
3.Number of teachers	212
4. Other staff	-
Health	
1. Hospital	-
2. 50-bed Private Hospital	1
3.16-bed Private Hospital	1
4. Township Health Department	1
5. Government Clinic	1
6. Private Clinic	57
4. Rural Health Center	-
3. Doctors	-
4. Nurses	-
5. Midwives	
6. Auxiliary Midwives	-
7. Health Assistant	-
8. Indigenous	-
9. Untrained midwife	-
10. Health Officer	-

Access of Water

Drinking Water	No. of Households	Domestic Use of Water	No. of Households
Purified drinking water	7943	Purified drinking water	21
Tube well	14	Tube well	15
Pipe water	406	Pipe water	2181
Artesian well	2538	Artesian well	8707
Pond water	7	Pond water	8
River/stream water	-	River/stream water	-

Types of toilets	
1. Flush	1068
2. Pit (traditional pit latrine)	10
3. Closed Defacation	173
4. Open defecation	78

Business	
Shop (commodity, food)	245
Services	-
Trading	5299
Industry	388
Government Staff	5568
Agriculture	-
Livestock Breeding	-
Fishery	-
Odd job	3536
others	2223

Cottage industry	12
Workshops	1
Dispensaries	-
Plant inside township	1
Company	16
Motel	-4
Hotel	1
Inn	1
Lodge House	2
Bank	9
Fuel Shop	2
Natural Gas Pump	3
Brokerage	-
Bus Stand	16

Transportation	
Private car/Dina/Light truck	2511
Motorcycle/Three-wheel cycle/Electric motorbike	142
Tractor-Trailer	8
Bicycle	1784
Boat/	8
Motorboat/ schooner	22
Bullock Cart	5

Communication	
1. Landline Phone	2659
2. Mobile Phone	10069
3. TV	10229
4.Radio	7173

Access to Electricity	
1.Electricity	10834
2. Kerosene Lighting	13
3. Candle Light	21
4. Battery	64
5. Private Generator	-
6. Solar Pane	3

Social	
Ward Administrator Office	11
Printing/Computer/Photocopier/Video shops	44
Recreation Places	1
Markets	3
Monastery	8
Pagoda	6
Community Hall	24
Church	5
Mosque	2
Chinese Temple	-

Hindu Temple	4
Library	21
Football Ground	1
Political Party	5 (NLD USDP UB PPP NUP)
INGO	2
NGO	4
Association	19

Security	
1. Police Station	1
2. Military	-

4.4.4 Public Health Component

Much of the health-related baseline data has been sourced from Ahlone Township profiles from General Administration Department (GDA) Ministry of Home Affairs (2019 data) and the Department of Population (DoP), Ministry of labour, Immigration and Population (2014 Census data). A literature review of medical research data base and journal was also undertaken.

Population

Ahlone Township has 55,172 residents residing according to General Administration Department (GDA) Ministry of Home Affairs (2019 data) that comprised of 10,997 households. More than half of the residents are females being 54.2% of the population, with males being 45.8%.

Township	Male N (%)	Female N (%)	Total population	Male & female ratio
Ahlone	25,264 (45.8)	29,908 (54.2)	55,172	1:1.18

Health care facilities

With regard to health care facilities, the township has one 50-bedded private hospital (Academy Hospital) and one 16-bedded private hospital (Thiri May Hospital). There are one township health centre and over 58 private clinics that include general practice clinics, specialist clinics, ophthalmology clinics, paediatric clinics, diagnostic centres, and dental clinics.

There is one township health centre where medical personnel and auxiliary appointed by government. The ratio of government employed medical personnel and population are listed as follows.

Health care personnel in government sector

Number of populations in Ahlone Township	Health care by doctors		Health care by nurses		Health care by health assistant	
	Number of doctors	Doctor and population ratio	Number of nurses	Nurse and population ratio	Number of health assis-tants	Health assistant and population ratio
55172	3	1:18390	10	1:5517	-	-

Source: Yangon Region, northern district administrative department

Health information

Endemic Diseases

Disease morbidity and mortality rate

The most prevalent disease in the township is diarrhoea and tuberculosis. It was documented that in the year 2018-2019 there were 167 people fell ill with tuberculosis and 2 died. There were 15 known cases of HIV/AIDS in 2019.

There were no cases of mortality due to diarrhoea, dysentery, malaria, and hepatitis.

Table 4-45: Morbidity and mortality of diseases in Ahlone Township in 2019

Types of Diseases									
Malaria		Diarrhea		Tuberculosis		Dysentery		Hepatitis	
Diag-nosed	Death	Diag-nosed	Death	Diag-nosed	Death	Diag-nosed	Death	Diag-nosed	Death
-	-	36	-	167	2	-	-	-	-

Health indicator

Health indicator	2018-2019
Population Growth Rate (%)	0.23
Birth Rate	14
Infant Mortality Rate (IMR)/1,000 Live Birth	0.0
Maternal Mortality Rate (MMR)/1,000 Live Birth	0.0
Abortion rate in /1000	0.0
Number of mothers	770

Source: Township Health Profile 2020 of Ahlone Township

The birth rate was 14 per 1,000 total population in 2019.

Three in every 100 persons in Ahlone Township have, at least, one form of disability. Slightly more females than males have disability. The prevalence of disability increases with age and it increases considerably after the age of 70. Difficulties with walking and seeing were the most commonly mentioned forms of disability in the Township.

Source of drinking water

According to the 2014 Myanmar Population and Housing Census, 99.6% of households in Ahlone Township use improved sources of drinking water such as tap water, tube well, borehole, bottled water/ purified water.

Table 4-46: Total number of households obtaining various water source

Using for drinking water	Total
Purified Drinking Water	7,943
Dug well water	14
Tap water/ Piped	406
Water borehole	2,538
Pond/ Pool/ Lake	7
Other uses	**Total**
Purified Drinking Water	21
Dug well water	15
Tap water/ Piped	2181
Water borehole	8707
Pond/ Pool/ Lake	8

Source: Township Health Profile, 2019 of Ahlone Township

Sanitation

Majority of households 10,682 (97.1%) in Ahlone Township have improved sanitation facilities. Flush toilets are used by 25.6% and water seal improved pit latrines are used by 72.0% of the households. Some 0.4 per cent of the households in the township have no toilet facilities.

Waste Management

Some households are relying on private garbage collectors and some are on YCDC garbage collection system (truck) to dispose of solid waste.

4.4.5 Cultural Component

There are no buildings which has intrinsically linked to neither culture nor heritage components had been identified inside the project nor within 1 Km. of areas of Influence. This is since the site had been allocated for utility and infrastructure development provision by Ministry of Electric Power.

4.4.6 Visual Components

Since the project site is inside electrical and utility infrastructure compound of the ministry, there is no aesthetically appealing area inside the whole premisses. And, the project is intertwined between government owned power plants nearby, the establishment of 151.54MW plant structures are hide by those other structures and plants nearby

4.4.7 Landscape

No points of interests in the project area that would attract visitors. And, the development of the project does not have any sizable impact to landscape and its significance in the area.

5. ENVIRONMENTAL IMPACTS ASSESSMENT AND MITIGATION MEASURES

This chapter discusses the methodology and approach for anticipated environmental impact identification and evaluation. The methodology adopted for the study of environmental impacts consist in identification, prediction, and assessment/ evaluation of likely effects. The prediction of environmental impacts has a basis in pre-project baseline data and anticipated changes. The main objectives of predicting the effects of project activities are delineation of an appropriate mitigation plan that would minimize the anticipated effects on environment. The methodology adopted for prediction in respect of air quality and noise-level changes are based on mathematical modelling. Any empirical model attempts to quantitatively describe the cause- and- effect relationship between pollution source and the environment. In the present report water, land, biological and socio-economic impact studies have used a combination of quantitative / qualitative techniques as well as professional judgement based on the merits of proposed schemes.

Base of the finding and evaluated results further Environmental Management Measures (EMM) and Environmental Monitoring Plan (EMP) will be created into Environmental and Social Management Plan (ESMP). In doing so, the selection for Best Available Technology or Techniques (BAT) will be contemplated for project developer when environmental remediation and impact mitigation efforts are put into action.

5.1 Impact Assessment Methodology

This section describes the impact assessment process undertaken to evaluate the level of risk to environmental, socio-economic and health receptors from activities associated with the proposed project. This description provides an account of the identification of potential impacts and benefits and the evaluation of their significance. The assessment to the level of impact significance requires consideration of the impact level in relation to the receptor sensitivity.

Table 5-1: Significance Matrix for Environmental Impacts

Receptor Sensitivity	Impact Level		
	Low	Medium	High
Low value/sensitivity receptor or resource, impact disturbs degraded area or slightly disturbs area with value for conservation, causes small changes in species and diversity, within standards, small local change in human use and quality of life values over a short-term duration, reversible over short-term.	Negligible	Low	Medium
Medium value/sensitivity receptor or resource, impact disturbs an area that has a value for conservation or causes change in species diversity. Impact important on a local or regional level, within standards, moderate change in human use and quality of life values at moderate level over a long-term duration, reversible over medium-term.	Low	Medium	High
High value/sensitivity receptor or resource, rare or endangered species or habitat impacted on a national or international level, exceeding standards, large permanent change in human use and quality of life values at a regional level, long-term or no reversible.	Medium	High	High

The impact assessment is based on four categories of impact significance level as described in the following table 5-2. These address the level of mitigation that is considered appropriate to be applied for a given impact.

Table 5-2: Categories of Impact Significance

Significance Level	Definition
High	Impact is classified as high and can cause numerous effects. Major impacts affect an entire population or species in sufficient magnitude to cause a decline in abundance and/or change in distribution. Large permanent change in human use and quality of life values at a regional and national level. Fatality from an accident or occupational illness. Impacts cannot be managed or resolved by any mitigation measures.
Medium	Impact may result in changes that affect the value of resources and environment. Moderate impacts affect a portion of a population and may bring about a change in abundance and/or distribution but does not threaten integrity of population. Impact may affect moderate change in human use and quality of life values at a local and regional level over a long-term duration. Major injury or health effects (including Permanent Partial Disability). Mitigation measures are required to manage or reduce the potential impacts and monitoring measures are required to determine effectiveness of mitigation measures.
Low	Impact may result in changes in resources and environment, but this change does not decrease value of these resources and environment. Minor impacts affect individuals within a population over a short period of time. Local change in human use and quality of life values over a short-term duration. Minor injury or health effects (Lost Time Injury). Impact can be managed and resolved by implementation of general mitigation measures.
Negligible	Impact has no effect.

The degree of significance depends upon the level of impacts (magnitude + extent + duration) and the sensitivity of the receptor that they may impact. These address the level of mitigation that is considered appropriate to be applied for a given impact. The criteria used to define the significance ranking of impacts on a qualitative basis are mentioned in the table below. This methodology will be applied for the impact assessment project. The criteria used to define the significance ranking of impacts on a qualitative basis are mentioned in the table 5-3 below.

Table 5-3: Criteria used to determine Impact Significance

Criteria	Score	Detail
Extent	3	High – Area of impact is beyond 5 km and impact extends to regional and national level
	2	Medium – Area of impact is beyond the project area but is in a limited area of 1-5 km
	1	Low – Area of impacts is in the project area within a radius of 1 km
Duration	3	Long Term – Permanent impact and impact will remain after decommissioning of the project. Impact occurs in long term duration (> 5 years)
	2	Medium – Impact can be reversible overtime (1-5 years), period of impact occurrence is within the project period, impact occurs over mid-term duration (1-5 years)
	1	Short Term – Impact can be quickly reversible (< 1 year), period of impact occurrence is less than the project period, impact occurs in short-term duration (<1 year).
Magnitude	3	High – Exceeds regulatory standards, changes the original structure of the environmental or social system or ecosystem
	2	Medium – Within regulatory standards, but changes some factors in the environmental or social system or ecosystem but does not change the structure
	1	Low – within regulatory standards, with small changes in some factors for the environmental or social system or ecosystem but does not change the structure

Criteria	Score	Detail
		Negligible – no detectable impact on the environment or socio-economic conditions
Receptor Sensitivity	3	High – High value/sensitivity receptor or resource, rare or endangered species or habitat impacted on a national or international level, exceeding standards, large permanent change in human use and quality of life values at a regional level, long-term or no reversible.
	2	Medium - Medium value/sensitivity receptor or resource, impact disturbs an area that has a value for conservation or causes change in species diversity. Impact important on a local or regional level, within standards, moderate change in human use and quality of life values at moderate level over a long-term duration, reversible over medium-term.
	1	Low - Low value/sensitivity receptor or resource, impact disturbs degraded area or slightly disturbs area with value for conservation, causes small changes in species and diversity, within standards, small local change in human use and quality of life values over a short-term duration, reversible over short-term.
		Negligible – no detectable sensitivity

Analysis of Impact Level

Analysis Impact Level = Magnitude + Extent + Duration

Total Score for Impact Level	Impact Level	Score
7-9	High	3
4-6	Medium	2
1-3	Low	1

The above matrix method is used to consider the Impact Level and Receptor Sensitivity as follows:

Significance = Impact Level x Receptor Sensitivity

Impact Significance Evaluation

Significance Level of Environmental Impact			Impact Level		
			Low	Medium	High
			1	2	3
Receptor Sensitivity	Low	1	Negligible (1)	Low (2)	Low (3)
	Medium	2	Low (2)	Medium (4)	Medium (6)
	High	3	Low (3)	Medium (6)	High (9)

Significance level of Impact = (Extent + Duration + Magnitude) x Receptor Sensitivity

5.2 Identification and Assessment of Potential Environmental Impacts

The Impacts for the proposed project are covered under the following subsections:

- Pre-construction Phase
- Construction Phase
- Operational phase
- Decommissioning Phase

5.2.1 Pre-construction Phase

5.2.1.1 Land Acquisition and Land Use

In general, land acquisition may affect the environment and people by the following ways:

i. Loss of Homestead land
ii. Loss of Agricultural Land
iii. Cultural, historical and Aesthetic Loss
iv. Loss of sensible places

Impacts on land resource are minor and insignificant for the project site. Since the project site is inside the MOEP compound land acquisition is not required.

5.2.1.2 Chance Finds of Archaeological Remains

There is no archaeologically important place in the project land. Impact on cultural, historical, and aesthetic is also unlikely.

However, if heritage resources or archaeological resources are discovered during preconstruction and construction phase while ground excavations such as foundations, piling or any project activities;

- Cease activities and consult archaeological department;
- Protection in situ if possible and
- Project Developer shall without delay notify the township General Administrative Office and Department of Archaeology and National Museum (Yangon branch).

5.2.2 Construction Phase

For the construction phase there will be impacts on physical, biological, and social environment. The impacts are both positive and negative. The project will involve development of Gas Based Combined Cycle Power Plant on 5.965 acres of land. Each development project more or less requires site preparation. The construction phase, in general, has adverse influence on all the components of environment. Most of these impacts are short lived and reversible in nature. Construction works generally involve are site clearance, excavation, filling of earth materials, dumping of unusable debris materials, transportation of materials to construction site, and other constructional activities and associated works like mobilization of constructional equipment, setting up of different construction plant, setting up of workforce camp, quarrying, transportation of material, material storage, etc. These activities have certain impacts of various magnitudes on different components of environment. A proper care is essential to minimize the adverse impacts to the possible extent to facilitate the restoration of the environment and can be discussed under following sub-heads.

Table 5-4: Impact Significant on Environmental Parameters During Construction Phase

Type of Environmental Parameters	Score				Significance level of Impact = Impact level x Receptor sensitivity Impact level = (Extent + Duration + Magnitude)
	Extent	Duration	Magnitude	Receptor Sensitivity	
Impact on Physical Environment					
Ambient air quality	1	1	1	1	1 (Negligible)
Greenhouse gases emissions	1	1	1	1	1 (Negligible)
Noise and vibration	1	1	2	1	2 (Low)
Soil erosion	1	1	1	1	1 (Negligible)
Soil Contamination	1	1	2	1	2 (Low)
Water contamination	1	1	2	2	4 (Medium)
Solid waste generation	1	1	2	1	2 (Low)
Traffic congestion	2	1	1	2	4 (Medium)
Impact on Biological Environment					
Vegetation loss	1	1	1	1	1 (Negligible)
Aquatic life	1	1	1	2	2 (Low)

Type of Environmental Parameters	Score				Significance level of Impact = Impact level x Receptor sensitivity Impact level = (Extent + Duration + Magnitude)
	Extent	Duration	Magnitude	Receptor Sensitivity	
Impact on Social Environment					
Social acceptability	1	1	1	2	2 (Low)
Risk of infectious diseases	1	1	1	2	2 (Low)
Emergency Risk	1	1	2	1	2 (Low)
Occupational Health and safety	1	2	2	2	4 (Medium)
Community Health and Safety	1	1	2	1	2 (Low)

5.2.2.1 Physical Environment

5.2.2.1.1 Ambient air quality

Combustion Emissions

Most of the air pollution coming from construction site is related to the burning of diesel fuel. Heavy-duty vehicles, cranes, excavators, generators, and many other types of equipment consume diesel and discharge emissions into the atmosphere.

Dust emission

During the construction phase of the project, fugitive emissions during site clearing operations and construction activities will increase particulate concentration in ambient air. The major construction activities from which air emission mostly dust emission may occur are; site clearing activities, earthwork for preparation of gradients ground excavation, cutting, filling, compacting, and shifting of soil will generate substantial quantities of dust at the construction site. The sources of emission will include running of earth moving machineries such as loaders, bulldozers, back holes, road rollers, compacters, water boxers and management vehicles, handling and mixing of cement.

- Delivery of construction materials such as building blocks, cement, sand, steel bars, ballast will be bulky and thus will require to be delivered on site by a fleet of trucks driving in and out of the construction site. During this exercise dust is likely to be generated from the following:
    - Handling of cement which is dusty by nature of the way it is
    - Handling of ballast which could contain loose dust particles
    - Site clearing of area of holding ballast, building blocks and sand will expose the site to wind action.
- The powdery nature of handling and mixing of cement will be a potential source of dust especially during handling and mixing it with other materials such as sand and gravel. Cement dust will likely be of concern during:
    - Opening-up of cement bags and emptying the cement to mix with other construction material
    - During loading and offloading of cement

A large volume of dust emission will lead to significant impact on workers, residents, and surrounding area. The dust emission will occur during winter and summer times most. The significance level of impact is low.

Air Pollution

Vehicular emission and fuel-based emissions will increase in the immediate vicinity of construction site. Exhaust emissions of construction vehicles such as loaders, excavators, trucks, dumpers, bulldozers, backhoes, compactors, road rollers, graders, management vehicles and diesel generators contain air pollutants such as carbon monoxide (CO), sulphur dioxide (SO_2), particulate matter (PM_{10}, $PM_{2.5}$), and nitrogen oxide (NO_x). During construction phase, due to the movement of these vehicles and utilization of associated construction machineries, the air quality will be impacted by these emitted gases.

Ground Excavation

Site preparation in readiness for construction work may require vegetation clearance, stripping off over-burden material, ground levelling and compaction. These activities will open- up the ground to wind action and thus potentially resulting in dust generation. This is because of the following:

- Vegetation clearance will directly expose the ground to agents of erosion;
- Stripping off overburden material will loosen soil aggregates thus making them easily susceptible to wind action;
- Removal of tree stumps and roots will weaken soil bounding and thus can easily be blown by wind

Particulate matter Control (PM_{10} and $PM_{2.5}$)

Particulate matter (PM) emissions from gas-fired combined cycle power plants are generally lower compared to certain other types of power plants, such as those burning coal or biomass. Natural gas, the primary fuel for these combined cycle plants, typically contains lower levels of impurities and ash, leading to reduced particulate matter formation during combustion. However, it is important to implement appropriate particulate matter control measures to ensure compliance with environmental regulations and to address any potential impact on air quality.

- As the power plant uses HRSG system which indirectly help PM emission by improving combustion efficiency that result in leaving fewer unburned particles and reducing the potential for PM formation. The system also lower fuel consumption which can contribute to a reduction in particulate matter emissions
- Ensuring the natural gas supplied to the power plant meets specified quality standards helps prevent impurities that could contribute to particulate matter emissions.
- Routine maintenance of equipment, including combustion chambers, is essential to prevent the buildup of deposits that can lead to increased PM emissions.
- Optimize operating conditions, such as fuel-air ratios and combustion parameters, to reduce the potential for particulate matter formation.
- When possible, introducing water or steam into the combustion process can help capture particulate matter and reduce its emission.

NOx

- Introducing water or steam into the combustion process can lower flame temperatures, leading to reduced NOx emissions.
- Precise control of combustion timing and tuning helps optimize the combustion process for reduced NOx formation without compromising overall plant performance.
- Optimize operating conditions, such as load and ambient conditions, to ensure efficient combustion and minimize NOx formation.
- Implementing continuous emission monitoring systems ensures real-time tracking of NOx levels, enabling prompt identification and correction of any deviations from regulatory limits.

SO_2

Sulphur dioxide (SO_2) emissions are generally low in natural gas-fired combined cycle power plants due to the inherently low sulphur content in natural gas. However, control measures can be employed to further minimize SO_2 emissions:

- Ensuring the use of natural gas with low sulphur content is fundamental in reducing SO_2 emissions. The selection of low-sulphur natural gas can be an effective preventive measure.
- Optimizing operational parameters, such as combustion conditions and air-to-fuel ratios, can contribute to efficient combustion and reduce the potential for SO_2 formation.

An increase in visible dust beyond the boundaries of the proposed power plant due to the activities undertaken at the plant site, or on the access road, adverse impact on community assets, or if there are persistent complaints from the community or the vehicles are not incompliance with the YCDC rules for vehicles can determine the whether the impact is significant. Detailed contribution of the impact level is described in the modelling report. Modelling report also approve that impact level is insignificant.

The impact significant level is considered as negligible.

5.2.2.1.2 Greenhouse gas emissions

The greenhouse gases such as carbon dioxide (CO_2), and nitrous oxide would be generated from the construction machineries and vehicles traffic during the construction phase. It can lead to the global warming and contribute to climate change. The significance level of impact is low.

Greenhouse gas (GHG) emissions from natural gas-fired combined cycle power plants primarily consist of carbon dioxide (CO_2), but can also include smaller amounts of methane (CH_4). Recommended control measures for greenhouse gases include:

- Increasing the overall efficiency of the combined cycle power plant reduces the amount of natural gas needed to generate a unit of electricity, subsequently lowering CO_2 emissions per unit of power produced.
- Implementing effective monitoring and preventive measures to minimize methane leaks from pipelines and equipment helps address the potent greenhouse gas methane, which can escape during natural gas extraction and transportation.
- Continuous optimization of operational parameters, load management, and maintenance practices helps improve efficiency and reduce overall greenhouse gas emissions.

Detailed contribution of the impact level is described in the modelling report. Modelling report also approve that impact level is insignificant.

The significance level of impact is negligible.

5.2.2.1.3 Noise and vibration

Noise and vibration shall be caused by the operation of earth moving and excavation equipment, concrete mixers and transportation of equipment and materials. Movement of traffic during night hours can also disturb the local community. Delivering of building materials by trucks, and operating earth moving machines, excavators, loaders, bulldozers, backhoes, metal cutters, compressors and concrete mixers will contribute a certain level of noise and vibration within the construction site and surrounding area. Higher noise level within the site can impose adverse impact on health of workers, and those are in vicinity of the project site. As crawling type earth moving machineries vibrate earth surface heavily, it can impose negative impact on natural habitat and native animals.

For an approximate estimation of dispersion of noise in the ambient air from the source location, a standard mathematical model for sound wave propagation has been used. The sound pressure level generated by noise sources decreases with increasing distance from the source due to wave divergence. An additional decrease in sound pressure level with distance from the source is expected due to atmospheric effect or its interaction with objects in the transmission path.

For hemispherical sound wave propagation through homogenous loss free medium, one can estimate noise levels at various locations, due to different sources using model based on following equation:

$L_{P2} = L_{P1} – 20 \text{ Log } (r2/r1) - A_E - A_M$

Where, sound L_{P2} and L_{P1} are the Sound Pressure Levels (SPLs) at distances of r2 and r1 from the source.

A_E and A_M are attenuations due to Environmental conditions (E) and Machine correction (M)

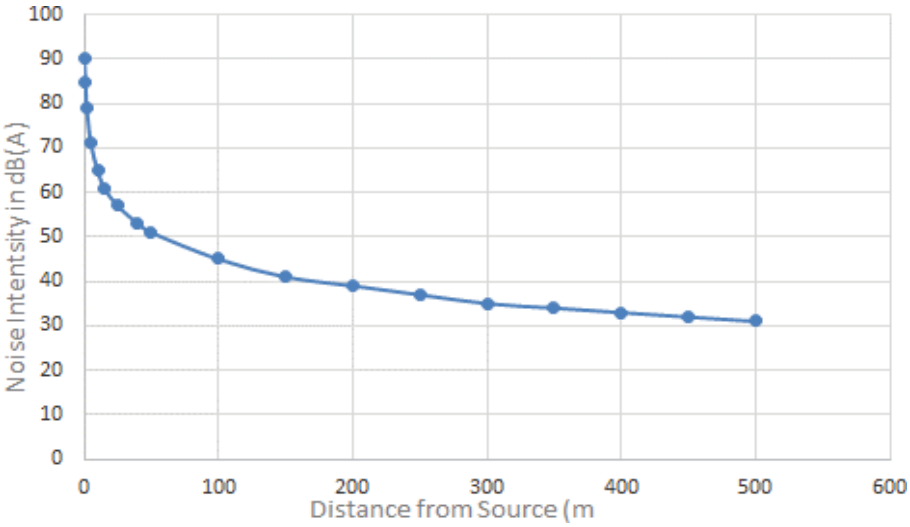


Figure 5-1: Noise Intensity in respect to Distance from Noise Source

As per OSHA standard about 90 dB(A) of noise is expected to be generated from construction activity. This noise shall attenuate to less than 45dB(A) i.e., night time prescribed noise level at about 100m. The distance of nearest settlement is about 200m. The significance level of impact is low.

5.2.2.1.4 Soil Erosion

In the rainy season of during construction phase, soil erosion will be occurred due to the construction activities, surface, and stormwater runoff. The soil erosion can happen when the excavated or borrowed soil are stacked on bare land. Construction at site could lead to increased erosion by concentrating water flows and removing the natural erosion protection (vegetation cover) for site clearing, as well as increasing run-off from the site, thus reducing infiltration and groundwater recharge. The significance level of impact is negligible.

5.2.2.1.5 Soil Contamination

Oil, fuel, chemicals and lubricants spills or leaks from construction machineries and vehicles can contaminate soil. These impacts are dependent on the size of the spill and the speed with which it is remediated. The likelihood of a spill is also associated with the volume of product that may be stored onsite. The significance level of impact is low.

5.2.2.1.6 Water contamination

Adequate supplies of drinking water that is compliant with the national drinking water quality standards to all workers should be ensured. In case of groundwater heavy metals (nitrate, arsenic, and coliforms) contamination should be checked and treated to the national standard level before use.

The construction at site can alter the natural drainage pattern of the area at a micro level. There is potential of contamination of low-lying areas and surface water quality due to sediment run-off from construction area. During construction, activities such as grading and demolition create pollutants that can leave the site and harm the waterways. Sediment is one of the main pollutants of concern. When it rains, stormwater washes over the loose soil on a construction site, along with various materials and products being stored outside. As stormwater flows over the site, it can pick up pollutants like, chemicals, debris, loose soil, sediment, spilled fluids are pollutants those can be transported to nearby storm drains or directly into Harbi Creek and Yangon River.

The impact significant level is medium.

5.2.2.1.7 Solid waste generation

Site clearance, excavation, labour camp and installation work shall produce various kinds of waste. The construction demobilisation shall involve deployment of workers, removal of campsite and other temporary structures. These activities shall result in generation of waste. The major wastes as expected are as follows.

- Construction Debris
- Domestic solid waste from labour camp

- Packaging material of the plant parts
- Waste oil from generator and other construction machinery
- Metal scraps, Paint containers, etc.

The debris generated due to construction activities may spread out in nearby areas. This may lead to soil and water contamination.

Improper disposal of solid waste from the labour camps at site and lack of proper sanitation facility for labour shall lead to unhygienic conditions and spread of diseases in the area. It can lead to discontent of local community and result in conflicts with the labour engaged at site.

Improper disposal of packaging materials, boxes, plastics, and ropes can lead to littering in the construction site and surrounding areas. Hazardous wastes such as waste oil, lubricants, hydraulic oil etc. can cause contamination of soil and water bodies if adequate precautions for management and handling are not undertaken. Use of chemicals such as paints, curing chemicals can lead to contamination of soil.

The significance level of impact is low.

5.2.2.1.8 Traffic flow

The construction activities shall require transportation of construction material, mounting structures, and other components to the site. The additional traffic movement on the road due to project activities shall increase accident probability. Transportation of construction material in open trucks / tippers can also lead to dust generation along the route. Excess traffic on the road shall create discomfort for locals due to increment in noise level and fugitive dust and gaseous pollution expected to exhaust from the vehicles. The significance level of impact is medium.

5.2.2.2 Biological Environment

Protected areas

There is no protected area in the proposed project area and surroundings.

5.2.2.2.1 Changes to land cover or vegetation loss

Due to the construction the vegetation cover will be lost a considerable impact from the process of land conversion to land use for and transportation use by mobilizing equipment, building machines and motor vehicles. The use of heavy-duty machinery leads to a high level of vegetation damage and to considerable soil and ground compaction. Clearing of land for construction of the building will destroy vegetation and displace animals from their habitats of natural way of living. However, the construction site and its surrounding area have already been converted into a power generation industry. Hence, it is unlikely to have an effect on vegetation loss. The significance level of impact is negligible.

Fauna

There is no IUCN listed endangered species in the proposed project area and surroundings.

5.2.2.2.2 Aquatic Life

As stormwater flows over the site, it can pick up pollutants like chemicals, debris, loose soil, sediment, spilled fluids are pollutants those can be transported to nearby storm drains or directly into Harbi Creek and Yangon River. Improper disposal of sewage and wastewater from toilets and construction debris can contaminate the aquatic environment. The impact significance level is low.

5.2.2.3 Social Environment

5.2.2.3.1 Social Acceptability

In the construction phase, skilled workers might be engaged in the project to perform technical work and they might come from outside the area. However, since the area has good labour force, most of the laborers will come from the local and other townships.

The potential impacts that might arise in reference to labour related issues have been mentioned below.

- Once the construction activity for the project gets underway, there is a possibility for inflow of migrant workers from other parts of the country in project area. For unskilled work in the construction phase, the local population and its surrounding areas should be given first preference.

- The influx of migrant workers might put pressure on the existing resources like water supply, supply of fuel, provision of basic facilities, waste handling and sewage disposal of the project influenced population which might create frictions between them and the resident population of the area. However, chance of this scenario is rather low considering the project capacity and nature of work. The significance level of impact is low.

5.2.2.3.2 Risks for infectious diseases

The influx of construction workers from different areas of the country could bring different infectious diseases like Hepatitis, Malaria, Tuberculosis, and HIV/AIDS. These infectious diseases could spread between the workers and the local community and there is a possibility to increase the risks. The significance level of impact is low.

5.2.2.3.3 Emergency Risk

During construction phase, flood can occur not only because of heavy rain and storms, but also the surface water hydrology changes and blockage of solid waste and eroded soil could also cause the flood. The improper storage and handling of fuels (loading, unloading), vehicle transporting petroleum products involving in accidents (collision, overturning), defective oil tightness integrity or incomplete closing of valves and connections, and not following no-naked flames warning signs will pose a risk of fire and explosion. There is also a possibility that if earthquake occurs the construction work structures would be collapsed. The significance level of impact is low.

5.2.2.3.4 Occupational Health and Safety Issues (Risks of accidents and injuries to workers)

Loading and unloading operation of the construction material may cause an injury if not handled properly. During construction works, physical injury can result due to road accidents, construction accidents and other occupational hazards. Over exertion injuries and illness shall potentially be the most common health hazards associated with construction activities. Further there is potential for slips and fall on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction material, liquid spills and uncontrolled use of electrical cords and ropes on ground, which results in injuries and time loss during construction. Hazards associated with fall of construction material or tools, as well as collapse of constructed slabs, walls and roofs can result in injury to head, eyes, and extremities. Transportation and movement of vehicles are associated with road accidents and related hazards, which can lead to injuries and fatalities. The significance level of impact is medium.

5.2.2.3.5 Community Health and Safety

It is anticipated that there will be an impact on community health and safety because of influx of construction workers (who might bring the infectious diseases), and increase of vehicle traffic (vehicular exhaust emissions can cause the pollution – related diseases including respiratory problems, heart diseases, stroke, and chronic obstructive pulmonary disease). The increase of traffic and operation of construction machineries can also cause accidents to the local community and the injuries and even death is possible and hence the safety of the community is threatened. The significance level of impact is low.

5.2.3 Operation Phase

For the operation phase there will be impacts on physical, biological, and social environment. The impacts are both positive and negative. During operation phase, it will also include proper maintenance works.

Table 5-5: Impacts Significant Level on Environmental Parameters during Operation Phase

Type of Environmental Parameters	Score				Significance level of Impact = Impact level x Receptor sensitivity Impact level = (Extent + Duration + Magnitude)
	Extent	Duration	Magnitude	Receptor Sensitivity	
Impact on Physical Environment					
Ambient air quality	1	2	1	1	2 (Low)
Greenhouse gases emissions	1	2	1	1	2 (Low)
Climate change	2	2	1	2	4 (Medium)
Waste water	1	2	2	2	4 (Medium)
Water contamination	1	1	2	1	2 (Low)

Type of Environmental Parameters	Score				Significance level of Impact = Impact level x Receptor sensitivity Impact level = (Extent + Duration + Magnitude)
	Extent	Duration	Magnitude	Receptor Sensitivity	
Solid municipal waste generation	1	1	2	1	2 (Low)
Chemical waste	2	1	1	2	4 (Medium)
Noise and vibration	1	2	2	2	4 (Medium)
Impact on Biological Environment					
Impact on flora and fauna	1	1	1	1	1 (Negligible)
Impact on aquatic life	1	2	2	2	4 (Medium)
Impact on Social Environment					
Occupational Health and Safety	1	2	2	2	4 (Medium)
Community Health and Safety	1	1	2	1	2 (Low)
Risk of infectious diseases	1	1	1	1	1 (Negligible)
Increase Emergency Risk	1	1	2	1	2 (Low)

5.2.3.1 Physical environment

5.2.3.1.1 Ambient Air Quality

Ambient air quality may be affected due to emission of flue gases from the gas turbine stack. Incomplete burning of gases from the operation of gas turbine may also affect the air quality. The situation becomes aggravated when gas contains high percentage of impurities like sulphur, hydrocarbon, nitrogen etc. The high temperature of flue gas also produces impacts on the air quality in terms of thermal pollution. The combustion of fossil fuels for power generation inevitably results in emission of gaseous pollutants to the atmosphere. The major pollutants of potential concern are Sulphur dioxide (SO_2), oxides of nitrogen (NO_x), carbon monoxide (CO) and Carbon dioxide (CO_2). However, according to air modelling findings the concentration of pollutants emitted from the power plant is within the NEQEG limits, aligning with the emission targets set by the power plant.

Sulphur dioxide (SO_2) emission

The emissions of Sulphur dioxide are dependent on the Sulphur content of the fuel. Since there is no Sulphur content in the natural gas, there would be **no Sulphur dioxide emission** from the plant.

Nitrogen Oxides (NO_x) emissions

Burning of fossil fuels at high temperature (above1600°C) generally produces two forms of nitrogen oxides namely, nitric oxide (NO) and nitrogen dioxides (NO_2); commonly referred to as nitrogen oxides (NO_x). The proportion of NO_x and NO_2 varies depending on the combustion technology, and in the case of gas turbines approximately 90 percent of the nitrogen oxides is present as NO with the remaining being NO_2. Once the NO enters the atmosphere, it reacts with oxygen in the air and oxidizes to NO_2 with passage of time. Based on baseline data of air monitoring results, the NO_x concentration is within the NEQG acceptable limits

Carbon monoxide (CO) emission

Carbon monoxide (CO) is generated when incomplete combustion takes place. As per design, the emission of CO from the gas turbine would not be an issue. Therefore, the impact due to emission of CO would not be significant for the proposed power plant.

Carbon dioxides (CO_2) emission

Emission of CO_2 is associated with global warming. CO_2 gas emission depends on the fuel burned and the carbon content of the fuel. The natural gas contains a significant portion of carbon, which reacts with oxygen to produce CO_2 and heat; at full capacity CO_2 emission due to the project operation, with its present quantum will not have much impact on global warming.

The significance level of impact is low.

5.2.3.1.2 Greenhouse gas emissions

The activities and sectors associated with the project: transportation, and solid waste dumping ground will emit the greenhouse gases to the atmosphere and these gases are carbon dioxide, nitrous oxide, fluorinated gases, and methane respectively. The significance level of impact is low.

5.2.3.1.3 Climate Change

Greenhouse gases are those that absorb and emit infrared radiation in the wavelength range emitted by Earth which eventually contributed to global warming and finally climate change. Burning natural gas releases both CO_2 and methane, therefore, it contributes to climate change, while improving air quality. In order, the most abundant greenhouse gases in Earth's atmosphere are

- Water vapor (H_2O)
- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Ozone (O_3)
- Chlorofluorocarbons (CFCs)

The table below shows the comparison of IFC CO_2 Emission rate for Combine Cycle Gas Turbine Plants and the specification of CCPP:

Comparison of IFC CO_2 Emission rate and the specification

IFC/WB Typical Values for CO_2 Emissions in a CCPP Plant (Natural Gas)				
Parameter	**Performance of CO_2 emission as per Engine Catalogue**	**Efficiency, (% Net, HHV)**	**Efficiency (% Net, LHV)**	**Projected**
		(w/o CCS*)	(with CCS*)	
Efficiency, (% Net)	58.4	50.8	43.7	**54-58**
CO_2 Emission, (t CO_2 / GWh)	342.1	355	39	**348-374**

**CCS-Carbon capture and storage*

The CO_2 emission factor for Myanmar Ahlone Power Plant 151.54 MWCCPP is 342.1 tCO_2/GWh. Assuming 85% plant load factor, the total annual CO_2 emissions of Myanmar Ahlone Power Plant 151.54 CCPP is estimated:

0.15154 GW x 8760 hours/year x 0.85 = 1128.4GWh/year

1128.4 GWh/year x 342.1 tCO_2/GWh = 386,026 tCO_2/year

Note: All the calculations are done considering efficiency for combined cycle power plant

Impact Significance on Climate Change is medium.

5.2.3.1.4 Impact due to wastewater from power plant

Wastewater drains from plant will consist of -

- discharge from blow down cooling tower
- rejection from demineralization plant water and
- domestic wastewater from sinks, and occasional equipment floor wash and other wash water etc.

Discharge of cooling tower blow-down flow into the river will increase the ambient water temperature of river water. About 206 m^3/hour of water is expected to discharge from the plant to the river. Outlet water from blowdown tower is normally warmer than the inlet temperature water. Warm water holds less dissolved oxygen than cool water and may not contain enough dissolved oxygen for the survival of different species of Aquatic life. The temperature rise caused by the condenser cooling water discharge from power plant to the receiving water body should not be more than 3 °C higher than the intake water temperature. Thus, before it is discharged back into the river, the cooling water exiting the plant will be collected in the cooling ponds to reduce the temperature. The impact significant is medium.

The minimum flow in Yangon River was 2050 m^3/sec, considering this mean flow, the abstraction of this project is 0.00014% of the river mean flow and the discharge is 0.00002% of the river flow. so, there will not be any impact on water quality and temperature from discharge. Proper care will be taken in the design of water circulation system for the Combined Cycle power plant that no contamination or waste is carried to the river. Thus, the river water will remain free from any sort of negative impact originated from the power plant. Impacts on Water quality are assessed as moderate in nature and shall further be reduced to minor after implementation of Management Plan. Significance level of impact for water contamination is low.

5.2.3.1.5 Solid and Municipal Waste

The operation of the plant itself would not generate any solid waste. Solid waste generated by the people working at the proposed site is paper, cartoons, bags, boxes, office wastes, pallets, empty drums etc. along with negligible quantity of domestic waste. There will have waste Air filters and waste rugs be generated occasionally which need to be properly disposed. During operation phase of the project around 50 -100 workers will be employed. It is estimated that around 40 kg/day municipal solid waste will be generated.

Hazardous Waste: Hazardous waste that may also be generated during the operation phase of the proposed project includes small amounts of waste/spent oil, batteries, lighting lamps, E waste, etc.

Lubricating Oil: Insignificant amount of used lubricating oil would be generated from the plant.

E Waste: The power plant is not producing electronic items however, a variety of E-wastes can will be generated during the operation of power plant. The quantity/volume and characteristics of e-waste depend on many factors such as nature and scale of operation and maintenance activities.

Battery Waste: In the life of the plant, there's a chance that battery waste will be generated and if not handled properly, battery can release hazardous substance harmful for human health at the end of its life.

- Batteries are one of the most common forms of industrial hazardous waste, containing metals toxic to human health and the environment.
- As batteries start to break down in landfill, the heavy metals they contain can leach into surface and groundwater, polluting soil and water, and harming humans and wildlife.

Significance level of impact for Solid and Municipal Waste is low.

5.2.3.1.6 Chemical wastes generated from power plant

Unlike coal plants or nuclear plants no solid waste will be generated through power generating process in CCPP. Solid chemical waste from electricity generation is not considerable.

However, in power plant chemicals are required for water treatment to remove harmful dissolved salts and impurities in the raw water before feeding it to the boiler. Deposition of dissolved salts and suspended impurities will form scale on the inside wall of different heat exchangers thus there will create excessive pressure and thermal stress. Dissolved salts may react with various parts of the boiler and corrode the surfaces. Corrosion damage may occur to turbine blades. To prevent corrosion and demineralization of raw water treatment chemicals using is power plant are highly effective and have impacts if not handling properly.

Chemicals used in water treatment plant such as Ammonia, Hydrochloric acid, Sodium hydroxide, hydrazine, Caustic, Polymers are toxic. They are high risk for flammability, explosive burning, and rust. Chemical spill or splash can result exposure to unprotected eyes and skin and immediately effected. Once absorbed by eyes or skin the chemical will reach to bloodstream and cause further damage. If chemicals are inhaled accidentally symptoms can occur irritation of the eyes, noise, cough, blood in sputum and shortness of breath.

Potential toxic waste may be empty waste containers which include contaminated totes, drums, cans, and equipment parts. Solid waste also includes waste rags, wipes, and absorbent materials contaminated with acids, alkali, and solvents. If improperly managed, this waste can pose dangerous health and environmental consequences like the uncontrolled escape of greenhouse gases contaminate water and soil, creating health hazards to living beings. Liquid effluent and liquid waste (such as oils) generated from CCPP may be arising from maintenance activities.

The impact significance level is medium.

5.2.3.1.7 Noise and Vibration Impacts

During operation, the maximum expected noise level from turbine generator and other sources will be <85 dB(A) on any specific source point within plant premises. The sound pressure levels generated by various noise sources decrease with increasing distance mainly due to wave divergence. Since the various plant equipment are located at large distances, higher cumulative levels are not achieved. However, prediction was performed for the maximum expected noise levels at various locations. The community-level noise calculation was also performed to arrive at the anticipated levels the community is likely to get exposed to for a longer period. The impact significance level is medium.

5.2.3.2 Biological Environment

The proposed project will be a 151.54 MW combined cycle power project and may have long term impact on the ecological resources in the area if not properly addressed. Proper mitigation measures should be implemented if the negative impact identified on this issue

5.2.3.2.1 Impact on Flora and Fauna

Flora: The power plant will not emit any toxic gas or dust during operation hence, the impact on floral species in the area is insignificant.

Fauna*:* The power plant has close circuit cooling system and not emit thermal discharge to water body, the nominal discharge from the project will be controlled by in house WWTP and discharge quality will be within national limit. Therefore, the impact on aquatic fauna in the area is insignificant.

Fishery: Since the project has not have any thermal discharge, the impact on fishery in the area would not be an issue. Moreover, the construction workers (unless native to the area of project) shall be debarred from taking out any fishing activity in the vicinity to avoid any impact on local resources.

5.2.3.2.2 Impact on Aquatic Life

The benefit of the project is substantial and will support to the development of Yangon City in the future. On the other hand, the impact of the project on the environment, especially the aquatic biodiversity is crucial to consider mitigating the capture fisheries resources, especially the larval and juvenile stages of several kinds of aquatic species for the fisheries- dependent communities along the river system. Additionally, the mitigation measures on the migratory fish species are crucial for the sustainability of fisheries production rather than impact due to the Project. The followings are the potential impacts to consider the mitigation plan in the long term.

- habitat loss or alteration along the Herbal tidal creek, especially for the benthos species.
- Changes in water quality caused by the waste effluent in the long term.
- Temperature of effluent water can impact of aquatic environment.
- Intake well where water extracted can harm fishes.
- Habitat loss or alteration along the Herbal tidal creek, especially for the benthos species
- Cumulative impacts from multiple power plant projects to the Yangon River aquatic ecosystem

The volume of water requirement for makeup would have been decreased by times, hence the quantum of water to be extracted will be too small in comparison to the available volume considering the flow in the Yangon River.

The overall impact significance level on aquatic life is medium.

5.2.3.3 Social Environment Impacts

5.2.3.3.1 Community Development Activity

As per Myanmar Ahlone Power Plant's CSR Policy, it will propose community development programme based on need-based assessment and consultation with local communities and relevant stakeholders.

5.2.3.3.2 Employment

The local business communities engaged in trade and commerce will be benefited. On the other hand,

people living in abject poverty are expected to marginally gain in terms of greater number of employment days. As the labour demand grows, a general wage increase is expected. The socioeconomic enhancement on account of these positive changes is anticipated. The project activities are expected to enhance economic activities in the area which will benefit the overall economic development of the area by way of meeting energy demands. Income generating opportunities will also grow in the area on account of creation of new job opportunities. The installation of proposed plant is expected to further increase the prospects by bringing in some direct and indirect employment opportunities.

5.2.3.3.3 Occupational Health and Safety

Working at the environment of heat, noise, confined spaces, electricity hazards, fire and explosion hazards, chemical hazards, and exposure to dust will affect the workers' health and safety. Sanitation, safe drinking water, and provision of food can affect their health and safety as well as affect their efficiency and productivity. The impact significance level is medium.

5.2.3.3.4 Community Health and Safety

Since, natural gas- based power plant is designed with no emissions of all types of air pollutants including carbon dioxide (CO_2) emissions, air quality is not impacted by powerplant operation and effect on community health and safety due to air quality is unlikely. Noise generation is also not affected to surrounding residentials. Therefore, air quality and noise impact on the surrounding community is low.

5.2.4 Decommissioning Phase

At the stage of the project planning and implementation process, the necessity for planning and timing of the decommissioning of the construction equipment and structures after the completion of construction and end of life power project of the Myanmar Ahlone Power Plant Co. Ltd., 151.54 MW CCPP is important. The management of the company has planned to prepare a full-scale decommissioning plan for the project after construction and after the life expectancy of the project to clean up the site.

After Completion of The Construction of Power Plant

The EPC contractor is responsible for the decommissioning of the Equipment and temporary structure at the project site. After the completion of the construction, there will have plenty of construction equipment, scrap metal, construction materials, different types of waste chemicals as well as the jetty. The EPC contractor should follow the Decommissioning plan that will be prepared by Myanmar Ahlone Power Plant Co., Ltd. before leaving the site.

It will be ensured by the contractor that no hazardous substance will be discharged to the atmosphere.

At The End of Plant's Life

After the power plant will reach its end of life, Myanmar Ahlone Power Plant Co., Ltd. authority should dismantle the entire power plant project and restore the project site back to the normal unless otherwise mentioned by the authority. The Myanmar Ahlone Power Plant Co., Ltd. will follow the detail decommissioning plan will be prepared prior to this.

General Principles of Decommissioning

The general principles of the decommissioning of a project are detailed below. These principles must be required to be revisited and supplemented in the event of decommissioning of the power plant.

On decommissioning of the power project, EPC Contractor and Myanmar Ahlone Power Plant Co., Ltd. will:

- Ensure that all non-vegetated sites are promptly revegetated with species appropriate to the area as soon as operations cease.
- All the temporary & permanent structures, foundations, concrete, and tarred areas are demolished, removed and waste material disposed of at an appropriately licensed waste disposal site.
- All equipment, vehicle and machineries should be dismantled, recycled, or disposed of at an appropriately licensed disposal site.
- The aggregates, steel and other construction materials should be sold secondarily to the licensed vendor.

- All disturbed areas are compacted, sloped, and contoured to ensure drainage and runoff and to minimize the risk of erosion.
- All hazardous materials should be kept separate, documented, and disposed to the safe recycling or disposal site.

A detail decommissioning and restoration of site plan should have to be developed prior to the decommissioning of the Power project by EPC contractor and Myanmar Ahlone Power Plant Co., Ltd.

Impacts

The plant has been designed for an operation period of 25 years. Decommissioning of the project involves dismantling of the power plant structure and all associated electrical infrastructure and site buildings. The impacts associated with decommissioning activities are:

- Improper disposal of demolition waste and obsolete machineries shall lead to contamination of soil and discontent of community
- Demolition activities shall lead to generation of dust which can be carried downwind to habitations
- Land may lose fertility potential during the year as no agriculture activity shall take place during the year of operation

5.3 Mitigation Measures

This section outlines the necessary mitigation measures that will be adopted to prevent or minimized significant negative environmental impacts associated with the activities of the project during Pre-Construction, Construction, Operation and Decommissioning Phases.

5.3.1 Pre-Construction Phase

5.3.1.1 Land Acquisition and Land Use Impact Mitigation Measures

The proposed project didn't require any rehabilitation or relocation of homestead since the project will be established inside MOEP's premises for the development of power project.

About 6 acres of land for the project has been allotted by MOEP. The proposed 151.54 MW CCPP will be established adjacent west side of Ahlone CCPP. There were no homestead falls inside the proposed project site. There is no archaeologically important place in the project land and no loss of sensible place. Therefore, the above-mentioned impacts are absent.

The project area has in built access road. There is no need for construction of separate approach road. Since the construction materials and equipment will be carried through intracity roadway, the existing access road will be adequate to meet the requirement of the power project.

The access road will be used for the transportation during the construction and operation period. The existing access road should be maintained in proper way.

The state-run power grid already has a 400 kV transmission network available right beside which will be utilized for exporting power from the Project. The length of transmission line for connecting to the transmission network will be less than 1 km only. The facility for transformer is built in the existing Govt. land where absolutely no land acquisition is needed and therefore, no resettlement is necessary. No separate land acquisition is required for labour camp.

5.3.2 Construction Phase

5.3.2.1 Physical Environmental Impact Mitigation Measures

5.3.2.1.1 Mitigation Measures Ambient air quality

Mitigation Measures for Combustion Emissions

To control and minimize emissions of air pollutants from construction equipment, machinery and vehicles, the following measures are recommended:

- All equipment, machinery and vehicles shall be maintained in good working condition at all

- Times to ensure safe operation with minimal emissions from exhausts.
- All equipment, machinery and vehicles shall be shutdown/ turned off during work breaks and when not in use.
- Unnecessary idling, revving or inappropriate use of equipment shall be prohibited.
- Burning of wastes on site shall be prohibited

Mitigation Measures for Dust emission

To control and minimize emissions of air pollutants from construction equipment, machinery and vehicles, the following measures are recommended:

- Appropriate loading and maintenance of stockpiles of materials so as to minimize dust blow (seek to achieve a distance of at least 500m from nearest sensitive receptors);
- Minimizing drop heights for material transfer activities such as unloading of materials;
- Construction phase to begin with construction of access roads;
- Roads will be kept damp via a water browser;
- Watering unpaved/dusty roads (at least twice a day; cost estimate provided).
- Sprinkling and covering stockpiles.
- Provide wheel wash for all vehicles leaving the project site;
- Site roads will be maintained in good order;
- Regulation of site access;
- Sheeting of lorries transporting construction materials and soil; enforcement of vehicle speed limits on nonmetal roads to <20 km/h.
- Scheduling of deliveries during after regular working hours
- Protecting local community from traffic hazard during construction phase, with installation of proper traffic sign and warnings
- Speed reduction to 10 km per hour within the Myanmar Ahlone Power Plant Co., Ltd. Complex
- Keeping vehicles under good condition, with regular checking of vehicle condition to ensure compliance with national standards.

5.3.2.1.2 Mitigation Measures for Greenhouse gas emissions

Recommended control measures for greenhouse gases include:

- Increasing the overall efficiency of the combined cycle power plant reduces the amount of natural gas needed to generate a unit of electricity, subsequently lowering CO_2 emissions per unit of power produced.
- Implementing effective monitoring and preventive measures to minimize methane leaks from pipelines and equipment helps address the potent greenhouse gas methane, which can escape during natural gas extraction and transportation.
- Continuous optimization of operational parameters, load management, and maintenance practices helps improve efficiency and reduce overall greenhouse gas emissions.
- The significance level of impact is low.

5.3.2.1.3 Mitigation Measures for Noise and vibration

The drivers and operators of construction vehicles and machineries will be trained how to reduce the noise from their operations, and the construction activities will be restricted in night times. The regular maintenance of vehicles and machineries and wearing the ear mufflers (hearing protection devices) can also protect the noise and vibration. The noise will be strictly maintained within the noise level (National Environmental Quality Emission Guidelines) set by Ministry of Natural Resources and Environmental Conservation.

The following measures will also be adopted using sound absorb, sound proof engines at construction site and proper maintenance, enclosing noisy outdoor engines and generators in sound proof wall or

buildings, regular checking, and maintenance to silencers of engines and conserving trees around the site as some buffers against noise.

5.3.2.1.4 Mitigation Measures for Soil Erosion

The areas susceptible to erosion will be protected with mulch or a suitable alternative. To avoid erosion along the bank of streams where the developer will monitor on a regular basis at site and construction of sand traps, stilling basins, retaining walls, and taming works will be done as mitigation measures. Implement erosion control/management when the natural slope is more than 20^{o}. The company will construct three layers of embarkment to control erosion. In the process of land cutting, land filling and land construction minimize length and steepness of slope. Minimize the area of bare soil exposed as practical as possible (do not clear the vegetation more than necessary leaving large area of bare land). Run-off from areas adjacent to the site will be diverted around disturbed areas (construction of small diversion canal/drainage). Build sediment trap or dam where necessary to control sediment. Ensure that the slope of a stockpile is not more than 37^{o}. Ensure that run-off from the site is discharged at non-erosive velocities; discharge will be to location that do not adversely impact the natural waterways (the stream).

5.3.2.1.5 Mitigation Measures for Water Contamination / Aquatic Life

In order to reduce or avoid the surface and ground water contamination, the sedimentation basin will be built on a construction site to capture the disturbed soil which is washed off during rainfall and lead to protection of the water quality of surface and ground water. The sand traps will also be constructed to settle the sand at the bottom and store the deposited sand. The systematic stacking and piling of materials on site, the regular solid waste disposal at the dumping site designated by the local municipality, avoidance of hazardous wastes disposal in drinking-water sources, adopting the proper waste management system (if needed, the landfill with impermeable membrane will be constructed), regular maintenance and check of the machineries, vehicles and sources which can cause oil spill and hazardous chemical spills (if found, the immediate repair and cleansing will be conducted), systematic storage of fuels and filling station at construction site yard compound, handling and disposal of new oil and used oil waste, provision of impervious basement at operation area to prevent oil spill when heavy machineries are working, daily checking to earth moving machines by motor transport officer before start engines, and providing a good pavement at machine workshop and garage are the mitigation measures for the project to avoid the surface/ground water contamination.

The proper sanitation system for the construction workers and project staff will also be applied and that system covering the following aspects: considering and calculation of the set-back distances for sanitation facilities in relation to travel time to aquifer, locating sewers outside drinking-water sources, ensuring sufficient distance between base of latrine pit, soak away or infiltration trench and highest water table, constructing and maintaining vault latrine pits impermeable, fitting sewers with linings to reduce breakage, fitting waste stabilization ponds with linings, maintaining on-site sanitation facilities in good condition and encouraging to use, preventing sewer leakage and implementation of adequate final disposal of sludge as permitted by the local municipality.

5.3.2.1.6 Mitigation Measures for Solid waste generation

The later practices will be exercised as mitigation measures they are keep dust bins at appropriate places painting different colours for hazardous substances and biodegradable substances, providing facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure, periodically disposal of solid waste at permitted land fill area or dumping sites and proper loading and unloading at garbage truck and educating workers to dispose waste properly. If possible, the recycling and refurbishment of solid waste will be done to reduce the amount and volume of construction debris.

5.3.2.1.7 Mitigation measures for chemical wastes

Contaminated equipment parts, containers will be kept empty and labelled. Waste contained in appropriate bags and sealed to prevent leakage. The bags are labelled. The toxic waste is collected by a third-party contractor for off-side disposal.

5.3.2.2 Biological Environmental Mitigation Measures

5.3.2.2.1 Mitigation Measures for Flora and fauna

Plan and execute for minimal disturbance to the flora. During construction phase do not clear vegetation more than necessary and keep big trees intact as far as possible. Strict discipline to avoid open burning of debris and prevent bush fire; educate staff or fire awareness and fire protection.

Avoid the use of excessive bright light at night to prevent aggregation and eventual death of insects. Prevent the potential injury or death of small animals due to vehicular movements at night. Set up a plant nursery near the end of the Operation Phase for rehabilitation of the site. Developer is encouraged to plant trees; create green belt as practical as possible. Monitor the effectiveness of mitigation, monthly.

5.3.2.3 Social Environmental Mitigation Measures

5.3.2.3.1 Mitigation measures for social acceptability

Primarily, the job opportunity will be disseminated to the community based on the severity of the impact experienced by the affected people. The adequate infrastructure and services will be arranged according to the actual need of the people.

5.3.2.3.2 Mitigation measures for risks for infectious diseases

The project will follow the general EHS guidelines set by International Finance Corporation, World Bank Group. The interventions for communicable diseases will be as follows: providing surveillance and active screening and treatment of workers, preventing illness among workers in local communities (undertaking health awareness and education initiatives, training health workers in disease treatment, conducting immunization programs for workers in local community to improve health and guard against infection, providing health services), promoting collaboration with local authorities to enhance access of workers to public health services and promote immunization.

For the vector-borne diseases, the mitigation measures are prevention of larval and adult propagation through sanitary improvements and elimination of breeding grounds close to human settlements, elimination of unusable impounded water, increase in water velocity in natural and artificial channels, implementation of integrated vector control programs. Educating project personnel and residents of ward on risks, prevention, and available treatment, monitoring communities during high-risk seasons to detect and treat cases, distributing appropriate education materials and following safety guidelines for the storage, transport, and distribution of pesticides to minimize the potential for misuse, spills, and accidental human exposure.

5.3.2.3.3 Mitigation measures for Occupational Health and Safety Issues

Health and safety plan will be prepared prior to construction. H&S training will be conducted, including good housekeeping, clean-up of debris and spills, and working in confined spaces and at height. The workers should wear PPE (Personal Protective Equipment), such as safety glasses with side shields, face shields, hard hats and safety shoes should be mandatory at construction site. Ear plugs should be provided for workers in high noise areas. Harnesses and scaffold barriers for work at height will be provided. Segregation of pedestrians and traffic on-site will be segregated. Excessive waste debris and liquid spills should be cleaned up regularly. Good housekeeping should be ensured at the construction site to avoid slips and falls. Following occupational health and safety procedures of excavation work, work at height, using scaffolding, using ladders, preventing slips, safe workplace transport operations, electrical work, fire, good lifting, or manual handling techniques, using hand-held tools, using power tools, chemicals use, using cement mixers, plate compactors use, using ground consolidation equipment, using road making equipment. Provision of appropriate training on EHS issues including first aid use for all workers. Regular talks to be held for all workers on sanitation, communicable diseases including HIV to be held for all workers.

All contractors and subcontractors will implement EHS procedures as a condition of contract. It is required for completion and implementation of Fire Safety Plan prior to commissioning any part of the plant, regular inspection, review and recording of EHS performance, pest and vector control, maintenance of a high standard of housekeeping at all times. The contractors will be responsible for relevant temporary water / toilet facilities during construction and the need to provide appropriate services will be specified in their contracts, provision of first aid equipment at easily accessible locations around the adequate supplies of drinking water that is compliant with the national drinking water quality standards to all

workers. No ground water will be used as drinking water, adequate sanitation facilities. Toilets and bath-rooms must be properly equipped including hand washing facilities with hot water and with separate facilities for men and women.

5.3.2.3.4 Mitigation Measures for Community Health and Safety

The project will follow the general EHS guidelines set by International Finance Corporation (IFC), World Bank Group.

Since the community health and safety is related to environmental impacts following above mitigation measures for air pollution, noise and vibration, surface water quality degradation, ground water quality degradation, soil contamination, emergency risk etc.

Public access to the site must be restricted. Posting warning signs on “Construction Work in Progress”, “Do not Enter” etc. in and around construction site.

Regarding the traffic safety, emphasizing safety aspects among drivers and improving their driving skills. Make sure of having required licenses. Adopting limits for trip duration and arranging driver rosters to avoid overtiredness. Avoiding dangerous routes and times of day to reduce the risk of accidents.

Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.

Collaboration with local communities to improve signage, visibility, and overall safety of roads. Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions.

Coordination with emergency responders to ensure that appropriate first aid is provided in the event of accidents.

To prevent communicable diseases providing surveillance and active screening and treatment of work-ers.

Preventing illness among workers in local communities (undertaking health awareness and education initiatives, providing health services). To prevent Vector-Borne diseases eliminate larval and adult prop-agation through sanitary improvements and elimination of breeding grounds close to human settlements. Elimination of unusable impounded water, increase in water velocity in natural and artificial channels.

5.3.3 Operation Phase

5.3.3.1 Physical Environmental Impact Mitigation Measures

5.3.3.1.1 Mitigation Measures for Ambient air quality

It has been discussed earlier that the proposed power plant would be constructed with a modern design and sophisticated machinery setting. The power plant would be operated by natural gas, so CO, Particu-late Matter and SO_2 would not be a concern in terms of emission. Since multi-stage NO_x burner is using advanced burner technologies and additional emission control systems, the NO_x emission from the power plant would be kept at a minimum level.

5.3.3.1.2 Mitigation Measures for Climate Change

It has been discussed earlier that the proposed power plant would be constructed with a modern design and sophisticated machinery setting. The power plant would be operated by natural gas and a combined cycle operation, therefore CO_2 emission in this project would be minimal and as per the IFC guideline which would be at minimum level with optimum designed cycle efficiency in order to maximize the MW output. During the development or operation phase, if the generation of CO_2 emissions is higher than according to SPS 2009, CO_2 emission of 100,000 tCO_2/year or more will require monitoring and the pro-vision of offsets through the project. The monitoring should be done as per the calculated value for the emissions.

5.3.3.1.3 Mitigation Measures for Wastewater

Wastewater is expected to be discharged from the plant into Harbi Creek, which will then flow into the Yangon River. The temperature not exceeding 3°C above the river water temperature. Wastewater will be treated before discharge, ensuring that wastewater from the power plant has no impact on the aquatic environment.

Proper care will be taken in designing the water circulation system for the Combined Cycle power plant to ensure that no contamination or waste is carried to the river. Thus, the river water will remain free from any negative impacts originating from the power plant. The quality of the discharged water will be monitored regularly. To ensure that the water quality meets the necessary criteria, variables such as temperature, pH, conductivity, turbidity, and total dissolved solids will be frequently measured.

Additionally, consultations with concerned stakeholders will be conducted to mitigate any potential impact on the social security of the fishing communities.

5.3.3.1.4 Mitigation Measures for Solid Waste, Hazardous Waste,

All solid waste will be collected properly. Segregation of solid waste primarily will be at source. The World Bank EHS guidelines on Hazardous Materials Management, Waste Management and Thermal Power will be followed for all solid and hazardous waste management. Recyclable Waste will be sold to the authorized recycler. Other solid wastes will be disposed to designated landfill facility. Records of all waste transfer will be kept. The air filters and waste rugs should be collected in a safe place and should be disposed to the land fill.

Lubricating Oil: Insignificant amount of used lubricating oil would be generated from the plant. The generated waste oil will be stored in a sealed tank.

E-Waste: Proper handling and Management of E-Waste is required to avoid any damage to human health, local environment including land, water, and air. Kinds of E-wastes generated from different sources/ activities at division/ unit offices/ operational areas are:

- Used and obsolete IT and telecom equipment: electronic and electrical hardware/ components, PC peripherals, etc.
- Faulty/scrap meters and metering equipment, electronic timers;
- *Polychlorinated biphenyls* (PCBs)
- Faulty/used electronic and electrical equipment,
- Capacitors i.e., electrolytic capacitors and capacitors containing Polychlorinated Biphenyls;

IFC EHS guidelines on Hazardous Materials Management and Waste Management will be followed. The EHS department of the Myanmar Ahlone Power Plant company limited will be responsible for proper handling of hazardous waste in compliance with all applicable law. The company will provide personnel training to the related plant workers to handle the hazardous waste, accumulation limits and times, and reporting and recordkeeping. The wastes that require disposal would be characterized based on generator knowledge or analytical testing to determine the appropriate management and handling procedures. Once properly characterized, the wastes would be temporarily stored at the site in appropriate containers and impermeable storage areas according to all applicable hazardous waste storage law. Impermeable surface should also be used for refuelling whilst there will be training of workers for spill response and provision of keeping stock of spill equipment such as bunds, soaking material etc. at project site. Oily waste and chemicals should be stored in a tank have sufficient secondary containment (110% more than its capacity).

All the hazardous waste should be properly levelled, where the following information should be added:

1. Name & type of waste
2. Quantity of waste
3. Date of waste generation (period of waste generation)
4. Waste generation site
5. Disposal site
6. Responsible authority who handles this waste.

The waste will be removed from the site with a regular interval for safe disposal at designated permitted facility.

The oil storage of the project (fresh and used) should be done on hard standing floor and roofing with a secondary containment facility of 110% bigger than the allowable maximum storage capacity. The waste lubricated oil thus collected will be supplied /sold to the venders or the Lube Oil Re-cycling plants approved by DoE at throwaway price. As there is no chance of mixing and disposal of oil onto land or water, so there is no mitigating measure to be suggested.

5.3.3.1.5 Mitigation Measures for Chemical Wastes

Contaminated equipment parts, containers will be kept empty and labelled. Waste contained in appropriate bags and sealed to prevent leakage. The bags are labelled. The toxic waste is collected by a third-party contractor for off-side disposal.

5.3.3.1.6 Mitigation Measures for Noise and Vibration Impacts

Necessary noise abatement measures will be taken as required avoiding adverse noise and vibration impact on the neighbourhood. To reduce the effect, costlier and most effective Critical Type Silencer will be used in the stack. Significant noisy components such as the gas turbine sets are enclosed in buildings acoustically designed, providing Styrofoam filler of 50 mm width in between 300 mm thick brick walls around the power house building. Moreover, thick doors are provided and holes which may create sound pollution are sealed with sound proof materials. Vibration pad will also be used at the bed of all power generation units to prevent the vibration.

The following are the noise protection capacity of the material which would be used for sound insulation for the power house building:

As per above calculation the Styrofoam filter and brick wall are capable to absorb more than 112 dB(A) noise from the engine room, but the approximated engine room noise is around 85dBA near the turbines, which is lower enough to minimize the engine room noise by the acoustic measurement. Moreover, Vibration pad will also be used at the bed of all power generation units to prevent the vibration. Proper PPE should be provided to the workers who will exposed to high noise in the control room and turbine room. High noise areas should be signed properly.

For the measurement of the dispersion of the stack noise to surrounding environment, a noise modelling simulation has been done by using noise modelling software. The model has calculated the noise from the exhaust stack of 85dBA and the result of the modelling has been given below:

The distance of the following noise level has been calculated from the centre of the stack row.

Figure 5-2: Noise Sources within 151.54 MW CCPP Project Boundary

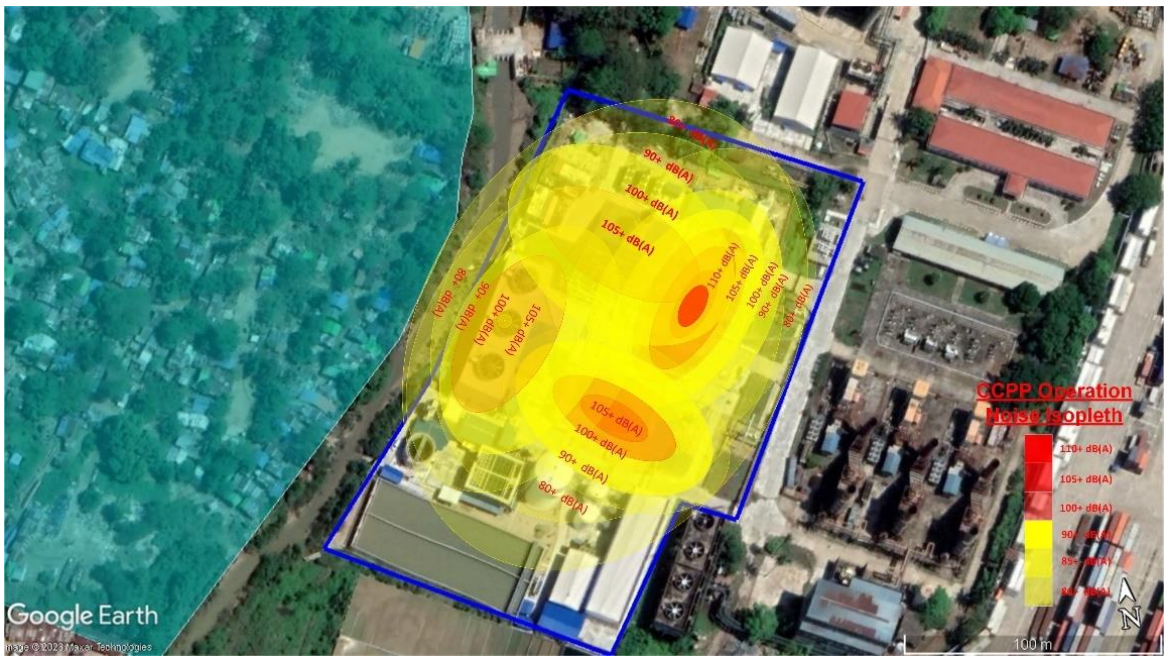


Figure 5-3: Plot of output noise power level in dB(A) from Operation Noise sources

The modelling result shows that the power plant will produce max noise up to 110+ dB (A) within the boundaries whereas the noise level is to be found 80 – 90 dB(A) within 500m from the point stationary point sources of the project during operation. The following are the IFC and NEQG standard for the ambient noise:

Table 5-6: IFC and NEQG standard

Standard	Zone	Day time dBA	Night time, dBA
IFC EHS Guideline 2007	Residential, Institutional, educational	55	45
	Industrial, commercial	70	70
NEQG Guideline	Mixed area	60	50
	Commercial	70	60
	Industrial	75	70

It is evident that the area falls under industrial zone since there are many power plants and port industries are already existing in the area; the result clearly stipulates that the sound intensity level of nearby residential areas is within the NEQG and World Bank guideline (70 dB(A) at industrial zone or even 60 dB(A) for mixed zone) at all sides from the centre of the stack and gradually reduces at further distances. Apparently, there are certain noises from urban activities that is being underlying noise pollution in the area. With the major noise sources of the project site is more than 500m away from the human receptors, the operation of the power plant there will not significantly be effect of noise contribution from the power plant project beyond 300m from the origin of the noise sources. However, ear plugs will be provided for any workers working in high noise zone exceeding 80 dB(A). The noise level in control room shall not exceed 70 dB(A).

5.3.3.2 Biological Environmental Impact Mitigation Measures

5.3.3.2.1 Mitigation Measures for Impacts on Fish

The volume of water required for makeup has been significantly reduced, resulting in a quantum of water extraction that is minimal compared to the available volume in the Yangon River. Water will be extracted exclusively through intake wells, where fine mesh screens will be installed on the intake pipes to prevent fish from entering the structure. To minimize thermal pollution, cooling towers will be used to reduce the temperature of the effluent water before it is discharged back into the river, ensuring it meets the ± 3° C ambient temperature limit. Mixing zones will be created to allow the effluent water to gradually blend with the river water, thereby reducing its impact on aquatic species. Advanced treatment processes will be implemented to remove contaminants from the effluent water prior to discharge, ensuring compliance

with environmental standards. Regular water quality monitoring will be conducted to ensure adherence to discharge limits and to detect any potential issues early. Additionally, ongoing consultation with concerned stakeholders will be essential to mitigate the impact on the social security of the fisher communities.

5.3.3.3 Social Environmental Impact Mitigation Measures

5.3.3.3.1 Occupational Health and Safety of workers

Proper monitoring for work place environment, health & safety condition of the workers, PPE check, Fire drill and training of workers

- IFC EHS guidelines on Occupational H&S, Community H&S and Thermal Power will be followed.
- Regular health check-up of workers
- Proper PPE should be provided to protect from the heat, electric shock and noise protection,
- Regular awareness and training should be provided for fire safety & chemical hazard,
- Safe drinking water should be provided

5.3.4 Decommissioning Phase

Mitigation Measures

Dismantling activities should be taken care by experienced professionals under the guidance of plant EMS Head. All the dismantled infrastructures and debris should be segregated and stored separately with cover facility to negotiate with contamination effects of such wastes.

The metal structure should be sold out to the approved recyclers, whereas, debris should be disposed-off as per their characteristics. The construction debris can be utilized for land filling in nearby low areas and debris having contamination potential should be transported to authorized dumping site.

Impact Significance

Decommissioning phase impact shall be limited to the site and minor in nature. However, impact shall further be mitigated to the insignificant level.

5.4 Risks and Hazards Assessment

5.4.1 Risks and Hazards Identification

Within the project framework, certain installations and components pose potential risks, categorized into major hazard installations and areas prone to major accidents. Key considerations identified in the project include:

- Explosion Risks
- Fire Hazards
- Electric Shock and Mechanical Injury
- Toxic and Hazardous Materials
- Natural gas leakage

Addressing these potential risks requires a robust safety management system, comprehensive training programs, and adherence to stringent protocols to ensure the well-being of personnel and the overall safety of the project environment.

These risk assessments and mitigation measures collectively contribute to a comprehensive safety management system, fostering a secure working environment and minimizing the potential impact of hazards on both personnel and the surrounding ecosystem. Regular reviews and updates to safety protocols are crucial for adapting to evolving circumstances and ensuring ongoing protection. Given proposed project are being completely new and system integration are being set up in Distributed Control System and project governance through sub-contracting in strict project procurement, the assessment for 5 major areas identified are discussed below.

5.4.2 Risk Assessment Methodology

5.4.2.1 Use of Risk Assessment

Risk Assessment method is used to determine the significance considering the following factors:

- Probability of an adverse event;
- Consequences of an adverse event; and
- Probability of detection of the effect or the degradation which results from loss of control.

Risk is calculated as the product of all three factors. The effects which are having highest risk factor are considered to be most significant. Those effects which are governed by regulations are to be regarded as most significant.

5.4.2.2 Risk Calculation

Table 5-7: Factors for Risk Calculation

Probability of occurrence		Probability of detection		Severity of degradation	
Criteria	**Scale**	**Criteria**	**Scale**	**Criteria**	**Scale**
Very low	1	Low	5	Negligible	1
Low	2	Moderate	4	Low	2
Moderate	3	High	3	Moderate	3
High	4	Very high	2	High	4
Very high	5	Certain	1	Very high	5

Table 5-8: Categories of Probability of Occurrence

Level	Definition
Very low	An unlikely probability of occurrence
Low	A remote probability of occurrence
Moderate	A moderate probability of occurrence
High	A high probability of occurrence
Very high	A very high probability of occurrence

Table 5-9: Categories of Probability of Detection

Level	Definition
Low	Low or no detectability
Moderate	Moderate degree of detectability (Fair detectability)
High	Good/high degree of detectability
Very high	Very high degree of detectability
Certain	Definite detectability

Table 5-10: Categories of Severity of Degradation

Level	Definition
Negligible	The severity of degradation is no impact and can be neglected
Low	The severity of degradation is low and the impact is almost negligible
Moderate	The severity of degradation is sensible enough to be taken into account
High	The severity of degradation is high enough for causing any damages
Very high	The severity of degradation is very high and the damages will be enormous

RISK = PROBABILITY OF OCCURRENCE X PROBABILITY OF DETECTION X SEVERITY OF DEGRADATION

5.4.2.3 Evaluation of Risks

Table 5-11: Evaluation of Risk

Risk		
Scale	**Scale if 'Probability of Detection' is NA**	**Evaluation**
1 – 25	1 – 5	Very low
26 – 50	6 – 10	Low
51 – 75	11 – 15	Moderate
76 – 100	16 – 20	High
101 – 125	21 – 25	Very high

Table 5-12: Categories of Risk Evaluation level

Risk Evaluation level	Definition
Very low	A risk at this level – if it occurs – will have little or no impact on achieving out-come objectives.
Low	A risk at this level – if it occurs – will have a minor impact on achieving desired results, to the extent that one or more stated outcome objectives will fall below goals but well above minimum acceptable levels.
Moderate	A risk at this level – if it occurs – will have a moderate impact on achieving de-sired results, to the extent that one or more stated outcome objectives will fall well below goals but above minimum acceptable levels.
High	A risk at this level – if it occurs – will have a significant impact on achieving de-sired results, to the extent that one or more stated outcome objectives will fall below acceptable levels.
Very high	A risk at this level – if it occurs – will have a severe impact on achieving desired results, to the extent that one or more of its critical outcome objectives will not be achieved.

5.4.2.4 Risk Evaluation

Table 5-13: Risk Evaluation for Construction and Operation Phase

Impact	Probability of occurrence	Probability of detection	Severity of degradation	Scale	Level
Explosion Risks	3	2	5	30	Low
Fire Hazards	4	3	4	48	Low
Electric shock and mechanical Injury	3	3	4	36	Low
Toxic and Hazardous Materials	2	4	5	40	Low
Natural gas leakage	4	3	5	60	Moderate

1. Explosion Risks

The production system of the energy station includes numerous explosive substances and devices, such as high-pressure vessels and gas burning systems, presenting a potential explosive risk. Vigilant mitigation measures such as regular maintenance, explosion proof equipment and emergency response plan are crucial to mitigate this hazard.

The risk occurrence level is low.

Mitigation measures

Nevertheless, rigorous safety protocols, regular equipment inspections, and the use of explosion-proof materials and design features are being installed in sufficient level for minimizing the likelihood and impact of explosions.

2. Fire Hazards

The energy station is susceptible to fire hazards, particularly in areas storing and using combustible media. Potential fire sources include cable combustion due to poor heat dissipation, short circuits, and overheating in dense cable areas, as well as the possibility of medium leakage leading to explosions.

The hazard occurrence level is low. However, fire hazards can still arise from combustible media storage, cable combustion, and the potential for medium leakage leading to explosions in the energy station.

Mitigation measures

Therefore, the project developer ensures active operational and functional adequate fire suppression systems, proper storage protocols, heat dissipation mechanisms, and regular inspections can significantly reduce the risk of fires in the facility.

3. Electric Shock and Mechanical Injury

Various components, including motor machines, high and low voltage power distribution units, electrical equipment, and diverse machinery like fans, water pumps, and cranes, pose risks of electric shock and mechanical injuries. Carelessness during operation and maintenance may result in injuries such as electric shocks, heavy object falls, or accidents involving rotary machinery. The presence of various motor machines, electrical equipment, and machinery introduces the risk of electric shock and mechanical injuries during operation and maintenance. The risk occurrence level is low.

Mitigation measures

The project developer enforces strict adherence to safety procedures, employee training programs, and the use of personal protective equipment (PPE) can mitigate the risks of electric shock and mechanical injuries.

4. Toxic and Hazardous Materials

The project's process flow and production processes involve the use of potentially toxic and hazardous materials. These include natural gas, oil, sodium hydroxide, hydrochloric acid, sulfuric acid, ammonia, and sodium hypochlorite, particularly in the chemical water treatment system. The use of toxic and hazardous materials, including natural gas, oil, and chemicals like sodium hydroxide, hydrochloric acid, sulfuric acid, ammonia, and sodium hypochlorite, poses risks of exposure and potential environmental impact are identified in the project during operation phase. The hazard occurrence level is low.

Mitigation measures

Employing proper handling procedures, containment measures, personnel training on material safety data sheets (MSDS), and implementing emergency response plans are essential for managing risks associated with toxic and hazardous materials.

5. Natural Gas Leakage

Natural gas for the plant is sourced from MOEP natural gas station just beside the Project site. The processed gas (mainly methane) moves through transmission pipelines to power plant. Distribution pipelines can leak due to damage from natural processes such as earthquakes. Gas can also leak from equipment such as gas turbine and compressors. A leak in a gas turbine and transmission pipelines can pose a significant health and safety risk to workers and public.

Small gas leaks may not have a smell or other physical signs. However, if there is a gas leak in the confined area, a person may notice: the smell of sulphur or rotten eggs, a hissing or whistling sound near a gas line, a white cloud or, dust cloud near a gas line, bubbles in water a damaged gas pipe, and dead plants. Gas leak can cause a reduction in the amount of oxygen in the air and develop gas leak symptoms. These can include: breathing difficulties, dizziness, fatigue, or drowsiness, feeling lightheaded, flu-like symptoms, headaches, irritation to the eyes and throat, mood changes, including depression, nausea, nosebleeds, pains in the chest, pale skin or blistering, following direct contact with gas, reduced appetite and ringing in the ears. The risk occurrence level is low.

Mitigation measures

Gas leak outside the power plant were managed by MoGE pipeline systems which is equipped with fixed gas leak-detection system and automatic shutoff valves or remote-control valves that can warned operators of an imminent accident and allow for quick mitigation. Flow in the pipeline will be completely shut down if leakage is detected. Power plant will also be shut down temporarily until it is fixed. Gas leak inside the power plant will detect and monitor using portable gas detector.

Photo 5-1: Gas detector used in Power Plant

6. CUMULATIVE IMPACT ASSESSMENT

6.1 Conceptual Framework for Cumulative Impact Assessment for This Project

The EIA Procedures requires an EIA investigation to consider cumulative impact (Article 53). Numerous definitions of Cumulative Impacts (CIA) or effects exist with slight differences in meaning. The EIA Procedure gives the following definition of cumulative impacts:

Cumulative impacts can be defined as "*the impact or impacts of a project that in itself or themselves may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse projects or undertakings in the same geographic area or region*."

In general, cumulative impacts can be defined as "the changes to the environment caused by a proposed project in combination with other past, present, and reasonably foreseeable projects or human activities".

It should be noted that baseline environmental quality of the EIA study area, such as baseline ambient air quality, is the results of existing economic activities and projects already in operations. Therefore, the impacts of this Project discussed in Chapter 6~7 are cumulative impacts of the Project and other existing economic activities or projects in the study area. For example, the predicted noise level caused by the Project is the incremental increase in the noise level. The impact is the net noise level i.e., ambient noise level and the predicted increase in noise level. Figure 6-1 illustrates the cumulative impact of the Project and other existing economic activities.

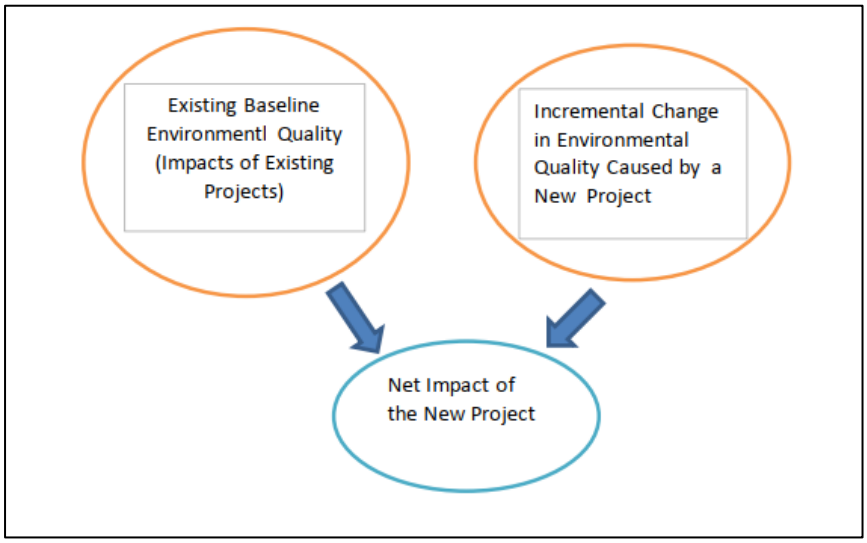


Figure 6-1: Cumulative Impact of New Project and Existing Projects

The development of multiple power plant projects within existing Ahlone utility complex of MOEP can severely degrade the ambient environmental quality and cause significant adverse impacts on wellbeing of those receptors, primarily by cumulative ambient air and noise quality for wellbeing of human beings and those living animal nearby.

Cumulative Impact Assessment is the process of analyzing the potential impacts and risks of existing and proposed projects in the context of the potential impacts of other human activities and natural environmental and social external drivers on the chosen valued ecosystem components (VECs) over time. VECs that are likely to be relevant to Combined Cycle Power Plants (CCPP) projects are being Ambient Air and Noise Quality of the area and its vicinity.

Cumulative impacts that could be attributed to a set of CCPP projects include:

1. Effects on ambient conditions such as the incremental contribution of air pollutant and noise level in the air shed.
2. Impacts terrestrial fauna.

Secondary, consequential, or induced social impacts, such as social wellbeing of those residents and workers inside the project area especially within primary areas of influence.

6.2 Need for Cumulative Impact Assessment for This Project

Cumulative Impact Assessment (CIA) for a proposed Combined Cycle Power Plant (CCPP), which it located within a compound that already houses other gas turbine plants requires a structured approach. There are another two CCPP project and one industrial port project described in the map below that are in in operations. The 388 MW and 154 MW CCPPs are operated by ToyoThai and MOEP nearby that are causing elevated impacts than that of proposed 151.54 MW Myanmar Ahlone Power Plant.

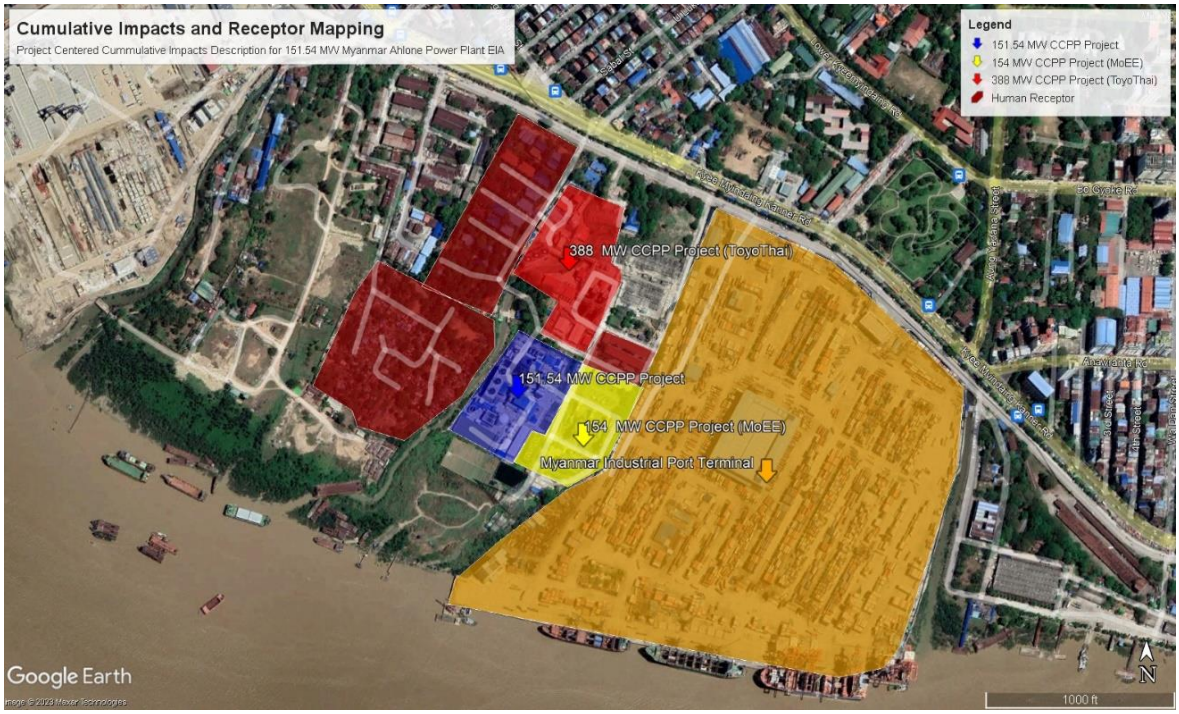


Figure 6-2: Cumulative Impact and Receptor Mapping

The immediate receptors are human receptor of Saw Yanpaing Wards, Government Staff Housing, and adminsitration office of CCPP project MOEP. All the power plants and the industrial port combined, they are attributing and associating to negative and adverse impacts to communities and environmental receptors in the same area of Ahlone utility compound of MOEP.

The precise assessment of cumulative impacts of existing CCPP and Industrial port not possible at this stage due to the lack of crucial information of each project such as project components, the proposed construction method, details of construction and operational equipment to be used for all projects, the precise location of works to be undertaken for each project, detailed description of social and economic impacts of each project, propose safeguards and mitigation measures to deal with relevant impacts of the projects, etc.

In addition, there are new industrial ports and anthropogenic sources of Yangon City that could escalate the cumulative impacts in the specific location at the vicinity of proposed project. This assessment should analyze the combined environmental, social, and economic impacts of the power plant and the existing projects. Given the complexity of cumulative impacts should emphasize the need for collaborative mitigation strategies that involve multiple stakeholders, including other projects and government agencies.

6.3 Cumulative Impact Assessment For Existing And Planned Project

Despite the lack of crucial information for precise assessment the cumulative impacts of existing and planned project can be conceptually described as follows:

(1) Air pollutant and Noise emissions

With all the existing projects and proposed project are located at the closed vicinity of residential and commercial district of Yangon city, the concentration of air pollutants and noise intensity in the ambient air shed during construction and operation phase is very likely to be significantly high.

(2) Surface Water Quality and Quantity in the Hlaing (Yangon) River

Pollution in the Hlaing (Yangon) River could occur as a result of organic/inorganic and nutrient wastewater discharge from existing riparian communities, urban dwellers, and project operations at the vicinity of proposed project.

However, impacts to natural resource sharing among community can be negligible as the river offers ample source of water (stream flow rate) for power plant operation and riverway navigation.

(3) Habit Loss

Undeniably, any project development contributes loss of habitats for both flora and fauna resources. Human intervention to natural habitat could also contribute for both positive and negative socioeconomic impacts of the local communities that is to be evaluated among the constraints of environmental benefits and losses under the determinant of ecosystem services and trade-off.

(4) Yangon River aquatic ecosystem

Cumulative impacts from multiple power plant projects can affect the Yangon River aquatic ecosystem.

(5) Social Impacts

Cumulative social impacts consist of positive and negative impacts. While, Positive impacts are related to the improvement of basic social infrastructures and facilities such as employment opportunity and electricity supply system, education and health facilities, markets, and other economic benefits of the specific community to the Yangon district as a whole the negative impacts are mainly concerned with air and noise pollution and habitat loss that are directly affected to local people resided nearby and workers employed inside the power plants.

Conclusion

In summarize, for further assessment of cumulative impacts which need to be completed with involvement of all others power plants development inside the MOEP compounds, commercial projects at the vicinity. Other sectors including urban industry, road and transport users, ports and terminals which need to be stakeholder in cumulative impact assessment.

Myanmar Ahlone Power Plant project will participate in CIA process. Therefore, project developer is committed to collaborate with Department of Electricity Power Planning (DEPP) of MOEP in order to inform that project proponent will participate in CIA process which may be initiated by DEPP in cooperation with other CCPP developers and existing industries nearby to carry out CIA and cooperation in management of such impacts as presented in Environmental and Social Management Plans.

7. ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS

7.1 Background and Overview of Environmental Management Plan (EMP)

In the context of a project, Environmental Management Plan (EMP) is concerned with the implementation of the measures necessary to minimize or offset adverse impacts and to enhance beneficial impacts. An EMP is also required as per the provision of the Environment Protection Act and Regulations of Government of Myanmar. The main objectives of EMP are

- To reduce environmental and social impacts due to the project activities and components
- To minimize risk to the environment during the construction and operation works
- To ensure Environment, Health and Safety measures are implemented throughout project development
- To increase environmental management capacity

Based on the impact assessment done in the Chapter (5) and referring to identified potential environmental impacts the impact, this section covers the Environmental Management Plans (EMPs) for construction phase, and operation phase. This EMP of the proposed project is for project proponent to implement, monitor, review and improve along the respective phases of the project. Feasible and economically expedient measures are planned to be implemented at EMP which can reduce to a reasonable level and/or exclude possible essential negative consequences of environmental impact.

7.2 Roles and Responsibility

For realization of EMP, it is necessary to identify persons responsible for performance of impact decrease/prevention actions, and those responsible for control over the given actions and to define their role at all stages of the project implementation. The Project proponent, Myanmar Ahlone Power Plant Company Limited will be overall responsible for EMP implementation of the project.

During construction stage, Project Implementation unit (PMU) will be responsible for EMP implementation whereas during operation stage Operation & Maintenance unit will be responsible for EMP implementation authority has been developed a EHS norms for all the contractors will be working at the project site.

Under the provision of the guideline, all contractors should submit their own Environmental & Social Management Plan/System in accordance to ESIA and ADB's SPS Guideline, 30 days before commencing the work. Accordingly, they will follow this guideline while performing the job.

Roles and Responsibilities of EMP Implementation in Construction Phase

During construction stage, Project Implementation Unit (PMU) will be overall responsible for EMP implementation. Construction contractor will be responsible for construction as well as maintenance of sanitary and health condition at construction site including labour camp. The construction contractor will be responsible for preparation and maintenance of records and all required reporting data as stipulated in the EMP. The PMU will play oversight supervisory role for implementation of EMP at site. The roles and responsibilities of EMP implementation during construction stage are highlighted in Table 7-1 below.

Table 7-1: Roles and Responsibilities of EMP Implementation during Construction Stage

Role	Responsibilities
EHS Manager	Preparation and implementation of the Environmental Supervision Plan during construction Ensure that all construction personnel and subcontractors are informed of the intent of the EMP and are made aware of the required measures for environmental and social compliance and performance Supervision of contractor performance on implementation of the Construction and Work Camp Management Plan Reporting any incidents or non-compliance with the EMP to the PMU Ensuring adequate training and education of all staff involved in

Role	Responsibilities
	environmental supervision Making recommendations to the PMU regarding EMP performance as part of an overall commitment to continuous improvement
Asst. EHS Manager	Prepare and maintain records and all required reporting data as stipulated by the EMP Ensure that all construction personnel and subcontractors are informed of the intent of the EMP and are made aware of the required measures for environmental and social compliance and performance Preparation and implementation of the Environmental Monitoring Plan during construction EHS Audit, Training of project Personnel
Community Manager	Grievance Redress Committee (GRC) / Public & Stakeholder Consultation

General construction management and control over conducting technological process during construction works will be assigned to the contractor and Myanmar Ahlone Power Plant Company Limited project management. The contractor, in turn, concludes contracts with subcontract organizations performing works at the construction site. The authority of project developer bears responsibility under Project Implementation unit (PMU) for selection and assessment of subcontract organizations. Control functions over contract organizations activity in the field of labour safety, industrial safety and preservation of the environment are also assigned to the Consortium.

The following are the management team of project developer who will be responsible for the monitoring program of the proposed project during the construction period; Team for Environment monitoring and ensuring compliance during construction period is highlighted in Figure 7-1.

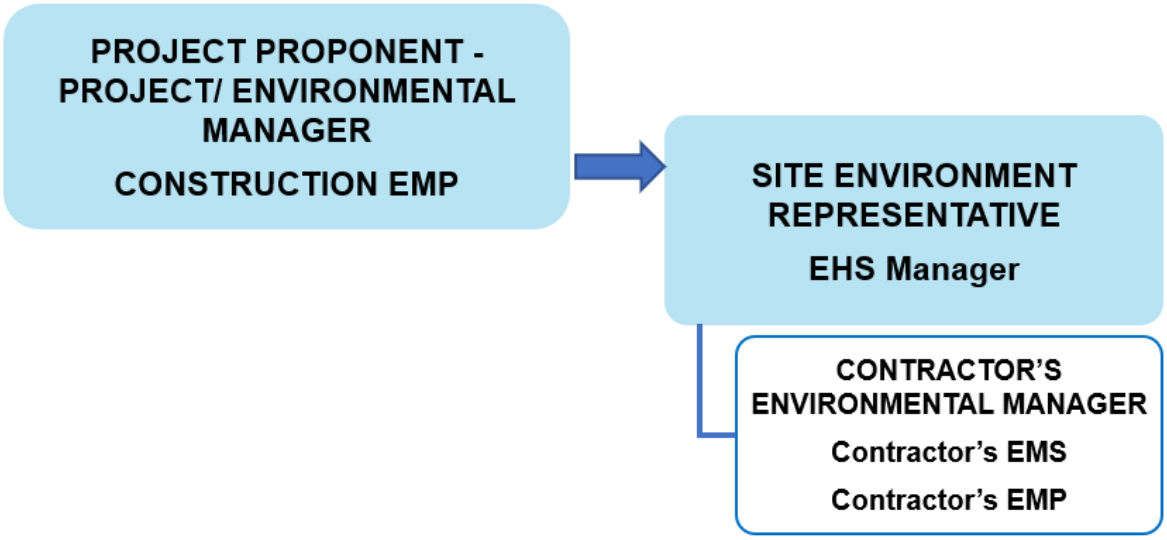


Figure 7-1: Organizational Structure during Construction Phase

Roles and Responsibilities of EMP Implementation in Operation Phase

During operation stage, operation and maintenance unit will be overall responsible for EMP implementation. The EHS team of operation and maintenance unit will be responsible for preparation and maintenance of records and all required reporting data as stipulated in the EMP. The roles and responsibilities of EMP implementation during construction stage are heighted in Table 7-2.

Table 7-2: Roles and Responsibilities of EMP Implementation During Operation Stage

Role	Responsibilities
Project Director	Effective and environment friendly operation of the project, Set guiding tools and suggestions which need to be followed at various stages of plant installation, operation, and maintenance.
Supervising Engineer	Coordinating with EHS team for effective implementation of Environmental safeguards in O & M schedule of the plant.
EHS Manager	Prepare and maintain records and all required reporting data as stipulated by the EMP Ensure that all project personnel are informed of the intent of the EMP and are made aware of the required measures for environmental and social compliance and performance Implementation of the Environmental Monitoring Plan EHS Audit, Training of project Personnel
External Independent Environmental Monitoring Consultant	Report to Myanmar Ahlone Power Plant Co., Ltd. on project compliance with environmental and social commitments in the EMP, ESIA and other applicable standards
Community Manager	Grievance Redress Committee (GRC) / Public & Stakeholder Consultation

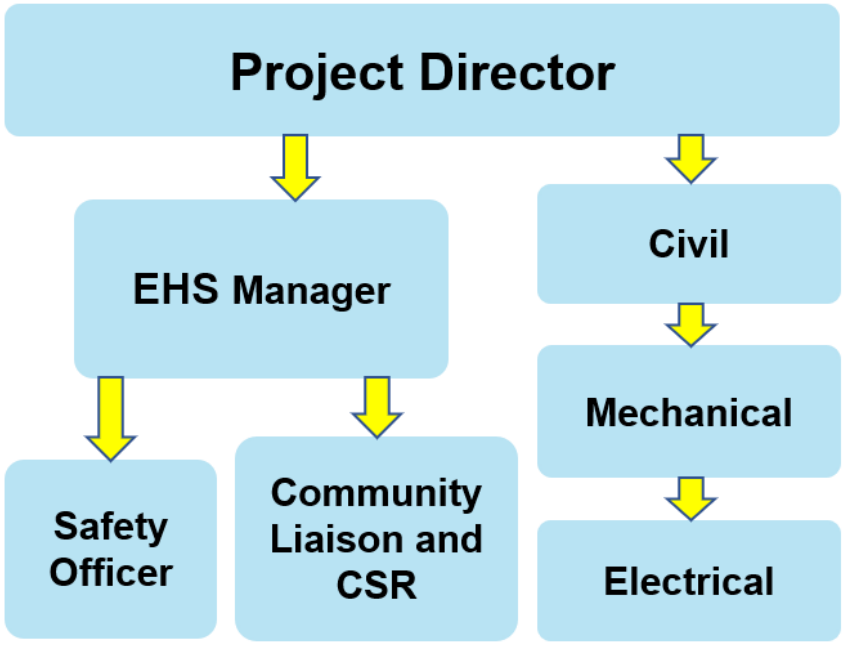


Figure 7-2: Organizational Structure during Operation Phase

The Management of project developer will be responsible to operate the power project under Operation & Maintenance unit (O&M) during the operation phase and will be responsible to maintain the environmental and social standard of the project. Team for Environment monitoring will ensure compliance during at all phases Myanmar Ahlone Power Plant Co., Ltd., is to ensure all contractors and subcontractors working on site are aware of EMP and all employees are given basic induction training on good construction and site management practice. Myanmar Ahlone Power Plant Co., Ltd., is responsible basic training of persons employed to operate and maintain the monitoring system.

Roles and Responsibilities of EMP Implementation of Decommissioning and Dismantling Phase

At the stage of the project planning & implementation process, the necessity for planning and timing of the decommissioning of the construction equipment and structures after the completion of construction and end of life power project of the Myanmar Ahlone Power Plant Co. Ltd., 151.54 MW CCPP is

important. The management of the company has planned to prepare a full-scale decommissioning plan for the project after construction and after the life expectancy of the project to clean up the site.

After Completion of The Construction of Power Plant

The EPC contractor is responsible for the decommissioning of the Equipment and temporary structure at the project site. After the completion of the construction, there will have plenty of construction equipment, scrap metal, construction materials, different types of waste chemicals as well as the jetty. The EPC contractor should follow the Decommissioning plan that will be prepared by Myanmar Ahlone Power Plant Co., Ltd. before leaving the site.

It will be ensured by the contractor that no hazardous substance will be discharged to the atmosphere.

At The End of Plant's Life

After the power plant will reach its end of life, Myanmar Ahlone Power Plant Co., Ltd. authority should dismantle the entire power plant project and restore the project site back to the normal unless otherwise mentioned by the authority. The Myanmar Ahlone Power Plant Co., Ltd. will follow the detail decommissioning plan will be prepared prior to this.

General Principles of Decommissioning

The general principles of the decommissioning of a project are detailed below. These principles must be required to be revisited and supplemented in the event of decommissioning of the power plant.

On decommissioning of the power project, EPC Contractor and Myanmar Ahlone Power Plant Co., Ltd. will:

- Ensure that all sites not only vegetated are vegetated as soon as possible after operation ceases with species appropriate to the area.
- All the temporary & permanent structures, foundations, concrete, and tarred areas are demolished, removed and waste material disposed of at an appropriately licensed waste disposal site.
- All equipment, vehicle and machineries should be dismantled, recycled, or disposed of at an appropriately licensed disposal site.
- The aggregates, steel and other construction materials should be sold secondarily to the licensed vendor.
- All disturbed areas are compacted, sloped, and contoured to ensure drainage and runoff and to minimize the risk of erosion.
- All hazardous materials should be kept separate, documented, and disposed to the safe recycling or disposal site.

A detail decommissioning and restoration of site plan should have to be developed prior to the decommissioning of the Power project by EPC contractor and Myanmar Ahlone Power Plant Co., Ltd.

7.3 Environmental Management Plan

All beneficial and adverse impacts which may likely to occur at different phases of the project have been identified. Predictions, evaluation, aspect of mitigation and benefit enhancement measures have also been discussed concurrently with impact prediction and evaluation. In view of the earlier discussion summary of recommended mitigation measures and responsible organization and implementation organizations are presented in Table 7-3 and Table 7-4

7.3.1 Construction Phase

Table 7-3: Environmental Management Plan during Construction Phase

Potential Impacts	Mitigation Measures	Implementing Organization	Responsible Organization
Physical Environment			
Ambient Air Quality Dust emissions Combustion Emissions [Dust emissions caused by construction activities, construction vehicle movement and transport of construction materials]	• Appropriate loading and maintenance of stockpiles of materials to minimize dust blow (seek to achieve a distance of at least 500m from nearest sensitive receptors); • Minimizing drop heights for material transfer activities such as unloading of materials; • Construction phase to begin with construction of access roads; • Roads will be kept damp via a water browser; • Watering unpaved/dusty roads (at least twice a day; cost estimate provided). • Sprinkling and covering stockpiles. • Provide wheel wash for all vehicles leaving the project site; • Do not permit any open burning on the project site; roads will be compacted and gravelled if necessary; • Site roads will be maintained in good order; • Regulation of site access; • sheeting of lorries transporting construction materials and soil; enforcement of vehicle speed limits on nonmetal roads to <20 km/h. • Scheduling of deliveries during after regular working hours • Protecting local community from traffic hazard during construction phase, with installation of proper traffic sign and warnings • Speed reduction to 10 km per hour within the Myanmar Ahlone Power Plant Co., Ltd. Complex • Keeping vehicles under good condition, with regular checking of vehicle condition to ensure compliance with national standards. • Covering top of trucks carrying materials tithe site and carrying construction debris away from the site	All contractors on site under Supervision of the Project Manager, MAPP Co., Ltd.	MAPP Co., Ltd
Greenhouse gas emissions	• Increasing the overall efficiency of the combined cycle power plant reduces the amount of natural gas needed to generate a unit of electricity, subsequently lowering CO2 emissions per unit of power produced. • Implementing effective monitoring and preventive measures to minimize methane leaks	All contractors on site under Supervision of the Project Manager, MAPP Co., Ltd.	MAPP Co., Ltd

Potential Impacts	Mitigation Measures	Implementing Organization	Responsible Organization
	from pipelines and equipment helps address the potent greenhouse gas methane, which can escape during natural gas extraction and transportation. • Continuous optimization of operational parameters, load management, and maintenance practices helps improve efficiency and reduce overall greenhouse gas emissions.		
Noise [As a result of the use of noisy machinery and increased vehicle movements.]	• Use of protective hearing equipment for workers • Implementation of good site practices including: • Provision of noise barrier around the project site to reduce off-site noise levels; enforcement of vehicle speed limits; strict controls of vehicle routing; • Diesel engine construction equipment to be fitted with silencers; • Limited noisy construction activities at night; • Prohibition of light vehicle movements at night;	All contractors on site under Supervision of the Project Manager, MAPP Co., Ltd.	MAPP Co., Ltd
Soils and Hydrology [Site clearance –] excavation and disposal of material, exposure of potentially contaminated soils, spillage, or leakage of substances on land, movement of equipment and vehicles on site	• Follow mitigation measures set out in this ESIA and the EHS Guidelines on Construction. • Development of effective site drainage systems designed to include allowance for climate change; • Restriction of access only to construction site areas; • Disposal of waste materials unsuitable for reuse on-site, (e.g., for landfilling) at appropriately licensed sites; • Provision of oil and suspended solid interceptors; • Management of excavations during construction to avoid the generation of drainage pathways to underlying aquifers; • Revision of impermeable bases in operational areas to prevent absorption of spillages.	All contractors on site under Supervision of the Project Manager, MAPP Co., Ltd.	MAPP Co.,Ltd
Water Quality/ Water contamination During construction of intake structure, water discharge structure, construction activities on land	• River water quality must be within prescribed limits of the national ambient water quality standards. • No discharge of effluents into the river- all effluents shall be collected and removed off site for treatment by approved firms or disposed after proper treatment at site (records of effluent transfers to be maintained); • No discharge of surface water runoff direct into the river - development of a temporary site drainage plan which reduces flow velocity and sediment load by passing discharge through a sediment pond; • Surface water run off should be disposed after passing through sedimentation tank and oil water interceptors. • Protection of temporary stockpiles of soil from erosion by using a reduced slope angle	All contractors on site under Supervision of the Project Manager, MAPP Co., Ltd.	MAPP Co.,Ltd

Potential Impacts	Mitigation Measures	Implementing Organization	Responsible Organization
spillages, disposal of liquid wastes; surface run- off, exposure of contaminated soils	where practical, sheeting and by incorporating sediment traps in drainage ditches; • Maintenance of well-kept Construction site. • All fuel, oil and chemicals should be stored in bonded area 110% volume. • Impermeable surface should be used for refuelling • Regular training of all workers in spill response • Provision of spill equipment at easily accessible locations around the site • No septic tank within 100 m of tube well or the river.		
Solid Waste Generation of construction Waste	• All waste taken off-site will be undertaken by a licensed contractor and Myanmar Ahlone Power Plant Co., Ltd. will audit disposal procedure; • Collection and segregation of wastes and safe storage; • Recording of consignments for disposal; • Prior agreement of standards for storage, management, and disposal with relevant authorities. • Final disposal of wastes shall be strictly adhered to environment friendly disposal Contract • Hauling of construction debris away from the site and their appropriate disposal in a designated disposal site	All contractors on site under Supervision of the Project Manager, MAPP Co., Ltd.	MAPP Co., Ltd
Generation of sewage and solid waste by influx of workers	• Construction of sanitary latrine and septic tank system (one latrine for 20 persons) • Erecting “no litter” sign, provision of waste bins/cans, where appropriate • Waste minimization, recycle and reuse • Proper disposal of solid waste (in designated waste bins)		
• Biological Environment			
Flora and Fauna [Site Clearance-Vegetation removal and Habitat disturbance]	• Good site management practices will be observed to ensure that disturbance of habitats off-site is minimized. • Specific mitigation measures include restricting personnel and vehicles to within construction site boundaries, lay down areas and access roads.	All contractors on site under Supervision of the Project Manager, MAPP Co., Ltd.	MAPP Co., Ltd
Aquatic Life			
Contamination of water body	• Monitor and improve management and disposal of site waste. • Keep materials such as sand or cement secure. • Cover up all drains to prevent waste from ending up in the water.	All contractors on site under Supervision of the Project Manager, MAPP Co., Ltd.	MAPP Co., Ltd

Potential Impacts	Mitigation Measures	Implementing Organization	Responsible Organization
	• Always keep the road and footpath to the site clean. • Properly collect and treat any wastewater that produce from construction activities. • The proper sanitation system for the construction workers and project staff		
Social environment			
Community health and safety	• Following above mitigation measures for air pollution, noise and vibration, surface water quality degradation, ground water quality degradation, soil contamination, emergency risk etc. (because the community health and safety is related to these environmental impacts) • Public access to the site must be restricted. Posting warning signs on “Construction Work in Progress”, “Do not Enter” etc. in and around construction site. • Emphasizing safety aspects among drivers. • Improving driving skills and requiring licensing of drivers. • Adopting limits for trip duration and arranging driver rosters to avoid overtiredness. • Avoiding dangerous routes and times of day to reduce the risk of accidents. • Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. • Collaboration with local communities to improve signage, visibility, and overall safety of roads. • Coordination with emergency responders to ensure that appropriate first aid is provided in the event of accidents. • Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions. • Providing surveillance and active screening and treatment of workers. • Preventing illness among workers in local communities (undertaking health awareness and education initiatives, providing health services). • Prevention of larval and adult propagation through sanitary improvements and elimination of breeding grounds close to human settlements. • Elimination of unusable impounded water, increase in water velocity in natural and artificial channels	All contractors on site under Supervision of the Project Manager, MAPP Co., Ltd.	MAPP Co., Ltd
Occupational Health and Safety	• Following occupational health and safety procedures of excavation work, work at height, using scaffolding, using ladders, preventing slips, safe workplace transport operations, electrical work, fire, good lifting, or manual handling techniques, using hand-held tools,	All contractors on site under Supervision of	MAPP Co., Ltd

Potential Impacts	Mitigation Measures	Implementing Organization	Responsible Organization
	using power tools, chemicals use, using cement mixers, plate compactors use, using ground consolidation equipment, using road making equipment, • Wearing Personal Protective Equipment (PPE), medical and first aid use • Regular talks to be held for all workers on sanitation, communicable diseases including HIV to be held for all workers. • Regular H&S training will be conducted for all construction staff, including training on good housekeeping, clean-up of debris and spills, and working in confined spaces and at height. • Implementation of EHS procedures as a condition of contract all contractors and subcontractors; • Completion and implementation of Fire Safety Plan prior to commissioning any part of the plant; • Provision of appropriate training on EHS issues for all workers; • Regular inspection, review and recording of EHS performance; • Pest and vector control; • Maintenance of a high standard of housekeeping at all times. • Provision of first aid equipment at easily accessible locations around the site • The contractors will be responsible for relevant temporary water / toilet facilities during construction and the need to provide appropriate services will be specified in their contracts. • Provide adequate supplies of drinking water that is compliant with the national drinking water quality standards to all workers. No ground water will be used as drinking water. • Provide adequate sanitation facilities. Toilets and bathrooms must be properly equipped including hand washing facilities with hot water and with separate facilities for men and women.	the Project Manager, MAPP Co., Ltd.	
Possible spread of disease from workers	• Regular medical check-up of workers • Clean bill of health, (good health certificate) condition for employment		
Increased traffic/navigation Generation of noise, especially affecting the nearby residential areas Deterioration of air quality from increased vehicular movement, affecting people in the	• Scheduling of deliveries during after regular working hours • Protecting local community from traffic hazard during construction phase, with installation of proper traffic sign and warnings • Speed reduction to 10 km per hour within the Myanmar Ahlone Power Plant Co., Ltd. complex • Keeping vehicles under good condition, with regular checking of vehicle condition to ensure compliance with national standards.	All contractors on site under Supervision of the Project Manager, MAPP Co., Ltd.	MAPP Co., Ltd

Potential Impacts	Mitigation Measures	Implementing Organization	Responsible Organization
surrounding areas. Wind-blown dust from material (e.g., fine aggregate) storage areas	• Watering unpaved/dusty roads (at least twice a day; cost estimate provided). • Sprinkling and covering stockpiles. • Covering top of trucks carrying materials tithe site and carrying construction debris away from the site.		
Natural Disasters Flash flooding.	• Good engineering design will incorporate the following mitigation measures: • Drainage system designed to direct flood water from main plant areas into the river and direct potentially contaminated waters through the oil interceptor	All contractors on site under Supervision of the Project Manager, MAPP Co., Ltd.	MAPP Co., Ltd

Notes: Implementation of Good Site management practices shall be the responsibility of all contractors on site under supervision of the Myanmar Ahlone Power Plant Co., Ltd. Implement mitigation measures are as set out in the ESIA and EHS Guidelines on Air Emissions and Air Quality, Noise, waste water and Thermal Power

7.3.2 Operation Phase

Table 7-4: Environmental Management Plan for Operation Phase

Potential Impacts	Mitigation Measures	Implementing Organization	Responsible Organization
Physical Environment			
Air Quality	• Implement mitigation as set out in the ESIA and EHS Guidelines on Air Emissions and Air Quality and Thermal Power. • Emissions standards to be achieved during operation are 51 mg/m3 or 25ppm NOx. • Emissions from stack are expected not to exceed the standards air emission level for energy sector development thermal power plant provided by National Environmental Quality (Emission) Guidelines. • Emissions level will be measured in accordance with standards of National Environmental Quality (Emission) Guidelines.	MAPP Co., Ltd Project Engineer	MAPP Co., Ltd Top management and EHS department.
	• Myanmar Ahlone Power Plant Co., Ltd. will implement the mitigation measures suggested in the ESIA report. If ground level concentrations are found to be above the National Ambient Air Quality Standards, options for further mitigation will need to be implemented.	Third party monitoring	Third party inspection.
Greenhouse	• Increasing the overall efficiency of the combined cycle power plant reduces the amount of natural gas needed to generate a unit of electricity, subsequently lowering CO2 emissions per unit of power produced. • Implementing effective monitoring and preventive measures to minimize methane leaks from pipelines and equipment helps address the potent greenhouse gas methane, which can escape during natural gas	MAPP Co., Ltd Project management.	

Potential Impacts	Mitigation Measures	Implementing Organization	Responsible Organization
	extraction and transportation. • Continuous optimization of operational parameters, load management, and maintenance practices helps improve efficiency and reduce overall greenhouse gas emissions.		
Natural gas leakage	• Gas leak outside the power plant will be managed by MoGE pipeline systems which is equipped with leak-detection system and automatic shutoff valves or remote-control valves that can warned operators of an imminent accident and allow for quick mitigation. • Flow in the pipeline will be completely shut down if leakage is detected. Power plant will also be shut down temporarily until it is fixed. • Gas leak inside the power plant will detect and monitor using portable gas detector	MAPP Co., Ltd Project management.	
Aquatic life [a] Discharge of process water.	• Good site management practices including the following will be implemented • Proper treatment of contaminated water or cooling water before discharge to natural water body. • No disposal of solid wastes into the discharge structure; • Regular maintenance of site drainage system to ensure efficient operation; • All discharges will comply with local and World Bank guidelines. • All fuel, oil and chemicals should be stored in bounded area. • Regular training of all workers in spill response • Provision of spill equipment at easily accessible locations around the site	All contractors on site under supervision of the MAPP Co., Ltd Project Manager.	MAPP Co., Ltd Management EHS department.
	• Discharged water quality will not exceed the effluent level guideline value set out for thermal power of energy sector development provided by National Environmental Quality (Emission) Guidelines.	Third party monitoring	
Noise Quality	• No employee should be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection. • No unprotected ear should be exposed to a peak sound pressure level of more than 140 dB(C). • The use of hearing protection should be enforced actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound levels reach 140 dB(C), or the average maximum sound level reaches 110 dB(A). • Hearing protective devices provided should be capable of reducing sound levels at the ear to at least 85dB(A). • Emissions at the site boundary and nearest sensitive receptors must be within prescribed limits of the EHS Noise Guidelines. • Specific design mitigation measures to minimize noise impacts include, gas turbines, steam turbine generators; air compressors, pumps and emergency diesel engines are enclosed in the buildings with proper	MAPP Co., Ltd Project Manager.	MAPP Co., Ltd Management EHS department.

Potential Impacts	Mitigation Measures	Implementing Organization	Responsible Organization
	acoustic design; • Provision of a noise barrier around the project site to minimize off-site noise levels.		
Flora and Fauna Disturbance to habitats as a result of noise, vehicle, and personnel movements.	• The following mitigation measures will be implemented: • restrict personnel and vehicle movements to access roads and within boundaries of site only; • control of noise during operation.	MAPP Co., Ltd Project Manager.	MAPP Co., Ltd Management EHS department
Visual Impact Visual image of Power plant from surround-ing areas.	The visual effect of the power plant will be improved through: - Creation of landscaped - Boundary along the fence of the power plant. - Planting enough trees around the project site	MAPP Co., Ltd Project Manager.	MAPP Co., Ltd Management EHS department
Solid Waste Waste Genera-tion	• Collection and segregation of wastes and safe storage; • It is of highest importance that final disposal of wastes shall be strictly adhered to environment • No solid waste should be used as fertilizer unless it is first tested to confirm suitability per national require-ments. • Recording of consignments for disposal; • Records of all waste transfers to be maintained. • All waste taken off-site will be undertaken by a licensed contractor and Myanmar Ahlone Power Plant Co., Ltd. will audit disposal procedure; • Good practice measures undertaken during the construction phase will be continued into the operation phase. • Prior agreement of standards for storage, management, and disposal with relevant authorities. • It is of importance that final disposal of wastes shall be strictly adhered to environment friendly disposal Con-tract.	MAPP Co., Ltd Project Manager.	MAPP Co., Ltd Management EHS department.
Soil and Hy-drology: [Spillage of oils, chemicals, or	• Follow mitigation measures in ESIA and EHS Guidelines on Hazardous Materials Management and Waste Management. • Good site management measures as described in the EMP, under aquatic environment will minimize any po-tential risks. As part of this, regular checks of bunds and drainage systems will be undertaken to ensure	MAPP Co., Ltd Project Manager.	MAPP Co., Ltd Management EHS department

Potential Impacts	Mitigation Measures	Implementing Organization	Responsible Organization
fuels onsite]	containment and efficient operation. and are unsuitable for process wastewater treatment.		
	• Provision of oil and suspended solid interceptors; • Management of excavations during construction to avoid the generation of drainage pathways to underlying aquifers; • Revision of impermeable bases in operational areas to prevent absorption of spillages		
Surface Water discharge Increase of river water pollution	• Regular monitoring of surface water discharge and river water quality including at the upstream and downstream of the discharge point		
Turbines and cooling system	• The gas turbine, steam turbine and cooling system require repair and maintenance schedules for the turbines and cooling system to maximize life cycle and operation efficiency. • As per the manufacturer's schedule the gas turbine set needs timely minor, hot gas path and major inspection at specific time interval. • The repair and maintenance of steam turbine and cooling water system will be done according to the manufacturer's recommendation and as required.	MAPP Co., Ltd Engineer, technician	MAPP Co., Ltd Management
Social environment			
Community health and safety	• Following above mitigation measures for air pollution, noise and vibration, surface water quality degradation, ground water quality degradation, soil contamination, emergency risk etc. (because the community health and safety is related to these environmental impacts) • Public access to the site must be restricted. Posting warning signs on “Construction Work in Progress”, “Do not Enter” etc. in and around construction site. • Emphasizing safety aspects among drivers. • Improving driving skills and requiring licensing of drivers. • Adopting limits for trip duration and arranging driver rosters to avoid overtiredness. • Avoiding dangerous routes and times of day to reduce the risk of accidents. • Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. • Collaboration with local communities to improve signage, visibility, and overall safety of roads. • Coordination with emergency responders to ensure that appropriate first aid is provided in the event of accidents.	MAPP Co., Ltd Project Manager.	MAPP Co., Ltd Management EHS department

Potential Impacts	Mitigation Measures	Implementing Organization	Responsible Organization
	• Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions. • Providing surveillance and active screening and treatment of workers. • Preventing illness among workers in local communities (undertaking health awareness and education initiatives, providing health services). • Prevention of larval and adult propagation through sanitary improvements and elimination of breeding grounds close to human settlements. • Elimination of unusable impounded water, increase in water velocity in natural and artificial channels		
Occupational Health & Safety	• Follow mitigation measures in ESIA and EHS Occupational Health and Safety and Thermal Power Guidelines. • Drinking Water provided to employees to meet drinking water standards. • Occupational EMF exposure should be prevented or minimized through the preparation and implementation of an EMF safety program. • Use of warning signs near noisy environments and high temperature surfaces and provide personal protective equipment (PPE) as appropriate, including ear muffs and insulated gloves and shoes. • The standard mitigation that has been suggested in the EMP report will be implemented and followed on site.	MAPP Co., Ltd Project Manager.	MAPP Co., Ltd Management EHS department

Notes: [a] It is to be noted that wastewater from the Power Plant is not only the discharge water drain into the Harbi Creek from it into the Yangon River. Harbi Creek is actually just a drain. Waste water from residents and all sorts of business that using water of Saw Yan Paing Wards flow in the drain. Moreover, there is a large community of squatters situated along downstream of Harbi Creek till Yango River. Sanitation, sewage system, does not employ in these squatters. As Ahlone Power Plant is practising strictly on wastewater river water pollution and affect to aquatic life cannot be due to Power Plant.

7.3.3 Decommissioning Phase

Table 7-5: Environmental Management Plan during Decommissioning Phase

Potential Impacts	Mitigation Measures	Implementing Organization	Responsible Organization
Physical Environment			
Dust Emission and Air Pollution	• Minimizing dust from material handling sources, such as conveyors and bins, by using covers and/or control equipment • Minimizing dust from open area sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content • Applying water or non-toxic chemicals to minimize dust from vehicle movements, selectively removing potential hazardous air pollutants, such as asbestos, from existing infrastructure prior to demolition, speed reduction for traffic • Avoiding open burning of solid waste.	Contractor	Project Proponent (Developer)
Greenhouse gas emissions	• Conducting training to raise the awareness of drivers, operators and concerned staff on greenhouse emissions and mitigation measures • Prohibiting unnecessary driving and moving at site and idling of vehicles and construction machineries as well • Regular maintenance of vehicles and machineries • Formulating the construction management procedures including the efficient use of construction vehicles and machineries	Contractor	Project Proponent (Developer)
Surface water contamination	• Avoid discharging wastewater and waste to the waterway from demolition site	Contractor	Project Proponent (Developer)
Waste generation (Hazardous and Non-Hazardous Solid Waste)	• The mitigation measures used for the construction phase will be adopted.	Contractor	Project Proponent (Developer)
Traffic flow	• Following the mitigation measures for traffic flow in construction phase	Contractor	Project Proponent (Developer)
Social Environment			
Living and livelihood	• Preparing the employment contract between workers and the concerned company according to the Myanmar Labor Law (workers' labor right will be protected by confirming termination service)	Contractor	Project Proponent (Developer)
Occupational safety and health (Risk of	• Company has guidelines and procedures (Please see in the Annex section) and generally the following aspects are covered:	Contractor	Project Proponent (Developer)

injuries and accidents to workers)	• Guidelines and procedures for organizing the site (planning the work, organizing the work, common facilities to be provided, site access, public safety, lighting, site tidiness, storage areas, fire safety) • Preventive measures for accidents or injuries from excavations, working at height, moving, lifting and handling loads, site vehicles and mobile plants operation, chemicals use, handling and storage • Protective Equipment (Safety helmet, footwear, googles and safety spectacles, gloves and protective clothing, other protective equipment) • Emergency procedures and preparedness (company's emergency personnel contact information, evacuation plan including exit routes, evacuation signals and sirens, location of eyewash stations and showers, fire extinguishers) • Providing First Aid kits and training on how to use them • Accident/Injury Reporting procedures • Training (Orientation) for all employees and workers		

7.4 Environmental Monitoring Plan and Budget

The environmental monitoring program should be carried out as an integral part of the project planning and execution. It must not be seen merely as an activity limited to monitoring and regulating activities against a pre-determined checklist of required actions. Rather it must interact dynamically as project implementation proceeds, dealing flexibly with environmental impacts, both expected and unexpected. For this purpose, it is recommended that the Project Director (PD) for this specific project should take the overall responsibility of environmental management and monitoring. The PD will form a team with required manpower and expertise to ensure proper environmental monitoring, as specified in Table 7-6 below, for construction phase. Monitoring will be performed by trained staff of the contractor and supervision by Myanmar Ahlone Power Plant Co., Ltd. is required, to ensure the implementation of good site management practices by all contractors during construction.

Most of the environmental parameters will experience beneficial effects during the operation phase of the power plant project. Efforts should be made to enhance these beneficial impacts, which may include incentives for proper growth of more projects in the area. The plant management authority of Myanmar Ahlone Power Plant Co., Ltd. should be responsible for overall environmental monitoring during the operation phase of the project. Table 7-7 summarizes the monitoring plans for significant environmental impacts during operation phase.

The environmental monitoring plan in the decommissioning phase provides a specific description of technical details for mitigation measures, including the parameters to be measured, the methods to be used, the sampling, frequency, and monitoring budget. These are presented in Table 7-8. The project developer and the contractor are required to follow this monitoring plan during the decommissioning phase.

7.4.1 Construction Phase

Table 7-6: Environmental Monitoring Plan During Construction Phase

Potential Impacts	Monitoring on Mitigation Measures/ Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
Physical Environment							
Impact on Air Quality	• Application of effective water sprays • Covering fine particle materials on site • Keeping the excavated earth material at the designated place and covering it to prevent wind erosion • Installation of wheel washing facilities • Restrict maximum speed on construction site pathways. • Proper upkeep and maintenance of vehicles. • Green plantation. • Employing low-sulfur fuels for machines and equipment powered with diesel engines. • Ensure that adequate water flow in the sanitation system and aeration to reduce the potential of odour formation. • Using Generators only during power failure • Complying generators sets with the applicable emission norms • Minimizing the amount of exposed ground and stockpiles.	• Verify the implementation by site inspection and interview employees. • Verify relevant records / documents for the implementation. • At the project site and surrounding area of project site	Daily At the project site and surrounding area of project site	NEQ(E)G (2015) Ambient Air Quality Standards	Project Proponent/ Contractors/ Subcontractors	Project Proponent	70,000,000 Included in construction budget (Budget for monitoring activities, capacity building, inspection fees by MONREC, personnel cost and other logistics cost) (Note: Budget for implementation of mitigation measures will be included in the construction cost)
	<u>Ambient Air Quality</u> • PM10, PM2.5, • NO2, SO2, CO, O3	• Measure at surrounding sensitive receptors within area of influence, locations are presented in Table 7-10	Twice a year	NEQ(E)G (2015) Ambient Air Quality Standards			
Greenhouse gas emissions	Measure emissions reductions through equipment efficiency and alternative fuels. Parameters: CO2, NOx, PM.	• Verify the implementation by site inspection and interview employees.	Daily	NEQ(E)G (2015) Ambient Air Quality Standards			

Potential Impacts	Monitoring on Mitigation Measures/ Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
		• Verify relevant records with Portable Emission Measurement Systems. • Measure at project site and sur-rounding sensitive receptors within area of influence,					
Noise and Vibration	• Conducting noisy construction activities during the daytime only. • Undertaking proper maintenance of equipment. • Use of well-maintained equipment fitted with silencers. Use of proper personal protective equipment.	• Verify the implementation by site inspection and interview employees. • Verify relevant records / documents for the implementation	Daily	NEQ(E)G (2015) Allowable Noise levels			
	• Noise level Leq In dbA	• Measure at surrounding sensitive receptors within area of influence, locations are presented in Table 7-12	Twice a year				
Water Contamination	• Adequate arrangements for proper drainage. • Regular cleaning and maintenance of the sediment removal facilities to ensure that the facilities are always in normal function. • Cleaning of toilet wastes regularly. • Installation of oil traps on drainage. • Use of drip trays to collect oil leakage.	• Verify the implementation by site inspection and interview employees. • Verify relevant records / documents for the implementation. • At the project site	Daily	NEQ(E)G Guidelines (2015) Effluent for Thermal Power, section 2.1.1	Project Proponent/ Contractors/ Subcontractors	Project Proponent	35,000,000 Included in construction budget (Budget for monitoring activities, capacity building, inspection fees by MONREC, personnel cost
	<u>River Water</u> Arsenic, cadmium, chromium (total), copper, iron, lead, mercury, oil and grease, pH,	• Verify the implementation by site	Twice a year				

Potential Impacts	Monitoring on Mitigation Measures/ Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
	Water temperature increase, total residual chlorine, total suspended solids, Zinc, Aquatic Environment Discharge of process water. Temperature, Salinity, Dissolved Oxygen, pH, Total dissolved solid, Conductivity	inspection and interview employees. • Verify relevant records / documents for the implementation. • Test the up-stream, down-stream of river water from Power Plant effluent locations are presented in Table 7-14					and other logistics cost) (Note: Budget for implementation of mitigation measures will be included in the operation and maintenance cost)
Soil Contamination	• Collecting the solid waste and domestic waste generated during the construction phase in the bin, and temporarily kept in the garbage collection room before disposing to the final dump site. • Regular checking to the storage area	• Verify the implementation by site inspection and interview employees. • Verify relevant records / documents for the implementation.	Daily	IFC's EHS General Guidelines (2007),	Project Proponent/ Contractors/ Subcontractors	Project Proponent	30,000,000 Included in construction budget (Budget for monitoring activities, capacity building, inspection fees by MONREC, personnel cost and other logistics cost) (Note: Budget for implementation of mitigation measures will be included in the construction cost
	<u>Soil quality</u> ▪ **Nutrients** Moisture, pH, Soil: Water 1:2.5, EC Soil: Water 1:5, Texture, Organic Carbon %, Humus %, Total N %, CEC, Exchangeable Cations, Available Nutrients ▪ **Heavy Metals** Iron (Fe), Lead (Pb), Cadmium (Cd), Nickle (Ni), Chromium (Cr)	• Test soil at the project site	Twice a year	FAO Soil Bulletin 65.8 guidelines			
Solid waste	• Monitor construction wastes and disposal • Monitor trash/garbage generated and disposal	• Quantity of solid disposal process • Location: waste, segregation	Monthly	IFC's EHS General Guidelines (2007),			15,000,000 Included in construction budget

Potential Impacts	Monitoring on Mitigation Measures/ Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
Biological Environment							
Impact on Terrestrial Fauna and Flora	• Avoiding unnecessary clearing of trees. • Keeping noise levels and vibration of construction activities on the land within limits to reduce the impact on wildlife. • Minimizing the disturbance (including noise and vibration) during the construction, such as timing activities outside of migratory seasons or birds' presence in the area. • Landscaping as proposed in the designs and plants trees that would aesthetic the area. • Planting vegetation in all open areas after the completion of the construction. • Management of the introduced vegetation on completion of the development to restore or improve the Project site.	• Inspection on mitigation measures. • Verifying construction practices.	Weekly	IFC's EHS General Guidelines (2007),	Project Proponent/ Contractors/ Subcontractors	Relevant Authority/ Project Proponent	30,000,000 Included in construction budget (Budget for monitoring activities, capacity building, inspection fees by MONREC, personnel cost and other logistics cost) (Note: Budget for implementation of mitigation measures will be included in the construction cost
	• Field Survey for 500m radius area of project site	• Desk-Based Literature Review • Field Investigations and Survey (quantitative & qualitative) • Expert Involvement (Taxonomic Identification, • Habitat Assessment) • Drone Photographs • Resident Interview	Twice a year				
Social Environment							
Changes in Livelihoods	• Monitor changes in livelihoods due to project activities.	• Field surveys and interviews; affected communities	Semi-annually	IFC Performance Standards	Project Proponent/ Contractors/ Subcontractors	Relevant Authority/ Project Proponent	20,000,000 included in construction budget
Cultural Heritage Impact	• Identify and mitigate impacts on cultural heritage sites.	• Cultural assessments; site inspections	Annually	Cultural Heritage Protection Laws			

Potential Impacts	Monitoring on Mitigation Measures/ Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
Occupational health and safety	• Monitor OHS measures taken • Monitor provision of First Aid kit and stocking of medicines and drugs • Monitor Emergency Preparedness and Response plan + actions	• Worker satisfaction as measured by staff interviews and complaints reported. • Visual Inspection Daily visual inspection Location; At the project site.	Monthly	IFC's EHS General Guidelines (2007),			
Worker's health	• Monitoring process of worker's health	• Visual Inspection Daily visual inspection Location; At the project site.	Monthly				
Safety orientation & training of workers	• Frequency of training & orientation of workers for safety	• Visual Inspection Daily visual inspection • Location; At the project site.	Monthly				
Personal Equipment Protective	• Ensure every single person involved in the construction activity wear proper PPE	• Visual Inspection Daily visual inspection • Location; At the project site.	Monthly				
Sanitation & drinking water facility to workers	• Availability of safe drinking water and sanitation to the workers	• Visual Inspection Daily visual inspection • Location; At the project site.	Monthly				
Complain from neighbours	• Any significant complain from neighbours and • it's remedial procedure from	• Recording information • Location; Adjacent wards	Monthly				
Traffic volume	• Incoming & outgoing traffic, traffic movement • Records • Increased congestion	• Visual Monitoring • Location; At the project site	Monthly				

Potential Impacts	Monitoring on Mitigation Measures/ Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
	• Travel time • (Compared to reasonable daily commute)						
Site Security	• Proper fencing, isolation of site from general access, marked passage for workers and visitors	• Visual Monitoring • Location; At the project site	Monthly				
Movement of equipment and vehicles on site.	• Waste materials. • Oily waters. • Drainage pathways. • Potential spillage in Operational areas. Visual Inspection	• Visual Monitoring • Location; At the project site	Monthly				

7.4.2 Operation Phase

Table 7-7: Environmental Monitoring Plan During Operation Phase

Potential Impacts	Monitoring on Mitigation Measures/ Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
Physical Environment							
Impact on Air Quality	• Application of effective water sprays • Covering fine particle materials on site • Keeping the excavated earth material at the designated place and covering it to prevent wind erosion • Installation of wheel washing facilities • Restrict maximum speed on construction site pathways. • Proper upkeep and maintenance of vehicles. • Green plantation. • Employing low-sulfur fuels for machines and equipment powered with diesel engines.	• Verify the implementation by site inspection and interview employees. • Verify relevant records / documents for the implementation. • At the project site and surrounding area of project site	Daily At the project site and surrounding area of project site	NEQ(E)G (2015) Ambient Air Quality Standards	Project Proponent	Project Proponent	75,000,000 Included in operation and maintenance budget (Budget for monitoring activities, capacity building, inspection fees by MONREC, personnel cost

Potential Impacts	Monitoring on Mitigation Measures/ Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parame-ter	Responsible Party		Estimated Budget Per Year (Myan-mar Kyats)
					Implementing Organization	Responsible Organization	
	• Ensure that adequate water flow in the sanitation system and aeration to re-duce the potential of odour formation. • Using Generators only during power failure • Complying generators sets with the applicable emission norms • Minimizing the amount of exposed ground and stockpiles.						and other lo-gistics cost) (Note: Budget for implemen-tation of miti-gation measures will be included in the operation cost)
	PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, O_3	• Measure at surrounding sensitive receptors within area of influence, locations are presented in Table 7-10	Twice a year	NEQ(E)G (2015) Ambi-ent Air Quality Standards			
Stack Emis-sion	• NOx, SO_2, Smoke	• 24/7 continuous moni-toring (CEMS) • Detail operation and maintenance procedure are presented in Ap-pendix • Location is presented in Table 7-10	Twice a year	NEQ(E)G (2015) Air Emission for Thermal Power Section 2.1.1			
Greenhouse gas emissions	Measure emissions reductions through equipment efficiency and alternative fuels. Parameters: CO2, NOx, PM.	• Verify the implementa-tion by site inspection and interview employ-ees. • Verify relevant records with Portable Emission Measurement Systems. • Measure at project site and sur-rounding sensi-tive receptors within area of influence,	Daily				
Noise and Vibration	• Conducting noisy construction activi-ties during the daytime only.	• Verify the implementa-tion by site inspection	Daily	NEQ(E)G (2015)			

Potential Impacts	Monitoring on Mitigation Measures/ Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
	• Undertaking proper maintenance of equipment. • Use of well-maintained equipment fitted with silencers. Use of proper personal protective equipment.	and interview employees. • Verify relevant records / documents for the implementation		Allowable Noise levels			
	• Noise level Leq In dbA	• Measure at surrounding sensitive receptors within area of influence, locations are presented in Table 7-12	Twice a year				
Water Contamination	• Adequate arrangements for proper drainage. • Regular cleaning and maintenance of the sediment removal facilities to ensure that the facilities are always in normal function. • Cleaning of toilet wastes regularly. • Installation of oil traps on drainage. • Use of drip trays to collect oil leakage.	• Verify the implementation by site inspection and interview employees. • Verify relevant records / documents for the implementation. • At the project site	Daily	NEQ(E)G Guidelines (2015) Effluent for Thermal Power, section 2.1.1	Project Proponent	Project Proponent	45,000,000 Included in operation and maintenance budget (Budget for monitoring activities, capacity building, inspection fees by MONREC, personnel cost and other logistics cost)
	<u>River Water & Power Plant Effluent Water (power plant outlet drain)</u> Arsenic, cadmium, chromium (total), copper, iron, lead, mercury, oil and grease, pH, Water temperature increase, total residual chlorine, total suspended solids, Zinc,	• Verify the implementation by site inspection and interview employees. • Verify relevant records / documents for the implementation. • Test the river water from area of influence. locations are presented in Table 7-14	Twice a year				
	Aquatic Environment Discharge of process water.						(Note: Budget for implementation of mitigation measures will be included in the operation and maintenance cost)

Potential Impacts	Monitoring on Mitigation Measures/ Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
	Temperature, Salinity, Dissolved Oxygen, pH, Total dissolved solid, Conductivity						
Soil Contamination	• Collecting the solid waste and domestic waste generated during the construction phase in the bin, and temporarily kept in the garbage collection room before disposing to the final dump site. • Regular checking to the storage area	• Verify the implementation by site inspection and interview employees. • Verify relevant records / documents for the implementation.	Daily	IFC's EHS General Guidelines (2007),	Project Proponent	Project Proponent	30,000,000 Included in operation and maintenance budget (Budget for monitoring activities, capacity building, inspection fees by MONREC, personnel cost and other logistics cost) (Note: Budget for implementation of mitigation measures will be included in the operation cost
	Soil quality ▪ **Nutrients** Moisture, pH, Soil: Water 1:2.5, EC Soil: Water 1:5, Texture, Organic Carbon %, Humus %, Total N %, CEC, Exchangeable Cations, Available Nutrients ▪ **Heavy Metals** Iron (Fe), Lead (Pb), Cadmium (Cd), Nickle (Ni), Chromium (Cr)	• Test soil at the project site	Twice a year	FAO Soil Bulletin 65.8 guidelines			
Natural Gas Leakage	• Methane	• Detect and monitor using portable gas detector	Daily	IFC's EHS General Guidelines (2007),			Included in operation and maintenance budget
Increased solid waste generation	• Monitor construction wastes and disposal • Monitor trash/garbage generated and disposal	• Quantity of solid disposal process • Location: waste, segregation	Monthly	IFC's EHS General Guidelines (2007),			20,000,000 Included in operation and maintenance budget

Potential Impacts	Monitoring on Mitigation Measures/ Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
Hazardous waste generation	Monitoring of mitigation measures in Environmental Management Plan table	Inspection and observation	Monthly	IFC's EHS General Guidelines (2007),			20,000,000 Included in operation and maintenance budget
Biological Environment							
Impact on Terrestrial Fauna and Flora	• Avoiding unnecessary clearing of trees. • Keeping noise levels and vibration of construction activities on the land within limits to reduce the impact on wildlife. • Minimizing the disturbance (including noise and vibration) during the construction, such as timing activities outside of migratory seasons or birds' presence in the area. • Landscaping as proposed in the designs and plants trees that would aesthetic the area. • Planting vegetation in all open areas after the completion of the construction. • Management of the introduced vegetation on completion of the development to restore or improve the Project site.	• Inspection on mitigation measures. • Verifying construction practices.	Weekly	IFC's EHS General Guidelines (2007),	Project Proponent/	Project Proponent	40,000,000 Included in operation and maintenance budget (Budget for monitoring activities, capacity building, inspection fees by MONREC, personnel cost and other logistics cost) (Note: Budget for implementation of mitigation measures will be included in the operation cost
	Field Survey for Terrestrial Fauna, Flora and Aquatic Environment • 500m radius area of project site for Terrestrial Fauna, Flora • 1km radius area of project site for Aquatic Environment	• Desk-Based Literature Review • Field Investigations and Survey (quantitative & qualitative) • Expert Involvement (Taxonomic Identification,	Twice a year				

Potential Impacts	Monitoring on Mitigation Measures/ Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parame-ter	Responsible Party		Estimated Budget Per Year (Myan-mar Kyats)
					Implementing Organization	Responsible Organization	
		• Habitat Assessment) • Drone Photographs • Resident Interview					
Social Environment							
Community Health and Safety	• Assess community health status and concerns	• Health Assessments: Conduct surveys to as-sess community health status. Community Feedback: Gather input through meetings and interviews to understand health concerns.	Monthly	IFC's EHS General Guidelines (2007),	Project Proponent/	Project Pro-ponent	20,000,000 Included in op-eration and maintenance budget
Occupational Health and Safety	• Monitor compliance with safety regula-tions and effectiveness of training.	• Safety Audits: Regu-larly inspect work sites for compliance with safety regulations. • Training Sessions: Monitor attendance and effectiveness of safety training for workers. • Incident Reporting: Track and analyse workplace accidents and near-misses.	Monthly				
Increased Emergency risk (risk of fire)	• Evaluate fire risks and test emergency response procedures.	• Fire Risk Assessments: Evaluate construction practices and equip-ment for fire hazards. • Emergency Drills: Con-duct regular fire drills to test emergency re-sponse procedures. • Equipment Inspections: Check firefighting	Monthly				

Potential Impacts	Monitoring on Mitigation Measures/ Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
		equipment and ensure accessibility.					
Risks for infectious diseases	• Monitor health screenings and sanitation practices.	• Health Assessments: Conduct surveys to assess community health status. Community Feedback: Gather input through meetings and interviews to understand health concerns.	Monthly				

7.4.3 Decommissioning Phase

After the end of the Operation Phase affective and meaningful decommissioning task will be carried out. The project proponent will ensure that there is no residual impact and contaminated soil, or substance left. The project site will be restored to its original or agreed-upon post project condition. This is including landscaping, removing concrete foundations, and possibly replanting vegetation.

Table 7-8: Summary of monitoring plan during the Decommissioning Phase

Potential Impacts	Monitoring on Mitigation Measures/Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
Physical Environment							
Impact on Air Quality	• Application of effective water sprays • Covering fine particle materials on site • Keeping the excavated earth material at the designated place and covering it to prevent wind erosion • Installation of wheel washing facilities • Restrict maximum speed on construction site pathways. • Proper upkeep and maintenance of vehicles. • Green plantation. • Employing low-sulfur fuels for machines and equipment powered with diesel engines. • Ensure that adequate water flow in the sanitation system and aeration to reduce the potential of odour formation. • Using Generators only during power failure • Complying generators sets with the applicable emission norms • Minimizing the amount of exposed ground and stockpiles.	• Verify the implementation by site inspection and interview employees. • Verify relevant records / documents for the implementation. • At the project site and surrounding area of project site	Daily (During high-impact activities) At the project site and surrounding area of project site	NEQ(E)G (2015) Ambient Air Quality Standards	Project Proponent/ Contractors/ Subcontractors	Project Proponent	40,000,000 included in decommissioning budget (Budget for monitoring activities, capacity building, inspection fees by MONREC, personnel cost and other logistics cost) (Note: Budget for implementation of mitigation measures will be included in the decommissioning cost)
	<u>Ambient Air Quality</u> • PM10, PM2.5,	• Measure at surrounding sensitive receptors within area	Twice a year	NEQ(E)G (2015)			

Potential Impacts	Monitoring on Mitigation Measures/Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
	• NO2, SO2, CO, O3	of influence. The locations are presented in table 7-10		Ambient Air Quality Standards			
Noise and Vibration	• Conducting noisy construction activities during the daytime only. • Undertaking proper maintenance of equipment. • Use of well-maintained equipment fitted with silencers. • Use of proper personal protective equipment.	• Verify the implementation by site inspection and interview employees. • Verify relevant records / documents for the implementation	Daily (During high-impact activities)	NEQ(E)G (2015) Allowable Noise levels			
	• Noise level Leq In dbA	• Measure at surrounding sensitive receptors within area of influence. The locations are presented in Table 7-12	Twice a year				
Water Contamination	• Adequate arrangements for proper drainage. • Regular cleaning and maintenance of the sediment removal facilities to ensure that the facilities are always in normal function. • Cleaning of toilet wastes regularly. • Installation of oil traps on drainage. • Use of drip trays to collect oil leakage.	• Verify the implementation by site inspection and interview employees. • Verify relevant records / documents for the implementation. • At the project site	Daily	NEQ(E)G Guidelines (2015) Effluent for Thermal Power, section 2.1.1	Project Proponent/ Contractors/ Subcontractors	Project Proponent	20,000,000 included in decommissioning budget (Budget for monitoring activities, capacity building, inspection fees by MONREC, personnel cost and other logistics cost)
	<u>River Water</u> Arsenic, cadmium, chromium (total), copper, iron, lead, mercury, oil and grease, pH, Water temperature increase, total residual chlorine, total suspended solids, Zinc,	• Verify the implementation by site inspection and interview employees. • Verify relevant records / documents for the implementation.	Twice a year				

Potential Impacts	Monitoring on Mitigation Measures/Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
	Aquatic Environment Discharge of process water. Temperature, Salinity, Dissolved Oxygen, pH, Total dissolved solid, Conductivity	• Test the up-stream, down-stream of river water from Power Plant effluent. The locations are presented in Table 7-14					(Note: Budget for implementation of mitigation measures will be included in the decommissioning cost)
Soil Contamination	• Collecting the solid waste and domestic waste generated during the construction phase in the bin, and temporarily kept in the garbage collection room before disposing to the final dump site. • Regular checking to the storage area	• Verify the implementation by site inspection and interview employees. • Verify relevant records / documents for the implementation.	Daily	IFC's EHS General Guidelines (2007),	Project Proponent/ Contractors/ Subcontractors	Project Proponent	10,000,000 included in decommissioning budget (Budget for monitoring activities, capacity building, inspection fees by MONREC, personnel cost and other logistics cost) (Note: Budget for implementation of mitigation measures will be included in the decommissioning cost
	<u>Soil quality</u> ▪ **Nutrients** Moisture, pH, Soil: Water 1:2.5, EC Soil: Water 1:5, Texture, Organic Carbon %, Humus %, Total N %, CEC, Exchangeable Cations, Available Nutrients ▪ **Heavy Metals** Iron (Fe), Lead (Pb), Cadmium (Cd), Nickle (Ni), Chromium (Cr)	• Test soil at the project site	Twice a year	FAO Soil Bulletin 65.8 guidelines			
Solid waste (Decommissioning wastes, debris)	• monitor decommissioning works (dismantling, demolition) and generation of huge quantity of debris, and systematic disposal and tidying up of the site	• Quantity of solid disposal process • Location: Waste storage areas, demolition site, former fuel storage areas,	One time	IFC's EHS General Guidelines (2007),			8,000,000 included in decommissioning budget

Potential Impacts	Monitoring on Mitigation Measures/Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parameter	Responsible Party		Estimated Budget Per Year (Myanmar Kyats)
					Implementing Organization	Responsible Organization	
		chemical handling zones,					
Biological Environment							
Impact on Terrestrial Fauna and Flora	• Avoiding unnecessary clearing of trees. • Keeping noise levels and vibration of construction activities on the land within limits to reduce the impact on wildlife. • Minimizing the disturbance (including noise and vibration) during the construction, such as timing activities outside of migratory seasons or birds' presence in the area. • Landscaping as proposed in the designs and plants trees that would aesthetic the area. • Planting vegetation in all open areas after the completion of the construction. • Management of the introduced vegetation on completion of the development to restore or improve the Project site.	• Inspection on mitigation measures. • Verifying construction practices.	Weekly	IFC's EHS General Guidelines (2007),	Project Proponent/ Contractors/ Subcontractors	Project Proponent	15,000,000 included in decommissioning budget (Budget for monitoring activities, capacity building, inspection fees by MONREC, personnel cost and other logistics cost) (Note: Budget for implementation of mitigation measures will be included in the decommissioning cost
	• Field Survey for 500m radius area of project site • Natural habitat	• Desk-Based Literature Review • Riverbank that may impact by decommissioning actities • Field Investigations and Survey (quantitative & qualitative) • Expert Involvement (Taxonomic Identification) • Drone Photographs • Resident Interview	Twice a year				

Potential Impacts	Monitoring on Mitigation Measures/Enhancements and Relevant Parameters	Monitoring Methods & Location	Monitoring Frequency	Regulatory Standards for Parame-ter	Responsible Party		Estimated Budget Per Year (Myan-mar Kyats)
					Implementing Organization	Responsible Organization	
Social Environment							
Occupational health and safety	• Monitor OHS measures taken • Monitor provision of First Aid kit and stocking of medicines and drugs • Monitor Emergency Preparedness and Response plan + actions	• Worker satisfaction as measured by staff interviews and com-plaints reported. • Visual Inspection Daily visual inspec-tion Location; At the project site.	Monthly	IFC's EHS General Guidelines (2007),			10,000,000 included in de-commissioning budget
Social issue, social ill-ness	• check social illness/ ill-social be-haviours • monitor conducts of workers • check disciplinary action taken	• Use anonymous sur-veys to assess social issues. • Monitor worker inter-actions in common areas. • Implement a confi-dential reporting sys-tem. • Train supervisors to monitor and address behaviour. • Audit the disciplinary process for fairness. • Allow workers to pro-vide input on the dis-ciplinary system.	Monthly				

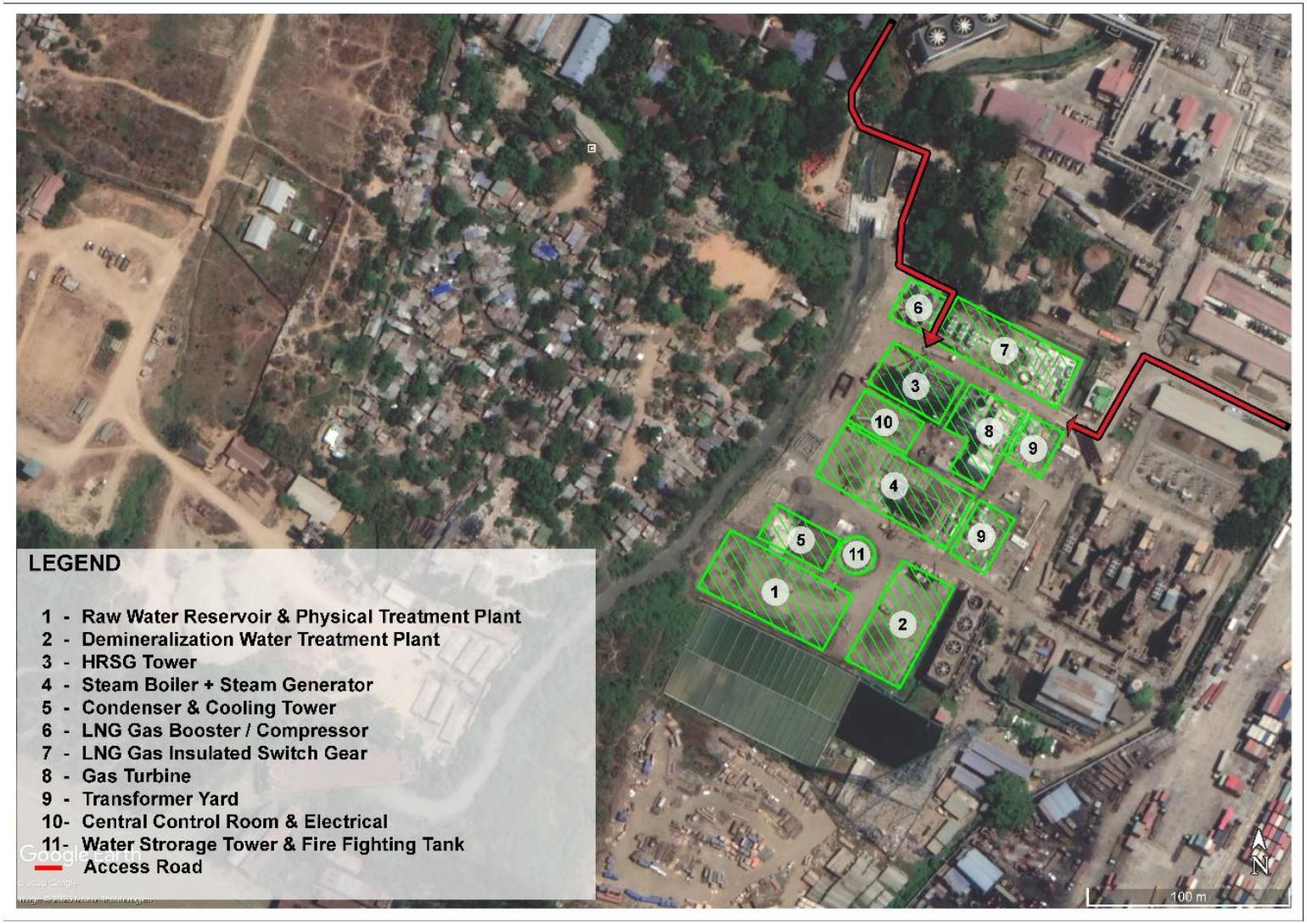


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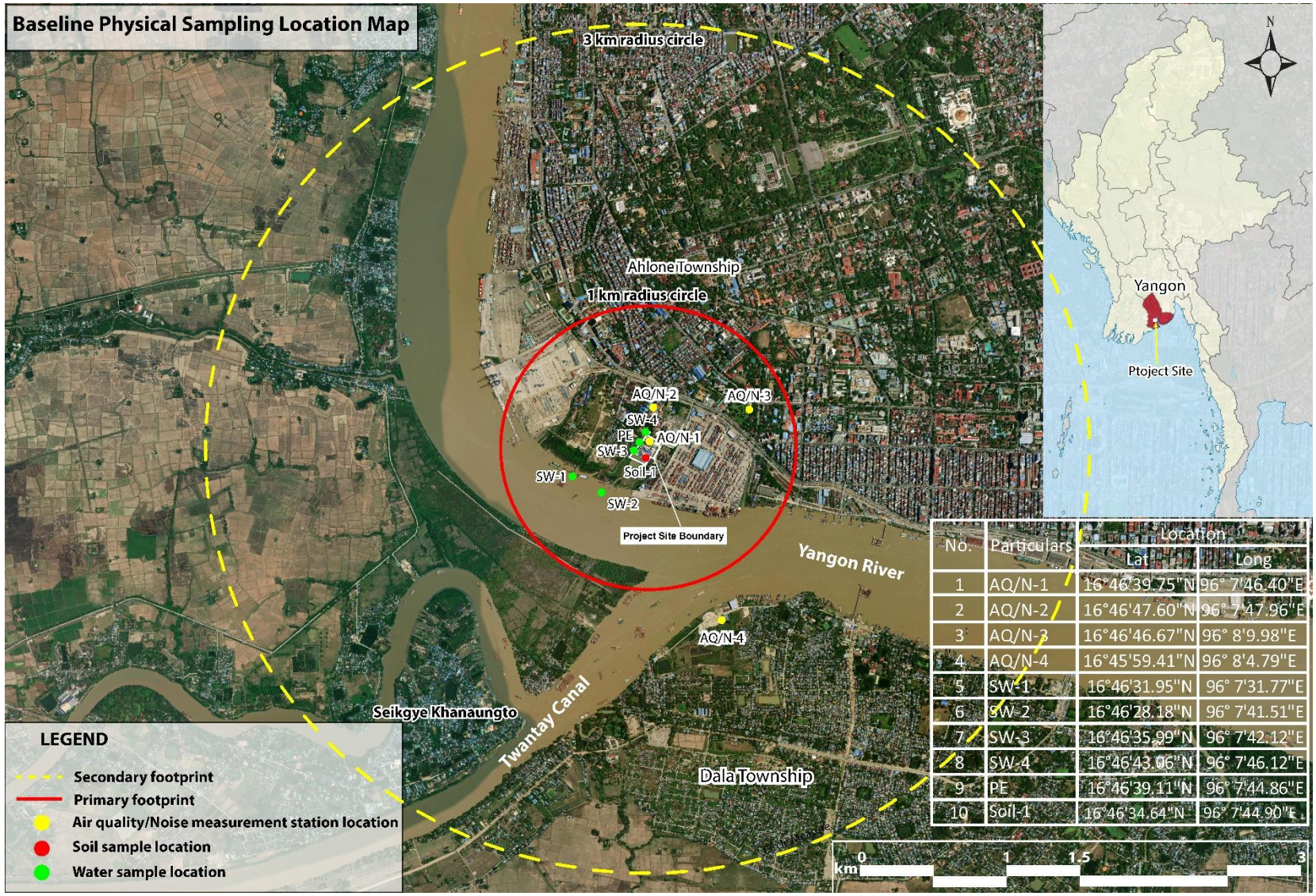
Figure 7-3: Project Layout of Proposed 151.54 MW Combined Cycle Power Plant (Ahlone)



No.	Particulars	Location	
		Lat	Long
1	AQ/N-1	16°46'39.75"N	96° 7'46.40"E
2	AQ/N-2	16°46'47.60"N	96° 7'47.96"E
3	AQ/N-3	16°46'46.67"N	96° 8'9.98"E
4	AQ/N-4	16°45'59.41"N	96° 8'4.79"E
5	SW-1	16°46'31.95"N	96° 7'31.77"E
6	SW-2	16°46'28.18"N	96° 7'41.51"E
7	SW-3	16°46'35.99"N	96° 7'42.12"E
8	SW-4	16°46'43.06"N	96° 7'46.12"E
9	PE	16°46'39.11"N	96° 7'44.86"E
10	Soil-1	16°46'34.64"N	96° 7'44.90"E

Figure 7-4: monitoring spots during construction operation and decommissioning phases

7.5 Environmental Management Sub-Plans

The sub-plans cover all project phases. The following Management Plans are detailed.

1) Air Pollution Control Management Plan
2) Noise Pollution Control Management Plan
3) Wastewater Management Plan
4) Waste Management Plan (including hazardous, non-hazardous waste and e-waste)
5) Corporate Social Responsibility Programme (CSR)

7.5.1 Air Pollution Control Management Plan

Objectives

The main objective is to mitigation/reduce emission (smoke or gaseous emission and fugitive dust emission) and control air quality as practical as possible.

Legal Requirements

The plan will be in line with Environmental Conservation Law (2012), Environmental Conservation Rules (2014), and National Environmental Quality (Emission) Guideline – relevant standards for air emissions (2015).

Implementation Schedule

The plan will be implemented for the construction, operation, and decommissioning phases of project.

Management Actions

The following mitigation measures will be implemented for reducing the air and dust emissions generated from the construction, operation (including maintenance work) and decommissioning phases of the project.

- ✓ Restricting speed control of earth moving machines, transport buses and traffic within the project site;
- ✓ Pouring water on road ways at site and excavated area, cutting area, filling area and compacting area;
- ✓ Installing a wash deck at the exit way of the site to remove mud from vehicles which may become dust around the site and along the main road;
- ✓ Installing trucks with proper covers when carrying sand, river shingles and cement to avoid falling along the main road and emission of particulates;
- ✓ Erecting notice and caution signs of “Dusty Area” around the project areas for the awareness of the people;
- ✓ Providing the workers with facial masks to wear in the project site;
- ✓ Regular maintenance of construction plants, vehicles, machineries, and equipment;
- ✓ Prohibiting unnecessary driving and moving at site and idling of vehicles;
- ✓ Prohibition of open fire burning of materials or wastes;
- ✓ Proper storage of chemical and emitted construction materials;
- ✓ Conducting training to raise the awareness of drivers, operators and staff on greenhouse emissions and mitigation measures;
- ✓ Formulating the construction management procedures including the efficient use of construction vehicles and machineries to reduce greenhouse gas emissions during the construction phase;
- ✓ Designing and constructing the site offices as much as possible to get the natural light and ventilation.

For the operation phase, the investors of industries and factories will be encouraged to adopt the following mitigation measures.

- ✓ Controlling the emissions of the factories and industries by different technologies and technical measures to follow Guidelines for Air Emissions described in National Environmental Quality Emission Guidelines (For the parameters not included in the National Environmental Quality Emission Guidelines, “Air Quality Guidelines for Europe, 1997. WHO Regional Publications, European Series No. 23. World Health Organization” will be followed);
- ✓ All fuel will be sourced from trusted sources that have employed the necessary steps to eliminate lead and reduce Sulphur content;

Table 7-9: Air Pollution Control Monitoring Plan

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
Restricting speed control of earth moving machines, transport buses and traffic within the project site	Construction and Decom-missioning	Vehicles moving in construction site	Measuring vehicular speed	Construction Site Supervisor (Contractor)	3 times a week in dry season Once a week in wet season
Pouring water on road ways at site and ex-cavated area, cutting area, filling area and compacting area	Construction and Decom-missioning	Areas mentioned in construction site	Observation Inspection	Construction Site Supervisor (Contractor)	Daily in dry season Once a week in wet season
Installing a wash deck at the exit way of the site to remove mud from vehicles	Construction and Decom-missioning	Wash Deck	Observation Inspection	Construction Site Supervisor (Contractor)	Two times a week
Installing trucks with proper covers when carrying sand, river shingles, cement, exca-vated earth, construction debris	Construction and Decom-missioning	Trucks carrying sand, river shingles, ce-ment, excavated earth, construction debris	Observation Inspection	Construction Site Supervisor (Contractor)	whenever these trucks come to the site and leave from the site
Erecting notice and caution signs of “Dusty Area” around the project areas for the awareness of the people	Construction and Decom-missioning	Around Construction Site	Observation Inspection	Construction Site Supervisor (Contractor)	Once
Providing the workers with facial masks to wear in the project site	Construction and Decom-missioning	Workers wearing fa-cial masks	Observation Inspection	Construction Site Supervisor (Contractor)	Whenever workers need to wear masks
Regular maintenance of construction plants, vehicles, machineries, and equipment	Construction and Decom-missioning	Construction plants, vehicles, machiner-ies, and equipment Maintenance records	Observation Inspection	M&E Officer and Construction Site Super-visor (Contractor)	Weekly
Prohibiting unnecessary driving and moving at site and idling of vehicles	Construction and Decom-missioning	Vehicles at site	Observation Inspection	Construction Site Supervisor (Contractor)	Daily

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
Proper storage of chemical and emitted construction materials	Construction and Decommissioning	Storage area	Observation Inspection	Store Supervisor (Contractor)	Daily
Conducting training to raise the awareness of drivers, operators and staff on greenhouse emissions and mitigation measures	Construction and Decommissioning	Number of trainings conducted Training Manuals	Recording	Environment, Health and Safety Officer (Contractor)	Every four months
Formulating the construction management procedures including the efficient use of construction vehicles and machineries to reduce greenhouse gas emissions during the construction phase	Construction and Decommissioning	Construction Management Procedures and Guidelines	Inspection	Environment, Health and Safety Officer and Site Engineer (Contractor)	Once at least (if needed two or three times for revision)
Using natural light as much as possible (and using energy efficient electrical appliances like energy - saving light bulbs)	Construction and Decommissioning	Construction Site Office Construction Site	Observation Inspection	Administrative Officer and Construction Site Supervisor (Contractor)	Monthly
	Operation	Office in MAPP	Observation Inspection	Administrative Officer (Developer)	Weekly
Keeping windows shut when HVAC is in use, but employing natural ventilation whenever possible	Construction	Construction Site Office	Observation Inspection	Administrative Officer (Contractor)	Daily
	Operation	Office in MAPP	Observation Inspection	Administrative Officer (Developer)	Daily
Turning off the lights and computer and office appliances when leaving the office	Construction	Construction Site Office	Observation Inspection	Administrative Officer (Contractor)	Daily
	Operation	Office in MAPP	Observation Inspection	Administrative Officer (Developer)	Daily
Recycling and/or reusing as many waste materials as possible	Construction	Wastes generated from Construction Site and Office	Observation Inspection	Environmental, Health and Safety Officer and Administrative Officer (Contractor)	Weekly
	Operation	Wastes generated from Office in MAPP	Observation Inspection	Environmental, Health and Safety Officer and Administrative Officer (Developer)	Weekly
	Construction	Construction Site Office	Observation Inspection	Administrative Officer (Contractor)	when air conditioners and refrigerators

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
Using the environmentally friendly air conditioners and refrigerators to avoid or reduce the emission of fluorinated gases	Operation	Office in MAPP	Observation Inspection	Administrative Officer (Developer)	are necessary to be used

Air Quality Monitoring Locations and Parameters to be measured

Table 7-10: Air Quality Monitoring Locations and Parameters to be measured

Code	Parameter	NEQG Guideline Values	Latitude (North)	Longitude (East)	Methods
AQ 1	PM_{10} $PM_{2.5}$ NO_2 SO_2 CO O_3	24hr -50 µg/m^3 24hr -25 µg/m^3 1hr-200 µg/m^3 24hr-20 µg/m^3 8hr-9 ppm (US EPA) 8hr max- 100 µg/m^3	16°46'39.75"N	96° 7'46.40"E	• Device: Haz-scanner EPAS Air Monitoring Station • Duration: Recording continuously at 1-minute intervals 24 hrs period • Data analysis: Haz-scanner Data analysis software, Microsoft Office
AQ 2			16°46'47.60"N	96° 7'47.96"E	
AQ 3			16°46'46.67"N	96° 8'9.98"E	
AQ 4			16°45'59.41"N	96° 8'4.79"E	
AQ 5 (Stack Emission)	NO_x	100 mg/Nm^3 (Combustion turbine) 240 mg/Nm^3 (Boiler)	16°46'39.64"N	96° 7'46.90"E	• CEMS (Continuous emission monitoring systems)
	SO_2	-			
	Smoke	-			

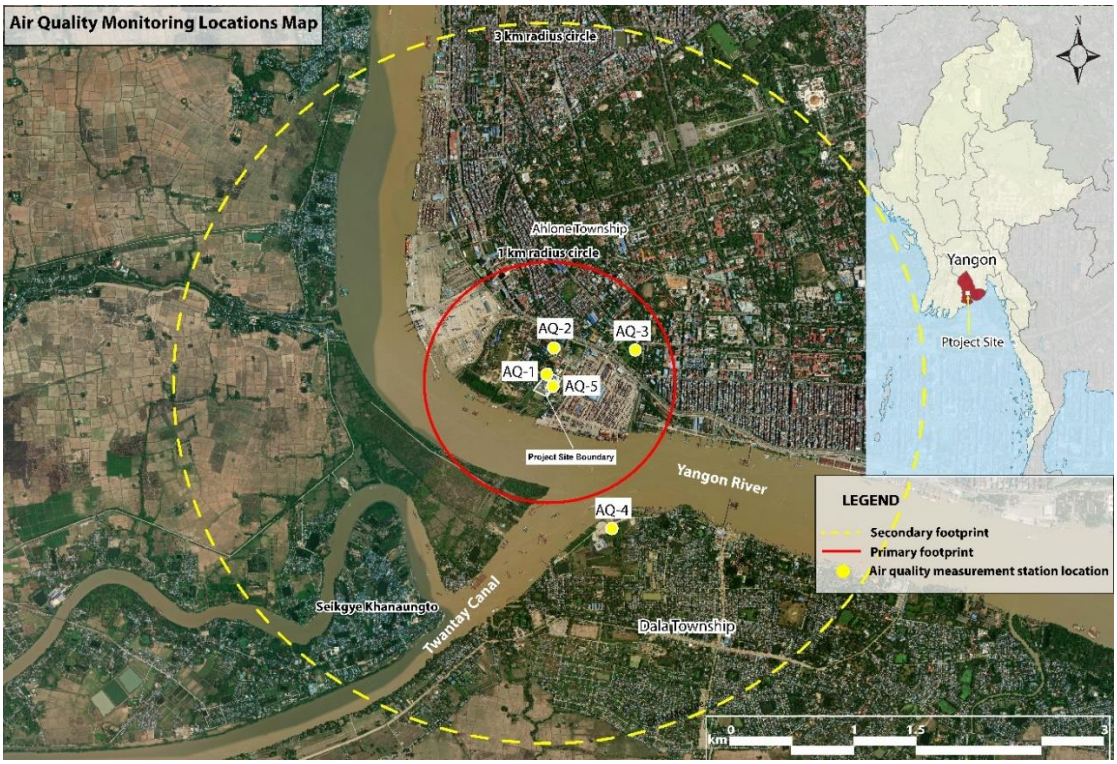


Figure 7-5: Air Quality Monitoring Locations

Budget and Responsibilities

Budget

For the construction phase, total 70,000,000 Ks per year is budgeted for implementing Air Pollution Control Management Plan.

For the operation phase, total 75,000,000 Ks per year is budgeted for implementing Air Pollution Control Management Plan.

For the decommissioning phase, total 40,000,000 Ks is budgeted for implementing Air Pollution Control Management Plan.

Responsibilities

For the construction and decommissioning phases, the contractors will be responsible for implementing Air Pollution Control Management Plan. For the operation phase, the developer will be implementing Air Pollution Control Management Plan.

7.5.2 Noise Pollution Control Management Plan

Objectives

The objective of the plan is to reduce and mitigate the noise level which can be generated from the project activities.

Legal Requirements

The plan will be in line with Environmental Conservation Law (2012), Environmental Conservation Rules (2014), and National Environmental Quality (Emission) Guideline – relevant standards for noise emissions (2015).

Implementation Schedule

The plan will be implemented for the construction, operation, and decommissioning phases of project.

Management Actions

The following mitigation measures will be implemented for reducing the noise emissions generated from the construction, operation (including maintenance work) and decommissioning phases of the project.

- ✓ Providing training to the drivers and operators of construction vehicles and machineries how to reduce the noise from their operations;
- ✓ Restrict/limit vehicular movement to mitigate vibration.
- ✓ Restriction of the construction activities in night times;
- ✓ Regular maintenance of vehicles and machineries; keep machinery and vehicle well-operated, well-maintained, and well-lubricated to mitigate noise and vibration.
- ✓ Wearing the ear mufflers (hearing protection devices) to protect the noise and vibration;
- ✓ Maintaining the noise within the noise level (National Environmental Quality Emission Guidelines) set by Ministry of Natural Resources and Environmental Conservation;
- ✓ Install sound absorb, sound proof engines, silencer, muffler where possible. and proper maintenance;
- ✓ Regular checking and maintenance to silencers of engines;
- ✓ Conserving trees around the site as some buffers against noise;
- ✓ Planning activities in consultation with local communities so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance;
- ✓ The outside standard working hours such as weekend, evening or night-time works will be controlled and limited;
- ✓ Avoiding or minimizing project transportation through community areas.
- ✓ Procure eco-friendly machinery that emits lower noise level in the first place.
- ✓ Ensure that foundations for machinery/equipment are stable to mitigation vibration.
- ✓ Create smooth road surface to mitigate vibration.
- ✓ Develop green belt (plant fast growing trees) around the compound to abate noise.
- ✓ Provide PPE e.g., ear muffs, ear protectors where necessary.

Monitoring Program

Monitoring will be carried out for construction, operation, and decommissioning phases.

Table 7-11: Noise Pollution Control Monitoring Plan

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
Providing training to the drivers and operators of construction vehicles and machineries how to reduce the noise from their operations Restrict/limit vehicular movement to mitigate vibration.	Construction and Decommissioning	Trainings conducted Training manuals Drivers' and operators' work after having training	Observation Inspection	Construction Site Supervisor (Contractor)	Weekly
Restriction of the construction activities in night times	Construction and Decommissioning	Construction site	Observation Inspection	Construction Site Supervisor (Contractor)	Weekly
Regular maintenance of vehicles and machineries Keep machinery and vehicle well-operated, well-maintained, and well-lubricated to mitigate noise and vibration.	Construction and Decommissioning	Vehicles and machineries Record of maintenance	Observation Inspection	Construction Site Supervisor (Contractor)	Weekly
	Operation	Vehicles and machineries Record of maintenance	Observation Inspection	Administrative Officer and M&E Officer (Developer)	Weekly
Wearing the ear mufflers (hearing protection devices) to protect the noise and vibration	Construction and Decommissioning	Workers wearing ear protection on site	Observation Inspection	Construction Site Supervisor (Contractor)	Whenever workers need to wear ear protection
	Operation	Staff wearing ear protection on site	Observation Inspection	Supervisor (Developer)	Whenever workers need to wear ear protection
Maintaining the noise within the noise level (National Environmental Quality Emission Guidelines) set by Ministry of Natural Resources and Environmental Conservation	Construction and Decommissioning	Sound level at the sensitive receptors	Measuring	Environment, Health and Safety Officer and Site Engineer (Contractor)	Every six months
	Operation	Sound level at the sensitive receptors	Measuring	Environment, Health and Safety Officer and Site Engineer (Developer)	Every six months
Using sound absorb, sound proof engines at construction site and proper maintenance	Construction and Decommissioning	Construction site	Observation Inspection	Construction Site Supervisor and M&E Officer (Contractor)	Weekly

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
		Record of maintenance	Hearing		
	Operation	Construction site Record of maintenance	Observation Inspection Hearing	Supervisor and M&E Officer (Developer)	Weekly
Regular checking and maintenance to silencers of engines	Construction and Decommissioning	Sound generated from engines Record of maintenance of Silencers of engines	Hearing Observation Inspection	Construction Site Supervisor (Contractor)	Weekly
	Operation	Sound generated from engines Record of maintenance of Silencers of engines	Hearing Observation Inspection	Supervisor (Developer)	Weekly
Conserving trees around the site as some buffers against noise	Construction and Decommissioning	Trees around the site	Observation Inspection	Environment, Health and Safety Officer (Contractor) in cooperation with local community and authority	Monthly
	Operation	Trees around the site	Observation Inspection	Environment, Health and Safety Officer (Developer) in cooperation with local community and authority	Monthly
Planning activities in consultation with local communities so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance	Construction and Decommissioning	Consultation with local communities	Documenting Recording	Environment, Health and Safety Officer, Administrative Officer and Site Engineer (Contractor)	Whenever local community is needed to be informed.
	Operation	Consultation with local communities	Documenting Recording	Environment, Health and Safety Officer and Administrative Officer (Developer)	Whenever local community is needed to be informed.

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
Controlling and limiting the outside standard working hours such as weekend, evening, or night-time works	Construction and Decommissioning	Work Schedule and Roster	Inspection	HR Officer (Contractor)	Weekly
	Operation	Work Schedule and Roster	Inspection	HR Officer (Developer)	Weekly
Avoiding or minimizing project transportation through community areas.	Construction and Decommissioning	Transportation Route	Observation Inspection	Administrative Officer and Construction Site Supervisor (Contractor)	Monthly
	Operation	Transportation Route	Observation Inspection	Administrative Officer (Developer)	Monthly

Budget and Responsibilities

Budget

Construction phase: Total budget for implementing the Noise Pollution Control Management Plan is already covered in Air Quality Management and Monitoring Plan for construction phase.

Operation phase: Total budget for implementing the Noise Pollution Control Management plan is already covered in Air Quality Management and Monitoring Plan for operation phase.

Decommissioning phase: Total budget for implementing the Noise Pollution Control Management Plan is already covered in Air Quality Management and Monitoring Plan for decommissioning phase.

Responsibilities

For the construction and decommissioning phase, the contractors will be responsible for implementing Noise Pollution Control Management Plan. For the operation phase, the developer will be implementing Noise Pollution Control Management Plan.

Noise Monitoring Locations and Parameters to be measured

When monitoring the generated noise from the project, noise assessment will be carried out at the same 4 locations where baseline measuring was conducted. That is to determine whether the mitigation measures taken by project do not exceed the applicable noise level guideline at the most sensitive point of reception.

Table 7-12: Noise Monitoring Locations and Parameters to be measured

Code	Parameter	NEQG Guideline Value (1hr) Leq in dbA	Latitude (North)	Longitude (East)	Methods
NQ 1	Noise level, 1-hour average noise level, equivalent continuous sound level (L_{eq} in dbA) day and night time.	• Day time 55 and night time 45 dbA for residential, institutional, and educational • 70 dbA (day and night) time for industrial and commercial area	16°46'39.75"N	96° 7'46.40"E	• Haz-scanner EPAS Air Monitoring Station and Sper 850015 scientific sound meter • Duration: Recording continuously at 1-minute intervals 24 hrs period • Data analysis: Haz-scanner Data analysis software, Microsoft Office
NQ 2			16°46'47.60"N	96° 7'47.96"E	
NQ 3			16°46'46.67"N	96° 8'9.98"E	
NQ 4			16°45'59.41"N	96° 8'4.79"E	

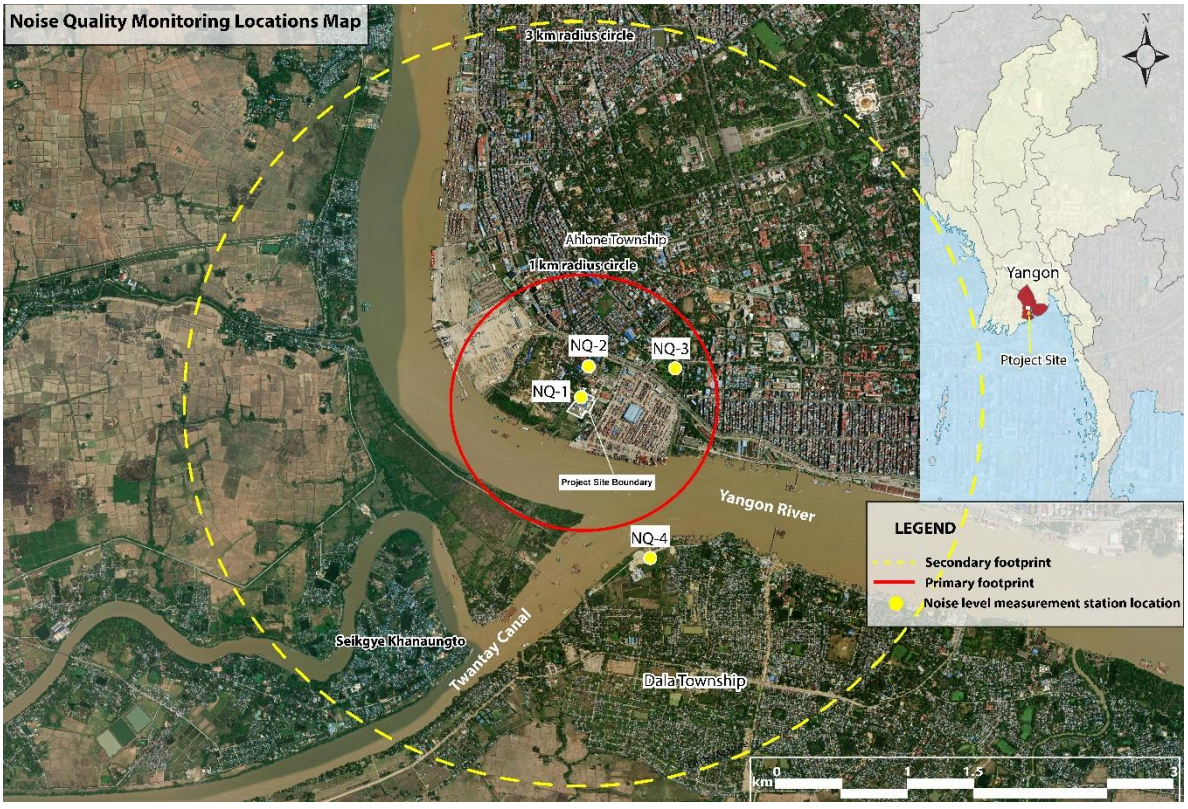


Figure 7-6: Noise Quality Monitoring Locations

7.5.3 Wastewater Management Plan

Objectives

The objective of the plan is to manage the wastewater generated from power plant is not to impact the river water quality and to manage the wastewater (effluent).

Legal Requirements

The plan will be in line with Environmental Conservation Law (2012), Environmental Conservation Rules (2014), NEQEG emission guideline values (2015) prescribed by ECD, NEQ(E)G-2.1.1(Thermal Power Effluent Levels)

Implementation Schedule

The plan will be implemented for the construction, operation, and decommissioning phases of project.

Management Actions

The following practices will be exercised as management actions to

- ✓ Avoid disposing of all waste, (solid and liquid) into the stream such as installation and construction of drainage structure properly;
- ✓ Ensure that all activities do not impact the Harbi Creek
- ✓ Building the sedimentation basin on a construction site to capture the disturbed soil which is washed off during rainfall and lead to protection of the water quality of surface and ground water;
- ✓ Constructing sand traps to settle the sand at the bottom and store the deposited sand;
- ✓ Regular maintenance and check of the machineries, vehicles and sources which can cause oil spill and hazardous chemical spills (if found, the immediate repair and cleansing will be conducted);
- ✓ Prevent oil spills or oil spread into the stream; keep fuel depot away from the stream.
- ✓ Systematic storage of fuels and filling station at construction site yard compound, handling and disposal of new oil and used oil waste;
- ✓ Providing the proper sanitation system for the construction workers and project staff;
- ✓ Preventing sewer leakage and implementation of adequate final disposal of sludge as permitted by the local municipality; Black water for toilets will end up in septic tanks and soak pits.
- ✓ Checking all development/activity - related machinery thoroughly not to leak oils on the ground and regular maintenance of the machinery;
- ✓ Carrying out all maintenance works in a designated area and such areas will be cemented and enclosed to avoid storm water from carrying away oil and form wastewater;
- ✓ Prevent erosion (especially along the bank during rainy season).
- ✓ Apply recirculation of water (for general conservation of water); deploy cooling tower and series of cooling ponds.
- ✓ As water is mostly recirculated industrial wastewater is not a serious issue.
- ✓ Set up network of drainage system for domestic wastewater rain influx and storm water.
- ✓ Domestic wastewater (brown water) from office, dormitory, kitchen, baths etc. will end up in waste water pond and dry up (no special treatment required).

Monitoring Program

Monitoring will be carried out for construction, operation, and decommissioning phases.

Table 7-13: Wastewater Monitoring Plan

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
Installation and construction of drainage structure properly	Construction	Drainage at Construction Site	Observation Inspection	Environment, Health and Safety Officer and Site Engineer (Contractor)	Weekly during construction
	Operation	Drainage at respective areas	Observation Inspection	Environment, Health, and Safety Officer (Developer)	Monthly
Building the sedimentation basin on a construction site Prevent erosion (especially along the bank during rainy season).	Construction and Decommissioning	Construction Site Quality of Construction Wastewater	Observation Inspection Measuring	Site Engineer (Contractor) Environment, Health, and Safety Officer (Contractor)	Once Every six months
Constructing sand traps to settle the sand at the bottom and store the deposited sand	Construction	Construction Site	Observation Inspection	Site Engineer (Contractor)	Once
Regular maintenance and check of the machineries, vehicles and sources which can cause oil spill and hazardous chemical spills Prevent oil spills or oil spread into the stream; keep fuel depot away from the stream.	Construction and Decommissioning	Machineries, vehicles, and sources Record of maintenance	Observation Inspection	Environment, Health and Safety Officer and M&E Officer (Contractor)	Weekly
	Operation	Machineries, vehicles, and sources Record of maintenance	Observation Inspection	Environment, Health and Safety Officer and M&E Officer (Developer)	Weekly
Systematic storage of fuels, handling and disposal of new oil and used oil waste	Construction and Decommissioning	Store at Construction Site	Observation Inspection	Store Manager (Contractor)	Weekly
Providing the proper sanitation system for the construction workers and staff	Construction and Decommissioning	Sanitation System (toilet, septic tank, water supply, collection, and disposal system)	Observation Inspection	Environment, Health and Safety Officer and Site Engineer (Contractor)	Monthly

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
	Operation	Sanitation System (toilet, septic tank, water supply, collection, and disposal system)	Observation Inspection	Environment, Health, and Safety Officer (Developer)	Monthly
Maintaining on-site sanitation facilities in good condition and encouraging to use	Construction	Sanitation facilities	Observation Inspection	Environment, Health and Safety Officer and M&E Officer (Contractor)	Monthly
	Operation	Sanitation facilities	Observation Inspection	Environment, Health and Safety Officer and M&E Officer (Developer)	Monthly
Preventing sewer leakage and implementation of adequate final disposal of sludge as permitted by the local municipality	Construction	Sewer Disposal of sludge	Observation Inspection	Environment, Health and Safety Officer and M&E Officer (Contractor)	Monthly
	Operation	Sewer Disposal of sludge	Observation Inspection	Environment, Health and Safety Officer and M&E Officer (Developer)	Monthly
Checking all development/activity - related machinery thoroughly not to leak oils on the ground and regular maintenance of the machinery	Construction	Machineries Record of machinery maintenance	Observation Inspection	Environment, Health and Safety Officer and M&E Officer (Contractor)	Weekly
Carrying out all maintenance works in a designated area and such areas will be cemented and enclosed to avoid storm water from carrying away oil and form wastewater	Construction	Maintenance Works Designated area for maintenance works	Observation Inspection	Environment, Health and Safety Officer and M&E Officer (Contractor)	Weekly
	Operation	Maintenance Works Designated area for maintenance works	Observation Inspection	Environment, Health and Safety Officer and M&E Officer (Developer)	Weekly
Managing car wash areas and other places handling oil activities within the site and controlling the drains from these areas	Construction and Decommissioning	Car Wash Areas and other places handling oil activities and drains connected	Observation Inspection	Environment, Health and Safety Officer, and Site Engineer (Contractor)	Weekly

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
	Operation	Car Wash Areas and other places handling oil activities and drains connected	Observation Inspection	Environment, Health and Safety Officer, and Cleans-ing Supervisor (Developer)	Weekly
Treating domestic and industrial wastewater to reach the standards stip-ulated in National Environmental Quality (Emission) Guidelines before disposal	Operation	Quality of treated wastewater	Measuring at laboratory	Environment, Health and Safety Officer (Developer)	Every six months
	Operation	Quality of treated wastewater	Measuring at laboratory	Environment, Health and Safety Officer (Developer)	Every six months
Ensure that all activities do not impact the Harbi creek	Operation	Quality of treated wastewater	Measuring at laboratory	Environment, Health and Safety Officer (Developer)	Every six months
Apply recirculation of water (for general conservation of water); deploy cooling tower and series of cooling ponds.	Operation	Quality of treated wastewater	Measuring at laboratory	Environment, Health and Safety Officer (Developer)	Every six months
Adhere to the principle of water conser-vation; educate staffs for this.	Construction Operation	Construction Site Power plant	Number of Trainings conducted and train-ing contents Workers' and staff's performance	Environment, Health and Safety Officer (Developer)	Every six months

Wastewater Quality Monitoring Locations and Parameters to be measured

In order to control environmental impact caused by wastewater from the power plant during operation phase the wastewater will be monitored according to parameters set by National Environmental Quality (Emission) Guidelines for Thermal Power. Water quality will be assessed and comparing with the values of National Environmental Quality (Emission) Guidelines - section 2.1.1.

Table 7-14: Wastewater Quality Monitoring Locations and Parameters to be measured

Sr	Parameter	Unit	NEQG guideline values	Method/Device	Location
1	Arsenic,	mg/l	0.5	*Colorimetric Method*	Total 5 water samples • 1 water sample PE (power plant effluent water) in outlet of power plan drain) 16°46'39.11"N, 96° 7'44.86"E • 2 water samples in Up Stream and Down-stream of Yangon River. SW-1, 16°46'31.95"N, 96° 7'31.77"E, SW-2, 16°46'28.18"N, 96° 7'41.51"E • 2 water samples in Up Stream and Down-stream of Harbi Creek SW-3, 16°46'35.99"N, 96° 7'42.12"E, SW-4, 16°46'43.06"N, 96° 7'46.12"E
2	Cadmium	mg/l	0.1	*Adaptation of the Oxalate Method*	
3	Chromium (total),	mg/l	0.5	*Inductively Coupled Plasma-Optical Emission Spectrometric Method*	
4	Copper	mg/l	0.5	*Colorimetric Method*	
5	Iron	mg/l	1	*APHA 3500 -Fe B (Phenanthroline Method)*	
6	Lead	mg/l	0.5	*Lead Trak Fost Colum Extraction Method*	
7	Mercury	mg/l	0.005	*Inductively Coupled Plasma-Optical Emission Spectrometric Method*	
8	Oil and grease	mg/l	10	*Standard Method of water and Waster Analysis*	
9	pH	S.U[a]	6 - 9	*APHA 4500 - H+ B (USA Standard Method 22nd Edition)*	
10	Temperature increase	°C	<3[b]	*HANNA HI98192 combo meter*	
11	Total residual chlorine	mg/l	0.2	*APHA 4500 - Cl (Iodometric Method)*	
12	Total suspended solids	mg/l	50	*Standard Method of water and Waster Analysis*	
13	Zinc	mg/l	1	*Colorimetric Method*	

[a] *Standard unit*

[b] *Temperature increases due to discharge of once-through cooling water*

To monitor the water quality, water samples will be taken from Yangon River (Hlaing River) and at the point where water drains out from Power plant to Harbi Creek,

Photo 7-1: The point where water drains out from Power Plant into Harbi Creek

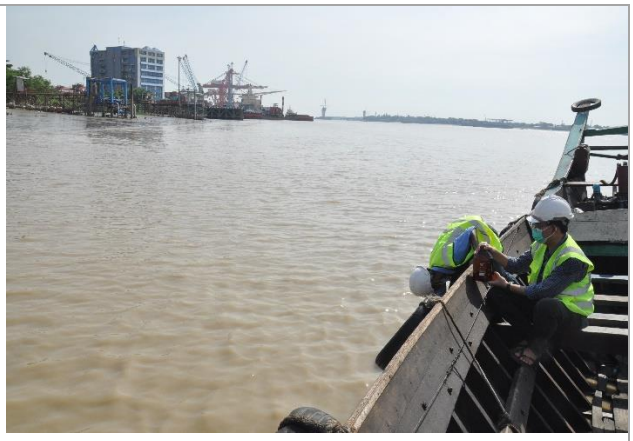


Photo 7-2: Taking water sample from Yangon River

Budget and Responsibilities

Budget

For the construction phase, total 35,000,000 Ks per year is budgeted for implementing Wastewater Management Plan.

For the operation phase, total 45,000,000 Ks per year is budgeted for implementing Wastewater Management Plan.

For the decommissioning phase, total 20,000,000 Ks is budgeted for implementing Wastewater Management Plan.

Responsibilities

For the construction and decommissioning phases, the contractors will be responsible for implementing Wastewater Management Plan. For the operation phase, the developer will be implementing Wastewater Management Plan.

- ✓ Controlling greenhouse gas emissions by energy use efficiency, process modification, selection of fuels or other materials, the processing of which may result in less emission, application of emission control techniques, if possible;

  Staff/employee of offices and other development/facilities will be encouraged to do the following practice:
- ✓ Using natural light as much as possible (and using energy efficient electrical appliances like energy - saving light bulbs);
- ✓ Keeping windows shut when HVAC is in use, but employing natural ventilation whenever possible;
- ✓ Turning off the lights and computer when leaving the office;
- ✓ Recycling and/or reusing as many waste materials as possible;
- ✓ Using the environmentally friendly air conditioners and refrigerators to avoid or reduce the emission of fluorinated gases.

Monitoring Program

Monitoring will be carried out for construction, operation, and decommissioning phases.

7.5.4 Waste Management Plan

Objectives

The objective of the plan is to manage the waste hazardous, non-hazardous waste, and e-waste generated from project activities to avoid any environmental damages and to monitor the effectiveness of the management plan and actions.

Legal Requirements

The plan will be in line with Environmental Conservation Law (2012), Environmental Conservation Rules (2014), National Environmental Policy of Myanmar (2019), National Waste Management Strategy and Master Plan for Myanmar (2018 – 2030).

Implementation Schedule

The plan will be implemented during the construction and operation phases of project.

Management Actions

The following management actions for hazardous and non-hazardous wastes will be carried out. The waste management will be sustainable and based on the principle of 3 Rs (Reduce, Reuse, Recycle) practice.

Non-hazardous waste management

For non-hazardous wastes, the following practices will be exercised as management actions:

- ✓ Avoidance of unnecessary cutting and removing of vegetation plants;
- ✓ Producing a precise construction drawing to avoid unnecessary cutting and filling of earth work and excavation work;
- ✓ Ensuring calculation and estimation of materials requirement to avoid excessive purchase;
- ✓ Ensuring purchase of materials and stacking at collection yard and ware houses;
- ✓ Educating workers to manage waste properly;
- ✓ Providing facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure;
- ✓ Reusing of construction materials and office materials to reduce the amount and volume of construction debris (for example, using formwork for several times, reusing the excavated earth for backfilling, and reusing scrap papers for office use and printing both sides whenever possible);
- ✓ Recycling of solid waste to reduce the amount and volume of construction debris (for example, sending recyclable solid waste to local recyclers);
- ✓ Providing dust bins at appropriate places for recyclables and non-recyclable wastes;
- ✓ Transporting waste to the waste transfer plot which has transfer container and trailer;
- ✓ Designing and constructing the waste transfer plot with drainage of paved areas and adequate water hydrants for maintenance of cleanliness and fire control and routes for garbage collection trucks for easy access;

The domestic waste from power plant will be segregated as recyclables and non-recyclables. These wastes would be disposed in the relevant dust bins. The storage of solid waste shall be stored in solid waste receptacles or trash containers which must be large enough to facilitate storage and collection.

The waste generated from the plant would be collected daily by the cleaners and disposed to YCDC garbage collection system. The system requires use of a container, truck container pick-up equipment, and replacement of the container.

The waste generated from the plant will be categorized as hazardous waste, non-hazardous waste, toxic waste, and chemical waste and e-waste temporarily stored in the bin center separately based on the type of waste.

Hazardous waste management

For hazardous wastes the following practices will be exercised as management actions:

- ✓ Educating workers and staff about hazardous wastes and waste management;
- ✓ Identifying and characterizing the waste as hazardous waste;
- ✓ Providing safety shoes, masks, face shields and tools with the workers/cleaners (who have been trained to manage hazardous wastes) to handle the waste;
- ✓ Segregation and collection will be made on the day of generation of the waste and sending for the transit storage for facilitating the storage at the place of "earmarked" storage point;
- ✓ Storing hazardous waste in the specific containers used for storage (the date of storage is stated specifically, and each container contains the label and tag of the waste stored);
- ✓ Clear mention of the content and composition of the chemicals for hazardous chemicals;
- ✓ The waste storage area will be away from the place of generation and specifically marked for the purpose of storage;
- ✓ The waste storage area will have a hard, impermeable floor with drainage, and designed for cleaning/disinfection with available water supply;
- ✓ The waste storage area will be secured by locks with restricted access and designed for access and it will also be protected from sun, and inaccessible to animals/rodents.
- ✓ Cleaning the waste storage area by authorized cleaning staff at fixed intervals;
- ✓ Avoiding the use of containers with leakage;
- ✓ Keeping hazardous waste containers always closed except to add waste;
- ✓ Storing hazardous wastes with secondary containment;
- ✓ Making space available in between the containers of different characteristics;
- ✓ Having all the equipment for controlling the pollution, water – spray systems, and alarm systems to caution others at the storage area;
- ✓ Carrying out regular inspections to find the deficiencies of the storage systems;
- ✓ Availability of an extra number of containers at the place of storage to meet the exigencies of the demand or excess generation of the wastes;
- ✓ Maximum quantity permissibility depends upon the type and characteristics of the waste intended to be stored;
- ✓ The maximum quantity will not be more than a truckload;
- ✓ Taking care of loading waste container to the transportation truck;
- ✓ Availability of first-aid kit and cleaning materials for emergency spills.

7.5.4.1 E-Waste management

The following will be implemented for the management the use of electronic devices and when the project finances electrical/electronic equipment (computers, tablets, mobile phones, laptops, etc.) are replaced, irreparable or at their end of life.

- ✓ Procure Electronic devices from credible manufactures to avoid purchasing second hand, refurbished or obsolete devices with a short shelf life or already categorized as E-Waste. If possible, select sources offering repair and take back schemes. Ensure insurance coverage and electronic physical protective devices are fitted.
- ✓ Re-evaluating the used products.
- ✓ Reusing large electronics
- ✓ Donating used electronics to social programs
- ✓ E-waste will be handed over to the administration department and recorded.
- ✓ Place it in the E-waste storage bins. The bins should be placed under covered area to protect it from sunlight and rain.
- ✓ Hand over E-waste to the suitable E-waste collectors, dismantlers, and recyclers.

Monitoring Program

Monitoring will be carried out for construction, operation, and decommissioning phase.

Table 7-15: Monitoring Plan for Hazardous and Non-hazardous Waste

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
Non-hazardous Waste					
Avoidance of unnecessary cutting and removing of vegetation plants	Construction	Construction Site	Observation Inspection	Environment, Health and Safety Officer and Site Engineer (Contractor)	Daily during site clearing
Producing a precise construction drawing to avoid unnecessary cutting and filling of earth work and excavation work	Construction	Drawings	Observation Inspection	Environment, Health and Safety Officer and Site Engineer (Contractor)	Once before site clearing and earthwork
Ensuring purchase of materials and stacking at collection yard and warehouses	Construction	Collection Yard Warehouse	Observation Inspection	Environment, Health and Safety Officer, Store Keeper, and Site Engineer (Contractor)	Monthly
Providing dust bins at appropriate places for different waste (recyclables, non-recyclables and kitchen waste)	Construction	Construction Site	Observation Inspection	Environment, Health and Safety Officer, Site Engineer and Cleaner (Contractor)	Daily
Providing facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure	Construction	Construction Site	Observation Inspection	Environment, Health and Safety Officer and Site Engineer (Contractor)	Daily
If possible, the recycling and reusing of solid waste will be done to reduce the amount and volume of solid waste	Construction and Decommissioning	Construction Site and Site Office	Observation Inspection	Environment, Health and Safety Officer and Site Engineer (Contractor)	Monthly
	Operation	Power Plant	Observation Inspection	Environment, Health and Safety Officer (Developer)	Monthly
Designing and constructing the transfer plot with drainage of paved areas and adequate water hydrants	Construction	Design of Transfer plot Construction site of Transfer plot	Observation Inspection	Environment, Health and Safety Officer and Site Engineer (Contractor)	Two or three times each during design stage and construction stage

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
Designing and constructing the bin centre including necessary requirements	Operation	Design of bin centre Construction site of bin centre	Observation Inspection	Environment, Health and Safety Officer and Site Engineer (Developer)	Two or three times each during design stage and construction stage
Transporting waste to the waste transfer plot/ bin centre	Construction and Decommissioning	Waste Transfer Plot	Observation Inspection	Environment, Health and Safety Officer and Cleansing Officer (Contractor)	Every two or three days
	Operation	Bin Centre	Observation Inspection	Environment, Health and Safety Officer and Cleansing Officer (Developer)	Every two or three days
Hazardous Waste					
Educating workers and staff about hazardous wastes and waste management	Construction and Decommissioning	Number of Trainings conducted and training contents Workers' and staff's performance	Recording and Documenting Observation Inspection	Environment, Health and Safety Officer (Contractor)	Weekly
	Operation	Number of Trainings conducted and training contents Workers' and staff's performance	Recording and Documenting Observation Inspection	Environment, Health and Safety Officer (Developer)	Weekly
Identifying and characterizing the waste as hazardous waste	Construction and Decommissioning	Type of Hazardous Waste	Observation Inspection	Environment, Health and Safety Officer and Site Engineer (Contractor)	Whenever the waste is needed to identify and characterize

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
	Operation	Type of Hazardous Waste	Observation Inspection	Environment, Health and Safety Officer and Supervisor (Developer)	Whenever the waste is needed to identify and characterize
Providing safety shoes, masks, face shields and tools with the workers/staff/cleaners (who have been trained to manage hazardous wastes) to handle the waste	Construction and Decommissioning	Workers/cleaners equipped with Personal Protective Gear	Observation Inspection	Environment, Health and Safety Officer and Site Engineer (Contractor)	Whenever Personal Protective Equipment is needed to wear
	Operation	Workers/cleaners equipped with Personal Protective Gear	Observation Inspection	Environment, Health and Safety Officer and Supervisor (Developer)	Whenever Personal Protective Equipment is needed to wear
Segregation and collection on the day of generation of the waste and sending for the transit storage for facilitating the storage at the place of “earmarked” storage point	Construction and Decommissioning	Segregated Waste Construction Site Storage Site	Observation Inspection	Environment, Health and Safety Officer (Contractor)	Whenever segregation and collection are made
	Operation	Segregated Waste Power plant Storage Site	Observation Inspection	Environment, Health and Safety Officer (Developer)	Whenever segregation and collection are made
Storing hazardous waste in the specific containers used for storage (the date of storage is stated specifically, and each container contains the label and tag of the waste stored)	Construction and Decommissioning	Storage Site	Observation Inspection	Environment, Health and Safety Officer (Contractor)	Weekly
	Operation	Storage Site	Observation Inspection		Weekly
Clear mention of the content and composition of the chemicals for hazardous chemicals	Construction and Decommissioning	Hazardous Chemicals and Tag	Observation Inspection	Environment, Health and Safety Officer (Contractor)	Whenever chemical waste is found
	Operation	Hazardous Chemicals and Tag	Observation Inspection		Whenever chemical waste is found

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
The waste storage area will be away from the place of generation and specifically marked for the purpose of storage	Construction and Decommissioning	Waste Storage Area	Observation Inspection	Environment, Health and Safety Officer (Contractor)	Once
	Operation	Waste Storage Area	Observation Inspection		Once
The waste storage area will have a hard, impermeable floor with drainage, and designed for cleaning/disinfection with available water supply	Construction and Decommissioning	Waste Storage Area	Observation Inspection	Environment, Health and Safety Officer and Site Engineer (Contractor)	Once
	Operation	Waste Storage Area (Bin Centre)	Observation Inspection		Monthly
The waste storage area will be secured by locks with restricted access and designed for access and it will also be protected from sun, and inaccessible to animals/rodents	Construction and Decommissioning	Waste Storage Area	Observation Inspection	Environment, Health and Safety Officer, Security Officer (Contractor)	Weekly
	Operation	Waste Storage Area (Bin Centre)	Observation Inspection	Environment, Health and Safety Officer, Security Officer (Developer)	Weekly
Cleaning the waste storage area by authorized cleaning staff at fixed intervals	Construction and Decommissioning	Waste Storage Area	Observation Inspection	Cleansing Supervisor (Contractor)	Daily
	Operation	Waste Storage Area (Bin Centre)	Observation Inspection	Cleansing Supervisor (Developer)	Daily
Avoiding the use of containers with leakage	Construction and Decommissioning	Waste Container	Observation Inspection	Cleansing Supervisor (Contractor)	Daily
	Operation	Waste Container	Observation Inspection	Cleansing Supervisor (Developer)	Daily
Keeping hazardous waste containers closed at all times except to add waste	Construction and Decommissioning	Waste Container	Observation Inspection	Environment, Health and Safety Officer, and Cleansing Supervisor (Contractor)	Daily

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
	Operation	Waste Container	Observation Inspection	Environment, Health and Safety Officer, and Cleansing Supervisor (Developer)	Daily
Storing hazardous wastes with secondary containment	Construction and Decommissioning	Secondary Containment for Hazardous Waste	Observation Inspection	Environment, Health and Safety Officer and Cleansing Supervisor (Contractor)	Daily
	Construction	Secondary Containment for Hazardous Waste	Observation Inspection	Environment, Health and Safety Officer and Cleansing Supervisor (Developer)	Daily
Making space available in between the containers of different characteristics	Construction and Decommissioning	Space Availability between the containers	Observation Inspection	Environment, Health and Safety Officer and Cleansing Supervisor (Contractor)	Weekly
	Operation	Space Availability between the containers	Observation Inspection	Environment, Health and Safety Officer and Cleansing Supervisor (Developer)	Weekly
Having all the equipment for controlling the pollution, water – spray systems, and alarm systems to caution others at the storage area	Construction and Decommissioning	Availability and functionality of Equipment	Observation Inspection	Environment, Health and Safety Officer and Cleansing Supervisor (Contractor)	Weekly
	Operation	Availability and functionality of Equipment	Observation Inspection	Environment, Health and Safety Officer and Cleansing Supervisor (Developer)	Weekly
Carrying out regular inspections to find the deficiencies of the storage systems	Construction and Decommissioning	Facilities and functions of storage system	Observation Inspection	Environment, Health and Safety Officer and Cleansing Supervisor (Contractor)	Monthly
	Operation	Facilities and functions of storage system	Observation Inspection	Environment, Health and Safety Officer and Cleansing Supervisor (Developer)	Monthly
Availability of an extra number of containers at the place of storage to meet the exigencies of the demand or excess generation of the wastes	Construction and Decommissioning	Availability of Extra Number of Containers	Checking	Environment, Health and Safety Officer, Cleansing Supervisor (Contractor)	Weekly

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
	Operation	Availability of Extra Number of Containers	Checking	Environment, Health and Safety Officer, Cleansing Supervisor (Developer)	Weekly
Maximum quantity permissibility depends upon the type and characteristics of the waste intended to be stored	Construction and Decommissioning	Maximum quantity of waste permitted Type and characteristics of waste	Inspection Observation	Environment, Health and Safety Officer and Cleansing Supervisor (Contractor)	Daily
	Operation	Maximum quantity of waste permitted Type and characteristics of waste	Inspection Observation	Environment, Health and Safety Officer and Cleansing Supervisor (Developer)	Daily
The maximum quantity will not be more than a truckload	Construction and Decommissioning	Maximum quantity of waste	Inspection Observation	Environment, Health and Safety Officer and Cleansing Supervisor (Contractor)	Daily
	Operation	Maximum quantity of waste	Inspection Observation	Environment, Health and Safety Officer and Cleansing Supervisor (Developer)	Daily
Taking care of loading waste container to the transportation truck	Construction and Decommissioning	Cleaners' Performance	Inspection Observation	Environment, Health and Safety Officer and Cleansing Supervisor (Contractor)	Whenever waste container is loaded
	Operation	Cleaners' Performance	Inspection Observation	Environment, Health and Safety Officer and Cleansing Supervisor (Developer)	Whenever waste container is loaded
Availability of first-aid kit and cleaning materials for emergency spills	Construction and Decommissioning	First aid kit Cleaning Materials	Inspection Observation	Environment, Health and Safety Officer and Cleansing Supervisor (Contractor)	Weekly

Mitigation Measures	Project Phase	Monitoring Item/ Place	Monitoring Mean	Responsible Person/ Organization	Frequency of Monitoring
	Operation	First aid kit Cleaning Materials	Inspection Observation	Environment, Health and Safety Officer and Cleansing Supervisor (Developer)	Weekly
E-waste					
Procurement of electronic devices of high quality, and from reputable retailers/ sources from credible manufactures to avoid purchasing second hand, refurbished or obsolete devices with a short shelf life or already categorized as E-Waste. If possible, select sources offering repair and take back schemes. Ensure insurance coverage and electronic physical protective devices are fitted. E-waste will be handed over to the administration department and recorded. Place it in the E-waste storage bins. The bins should be placed under covered area to protect it from sunlight and rain. Hand over E-waste to the suitable E-waste collectors, dismantlers, and recyclers.	Operation	Type and characteristics of waste	Inspection	Environment, Health and Safety Officer	

Budget and Responsibilities

Budget

For the construction phase, total 15,000,000 Ks per year is budgeted for implementing Waste Management Plan (Hazardous and non-hazardous waste).
For the operation phase, total 40,000,000 Ks per year is budgeted for implementing Waste Management Plan (Hazardous and non-hazardous waste).
For the decommissioning phase, total 80,000,000 Ks is budgeted for implementing Waste Management Plan (Hazardous and non-hazardous waste).

Responsibilities

For the construction and decommissioning phases, the contractors will be responsible for implementing Waste Management Plan (Hazardous and non-hazardous waste). For the operation phase, the developer will be implementing Waste Management Plan (Hazardous and non-hazardous waste).

7.5.5 Corporate Social Responsibility (CSR)

Myanmar Ahlone Power Plant company Limited believes in principle that "Growth Does Not Exist in Isolation". It is the company interest, being socially responsible is not an occasional act, but it is an on-going year-round commitment, which is integrated into the very core of their business objectives and strategy. Myanmar Ahlone Power Plant Company limited believes that an environment of common trust and confidence building is essential during project implementation.

The main principles of the company's Corporate Social Responsibilities are:

- ✓ Adopt an approach that aims at achieving a greater balance between social and economic development;
- ✓ Adopt new measures to accelerate and ensure the satisfaction of the basic needs of all people;
- ✓ Work towards elimination of all barriers to the social inclusion of disadvantaged groups- such as the poor or the disabled; and
- ✓ Give unfailing attention to children for in their hands lies the future of the society. It is for their sake that health, education, and environment are given priority in their programme and investments.

Myanmar Ahlone Power Plant Co., Ltd. will put into practice the Cooperate Social Responsibility (CSR) plan that is to allocate 2% of its net profit for CSR activities. The objective of this plan is to ensure social well-being of employees, and better transparent and friendly relationship with communities nearby.

Management Actions

The following actions will be taken to implement CSR activities.

Conduct a CSR assessment

- ✓ Establish a CSR team;
- ✓ Review corporate documents, processes and activities and internal capacity;
- ✓ Engage key stakeholders (community, project affected persons, local authorities, ward general administrative leaders etc.).

Develop a CSR strategy and CSR commitments

- ✓ Build support with senior management and employees;
- ✓ Decide on direction, approach, boundaries, and focus areas;
- ✓ Hold discussions with stakeholders;
- ✓ Create a working group to develop the commitments.

Implement CSR commitments

- ✓ Prepare and implement CSR program;
- ✓ Set measurable targets;
- ✓ Make commitments public.

Assure and report on progress

- ✓ Measure and assure performance;
- ✓ Engage stakeholders;
- ✓ Report on performance and results, internally and externally.

Monitoring and Evaluation Plan

Monitoring will be carried out during the implementation of the CSR programs whether these programs implemented are in line with the commitments made by the developer and the requirements of the local community and also the quality and the timeline for implementation are met. The monitoring process will be done by the responsible persons of the development company and the representatives of the local community and authority. The monitoring team will be later established in consultation with the local community and authority.

The CSR strategy and initiatives will be evaluated at periodic intervals to find out the results of the program, barriers for implementing the programs and how to handle these obstacles. If necessary, the

original objectives, direction, approach, boundaries, and focus areas will be revisited and new ones will be made.

The developer would consider the following aspects for CSR evaluation:

1) What worked well? In what areas did the company (developer) meet or exceed its targets?
2) Why did it work well? Were these factors within or outside the company that helped it to meet its targets?
3) What did not work well? In what areas did the company not meet its targets?
4) Why were these areas problematic? Were there factors within or outside the company that made the process more difficult or that created obstacles?
5) What is the lesson learned from this experience? What should continue and what should be done differently?
6) Drawing on this knowledge and information concerning new trends, what are the CSR priorities for a company in the coming year? Are there new CSR objectives?

The evaluation will involve seeking inputs from management, CSR team, employees, and external stakeholders.

Budget and Responsibilities

The project developer will accept Corporate Social Responsibility (CSR) for the communities and the CSR programs will be implemented by the developer.

MAPP Co., Ltd contributes for religious festivals conducted nearby community in the ward and provides school uniforms and stationery to the students in the ward. MAPP Co., Ltd will also contribute to 'Tree planting events' conducting by Township General Administration.

The budget for CSR programs is allocated 2% of the total profit made by each year.

Table 7-16: Corporate Social Responsibility (CSR) plan

Activity	Responsible company	Frequency	Estimated amount (% of net profit)
Contribution in general development of the public schools in the township	Myanmar Ahlone Power Plant Co., Ltd.	Annually	0.4%
Contribution to nearby community Buddhist celebrations, social welfare, and donation to monasteries	Myanmar Ahlone Power Plant Co., Ltd.	Annually	0.4%
Employees for health and wellbeing, training and development, social welfare	Myanmar Ahlone Power Plant Co., Ltd.	Annually	0.8%
Contribution to regional development	Myanmar Ahlone Power Plant Co., Ltd.	Annually	0.4%
Total			**2.0%**

7.6 Training Programme

Industrial Visit Plan for Students

MAPP Co., Ltd can conduct training programme for engineering students. After obtained the permission from Ministry of Electric Power (MOEP), Myanmar Ahlone Power Plant can offer industrial visit for undergraduate students in order to give them a practical exposure as well as learning how a combined cycle plant works to produce electricity and captures waste heat from gas turbine to increase efficiency and electrical output.

Intern Programme

Internships and training program are an opportunity for students and new graduates to gain work experience in a professional setting. Internship programs will be created in accordance with company requirements and announcement will be made for the posting.

7.7 Green Belt Development

Even after taking stringent measures for pollution control, in different stages, a significant number of pollutants are produced such as dust, noise and NO_x during the operational phase. A sustainable and green solution for this problem could be minimized by developing a "Green Belt", “Green walls” and “vertical gardens”. In the surrounding areas, trees of specific species can reduce the pollution as well as can provide enhanced oxygen for the surrounding area. Suitable budget will be allocated before operation of the plant as this is delayed activity to be started with stabilization of the power plant.

The air pollution that can be emitted by the industries in the area settles on the ground and vegetation of surrounding area. The plants interact with both gaseous and particulate pollutants and to great extent absorb them and thus, remove them from the atmosphere. This pollution removal property of the plants has been proven by many scientists that the green belt for reducing the pollution originated from the industrial operations. The following table lists applicable and practical choice of plant in different types that could support nature-based solution for impacts mitigations.

Table 7-17: Suitable plant Species for "Green Belt Development"

Name of the Plant	Type	Function
Australian wattle	Tree	Reduces Particulate Matter
Bael tree	"	"
The Siris Tree	"	"
White Siris	"	"
Sugar Apple	"	"
Kadam	"	"
Nim	"	"
Bamboo	"	"
Australian Whistling Pine	"	"
Rangan	Shrub	Noise Attenuation
Kamini	"	"
Karabi	"	"
Guava tree	"	"
Tagar	"	"
Mastered Green	Forb/Herb	NO_x Absorption

Given the allocation of a dedicated budget for carbon offsetting and the limited usable land for green belt development, the project developer is encouraged to incorporate these measures as part of their commitment to environmental conservation and sustainability compliance. Myanmar Ahlone Power Plant Co., Ltd, have the option to engage in carbon offsetting independently through strategic plans and programs, or by supporting civil society groups, organizations, and relevant ministries and departments that promote green philanthropy and sustainability. This support can be provided through financial contributions to regular fundraising efforts, thereby contributing to national climate policy and making a tangible impact.

While the feasibility of establishing a green belt development within the limited usable land of the project site appears impractical, there is considerable of install green walls or vertical gardens on the external and internal walls of buildings and structures within the power plant. Use climbing plants on fences, walls, and other vertical surfaces to maximize green space without occupying much ground area. These can help improve air quality, reduce heat, and enhance the aesthetics of the facility.

There is considerable potential for the development of a green buffer along the Harbi Creek. The terrain alongside the bed of Harbi Creek at the border of the project site is about 200-meter distance. However, recently YCDC has built retaining wall along the Harbi Creek. Thus, not much space is left to grow trees. However, the Project developer will grow trees wherever the space available. It is estimated that approximately 10-15 trees can be planted alongside of Harbi Creek. Flora consultants suggested to plant Moe-Ma-Kha plants. This approach holds significant advantages for both the proposed power plant and the stability of the channel, offering a mutually beneficial solution.

Moreover, trees can be planted in front of boundary wall of the powerplant and space available in the power plant compound. Flora consultants suggested to plant locally known as “Ah Thawka trees” or သဘော်တည်ပင် [scientific name: *Polyalthia longiflia* belongs to Annonaceae family; common name: India willow/ False Ashok]. To grow trees the project developer will communicate with the ward and township administrative authorities and inform about the trees planting plan. Saplings (young trees) can be purchased from Forest Department. "Green Belt Development” will be implemented with the support of Township Administrator as “Rainy Season Tree Planting Event”.

Trees planting

Although the total greenbelt development area cannot be fulfilled, Myanmar Ahlone Power Plant Co., Ltd do planting trees in project area. Myanmar Ahlone Power Plant Co., Ltd has planted “Ah Thawka trees” alongside of Harbi Creek, inside and at the boundary the power plant compound. Eugenia uniflora (အာစီယံသပြေ) Plumerias (frangipani တရုတ်စကား) and local wild white and purple kancana are planted at the entrance and the fence.

Photo 7-3: Myanmar Ahlone Power Plant Co., Ltd planting trees around the plant

7.8 Compliance Reporting Planning

This section described the indicative schedule of project developer's commitments to submit environmental monitoring report which will be adopted to acting national guidelines and international best practices. The periodical monitoring report will include the followings contents sanctioned in article 109 of EIA Procedure. They are -

1. Frequency of Reporting
   The monitoring reports will be submitted to the Ministry every six (6) months, in accordance with the schedule outlined in the Environmental Management Plan (EMP), or as periodically prescribed by the Ministry.

2. Inclusive Documentation
   The monitoring reports will comprehensively include documentation of compliance with all conditions stipulated in the EMP, demonstrating our commitment to adhering to the regulatory framework and environmental standards.

3. Implementation Progress
   The reports will detail the progress made to date on the implementation of the EMP against the submitted schedule. This transparency will enable the Ministry to assess our dedication to timely and effective execution of the environmental management measures.

4. Identification of Challenges
   The project management team will openly address difficulties encountered during the EMP implementation, accompanied by recommendations for remedying those difficulties. The team will outline proactive steps proposed to prevent or mitigate similar challenges in the future, demonstrating our commitment to continuous improvement.

5. Non-Compliance Reporting
   The reports will explicitly outline the number and types of non-compliance instances with the EMP. For each identified non-compliance, we will propose remedial measures and provide realistic timelines for the completion of remediation, ensuring accountability and swift corrective actions.

6. Accident and Incident Reporting
   The report will include all accidents or incidents related to occupational and community health and safety, as well as environmental impacts. This transparency will aid in prompt response and remediation, fostering a safer environment for both the workforce and the community.

7. Environmental Parameter Monitoring
   The reports will include detailed monitoring data of environmental parameters and conditions as committed in the EMP or as otherwise required by regulations. This will demonstrate our commitment to maintaining environmental integrity and compliance with set standards.

By adhering to these commitments, the project developer will forester trust and transparency with the Ministry, regulatory bodies, and the local community, ensuring responsible and sustainable operation of the combined cycle power plant.

7.9 Emergency Response and Disaster Management Plan

An emergency is any situation or occurrence of a serious nature, developing suddenly and unexpectedly, and demanding immediate action. An emergency can cause serious injury / loss of life / lives and may cause extensive damage to property and environment causing serious disruption both inside and outside the plant. Emergencies have been broadly classified into two categories:

- On–site Emergency.
- Off–site Emergency.

On Site Emergency

An on-site emergency is a kind of situation, which can cause casualties / equipment / property damage, work environment damage within the site premises. It may need to take help of outside agencies to bring the situation under control.

Off Site Emergency

An emergency that takes place in an installation and the effects of emergency extends beyond the premises or the emergency created due to an accident, catastrophic incidents, natural calamities, etc. It no longer remains the concern of the installation management alone but also becomes a concern for the public living outside and to deal with such eventualities will be the responsibilities of district administration.

A response plan is required to control and mitigate the effects of catastrophic incidents in Above Ground Installation (AGI) or Underground Installations (UGI) or road transportation. This plan shall be prepared by the district administration based on the data provided by the installation(s), to make the most effective use of combined resources, i.e., internal as well as external to minimize loss of life, property, environment and to restore facilities at the earliest

The off-site emergency plan outlines actions that employers and employees must take in the event of an emergency to ensure employee safety and to minimize property damage.

Such procedures include:

- Ways to alert employees;
- Reporting emergencies;
- Evacuation;
- Designated assembly locations;
- Contact people and their telephone numbers;
- First aid and medical assistance;
- Clean-up and business resumption;
- Employee training;
- Ways of testing the plan (mock drills); and
- Communication with media, community and employees and their families.

Prepare Emergency Response Plan (ERP) and team to prevent fatilities and injuries, to reduce damage and to protect environment and community.

Prepare emergency preparedness plan and execute the plan.

Emergency Response Plan will cover emergency resources, emergency preparedness and training, emergency response procedures, administration of the plan, communication and procedures, and debriefing and post-traumatic stress procedures.

For practical purpose provide training for firefighting, training for First Aid and Rescue.

Provide facilities (e.g. firefighting equipment, suit, first aid kits, and emergency vehicle.

Display phone numbers of Firefighting Department, Ambulance Services, Red Cross Society, Hospital and Police Station.

Available off-site resources for handling emergency situations:

1. **Fire Station:** Fire Station is the nearest fire station which is 10 km from the project site. During the Off-Site Disaster, the main role of fire services will be as follows:
   - Fire fighting
   - Spraying water to knock down toxic gases/vapours
   - Washing away spilled chemicals
   - Rescue of people trapped in fire services must be aware of the properties and behaviour of various industrial chemicals.

While fighting an emergency they themselves should not be get affected by the toxic gases or any other harmful chemicals. Proper protective equipment should be used for this purpose.

2. **Hospital:** Nearest General Hospital is 5 km from the project site. Quick medical treatment of people injured in a major industrial/transportation accident is essential. Medical services should be geared up to meet special requirements of an industrial accident.

Emergency Situations at 151.54 Mw CCPP Project Site

Based on relevant experience and best professional judgment, it is believed that the following types of hazards (Source, Situation, Act, or combination thereof) have the potential to occur at the plant:

1. Excavation cave-ins
2. Explosion
3. Facility Blackout - loss of electric power
4. Fire, caused from:
   a) Lubricants / Petrochemicals Materials
   b) Electrical short circuits
   c) Flammable materials storage areas – materials that can cause fire incident include - Adhesives (at stores), Diesel, Hydraulic oil, Lubrication oil /Grease, Paints and Paint thinners
   d) FRP Storage area (Used for cooling tower works)
   e) Oil rags/waste at work locations
   f) Shuttering material storage yard
   g) Wooden cases storage area
   h) Wooden scrap yard

Note: Possible quantity of storage has been considered while determining severity

5. Medical conditions/emergencies - Serious injuries or ill health; causes include but not limited to:
   a) Asphyxiation from lack of oxygen during working in confined space
   b) Electric shock / Electrocution (non-fatal)
   c) Fall from height
   d) Person suspended in safety harness
6. Pandemics/epidemics/outbreaks of communicable disease
   a) Traffic accidents
   b) Natural calamities
   c) Earthquakes
   d) Flooding (heavy rains)
7. Natural gas leakage

7.9.1 Risk Assessment of Possible Emergencies and Controls Matrix

Table 7-18: Risk assessment of possible emergencies and controls matrix

Emergency	Likelihood of occurrence	Potential cause/ Incident	Area	Severity of consequence	Preventive measures	Mitigation
Earthquake	Remote	Earthquake	Whole of project site	High severity Effects are proportional to earthquake magnitude	▪ Site located in Seismic Zone II; no history of such incident ▪ Design of plant has considered relevant safety factors of seismic zone potential effects	▪ Review and ▪ Implementation of remedial measures after assessing the magnitude of effects – by top management
Excavation cave-in	Likely	Excavation cave- ins caused by unsafe work practices	Across site – varied locations	High severity bodily burns Effects localized	▪ Safe work practices to be established and implemented ▪ Work in excavated areas is supervised with prior-to work assessment of conditions for work ▪ Work is always carried out under supervision from above the excavation level	▪ Medical emergency procedures are followed
Explosion	Likely	Acetylene gas Cylinder accidental explosion due to pressure build- up; catch fire with nearby flame sparks (if working with)	Gas cutting works area (Max permitted storage is 20 Cylinders)	High severity – bodily burns Effects localized	▪ Safe work practices established and implemented ▪ Fire extinguishers kept nearby workplace	▪ Fire extinguishing by trained persons ▪ Medical emergency procedures are followed for the affected personnel
Explosion	Likely	Gas and Pressure Pipeline	Gas and Steam Process System	High severity – bodily burns Effects localized	▪ Safe work practices to be established and implemented ▪ Fire extinguishers kept nearby workplace	▪ Fire extinguishing by trained persons ▪ Medical emergency procedures are followed for the affected personnel
Facility Blackout	Likely	Loss power of electric	Whole site project	Low severity Effects localized to the area	▪ Readily available flashlights; ▪ Adequate emergency lighting; ▪ Alternative lighting arrangement will be in stand-by at critical work areas while working	▪ Depending upon the cause immediate measures will be taken. ▪ All electrical

Emergency	Likelihood of occur-rence	Potential cause/ Incident	Area	Severity of consequence	Preventive measures	Mitigation
				People may panic and may be affected of it	at night Candles are not lit and kept near any flammable items ▪ No burning candles are unat-tended	equipment, especially those will be switched off till the power is re-instated ▪ Panic personnel will be counselled ▪ Attention is given to the fact that the re-establishment of elec-trical power can be with a power surge. Heavy equipment' high electrical load factor could adversely impact
Fire	Likely	Shuttering material (wood) accidental catching up fire due to sparks/ flying fire ob-jects from nearby work area	Shuttering mate-rial storage	Low severity Effects localized to the area	▪ The whole site is declared as no smoking zone ▪ Fire extinguishers are kept near all storage area to extin-guish the fire at its initial stage ▪ Water hoses are provisioned which is near-by	▪ Firefighting, and Evacuation of person-nel at that location to the safe place at once
Fire	Likely	Lubricant Accidental catching up fire due to sparks/ flying fire objects from nearby work area while material handling	Fuel stored in project site	Low severity Effects localized to the area	〃	〃
Fire	Likely	Oil rags/ waste Acci-dental catching up fire due to sparks/ flying fire objects from nearby work area	Equipment / Pip-ing erection area	Low severity Effects localized to the area	〃	〃
Fire	Likely	Diesel Leaks in 200 L drums	Stores	Low severity Effects localized to the area	〃	〃

Emergency	Likelihood of occur-rence	Potential cause/ Incident	Area	Severity of consequence	Preventive measures	Mitigation
Fire	Likely	Wooden scrap	Woode scrap yard	Low severity Effects localized to the area	ll	ll
Fire	Likely	Wooden Materials	Wooden cases At material stor-age yard	Low severity Effects localized to the area	ll	ll
Fire	Likely	Due to electrical short circuit	Offices / PC Work Stations	Low severity Localized to the area	▪ Prevent the loose connections ▪ Prevent over loading ▪ Prevent multiple connections from one source ▪ Prevent the overheating of the equipment's ▪ Keep the electrical equip-ment's in healthy condition	▪ Switch off the power supply ▪ Use suitable fire ex-tinguisher to extin-guish the fire
Fire	Likely	Accidental catching up fire due to sparks/ flying fire objects from nearby, electrical short circuits in store room, unattended lit candles, etc.,	Stores maintain-ing: Adhesives Diesel Hydraulic oil Lube. Oil Grease Paints and Paint thinners	Low severity Effects localized to the area	▪ The whole site is declared as no smoking zone ▪ Fire extinguishers are kept near all storage area to extin-guish the fire at its initial stage. ▪ Water hoses are provisioned near-by	▪ Firefighting ▪ Evacuation personnel location to place at once at the of that safe
Fire	Likely	FRP – accidental catching up fire due to sparks/ flying fire ob-jects from nearby work area	FRP Storage Area (for Cooling tower construction works)	– Medium to high se-verity since – FRP fire spreads faster Can affect the surrounding area	▪ Prevent multiple electrical connections from one source ▪ Do not keep flammable items or materials nearby Fire extin-guishers, water hose near-by	▪ Switch off the power supply Firefighting by trained personnel and Fire Tender help sought if required
Flooding in the site	Likely (dur-ing rainy season)	Inundation (deluge / flood) of water due to heavy rains	All work areas	– Low severity – Effects mainly in the excavated area / trenches – None - since situa-tion can be pre-dicted/ detected	▪ Pre alert given based on fore-cast and on situational day-to-day basis ▪ Working in excavated areas, trenches, Open confined ves-sels, or areas are provided ad-ditional vigilance	▪ Evacuate all person-nel from areas of danger - on sensing the danger ▪ Rescue team to verify and act to rescue if someone got caught

Emergency	Likelihood of occurrence	Potential cause/ Incident	Area	Severity of consequence	Preventive measures	Mitigation
				instantly	▪ The drains always kept clean especially in the rainy season ▪ Keep the mobile pump ready to pump out the water	inside ▪ Provide medical aid as needed
Medical Emergency Electrical Shock/ Electrocution	Likely	Due to contact with live wires or due to electrical faults	All work areas wherever there are electrical points	Low to medium severity Localized to the area	▪ Provide double earthling to Equipment; periodical checks for effectiveness ▪ Provide E L C B's ▪ Provide rubber mattings in front of control panels & isolators. ▪ Signage - Never touch the live circuit ▪ Safe work practices - Isolating the circuit before carrying out the maintenance ▪ Use of PPE's	▪ Switch off the power supply ▪ Administer artificial resuscitation if required ▪ Provide medical aid as needed
Medical Emergency	Likely	Asphyxiation from lack of oxygen	During working in confined space at Cooling water pipelines, bypass stack, and HRSG (after completion of installation)	Medium to high severity Localized to the area	▪ Personnel work competence ensured ▪ Preventive maintenance of equipment and machinery ▪ Workplace monitoring prior to task execution SCBA provided where necessary	Follow appropriate medical procedures
Medical Emergency	Likely	Fall from height	Structural erection, Bypass stack erection, Scaffolds, HRSG erection, High roof at Electrical control Buildings	Medium to high severity Localized to the area	▪ No un- protected openings on any roof ensured ▪ Safety harness, safety life line provisioned while working at height ▪ Only competent & medically fir persons are allowed to work at height	Follow rescue procedure in case person is in suspended harness If panic, provide medical counselling
Medical	Likely	Fall from height	While climbing	Medium to high	▪ Fall arrestor used for high rise	Follow rescue

Emergency	Likelihood of occurrence	Potential cause/ Incident	Area	Severity of consequence	Preventive measures	Mitigation
Emergency			higher heights on ladder (does not have railing) with fall protection	severity Localized to the area	climbing using ladders	procedure in case person is in suspended harness If panic, provide medical counselling
Pandemics/ epidemics/ outbreaks of communicable disease	Likely	Unpredictable Outbreaks for unknown reasons	All personnel at site	Medium to high	▪ HR will initiate actions immediately upon getting news from media. ▪ Health precautions from Government and Health organizations will be followed	Affected personnel will be provided with medical assistance Affected personnel will not be allowed to workplace till normal health is restored
Traffic accidents (during construction phase within project site)	Likely	Violation of safety rules, unforeseeable road / traffics conditions	Throughout work site	Low to moderate	▪ Speed limit is restricted ▪ Security watch and guide traffic at designated places ▪ Road and terrain conditions inspected and attended to correct faults ▪ All vehicles mandatorily use reverse horn while moving in reverse / rear direction ▪ Only authorized, competent persons are allowed to drive vehicles within site premises	Personnel injury is deal as per medical procedure
Natural gas leakage	Likely	Fatigue, dizziness, and headaches. If the exposure progress - will developed such as nausea, agitation, and displaced speech. In high concentrations, methane depose oxygen causing asphyxiation	Throughout work site	Low to moderate	▪ Gas leak outside the power plant will be managed by MoGE pipeline systems which is equipped with leak-detection system and automatic shutoff valves or remote-control valves that can warned operators of an imminent accident and allow for quick mitigation ▪ For each gas turbine in GE's package the entire gas piping	Gas leak inside the power plant will detect and monitor using portable gas detector.

Emergency	Likelihood of occur-rence	Potential cause/ Incident	Area	Severity of consequence	Preventive measures	Mitigation
					system has shut down opera-tion if there is emergency.	

7.9.2 Provisions for Plant Facilities in Emergency

There following are list of Emergency Facilities prepared for disaster prevention and containment. They include;

- Emergency Control Centre
- Emergency Siren system
- Hand held Wireless Communicator (Walkie-Talkie used) - with security & operations personnel – Total quantity: 15
- 2 Fire Tenders (One at existing plant which is at less than one KM and another at site)
- Fire hydrant and fire extinguishers at critical / identified locations (In addition, being a multi-employer work site, respective contract organizations also maintain required emergency response facilities)
- Call points – intercom phone in all departments
- Trained Fire Fighting team
- Trained First-Aiders
- First Aid facility at Occupational Health Centre ast 151.54 MW CCPP
- Ambulance (on-call)

Table 7-19: Supportive resources exclusively maintained for emergency response activities

S. No.	Particulars	Qty	S. No.	Particulars	Qty
1	Leather glove 16”	4	12	Artificial resuscitators	4
2	PVC Glove 16”	4	13	Helmets	4
3	Rubber Glove 16”	4	14	Rain coats	4
4	Shock proof glove 16”	4	15	Gum Boots	4
5	FIRE Suite 36” 42”	4	16	Stretchers	2
6	Leather apron	4	17	Blankets	2
7	Plain glass goggles	4	18	Torch light with cells	4
8	Goggle for gas welding	4	19	Safety Belt	4
9	Welding Shield	4	20	Gas mask	4
10	Spark resistant tools	1 Kit	21	Barricade tapes	1 Rollof 5 Kg.
11	SCBA Sets	3			

7.9.3 Emergency Control Organization

Emergency Control Centre (ECC)

There will be an emergency control centre inside the premises of the project to take action as soon as possible.

Emergency Siren

A wailing siren with different frequencies (short intervals) indicating that there is an emergency at site.

An emergency siren will be installed for the Project. If the emergency arises at proposed plant and if it is determined that situation will affect the power plant, then siren will be blown at existing plant control room as well as project site control room.

Emergency mitigation teams

Two teams function separately in emergency mitigation activity.

Team 1: Incident Control Team (emergency mitigating team functioning at the site of incident)

The team is headed by the incident controller (who is HOD of the concerned area, where emergency occurred) and he is assisted by:

- Emergency mitigating (Firefighting) team
- Emergency technical support team
- First aid team
- Rescue team

Team 2: Emergency Control Team (assists emergency mitigation activities from emergency control centre)

The team is headed by CPD. In his absence Vice President (C&I) takes charge as Chief emergency Controller. (In his absence next higher official \ delegated person takes the charge as chief emergency controller). Chief emergency controller is assisted by Emergency advisory team.

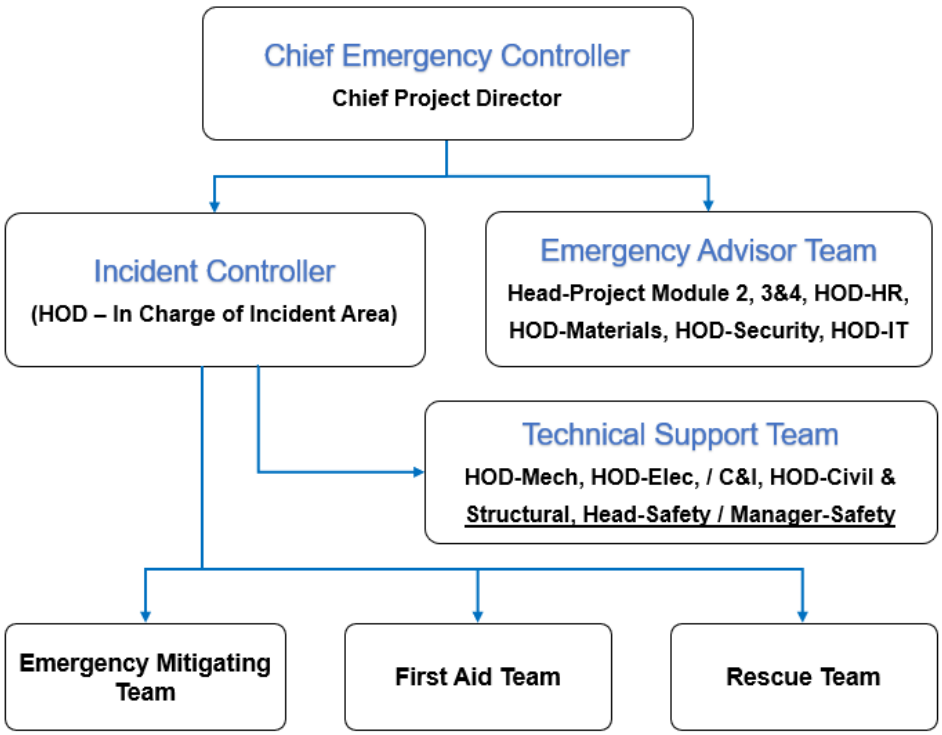


Figure 7-7: Emergency Control Organization Chart

Roles and Responsibilities

The roles and responsibilities described hereunder are in full. However, all elements may not be applicable to all emergencies. The responsibilities that need to be executed are specific to a type of emergency. The response procedure for each category of emergency is described in section 8.

Role of Unit Head Chief Emergency Controller (CEC) – Project

- Assumes charge as Chief Emergency Controller
- Establish contact with incident controller through cell phones or public address system and other available systems, assesses the severity of the emergency.
- Alert other CEC and rush to the spot if required.
- In case of requirement declares emergency by arranging for blowing of emergency siren.
- Directs the team members who are assisting him regarding
- Medical arrangements at outside hospitals if required
- Transportation for evacuation of personnel

- Contacting and interacting with statutory authorities / media / relatives of the injured persons in case of any casualty through Head - HR.
- Arranging additional outside help from the nearby fire stations and industries for mitigating the emergency through Head- HR/Security
- Necessary food supplies etc. for the emergency mitigating team.
- Authorizes the sounding the All-Clear siren after the emergency is over.
- Arranges for investigation of the incident.

Incident Controller (HOD / In charge of the area or delegated person)

The Incident Controller will take control of handling the emergency. The responsibilities of the Incident Controller include:

- To stop all the activities at the affected area, isolates power supply if needed
- To assess the scale of the incident and take decisions as may be required.
- After assessment of risk, if necessary, inform CPD / VP- Project to declare emergency.
- To establishes contact with chief emergency controller and inform about the situation from time to time
- To initiate the emergency procedures with the help of available facilities to secure the safety of employees, minimize the damage to plant and property and minimize the loss of material; to guide fire squad, salvage squad, first-aid squad, and auxiliary team
- To direct rescue and fire-fighting operations.
- To search for casualties
- To arrange for evacuation of non-essential workers to assembly areas.
- To setup a communication point with the emergency control team within the Plant
- To assume the responsibilities of the Chief Emergency Controller till the person arrives.
- To provide support to the emergency services as requested.
- To issue verbal communication to engineers for necessary isolations and precautions, this will be treated as permit to attend emergency situations.
- To ensure that all clear siren is given in consultation with Fire squad / Combat team when emergency has been brought under control.
- To arrange for clearing of spills and waste at the site and restoring normalcy for regular operations / activities
- To collect evidences that will be necessary for subsequent inquiry to the root cause of the emergency and for concluding corrective measures to avoid recurrence

Role of Emergency Technical Support Team

- Arrange for the resources / material for controlling the emergency and to get back to normal operations
- Arranging for cranes, required tools, equipment, electrical assistance for controlling the emergency and to get back to normalcy
- Evaluate the technical aspects in the control / mitigation of the emergency and operational continuity
- Carrying out the technical study and recommend as per the requirement
- Communicate with emergency advisory team and furnish required clarification
- Identifying and establishing contact with outside technical expertise as per requirement and getting advices or necessary help from them

Role of Emergency Advisory Team

- In absence of CPD (CEC – Project), VP- Project assumes responsibility as Chief Emergency controller and carries out the activities as mentioned under the role of Chief Emergency controller.

- Others report to the Chief emergency controller guides him in controlling the situation and acts as per his instructions.
- Log the sequence of events so that report of the emergency action can be prepared for review and for identifying flaws, so as to correct the same.
- If required establishes contact with statutory authorities and media personnel as per the advice of Chief Emergency controller and gets outside help or to appraise about the situation and get help in case event turns off site emergency.
- Establishes contact with outside hospitals / nursing homes for prior information and readiness in case of sending injured to the hospitals, getting additional ambulances etc.,
- Prepare record of affected personnel with local and permanent address, establishes contact with the relatives of the injured or victimized personnel and assures them about the situation and renders necessary help as per Chief Emergency controllers' advice.
- Keep additional vehicle with drivers as stand-by and authorized to utilize any vehicle during emergency.
- Provide vehicles as directed by the emergency control Centre.
- Co-ordinate with state transport authorities and other transport agencies for maximum mobilization of vehicles.
- Arranging for food, water and other requirements
- Establishing contact with nearby / industries and appraise them about the situational requirements and agree upon mutual help during emergencies. Alert them in case they are getting affected of an emergency at site to get additional help from them.

Role of Emergency Mitigating (Fire Fighting) Team

- Immediately after hearing the emergency siren the team will get ready to face the incident
- After receiving the information from CEC or Incident Controller they should report to the incident controller (HOD / in charge of concerned dept.).
- Takes directions from incident controller they should start fighting of emergency situation for general fire.
- During firefighting shall follow:
    1. Personnel Safety by wearing the required PPE.
    2. Plant, Property and Environment Safety.
    3. Minimum loss due to the incidence.

Role of First Aid / Rescue Teams

- Immediately after hearing the siren, they should report to the incident controller (HOD / in charge of concerned dept.).
- To have directions from incident controller to start rescuing the entrapped personnel and give the necessary first aid before sending them to actual medical aid.

Role of Security

- Stop entry of all external vehicles and personnel from outside the premises.
- Shall stand in readiness for further instructions from Chief Emergency Controller and shall act as per the instructions given by him.
- Direct all the vehicles (such as ambulances, fire tenders etc.) coming for help from outside organizations to the incident spot.
- During nights if any incident which is alarming or which can cause emergency, security guard should immediately inform the same to the senior official available in the shift by mobile phone and act as directed by him.

Mutual Aid / Role of Nearby Companies

Role played by members of neighbouring industries

- On receiving information and call for assistance they shall extend all possible help.

- The place of incident shall be informed and guided by the main gate security guard once they approach for providing assistance.
- Fire Crew in-charge on arrival will report to the incident controller of Myanmar Ahlone Power Plant company limited and as per his directions, he shall go to the site of emergency and report to the incident controller and starts their activity as directed by him.

Head – HR

- He is the only authorized person to issue public statements; coordinate & liaise with the GOVT. Officials
- He shall coordinate & liaise with medical team for arranging medical help
- He shall coordinate with the Chief Emergency Controller & arrange for required help from external agencies

Training & Mock Drills

Training

Emergency plan and response procedures have been prepared taking into consideration prevailing industrial / sector safety best practices. Accordingly, the roles & responsibility to the concerned personnel are assigned and they are trained to carry out tasks effectively. The following aspects have been emphasized during training:

- Saving the life has been given top priority
- Reducing the loss & damage to the property
- The emergency response team members undergo periodical refresher program to ensure their continued ability to render services more effectively.
- Mock drills are conducted to ensure ever-preparedness of the teams to respond to any identified emergencies.

Mock Drills

Emergency response procedures are established for the identified emergencies. Mock drills for identified potential emergencies shall be conducted as per the mock drill schedule.

Mock drill includes any of the following scenarios:

- Fire emergencies
- Other OH&S emergencies
- Of the above emergencies, one live mock drill and a table-top mock drill are conducted alternatively. The scenario for the mock drill may be chosen from any of the above-mentioned emergencies and all aspects of the emergency.

Review of Mock Drill

For every mock drill, the safety committee reviews the efficiency and response time of the exercise as per the following criteria:

- Did the operations go on as per the plan?
- Did all persons assigned with specific responsibilities perform as planned?
- Did they experience any difficulty in performing their duties?
- How was the cooperation between the teams?
- Were there reasons for any confusion or conflicting instructions?
- Were all the persons contacted in time? Could they isolate plant equipment as per standard operating procedure

Rating of response to emergency is done based on the following parameters:

1. Communication;
2. Equipment;
3. Manpower and skill;

4. Coordination within the team and with other teams.

The safety committee designates two observers for each of the Mock Drill and their Evaluation Report is discussed and corrective actions are implemented.

7.9.3.1 Emergency Response Procedure - FIRE INCIDENT

In compliance with Myanmar Fire Brigade Law (2015) and Myanmar Fire Safety Code of Procedures – Draft (2020), a construction site fire safety plan will be developed.

Emergency response procedural steps

- All personnel at site – shall move out of their workplace and assemble at the nearest safe assembly point
- Emergency mitigating (Firefighting) team – Mitigate the Fire as per procedure (Trained)
- Emergency technical support team – Mobile resources as need for the situation
- First aid team – Provide first-aid to the affected persons before sending them to actual medical aid
- Rescue team – Assist and ensure all personnel in the emergency affected site are evacuated; carry out intensive search in the area to make double0sure that no person is left un attended
- Security – Stop vehicle / personnel entry in to the site; control traffic within site
- Head – HR - Coordinate with rescue team and arrange for additional help such as logistics and other medical arrangements for the affected personnel
- Incident controller – Blow siren for all clear indication after the emergency is over.
- Concerned HODs and Contractors – Shall ensure that they take stock of their personnel to determine whether anybody is missing. Coordinate with security, HR as needed

Clean-up and/or restoration

The Emergency mitigating (Firefighting) team and the Emergency technical support team shall ensure clean-up of affected area to enable restoration of normalcy for work– Mobile resources as need for the situation

Reporting

The concerned contractor organization's safety representative / safety officer (if the emergency location is SMPL office, then it will the responsibility of Manager-Safety) shall report the emergency incident. This reporting is done on completion of the emergency response.

Other Emergencies

Action to be taken is given against each of the identified potential emergency. On observing any of the following situations, the first observer shall report it to Safety Officer. Based on the need, Safety Officer shall plan and depute competent personnel / team to mitigate the situation.

7.9.3.2 Excavation Cave-In

- Raise alarm as per requirement or disperse unwanted personnel move away from sight of incident to
- Inform the emergency to the concerned persons as per plan
- Rush ambulance, first aid, rescue teams to the scene of incident
- Arrange to provide artificial respiration such as oxygen masks etc., if needed
- Check for any toxic gas presence before sending the rescue if possible
- Give prior information to the nearby / tie up hospitals for emergency attention to the injured
- Arrange proper equipment for removal of soil and careful rescue of trapped persons
- Deal with the injured persons carefully in case of fractures such that the fractured portion is stabilizing and not disturbed.
- Take roll call of persons working at the area to identify any missing persons and for continuing the search.

- Follow Medical emergency procedures

7.9.3.3 Explosions

Incident can occur at Gas and Pressure Pipeline in the area of Gas and Steam Process System. Safe work practices to be established and implemented. Fire extinguishers kept nearby workplace. Mitigation measures are:

- Fire extinguishing by trained persons
- Medical emergency procedures are followed for the affected personnel

7.9.3.4 Facility Blackout - loss of electric power

Safety measures include:

- 500 KW and 800 KW back up Diesel Generator
- Readily available flashlights;
- Adequate emergency lighting; and
- Security measures to prevent theft and vandalism

Safety tips in case of loss of electric power

- NEVER use a generator indoors (example, small gen set in a room or like structure at site) where there are possibilities that exhaust fumes which contain carbon monoxide can be deadly if inhaled.
- USE portable generators outdoors only, in a dry, ventilated area
- PLUG individual appliances into the generator using heavy-duty outdoor-rated cords with a wire gauge adequate for the appliance load.
- DO NOT USE wet electrical appliances.
- DO NOT TURN ON damaged electrical appliances.
- DO NOT PUT candles on or near anything that will burn.
- NEVER leave burning candles unattended.

Fire, caused from other sources (with a less magnitude of severity)

Following materials used at construction site has the potential to cause fire:

- Bitumen,
- Electrical short circuits
- Flammable materials storage areas – materials that can cause fire incident include - Adhesives (at stores), Diesel, Hydraulic oil, Lubrication oil /Grease, Paints and Paint thinners
- FRP Storage area (Used for cooling tower works)
- Oil rags/waste at work locations
- Shuttering material storage yard
- Wooden cases storage area
- Wooden scrap yard

Fire mitigation

Use a fire extinguisher only if ALL the following apply:

- the fire is small, contained and not spreading beyond its starting point;
- the exit is clear so you can exit safely;
- you can avoid smoke inhalation;
- a proper extinguisher is readily available; and
- You know how to use the extinguisher.

If any of these conditions do not apply, do not use the fire extinguisher. Call on “Emergency Number” for help and leave the area immediately.

Typical extinguishers and their uses

Water extinguishers are suitable for class A (paper, wood, etc.) fires.

Dry chemical extinguishers are useful for class ABC fires and are your best all-around choice. Their advantage over CO_2 extinguishers is that they leave a blanket of non-flammable material on the extinguished material which reduces the likelihood of re-ignition. Dry chemical extinguishers cause a messy residue that will need to be cleaned.

CO_2 (carbon dioxide) extinguishers are for class B and C fires. Their advantage over dry chemical is that they leave behind no harmful residue.

7.9.3.5 Medical Conditions/ Emergencies Serious Injuries

Medical Conditions/ Emergencies Serious Injuries or Ill Health; Causes Include but not Limited to:

- Asphyxiation from lack of oxygen during working in confined space
- Electric shock / Electrocution (non-fatal)
- Fall from height
- Person suspended in safety harness
- In case of any medical emergency call occupation health centre; either doctor or the paramedical staff will guide for further action. Use emergency numbers to immediately communicate the emergency and to initiate action
- The rescue of a worker who has fallen and is being suspended in his/her safety harness needs to be undertaken as quickly as possible for several reasons:
- The worker may have suffered injuries during the fall and may need medical attention.
- Workers suspended in their safety harness for long periods may suffer from blood pooling in the lower body and this can result in “suspension trauma.”
- The suspended worker may panic if they are not rescued quickly.
- The event that led to the fall may create additional risks that need to be addressed.

General Rescue Procedures:

A. If Elevating Work Platform is available on site:

- Bring it to the site and use it to reach the suspended worker.
- Ensure that rescue workers are protected against falling.
- Ensure that the EWP (Elevated work platform) has the load capacity for both the rescuer(s) and the victim.
- If the victim is not conscious, 2 rescuers will be probably be needed to safely handle the weight of the victim.
- Position the EWP platform below the worker and disconnect his lanyard when it is safe to do so.
- Treat the victim for Suspension Trauma and any other injuries.
- Arrange for transport to nearest hospital.

B. If no Elevating Work Platform is available:

- Where possible, use ladder(s) to reach the victim.
- Rig separate lifelines for rescuers to use while carrying out the rescue from the ladder(s).
- If worker is not conscious or cannot reliably help with his/her own rescue, at least 2 rescuers may be needed.
- If worker is suspended from a lifeline, where possible, move the suspended victim to an area that can be safely reached by the ladder(s).
- If victim is suspended directly from his/her lanyard or from a lifeline, securely attach a separate lowering line to the victim’s harness.
- Other rescuers should lower the victim while he/she is being guided by the rescuer on the ladder.
- Once the victim has been brought to a safe location, administer First Aid and treat the person for Suspension Trauma and any other injuries.

- Arrange for transport to nearest hospital.

C. If the injured person is suspended near the work area and can be safely reached from the floor below or the area they fell from:

- Ensure that rescuers are protected against falling.
- If possible, securely attach a second line to the workers' harnesses to assist in pulling them to a safe area. (Note: at least 2 strong workers will be needed to pull someone up.)
- Ensure that any slack in the retrieving lines is taken up to avoid slippage.
- Once the victim has been brought to a safe location, administer First Aid and treat the person for Suspension Trauma and any other injuries and arrange for transport to the nearest hospital.

D. If a person has fallen and is suspended in an inaccessible area (e.g., a tower, against a building or structure that has no openings)

- Specialized rescue techniques are needed for this type of situation. It may involve a rescuer rappelling or being lowered down to the victim, it may involve using the lifeline to retrieve the fallen worker, or the use of high-reach emergency equipment.
- Due to the inherent risk to the rescuers and/or the victim, this type of rescue should not be undertaken by people without specialized training and experience

Pandemics/Epidemics/ Outbreaks of Communicable Disease

Generally, media (Newspapers / TV) provides alerts of such situation. If any person working on SMPL site is suffering from or has symptoms of or someone else at site suspects co-worker of having pandemic / epidemic / outbreaks of communicable disease, immediately inform HR. HR and Admin will take immediate action to protect the workforce at site

7.9.3.6 Traffic accidents

1) Disperse unwanted personnel move away from sight of incident to the nearest assembly point
2) Inform the emergency to the concerned persons as per plan
3) Rush ambulance, first aid, to the scene of incident
4) Give prior information to the nearby / tie up hospitals for emergency attention to the injured
5) Deal with the injured persons carefully in case of fractures such that the fractured portion is stabilizing and not disturbed

7.9.3.7 Natural calamities

Earthquake

In case of earth quake, no siren will be given all the personnel inside the plant are instructed to shut down their operations and come out in to open yard and assemble at the assembly points. If inside a building give instruction to:

1) Duck under the nearest sturdy table or desk and hold onto it until the shaking stops. If you are not near a sturdy object, make yourself as small as possible and cover your head and neck.
2) If you stand in a doorway, brace yourself against the frame and watch out for a swinging door or other people.
3) Avoid windows, filing cabinets, bookcases and other heavy objects that could fall or shatter.
4) Stay under cover until the shaking stops, and then leave the building.
5) If it is safe to do so, turn off electrical equipment.
6) Evacuate the building if told to do so by senior staff or HSE staff.

If outside a building:

1) Move away from trees, signs, buildings, construction machineries, electrical poles, and wires.
2) Protect your head with your arms from falling bricks, glass, plaster, or other debris.
3) Move away from fire and smoke.
4) Proceed to your designated evacuation assembly point if safe to do so.

Stay alert for further instructions. If required, transportation will be arranged for sending the people to safer places. Rescue operation will be carried out by security personnel for any possible casualties

and the same are given first aid treatment and will be sent to the nearest hospitals in case of requirement.

Flooding (Heavy rains)

When there is a flood caused by heavy rain, those who are in the basements and ground floor should reach the upper floors through the exit stairways and assemble just outside main gate. Water flood will endanger building basement and low-level floors. Remain in the upper floors till the water recedes or as instructed.

Actions To Be Taken

De-energize equipment immediately if the flood is isolated to your facility due to sprinkler system activation, broken pipes. Cover equipment with waterproof sheeting.

1) Monitor conditions and escape routes.
2) Shut off electrical power and utilities if flooding is imminent.
3) Immediately evacuate to higher ground—flood waters often raise rapidly.
4) Call fire services if needed.

Recovery action

1) Ensure that facilities and equipment are cleaned, dehumidified, sanitized and deodorized before allowing the re-entry of employees.
2) Do not turn on utilities until the structure, appliances and utilities are dry and the building is checked for safety.
3) Be sure water supplies are safe to drink. Dispose of any food or consumables that may have been in contact with flood waters.
4) Begin mitigation planning to avoid repetition of same problems in future.

Cyclones / heavy winds

1) Know about the severity / direction of the cyclone from news bulletins / meteorological dept.
2) Review the activities / operations planned and stop operations which may create an emergency due to cyclone / high winds
3) Ensure emergency equipment such as batteries / torches etc., are in availability
4) Ensure food supplies to the work force
5) Ensure readiness of emergency **vehicles** / medicines, medical centre with staff etc.

7.9.3.8 Natural gas leakage

Preparedness and operation in case of gas leakage –

Provide **emergency suppression plan** in order to control an emergency from gas leakage immediately.

After transferring natural gas piping system to MAPP Co., Ltd., the project emergency plan will be adapted to the emergency plan. –

Organize exercise on emergency suppression plan, at least once a year. –

Review, improve and assess the efficiency of emergency suppression plan periodically.

Provision of well-trained officers to control gas leakage situation.

Provide telephone number list of agencies that must be coordinated in emergency situation such as police station, and hospital.

Disaster Management Planning Framework During Natural Calamities

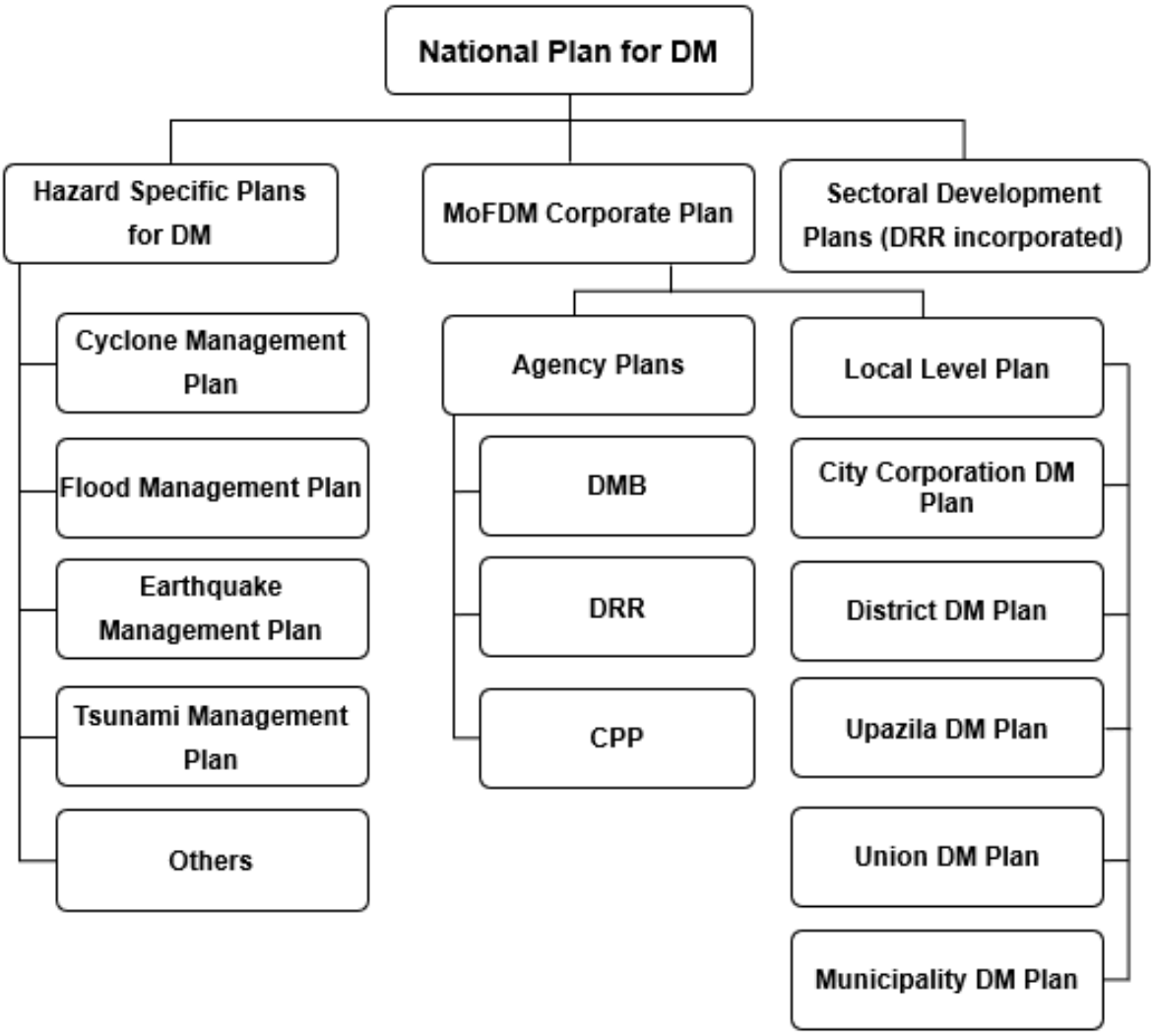


Figure 7-8: Disaster Management Planning Framework

8. IMPACTS ON HEALTH AND SAFETY

Introduction

This chapter discussed the potential health impacts on occupational and community health and safety, linked to the project's nature and activities in construction, operational and closing phases. The identified potential occupational hazards related to the project activities and mitigation measures to prevent and/or minimize the impact of such hazards are Recommended. The prediction and analysis of the health impacts is based on compliance with World Bank Safeguards as well as World Bank's Environment, Health and Safety guidelines and professional judgment.

8.1 Occupational Health and Safety (OHS)

Occupational health and safety (OHS) refers to health, safety and welfare issues of the workers who involved in this Project. Contractors, management staff and workers are obliged to comply the occupational safety and health policy based on the Occupational Safety and Health Law (Pyidaungsu Hluttaw Law No 8 of 2019) and Factory Act.

8.1.1 Health care for workers

Construction sites are among the most dangerous workplace where accidents and injuries are common occurrence. According to Factories Act (1951) every factory employing more than 150 workers first aid supplies should be available and have someone who has a valid certificate in first-aid training available at the worksite. As attested by Factories Act 1951, section 47, factories with more than 250 workers shall be provided a first-aid room or dispensary of the prescribed dimension, containing the prescribed equipment, and shall be kept under the supervision of such medical officer (medical doctor) and nursing staff (nurses) as may be prescribed.

Due to the lack of more than 250 workers during the construction phase a dispensary with medical personnel was not established at the construction site. However, a well-equipped first-aid kits were placed on site to ensure the safety of workers.

- The construction site first-aid kit was placed in an early accessible location where it can be quickly accessed in case of emergency.
- The kit was also be clearly labelled and regularly inspected to ensure all items are in good condition and fully stocked.
- In addition, the kit was maintained and restocked on a regular basis to ensure it is always ready for use.
- If any injury that required immediate care occurs, there must have a transport for an injured person to go to the nearest health care facility. If it is a minor injury offer onsite care.

Management of health care waste

Management of health care waste from worksite such as pharmaceutical waste includes expired, unused, spilt and contaminated pharmaceutical products, wastes contaminated with human tissue, blood, pathogens, gloves, are harmful to environment. These waste from healthcare activities have to dispose according to the "Health Care Waste Management Guideline, 2019" published by Ministry of Health (MOH).

Periodic Medical Examination

The periodic medical examination is to monitor the health status of employee to determine its departure from normal health, so as to identify potential problem area and effectiveness of existing preventive strategies and provide preventive counselling. Pre-employment examinations are used to identify individuals believed to be at increased risk of developing occupational disease. Regular medical examination of workers can detect abnormalities or occupational diseases at the early stage so that timely treatment can be given. Moreover, it is important to detect workers with infectious diseases and to prevent spread of disease to others.

Generally, it is recommended to check every 12 months or 6 months. The purposes are;

- To detect early abnormalities and prevent workers from developing occupational diseases
- To verify the effectiveness of existing preventive strategies

- To provide occupational health education and advice to workers

Reporting of infectious disease

In detection of infectious disease and infectious disease related condition during examination responsible medical personnel must report to worker's supervisor and Township Health Department without delay. Then, arrange for further treatment.

Health and safety for migrant workers

Project contractors might hire migrant workers from outside the township. Because migrant workers are employed outside their home town, the company may need to provide the labour camp (accommodation) for them. The labour camp should be safe, hygienic, and comfortable. Sanitation facilities should be located conveniently, meeting minimum standards of health and hygiene. For health and safety, measures should be taken to prevent the spread of diseases, fire safety measures and security to protect workers and their belongings. Inspection of premises should be frequent. In this project families are not allowed to bring along.

8.1.2 Impacts on occupational health and safety during construction phase and decommissioning phase

Construction workers are one exposed to physical, chemical, biological and ergonomic risk factors than workers in other industries. During construction and closing activities of the Project there can be health consequences from exposures to environmental threats including air quality, elevated noise, and water quality within the site can affect the workers. Because of intensive engineering and construction activities construction workers are likely to have accidental injuries and hazards as a result of handling hazardous waste. Assessment of impact significance is described in Chapter 5 section 5.1. Anticipated health impacts on workers during construction and decommissioning phases are discussed as follow.

Table 8-1: Potential health impacts during construction phase and decommissioning stages

Category	Source	Health impact
Physical Environment		
Air pollution including dust emission	Dust arising from the construction sites and labour camp while - drilling earthworks - vehicle movement on unpaved surfaces - release of engine emissions from construction equipment and vehicles - demolition of existing buildings	Lengthy exposure of workers to air pollutants raises the respiratory diseases risks including eye irritation, skin irritation, chocking of the throat, difficult breathing, asthma, chronic obstructive pulmonary ailments, allergies
Noise and vibrations	Noise and vibrations will mainly result from use of heavy equipment including bulldozers, graders, and dump trucks during site preparation and construction activities.	Elevated noise level can lead to temporary or permanent hearing damage and can impair workers' efficiency. It can also lead to accidents due to limited speech communication, misunderstanding oral instructions and masking the sounds of approaching danger or warnings.
	Operating heavy machinery and vehicles can cause whole-body vibration.	Hand-arm vibration diseases normally result from the use of powered hand-tools, which could damage the nerves and blood vessels in the hand and arm.
Worker's accidents and hazards during construction		
Risk of accidents	Accidents are bound to happen when heavy machinery is involved. Major hazards are:	Types of injuries ▪ contusion or bruising, ▪ amputation, ▪ heatstroke, ▪ burns,

Category	Source	Health impact
	Slips, trips, and falls on the same level, caused by improperly constructed surfaces or unprotected edges Struck-by, caused by vehicle strikes or falling/flying objects Caught-in-betweens, engulfment, pressed, hit, cut, injuries from blunt instruments while operating on moving rotating machines, cutting machines or unguarded parts Electrocutions caused by contact with utility lines or live circuits Eye irritation and burns	▪ fainting or coma, ▪ head, hand eye injuries, ▪ bleeding, ▪ fractures
Solid waste generation	Large quantity of various kind of solid waste will attract germ-carrying pests like flies and cockroach insect and rodent vectors	Cholera Dengue fever
Communicable disease	The influx of construction workers from different areas of the country could bring different infectious diseases	Sexually Transmitted Diseases (STDs) and HIV/AIDS, tuberculosis, hepatitis, epidemic diseases such as COVID 19, H1N1 influenza
	Contaminated water and poor sanitation Absent, inadequate, or inappropriately managed water and sanitation services expose individuals to preventable health risks.	Transmission of diseases such as cholera, diarrhoea, dysentery, hepatitis A, typhoid Water-borne, water-based, water-related, and vector-borne diseases can be spread between the workers
Non-communicable diseases	Over-exertion High physical work particularly manual handling e.g., lifting, lowering, pushing, and carrying), repetitive tasks.	The highest rates of musculoskeletal disorders (MSD) especially back and in lower extremities.
	Prolonged occupational exposure to vapours and fumes.	Respiratory diseases such as asthma,
	In construction sites, silica dust is generated during the cutting process of construction materials such as bricks, concrete, mortar, and tiles. Workers can be encountered prolonged and high exposure to silica dust.	Silicosis due to exposure to silica dust, Chronic obstructive pulmonary disease (COPD)
	Asbestos containing construction materials may release fibres into the air during demolition work, building insulation, maintenance, and repair	Mesothelioma, lung cancer, and asbestosis
	During the hot weather, high temperatures and humidity in combination with fogged-up safety glasses, masks, earmuffs (hearing protectors) can cause heat stress	Heat stress Dehydration, heatstroke, and heat exhaustion
	Tobacco uses by workers (smokers) Second hand smoke Betel quid consists of tobacco	Increase the risk of lung disease. Chronic obstructive pulmonary disease (COPD): Chronic bronchitis, emphysema, lung cancer, oral conditions
	Handling or touching toxic chemical, dangerous substances, and rough materials during working hours	Skin diseases can cause as occupational skin problems such as dryness, redness and itching of the skin. The skin may become swollen, cracked, scaly and thickened, and blisters and occupational dermatitis may develop.

Category	Source	Health impact
Psychoso-cial health	Tight planning in budget and time of construction projects Work-related stress at the worksite Low social support from the supervisor Low job autonomy and skill discretion	Work-related stress and lower work ability cause stress, fatigue and burnout, depression Job strain-related anxiety disorders Stress, tension

Recommended mitigation measures

In order to prevent accidents and incidents, if possible, the project proponent may regulate to install security and maintain safety prevention measures and devices for use in each plot of construction. Recommended mitigation measures are shown in Table 8-2.

Table 8-2: Mitigation Measures in Construction and Decommissioning Stages

Health Impact	Mitigation Measures
For general health and safety	Provide health care facilities and first aid within construction sites Provide OHS training program and information of basic hazard awareness, site specific hazards, safe work practices and emergency procedure Provide OHS orientation training to all new employees such as the basic site rules of work at on the site and of personal protection and preventing injury Provide adequate lavatory facilities for the number of people expected to work in the facility Provide adequate supplies and easy access of drinking water with a sanitary means Provide temporary shelters to protect against heat stroke during working activities or for use as rest areas as needed Promote the use of repellents, clothing, netting, and other barriers to prevent insect bites Conduct a short meeting at the start of a workday for workers to brief the day's scheduled work activities and potential hazards
Hearing impairment	The machine, equipment and vehicles should be turned off when not in use No employee should be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection. Hearing protective devices provided should be capable of reducing sound levels at the ear to at least 85dB(A)
Hand-arm vibration diseases	Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, should be controlled through choice of equipment, installation of vibration dampening pads or devices, and limiting the duration of exposure. Limits for vibration and action values, (i.e., the level of exposure at which remediation should be initiated) are provided by the American Conference of Governmental Industrial Hygienists (ACGIH), 2006. Exposure levels should be checked on the basis of daily exposure time and data provided by equipment manufacturers
Slips and falls	Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths ▪ Cleaning up excessive waste debris and liquid spills regularly at jobsite ▪ Locating electrical cords and ropes in common areas and marked corridors ▪ Use of slip retardant footwear ▪ Adequate training
Work in heights	Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones, as well as securing, marking, and labelling covers for openings in floors, roofs, or walking surfaces

Health Impact	Mitigation Measures
Struck by objects	Conducting sawing, cutting, grinding, sanding, chipping or chiselling with proper guards and anchoring as applicable Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes
Rotating and moving equipment	Designing machines to eliminate trap hazards and ensuring that extremities are kept out of harm's way under normal operating conditions. Ensure the visibility of personnel through their use of high visibility vests when working in or walking through heavy equipment operating areas, and train workers to verify eye contact with equipment operators before approaching the operating vehicle. Ensure moving equipment is outfitted with audible back-up alarms Use inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and secure loads when lifting them to higher job-site elevation Wear a seatbelt while operating construction machinery or a work vehicle
Communicable disease Hepatitis HIV/AIDS Malaria Dengue Influenza	Be aware of their own communicable disease vaccination and immunity status. Conduct immunization programme for workers Report communicable disease exposures to their supervisor Report to Township Health Department All workers must receive instruction in prevention strategies and behaviour appropriate to the level of risk in their work. All workers communicable disease exposure incidents are to be reported to their supervisor Educating employees and area residents on risks, prevention, and available treatment Promoting use of repellents, clothing, netting and other barriers to prevent insects bite
Dehydration, heatstroke, and heat exhaustion	All road workers need to drink plenty of water or liquids with electrolytes Provide cool water close to work area Work schedule can be modified and arranged frequent rest periods with water breaks especially in hot days Provide training about hazards leading to heat stress and how to prevent
Risk of musculoskeletal disorders	Training of workers in lifting and materials handling techniques in construction and decommissioning projects, including the placement of weight limits above which mechanical assists or two-person lifts are necessary. Planning work site layout to minimize the need for manual transfer of heavy loads. Selecting tools and designing work stations that reduce force requirements and holding times, and which promote improved postures, including where applicable, user adjustable work stations. Implementing administrative controls into work processes, such as job rotations and rest or stretch breaks.
Respiratory diseases Asthma, silicosis, and cancer.	Use PPE, such as dusk masks, where dust levels are excessive Water can keep silica dust out of the air and prevent inhale. Pour water or sprinkle water to control dust at the source such as road ways at site and excavated area. Use tools with vacuum attachment to capture the dust where cutting material starts. Workers who are required to handle hazardous materials biphenyls (PCBs), electrical components containing mercury, corrosive, oxidizing, or reactive chemicals should be provided with specialized training and provided with, and wear, appropriate PPE (gloves, apron, splash suits, face shield or goggles, etc.).
Tobacco related lung diseases	According to Control of Smoking and Consumption of Tobacco Product Law, (2006), arrange at the specific area where smoking is allowed.

Health Impact	Mitigation Measures
Oral diseases and condition	Caption and marks referring to make known the non-smoking area and specific smoking area Caption and marks referring to make known to avoid spitting betel quid sputum
Risk of transmission of diseases linked to contaminated water and poor sanitation	To provide adequate supplies and easy access of safe drinking water with a sanitary means To provide adequate lavatory facilities for the number of people expected to work in the facility
Expose to contaminated dust, soil, and injurious corrosive materials	Provide adequate gloves to prevent contact To be available suitable facilities for quick drenching or flushing of the eyes and body in the work area for immediate emergency use
Skin Lesions	Provide skin protection creams to apply on skin Following contamination or during work breaks, hands should be washed with an appropriate hand cleanser or soap to remove all dirt and harmful contaminants from the skin, and then followed with the application of the correct protection or restore cream, specific to skin type. After work, restorative products should be applied to moisturize, nourish, and condition the skin, to improve its strength and prevent it from becoming dry or damaged
Psychosocial health	Psychosocial risk management is among employers' obligations to assess and manage all types of risk to workers' health (Counselling). **Regular reviews** and **incentives** for supervisors to ensure workers are treated fairly Arrange flexible work hour

8.1.3 Impacts on occupational health and safety during operation phase

Power sector is known for hazardous work environment. The proposed project employs about 70 workers during the operation stage. The workers working inside the plant might encounter occupational hazards due to different operational activities. Health and safety of engineers, workers, as well as supporting staff working in the plant operation and maintenance is important throughout the plant operation.

Anticipated health impacts on workers during operation phase are described in following table (Table 8-3).

Table 8-3: Potential health impacts during operation phase

Category	Source	Health impact
Noise	Air-cooled condenser (cooling tower), steam turbine generator, the exhaust stack or heat recovery steam generator. High-pressure steam piping and condenser fans are major noise sources	Hearing complexity and loss Increase blood pressure Discomfort Elevated noise level can lead to temporary or permanent hearing damage and can impair workers' efficiency.
Heat exposure	High temperature of steam turbine generator, the exhaust stack or heat recovery steam generator produce impacts on air quality in terms of thermal pollution that lead to heat exposure to workers	Heat stress, rashes Increase irritability Loss of concentration and ability to do mental task Loss of ability to do skilled tasks or heavy work
Accidents	Slips, trips, falls Working at height. Fall from height higher than 2 meters, stair towers and walkways	Injuries

Category	Source	Health impact
	Hurriedness in carrying out activities Lack of sufficient skills	
Exposure to chemicals	Chemical using for purifying water. Sodium hydroxide, sodium hypochlorite (NaClO), Hydrochloric acid, Ammonia Hydrazin Hydrate Corrosion and scale inhibitor cl340	High concentrations of these chemical can cause severe burns to eyes, skin, digestive system, lungs Acute exposure of Hydrazin hydrate can damage the liver, kidneys, and central nervous system in humans. The liquid is corrosive and may produce dermatitis from skin contact in humans and animals. Corrosion inhibitors are bio-toxic organic compounds which have toxicity
Methane emission loss into atmosphere	During the extraction, processing, transmission, storage, and distribution of natural gas. Leaking compressor component	Climate change Fatigue, dizziness, and headaches at high concentration
Occupational stress	Irregular work shifts	Sleep deprivation High blood pressure, headache
Prolong sedentary time Ergonomic	While observing and studying the functioning and performance of systems on monitors	Physical strains to eyes and body Fatigue Sleep deprivation Increased risk of obesity Susceptibility to chronic health conditions

8.1.4 Mitigation Measures against Negative Impact on Occupational Health and Safety in Operation phase

Employers and supervisors are obliged to apply Environmental, Health, and Safety (EHS) Guidelines for Occupational Health and Safety[13] by implementing all reasonable precautions to protect the health and safety of workers. Furthermore, guidance for Environmental Assessment (EA) of thermal power projects[14] is also referred.

Health care for employees

During operation, there are only about 70 employees in the workplace, and there is no in-house clinic. Although there is no clinic, in the administrative office, there are over-the-counter medications available for employees to use if they are feeling unwell. A first aid kits are available in every department if employees have minor injuries and require urgent care. If any injury that required immediate care occurs, there have a transport for an injured person to go to the nearest health care facility. If employees are feeling unwell at work, they are taken to the hospital for immediate medical treatment, and the employer takes responsibility for the cost of the treatment.

Noise

Uncontrolled noise and vibration from powerplant can cause major occupational health and safety concerns and affect productivity by hindering communication, inducing fatigue due to unpleasant, loud environment conditions. Noise producing from steam turbines are generally exceeding the standard noise level that can cause discomfort. The steam turbines generators cooling tower produce noise which is >80 dBA.

[13] International Finance Corporation (2007). Environmental, Health, and Safety (EHS) Guidelines GENERAL EHS GUIDELINES: INTRODUCTION

[14] International Finance Corporation (2008). Environmental, Health, and Safety Guidelines THERMAL POWER PLANTS

Noise limits for different working environments recommended are provided in table 8-4.

Table 8-4: Noise Limits for Various Working Environments[15]

Location / activity	Equivalent level LAeq, 8h	Maximum LAmax, fast
Heavy Industry (no demand for oral communication)	85 dB(A)	110 dB(A)
Open offices, control rooms, service counters or similar	45-50 dB(A)	---

Mitigation measures

- No employee should be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140 dB(C).
- The noise emission from the power plant can be mitigated to comply with regulatory limits by applying noise control methods or low-noise equipment.
- Workers should practice personal protection by use of appropriate soundproof earpiece, earplugs or headphones while working close to noise area and these devices should be issued sufficiently for workers.
- The use of hearing protection should be enforced actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound levels reach 140 dB(C), or the average maximum sound level reaches 110dB(A). Hearing protective devices provided should be capable of reducing sound levels at the ear to at least 85 dB(A)

Photo 8-1: Soundproof earpiece provided for workers in Ahlone CCPP

- The noise level should be measured annually in the noise emission areas.
- Use of acoustic insulating materials, isolation of the noise source, and other engineering controls should be investigated and implemented, where feasible
- Use of noise control techniques such as: using acoustic machine enclosures; selecting structures according to their noise isolation effect to envelop the building; using mufflers or silencers in intake and exhaust channels; using sound absorptive materials in walls and ceilings; using vibration isolators and flexible connections (e.g., helical steel springs and rubber elements); applying a carefully detailed design to prevent possible noise leakage through openings or to minimize pressure variations in piping;
- Sealing the doors and windows of the control rooms and office building. Sound barriers walls can be used as indoor. Composite foam also provides sound reduction in the workspace.
- Greenbelts should be developed around the power plant area to limit the spread of noise to the nearby community.

[15] Environmental, Health, and Safety (EHS) Guidelines GENERAL EHS GUIDELINES: OCCUPATIONAL HEALTH AND SAFETY

- Periodic medical hearing checks should be performed on workers exposed to high noise levels

Heat exposure

Occupational exposure to heat occurs during operation and maintenance of combustion units, pipes, and related hot equipment. Since a combined cycle power plant is a collection of heat engines that collaborate to transform heat energy from one source of heat into mechanical energy, it's generating heat and noise can cause discomfort to engineers, technicians, and workers while they do rounds. It is scheduled to work on-site surveying, taking, reading, and recording instrumentation data 5 times per day. Plant engineers and technicians are inevitable to expose noise, vibration, and heat at least three times in a day since routine inspection at power plant is every two hours.

In the summer season when the temperature reached its maximum the occupational heat stress may develop in workers if working lengthily near heat sources. Especially walk through the stair towers and walkway closed to gas turbines and work at hot surface compartments which have 110 – 120°C.

Mitigation measures

Recommended prevention and control measures to address heat exposure at thermal power plants include:

- Regular inspection and maintenance of pressure vessels and piping;
- Provision of adequate ventilation in work areas to reduce heat and humidity;
- Reducing the time required for work in elevated temperature environments and ensuring access to drinking water;
- Shielding surfaces where workers come in close contact with hot equipment, including generating equipment, pipes;
- Use of warning signs near high temperature surfaces and
- Provide sufficient personal protective equipment (PPE) heat-protective clothing, including insulated gloves and shoes for engineers, technicians, and workers who work in the hot environment
- To prevent heat-related disorders such as heat exhaustion and heat stroke, engineers, technicians, and workers shall take proper selfcare.

Photo 8-2: Heat-protective clothing provided for workers

- Administrative controls may change to task or schedules to reduce heat exposure time.
- Temperature measurement and control by using modern temperature controlling system all time.

Accidents

With the cautious work of safety engineers and employees on-site, power plant accidents are relatively rare (Salvation safety 2022). Accidental issues may occur during the operation phase however, with the proper controlled system accident is not anticipated. Effective measures can be taken in this regard using engineering controls and ongoing training to eliminate unsafe conditions and unsafe actions that can lead to an accident. Studies had shown that the highest accident number was related to the repair and maintenance unit.

Slips, trips, and falls

Mitigation measures

Power plants are generally clean facilities. Routine inspections around doorway and stairways for missing steps, loose handrails, corrosion, holes, grease, spills, of loose carpet or rugs.

- Always use handrails when ascending or descending any stairway and stair tower.
- Only take one step at a time when ascending or descending any stairway and stair tower.
- Train employees to avoid careless behaviour and hurriedness in carrying out activities.
- Conduct regular audits to identify the unsafe conditions and repairs prioritise
- Clear marking of work site hazards and training in recognition of hazard symbols and safety signs.
- All employees must obey the safety signs namely, prohibition signs, mandatory signs, advisory signs, and warning signs.

Photo 8-3: Example of safety signs in Ahlone power plant

Exposure to chemicals

Water purification is vital to combat the scaling and corrosion to supply purified water for steam turbines as well as feed water for heating network. About 10 chemicals are being used in water purifying process at Ahlone CCPP. Some of the chemicals are toxic. Prolong exposure of Sodium hypochlorite (NaHCl) may cause skin irritation and damage skin or dermal hypersensitivity. Concentrated HCl, NaOH, Aluminium Chloride ($AlCl_3$) can be corrosive to the skin, eyes, nose, mucous membranes, and respiratory and gastrointestinal tracts. The toxic product Hydrazin Hydrate (N_2H_4) is used as an oxygen scavenger for corrosion control and control the pH level in the boiler feedwater treatment. Corrosion and scale inhibitor CL340 is also very toxic. Engineers and staff working in water treatment department have to be taken caution while handling chemicals.

Accidental chemical exposures can still occur even with good engineering controls and safety precautions. Whenever a hazardous material is used in a process or operation (including transportation), regardless of the quantities handled, the following IFC guidelines must be implemented.

Mitigation measures

Worker health and safety

- All employees working with hazardous material should be provided with suitable personal protection equipment
  - Use chemical protective clothing - splash suits,
  - Wear respiratory protection
  - gloves, apron,
  - face shield or goggles for eye and face protection
- Emergency eyewash and shower stations
- Ventilation systems
  - Chemical should be stored in a specially prepared, dry storage area that is well ventilated and access is controlled
- Periodic monitoring of workplace air contaminants relative to worker tasks and plant operations is required. Workplace air quality monitoring equipment should be well maintained

If chemicals are accidentally contacted

To eyes: immediately wash (irrigate) the eyes with large amount of water, lifting the lower and upper eye lids. Get medical attention immediately. The flushing or irrigating time can be modified if the identity and properties of the chemical are known e.g., 5 – minutes for non-irritants or mild irritants, 15 – 20 minutes for moderate to severe irritants and chemicals that cause acute toxicity if absorbed through the skin, 30 minutes for most corrosives, and 60 minutes for strong alkalis (e.g., sodium, potassium, or calcium hydroxide)

To skins: immediately wash the contaminated skin with water. If the chemical penetrates the clothing, immediately remove the clothing, and wash the skin with water. If any skin reaction appears after washing get medical attention immediately.

In all cases if irritation persists, repeat the flushing procedure

- The emergency showers and eye wash station should be installed close to all workstations in the Chemical Department.
- Design of the emergency shower and eye wash station should be in aligned with Canadian Centre for Occupational Health & Safety and install a signboard.
- If a person accidentally breathes large amount of the chemical:
  - Move the exposed person to fresh air immediately
- If breathing stop
  - Perform artificial respiration
  - Keep the affected person warm and at rest position
  - Get medical attention immediately.

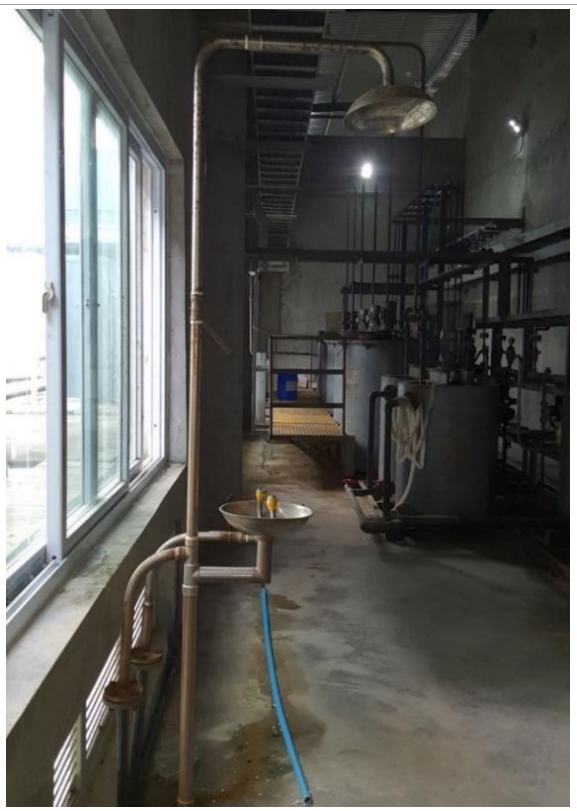


Photo 8-4: The emergency showers and eye wash station at Ahlone CCPP

Training

All employees working with hazardous materials should be trained in hazard identification, safe

Transportation of hazardous material

- Ensuring that the nature, integrity, and protection provided by packaging and containers used for transport are appropriate for the kind and quantity of hazardous material involved;
- Ensuring adequate transport vehicle specifications;
- Routes used;
- Loading and unloading procedures;
- Informing employees involved in the transportation and training them as appropriate to handle normal operations and emergencies;
- Using labeling and placarding (external signs in transport vehicles) as required; and
- Providing the necessary means for emergency response; and
- Compliance audit procedures.

Hazardous Wastes Handling and Disposal

Hazardous wastes should always be segregated from nonhazardous wastes. Adequate measures should be taken for the safe accumulation, labeling, handling, storage, transport, treatment, and disposal of hazardous wastes to avoid contamination of the physical and living environment, and to avoid exposure to human populations to pathogenic, carcinogenic or other agents.

Methane gas emission

Exposure to high concentrations of methane is dangerous. Methane hazardous events can occur due to accidental releases at facilities. An in-depth emergency response plan and ongoing training are necessary to mitigate the risk of a crisis. Due to its volatile nature, methane poses an extreme working hazard, requiring effective removal from the ventilation system.

To improve occupational health and safety and to prevent accidental exposure to methane gas in the workplace, managers are advised to take some precautions to ensure the safety and well-being of their staff.

Health risk and exposure effects

Methane occurs naturally in the atmosphere; however, it has not been shown to have adverse effects on human life at these concentration levels. If levels rise, the risk also increases. Initially, individuals experience, fatigue, dizziness, and headaches. If the exposure progress more severe symptoms will be developed such as nausea, agitation, and displaced speech. In high concentrations, methane depose oxygen causing asphyxiation.

Working exposure limit

Currently, there are no specified occupational exposure limits for methane gas. The National Institute for Occupational Safety and Health (NIOSH) recommends a maximum of 1000 ppm (0.1%) during an eight-hour work period.

Exposure Standard Details

Exposure level (ppm)	Effects of symptoms
1000	NIOSH 8-hours TLV*
50,000 to 150,000	Potentially explosive
500,000	Asphyxiation

**TLV = Threshold Limit Value*

Monitoring methane levels

Methane monitors are required to be mounted on machinery throughout the power plant to alert personnel of any increase in the gas level.

Routine monitoring of methane is required at the power plant.

Monitors are needed to provide alerts when levels exceed 1%. As levels can rise and fall rapidly, and personnel's reaction times vary, there is a warning at 1% rather than the dangerous level of 5% to ensure an adequate and timely response.

It is encouraged to use the Methane Monitor sensor measures CH_4 levels, ensuring it remains within a safe range. The sensor emits an initial warning signal at 1.1%, with an alarm sounding when levels reach 2.2%.

To ensure workers are continually protected, gas monitors need to be installed in every work place reducing the risk to personnel moving across the site.

Occupational stress

Most of the employees in the power sector get stress due to their working conditions, management policies, work-life balance, workload, job satisfaction and psychological factors (Badre, 2021). During the operation phase work in power plant will be demanding long hard hours. At times it is possible that staff may be become overwhelmed by workload and stress. Mental health of staff is critically important. It is required to provide care and attention in ensuring staff are mentally healthy.

The National Institute for Occupational Safety and Health (NIOSH) and the International Labour Office have defined occupational stress as the harmful physical and emotional responses that occur when job requirements do not match or exceed a worker's capabilities, resources, or needs. Long working hours is associated with occupational stress, well-being, and depression. Work on rotating shifts can be stressful and tiring.

Working hour in Ahlone CCPP

In power plant operation department, the employees will have to work for two days, two nights and then have two days off in a repeat cycle between a team of three. Employees will have two days off in a week. Working hour is 8 hours per day and not more than 44 hours in a week.

Nonstandard work shifts can have adverse effects on sleep, physical health, leisure time, and family activities. Working on rotating shifts can be stressful and tiring.

Mitigation measures

- To reduce occupational stress due to irregular shifts:
- Taking frequent breaks when working a 12-hour day.
- Manage sleep pattern by adjusting sleep routine to ensure maximum relaxation.
- Take short nap before starting a shift
- Monitor the diet
- Use caffeine wisely
- Regular exercise

Prolong sedentary time

Power plant control room operators are responsible for the safe and proper operation of power plants and associated control structures. It is a highly responsible and stressful job since the equipment needs constant monitoring and give full attention to monitoring controls during their shift. Sitting at the desk and focusing on display screens for long time can cause physical and mental fatigue and eye strains. Operating engineers and technicians who may not be engaged in enough physical activity throughout the day are increased risk of obesity, and other health problems.

Mitigation measures

To mitigate the impact of prolong sedentary time and eye strains:

- Provide ergonomic workstation design to improve operator comfort and safety (considered knee space, countertop height, monitor height, viewing angles, reach and amount of space the operator has behind the desk to sit comfortably).
- Encourage to do moderate-intensity exercises (a brisk walk, take the stairs, Office cardio circuit)
- Stand or walk during phone calls
- Take frequent break
- Blink eyes (every 20 minutes, blink 10 times)
- Exercise eyes

For the health and safety of the workers and employees, the plant management committee, administrators shall take necessary measures in accordance with the occupational health and safety policies. It is crucial to ensure that employees do follow safety rules and safe work practices. Furthermore, to enable all employees to actively engage their own duties it is important to consider feedback from those who are working in shifts and long hour.

8.1.5 Impact on Community Health and Safety

During the implementation of construction, operation, and closing activities, community health and safety issues will need to be taken into consideration. Community health and safety is to protecting local communities from hazards caused and or exacerbated by Project activities equipment and infrastructure.

Impacts on community health and safety may be due to air pollution, noise and vibration, influx of workers from other townships, solid waste generation including hazardous materials from Project site and road traffic movements.

Potential impacts and mitigation measures

Construction phase and Decommissioning phase

Air quality

Ambient air quality has been assessed at selected points near the project area. The physical environment baseline data collection results showed within 24 hours the emission of parameter PM_{10} was 91.3 µg/m^3 and $PM_{2.5}$ was 61.9 µg/m^3 which were higher than WHO air quality guidelines value [45 µg/m^3 and 15 µg/m^3]. Likewise, SO_2 concentration was high in the air [82.1 µg/m^3] compared to the WHO air

quality guidelines value 40 µg/m^3. The generated dust particles can pollute the atmosphere and if inhaled can lead to related health hazards for workers and the surrounding people at close proximity to the sites. During the construction phase local air quality can be temporarily affected by emission of dust particles and trace gases released by construction activities such as moving of equipment, excavating soils, levelling, grading, earthworks, and foundation construction. Impacts on air quality can be high mainly in the dry months.

Prolonged or repetitive exposure of PM_{10} can cause harmful effects on the respiratory system such as chronic bronchitis and asthma attacks. $PM_{2.5}$ can penetrate the nose and the throat and reaching the lungs. They may cause respiratory morbidity, damage to lung function and lung cancer.

Main effect of SO_2 is on mucous membrane and lungs that causing cough. Exposure to high concentrations of SO_2 for short periods of time can irritate the respiratory tract, cause bronchitis, asthmatic reactions, respiratory arrest, and congestion in the bronchial tubes of asthmatics. It is documented that SO_2 can lead to the formation of secondary particulate matter. However, health effects in the community with lung problems and irritation to the skin and mucous membranes of the eyes, nose, and throat due to SO_2 exposure and air pollution is unknown.

Mitigation measures

Dust suppression technique should be implemented such as sprinkling water or non-toxic chemicals minimize dust.

Spraying or sprinkling water on dust prone working areas such as transportation, digging works, material handling etc. Covered transportation of dusty materials while travelling to prevent spreading materials.

Diesel exhaust emissions from heavy machinery on site (excavators, front end loaders and hauling trucks, excavator) must be controlled and minimized by regular checks and servicing of vehicles. Any construction vehicle found to be emitting excessive smoke should be withdrawn from the operations and accorded the necessary mechanical attention before it can continue.

Restrict times and precaution will be taken in minimizing air pollution while crushing of stones and bricks, chemical mixing.

Influx of workers

Health risks

Labour influx can provoke higher rates of violence, injury, alcohol and drug consumption and sexually transmitted diseases in the workforce and the local population. Communicable diseases such as sexually transmitted diseases, tuberculosis, hepatitis, pneumonia epidemic diseases such as COVID 19, H1N1 influenza are significant health problems to concern. An increase occurrence of dengue fever, malaria, severe diarrhoea is expected. Common cold and flu caused by probably new strains are very well possible, as well as respiratory tract diseases.

Mitigation measures for health risks

Local people shall be well informed about possible negative consequences of spread of infectious diseases.

Health education and instruction to the workers at the project on risks, prevention, and available treatment.

Conflicts with workers

Conflicts and tension may arise between the local community and the construction workers which may be related to religious, cultural, value and ways of life or ethnic differences. Without paying attentions to local community alcohol, drug abuse, waste disposal practice can cause worker-community conflict. Anxiety, stress, and psychosocial problems can be arising from conflict. Irritability and anger can cause mental stress in local community.

Mitigation measures for conflicts

Establish a worker Code of Conduct that requires respect for local communities, appropriate behaviour during and outside working hours, prohibitions on carrying knives, or other weapons; prohibitions on

the possession or consumption of alcohol and drugs, and enforcement of penalties in the event of worker-community conflicts, petty crime, etc. Put in place zero-drug and alcohol tolerance policies.

All the workers would sign and follow the Code of Conduct

Noise and vibration

People residing near Ahlone CCPP will suffer from noise pollution and vibration generated by various sources during construction activities including piling, excavation, use of heavy earth moving machineries, etc. Construction noise as well as noise during decommissioning phase has negative effects on residents including emotional stress, annoyance, and distraction. Noise pollution can cause disturbance in people's various daily activities such as studying, sleeping/ resting, interference with conversation and watching television. This disturbance can cause anxiety, depression, anger, and stress-related symptoms.

Mitigation measures

Noise generating activities should be scheduled not to have simultaneous exposure. All construction equipment shall comply with the applicable noise standards. Regular maintenance of equipment's will be ensured to keep noise. Strict adherence to OSHA standards for noise exposure to be ensured.

Increase traffic loads

Because of the construction works there can be increased traffic loads in local roads. These movements are likely to have a significant impact on current access along the road leading to the power plant site.

Mitigation measures

Work zones will set as an advanced warning area with warning signs alerting motorists of upcoming changes in driving conditions, a transition area using traffic control devices such as light-colored traffic cones, barrels, barriers or sign for lane closures and traffic pattern shifts, a buffer area, and the work area.

Notice boards and caution signals should be installed.

Set up the enforcing slower speed limits signs.

8.1.6 Operation and maintenance phase

Impact on community health and safety during operation can be noise generation from the power plant. The steam turbine generator, air-cooled condenser, cooling tower will emit a noise which can be dispersed to the surrounding atmosphere to certain extent. Measured noise levels in the residential area in neighbouring of power plant was 55 dB LAeq during the day and 45 dB LAeq at night time. At neighbouring industrial and commercial area night-time noise level and day time noise level were the same at 70 dB LAeq which indicated main source of noise may come from city traffic and container yards. The closest residence is staff quarters situated 100 meters away from the power plant unlikely to be affected.

Mitigation measures

The noise emission from the power plant can be mitigated to comply with regulatory limits by applying noise control methods or low-noise equipment.

Based on the land availability, the development of greenbelt, that is plantation of trees with broad leaves along the entire periphery of the plant would be undertaken. It would contribute to reduce the noise and air pollution impact in immediate surrounding environment.

In conclusion, the impacts on the community at the stage of the construction were short-term and with implementation of mitigation measures the impacts level were low. The application of sound protecting facilities and technologies and greenbelt plan would reduce the noise generated from the project.

9. PUBLIC DISCLOSURE, CONSULTATION, AND STAKEHOLDER CONSULTATION

Introduction

Since solving social issues is more complicated and time consuming than that of environmental related impacts, it is therefore by applying the methodology described in this section stakeholder engagement and public disclosure activities are being carried out to date. This chapter presents full social report that have been successfully accomplished. Interviews, opinions, and feedback of those concerned party were collected by dividing into 2 key layers (i.e., administration and public). Prior conducting public disclosure, stakeholder engagement meeting and public consultation, all socioeconomic information of the whole Ahlone township was collected.

9.1 Stakeholders Consultation

Stakeholder consultation is a means of involving all primary and secondary stakeholders in the project's decision-making process in order to address their concerns, improve project design, and give the project legitimacy. Stakeholder consultation, if conducted in a participatory and objective manner, is a means of enhancing project sustainability. Public consultation and participation have been viewed as a continuous two ways process involving, promoting of public understanding of the processes and mechanisms through which developmental problems and needs are investigated and solved. The public consultation, as an integral part of environmental and social assessment process throughout the project preparation stage not only to minimizes the risks and unwanted hurdle against the project implementation but also bridges the gap between the community and the project formulators which leads to successful and timely completion of the project and making the project people friendly.

Therefore, keeping in mind the above objective public consultation with the people of different section of the society, like local administrative officials, some related social agencies, business groups, community representatives, respectable and influential persons of the project, area were made. Moreover, potential vulnerable people were also consulted with the aim to make people aware and minimize adverse impacts of the project. The option of alternative design was also discussed to achieve accelerate the implementation of proposed solar project with people's involvement.

Community input (both of knowledge and values) on socioeconomic and environmental issues can greatly enhance the quality of decision-making. Stakeholder consultation was therefore conducted in the project area not only to satisfy the legal requirements of the ESIA process in Myanmar but also to improve and enhance the social and environmental design of the project.

As per the Safeguard Policy Statement (SPS) of ADB, Public Consultation and participation plan needs to be included in the EIA/ESIA Report for all stages of the project (project design, construction, and operations phase) for categories "A" and "B". Also, a documentation of meaningful consultation with affected local communities especially project affected persons needs to be carried out.

9.2 Identification of The Stakeholders

People who live near and around the project who will be directly and indirectly affected by the project are considered as the stakeholders. For this particular project, stakeholders are the fishermen, the people who live near the project, the cow owners and the workers of the nearby plant. For the sake of their interest, it is an absolute necessity to consult all primary and secondary stakeholders.

9.3 Objectives of Stakeholders Consultation

The process of public participation and consultation was endorsed in the United Nations Conference on the Environment and Development (UNCED) in 1992 through one of the key documents of the conference Agenda 21. Agenda 21 is a comprehensive strategy for global action on sustainable development and deals with issues regarding human interaction with the environment. It emphasizes the role of public participation in environmental decision-making for the achievement of sustainable development.

For projects that have environmental and social impacts, consultation is not a single conversation but a series of opportunities to create understanding about the project among those it will likely affect or interest, and to learn how these external parties view the project and its attendant risks, impacts, opportunities, and mitigation measures. Listening to stakeholder concerns and feedback can be a valuable

source of information that can improve project design and outcomes and help a company to identify and control external risks. It can also form the basis for future collaboration and partnerships. For stakeholders, a company's consultation process is an opportunity to get information, as well as to educate company staff about the local context in which a project will take place, to raise issues and concerns, ask questions, and potentially help shape the project by making suggestions for the company to consider and respond to through the public consultation process, the Myanmar Ahlone Power Plant Company Limited. hope to:

- Promote better understanding of the project, its objective, and its likely impact;
- Identify and address concerns of all interested and affected parties of project area;
- Provide a means to identify and resolve issues before plans are finalized and development commences, thus avoiding public anger and resentment and potentially costly delays;
- Encourage transparency and inculcate trust among various stakeholders to promote cooperation and partnership with the communities and local leadership;
- Assessment of possible requirement of improvements;
- Solicit the views of affected communities/individuals on environmental and social problems;
- Improve environmental and social soundness;
- To settle problems with mutual consent;
- Create accountability and sense of local ownership during project implementation.

9.4 Consultation Process

The process of stakeholder consultation includes:

- Identification of the relevant stakeholders including all those individuals, groups and organizations potentially affected by or interested in the project;
- Imparting information about the project and its potential impacts on their lives in local and simple language;
- Recording of their concerns and aspirations through survey and discussions;
- Responding to their queries in a neutral manner.

In the primary survey a list of open-ended questionnaires is used in both the focus group discussions and the individual interviews. A two-person survey team carried out the discussions and the interviews. Project proponent, Local communities, Men, Women and Old persons, Members of district authorities of government officials, local labours, contractors were our stakeholders to whom we consulted.

Primary stakeholders were consulted during informal and formal meetings held in the project area. The consultation process was carried out in both languages Myanmar and English. During these meetings a simple, non-technical, description of the project was given, with an overview of the project's likely human and environmental impact. This was followed by an open discussion allowing participants to voice their concerns and opinions. In addition to providing communities with information on the proposed project, their feedback was documented during the primary stakeholder consultation. The issues and suggestions raised were recorded in field notes for analysis, and interpretation.

By reaching out to a wider segment of the population and using various communication tools—such as participatory needs assessment, community consultation meetings, focus group discussions, in-depth interviews, and participatory appraisal — ESIA involved the community in active decision-making. This process will continue even after this ESIA has been submitted, as well as during future ESIAs in which similar tools will be used to create consensus among stakeholders on specific environmental and social issues in the context of a proposed project.

It was important not to raise community expectations unnecessarily or unrealistically during the stakeholder consultation meetings in order to avoid undue conflict with local leaders or local administrators. The issues recorded in the consultation process were examined, validated, and addressed in the ESIA report.

9.5 Project Disclosure: Awareness About the Project

Focused group discussion / public consultations were conducted in conference of MOEP headquarter (Ahlone Township). All the attendees expressed their full support for Combined Cycle Power Plant. Local community found comfortable with proposed development. Locals were already aware of the upcoming project. In consultation, more than 50 people at each location were participated. Consultant team has also consulted/discussed informally with youths, women, and daily wage workers in and around the project site. At the very beginning of the public consultation/discussions the participants were introduced about the details of CCPP. It was explained to them that the project was explained and those present were informed that the project will be constructed inside state owned premises. No acquisition of land is needed for the proposed project. No permanent acquisition of land and consequent resettlement will be required for the project. Some noise, air pollution may occur, but it will be minimized using proper methods. The consultant has carefully studied all types of impacts in the locality likely to be affected by the proposed plant and informed the gatherings of the impacts. Information dissemination and consultation will continue throughout the project implementation period.

9.6 Stakeholder Consultation Technique

In recognition of the diversity of views within any community, it is very important to obtain a clear understanding of the different stakeholders and to analyse their capacity and willingness to be involved in some or all of the project and its planning process. It is important to be aware of how different power relations can distort participation. It is also important to examine how community skills, resources, and 'local knowledge' can be applied to improve project design and implementation. All of this can be achieved by careful use of the various tools of Stakeholder Consultation. Therefore, the following participatory technique was employed during stakeholder consultation:

- Informal meetings with communities in surrounding areas. Men, women, and local elders attended these meeting.

9.7 Stakeholders Consulted

In the consultation process for ESIA, there were two types of stakeholder consultation; Formal and Informal. Formal stakeholder comprises of those government officials and institutions whose consent and consultation views would be prime i.e., Government agencies, NGOs, and District fisheries department. Given below is a description.

9.7.1 Public Consultation and Stake Holder Engagement Meeting

Introduction

The ESIA team of Myanmar Survey Research Co., Ltd held a public consultation meeting (PCM) to clarify the ESIA activities and potential impacts of the Myanmar Ahlone Power Plant (MAPP) on the natural environment, in Ahlone Township, Yangon Region, on October 15, 2021. Four officials from the electricity sector; another four from the administration sector and six from MSR, totalling 14 persons, attended the PCM, among others.

Meeting Venue and Schedule

The first Public Consultation and Stake Holder Engagement Meeting for scoping exercise had been held on **15th October 2021** and the second had been on **6th January 2023** at Conference Hall of Ahlone Power Plant and Substation Hall of regional Ministry of Electric Power. The meeting was kicked off on 9AM to 1 PM. The documentation and attendance list are shown in the appendix and the outcomes of the meeting is discuses below.

9.7.2 1st Public Consultation and Stakeholder Engagement Meeting: Proceedings

At the 1st Public Consultation Meeting, there was no protest against the construction and operation of the Myanmar Ahlone Power Plant. Only two persons, both of whom are Ward Administrators, contributed their discussions.

(1) U Aung Soe, Ward Administrator of Thittaw Ward, mentioned his concern about the possible bloc age of water flow in the creek, and occurrence of inundation in the residential wards if soil, mud, and wastewater, discharged by the plant, are discarded into the creek.

(2) U Aung Khaing Myint, Ward Administrator of Saw Yan Paing (West) Ward, presented the need of teachers and other requirements at the three schools in his ward.

In other parts of the meeting, most attendees mentioned their pleasure at the emergence of the power plant.

Speeches

U Kyaw Khin, Power Station Manager, Ahlone Power Station

U Kyaw Khin is the manager of the government's Ahlone Power Station under the Ministry of Electric Power. He spoke of:

- the existence of five gas-operated power plants in Yangon Region–Ahlone, Thaketa, Ywama, Hlawga and Thilawa;
- a brief history of the Myanmar Ahlone Power Plant:

Myanmar Ahlone Power Station (1995)

Construction completed:	1995
No of turbine generators:	Three (33-MW) turbine generators
Initial output:	70 MW
Gas needed:	36 million cubic-feet
Current output:	160 MW
Total output:	3,700 MW
Consumption in Yangon Region:	1,350 MW (35%)

U Hsan Tun, Chairman of Ahlone Township Administration Council

U Hsan Tun talked about the crucial role of electricity in nation-building. He mentioned pleasure at seeing increasing power plants in Myanmar.

Clarifications (MAPP)

Daw Phyu Mar Lwin, Senior Manager, MAPP

Daw Phyu Mar Lwin explained matters related to the Gas Power Plant. She said her company was one of the eight companies that won tender, invited by the Ministry of Electric Power for 2020.

Myanmar Ahlone Power Plant – MAPP (2021)

Construction period:	Sep 2019 – Jan 2021
Operation started:	April 2021
Install capacity:	183 MW
Generation capacity:	151 MW (108,702 MW per month) (2021)
Construction stage recruitment:	450 – 500 employees
Operation stage recruitment:	80 employees
CSR fund and other plans:	To donate teaching aids to schools
	To provide scholarships to 10 students
	To grow trees in every rainy season
	To recruit young people during 5-year operation
Spacious compound:	No noise impacts on neighbors
Gas-operated:	No pollution to the air
20-hour operation:	2 shifts
Covid third wave period:	Workers were made to stay in the compound.

	They were provided board and lodging.
	Virus tests were conducted.
	Workers were vaccinated against Covid.
	Disinfectants were sprayed every morning.

Clarifications (MSR)

U Ko Ko Soe Lwin Thaw, Director, Head of ESIA Department, MSR

U Ko Ko Soe Lwin Thaw introduced MSR to the attendees.

Myanmar Survey Research Co., Ltd

Four departments:	1	Social Research
	2	Marketing Research
	3	Industrial Research & Business Consulting
	4	ESIA
ESIA licence obtained:	2015 (Environmental Conservation Department)	
All projects completed by MSR:	1,700 projects	
ESIA projects completed:	50 projects	
Significant projects:	Korea-Myanmar Industrial Complex Project	
	Upgrading Yangon-Mandalay Expressway	

U Aung Lin, Consultant (SIA), MSR

U Aung Lin explained the requirement of ESIA, compilation of the Assessment Report, and submission of it to the Environmental Conservation Department (ECD), under the Ministry of National Resources and Environmental Conservation.

Regarding the Social Impact Assessment, he clarified matters related to:

- holding Public Consultation Meetings with residents of the communities adjacent to the project site;
- delay of work due to the outbreak of Covid-19
- conducting Key Informant Interviews (KIIs), meeting with community leaders, community residents, township-level officials of government departments, health and education officials.
- Corporate Social Responsibility (CSR) fund set aside by the developer and contribution to the development of the communities nearby; and,
- activities in the post-ESIA period, such as monitoring of the environmental management and regular assessments, and the need to submit bi-annual or annual monitoring reports to the ECD.

Dr Htay Aung Pyae, Consultant (Physical Impacts), MSR

Dr Htay Aung Pyae explained potential impacts on physical things, introducing the project first.

Gas-fired power plant project

Total area:	6 acres	
Location:	Compound of Ahlone Power Station	
Raw materials:	Water and natural gas	
Sources of raw materials:	Myanma Oil and Gas Enterprise (for gas)	
	Myanma Port Authority (for water)	
Output sold:	To Electric Power Generation Enterprise	
Ministries whose rules and regulations are to be followed in implementing the project:	1	Ministry of Natural Resources and Environmental Conservation (MONREC)
	2	Ministry of Electric Power (MOEP)
	3	Ministry of Construction (MOC)

	4	Ministry of Immigration, Labour and Population (MOLIP)
Five main systems in gas-fired electricity generation:	1	Natural gas-powered turbine generator
	2	Steam-powered turbine generator
	3	Boiler system
	4	Cooling system
	5	Step-up transformer
Five potential areas for causing impacts:	1	Emission of gas
	2	Leakage of gas
	3	Utilization of water resource
	4	Noise and vibration
	5	Waste matters, rubbish, lubricants, and chemicals

Dr Htay Aung Pyae explained details of the areas of potential impacts, mentioned above—emission of gas (about 1,563 lbs of CO2 per megawatt-hour), leakage of gas in case of a natural disaster or accident, use of water (8,400 cu-m initially and only a small quantity daily later), and place of taking water samples (Yangon River).

Dr Aung Myint Thein, Consultant (Biological Impacts), MSR

Dr Aung Myint Thein spoke about the recording of trees found in the vicinity of the plant (22 kinds), taking photos of the animals (birds), good and bad impacts on the flora and fauna systems, the need to check the existence of animals and plants defined internationally and nationally for environmental conservation, the need to seek mitigation measures, and interaction and mutual benefits made between man and the natural environment. He encouraged growing more trees.

Dr Mon Mon Tin Oo, Consultant (Community Health), MSR

Dr Mon Mon Tin Oo talked about matters related to health and occupational safety of workers, her observance of the health and safety measures currently taken at the plant, the need to put up safety-alert symbols, the need to provide protective devices for protecting the ears against noise, to drink much water and take rest by taking turns to prevent fatigue and cramp, caused by heat, the need to wear heat-proof gear, the need to wear masks not to inhale dust, the need to post warning signs at places where liquid chemicals are kept, the need to wear gloves in handling chemicals, the need to conduct training courses on occupational safety, and systematic disposal of rubbish. She called for installing fire-fighting equipment.

Responses to questions

Regarding obtaining of water, Dr Htay Aung Pyae (MSR) explained that under the guidance of YCDC, water is to be obtained only from surface, not from underground. Although initial requirement is large, the daily requirement of water later will be a small quantity.

Regarding employment, Daw Phyu Mar Lwin (MAPP) said the company recruited about 500 Myanmar employees and 100 foreign experts in the construction stage, but at this operation stage, it recruited 80 Myanmar employees and 20 foreign experts.

Regarding the supply of electricity, U Kyaw Khin (MOEP) said the electricity generated will be fed into the national grid, and also it will be distributed to nearby townships in Yangon Region.

Regarding renewal of visas, Daw Phyu Mar Lwin (MAPP) said the company had foreign experts overstaying their visas. It happened during the Covid period when Immigration Offices were closed. There is no such incident now.

Discussions

U Maung Maung, Assistant Director (Retired), Myanma Electric Power Enterprise, said electricity is now being supplied to 50% of the population, and such a gas-operated power plant also exists in Tharketa, where the waste heat from the plant is used for heating boilers for further generating electricity.

U Aung Soe, Ward Administrator of Thittaw Ward, mentioned his concern about the possible blockage of water flow in the creek, and consequential occurrence of inundation in the residential wards. He said if the soil, mud and wastewater, discharged by the plant, are discarded into the creek, they will accumulate as time goes by, and eventually cause blockage of the flow of water and inundation in the wards.

He also told the plant officials to report about the stay of foreigners to the Ward Administration Council concerned.

U Aung Khaing Myint, Ward Administrator of Saw Yan Paing (West) Ward, spoke of the need of teachers and other requirements at the three schools in his ward.

Public Consultation Meeting to clarify ESIA for Myanmar Ahlone Power Plant (Detailed)

Myanmar Survey Research held a public consultation meeting to explain ESIA activities at Myanmar Ahlone Power Plant (MAPP) in Ahlone Township, Yangon Region, on October 15, 2021.

Attendees (Ahlone Township)

1	Daw Phyu Mar Lwin	Senior Manager	MAPP
2	U Kyaw Khin	Power Station Manager	Ahlone Power Station, Ministry of Electric Power
3	U Zaw Ko Ko Lat	Assistant Power Station Manager	Ahlone Power Station, Ministry of Electric Power
4	U Maung Maung	Assistant Director (Retired)	Myanma Electric Power Enterprise, Yangon Region
5	U Hsan Tun	Chairman	Township Administration Council, Ahlone Township, Yangon Region
6	Major Zaw Naing	Member	Township Administration Council, Ahlone Township
7	U Aung Soe	Ward Administrator	Thittaw Ward, Ahlone Township
8	U Aung Khaing Myint	Ward Administrator	Saw Yan Paing (West) Ward, Ahlone Township

Attendees (Myanmar Survey Research)

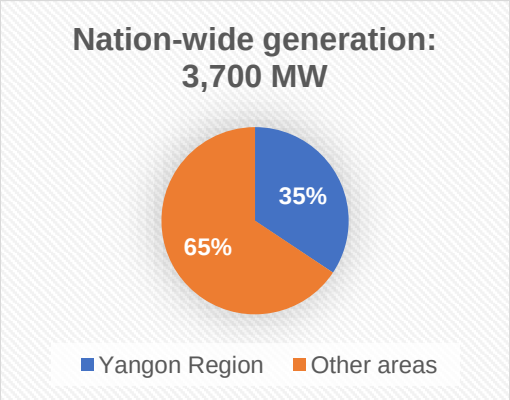
9	U Ko Ko Soe Lwin Thaw	Director, Head of ESIA Department	ESIA Department, Myanmar Survey Research Co., Ltd
10	Dr Htay Aung Pyae	Consultant (Physical Impacts)	ESIA Department, Myanmar Survey Research Co., Ltd
11	U Aung Lin	Consultant (SIA)	ESIA Department, Myanmar Survey Research Co., Ltd
12	Dr Mon Mon Tin Oo	Consultant (Community Health)	ESIA Department, Myanmar Survey Research Co., Ltd
13	Dr Aung Myint Thein	Consultant (Biological Impacts)	ESIA Department, Myanmar Survey Research Co., Ltd
14	U Ohn Kyaing	Manager	ESIA Department, Myanmar Survey Research Co., Ltd

9.7.3 PROCEEDINGS (Detailed)

CLARIFICATIONS

1. U Kyaw Khin, Power Plant Manager, Ahlone Power Station, Ministry of Electric Power

I'm Manager of the Myanmar Ahlone Power Plant (MAPP). Our plant is under the Electric Power Generation Enterprise (EPGE), Ministry of Electric Power. In Yangon, there are five gas-operated power plants—Ahlone, Thaketa, Ywama, Hlawga and Thilawa. With its construction completed in 1995, the power station started commercial generation of electricity with three 33-MW turbines. The initial output was 70 MW. We have made power purchase agreements with individual businessmen. For operation, 36 million cubic-feet of gas is needed. As the efficiency of the plant declined, we invited private businessmen, and CEC Co had a 50-MW power station constructed. As gas operation has been reinforced with steam, the efficiency has become better.



Now the station is generating 160 megawatts. Electricity generation by the private sector is helping fulfil the electricity needs of Yangon Region. The total capacity of electricity generated in the entire country is 3,700 MW, of which Yangon Region consumes 1,350 MW, which accounts for 35% of the total generation. To meet this requirement, EPGE is generating 2,000 MW per day. More plants are also being built. CEC Co is now generating 156 MW, and consideration of environmental friendliness was initially given to the construction of the plant. I would like to invite your comments and advice.

2. U Hsan Tun, Chairman of the Ahlone Township Administration Council, Yangon Region

In the efforts being made by the State Administration Council for national economic development, availability of electricity plays a crucial role. Power plants are now being built increasingly to help bring progress to various economic sectors of the country. I would like to mention my happiness in seeing a new power plant appearing in our township. We will provide assistance if you have requirements. We also learn from this meeting where measures for mitigating impacts on the natural environment will be presented. I would like to suggest utilize knowledge and experiences from this meeting in our efforts for national development.

3. Daw Phyu Mar Lwin, Senior Manager, MAPP

I'm going to present activities of MAPP. The Ministry of Electric Power invited tender for increased generation of electricity for 2020 in Yangon Region. Our company was one of the eight companies that won the tender. We started construction in September 2019 and wrapped it up in January 2021. The generation capacity of our plant is 151 MW, and 108 KW per month. On this PowerPoint presentation, you will see the site before the construction started. We drove in bored piles for strengthening the structure. Gas turbine generators were installed in February and operation started in April. The initial capacity was 115 kilowatts. With more turbines installed, the generation capacity increased to 151 MW in 2021.

Our plant has been built on a spacious compound so that noise pollution can be reduced. Because we use gas, there is no pollution to the air. During the construction period, we could provide jobs to 450 to 500 persons. Now in the operation stage, there are 80 workers. We have CSR fund and plans to contribute to the benefits of the public. We will donate teaching aids to schools. We have a plan to provide scholarships to 10 students per year from selected schools. We will provide jobs to young people during the five-year operation. We have a plan to grow trees in every rainy season. The start of the plant operation coincided with the third-wave attack of Covid-19. But we didn't stop the operation. We assigned two shifts for 24-hour operation. Workers were made to stay in the plant compound with the provision of board and lodging. So, we could run the plant for 24 hours without anyone infected with the virus. We diagnosed virus infection with test kits twice a week. We spray disinfectants at 5 pm every day. We have had every worker vaccinated against Covid.

4. U Aung Lin, Consultant (SIA), MSR

In our country, we have to conduct environmental and social impact assessments before implementation of a project and submit the report to the Environmental Conservation Department. Now this plant is already in operation.

Actually, before the plant is constructed, we have to collect physical data regarding soil, water and air and also socio-economic data, about wards in the environs and the respective township, to find out how they will be affected by this plant. Some projects involve utilization of farmlands and garden lands, owned by individual residents. For such projects, we have to hold public consultation meetings with the local residents in nearby villages and wards. We have to record whether compensations have been given and whether rules and regulations of the State are followed.

There are four teams to collect the data. I would like to introduce the leaders. This is U Ko Ko Soe Lwin Thaw, Head of the ESIA Department. This is Dr Htay Aung Pyae, leader of the physical data collection team. The person who leads the team for collecting biological data for fauna and flora is Dr Aung Myint Thein. I lead the team for collecting socio-economic data. Dr Mon Mon Tin Oo studies and assesses public health conditions.

5. U Ko Ko Soe Lwin Thaw, Director, Head of ESIA Department, MSR

I'll briefly introduce MSR to you. MSR has four main departments—Social Research, Marketing Research, Industrial Research and Business Consulting, and our department ESIA. Our ESIA Department obtained licence from the Environmental Conservation Department in 2015 and since then, we have started to conduct ESIA activities. In fact, our ESIA assessments began in 2009 to fulfil needs of foreign companies doing investments in Myanmar. So far, MSR has completed about 1,700 research reports, and ESIA Department has compiled around 50 projects. Included in some significant projects, carried out by the ESIA Department, are Korea-Myanmar Industrial Complex Project at Nyaung Hnit-pin, Hlegu Township; Nyaung Hnit-pin Infrastructure Project which involved the Ministry of Construction, Project for Upgrading Yangon-Mandalay Expressway, etc.

MSR is a third party, carrying out ESIA activities with the permission of the Environmental Conservation Department under the Ministry of Natural Resources and Environmental Conservation (MONREC). As MSR has been selected to conduct ESIA for Ahlone Gas Power Plant and also under guidance from ECD, MSR compiled a list of consultants and specialists and submitted it to ECD. There are two parts. The first part is submission of proposal for conducting ESIA for Combined Cycle Power Plant (151 – 154 MW) in Ahlone Township to the MONREC. The second part is to carry out EIA and SIA. Respective leaders will explain detailed work schedules.

6. Dr Htay Aung Pyae, Consultant (Physical Assessment), ESIA Department, MSR

I will present activities for physical impact assessments. Let me introduce the project first. The total land area on which this plant has been built is about six acres. It is the compound of Ahlone Power Station. As raw materials, water and natural gas are used. Natural resources are obtained from the Myanma Oil and Gas Enterprise (MOGE) and Myanma Port Authority (MPA). The electricity generated by this plant is sold to Electric Power Generation Enterprise (EPGE) of the Ministry of Electric Power. In operating this plant, we have to compile a report on Environmental and Socio-Economic Impact Assessments and submit it to the Environmental Conservation Department.

The plant, located within the compound of the Ahlone Power Station, started its construction in 2019, and started operation in 2021. In writing an ESIA report, we have to check whether the project is in conformity with the rules and regulations promulgated by the State. Guidance of the four ministries:

(1) Ministry of Natural Resources and Environmental Conservation (MONREC);
(2) Ministry of Electric Power (MOEP);
(3) Ministry of Construction; and
(4) Ministry of Labour—has to be obtained.

Coordination has to be made with commissions and committees concerned in the region. There are five main systems in gas-powered electricity generation:

(1) Natural gas-powered turbine generator;
(2) Steam-powered turbine generator;

(3) Boiler system;
(4) Cooling system; and
(5) Step-up transformer.

There are five potential impacts on the natural environment during the operation stage:

(1) Emission of gas;
(2) Leakage of gas;
(3) Utilization of water resource;
(4) Noise and vibration;
(5) Waste matters, rubbish, lubricants and chemicals.

Regarding emission of gas, about 1,563 lbs of CO_2 per megawatt-hour is emitted into the atmosphere, causing greenhouse effect. Leakage of gas may happen in case of a natural disaster or an accident. In utilization of water resource, about 8,400 cubic-meters (estimated 2,219,050 gallons) of water is to be utilized initially from the Yangon River, and later supplementary water in a small quantity only is needed for daily use. There will be noise and vibration in the plant precincts due to the running of the machines.

We measured the quality of ambient air, and collected data on it. To find out the quality of water, we collected water samples from Harbi Creek (lower and upper reaches) and Yangon River (lower and upper reaches) all along the length of the project area. We collected soil samples from the places of maximum impact. We sent the samples to laboratories, and obtained data. This was the collection of baseline data, which will be included in the report. The report will be submitted to ECD. We have to carry on with the tasks if we have had permission. After carrying out the ESIA tasks in accordance with the prescribed guidance, we will present the impacts with findings, assessments, suggestions and future tasks with time schedules. Regarding the future tasks, reports on mitigation measures will be submitted, in accordance with the ECD guidance, bi-annually or annually.

7. Dr Aung Myint Thein, Consultant (Biological), ESIA Department, MSR

I'm responsible for conducting biological impact assessment. On studying MAPP, you will see the conditions of plants and animals as shown in the photo. Regarding flora, it is better to know the plants and trees in the past, in addition to the existing plants and trees, for making assessments. Biology includes both flora and fauna. I have recorded 22 kinds of trees found in the vicinity of the power plant. I estimate that there will actually be 30 kinds—naturally growing and grown by man. These are the photos of animals—a sparrow on the plant, a crow in a tree and a squirrel on a coconut tree. I took these photos with difficulty. It's meaningful in taking these photos, to find out impacts by the construction of the plant. There are both good and bad impacts. Bad impacts are to be mitigated by making assessments. There are also other birds like myna and pigeon, which I failed to photograph. There are animals and plants defined internationally and nationally for environmental conservation. We're looking for such animals and plants whether they exist in these environs or not. We need to assess whether there are impacts on the ecosystem, connected with these plants and animals. If there are bad impacts, we need to assess how to mitigate them. We can reduce the CO_2 discharged by the power plant. Trees release oxygen, and creatures discharge CO_2 for trees. In this way, ecosystem is maintained. If there are no trees there will not be humans and animals. If there are no humans and animals, there will not be trees. Banyan trees benefit humans and animals most. Kinpun (sour-leaf) tree is the best in absorbing noise and CO_2. I've found small plants grown in the plant compound. I encourage growing more plants. Do not kill the plants. Trees and plants will control noise.

8. Dr Mon Mon Tin Oo, Consultant (Community Health), ESIA Department, MSR

I'm responsible for finding out whether there are impacts on the community health and safety of the workers of the power plant. My study is about the occupational health and safety. I've found posters and signboards on health and safety at the entrances in the plant compound. As workers have to stay at worksites every day, it is also needed to put up posters with warning signs with safety-alert symbols. I've also found signboards like "No admittance" and "Authorized persons only." During the construction stage, there were caterpillars, bore-piling machines, earth trucks, and trucks carrying construction materials that made noises, and also during the operation stage, turbine generators and steam-engines make noises when they are running. These long-term noises affect the hearing systems of workers, causing deafening rings in the ears. I've also learnt that workers have been given protective devices for ears. The noises from the plant do not go beyond the precincts; the nearby personnel housing estate

and residents in the neighbourhood cannot hear the noises. The noises have little bad impacts on the people in the neighbourhood.

During the construction stage, workers had to work in the sun. If they are exposed to extreme heat, they suffer fatigue and cramp. To prevent this, they need to drink much water, and take rest in the shade by taking turns. During the operation stage, workers and engineers make rounds in the plant for efficiency of machines. In doing so, they may be exposed to heat at certain places. They need to wear head-proof gear. You can see in the photo plant-issued heat-proof gear.

During the construction stage, moving machines caused the dust to rise. If one inhales so much dust, this can affect the respiratory tract. In this case, workers have to wear facial masks. The CO_2 discharged by the plant affects the workers, but not to the extent of causing fatalities.

The next topic is about the hazardous chemicals. It is needed to post warning signs at places where liquid chemicals that can burn the skin, mouth, throat and eyes, and chemicals that contain lead that can jeopardize the nervous system and parts of the body. It is essential to wear gloves and masks when one handles them. I've also found basins, which can be used in case of a accident to wash down the hazardous substances. Most accidents happen during the construction stage. If the officials concerned enforce the rules by making workers follow them strictly, there will be fewer accidents.

For safety at the plant, training courses are to be given. The training courses on improving skills, work-related knowledge, safe utilization of chemicals, fire hazard, first aid, etc must be conducted. The by-products coming out as wastewater are mud, silt and water. The waste matters do not have bad impacts on the people in the environs and their health. If rubbish is discarded systematically into rubbish bins, this cannot affect the health of workers. It is proper that clean water is provided at the plant for workers. Workers need to do exercise, consume wholesome foods and take proper rest.

I have also found that workers have been provided with good, clean houses, dining rooms, wash basins, kitchens, sports ground and toilets. During the second wave of Covid-19, workers were made to stay at the plant; those who came back from home were quarantined, having them tested; and the workers were vaccinated against the virus. All these were proper measures. I would like to call for installing fire-fighting equipment, in accordance with the guidance of the Fire Services Department, obtaining documents that certify completion of the inspection of fire-preventive measures.

9. U Aung Lin, Consultant (SIA), ESIA Department, MSR

My team is to find out how the plant will impact socio-economic life of the people. We hold discussions with the residents in the vicinity of the project site. We ascertain their opinions and attitudes, and insert them in the report. For this project, we will meet residents of Saw Yan Paing (West) Ward and those residing around the power plant. In the past, we could not start work because of the Covid infections. We will meet Ward Administrator and ward elders, ward residents and township-level departmental officials. Just as there are individual meetings and there are also mass meetings. We will also collect health, education, economic and social data and information of the nearest residential communities and the township.

We will explain the matter of CSR—a fund, set aside by the developer of the project, for contributing to the development of the nearby wards and villages. It is the money, that constitutes 2% of the profits made, to be utilized for the neighbouring residents and communities. We will ask about their requirements and insert them in the report.

In rural areas, people ask for digging tube-wells, construction of schools and clinics, upgrading of streets inside the villages and inter-village roads, etc. We will hold discussions with the neighbouring residents of wards, explaining to them what will be undertaken during five years and finding out their requirements. The findings will be included in the report, which will be submitted to the ECD.

On completion of our ESIA activities and having obtained the permission of ECD, we will have to continue monitoring impacts, and submit Monitoring Reports to ECD bi-annually or annually. It is the task of monitoring whether the project officials adhere to their promises and rules of the ECD.

After getting permission, the report will be posted on the website. The current stage is the Scoping Report stage. The next time, we will hold the Public Consultation Meeting where we will find out their opinions and suggestions.

9.7.4 QUESTIONS

10. U Zaw Ko Ko Lat, Assistant Station Manager, Ahlone Power Station, MOEP

Nowadays when foreign companies come to invest or visit, they usually appoint foreigners, even in the lowest positions such as sanitation worker, etc. Especially it is found in Chinese companies. I would like to know about three points:

(1) Whether MAPP has the priority of recruiting Myanmar workers over appointing Chinese massively;
(2) Why MSR has chosen the Yangon River water instead of tube-well water; and,
(3) Whether the data presented now have been provided by the client or are the data that MSR itself has studies and analyzed.

RESPONSE TO QUESTIONS 2 & 3: Dr Htay Aung Pyae (Consultant – Physical Impacts), MSR

I will answer the second and third questions. We obtain water for operating the boilers from the Yangon River. The volume will be very large initially, but during the operation stage, the quantity of water needed will be small—just supplementary. The guidance of YCDC has limited the use of underground water. The water is to be used for running the machines, and it will be kept within the machines, without going outside. So we do not need so much water daily.

Regarding the third question, the data we presented just now are those we have independently studies and analyzed.

RESPONSE TO QUESTION 1: Daw Phyu Mar Lwin (Senior Manager, MAPP)

In the construction stage, we recruited about 500 Myanmar workers and 100 foreign employees. In this operation stage, we recruited 80 Myanmar workers and 20 foreign employees.

11. U Hsan Tun, Chairman of Township Administration Council, Ahlone Township

I'm happy to learn that there is a fund set up by the developer. The nearest community is Saw Yangon Paing (West) Ward. And, there are personnel housing quarters and schools. I would like to know the following point:

Whether the electricity generated by MAPP is added all to the national grid, or whether it is distributed to townships in Yangon Region.

RESPONSE: U Kyaw Khin, Station Manager, Ahlone Power Station, MOEP

The electricity generated by MAPP is fed into the national grid. Then the electricity is distributed to nearby townships in Yangon Region.

12. Major Zaw Naing, member of the Township Administration Council, Ahlone Township

Our Township Administration Council is working for peace and tranquillity in the township. I've heard that there are about 100 foreign employees, the visas of some of them have already expired. I would also like to you to contact us if there are security matters for the local workers. We need to know about individual workers and their families. I would like to know whether the foreign employees are staying, exceeding their permitted periods.

RESPONSE: Daw Phyu Mar Lwin, Senior Manager, MAPP

There were about 500 local workers and 100 foreign experts during the construction stage. Now, in the operation stage, there are 80 Myanmar workers and 20 foreign experts. We had cases of foreigners overstaying their visas. That happened during the Covid period during which Immigration Offices were closed. We have had the visas of foreign experts extended now, and they are staying in compliance with the guidelines of the Immigration Department.

DISCUSSIONS

13. U Maung Maung, Assistant Director (Retired), Myanma Electric Power Enterprise, Yangon Region, EC member of Myanmar Journalists Association

I would like to mention my pleasure at the emergence of such an electricity plant. Our country needs a lot of electricity. Now electricity is being supplied to 50% of the population. Such a gas-operated power plant exists in Tharketa. The waste heat from this plant is used for heating boilers for further generating electricity. I, as a former government employee, am ready to provide any assistance needed. I would like to say that gas turbine plants do not have serious impacts on the environment.

14. U Aung Soe, Ward Administrator, Thittaw Ward, Ahlone Township

With the emergence of a gas-powered power plant, more electricity will be supplied. I'm happy that the electricity is being distributed within Yangon Region. Once, I participated in the discussions about reinforcement of the banks of the creek near the plant. The creek flows into the Yangon River. If the soil, mud and wastewater discharged by the plant is discarded into the creek, they will accumulate, causing blockages, and thereby inundation. If that happens, residents in Ahlone Township will be in trouble. I'm talking about this so that plant officials can take appropriate measures.

Another matter is about the employees. I've learnt that there are Chinese experts. They need to live by adhering to the rules and regulations of the State. The plant officials should notify the Ward Administration Council about the stay of foreigners.

15. U Aung Khaing Myint, Ward Administrator, Saw Yan Paing (West) Ward, Ahlone Township

I'm happy that assistance will be provided with the CSR fund. Our ward is located closest to the plant. There are three schools in our ward. There are needs of teachers and other requirements. It will be good to fulfil our needs. I'm also ready to provide help if there are needs regarding foreign residents.

16. U Hsan Tun, Chairman, Ahlone Township Administration Council

Thank you very much for your active discussions at this meeting. The discussions of the scholars are good for the nation and we learn a lot from them. We've learnt that how the environment can be impacted, to what extent, and how these impacts can be mitigated. If we extract underground water extremely, there can be bad consequences. Limitations have been imposed for this reason. There can be impacts, more or less, if a plant is built or a project is undertaken. I would like to mention my pleasure at the scholars' presentations of how natural environment can be impacted and how the impacts can be reduced.

We have a number of methods to generate electricity—hydro, wind, solar, coal-fired, and gas-powered. Coal-fired plants have the greatest bad impacts on the environment and living creatures. I'm also happy to learn that activities in the interests of the public will be carried out with the CSR fund. We, the Township Administration Council, are ready to provide assistance in the matters of security, prevention of disasters and hazards, and other requirements.

17. U Aung Lin, Consultant (SIA), MSR

Thank you very much for your contribution of discussions and suggestions at this meeting. If there are no more discussion, the meeting will be wrapped up now. I would like to announce the successful conclusion of the meeting on the Myanmar Ahlone Combined Cycle Power Plant Scoping consultation.

9.7.5 Second (2nd) Public Consultation and Stakeholder Engagement Meeting

Proceedings:

Discussions and explanations

1.	**U Kyaw Khin, Head of Ahlone Natural Gas Power Plant, Deputy Chief Engineer**
	 I am U Kyaw Khin, Head of Ahlone Natural Gas Power Plant. The Ahlone Combined Cycle Power Plant is now being operated according to the guidelines of Environmental Conservation Department (ECD) not to impact the environment and socio-economy of the local people. This meeting is Public Consultation Meeting for ESIA report. U Tin Maung Maung Oo, Deputy Head of the Plant cum Superintending Engineer will explain the history of the plant and the completion stages of the construction of the 151.54 MW Power Plant.
2.	**U Maung Maung Oo, Deputy Head of Ahlone Natural Gas Power Plant, Deputy Chief Engineer**
	 The State-owned natural gas power stations had been operating for 27 years since 1995 and their production capacities had decreased. To fulfill the annual power consumption, private investment for high-efficiency natural gas power plants became essential. This power plant was established on an Independent Power Producer and Build, Own and Operate basis in 2020. Under the decision of the Union Government Meeting 7/2020, Electric Power Generation Enterprise and Myanmar Ahlone Power Plant Company signed Power Purchase Agreement on May 12, 2022. Then, Myanmar Ahlone Power Plant assigned Myanmar Survey Research (MSR) as a third party to conduct ESIA. And the first Public Consultation Meeting for the scoping stage was held on October 15, 2021. Now, this second Public Consultation Meeting is being held for the final stage of the ESIA. All attendees are welcome to share your opinions.
3.	**U Hsan Tun, Head of Township General Administration Department, Chairman of Ahlone Township Administration Council**
	 I am Hsan Tun, Head of the Township General Administration Department and Chairman of the Ahlone Township Administration Council. In Ahlone township has a population of more than 50,000, more than 10,000 households, more than 2,000 houses, settling in 11 wards. There are MIP, Asia World and MEC ports. As there are Toyo Thai Power Plant and MECC Plant, young people have got jobs and power generation capacity has increased. Thank you for giving us a chance to learn ESIA process in construction projects. And I'm happy to learn that all the plants follow the guidelines. We'll also help with administration and security. The developers are requested to support the local people's needs. The attendees should learn about the plants and discuss what they want.
4.	**Daw Phyu Mar Lwin, Assistant General Manager, Myanmar Ahlone Power Plant Co., Ltd.**
	 I'm Daw Phyu Mar Lwin, AGM of MAPP. In 2019, the Ministry of Electric Power (MOEP) invited a tender for power generation under the electrification plan and 8 companies, including ours, won it. Let me explain the summary of the project. We received the Letter of Acceptance in September, 2019. MOEP and MAPP signed Power Purchasing Agreement in May 2020 to establish a plant the capacity of which is 183 MW and actual generation is 151.54 MW. Now, more than 100,000 MW per month is being generated. At the construction stage, we had 40 local staff members and 30 Chinese expatriates but now 60 locals and 10 foreigners. Since the Letter of Acceptance was received, the construction had been started. The first gas turbine was constructed from November 2019 to April 2020. It can produce the largest amount of power in Myanmar. In May 2020, single power generation was started and steam turbine was established in December 2020. And we operate the gas turbine and steam turbine simultaneously for four hours a day. The construction was completed in one and a half year. The power has been sold since January 18, 2021. Although the construction started during the first wave of Covid-19, power could be generated

within a short period. (**The above summary of the project facts was presented in powerpoint slides.**)

Our plant follows all the EIA guidelines and regarding this, MSR will explain the details. I will continue to explain the ESIA. In February 2021, it was approved to start ESIA procedure and the scoping report was approved in July 2022. While preparing the final report, the first Public Consultation Meeting was held in Moe Kaung Power Plant compound, following the Covid- 19 guidelines of MOHS, where the ESIA process was explained.

We grow trees annually for keeping the ecosystem balanced, and rubbish is disposed of systematically for creating a clean and beautiful atmosphere around the plant. Currently the plant is run by more local staff members and fewer foreigners after giving them technical and HSE trainings. We are practicing BOD system and will implemnt CSR plans when we gain profits. Recently, we donated teaching materials to monasteries in Hlaing Thaya Township and some snacks in the wards during Water Festival. Social welfare system offer assistance to the staff members. COVID 19 vaccines were offered twice.

5. **U Aung Lin, Social Environment Consultant, MSR (Master of ceremonies)**

The MC introduced MSR team members to the attendees.

I'm Aung Lin, Social Environment Specialist. The PCM was announced in the newspapers 15 days in advance and invitation letters were sent. After collecting data and information from the public, the reporting has to be prepared. It is important for the public to know the impacts of the plant on physical, biological, and social environments.

This meeting is held to share knowledge of environmental conservation laws in Myanmar which the developers and the local residents who live in the project area should follow. In Physical Environment, we study impacts on water, soil and air by quality tests. Noise pollution has to be checked, too. In Biological Environment, we need to conduct survey on plants and animals in this region. In Social Environment, we investigate socio-economy of the local residents and carry out population census to forecast the potential impacts of the projects and healthcare issues.

The developers have to spend 2% of their profit on CSR activities. We have to explain advantages and disadvantages of the project and the Environmental Management Plan. Then, public opinions are collected and concerns have to be alleviated. The impacts of the project have to be monitored continuously. So, we welcome the public opinions and suggestions.

6. **U Kyan Dyne Aung, Consultant, MSR**

I'm Kyan Dyne Aung, ESIA Consultant. I'll explain which laws and policies have to be followed by the developers. The details are mentioned in the report. There are 5 sections in the report. First section is about environmental conservation and social policy in which waste and wastewater management systems and CSR for social activities are mentioned.

As health and education section has been explained by our colleague, I'll talk about the remaining 4 sections. There are environmental conservation laws and rules and EISA procedures.

National environmental quality (emission) guidelines provide the basis for regulation and control of air emissions and liquid discharges from various sources, etc. Myanmar has signed other international agreements related to the environment. For example, we have to follow the Framework of UN Convention for Climate Change, the Montreal Protocol for Protection of the Stratospheric Ozone Layer and UNESCO Convention on Cultural and Natural Heritage. Myanmar Environmental Policy and Climate Change Policy must also be followed.

The project has to be developed according to the Sustainable Development Plan. There are a lot of laws and about 30-35 are related to the projects. Among them, the Myanmar Investment Law, the Public Health Law, the Occupational Health and Safety Law, the Conservation of Water Resources and Rivers Law, and the Social Welfare Law must be followed. I just briefed on the laws and policies related to the environmental conservation.

7.	**U Phone Myint Tun, Consultant, MSR**
	 I'm Phone Myint Tun, Physical Environmental Consultant. The project area is 5.965 acres and the plant will use water and natural gas from the natural resources. Water is from the Hlaing River which is under Myanmar Port Authority. Generated power will be provided to Electric Power Generation Enterprise. Environmental impacts will be monitored by ECD. Impacts on Physical Environment of Ahlone Power Plant are studied by comparing the conditions of 2017 and 2023 during which Combined Cycle Power Plant was established. I'll explain how the plant is operated and its impacts on the environment. Electrification by natural gas can cause gas leakage. Noise will be polluted due to engine operation. Water from the Hlaing River has to be purified and used in the project. There is no waste water in using cooling system. The advantages of the plant are that generator is run by fuel. And steam power can be transformed by heat recovery unit as water is very hot after passing the engine. But exhaust will come out when engine is started. Its smoke and noise can impact the environment. Sulphur content will be less by using natural gas. Only CO and CO_2 will be released now and Oxides of Nitrogen and Sulphur will be released when the machine efficiency is lower. At this stage, impacts on the environment have to be monitored. There are a large port, Myanmar Timber Enterprise, Thakhin Mya Garden, wards and other plants on the surroundings. Air qualities have to be measured in east, west, south and north of Ahlone Power Plant. There is another plant to the west of the power plant. Existing particles and vapour in middle of the power plant are investigated, Dala Township, Thakhin Mya Garden and Staff Housing. Soil samples were collected in the power plant for testing. Water samples were gathered from 4 different places – north, south, lower and upper part of the river as the water in drainage beside the plant undergoes ebbs and tides. All the samples were collected before operating of the plant. Monitoring can be done every 6 months. So far, the results are still satisplant.
8.	**Dr. Htay Aung Pyae, Consultant, MSR**
	 I'm Dr. Htay Aung Pyae, the report writer of ESIA for Ahlone Combined Cycle Power Plant. Scoping Report was approved by ECD with the help of everyone concerned. The impact of the chemicals used for purification of the water for the plant is conducted. CO_2 can bring about climate change. We'll explain how noise/vibration problem will be solved. Water quality is still fine and has no risk. To reduce carbon emission, we can grow trees. We also add emergency control plan. The Hlaing River can supply enough water for the plant. About 6 tons of chemicals have to be used in purifying the water. And there's less impact on the socio-economy. We studied in three phases – project construction, operation and decommission. In the final stage, impact mitigation was discussed and the developers are responsible for this mitigation. The harmful oxides will be reduced. The concerns and discussions from this meeting will be described in the report which will be submitted to ECD. Then, it will be shared to the public.
9.	**Dr. Aung Myint Thein, Consultant, MSR**
	 I'm Dr. Aung Myint Thein, who conduct impacts on biological environment. Plants which grow on land and in swampy area in the project area are different. In the past, mangroves existed. But when we visited here for the 4th time, they were no longer here. Crows and sparrows can bear noise of factories while pigeons and mynas can only stay behind factories. Plants and birds are systematically categorized. We found one squirrel, 18 birds, 1 butterfly and 1 crab. Within the 6-arce plant, there are 99 types of trees, most of them are planted. We identified their habitats and species. As the fence of the plant is chain-linked, noise can be heard outside. Released fumes transforms into acid when they are exposed to water. Acid rain affects soil and habitats. Cutting trees leads to loss in biodiversity. We have to re-consider the fact that the basketball pitch should be in the plant compound because emission of fumes from the plant may impact players who take a deep breath. The long-term advantage of the plant is power production. Trees and birds have their ecosystem but noise from the plant disturbs their voice to communicate themselves. Banyan tree can absorb CO_2 most among trees. But if it is not convenient to grow banyan trees in the plant, any other trees such as

	tamarind trees can be grown. It is essential to grow plants as many as possible to maintain the air quality and mitigate other impacts.
10.	**Dr. Mon Mon Tin Oo, Consultant, MSR**
	 I'm Dr. Mon Mon Tin Oo who study health impact. We have been monitoring health impacts on staff and local people by the project since construction period. Dust, that rose from ground digging or excavation, can affect respiratory system and lung or cause eye irritation or allergy. So those who work in the construction site should wear masks such as N95. Water has to be sprayed to reduce dust rising. The noise or vibration from the construction site may cause hearing difficulties and tinnitus. To prevent such hearing loss, machines should be run in intervals or by turn. Workers should wear earplugs. In the construction site, chemicals may cause burns and injuries to hands and eyes. They should drink water or wear Thanatkha, the traditional tree-bark make-up, if they work outside in the sun. Plant should be built by using soundproof materials. But we found that the project did not impact the people. For safety from chemicals, workers need to wear gloves, masks and apron. In case of chemical exposure, they should keep a bason to wash. To avoid accidents, supervisors should tell the instruction in toolbox meetings or give trainings to workers. Workers may fall from high scaffoldings. When machines are being run, eyes can be hurt or workers can be struck by machines. Workers should know what to do during emergency and how to perform first aid and should wear PPE during working hours. Migrant workers may have infectious diseases such as TB. So, toilets should be clean and garbage should be thrown away properly. Workers should be vaccinated. Otherwise, other workers can be infected. In case someone is infected, they should inform a local clinic. Their joints can be painful if they work hard. Breathing in fumes may lead to headaches and dizziness. When outside temperature is high, workers should wear heat-resistant dresses. They may get stress due to workload or hypertension when they work long hours or they don't have enough sleep. So, they should take a break or a nap and be on balance diet. Doing exercise is also necessary as they have to sit long hours in the office and eye strains or muscle stiffness may occur. When they are older, they will get hypertension and diabetes. They are more likely to be overweight. Their working tables and chairs should be comfortable. They can do exercise while sitting such as eye exercises. Signboards should be used for site safety. Though noise of the plant can disturb the people from surrounding area, there are any other noises from other plants. But the plant does not have dust or waste water which can impact the local people. The noisiest construction site of the plant is near the staff housing. But it is also near the main road and is already noisy due to vehicles. There should have engineering control which eliminates exposure to chemical or physical hazards through the use of equipment or devices. In the plant, toilets are clean; basins are available to wash hands; 3 meals are provided a day; beds, a quarantine center and a basketball pitch are available; and workers are vaccinated. Therefore, occupational health and welfare issues in the workplace are well managed here. And the plant has no impact on the workers and local people.
11.	**U Aung Lin, Social Environment Consultant, MSR (Master of ceremonies)**
	I'll explain Public Consultation Meeting (PMC). We interviewed local residents individually before PMC. The suggestions from the first PMC are really useful. We include demographic information of Ahlone Township in the report—the numbers of people, households, hotels, restaurants, plants and living standard of people nearby. Due to the virus outbreak, it was difficult to meet the people personally, so, we made phone calls or practiced social distancing if we had a chance to interview them. Political unrest delayed the process. Here, power supply is not frequently cut. And people welcome the project as it is a power plant project. Other discussion/suggestions are as follows; 1) There is no impact on the social environment. 2) Power should be supplied for 24 hours. 3) Waste water should be treated before disposal. 4) Fire safety precautions should be taken.

	5) Foreigners should have valid visa and they should be registered at the ward administration office. 6) Respective township administrator should be informed in case of emergency. 7) Yangon ECD should monitor the operation of the plant. All the attendees are welcome for discussion and suggestion.
12.	**Dr. Htay Aung Pyae, Consultant, MSR (Master of ceremonies)**
	I want to explain the ESIA report. We'll prepare a final report which will include the suggestions from the attendees today. We have to study dispersion of CO_2 and SO_2 in each transboundary. We visited the sites. On our first visit, we talked about clean workplace. We're glad that the developers follow the guidelines well and use the latest technology. So, the results are excellent. And the attendees are also welcome for suggestions to create the report with inclusive information.

Discussion/suggestion of the attendees	
13.	**U Aung Soe, Administrator of Thittaw Ward**
	 I'm Aung Soe, Administrator of Thittaw Ward and have been working for 13 years. Previously, the building here was the Southern Station of Electric Power Generation, and Refractory Stone Manufacturing Plant was replaced by MIP. Four surrounding wards are Ayeyarwady Ward which is on the north side of the river, Saw Yan Paing Ward which is in south, Thittaw Ward and Lutlatyay Ward. And we also have Ayeyarwady Shipyard. All people want 24-hour power supply. The government can't supply enough power. So, gas turbine can support additional power supply. Advantages of the plant is more than disadvantages. The negative impacts can be mitigated. ECD has been monitoring air and water qualities. We welcome the project. Additionally, health impacts are well discussed and we should prevent them in advance. There are one high school, one middle school and 5 primary schools here. So, I'd like to suggest to support the schools after discussing their requirements with the officials. Compared with other townships, Ahlone can access more power supply as power is cut for only 4 hours a day. Therefore, this project is good for people. I want to suggest to do more on electrification.
14.	**U Myo Zaw Win, Assistant Director, ECD, Yangon**
	 I'm Myo Zaw Win, Assistant Director of ECD, Yangon Region. We must do this project to meet the basic needs of the people. The scoping report has been approved and the plant has been operated for one year. Landslide in Adhani Port of Seikkyi Kanaungto Creek was mentioned in EIA report of other 3rd party. MSR collected baseline data for KMIC and KPSEZ in better ways. I suggest to construct new buildings properly. The port of Hlaing River should be protected by retaining walls as erosion may occur in west bank, where there's Dala Township and water will flow into the curve-shaped bank of Seikkyi Kanaungto with high speed. I give these suggestions to discuss with the management team to make the project better. Groundwater quality cannot be good. Water from the well of YCDC cannot be drunk. But its quality should not go beyond our standard. The monitoring report should be updated every 6 months according to Article 108 of ECD procedure. The comments of ECD should be compiled by following Articles 61, 62, 63, 64, 65 of the procedure. Additionally, EMP management should be categorized into large, medium and small, based on Article 63. The developer and MSR can present EIA process perfectly and there's no more complains from us.

15.	**U Htet Myo Hlaing, Deputy Head of Fire Station, Ahlone Township**
	 I'm Htet Myo Hlaing, Deputy Head of Fire Station, Ahlone Township. I'd like to suggest 3 fire safety procedures as flows; (1) fire precautions (2) fire prevention and (3) fire fighting Equipment and extinguishers should be kept systematically and checked occasionally to be used at any time. Fire drill should be conducted at office and workers should be provided trainings by staff members of the fire station. Assembly points should be designated and fire safety plan should be prepared. And different teams should be formed to fight the fire, to save the people, to bring the belongings and to do communication.

Responses from	
Dr. Mon Mon Tin Oo	A training for firefighting was given to the staff members. Fire extinguishers and equipment are also well maintained for emergency.
U Tin Maung Maung Oo Deputy Head of the plant	MSR presented that noise from the plant is beyond the standard and consultants suggested to grow plant to prevent from noise pollution. So, I'd like to know the plan to grow plants.
Daw Phyu Mar Lwin, Assistant General Manager Myanmar Ahlone Power Plant Co., Ltd.	As one attendee suggested to grow plants in 1st PCM, we have grown some plants in the compound and against the fence but all are small ones. We'll grow trees as suggested by Dr. Aung Myint Thein.
Dr. Htay Aung Pyae	I'd like to discuss technology. If shady trees are grown, noise pollution will be reduced. But we have to wait for some times until they grow up. Cumulative impact should be mitigated by all parties including responsible persons from the other plants. Noise from station generators can be prevent by soundproof materials. But the fence cannot block sound. So, I'd like to request the developer to consider alternative ways for Occupational Health Safety.
U Phone Myint Tun Consultant MSR Co., Ltd.	The impact of noise pollution does not affect the area if the source is far from it. There are some standards of NEQG. Sound should not be more than 70 decibels and it should be 55 decibels in residential area. In the plant and its surrounding, it is about 130 decibels. Sound in some places is 110 decibels. If there is no sound barrier in the air, the decibels will decrease from 110 to 55 in 500 meters away from the previous source. It is possible to use 10-feet tinplate sheets to prevent noise pollution, then noise cannot be heard outside very much. We, environmental specialists, prefer growing plants instead of using concrete wall. Gas in the air is nutrient for plants. But in industrial zone, it is difficult to control noise pollution (to be lower than 70 decibels) in the industrial zone. So, workers should wear earplugs or PPE. Staff housing is 500 meters away from here and noise pollution is not because of the plant operation but because of its surrounding which is close to the highway. Therefore, this decibel cannot be reduced any more.
U Kyaw Khin Head of the plant	Today PCM is held to prepare EIA report for operation and construction of Myanmar Alone Power Plant in Alone Natural Gas Power Station under Ministry of Electric Power. We'd like to say thank you to the township administrator and the officials from ECD, consultants from MSR. 
U Aung Lin MSR Co., Ltd.	Announced that the meeting was successfully over.

9.8 Findings and Suggestions from PCM for ESIA of Ahlone Combined Cycle Power Plant

9.8.1 Findings

1. There is only a staff housing quarter near the project area.
2. Toyo Thai and the State-owned power generation plants have been already operating in the Ministry of Electric Power compound since before this gas turbine project was launched.
3. The local people in the project area welcome the project.
4. The project officials have good relations with the administrators of the wards nearby and the town elders.
5. The project is being operated systematically and with discipline, adhering to the existing laws and service regulations.

9.8.2 Suggestions

1. Local people who live near the project requested for 24-hour supply of electricity.
2. CSR programs should be launched for primary, middle and high schools in the surroundings.
3. Measures for prevention of fire outbreaks should be taken systematically.
4. A plan should be drawn up for growing trees in the compound that reduce noise pollution from the plant operation.
5. Landslides and erosions must be prevented by building retaining walls and growing trees.
6. Respective township authorities and ward administrators mentioned their readiness for help in case any important matter comes up, calling on the plant officials to keep in touch with them.

9.9 Stakeholder Concerns and Recommendations

9.9.1 Community Concerns

The community consultations demonstrated that goodwill towards the project proponents indeed exists; approval for project activities by the communities is evident. The proponent recognizes that benefits from the project should be distributed equitably especially among primary stakeholders in the project area, and will continue to ensure that this principle is followed in its projects and community development program. The consultation process should include the local people with different life styles.

1. Local Employment

Communities in the project area emphasized that local people should be given priority when employing people for various project-related works and activities according to their skills. They still appreciated project developer's endeavour which will lead to the development of the surrounding area and create more employment opportunities by shifting compositional changes annually to local experts.

2. Interaction with Local Community

Foreign workforce coming in the project area that will not be aware of the local customs and norms, may result in conflicts with the local community, keeping in mind the sensitive law and order situation and culture of the area.

3. Impact on Environment & Livelihood

The public consultation should include the impact on people of their living environment and livelihood. In the public consultation meetings, people should be asked regarding this issue.

They still appreciated this endeavour which will lead to the development of the surrounding area and create employment opportunities.

9.9.2 Community Recommendations

- They local community recommends and demands implementation of CSR programmes targeting to surrounding the project area to provide better education and welfare services.
- They want to be provided with technical and vocational trainings to help them build up their

skills.

- Primary and high schools need to be supported for facilities and learning resources to ensure educational facility for the local children so that they have better access towards a better future.

9.10 Local Government & Other Representatives

During the consultation, the proponent and concerned representatives from government department were present and consulted. By considering all local people, government officials and NGO people, the meetings were be run through direct queries and feedbacks. In summary, the officials welcome the project since the project bridge the gap and fill the energy deficiency of the district fostering improvement to socioeconomic status of the region as a whole

9.11 Formal Stakeholder Consultation

A formal stakeholder consultation was carried out 15th October 2021 and the second had been on 6th January 2023 with a vision to engage with the community a lot better than the informal ones under the certain barriers of covid -19 pandemic restrictions and public exposure. The face-to-face consultation meeting were successfully accomplished under the supervision of public health experts and volunteers by adopting full precautionary and protective measures in full compliance to directives of ministry of health

Public Notice/Disclosure

An advertisement and invitation letters were published and circulated to all stakeholders to the general public. In addition, call for public invitation and invitation letters were posted on notice boards and information corners at the public areas and local administrative offices. A detailed public consultation invitation, event attendance lists and agenda is presented in the appendix.

Photo Records of The Public Consultation Meeting on Myanmar Ahlone Power Plant

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Posters on Covid-19 prevention and control</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Place where temperatures are taken, disinfectants sprayed and hands washed</td><td>Registration desk for attendees to PCM</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Ahlone Power Station Manager signs</td><td>Attendees at the meeting Attendance</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Attendees at the meeting</td><td>U Aung Lin (MSR) acts as master of ceremonies</td></tr>
</table>

	
Manager U Kyaw Khin delivers opening address	U Hsan Tun, Township Administration Council Chairman, gives a speech
	
Daw Phyu Mar Lwin (MAPP) clarifies the power plant project	U Ko Ko Soe Lwin Thaw introduces MSR to attendees
	
Dr Htay Aung Pyae (MSR) explains potential Impacts on physical things	Dr Aung Myint Thein (MSR) explains potential impacts on flora and fauna
	
Dr Mon Mon Tin Oo (MSR) explains Health and safety measures	U Aung Lin explains SIA activities

	
U Zaw Ko Ko Lat, Assistant Manager of Ahlone Power Station, asks questions	Dr Htay Aung Pyae replies to the questions
	
Daw Phyu Mar Lwin (MAPP) replies to the questions	U Hsan Tun, Chairman of TAC, asks questions
	
Power Station Manager replies to the questions	**Major Zaw Lat asks questions**
	
Daw Phyu Mar Lwin (MAPP) replies to the questions	U Maung Maung (Retired, MEPE), contributes discussions

	
U Aung Soe, Administrator of Thittaw Ward, contributes discussions	U Aung Khaing Myint, Administrator of Saw Yan Paing West Ward contributes discussions
	
U Hsan Tun, Chairman of TAC, gives concluding remarks of the meeting	U Aung Lin (MSR) announces closing off

9.12 Future Stakeholder Engagement Plan

Almost all categories of the stakeholders have been considered during the stakeholder consultations and focus group discussions. Moreover, newspaper advertisement was also published prior to conduct formal public consultation so as to convey the information to all type of people within the area.

Stakeholder consultations are ongoing process, for the betterment of the community, the Myanmar Ahlone Power Plant Company Limited is advised to hold future stakeholder consultation during monitoring phase of the project operation stage in order to make sure that the general public and potential impact receptors are not being harmed by any means.

The consultation process must be carried out at regular interval with people near and around the project site. It can be carried out half yearly or annually and, in those meetings, the Myanmar Ahlone Power Plant Co., Ltd. authority must listen to their voices and try to solve their problems if any that will be caused for the project.

9.13 Grievance Redressal Mechanism

Public participation, consultation and information disclosure should be undertaken as part of the local ESIA process. Continued public participation and consultation have been emphasized as a key component of successful project implementation. During the construction and operational phase of the project, the complaints that may be anticipated are mostly related to dust, noise, and vibration of the construction activities and turbines. However, unforeseen issues may also occur. To settle such issues effectively, the Grievance Redressal Mechanism will be implemented during the preconstruction, construction, and operational period of the project to ensure that all complaints from local communities are dealt appropriately, with corrective actions being implemented, and the complainant being informed of the outcome. It will be applied to all complaints from affected parties. The mechanism will be accessible to diverse members of the community, including more vulnerable groups such as women and youth. Multiple means of using this mechanism, including face-to-face meetings, written complaints, telephone conversations should be available. Confidentiality and privacy for complainants should be honoured where this is seen as necessary or important.

A mechanism is to be put in place to ensure that the following are available for community complaints for the life of the project:

- a 24-hour telephone number on which complaints about construction and operational activities at the site may be registered;
- a postal address to which written complaints may be sent;
- an email address to which electronic complaints may be transmitted; and
- a focal person to whom the community may directly lodge their complaints.

The telephone number, postal address, e-mail address and the focal person shall be informed to the Township General Administrative Office and Ward Administrative Office. The telephone number, the postal address, the email address and the focal person shall be displayed on a sign near the entrance to the site(s), and in a position that is clearly visible to the public.

Contact detail:

Name: Ms. Khin Myo Thant

Postal address: No.20, Sabal Street, Saw Yan Paing (west) Quarter, Ahlone Township, Yangon, Myanmar

E mail address: kmthant.kmt@gmail.com , phyu.kiec@gmail.com.

Enquiry hotline: +95 9 790956010, +95 9 798234609

9.13.1 A Grievance Redressal Committee

Myanmar Ahlone Power Plant Co., Ltd. shall set-up a grievance redressal committee that will address any complaints during all three phases pre-construction, construction, and operation of the project. Myanmar Ahlone Power Plant Co., Ltd. through its Grievance Redressal Mechanism intents to form a committee where the Project Manager will be the prime contact and officer who will drive the action. In

the panel female members will be deputed who will be from project itself, as to bring inclusion of all gender related issues and grievances identified. Team leaders from workers community and township level will also be made prime stakeholders. All the grievances from the individual/ community level will be directly addressed to Project management unit PMU/Project Manager in written and verbal form, further an apt action will be taken to address the query. If the grievance is related to women or has some gender sensitive component it will directly be transferred to senior female authority deputed in GRM of Myanmar Ahlone Power Plant Co., Ltd.

Members of The Grievance Redressal Committee (GRC)

Name	Designation	Status in GRC	E mail	Contact
Mr. Zhang Zhitao	General Manager	Chairman	zhitao1024@hotmail.com	09770437886
Ms. Phyu Mar Lwin	Assistant General Manager	Member - Secretary	phyu.kiec@gmail.com	09798234609
Ms. Khin Myo Thant	Finance Manager	Member	kmthant.kmt@gmail.com	09790956010
Ms. Swe Swe Win	Business Development Manager	Member	Sweswewin1983@gmail.com	09444786800

9.13.2 The Procedure of Community Grievances Redress Mechanism

The procedure of Community Grievances Redress Mechanism consists of 7 basic steps: Receive, Acknowledge, Assess, and assign, Investigate, Respond, Recourse or appeal, and Follow-up and close out.

Receive: Complainants will be provided with a variety of access points (by phone, by email, by letter, face-to-face with company staff) so that they can lodge a grievance in a manner convenient to them. When the complaint is received, the complainant will be explained to understand the timelines for the remaining steps in the procedure, how the complaint will be handled and the types of remedy the company can, or cannot, provide. The complainant confidentiality will be maintained, and grievance details would be provided only to those directly involved in the investigation.

Acknowledge: Once a complaint has been registered, a timely acknowledgement will be made to the complainant that their case is in the system. The acknowledgement will be in a culturally appropriate manner, such as a letter, a telephone call, a visit, or an email.

Assess and assign: A grievance officer (HR or Administration staff) will quickly assess the nature of grievance once it is logged. And, if needed, some other relevant staff will be assigned to do the assessment. In practice, the grievance officer will be mandated to directly address relatively minor, easily resolvable grievances (for e.g., paying compensation for a small matter) to minimize bureaucracy.

Investigate: Many complaints can be addressed quickly by a grievance officer or other company staff. Nevertheless, severe, or technically complex complaints will require more thorough investigation to provide evidence for analysis and to support the resolution. This process will begin by seeking to understand the complainant's perception of the issue and what should be done about it. The process then typically calls for examination of the circumstances of the case, which can be done by speaking with involved parties and conferring with relevant stakeholders.

Respond: As soon as the investigation is complete, a provisional response will be developed that is reasonable and proportional to the grievance and takes account of any cultural norms. The final agreement will be made both verbally and in writing and it will be specific, time bound and agreed by both parties.

Recourse or appeal: The mechanism will consider a recourse or appeals mechanism for complaints where the complainant and the operation cannot reach agreement. If access to judicial process is complex, very expensive or unavailable, a recourse mechanism gives both company and community the opportunity to explore all resolution options or to demonstrate good intent.

Follow up and close out: Once a resolution has been agreed or a decision made, the final stage is to implement the decision, monitor outcomes and close out the grievance. Follow-up also may be needed to address problems that develop during implementation of the response.

A Complaints Register shall record, but not necessarily be limited to:

i. the date and time of the complaint;
ii. how the complaint was made (telephone, mail, email or in person);
iii. any personal details of the complainant that were provided, or if no details were provided, a note to that effect;
iv. the nature of the complaint; and
v. any action(s) taken by the Proponent in relation to the complaint, including timeframes for implementing the action.

The Complaints Register shall be made available for inspection by the Ministry of Natural Resources and Environmental Conservation or any other relevant Government authorities on request. The form to register a complaint is shown as Appendix 12.

9.13.3 Grievance Redressal Mechanism for Employees and Contractual Workers

A schematic representation of the grievance redress procedure for employee and contractor will be followed by **Myanmar Ahlone Power Plant Co., Ltd.** is shown in Figure 9-1.

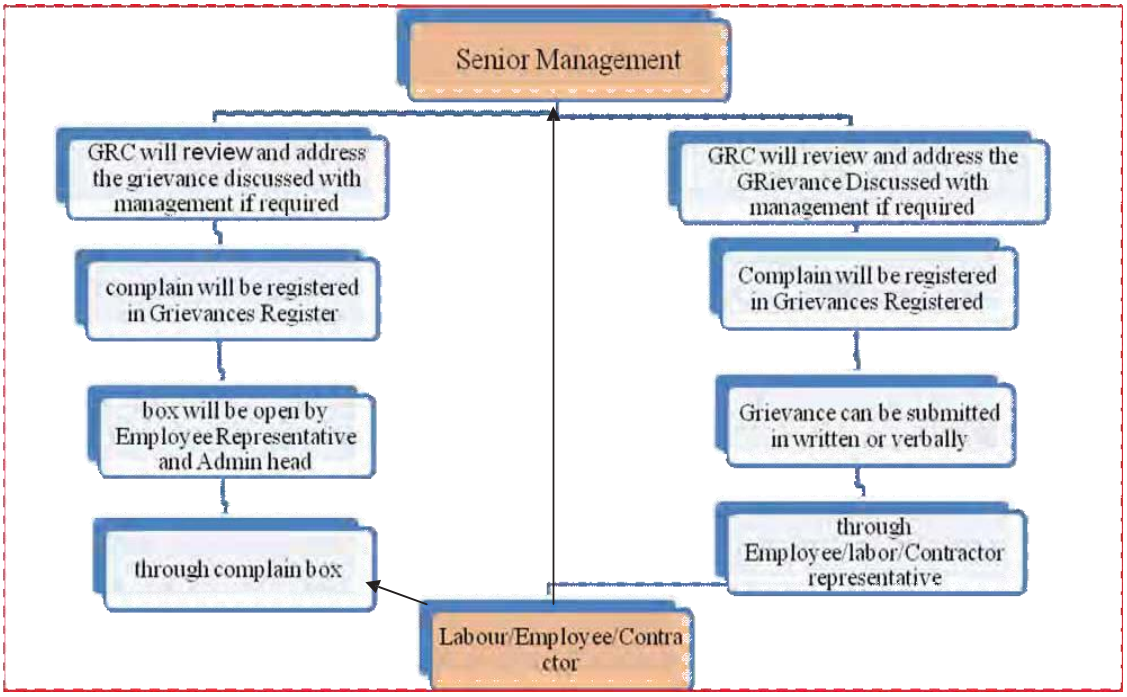


Figure 9-1: Grievance Redressal Mechanism for Employees and Contractual Workers

As stated in the above figure, the employees and contractual workers can register their grievances in verbal or written form by communicating their grievances to the compliance personnel or group audit personnel or by dropping the grievance in the compliant box, which will be located at every strategic location of the facility. The GRC will maintain a log of all complaints received in the form of a Grievance Register. Grievance log will help to track cases, respond to grievances in a timely manner, check the status of complaints and track progress, measure effectiveness, and report on results.

The GRC will then review and investigate the grievance, along with the representatives from the concerned departments; will identify measures to resolve the grievance as appropriate. This could involve provision of information to clarify the situation, undertaking measures to remedy actual problems or compensate for any damage that has been caused, and introduction of mitigation measures to prevent recurrence of the problem in the future. Where a grievance is found to be not a real problem a clear explanation will be provided to the complainant.

On the basis of the investigation, a formal response detailing how the grievance has been resolved will be provided to the complainant within 15 days where possible, and at the most within 4 weeks. Where resolution is delayed the complainant will be provided with regular updates on progress. On the basis of the response, the grievance form will be updated and the grievance will be closed.

9.13.4 Suggestions and Complaint Handling Mechanism

MYANMAR AHLONE POWER PLANT CO., LTD. recognizes the importance of complaint handling mechanism and hence intends to establish a SCHM (Suggestions and Complaint Handling Mechanism) for the project. The communication channels to report project related complaints/concerns will be disclosed at all levels of institutions. Under the provisions of labour laws and Human Rights, the Republic of the Union of Myanmar provides for setting out the practical regime of right to information for citizens, any citizen may request information from a "Responsible Officer" who shall provide the information within 20 working days from the date of receipt of application. In case more than one information providing unit or authority is involved with the information requested, then information shall be given in 30 working days from the date of application. The Act also requires every public authority to computerize their records for wide dissemination and to pro-actively publish certain categories of information so that the citizens need minimum recourse to request for information formally. However, it is quite likely that many people may not use the provisions of this Act, and will only restore to the Act in limited cases covering serious concerns. Being a project involving several divisions, districts, and large scale of civil works along with Environment issues, the project is likely to receive many suggestions, complaints, inquiries, etc. through the project implementation period.

9.13.5 Functional Premises of GRC for Grievance Redressal

The GRC meetings will be held in **Myanmar Ahlone Power Plant Co., Ltd.** project office at site and the same will be widely publicized in project area for the knowledge of general public. The key responsibilities of GRC are as follows:

- ✓ Review, consider and resolve grievances related to social and environmental aspects received by the Myanmar Ahlone Power Plant Co., Ltd. site office.
- ✓ Entertain grievances of indirectly affected persons and/or persons affected during project implementation.
- ✓ Resolve grievances within a period of two weeks at the GRC level and communication of the resolution to the aggrieved party.
- ✓ The GRC shall not engage in any review of the legal standing of any “complaint” nor shall deal with any matters pending in the court of Law.
- ✓ Arrive at decisions through consensus, failing which resolution is based on majority vote. Any decision made by the GRC must be within the purview of Environmental Management Plan, Corporate EHS and Social Policies or any such documents of relevance of that matter.
- ✓ If needed, may undertake field visits to verify and review the issues, dispute or other relevant matters.

9.14 Monitoring and Evaluation:

Similar to other project components, GRM will be monitored to ensure that the stakeholders are having no or limited issues with the project and in case there are concerns, they are being adequately addressed as per the mandate. In order to keep track on the effectiveness of GRM, it is the responsibility of the GRC to compile and maintain database on grievances for periodic review. The process of monitoring will include an internal monitoring and an external monitoring process.

The internal monitoring will be undertaken by the GRC, on a regular basis (at least at an interval of 6 months). This process will allow for a review of the GRM to be undertaken, in terms of the efficacy of the mechanism and the average time taken for the redressal of the grievance received. These monitoring reports will be shared with the PMU of Myanmar Ahlone Power Plant Co., Ltd.

In addition to the internal monitoring process, the project will consider engaging an external agency for undertaking monitoring of the GRM on an annual basis. This monitoring process will allow for an assessment to be undertaken of the number and nature of grievances received, the manner in which the grievances were settled and the number of pending grievances. The external monitoring report will also

be disclosed to the local community and other identified stakeholders.

9.15 Disclosure of EIA Report

In accordance with Article 65 of the Environmental Impact Assessment Procedure, within a period of 15 days, after the submission of the draft EIA report to ECD, the project proponent has to disclose the Environmental Impact Assessment Report to the social organizations, those who affected by the project, relevant government organizations, local organizations and other stakeholders for their information. The declaration should be made through the national media such as newspapers, project proponent's web-site, and disclose in public gathering places such as libraries, community halls, at GDA office of Ahlone Township as well as at the Myanmar Ahlone Power Plant Co., Ltd. site office.

E mail : phyu.kiec@gmail.com

Company Website: N/A

Information centre address :
No.20, Sabal Street, Saw Yan Paing (west) Quarter, Ahlone Township, Yangon, Myanmar

9.16 Disclosure of The Grievance Redressal Mechanism:

The process of existing disclosure mechanism of GRM followed by Myanmar Ahlone Power Plant Co., Ltd. facility, will keep the following aspects in mind:

- The grievance redress process shall be disclosed and the procedures mentioned therein shall be properly disseminated to the identified stakeholders.
- Myanmar Ahlone Power Plant Co., Ltd. shall integrate the grievance redress mechanism as a part of the induction training programme especially those conducted for self-employees and the contractors.
- To resolve disputes and grievances, information on Grievance Mechanism, the name and designation, of the grievance redress officials shall clearly mention and their respective contact details, office location will be distributed to township general administrative offices and ward administrative offices close to the location of the project.

9.17 Budgeting

The Myanmar Ahlone Power Plant Co., Ltd. administration shall ensure adequate budgeting and resource allocation for implementing the grievance redressal mechanism.

10. CONCLUSION AND RECOMMENDATION

10.1 Conclusion

Following Scoping opinions provided by ECDs and ToR of the scoping exercise this full environmental and social impact assessment (ESIA) of 151.54 MW Myanmar Ahlone Power Plant is prepared in tackling environmental and social impacts triggered by the development project and its related activities of combined cycle power plant – 151.54 MW that is to be managed and operated by Myanmar Alone Power Plant Co., Ltd.

Based on the presenting facts and information provided by the project proponent, it could be expected that the implementation of the project will bring socioeconomic and economic development to Yangon by mean of energy security and sufficiency. The desk-based studies on available information, site visits for collecting baseline data, factsheet, and comprehensive public consultation results indicates that there is no objectional, complicated, controversial socio-economic and political issues when weighing in support of the project is to be implemented on currently designated location. The environmental assessment of the Project ascertains that the Project is unlikely to cause any major environmental impacts. Many of the impacts are localised and short term or temporary in nature and can be readily addressed based on the built-in mitigation measures in the engineering design of the Project.

Since the project is to be established on power utility compound of the ministry: electricity and energy of Myanmar, the adverse impact on physical environmental changes by land use change and air pollutants emission is unavoidable. Apparently, ongoing implementation has made tangible changes to the existing natural environment. Under the approval of regional government and authorities, it is in full operational and maintenances activities to meet its mission as scheduled. Therefore, the company acquires to apply and conforms all necessary official notices for proceeding implementation as of the PPA.

However, the approval from ECD remains as a necessity. To accelerate the implementation activities further and ensure timely resort operation, the company is applying ECD's approval to prove it is adhering its environmental obligation in accordance to Myanmar environmental conservation laws and guidelines. Therefore, the project developer, Myanmar Ahlone Power Plant Co., Ltd. convinces to execute Environmental Management Measures and Monitoring Plan (EMM & EMP) that will be fully comply with and committed to apply all mitigation and management measures described in this full ESIA report. The company ensures all its current preliminary construction activities are abided in line with acting notices and orders enforced by ministry: Myanma Electric Power Enterprise (MEPE) and Myanma Oil and Gas Enterprise taking the role in the supervision and steering committee.

With energy sector is one of the crucial development sectors of the state and the communities those residing nearby are in favour to the project, the emergence of this power plant development project will bear fruit of infrastructure and economic development to the Yangon city. It is being developed inside 5.695 acres of ministry's premises. Thus, the implementation of 151.54 MW Ahlone Combined Cycle power plan Project could be considered welcome project since it is the added updating project of existing power utility and infrastructure of plant obsolete plant that needs overhaul upgrades

10.2 Recommendation

On behalf the project proponent, Myanmar Ahlone Power Plant Co., Ltd and by means of the scoping exercise prepared by the Myanmar Survey Research (MSR) and scoping opinions provided by Environmental Conservation Department (ECD), the strategy and approach to examine baseline detailed environmental data was performed to accomplished Environmental and Social Impact Assessment Report (ESIA) of Myanmar Ahlone Power Plant Co., Ltd. Strictly following according to the ECD guidelines and mentioned assessment methodology in the TOR, a thorough impact assessment and evaluation had been conducted in terms of each particular project stage.

This project development project can expect some adverse impact on the environment. On the other hand, the beneficial impacts on the region and the nation as well as human beings would only be meaningful and sustainable development would only be possible if adverse impacts are minimized through strict maintenance and control measures as mentioned for this project. All this would need vigilant care and cost money, and the project authority should take these into consideration.

The primary reason why the environmental impact from the plant is minimal is that the project proponent is abide by Myanmar/ADB/ IFC Standards and build a plant, which will meet the emission standards of

National Emission/Effluent Quality Guidelines (NEQG) endorsed by the Environmental Conservation Department (ECD) of MONREC.

The excellent characteristics of the fuel used, equipment and machinery, which conform to international standard and good operation practices all combine to make the proposed power plant project acceptable one. The Environmental monitoring Plan should be followed properly and review of the EMP should be done as per plan. Seasonal continuous baseline study for water, aquatic ecology and fishing should be conducted for filling any gaps before works start.

However, the following are the recommendations should be followed by the Myanmar Ahlone Power Plant Company Limited during all of the its 151.54 MW Combined Cycle Power Plant project stages.

1. **Continuation of periodical the baseline air monitoring study**

   Since the baseline air monitoring study has been conducted in two different separate seasons (i.e., wet and dry), a follow up baseline air quality monitoring should be conducted at quarterly so that the proper variances among seasonal data would be reflected. It is suggested to monitor air quality for 4 locations to get the seasonal monitoring without fail.

2. **Continuation of the Stakeholder Consultation**

   To evaluate the true consequences of the project, the Stakeholder consultations should be continued during the Construction and operation of the project in a regular interval. The stakeholder consultation should address any issues and complaints made by stakeholders while doing future regular consultations and reporting full implementation of committed corporate social responsibility programme of project developer.

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APPENDICES

Appendix – 1: Air Modelling Report

AIR MODELING REPORT ON
AHLONE 151.54 MW COMBINED CYCLE POWER PLANT
(REVISED)

Myatthu Kyaw

Table of Contents

1. Project Background

The report describes the air quality modelling study of a 151.54 MW Combined Cycle Power Plant (CCPP), hereafter called the “power plant”. The project is located inside the compound of Ministry of Electric Popwer (MOEP), Ahlone Township, Yangon region, Myanmar. It is a gas-fired power plant and natural gas is supplied with 14”-diameter MOEP gas pipeline which is about 100 ft (30 m) away from the power plant. The details of the power plant operation facilities are illustrated in project description section of the EIA report. In the following sections of the report, the objectives, methodology, result and discussion, and conclusion and recommendations of the air modelling using AERMOD dispersion modelling system will be presented.

2. Objectives of the Modelling

This modelling aims;

i. To estimate emission from the operation of Ahlone CCPP
ii. To study the dispersion pattern of air pollutants from the operation of Ahlone CCPP
iii. To assess the potential impacts of the operation of Ahlone CCPP on ambient air quality
iv. To consider the modelling results in evaluating impacts significance on ambient air quality.

3. Methodology

3.1 Air Quality Modelling

The overall methodological framework is presented in Figure 3-1 and workflow of AERMOD dispersion modelling system is illustrated in figure 3-2. In this study, emission from CCPP operation is estimated for the base year 2022. The spatial extent of the modelling study will be 10 km radius from the centre point of the CCPP. The site activity data is collected from the CCPP operation team and site-specific meteorological data (surface and profile data of AERMOD-ready inputs) are purchased from Met Data Services of Lakes Environmental Software.

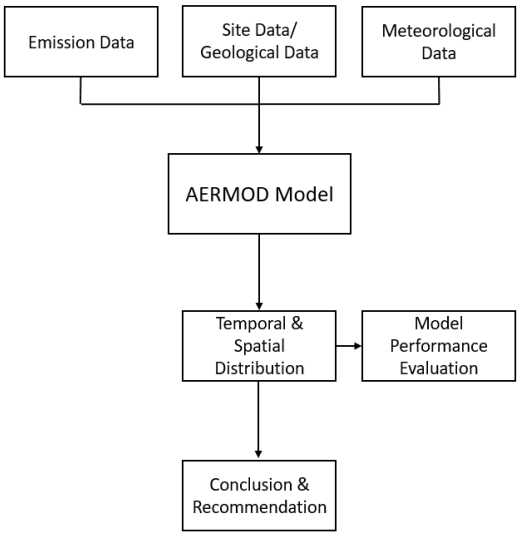

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Figure 3-1: Methodological Framework for Air Quality Modelling

3.1.1 Emission Estimation

Emission from the CCPP operation is estimated using equation 3-1. Basically, emission will be estimated by multiplying emission factor with the activity data unless the detailed information on emission sources and variables for emission factor calculation are available.

Emission = Activity Data × Emission Factor ..... (eq. 3-1)

Where,

Activity Data = Activity data give a measure of the scale of activity causing the emissions

Emission Factors = Emission factors are the mean value of pollutant emission from related activities

i. Emission Factors

Except from Nitrogen Oxides (NOx) and Carbon Monoxide (CO), Emission Factors (EFs) for other chemical species such as particulate matter with a diameter of 10 microns or less (PM_{10}) and, particulate matter with a diameter of 2.5 microns or less ($PM_{2.5}$), Sulfur Dioxide (SO_2), Methane (CH_4), volatile organic compounds (VOCs) and Non-methane Hydrocarbon (NMHC) are retrieved from Table 1.4.2, section 1.4 Natural Gas Combustion section of AP42[16], Compilation of Air Pollutant Emission Factors. It contains emissions factors and process information for more than 200 air pollution source categories. Since, flue gas concentration of NOx and CO are measured in term of dry basis at the power plant, the EFs for these species are calculated using the following equation.

$$E = C_d F_d \frac{20.9}{(20.9 - \%O_{2d})}$$

E = Pollutant emission rate, ng/J (lb/million Btu)

Cd = Pollutant concentration, dry basis, ng/scm (lb/scf)

Fd, Fw, Fc = Volumes of combustion components per unit of heat content, scm/J (scf/million Btu)

$\%O_{2d}$, $\%O_{2w}$ = Concentration of oxygen on a dry and wet basis, respectively, percent.

Table 3-1: Emission Factor for Selected Pollutants

No.	Pollutant	Emission Factor (lb/10^6 scf)
1	CO[a]	49.11
2	CO_2	120,000
3	SO_2[b]	1.8×10^{-4}
4	NO_x[a]	49.11
5	CH_4	2.3
6	$PM_{(total)}$[b]	7.6
7	VOC	5.5
8	NMHC[c]	8.5

[a] Emission Factor is calculated based on the measurement concentration on dry basis, i.e. CO and NOx at 25 ppmv or mg/m^3

[b] SO_2 EF is derived from Table 3.1-2a. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE

GASES FROM STATIONARY GAS TURBINES where sulphur content of the natural gas is 0.002%, obtained from gas analysis result by the power plants

[c] All PM (total, condensable, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate PM_{10}, $PM_{2.5}$ or PM_1 emissions.

[d] NMHC EF is derived from the VOC emission factor calculation, section 1.4 Natural Gas Combustion of AP42, U.S. EPA

3.1.2 Model Inputs and Operation

The estimated emissions of each studied pollutant (presented in Table 4-1) are used as model inputs. Other parameter such as carbon and sulfur content from gas analysis at 4.048% and 0.002%, real-time monitoring data of NOx and CO at 25 ppmv and 25 ppmv at 15% O_2, stack height at 58 m, stack inside diameter at 5.5m, stack exit temperature 91 - 98 °C, mean sea level of the project site are specified in the source pathway of the modeling section.

[16] AP42, Compilation of Air Pollutant Emission Factors, U.S.EPA

A base map with the reference point of latitude and longitude of the project site (Phase1), WGS 84 datum and a radius of 10 kilometers was defined as a center point. The following pathways are the main model options for different model runs;

i. **Control Pathway**: Pollutants, PM_{10}, $PM_{2.5}$, SO_2, and NO_2 are set as pollutant id with the averaging of 1-hour, 24-hour and annual to be compatible with National Environmental Quality (Emission) Guideline of MONREC.

ii. **Source Pathway**: Source type will be specified in this pathway where POINT source and the parameters such as line source emission rate in g/s, stack height, stack exit temperature, stack exit velocity are defined.

iii. **Receptor Pathway**: The receptors' location was specified with 500m x 500m distance in X and Y directions by using Uniform Cartesian grid tool. Flat terrain option will be chosen in terrain option as the project site lies in flat plain area.

iv. **Meteorological Pathway**: In this stage, Surface File (SFC) and Profile File (PFL) generated by AERMET will be specified.

v. **Output Pathway**: Contour plot file and tubular option (receptor table output option and maximum value table output option) will be specified in this stage.

4. Results and Discussion

4.1 Meteorological Data

The meteorological data for the base year 2022 is purchased from the Met Data Services of Lakes Environmental Software. The annual data are input to the WRPLOT View to create Wind Class Frequency Distribution chart (Figure 4-1) and Windrose Plot (Figure 4-2) so that wind class and direction throughout the base year can be seen clearly.

It is apparent that wind speed 0.5 - 2.1 m/s made up 42.9%, followed by 2.1 - 3.6 at 34.9%, and the highest speed with 8.8 - 11.1 contributed 0.1% while calm wind accounted for 1% throughout the year. When looking at the windrose plot, wind is influentially blowing from the south-west direction throughout the year.

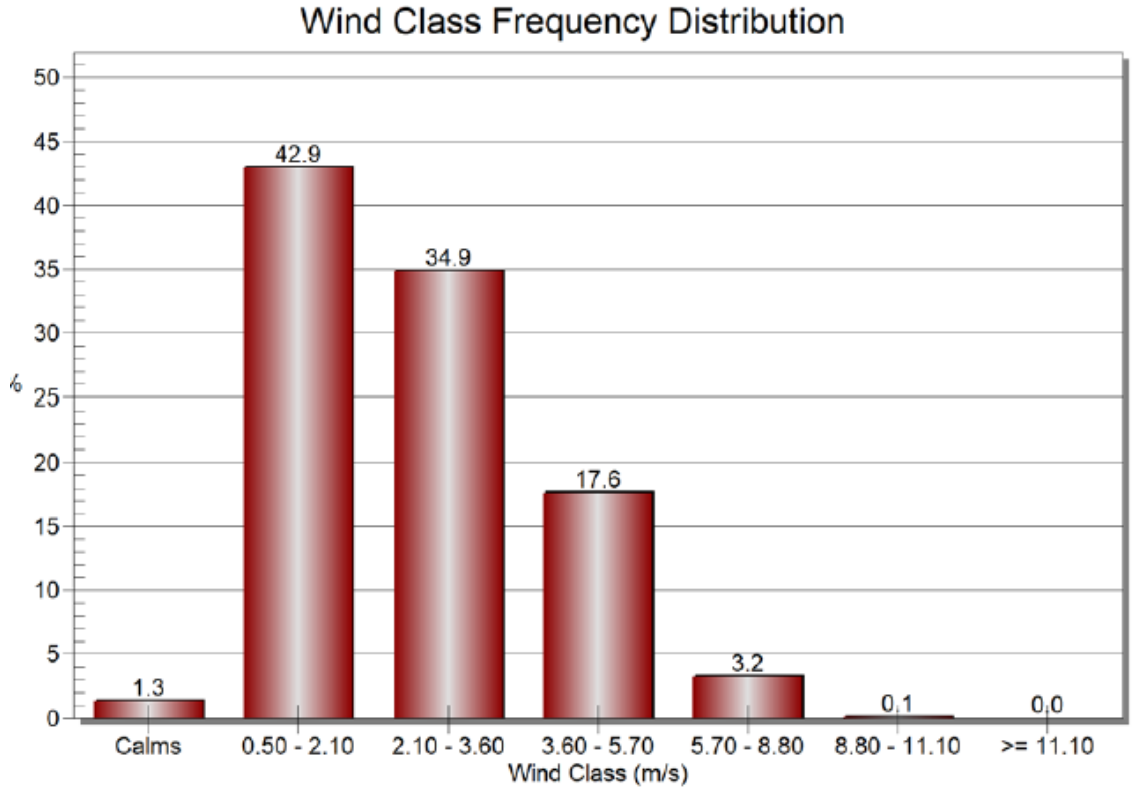


Figure 4-1: Wind Class Frequency Distribution

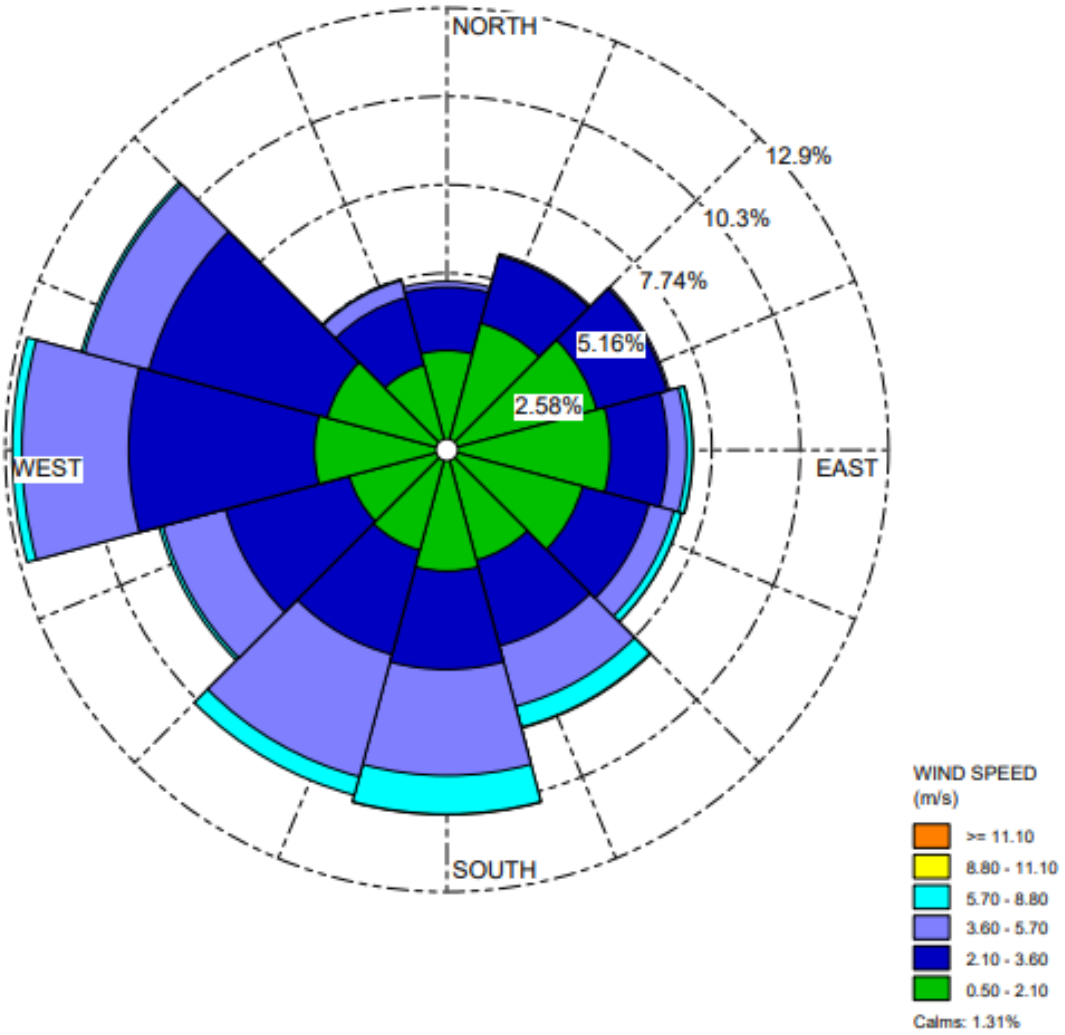


Figure 4-2: Windrose Plot for Ahlone CCPP for 2022 base year

4.2 Air Emission

The natural gas-fried CCPP basically generates air pollutants such nitrogen oxides (NOx), carbon monoxide (CO), and carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and volatile organic compounds (VOCs) and small amounts of sulphur dioxide (SO_2) and particulate matter (PM). The amount of these pollutants depends on the composition of each chemical species in the natural gas, combustion process, and emission control facilities of the power plant.

The emission of the above-mentioned pollutants is estimated referring to the natural gas analysis results, real-time monitoring results, especially CO and NOx, daily gas consumption, operating process, and emission factors of the AP42 for gas combustion facility. Table 4-1 illustrates the estimated concentration of the pollutants in lb/day, kg/day, and g/s from this CCPP and from other CCPP using natural gas. It is observed that the concentration of CO, NOx, and PM_{10} from the power plant have a slight agreement with the emissions from other CCPPs while CO_2 and SO_2 emissions do not correlate due to variation in sulphur content in the natural gas and emission factor used.

Table 4-1: Emission from CCPP operation

Pollutant	EF (lb/10^6scf)	Activity (10^6scf)	Emission from Natural Gas Combine Cycle Power Plant			
			(lb/day)[a]	(kg/day)[a]	(g/s)[a]	(g/s)[b]
CO	49.11	44	2160.84	980.14	11.34	3.25
CO_2	120000	44	5280000.00	2394965.76	27719.51	17123

Pollutant	EF (lb/10^6scf)	Activity (10^6scf)	Emission from Natural Gas Combine Cycle Power Plant			
			(lb/day)[a]	(kg/day)[a]	(g/s)[a]	(g/s)[b]
SO_2	1.8×10^{-4}	44	0.01	3.6×10^{-3}	0.000042	0.055
NO_x	49.11	44	2160.84	980.14	11.34	34.375
CH_4	2.3	44	101.20	45.90	0.53	NA
PM_{10}	7.6	44	334.40	151.68	1.76	0.204
$PM_{2.5}$	7.6	44	334.40	151.68	1.76	NA
VOC	5.5	44	242.00	109.77	1.27	NA
NMHC	8.5	44	374.00	169.64	1.96	NA

[a] emission from the studied CCPP

[b] emission from other gas CCPPs, where SO_2, NOx and PM_{10} are referred to Atmospheric Impact Report on Proposed CCPP and associated infrastructure, near Richards Bay, KwaZulu-Natal Province, CO from the study of Alberto Vannoni et. al. (2021), CO_2 from Combined Heat and Power Technology Fact Sheet Series, U.S Department of Energy.

4.3 Air Quality Modelling

Nitrogen Dioxide (NO_2) -NO_2 emissions from natural gas combustion pose environmental concerns due to their role in air pollution. During the combustion process, high temperatures and excess oxygen can lead to the formation of NOx, primarily nitrogen monoxide (NO) and nitrogen dioxide (NO_2). These pollutants contribute to smog formation, acid rain, and adverse health effects.

The release of NOx depends on the type of combustion technology. The design and operation of Heat Recovery Steam Generator (HRSG) in combined cycle power plants contribute to NOx reduction by lowering combustion temperatures, improving overall combustion efficiency, optimizing burner operation, and facilitating the integration of additional NOx control technologies.

Figure 4-3 presents the 1st highest concentration of 1-hr NO_2 throughout the study period (2022 year-round), and Figure 4-4 illustrates the more close-up version of NO_2 concentration to its immediate surrounding. According to the result, the highest concentrations are seen within the 500 m of the power plant with 12.7 ug/m^3 which is well met with the 1-hr NO_2 NEQEG at 200 µg/m^3 whereas the lowest concentrations appear in many locations of the study aera (10-km radius) around 1 µg/m^3. Therefore, the finding from the modeling study indicates that the NO_2 emission from the power plant does not have a significant effect on the local air quality.

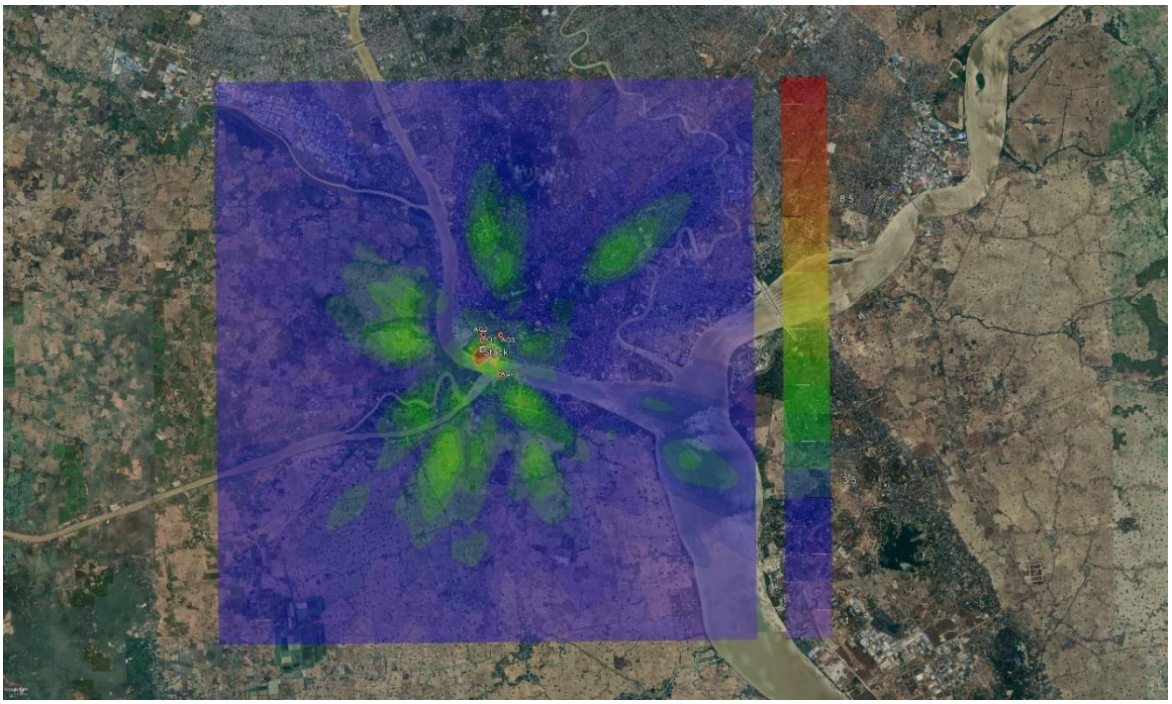


Figure 4-3: 1-hr NO_2 concentration

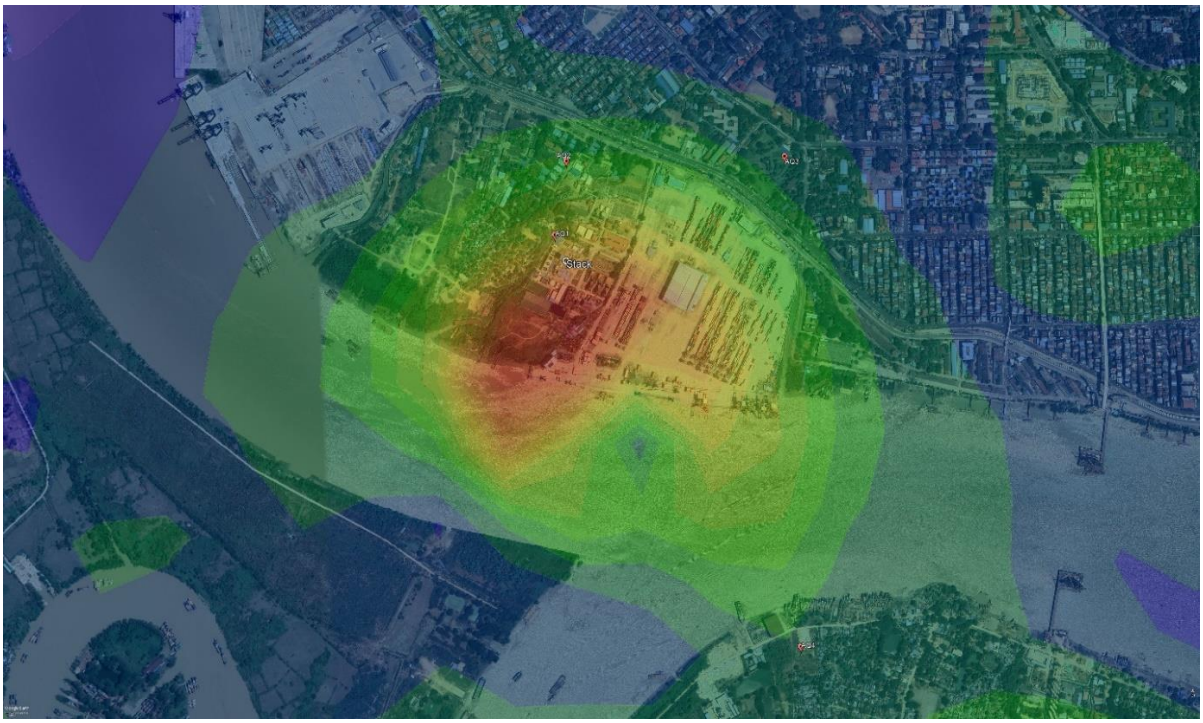


Figure 4-4: 1-hr NO_2 concentration (closed-up)

Sulphur Dioxide (SO_2) - SO_2 emissions from natural gas-fired power plants are generally lower due to this lower sulphur content. According to the analysis result of natural gas, the sulphur content is 0.002% and SO_2 emission is predictable to be minimum.

Due to the lower sulphur content, the simulated results from modeling study are also minimum where the highest concentration appears within the 1600 m of the power plant at 9×10^{-6} µg/m^3 (Figure 4-5 and Figure 4-6). Therefore, the finding from the modeling study indicates that the SO_2 emission from the power plant does not affect the local air quality.

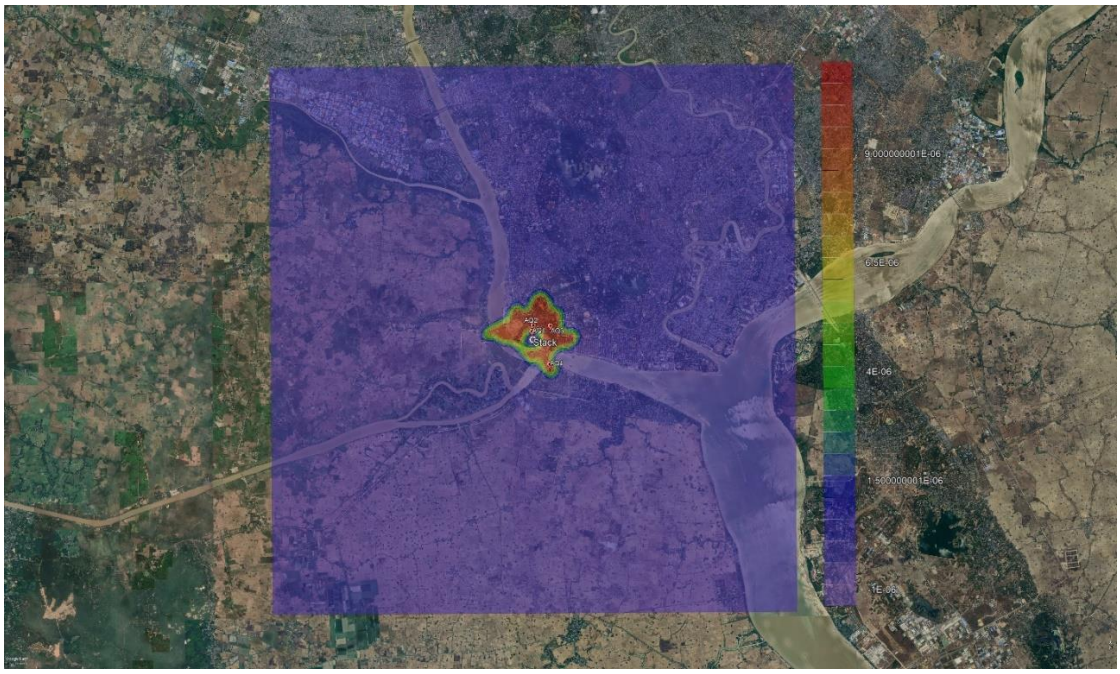


Figure 4-5: 24-hr SO_2 concentration

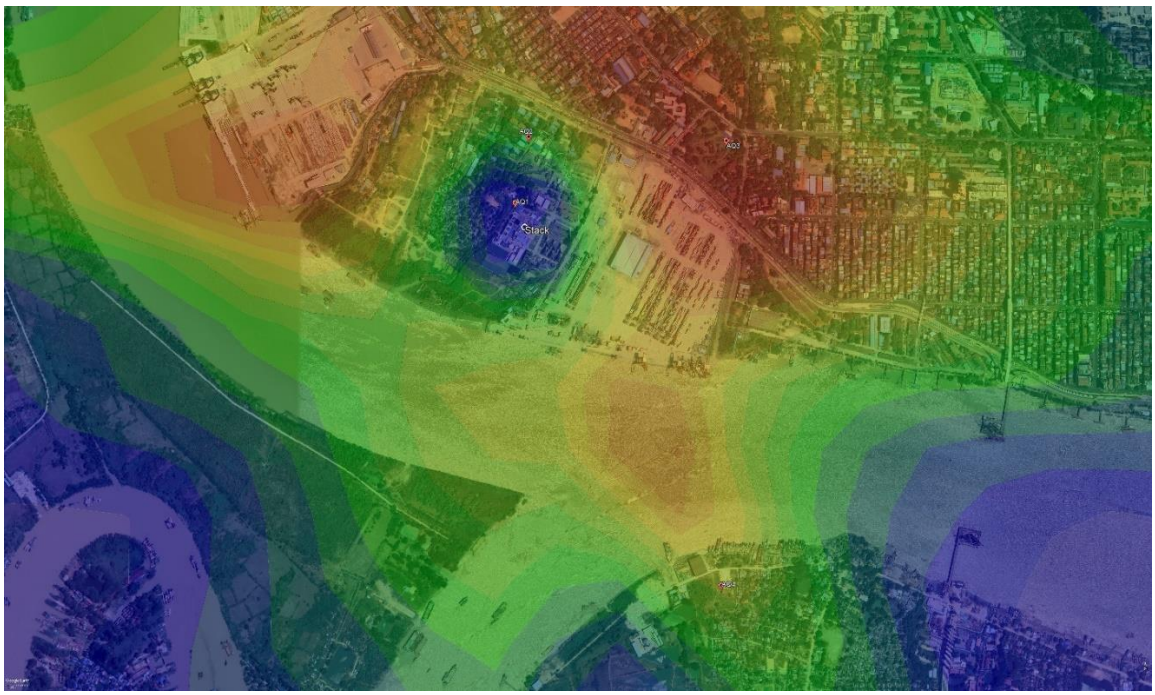


Figure 4-6: 24-hr SO_2 concentration (closed-up)

Particulate Matter with a diameter of 10 micrometers or less (PM_{10}) - The combustion of natural gas releases fewer particulate matter which, results in reduced PM_{10} emissions. Natural gas contains fewer impurities and contaminants, such as sulphur and ash, which are major contributors to particulate matter in combustion processes. The absence of these impurities leads to a lower likelihood of particulate matter formation.

According to the modeling studying, the highest concentration appeared at 0.41 µg/m^3 around 600 m east of the power plant. The value is apparently lower when comparing to the 24-hr PM_{10} limit of NEQEG at 50 µg/m^3. Thus, it can be considered that the PM_{10} emission from the power plant does not affect to the surrounding environment.

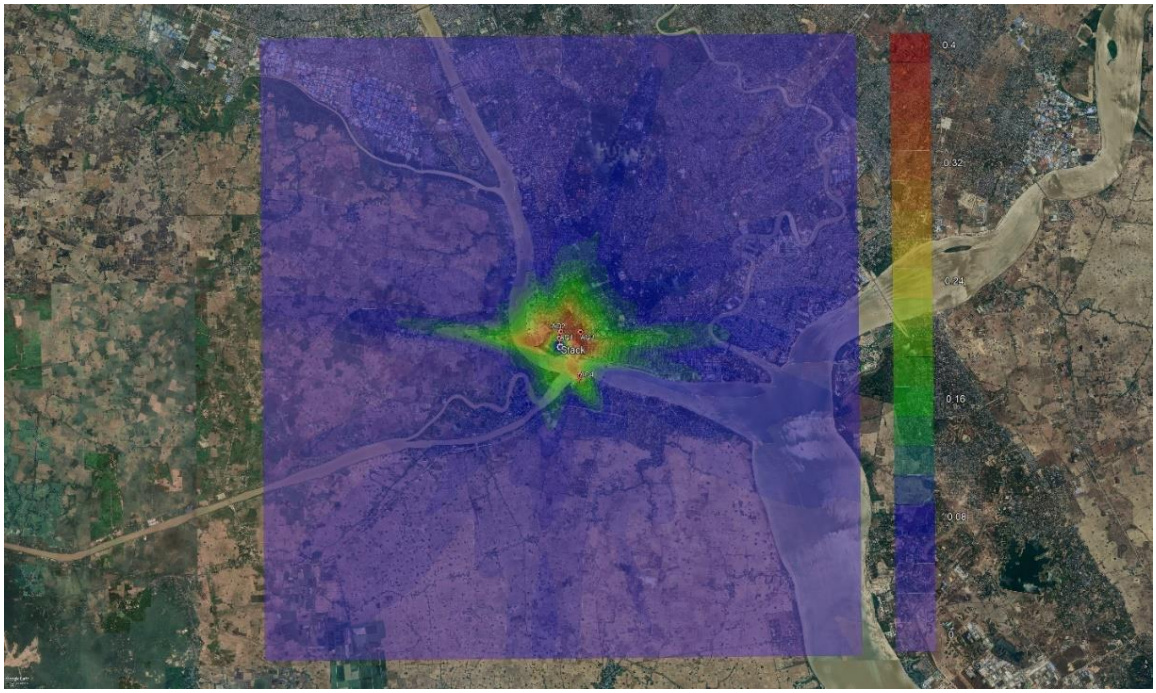


Figure 4-7: 24-hr PM_{10} concentration

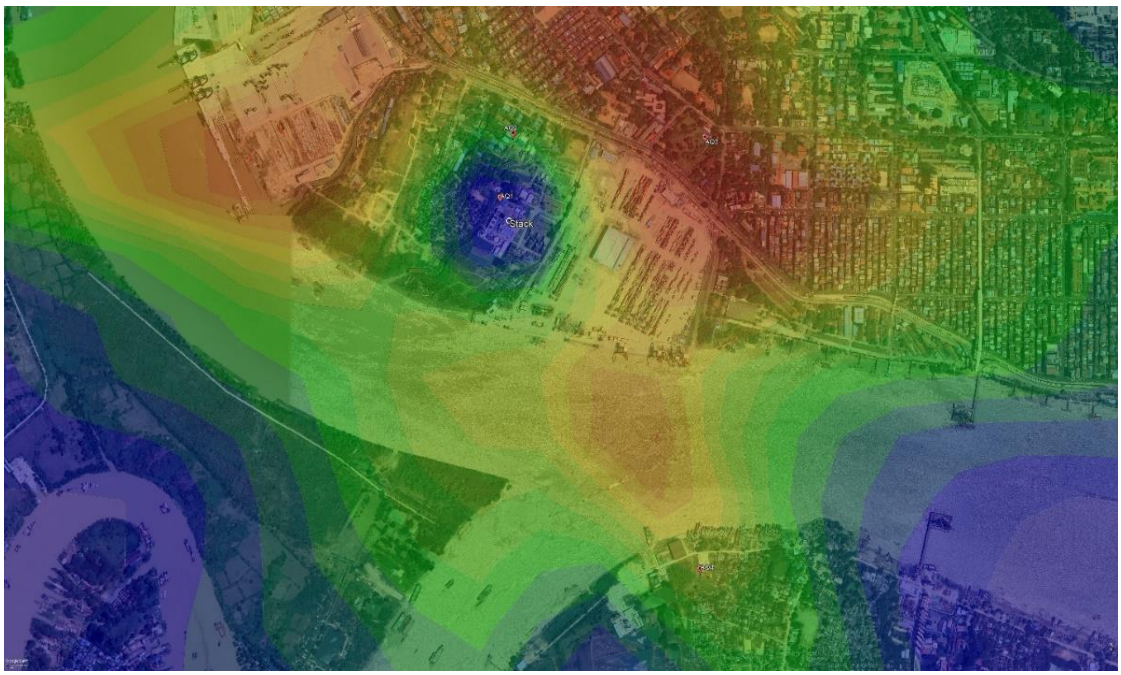


Figure 4-8: 24-hr PM_{10} concentration (closed-up)

Particulate Matter with a diameter of 2.5 micrometers or less ($PM_{2.5}$) – Similar to PM_{10} discussion, the natural gas has fewer impurities and contaminants leading to lower PM emission when burning. In addition, the specific emission factor (EF) for the natural gas is unknown and EF used in $PM_{2.5}$ estimation is the same as PM_{10}, the model simulation results are also identical.

The model result indicates that the highest concentration appeared at 0.41 µg/m^3 around 600 m east of the power plant, and accordingly, the $PM_{2.5}$ emission from the power plant does not affect to the surrounding environment.

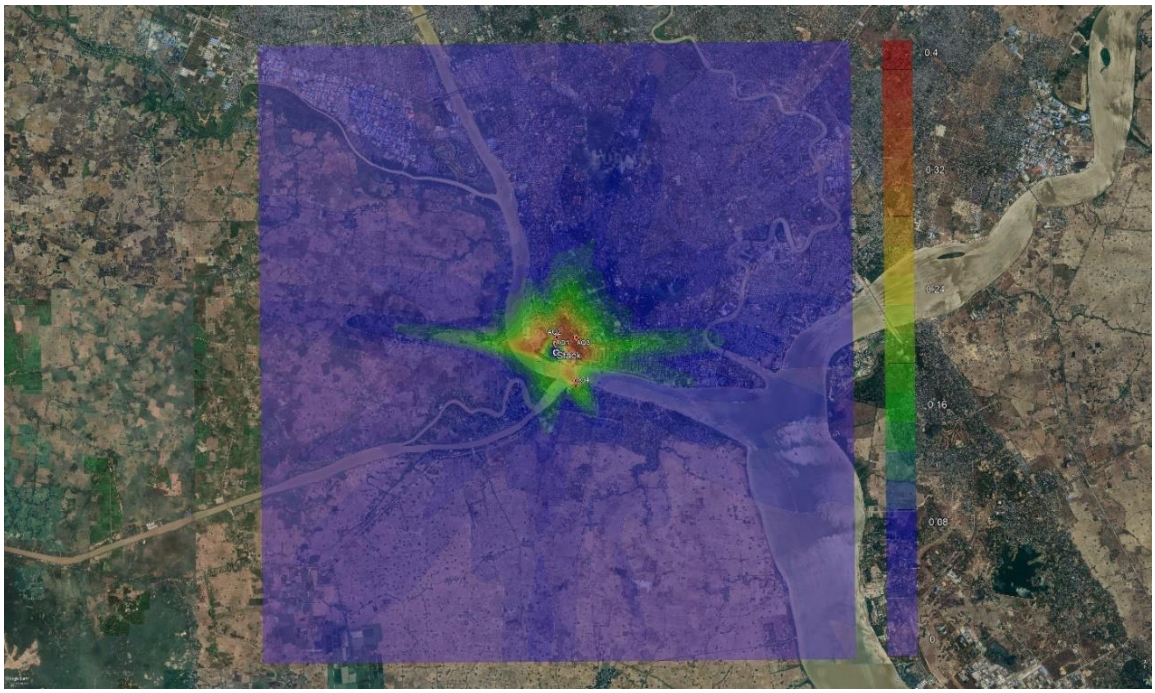


Figure 4-9: 24-hr $PM_{2.5}$ concentration

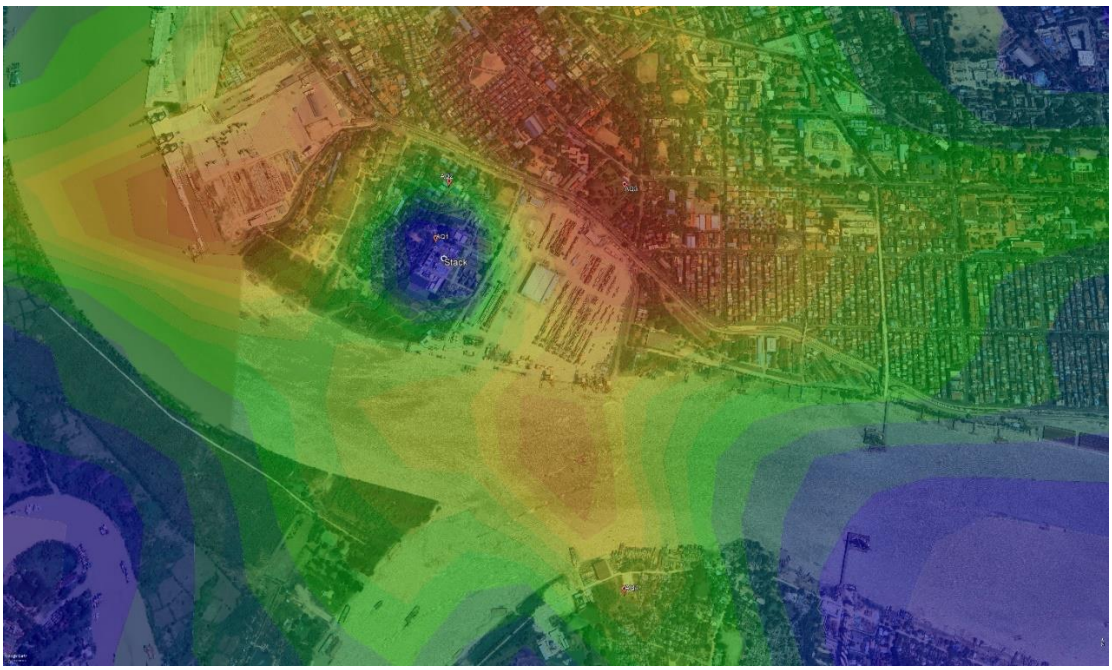


Figure 4-10: 24-hr $PM_{2.5}$ concentration (closed-up)

4.4 Validation

The results from model simulation are validated by comparing with the results from field measurement in wet and dry seasons. The measurements were carried out in 4 locations, 2 times for each location.

In addition, estimated emissions from the power plant are also compared with the results from the measurements carried out in January 2021 and July 22 in 4 different locations (Table 4-2). It cannot be denied that measurements have higher concentrations than modeling results due to the environmental factors such as siting of the measurement location, weather conditions during measurement, prevailing wind speed and direction, emission generating activities during measurements, etc.

It is observed that all the measured data, NO_2, SO_2, PM_{10} and $PM_{2.5}$ do not strongly correlate with the results from the model simulation where R^2 values of NO_2, SO_2, PM (PM_{10} and $PM_{2.5}$) are 0.41, 0.04, and 0.06 respectively. It can be due to the following reasons.

According to results from the model simulation, the concentrations of 1-hr NO_2, 24-hr SO_2, 24-hr PM_{10} and 24-hr $PM_{2.5}$ for the AQ1 are well below the NEQEG limit. AQ1 is located inside the power plant compound, $PM_{2.5}$ concentrations from 1st time measurement slightly exceeded whereas SO_2 and PM_{10} results are higher than that of NEQEG limit at 55.6 µg/m^3 and 111.2 µg/m^3 respectively. A sand pile is found about 370 m southwest of the power plant and this may probably affect the rise of PMs concentration during the measurement period.

The model simulation results for all studied pollutants at the AQ2 are also within the NEQEG limit. AQ2, situated around 280 m north of the power plant, has an apparent exceed of SO_2 concentration in 2nd time measurement while PM_{10} and $PM_{2.5}$ values are above the guideline limit. (Table 4-2). The air monitoring station of AQ2 might has similar air pollution effects to AQ1 while rose of SO_2 might be affected by unidentified activities during the measurement and/or mobilization of machineries and vehicles at the port terminal next to the project site.

Similarly, results of studied pollutants from the model at AQ3 also are well below the NEQEG limit. AQ3 is based in the public park, surrounded by public roads where Kyee Myin Daing strand road is in the south, lower Kyee Myin Daing Road or Bo Gyoke Aung San Road is in the north, Tha Khin Mya Garden Street in the immediate west and Aung Yadana Street in the east. SO_2, PM_{10} and $PM_{2.5}$ concentration from 2nd time measurement is found to be higher than the NEQEG limit. Perhaps, the rise of air emissions might be due to on-road vehicles.

Since, emission level of the studied pollutant meet with power plant target limit, the concentrations of pollutants at the AQ4 are also within the NEQEG limit. AQ4, located on the bank of the Yangon River,

at the opposite site of the 1350 m southeast away from the power plant which air quality might by interfered by the fugitive emission from sand piles and vessel navigation in Yangon River.

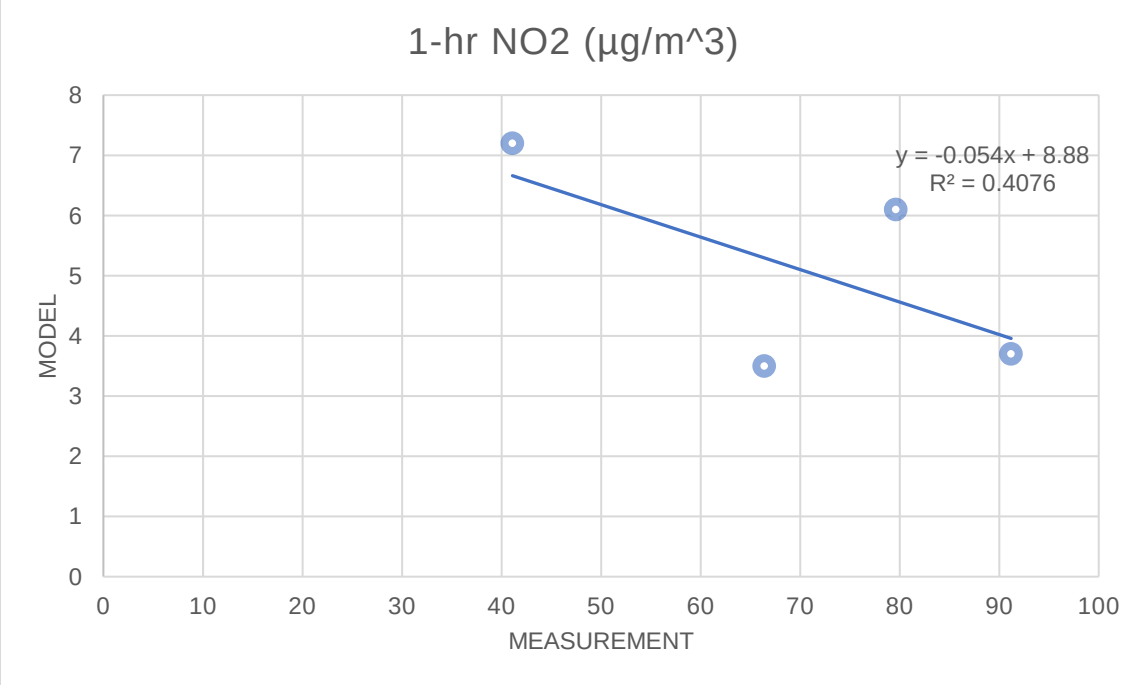


Figure 4-11: 1-hr NO_2 concentrations from model and measurement

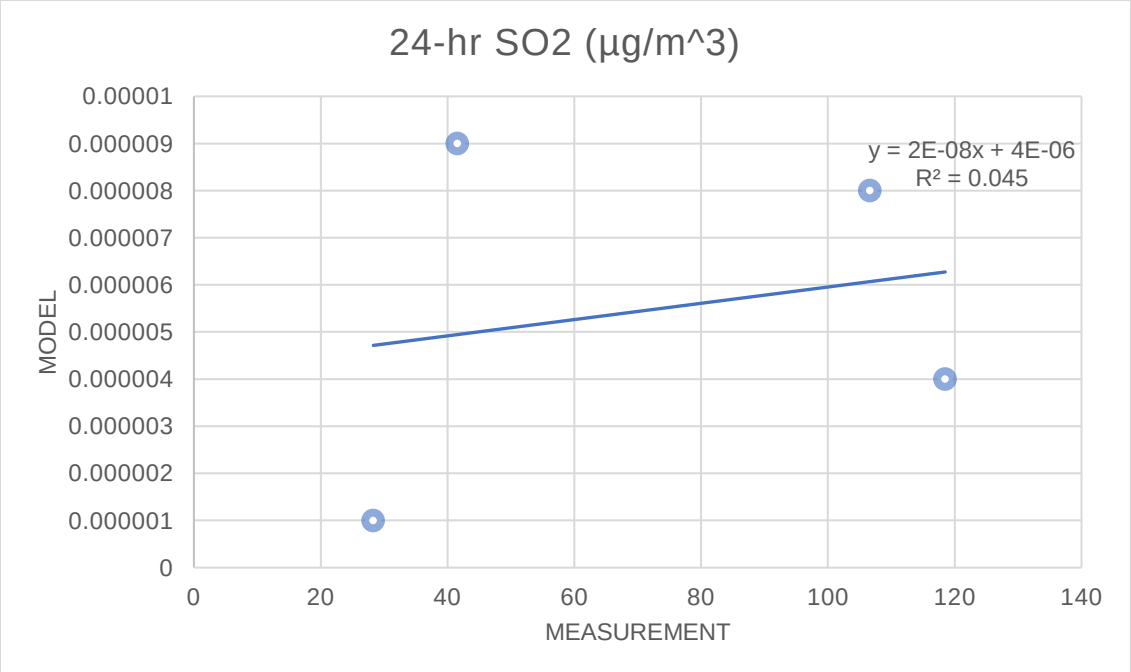


Figure 4-12: 24-hr SO_2 concentrations from model and measurement

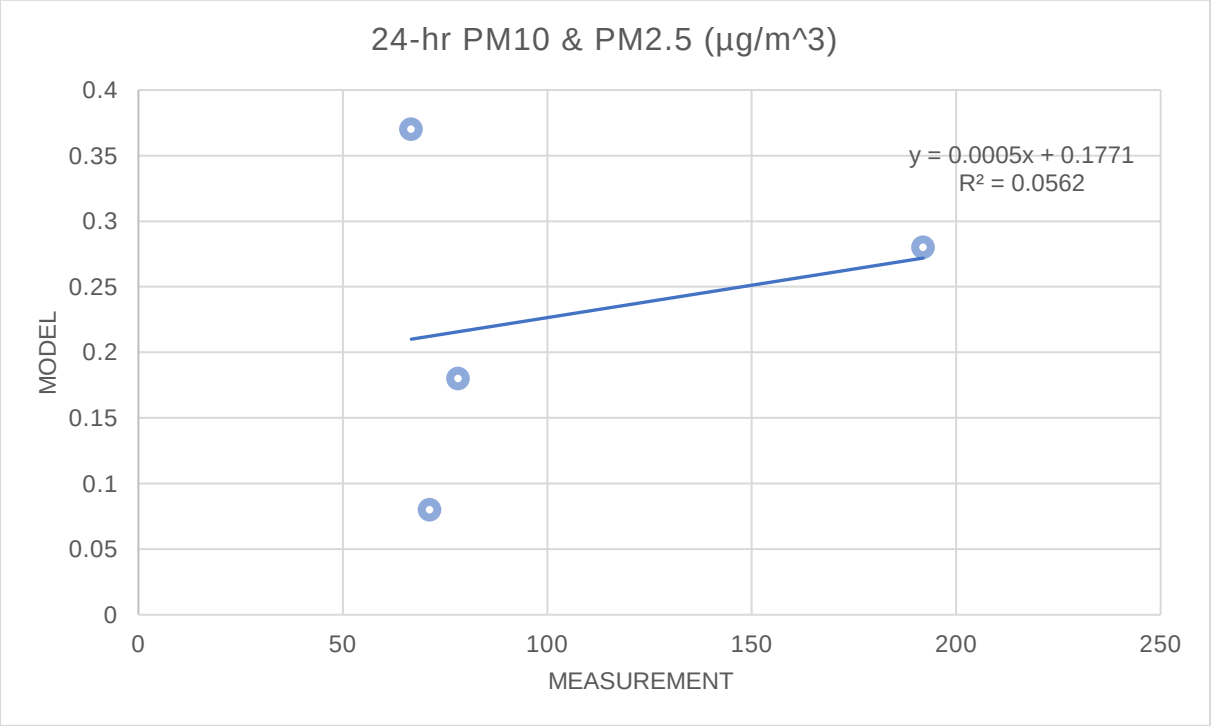


Figure 4-13: 24-hr PM_{10} and $PM_{2.5}$ concentrations from model and measurement

Table 4-2: Comparison of Emission with Measurement Data

Location	1-hr NO_2 (µg/m³)				24-hr SO_2 (µg/m³)				24-hr PM_{10} (µg/m³)				24-hr $PM_{2.5}$ (µg/m³)			
	M1	M2	MR	GL	M1	M2	MR	GL	M1	M2	MR	GL	M1	M2	MR	GL
AQ1	2	80.2	7.2	200	1	55.6	0.000001	20	31.4	111.2	0.08	50	27.1	23.1	0.08	25
AQ2	6.8	152.4	6.1		11.4	225.6	0.000004		54.6	101.9	0.18		39.4	66.7	0.18	
AQ3	4.6	177.8	3.7		1	82.1	0.000009		42	91.5	0.37		22	61.9	0.37	
AQ4	4.1	128.7	3.5		13.5	199.7	0.000008		59.8	324.1	0.28		55.4	184.5	0.28	

M1, measurement results from 1st time 1, 15, 28-29 January 2021

M2, measurement results from 2nd time 1, 21-22 July 2022

MR, model results

GL, National Environmental Quality (Emission) Guidelines

5. Conclusion and Recommendations

The findings of the study indicate that, overall, the concentration of pollutants emitted from the power plant is within the NEQEG limits, aligning with the emission targets set by the power plant. This suggests a successful implementation of clean combustion technologies and adherence to stringent environmental standards.

Furthermore, the study suggests that the potential impact on air quality and associated health effects in the surrounding areas would be minimal, given the compliance with emission targets and guideline limits. This points out the importance of continued efforts to utilize cleaner energy sources and employ advanced combustion technologies in power generation.

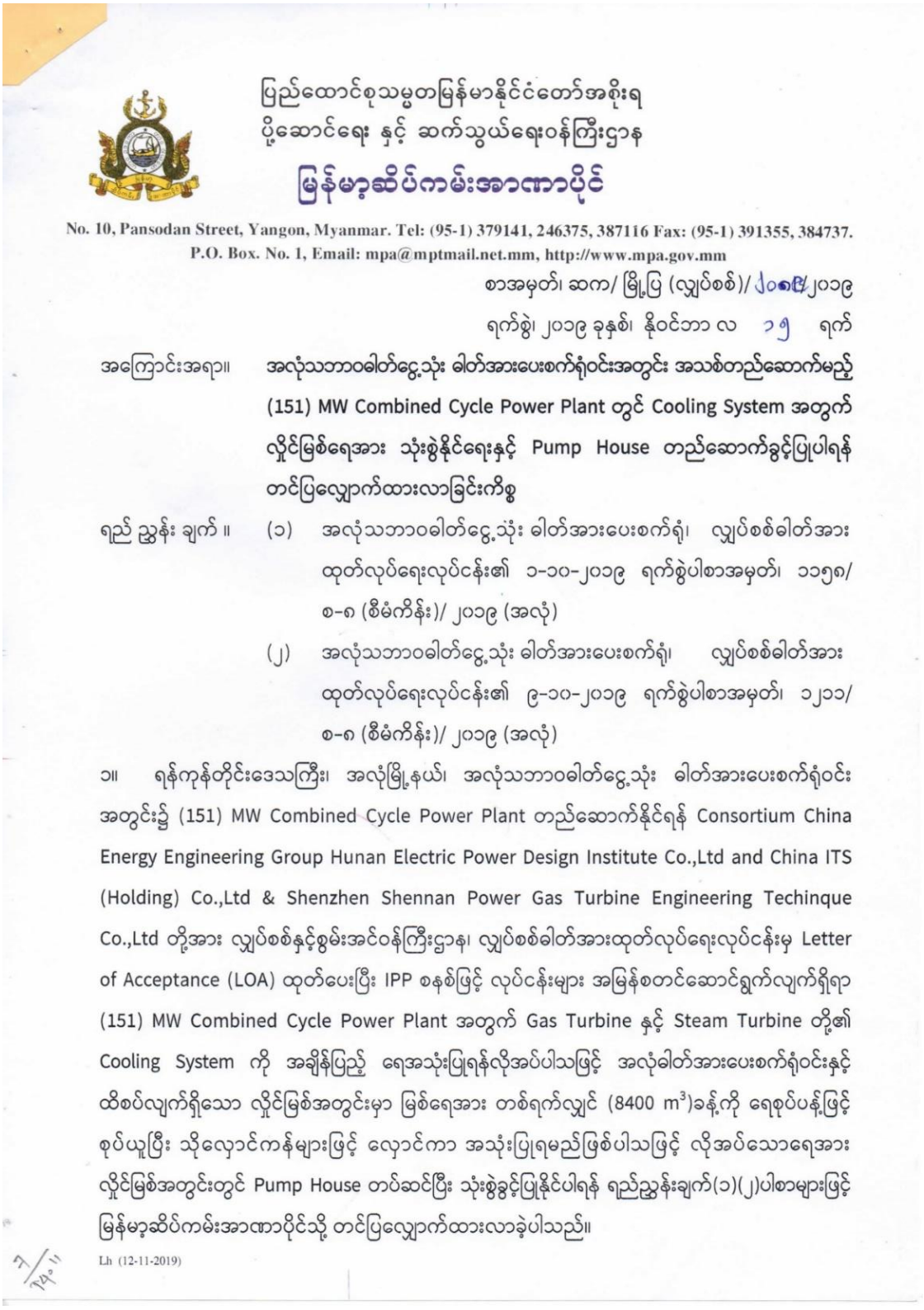
However, a comparison with field measurement data from four locations reveals that concentrations of pollutants exceed the guideline limits. This might be due to external factors such as emissions from nearby port terminals, sand piles, on-road vehicles, and vessels navigation in Yangon River.

To ensure the power plant's ongoing operation without harming the ambient air quality, some straightforward measures are recommended.

i. Regularly maintain and optimize existing equipment to boost efficiency and minimize emissions.
ii. Maintain open communication with the local community, addressing any concerns promptly.
iii. Promote SCR activities that demonstrate commitment and sustainability.

These steps, using existing technology and fostering transparency, can contribute to continued power plant operations with minimal impacts on air quality.

Appendix – 2: Permit and Approval



ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
ပို့ဆောင်ရေး နှင့် ဆက်သွယ်ရေးဝန်ကြီးဌာန
မြန်မာ့ဆိပ်ကမ်းအာဏာပိုင်

No. 10, Pansodan Street, Yangon, Myanmar. Tel: (95-1) 379141, 246375, 387116 Fax: (95-1) 391355, 384737.
P.O. Box. No. 1, Email: mpa@mptmail.net.mm, http://www.mpa.gov.mm

စာအမှတ်၊ ဆက/ မြို့ပြ (လျှပ်စစ်)/ ၂၀၁၉/၂၀၁၉
ရက်စွဲ၊ ၂၀၁၉ ခုနှစ်၊ နိုဝင်ဘာ လ ၁၅ ရက်

အကြောင်းအရာ။ **အလုံသဘာဝဓါတ်ငွေ့သုံး ဓါတ်အားပေးစက်ရုံဝင်းအတွင်း အသစ်တည်ဆောက်မည့် (151) MW Combined Cycle Power Plant တွင် Cooling System အတွက် လှိုင်မြစ်ရေအား သုံးစွဲနိုင်ရေးနှင့် Pump House တည်ဆောက်ခွင့်ပြုပါရန် တင်ပြလျှောက်ထားလာခြင်းကိစ္စ**

ရည် ညွှန်း ချက် ။ (၁) အလုံသဘာဝဓါတ်ငွေ့သုံး ဓါတ်အားပေးစက်ရုံ၊ လျှပ်စစ်ဓါတ်အား ထုတ်လုပ်ရေးလုပ်ငန်း၏ ၁-၁၀-၂၀၁၉ ရက်စွဲပါစာအမှတ်၊ ၁၁၅၈/ စ-၈ (စီမံကိန်း)/ ၂၀၁၉ (အလုံ)

(၂) အလုံသဘာဝဓါတ်ငွေ့သုံး ဓါတ်အားပေးစက်ရုံ၊ လျှပ်စစ်ဓါတ်အား ထုတ်လုပ်ရေးလုပ်ငန်း၏ ၉-၁၀-၂၀၁၉ ရက်စွဲပါစာအမှတ်၊ ၁၂၁၁/ စ-၈ (စီမံကိန်း)/ ၂၀၁၉ (အလုံ)

၁။ ရန်ကုန်တိုင်းဒေသကြီး၊ အလုံမြို့နယ်၊ အလုံသဘာဝဓါတ်ငွေ့သုံး ဓါတ်အားပေးစက်ရုံဝင်းအတွင်း၌ (151) MW Combined Cycle Power Plant တည်ဆောက်နိုင်ရန် Consortium China Energy Engineering Group Hunan Electric Power Design Institute Co.,Ltd and China ITS (Holding) Co.,Ltd & Shenzhen Shennan Power Gas Turbine Engineering Techinque Co.,Ltd တို့အား လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန၊ လျှပ်စစ်ဓါတ်အားထုတ်လုပ်ရေးလုပ်ငန်းမှ Letter of Acceptance (LOA) ထုတ်ပေးပြီး IPP စနစ်ဖြင့် လုပ်ငန်းများ အမြန်စတင်ဆောင်ရွက်လျက်ရှိရာ (151) MW Combined Cycle Power Plant အတွက် Gas Turbine နှင့် Steam Turbine တို့၏ Cooling System ကို အချိန်ပြည့် ရေအသုံးပြုရန်လိုအပ်ပါသဖြင့် အလုံဓါတ်အားပေးစက်ရုံဝင်းနှင့် ထိစပ်လျက်ရှိသော လှိုင်မြစ်အတွင်းမှာ မြစ်ရေအား တစ်ရက်လျှင် (8400 m^3)ခန့်ကို ရေစုပ်ပန့်ဖြင့် စုပ်ယူပြီး သိုလှောင်ကန်များဖြင့် လှောင်ကာ အသုံးပြုရမည်ဖြစ်ပါသဖြင့် လိုအပ်သောရေအား လှိုင်မြစ်အတွင်းတွင် Pump House တပ်ဆင်ပြီး သုံးစွဲခွင့်ပြုနိုင်ပါရန် ရည်ညွှန်းချက်(၁)(၂)ပါစာများဖြင့် မြန်မာ့ဆိပ်ကမ်းအာဏာပိုင်သို့ တင်ပြလျှောက်ထားလာခဲ့ပါသည်။

Lh (12-11-2019)

- ၂ -

၂။ သို့ဖြစ်ပါ၍ လှိုင်မြစ်အတွင်းမှရေကို Pump House တပ်ဆင်ပြီး အသုံးပြုရာတွင် ပူးတွဲ(၁)ပါ ပုံစံအတိုင်း Shore Line မှ ၁၁၈ ပေအကွာတွင် အလျား ၃၂.၈၁ ပေ နှင့် အနံ ၁၆.၄၁ ပေအရွယ် Floating Pump House (၁)လုံးအား ပူးတွဲ(၂)ပါ ပုံစံအတိုင်း တည်ဆောက်အသုံးပြုမည်ဆိုပါက ကန့်ကွက်ရန်မရှိပါကြောင်း အကြောင်းကြားအပ်ပါသည်။

ဦးဆောင်ညွှန်ကြားရေးမှူး(ကိုယ်စား)
နေမျိုးညွှန့်၊ အင်ဂျင်နီယာချုပ်-မြို့ပြ(ပူးတွဲ)

စာရိုက်မှူး
အလုံသဘာဝဓါတ်ငွေ့သုံး ဓါတ်အားပေးစက်ရုံ
လျှပ်စစ်ဓါတ်အား ထုတ်လုပ်ရေးလုပ်ငန်း

မိတ္တူကို
- မျှောစာတွဲ
- ရုံးလက်ခံ

Lh (12-11-2019)

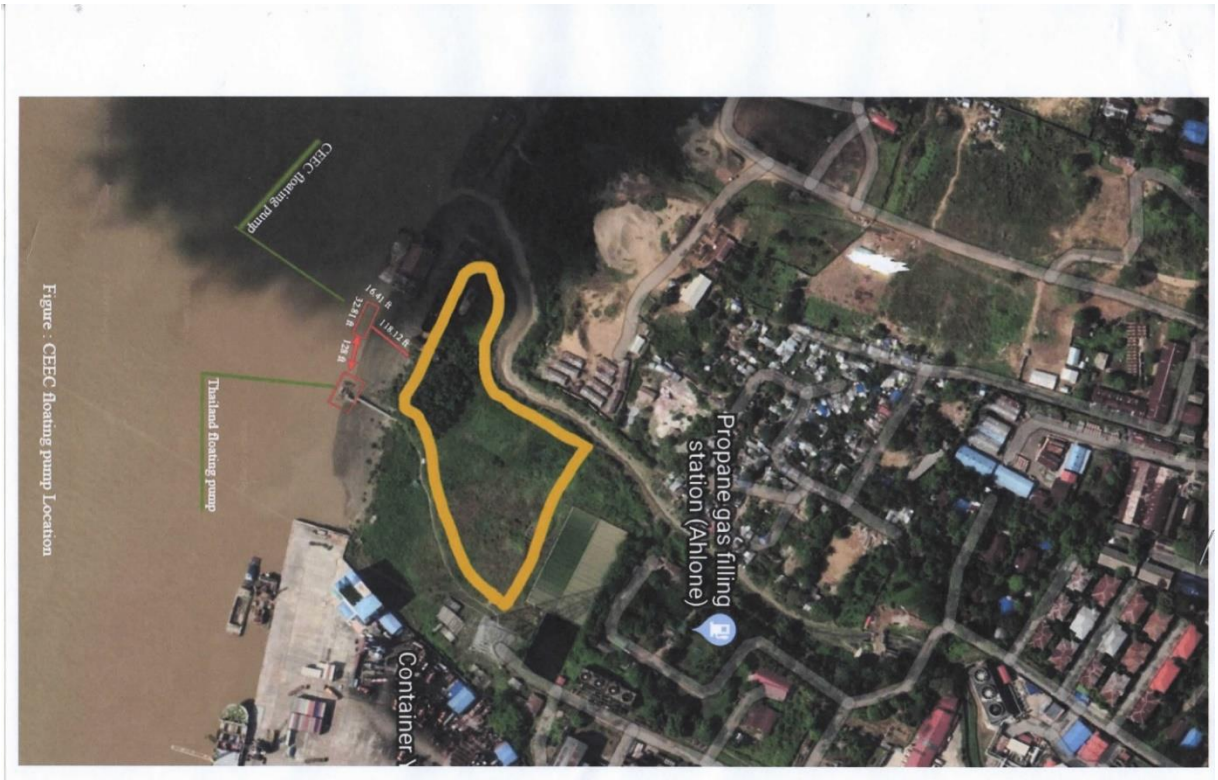
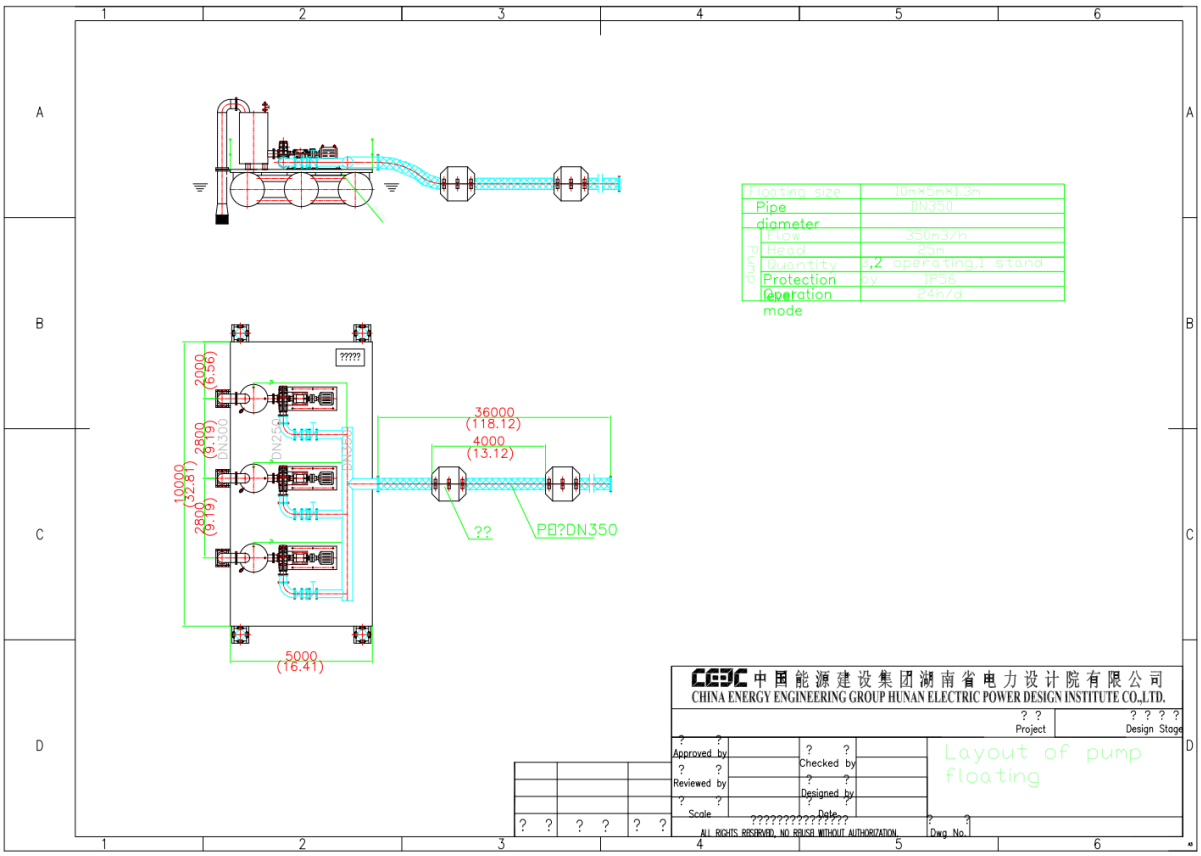
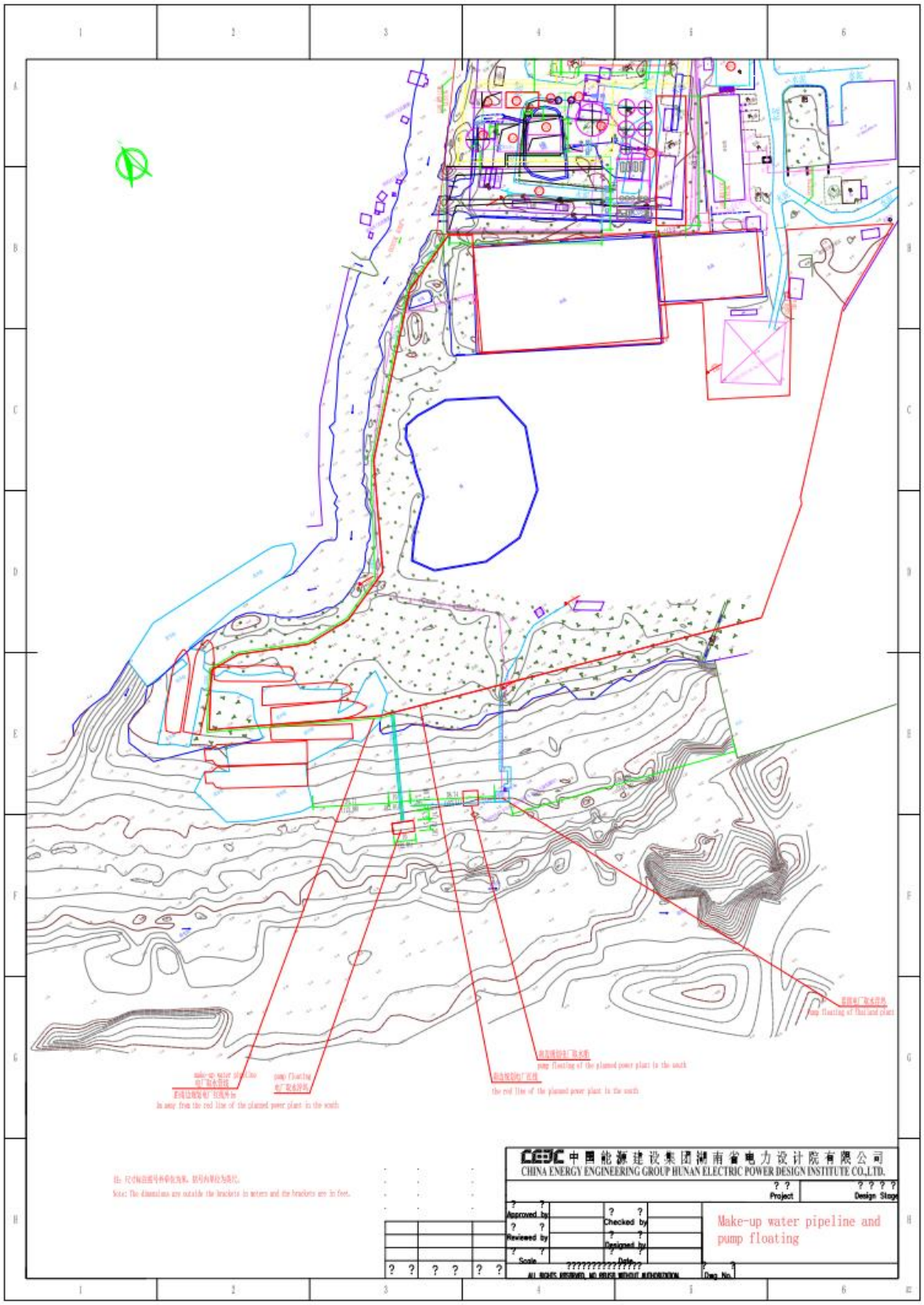
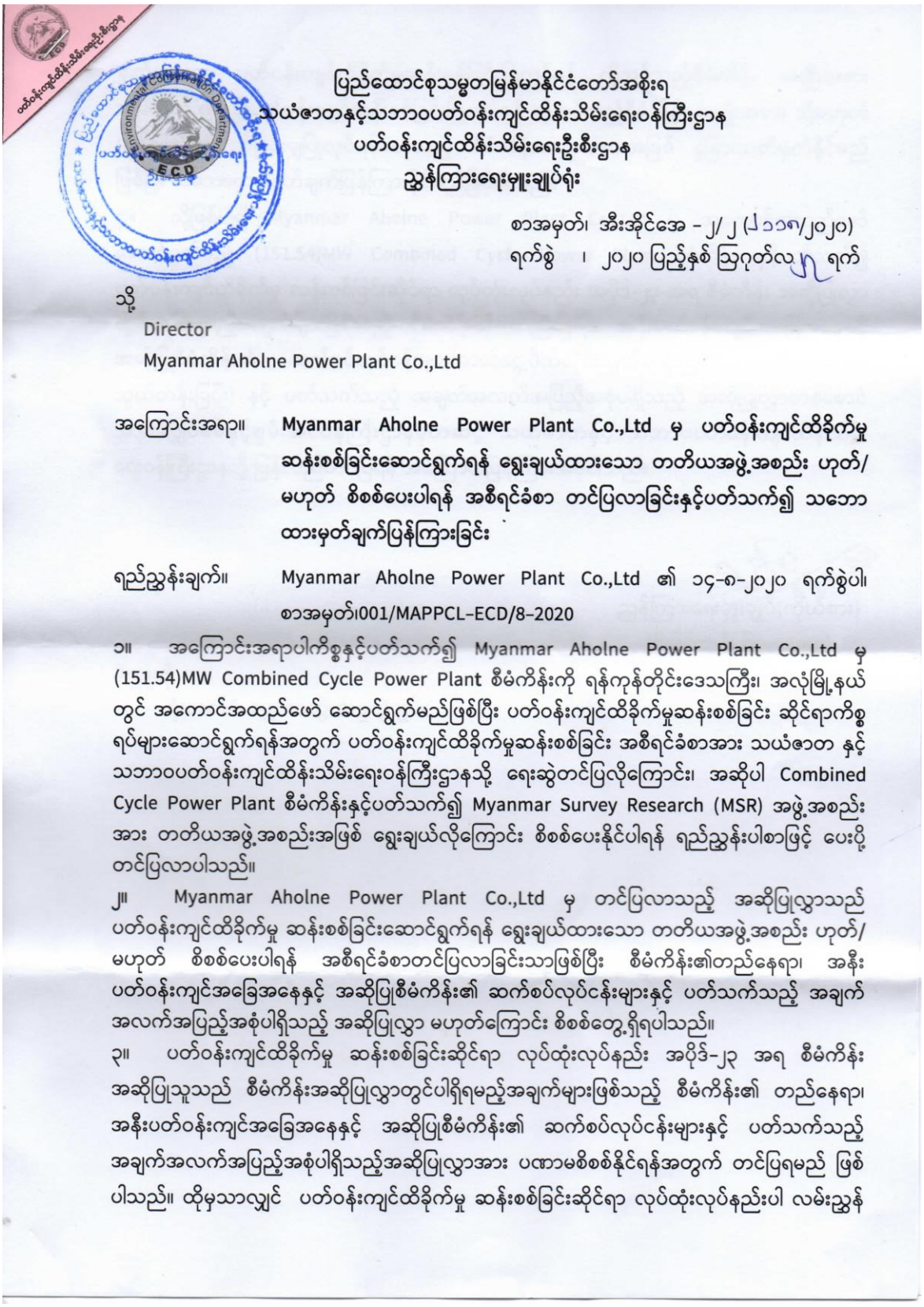


Figure : CEEC floating pump Location




CEEC 中国能源建设集团湖南省电力设计院有限公司
CHINA ENERGY ENGINEERING GROUP HUNAN ELECTRIC POWER DESIGN INSTITUTE CO.,LTD.
Project
Design Stage
Approved by
Checked by
Reviewed by
Designed by
Scale
Date
Dwg. No.
Make-up water pipeline and pump floating
ALL RIGHTS RESERVED. NO PART WITHOUT AUTHORIZATION



ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန
ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန
ညွှန်ကြားရေးမှူးချုပ်ရုံး

စာအမှတ်၊ အီးအိုင်အေ - ၂/ ၂ (ပ ၁၁၈/၂၀၂၀)
ရက်စွဲ ၊ ၂၀၂၀ ပြည့်နှစ် ဩဂုတ်လ ၂၇ ရက်

သို့

Director
Myanmar Aholne Power Plant Co.,Ltd

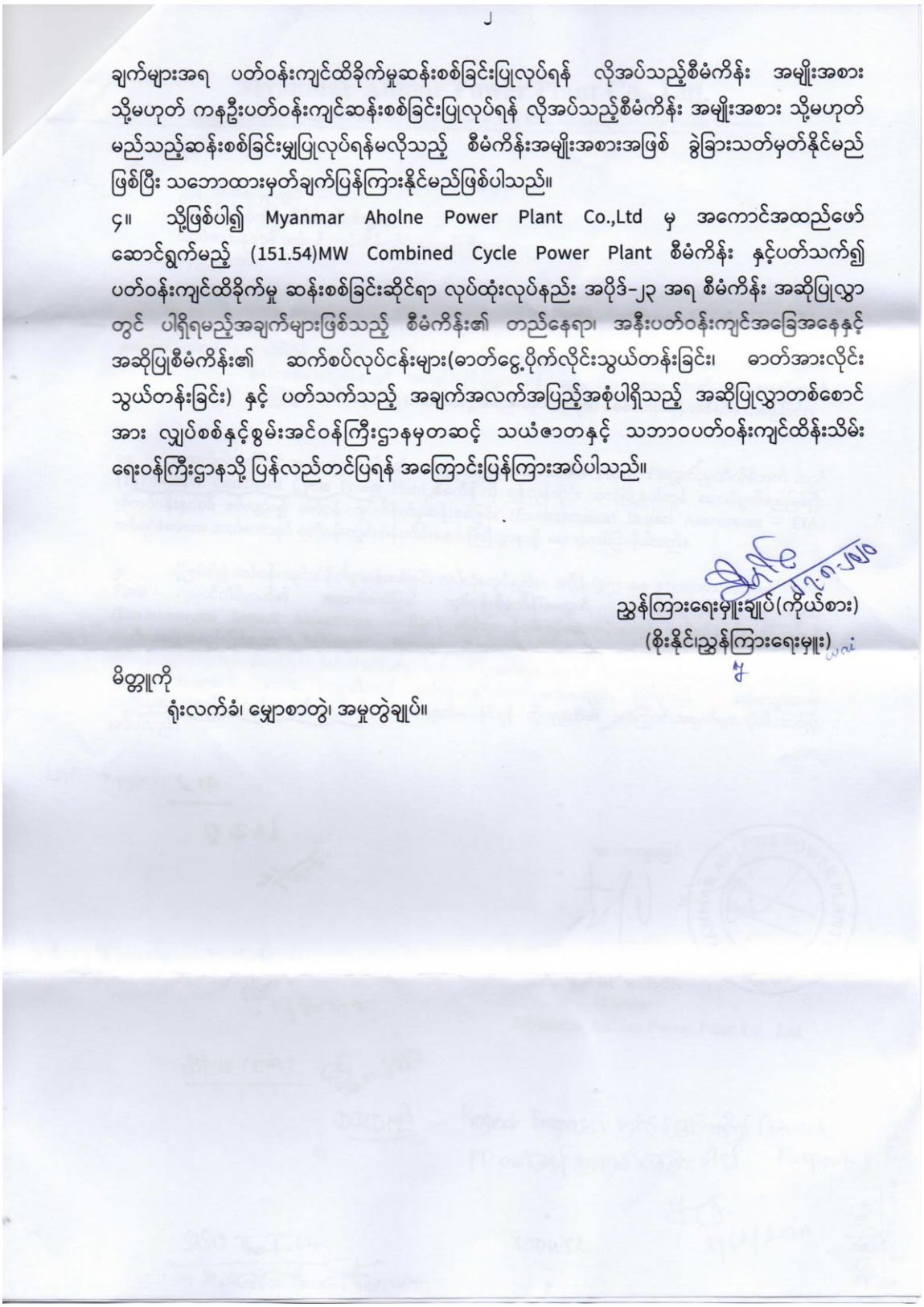
အကြောင်းအရာ။ **Myanmar Aholne Power Plant Co.,Ltd မှ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆောင်ရွက်ရန် ရွေးချယ်ထားသော တတိယအဖွဲ့အစည်း ဟုတ်/မဟုတ် စိစစ်ပေးပါရန် အစီရင်ခံစာ တင်ပြလာခြင်းနှင့်ပတ်သက်၍ သဘောထားမှတ်ချက်ပြန်ကြားခြင်း**

ရည်ညွှန်းချက်။ Myanmar Aholne Power Plant Co.,Ltd ၏ ၁၄-၈-၂၀၂၀ ရက်စွဲပါ၊ စာအမှတ်၊001/MAPPCL-ECD/8-2020

၁။ အကြောင်းအရာပါကိစ္စနှင့်ပတ်သက်၍ Myanmar Aholne Power Plant Co.,Ltd မှ (151.54)MW Combined Cycle Power Plant စီမံကိန်းကို ရန်ကုန်တိုင်းဒေသကြီး၊ အလုံမြို့နယ်တွင် အကောင်အထည်ဖော် ဆောင်ရွက်မည်ဖြစ်ပြီး ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း ဆိုင်ရာကိစ္စရပ်များဆောင်ရွက်ရန်အတွက် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာအား သယံဇာတ နှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသို့ ရေးဆွဲတင်ပြလိုကြောင်း၊ အဆိုပါ Combined Cycle Power Plant စီမံကိန်းနှင့်ပတ်သက်၍ Myanmar Survey Research (MSR) အဖွဲ့အစည်းအား တတိယအဖွဲ့အစည်းအဖြစ် ရွေးချယ်လိုကြောင်း စိစစ်ပေးနိုင်ပါရန် ရည်ညွှန်းပါစာဖြင့် ပေးပို့တင်ပြလာပါသည်။

၂။ Myanmar Aholne Power Plant Co.,Ltd မှ တင်ပြလာသည့် အဆိုပြုလွှာသည် ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆောင်ရွက်ရန် ရွေးချယ်ထားသော တတိယအဖွဲ့အစည်း ဟုတ်/မဟုတ် စိစစ်ပေးပါရန် အစီရင်ခံစာတင်ပြလာခြင်းသာဖြစ်ပြီး စီမံကိန်း၏တည်နေရာ၊ အနီးပတ်ဝန်းကျင်အခြေအနေနှင့် အဆိုပြုစီမံကိန်း၏ ဆက်စပ်လုပ်ငန်းများနှင့် ပတ်သက်သည့် အချက်အလက်အပြည့်အစုံပါရှိသည့် အဆိုပြုလွှာ မဟုတ်ကြောင်း စိစစ်တွေ့ရှိရပါသည်။

၃။ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း အပိုဒ်-၂၃ အရ စီမံကိန်းအဆိုပြုသူသည် စီမံကိန်းအဆိုပြုလွှာတွင်ပါရှိရမည့်အချက်များဖြစ်သည့် စီမံကိန်း၏ တည်နေရာ၊ အနီးပတ်ဝန်းကျင်အခြေအနေနှင့် အဆိုပြုစီမံကိန်း၏ ဆက်စပ်လုပ်ငန်းများနှင့် ပတ်သက်သည့် အချက်အလက်အပြည့်အစုံပါရှိသည့်အဆိုပြုလွှာအား ပဏာမစိစစ်နိုင်ရန်အတွက် တင်ပြရမည် ဖြစ်ပါသည်။ ထိုမှသာလျှင် ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းပါ လမ်းညွှန်



၂

ချက်များအရ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းပြုလုပ်ရန် လိုအပ်သည့်စီမံကိန်း အမျိုးအစား သို့မဟုတ် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းပြုလုပ်ရန် လိုအပ်သည့်စီမံကိန်း အမျိုးအစား သို့မဟုတ် မည်သည့်ဆန်းစစ်ခြင်းမျှပြုလုပ်ရန်မလိုသည့် စီမံကိန်းအမျိုးအစားအဖြစ် ခွဲခြားသတ်မှတ်နိုင်မည် ဖြစ်ပြီး သဘောထားမှတ်ချက်ပြန်ကြားနိုင်မည်ဖြစ်ပါသည်။

၄။ သို့ဖြစ်ပါ၍ Myanmar Aholne Power Plant Co.,Ltd မှ အကောင်အထည်ဖော် ဆောင်ရွက်မည့် (151.54)MW Combined Cycle Power Plant စီမံကိန်း နှင့်ပတ်သက်၍ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း အပိုဒ်-၂၃ အရ စီမံကိန်း အဆိုပြုလွှာ တွင် ပါရှိရမည့်အချက်များဖြစ်သည့် စီမံကိန်း၏ တည်နေရာ၊ အနီးပတ်ဝန်းကျင်အခြေအနေနှင့် အဆိုပြုစီမံကိန်း၏ ဆက်စပ်လုပ်ငန်းများ(ဓာတ်ငွေ့ပိုက်လိုင်းသွယ်တန်းခြင်း၊ ဓာတ်အားလိုင်း သွယ်တန်းခြင်း) နှင့် ပတ်သက်သည့် အချက်အလက်အပြည့်အစုံပါရှိသည့် အဆိုပြုလွှာတစ်စောင် အား လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာနမှတဆင့် သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်း ရေးဝန်ကြီးဌာနသို့ ပြန်လည်တင်ပြရန် အကြောင်းပြန်ကြားအပ်ပါသည်။

ညွှန်ကြားရေးမှူးချုပ်(ကိုယ်စား)
(စိုးနိုင်)ညွှန်ကြားရေးမှူး

မိတ္တူကို
ရုံးလက်ခံ၊ မျှောစာတွဲ၊ အမှုတွဲချုပ်။

Form (5-A)
E000227

THE REPUBLIC OF THE UNION OF MYANMAR

Myanmar Investment Commission

ENDORSEMENT

Endorsement No. 250/2023 **Date** 26 July 2023

This Endorsement is issued by the Myanmar Investment Commission in accordance with Section 25(d) of the Myanmar Investment Law.

(1) **Investor Name** MR. HU WEIMIN

(2) **Citizenship** CHINESE

(3) **Residential Address** HUICHENGMENLI, NO. 16, 7TH FLOOR, BUILDING 1, HAIDIAN DISTRICT, BEIJING, CHINA

(4) **Name and Address of Principal Organization** CHINA ITS (HOLDINGS) COMPANY LIMITED, HUICHENGMENLI, NO. 16, 7TH FLOOR, BUILDING NO. 1, HAIDIAN DISTRICT, BEIJING, CHINA

(5) **Place of Incorporation** PEOPLE'S REPUBLIC OF CHINA

(6) **Type of Business** GENERATION OF 151.54 MW ELECTRICITY FROM NATURAL GAS AND STEAM TURBINE POWER PLANT AND SUPPLY AND SALES OF ELECTRICITY ON IPP (BOO) BASIS

(7) **Place(s) of Investment Project** NO. 39, KANAR ROAD, AHLON POWER STATION, AHLON TOWNSHIP, YANGON REGION, 5.965 ACRES

(8) **Foreign Capital Amount** US$ 96.519 MILLION

(9) **Period for Foreign Capital to be brought in** -

(10) **Total Amount of Capital (Kyats)** EQUIVALENT IN KYAT OF US$ 98.288 MILLION

(11) **Construction/ Preparation Period** -

(12) **Validity of Endorsement** 5 YEARS (FROM THE COMMERCIAL OPERATION DATE)

(13) **Form of Investment** JOINT VENTURE

(14) **Name of Company Incorporated in Myanmar** MYANMAR AHLONE POWER PLANT COMPANY LIMITED

Chairman
Myanmar Investment Commission

ပုံစံ (၅-က)

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်
မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုကော်မရှင်
အတည်ပြုမိန့်

အတည်ပြုမိန့်အမှတ် (၂၅၀/၂၀၂၃) ၂၀၂၃ ခုနှစ်၊ ဇူလိုင်လ ၂၆ ရက်

မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုကော်မရှင်သည် မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုဥပဒေပုဒ်မ ၂၅ပုဒ်မခွဲ (ဃ) အရ ဤအတည်ပြုမိန့်ကို ထုတ်ပေးလိုက်သည်-

(၁) ရင်းနှီးမြှုပ်နှံသူအမည် Mr. HU WEIMIN

(၂) နိုင်ငံသား တရုတ်

(၃) နေရပ်လိပ်စာ HUICHENGMENLI, NO. 16, 7TH FLOOR, BUILDING 1, HAIDIAN DISTRICT, BEIJING, CHINA

(၄) ပင်မအဖွဲ့အစည်းအမည်နှင့်လိပ်စာ CHINA ITS (HOLDINGS) COMPANY LIMITED၊ HUICHENGMENLI, NO. 16, 7TH FLOOR, BUILDING NO. 1, HAIDIAN DISTRICT, BEIJING, CHINA

(၅) ဖွဲ့စည်းရာအရပ် တရုတ်ပြည်သူ့သမ္မတနိုင်ငံ

(၆) ရင်းနှီးမြှုပ်နှံသည့်လုပ်ငန်းအမျိုးအစား IPP (BOO) စနစ်ဖြင့် ၁၅၁.၅၄ မဂ္ဂါဝပ် သဘာဝဓာတ်ငွေ့နှင့် ရေနွေးငွေ့သုံး ဓာတ်အားပေးစက်ရုံ တည်ဆောက်၍ လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ရောင်းချခြင်းလုပ်ငန်း

(၇) ရင်းနှီးမြှုပ်နှံသည့်အရပ်ဒေသ(များ) အမှတ် (၃၉)၊ ကမ်းနားလမ်း၊ ဧရာဝတီရပ်ကွက်၊ အလုံဓာတ်အားပေးစက်ရုံဝင်း၊ အလုံမြို့နယ်၊ ရန်ကုန်တိုင်းဒေသကြီးရှိ မြေဧရိယာ ၅.၉၆၅ ဧက

(၈) နိုင်ငံခြားမတည်ငွေရင်းပမာဏ အမေရိကန်ဒေါ်လာ ၉၆.၅၁၉ သန်း

(၉) နိုင်ငံခြားမတည်ငွေရင်းယူဆောင်လာရမည့်ကာလ -

(၁၀) စုစုပေါင်းမတည်ငွေရင်းပမာဏ(ကျပ်) အမေရိကန်ဒေါ်လာ ၉၈.၂၈၈ သန်းနှင့်ညီမျှသော မြန်မာကျပ်ငွေ

(၁၁) တည်ဆောက်မှု/ပြင်ဆင်မှုကာလ -

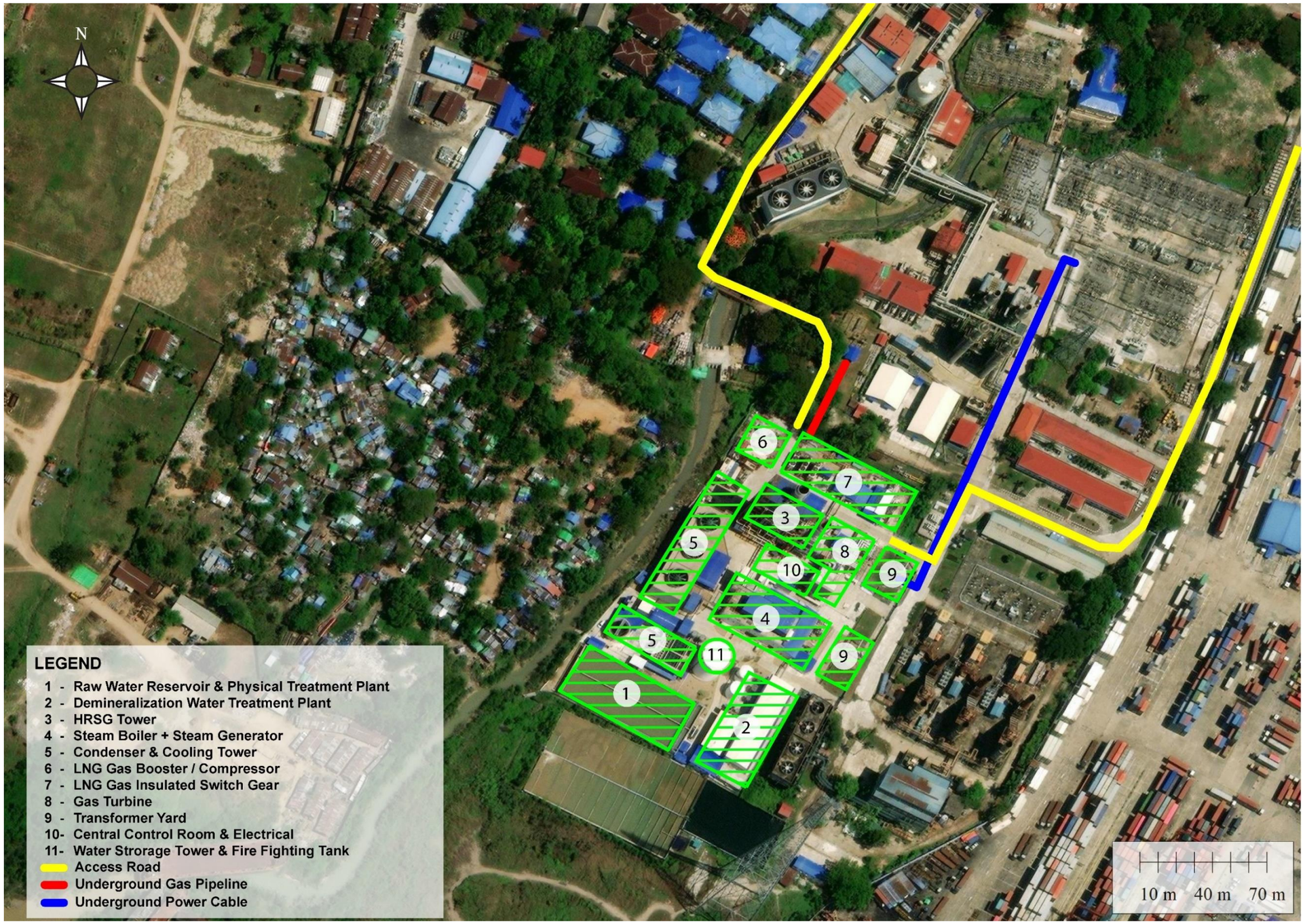
(၁၂) အတည်ပြုမိန့်သက်တမ်း ၅ နှစ် (စီးပွားဖြစ် စတင်သည့်နေ့မှ)

(၁၃) ရင်းနှီးမြှုပ်နှံမှုပုံစံ ဖက်စပ်နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှု

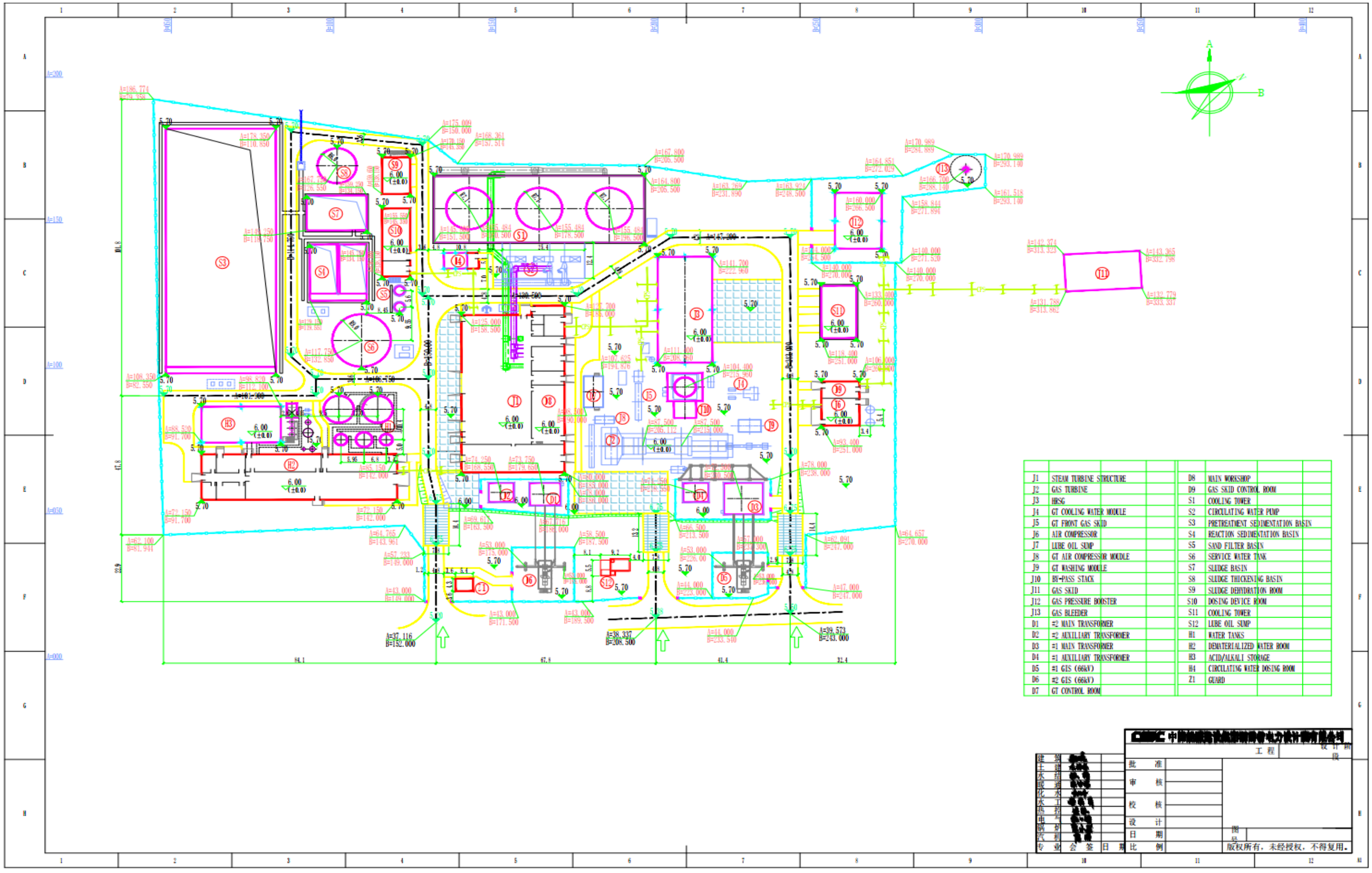
(၁၄) မြန်မာနိုင်ငံတွင်ဖွဲ့စည်းမည့်ကုမ္ပဏီအမည် MYANMAR AHLONE POWER PLANT COMPANY LIMITED

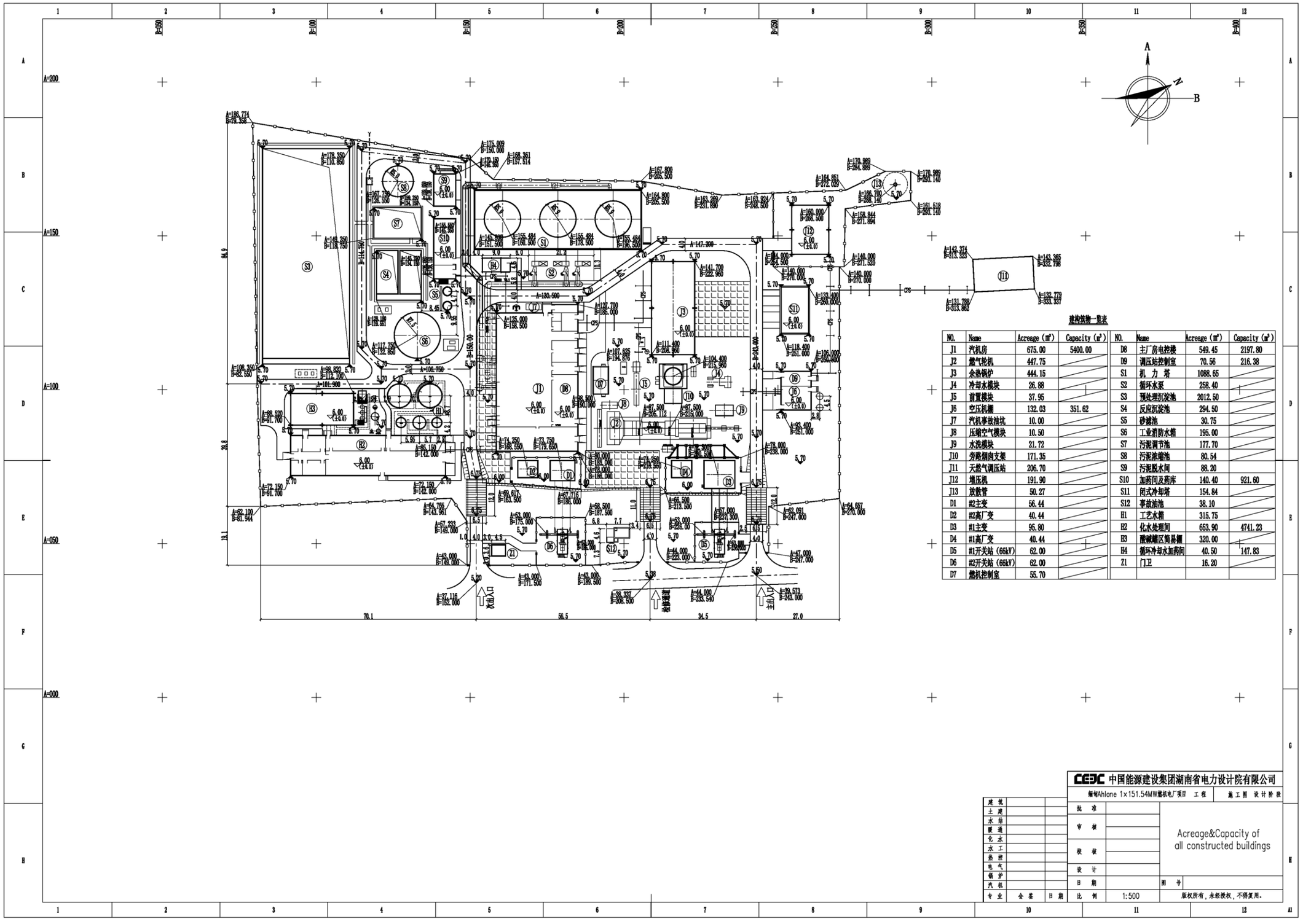
ဥက္ကဋ္ဌ
မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုကော်မရှင်

Appendix – 3: Enlarged Figures and Schematics



Appendix 3- 1: Enlarged Aerial Map for Project Layout and System Configuration


A
B
J1 STEAM TURBINE STRUCTURE
J2 GAS TURBINE
J3 HRSG
J4 GT COOLING WATER MODULE
J5 GT FRONT GAS SKID
J6 AIR COMPRESSOR
J7 LUBE OIL SUMP
J8 GT AIR COMPRESSOR MODULE
J9 GT WASHING MODULE
J10 BY-PASS STACK
J11 GAS SKID
J12 GAS PRESSURE BOOSTER
J13 GAS BLEEDER
D1 #2 MAIN TRANSFORMER
D2 #2 AUXILIARY TRANSFORMER
D3 #1 MAIN TRANSFORMER
D4 #1 AUXILIARY TRANSFORMER
D5 #1 GIS (66kV)
D6 #2 GIS (66kV)
D7 GT CONTROL ROOM
D8 MAIN WORKSHOP
D9 GAS SKID CONTROL ROOM
S1 COOLING TOWER
S2 CIRCULATING WATER PUMP
S3 PRETREATMENT SEDIMENTATION BASIN
S4 REACTION SEDIMENTATION BASIN
S5 SAND FILTER BASIN
S6 SERVICE WATER TANK
S7 SLUDGE BASIN
S8 SLUDGE THICKENING BASIN
S9 SLUDGE DEHYDRATION ROOM
S10 DOSING DEVICE ROOM
S11 COOLING TOWER
S12 LUBE OIL SUMP
H1 WATER TANKS
H2 DEMATERIALIZED WATER ROOM
H3 ACID/ALKALI STORAGE
H4 CIRCULATING WATER DOSING ROOM
Z1 GUARD
工程
批准
审核
校核
设计
日期
比例
版权所有，未经授权，不得复用。



建构筑物一览表

NO.	Name	Acreage (㎡)	Capacity (㎡)	NO.	Name	Acreage (㎡)	Capacity (㎡)
J1	汽机房	675.00	5400.00	D8	主厂房电控楼	549.45	2197.80
J2	燃气轮机	447.75		D9	调压站控制室	70.56	216.38
J3	余热锅炉	444.15		S1	机 力 塔	1088.65	
J4	冷却水模块	26.88		S2	循环水泵	258.40	
J5	前置模块	37.95		S3	预处理沉淀池	2012.50	
J6	空压机棚	132.03	351.62	S4	反应沉淀池	294.50	
J7	汽机事故油坑	10.00		S5	砂滤池	30.75	
J8	压缩空气模块	10.50		S6	工业消防水箱	195.00	
J9	水洗模块	21.72		S7	污泥调节池	177.70	
J10	旁路烟囱支架	171.35		S8	污泥浓缩池	80.54	
J11	天然气调压站	206.70		S9	污泥脱水间	88.20	
J12	增压机	191.90		S10	加药间及药库	140.40	921.60
J13	放散管	50.27		S11	闭式冷却塔	154.84	
D1	#2主变	56.44		S12	事故油池	38.10	
D2	#2高厂变	40.44		H1	工艺水箱	315.75	
D3	#1主变	95.80		H2	化水处理间	653.90	4741.23
D4	#1高厂变	40.44		H3	酸碱罐区简易棚	320.00	
D5	#1开关站（66kV）	62.00		H4	循环冷却水加药间	40.50	147.83
D6	#2开关站（66kV）	62.00		Z1	门卫	16.20	
D7	燃机控制室	55.70					

CEDC 中国能源建设集团湖南省电力设计院有限公司

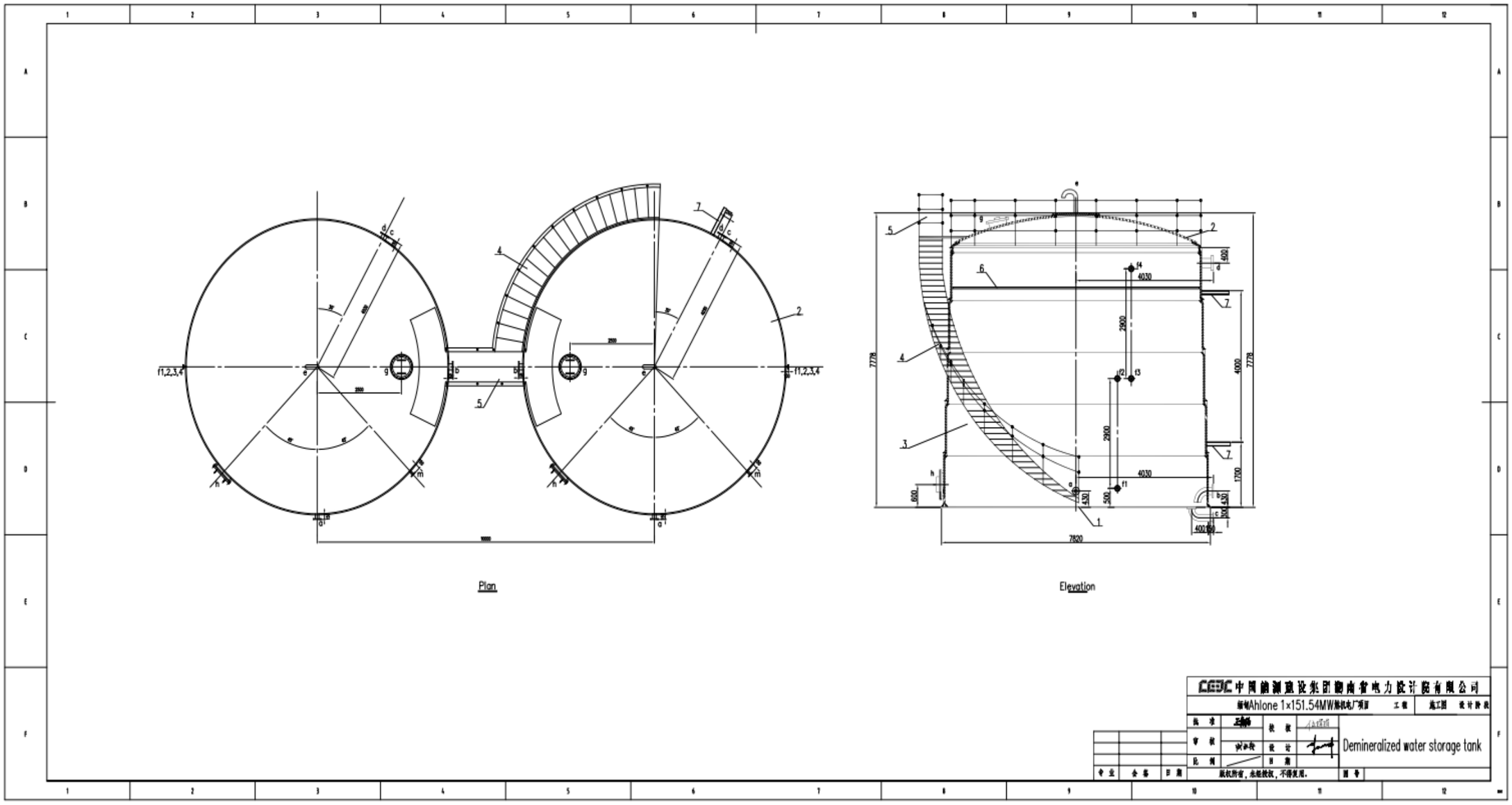
缅甸Ahlone 1×151.54MW燃机电厂项目 工程 | 施工图 设计阶段

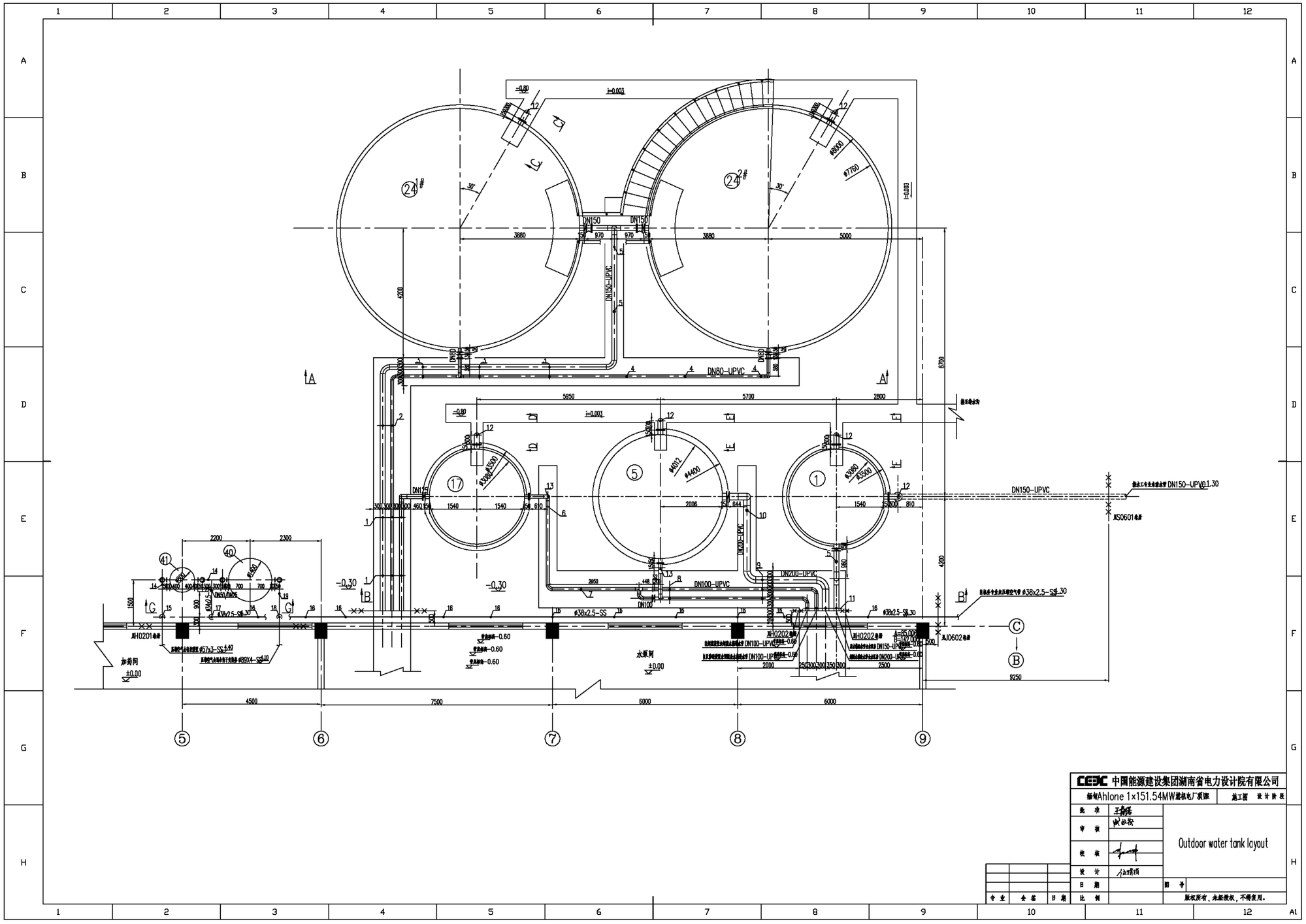
Acreage&Capacity of all constructed buildings

建筑 | 土建 | 水暖 | 暖通 | 仓水 | 水工 | 热控 | 电气 | 锅炉 | 汽机

批准 | 审核 | 校核 | 设计 | 日期 | 图号

专业 | 会签 | 日期 | 比例 1:500


Plan
Elevation
Demineralized water storage tank
CGDC 中国石油集团勘察设计有限公司
Ahlone 1x151.54MW燃机电厂项目


DN150
DN150
DN150-UPVC
DN80-UPVC
DN200-UPVC
DN100-UPVC
DN150-UPVC
DN100
DN80
DN80
DN150-UPVC
DN150-UPVC
DN100-UPVC
DN100-UPVC
DN200-UPVC
DN200-UPVC
DN150-UPVC
DN150-UPVC
XH0201检修
XH0202检修
XH0202检修
XJ0602检修
XS0601检修
加药间
±0.00
水泵房
±0.00
-0.30
-0.30
-0.60
-0.60
-0.60
-0.80
-0.80
i=0.003
i=0.003
i=0.003
3880
970
970
3880
5000
4200
8700
5650
5700
2800
2200
2300
4500
7500
6000
6000
2000
2500
9250
1540
1540
2006
1540
2950
1500
1500
1960
4200
2500
Outdoor water tank layout
中国能源建设集团湖南省电力设计院有限公司
缅甸Ahlone 1×151.54MW燃机电厂项目
施工图 设计阶段
王金伟
设计
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		9E.03	9E.04
SC PLANT PERFORMANCE	SC Net Output (MW)	132	147
	SC Net Heat Rate (Btu/kWh, LHV)	9,960	9,238
	SC Net Heat Rate (kJ/kWh, LHV)	10,508	9,747
	SC Net Efficiency (%, LHV)	34.3%	36.9%
1X CC PLANT PERFORMANCE	CC Net Output (MW)	205	218
	CC Net Heat Rate (Btu/kWh, LHV)	6,421	6,203
	CC Net Heat Rate (kJ/kWh, LHV)	6,775	6,545
	CC Net Efficiency (%, LHV)	53.1%	55.0%
	Plant Turndown – Minimum Load (%)	45.0%	46.0%
	Ramp Rate (MW/min)	50	29
	Startup Time (RR Hot*, Minutes)	38	38
2X CC PLANT PERFORMANCE	CC Net Output (MW)	412	439
	CC Net Heat Rate (Btu/kWh, LHV)	6,372	6,166
	CC Net Heat Rate (kJ/kWh, LHV)	6,723	6,505
	CC Net Efficiency (%, LHV)	53.5%	55.3%
	Plant Turndown – Minimum Load (%)	22.0%	22.0%
	Ramp Rate (MW/min)	100	58
	Startup Time (RR Hot*, Minutes)	38	38

NOTE: All ratings are net plant, based on ISO conditions and natural gas fuel. Actual performance will vary with project-specific conditions and fuel.
* Rapid Response/Fast Start

The 9E is a robust, proven platform that helps deliver high availability, reliability, and durability. The 9E.04 represents the most recent addition to the 9E family, delivering more power and performance with a new 4 stage turbine module that fits within the same footprint as an already installed 9E gas turbine unit. A strong performer in a variety of applications, the 9E provides a wide range of fuels capability, and can even switch fuels while running under full load.

GEA32931B (08/2021)

Specifications

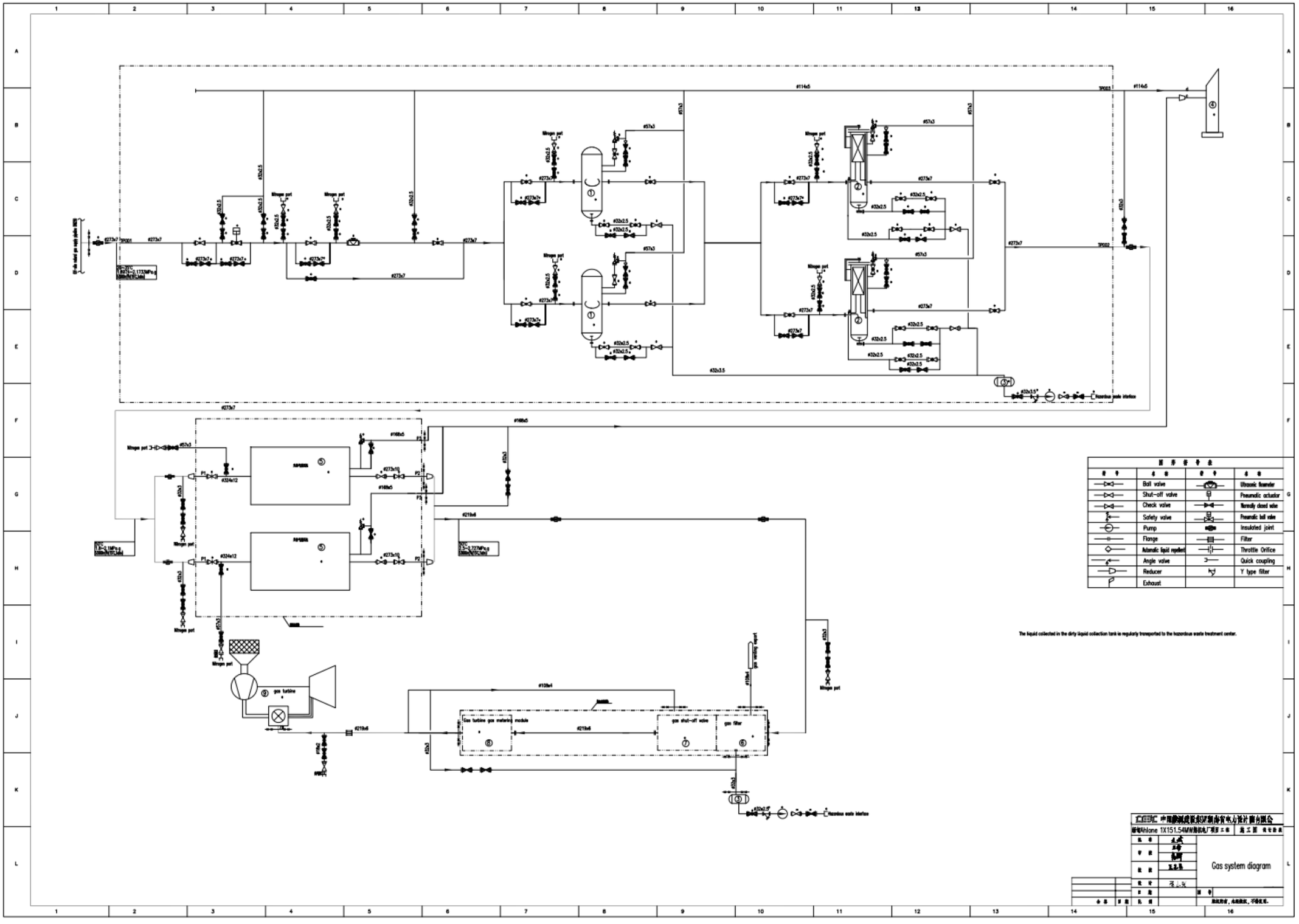
Power and performance

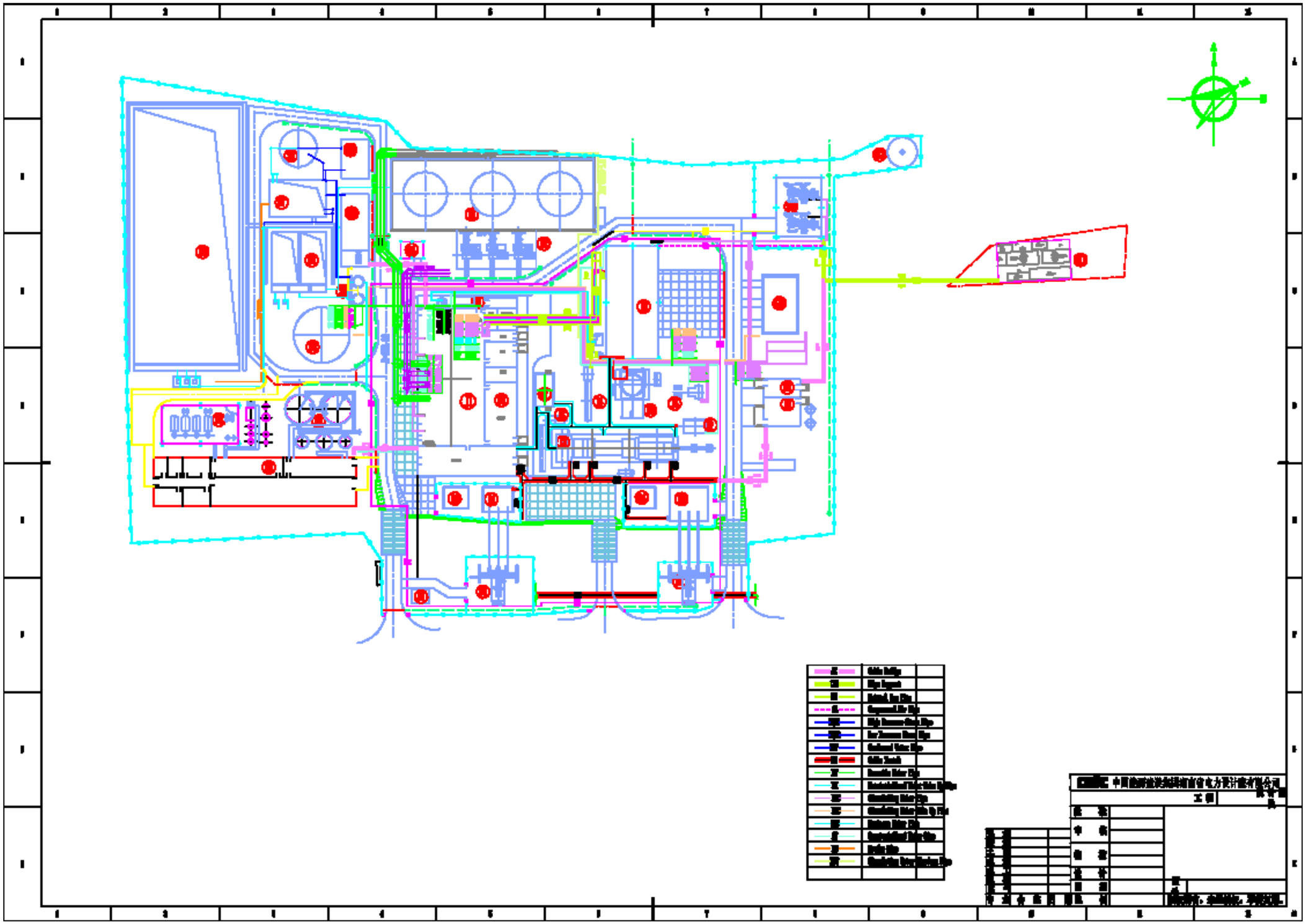
Get an inside look at the 9E gas turbine's product specifications

Specifications shown are 50 Hz

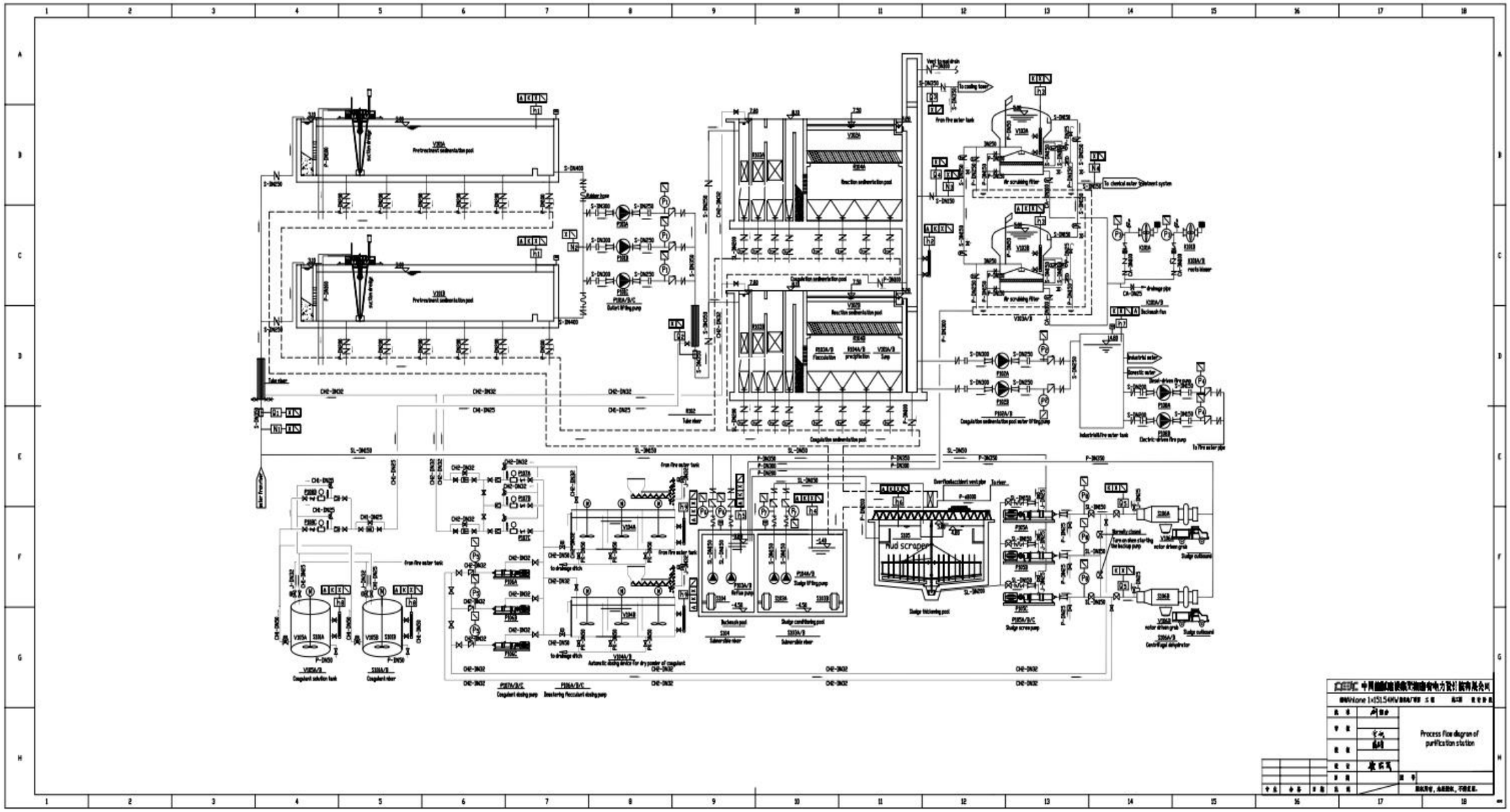
Simple Cycle | Combined Cycle 1×1 | Combined Cycle 2×1

	9E.03	9E.04
Net output (MW)	132	147
Net heat rate (Btu/kWh, LHV)	9960	9238
Net heat rate (kJ/kWh, LHV)	10508	9747
Net efficiency (%, LHV)	34.3%	36.9%
Ramp Rate (MW/minute)	50	29
Startup Time (RR Hot, Minutes)	30	30


Nitrogen port
gas turbine
Gas turbine gas metering module
gas shut-off valve
gas filter
Hazardous waste interface
The liquid collected in the dirty liquid collection tank is regularly transported to the hazardous waste treatment center.
Gas system diagram



Gas pipeline Diagram (Source: Project Developer- Myanmar Ahlone Power Plant Co., Ltd.)


Process flow diagram of purification station
Mud scraper

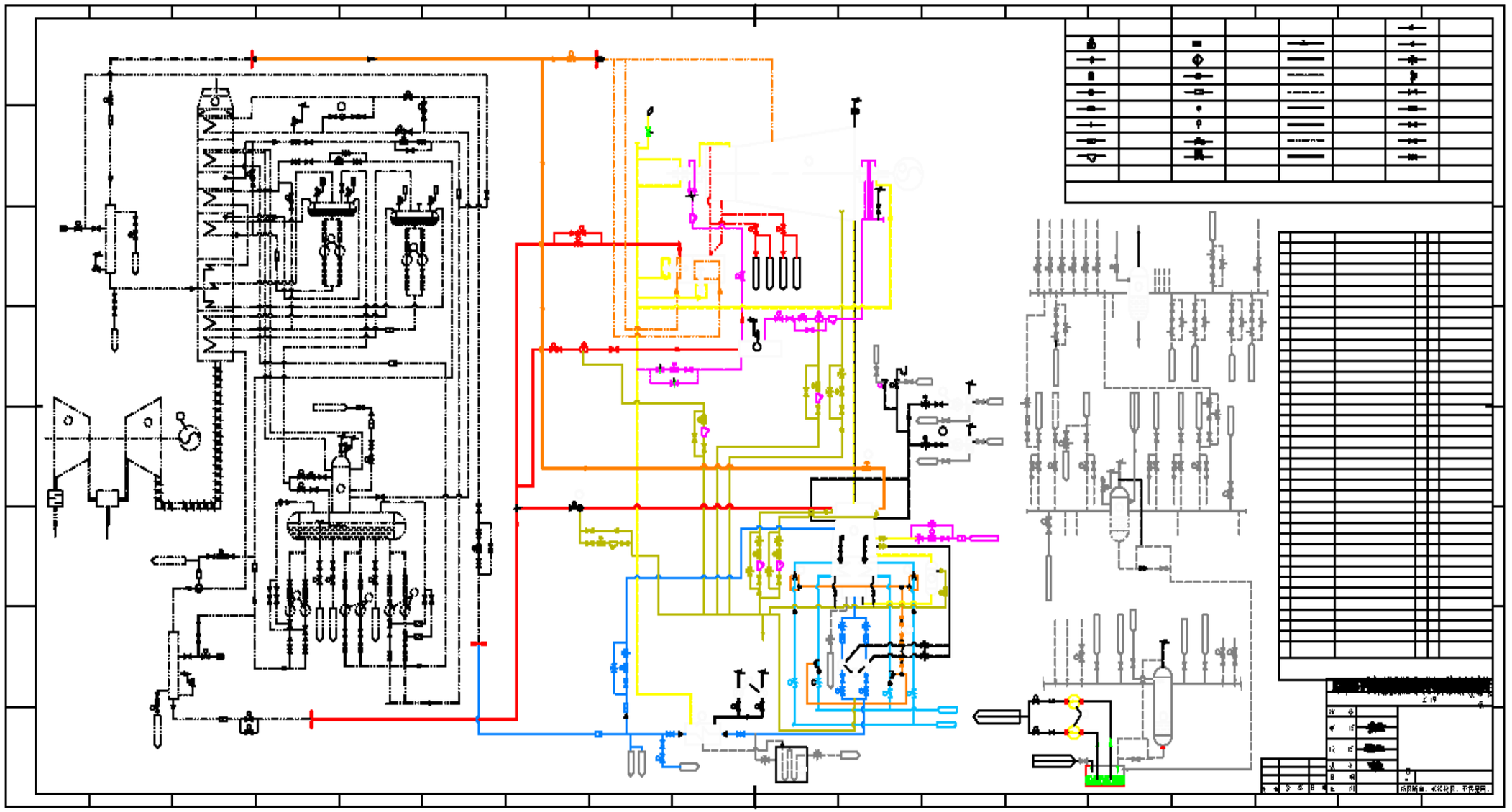


Illustration: Process Steam Heat (150 °C max.) Flow Diagram (Red – Steam outlet to Cooling system | Yellow – Steam Inlet to Turbine)

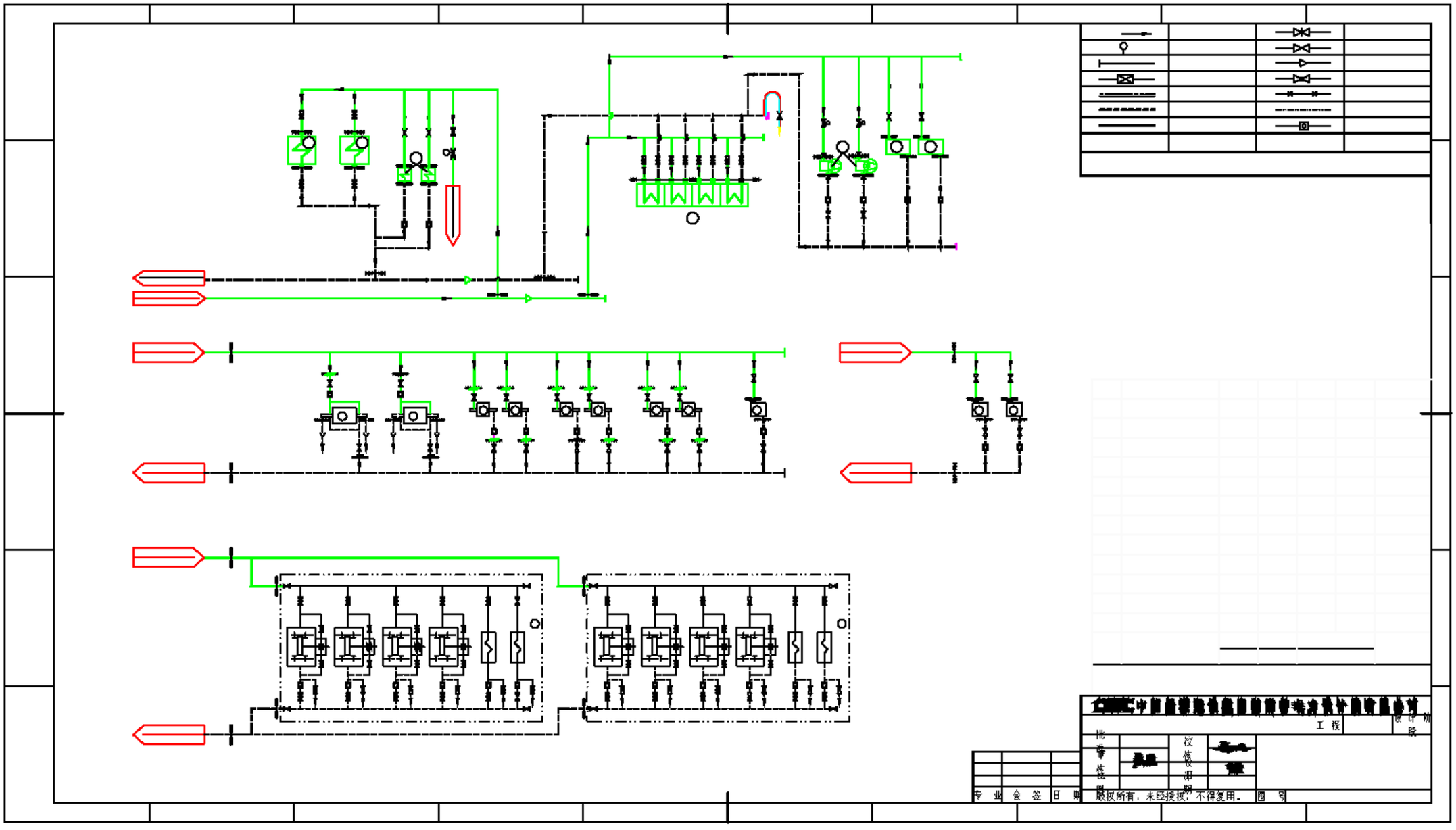
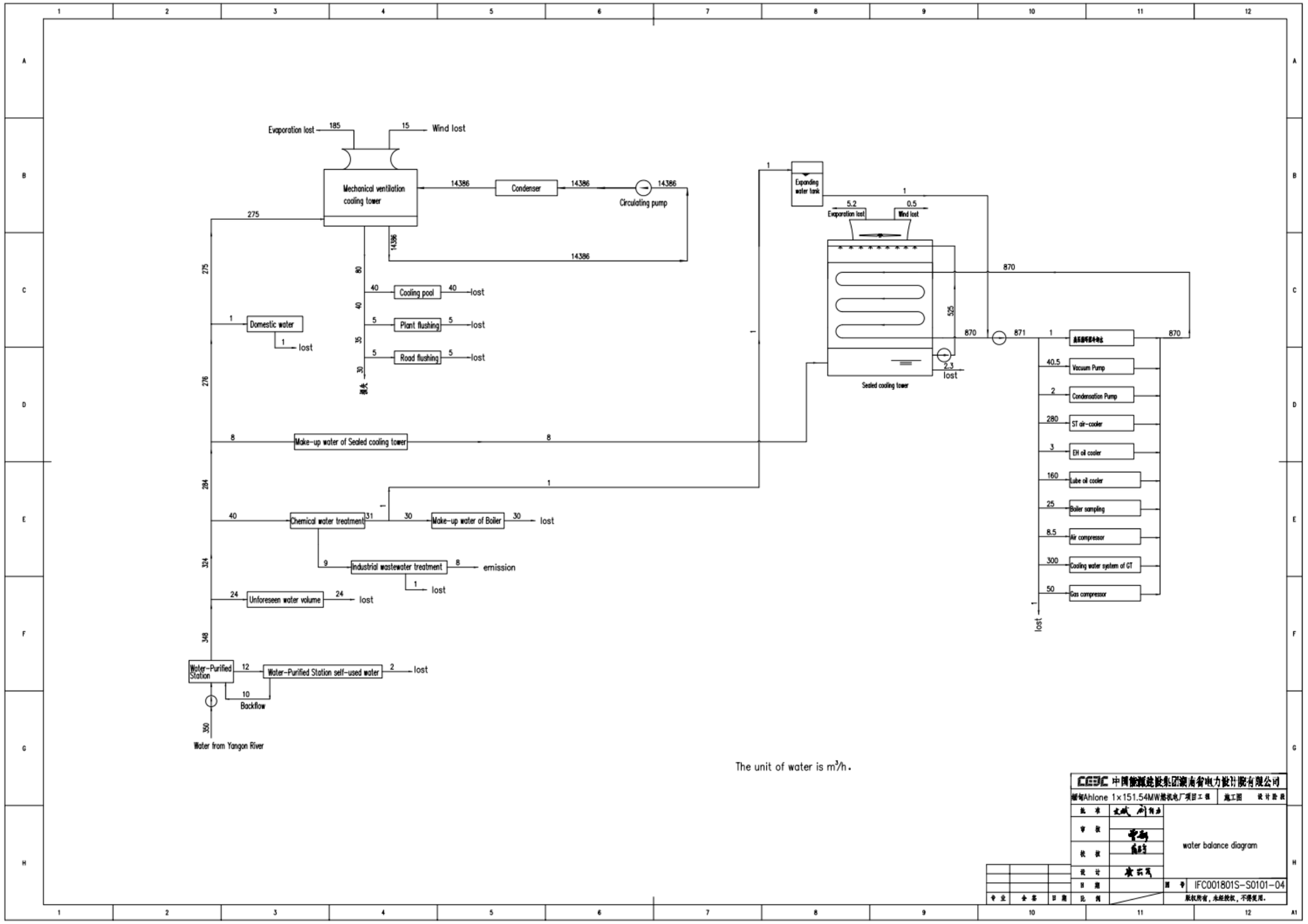


Illustration: Flow diagram of Sealed Cooling System


Evaporation lost
185
15
Wind lost
Mechanical ventilation cooling tower
14386
Condenser
14386
14386
Circulating pump
275
14386
14386
275
80
40
Cooling pool
40
lost
1
Domestic water
5
Plant flushing
5
lost
1
lost
40
5
Road flushing
5
lost
35
30
276
8
Make-up water of Sealed cooling tower
8
1
284
1
40
Chemical water treatment
31
30
Make-up water of Boiler
30
lost
9
Industrial wastewater treatment
8
emission
1
lost
324
24
Unforeseen water volume
24
lost
348
Water-Purified Station
12
Water-Purified Station self-used water
2
lost
10
Backflow
350
Water from Yangon River
1
Expanding water tank
1
5.2
Evaporation lost
0.5
Wind lost
870
525
870
871
1
870
2.3
lost
Sealed cooling tower
40.5
Vacuum Pump
2
Condensation Pump
280
ST air-cooler
3
EH oil cooler
160
Lube oil cooler
25
Boiler sampling
8.5
Air compressor
300
Cooling water system of GT
50
Gas compressor
1
lost
The unit of water is m³/h.
CEEC 中国能源建设集团湖南省电力设计院有限公司
缅甸Ahlone 1×151.54MW燃机电厂项目工程
施工图
water balance diagram
IFC001801S-S0101-04
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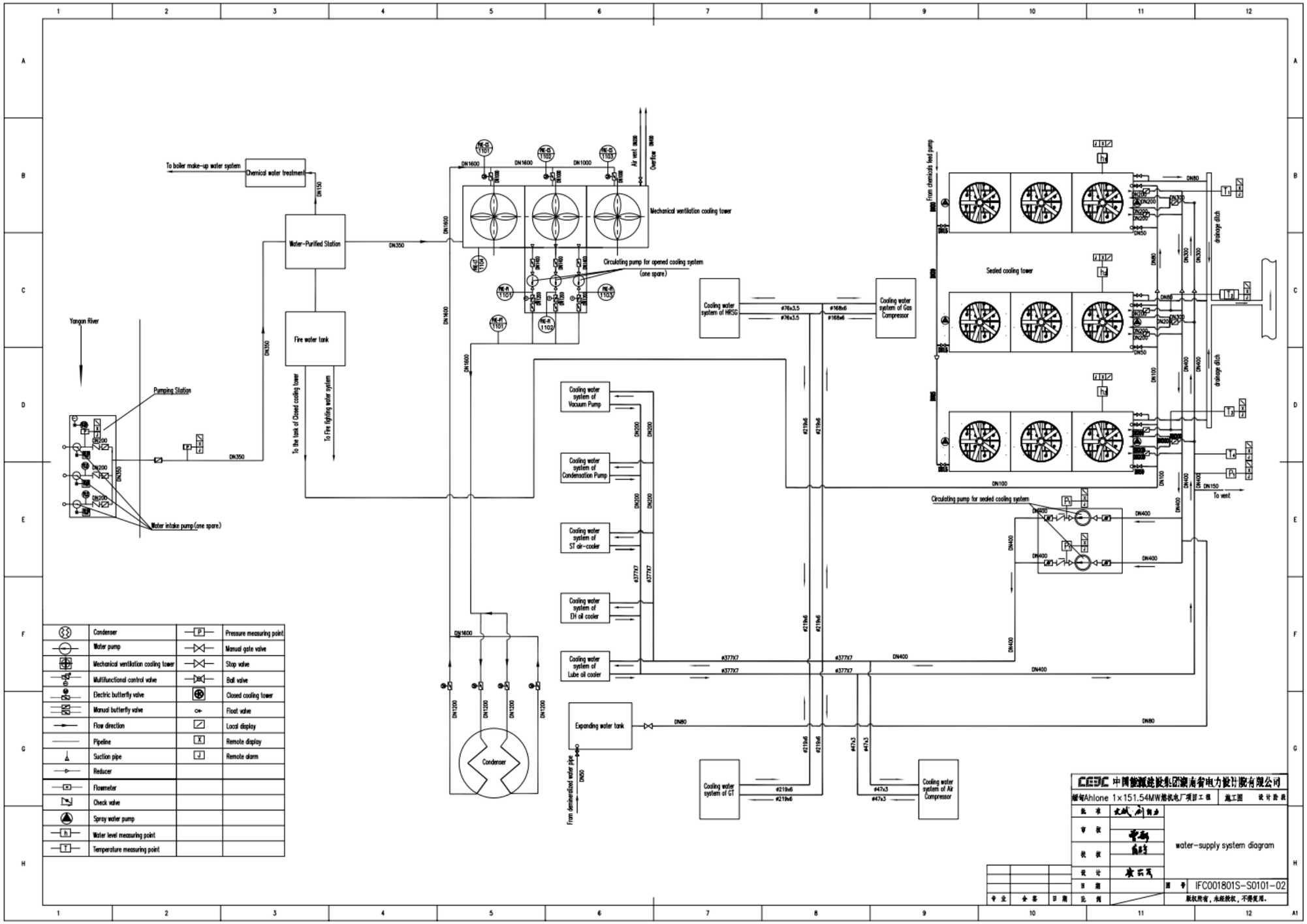
Ahlone Myanmar Power Plant
Description for Influent and Effluent Locations and Project Site
Legend
Inlet Water and Outlet Effluent
Inlet Water PipeLine: Water Supply
Project Area
Effluent: Surplus Water Discharge
Influent: Water Intake Station
Google Earth
Image © 2023 Airbus
500 ft
N


To boiler make-up water system
Chemical water treatment
Water-Purified Station
Fire water tank
To the tank of Closed cooling tower
To Fire fighting water system
Yangon River
Pumping Station
Water intake pump(one spare)
Mechanical ventilation cooling tower
Circulating pump for opened cooling system (one spare)
Air vent
Overflow
Cooling water system of HRSG
Cooling water system of Gas Compressor
From chemicals feed pump
Sealed cooling tower
drainage ditch
To vent
Circulating pump for sealed cooling system
Cooling water system of Vacuum Pump
Cooling water system of Condensation Pump
Cooling water system of ST air-cooler
Cooling water system of EH oil cooler
Cooling water system of Lube oil cooler
Expanding water tank
From demineralized water pipe
Condenser
Cooling water system of GT
Cooling water system of Air Compressor
Condenser
Water pump
Mechanical ventilation cooling tower
Multifunctional control valve
Electric butterfly valve
Manual butterfly valve
Flow direction
Pipeline
Suction pipe
Reducer
Flowmeter
Check valve
Spray water pump
Water level measuring point
Temperature measuring point
Pressure measuring point
Manual gate valve
Stop valve
Ball valve
Closed cooling tower
Float valve
Local display
Remote display
Remote alarm
缅甸Ahlone 1×151.54MW燃机电厂项目工程
施工图
water-supply system diagram
IFC001801S-S0101-02
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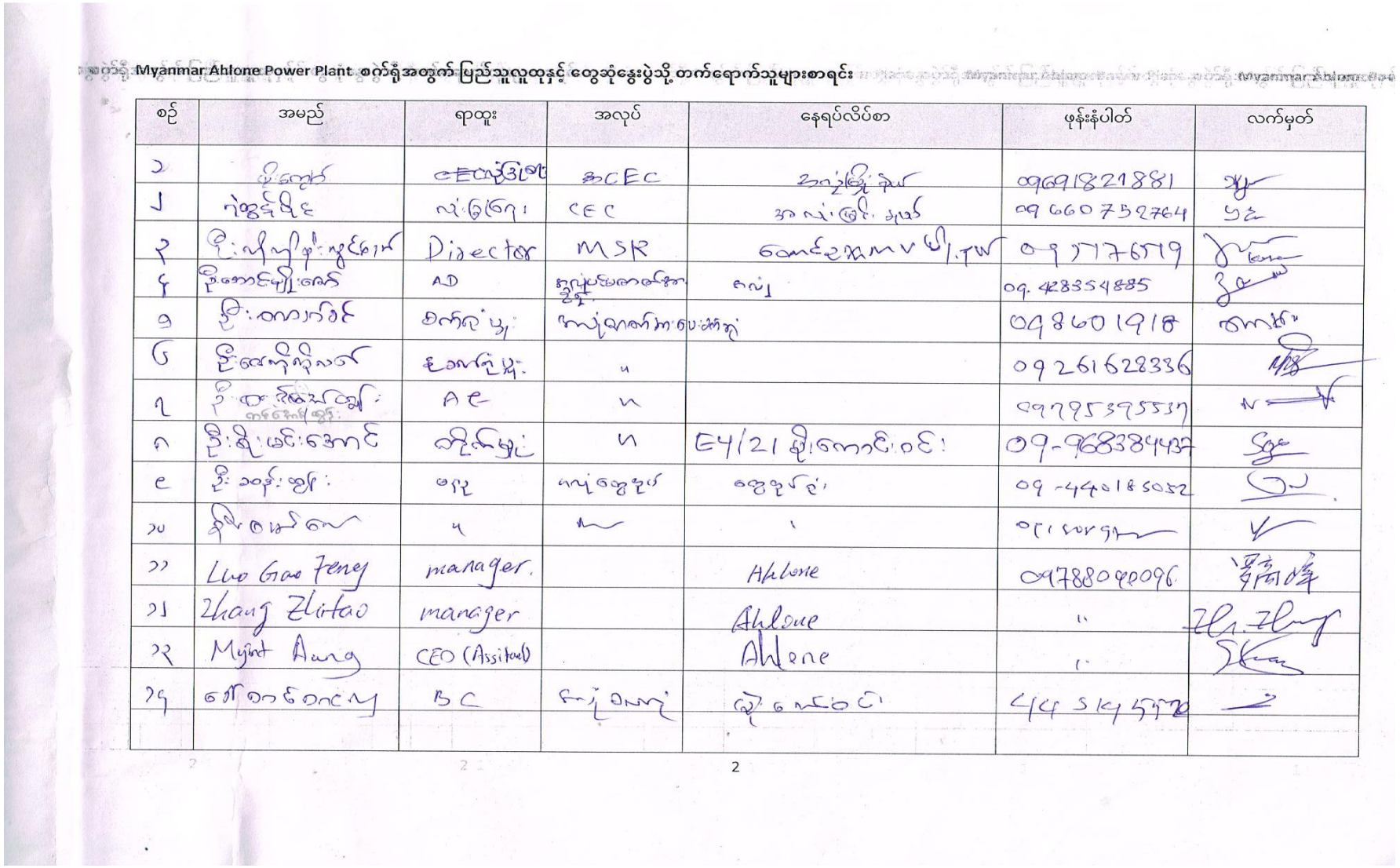
Appendix – 4: Documentation of First Public Consultation and Stakeholder Engagement Meeting



Myanmar Ahlone Power Plant စက်ရုံအတွက် မြည်သူလူထုနှင့် တွေ့ဆုံနွေးပွဲသို့ တက်ရောက်သူများစာရင်း

စဉ်	အမည်	ရာထူး	အလုပ်	နေရပ်လိပ်စာ	ဖုန်းနံပါတ်	လက်မှတ်
၁	မိုးကျော်	CEO(ဒါရိုက်တာ)	အCEC	အလုံအိုး ခရ	09691821881	
၂	ကဲထွန်းမိုင်	လုပ်ငန်းရှင်	CEC	အလုံးဖြူ ခရ	09 660 75 27 64	
၃	ဦးလှကျော်နိုင်းမွန်ဇော	Director	MSR	ဆောင်ဆယ်မြို့	09 77 76 719	
၄	ဦးအောင်ကျော်ဇော	AD	အလုပ်ရှင်အကောင်း	ရန်ကုန်	09 428354885	
၅	မြို့:တာဂင်	စီက်ရုံပိုင်	အလုံဆောက်အလုပ်ကုမ္ပဏီ		09 860 1918	
၆	ဦးဇော်ကိုကိုလတ်	နေစောင့်ပိုင်	"		09 261 628336	
၇	ဦးထက်ဆန်းဦး	AE	"		09 795 395537	
၈	ဦးဇိုးမင်းအောင်	ဝန်ထမ်းပိုင်	"	E4/21 ဇိုးကောင်းဝင်း	09-968384437	
၉	ဦးဘန်းထွန်း	စာရေး	လုံခြုံရေး	ဒေါ်ဇုန်ဦး	09-440185052	
၁၀	ခိုမိုးဝေယံလေး	"	"	"	09 [illegible]	
၁၁	Luo Guo Feng	manager		Ahlone	09788040096	
၁၂	Zhang Zhitao	manager		Ahlone	"	
၁၃	Myint Aung	CEO (Assitant)		Ahlone	"	
၁၄	ဇော်ဝေဒဝင်းလှ	BC	ဒုံခိုရေး	ရွှေဝေဒဝင်း	44 514 5772	

2

Myanmar Ahlone Power Plant စက်ရုံအတွက် ပြည်သူလူထုနှင့် တွေ့ဆုံနွေးပွဲသို့ တက်ရောက်သူများစာရင်း

စဉ်	အမည်	ရာထူး	အလုပ်	နေရပ်လိပ်စာ	ဖုန်းနံပါတ်	လက်မှတ်
၁	ဒေါ်ခင်ဌေးမိုး	SAE	အစိုးရဝန်ထမ်း	အလုံ(၂)ရပ်ကွက်	09969681591	
၂	မိုးတင်ထက်မြင့်	ကျွမ်း(2)		အလုံ(၂)ရပ်ကွက်	09-31342272	
၃	ဒေါ်စန်းစန်းမြင့်	AE	Contract	အလုံ	09.778424411	
၄	ဗေဒင်ဆိုးဆိုးယဉ်	AE	အင်ဂျင်နီယာ	အင်းစိန်-ဗွာဓလေဝံစစ်အိုခြံမ	09.255154189	
၅	ဦးသောင်းဆောင်း	ဥက္ကဋ္ဌ	ဘဏ်ဝန်ထမ်	ဘဏ်ဝန်ထမ်	09.5109855	
၆	ဦးမြင့်ဆွေ	"	ကိုယ်စား	ကိုယ်စား	09449520215	
၇	ဦးမျိုးဇော်လွင်	ကွန်မြူ - ဒု		ဖခ. ဆရာဇော်လင်း	09.975842219	
၈	ဖြစ်ဖြစ်ဆွိုင်	ပစ္စည်းထိန်းကြေး	ကုမ္ပဏီ	ဆိုင်ဓာတ်ဆေး	09-254315175	
၉	အာဂျိုင်	ဒု-ရုံးတော်ကွပ်ကဲရေး	"	"	09 797 868813	
၁၀	ဂဏာဂျိုင်	ပစ္စည်းထိန်းကြေး	"	"	09448034329	
၁၁	ဖျဂျိုင်	ကျွမ်းကျင်-ဒု	"	"	09976034545	
၁၂	ဝေယာဝဏ်	စာရင်းကိုင်ကြီး	"	"	09420702997	
၁၃	ခိုင်တင်ဝေ၊ ခိုင်	ပစ္စည်းထိန်းကြေး	"	ကွမ်းစားဝယ်ယာ၊ ရပ်ကွက်ဒု	09441100911	
၁၄	ဝေဒင်ယောဇင်			ကွမ်းစားဝယ်ယာ၊ ရပ်ကွက်ဒု	09780062524	
၁၅	ဒေါ်မူမူဆင်	ပဝ၀၀-၁	ပစ္စည်းထိန်း	"	09-264190421	

စာရင်း Myanmar Ahlone Power Plant စက်ရုံအတွက် ပြည်သူလူထုနှင့် တွေ့ဆုံနွေးဖွဲ့သို့ တက်ရောက်သူများစာရင်း

စဉ်	အမည်	ရာထူး	အလုပ်	နေရပ်လိပ်စာ	ဖုန်းနံပါတ်	လက်မှတ်
၃၆	အေးမောင်ဦး	HR&Admin	Myanmar Ahlone power plant	Ahlone	09420317193	
၃၇	ဒေါ်ခင်ဖြေဝင်းမြင့်မိုး	ဦးစီး(ဘဏ္ဍာရေး)	ပန်းဆွဲအလှူအပေးပြုလုပ်ရေးကော်မတီ	အလုံမြို့ ရန်ကုန်တိုင်း	09797897292	
၃၈	ဝေါသုပ်မြင့်	သက်ကြီးရှူးရင်း	"	"	09250814O	
၃၉	ဝေါခင်ကြည်သာ	ကုမ္ပဏီမှူး	"	"	"	
၄၀	ဦးမျိုးဝင်းဦး	ယာဉ်မောင်း	MSR	ကျိုက်ဖြိုနယ်	09799667322	
၄၁	ဦးတင်မောင်းလှဘော်	ယာဉ်မောင်း	MSR	သဖန်းကျွန်းမြို့နယ်	09793700389	
၄၂	ဦးအောင်လင်း	အကြံပေးဝန်ထမ်း	MSR	ဒေါပုတော်ကားမြို့နယ်	09 400977121	
၄၃	ဦးအုန်းကြိုင်	ပန်းတိုင်းအကြံပေး	MSR	မြို့ဖြာယာမြို့နယ်	09 799139844	
၄၄	ဦးသာမိုးအောင်	အကြံပေးဝန်ထမ်း	MSR	ဖောင်ပွင့်လာပမြို့နယ်	09	
၄၅	ဦးရဲမင်းအောင်		MSR	မြောက်ပွင့်လာပမြို့နယ်	09 798256552	
၄၆	ဒေါ်ဖြူဖြူသွင်	ဗဟိုရုံးမန်နေဂျာ	Myanmar Ahlone Power plant	ဒဂုံတောင်ပိုင်မြို့နယ်	09798234609.	
၄၇	ဒေါ်ခင်မျိုးသန့်	ဌာနဆိုင်ရာမန်နေဂျာ	"	ဗဟန်းကြီးမြို့နယ်	09790956010	

5

Myanmar Ahlone Power Plant စက်ရုံအတွက် ပြည်သူလူထုနှင့် တွေ့ဆုံနွေးပွဲသို့ တက်ရောက်သူများစာရင်း

စဉ်	အမည်	ရာထူး	အလုပ်	နေရပ်လိပ်စာ	ဖုန်းနံပါတ်	လက်မှတ်
၁	ဦးညီညီထွန်း	ကော်မရှင်နာ	ကသစ	အလုံမြို့သစ်အုပ်ချုပ်ရေးမှူး	09424801235	
၂	ဦးမြတ်အောင်ဌေး	"	"	သာကေတမြို့နယ်	09254103028	
၃	ဒေါ်အုန်းအုန်းတင်ဦး	"	"	မရမ်းကုန်းမြို့နယ်	09454919225	
၄	မဲဦးဖြိုး(ဒုစီမံကိန်းမန်နေဂျာ)	ဒုတိယတွဲဖက်	ဒုစီမံကိန်း	ရန်ကုန်တိုင်း	09424968584 63	
၅	ဒေါ်စောစောမြင့်	Librarian	ကသစ	ကျောက်တောင်	09420870247	
၆	ဒေါ်ခေး:ခေး:မော	E.E	ဒုအလုပ်ရှင်အဖွဲ့	အလုံ ဆိုက်ကောင်း:ဝင်း:	09430822 40	
၇	ဒေါ်ကောသွယ်တင်	A.E	ဒုT(အလုံ)	မြို့ကောင်းကျေးရွာ	09787177029	
၈။	ဒေါ်ဝဒိုးခေး:	က - ဌ	"	"	09782554458	
၉.	ဒေါ်ရတနာမွန်မာ	AE	အလုံမြို့သစ်	(၁၅)ကျေးရွာဝင်း:(အလုံ)	09731201 06	
၁၀	ဒေါ်ဖြူမောတွင်ဦး	ကျွမ်း - ၅	အင်ဂျင်		09.4996 58338	
၁၁	ဒေါ်ဝေမျိုးသူကြီး	ပထဝီ - ၂	ဆရာမ		09-780062524	
၁၂.	ဦးထွန်းမြင့်ဖြဲ့	အငြိမ်းစားဗိုလ်မှူး	"	အလုံ - ဆော်ဂေါက်	09756457758	

1

Appendix – 5: Audiences and Attendance List of Pubic Consultation (Scoping Report)

Attadance list for public consultation of Myanmar Ahlone Power Plant Development Project

No.	Name	Position	Job	Address	Phone Number	Sign
1.	U Phoe Kyaw	Security	CEC	Ahlone Township	09691821881	
2.	U Ye Tun Paing	Security	CEC	Ahlone Township	09660752764	
3.	U Ko Ko Soe Lwin Thaw	Director	MSR	South Okkala Township	095176519	
4.	U Aung Myo Zaw	AD	Ahlone Power Plant	Ahlone Township	09428354885	
5.	U Kyaw Khin	plant Manager	Ahlone Power Plant	Ahlone Township	098601918	
၆	U Zaw Ko Ko Latt	Deputy plant Manager	Ahlone Power Plant	Ahlone Township	09261628336	
7	U Tin Aung Htun	AE	Ahlone Power Plant	Ahlone Township	09795395537	
8	U Soe Min Aung	Township Electricity Officer	Ahlone Power Plant	E-4(2) Moekaung Electicity Staff Housing Compound, Ahlone Township	09968384437	
9	U San Tun	Township Administration Chairman	Ahlone Township Administration Office	Ahlone Township Administration Office	09440185052	
10.	U Maung Zaw		Ahlone Township Administration Office	Ahlone Township Administration Office		
11	Lho Gao Feny	Manager	Myanmar Ahlone Power Plant	Ahlone Township	09788040096	
12.	Zhaug Zlirtao	Manager	Myanmar Ahlone Power Plant	Ahlone Township	〃	
13.	Myint Aung	CEO(Assistant)	Myanmar Ahlone Power Plant	Ahlone Township	〃	
14	Daw Tin Tin Hla	BC	Ahlone Power Plant	Moekaung Electicity Staff Housing Compound, Ahlone Township	09445145520	
15.	Daw Khin Cho Win	SAE	Engineer	Ahlone Township	09969681591	
16.	U Tin Zaw Moe	Electronic Technician (2)		Ahlone Township	0931342272	
17.	Daw Lay Lay Myint	AE	Control	Ahlone Township	09798424021	
18	Daw Moe Moe Nge	AE	Engineer	Insein Ywama Electicity Staff Housing Compound	09255154189	
19	U Aung Soe	Village Administrator	Thittaw Ward	Thittaw Ward, Ahlone Township	095109855	

No.	Name	Position	Job	Address	Phone Number	Sign
20.	U Htein Lin	Village Administrator	Htarna Ward	Htarna Ward, Ahlone Township	09975842219	
21.	U Moe Zaw Tun	Electronic Technician (3)		61, Ayeyarwaddy Ward, Ahlone Township	09975842219	
22.	Daw Myat Mon Khine	Store Keeper (4)	Ahlone Power Plant	Moekaung Electicity Staff Housing Compound, Ahlone Township	09254315175	
23.	Daw Ei Ei Khine	Assistant Computer Operator	Ahlone Power Plant	Moekaung Electicity Staff Housing Compound, Ahlone Township	09797868813	
24.	Daw Aye Aye Soe	Store Keeper (3)	Ahlone Power Plant	Moekaung Electicity Staff Housing Compound, Ahlone Township	019448034329	
25.	Daw Mu Mu Win	Technician (5) Machine/Electronic	Ahlone Power Plant	Moekaung Electicity Staff Housing Compound, Ahlone Township	09976034545	
26.	Daw Wai Mar Aung	Accountant (3)	Ahlone Power Plant	Moekaung Electicity Staff Housing Compound, Ahlone Township	09420702997	
27.	U Tin Wln Oo	Store Keeper (1)	Insein Ywama Power Plant	Insein Ywama Power Plant	0944110091	
28.	Daw Mar Mar Thi			Insein Ywama Power Plant	09780062524	
29.	Daw Mu Mu Khin	Store Keeper (1)	Manintenance	Insein Ywama Power Plant	264190421	
30.	Daw May Thazin Oo	HR & Admin	Myanmar Ahlone Power Plant	Ahlone Township	09420317193	
31.	Daw Khin Myat Myat Moe	Staff officer(Admin)	Ahlone Power Plant	Moekaung Electicity Staff Housing Compound, Ahlone Township	09797897292	
32.	Daw Than Than Myaing	Sweeper	Ahlone Power Plant	Moekaung Electicity Staff Housing Compound, Ahlone Township	092508140	
33.	Daw Khin Hla Than	Office Helper	Ahlone Power Plant	Moekaung Electicity Staff Housing Compound, Ahlone Township	〃	
34.	U Myo Thane	Driver	MSR	Hlaing Township	09799667322	
35.	U Tun Min Latt	Driver	MSR	Thingangyun Township	09793700889	
36.	U Aung Lin	Manager	MSR	Kyauktada Township	09400977121	
37.	U Ohn Kyaing	Assistant Manager	MSR	Hlaingtharyar Township	09799139844	
38.	U Thar Moe Aung	Engineer	MSR	South Okkalapa Township	09971104770	

No.	Name	Position	Job	Address	Phone Number	Sign
39.	U Ye Min Aung		MSR	North Okkalapa Township	09798256552	
40.	Daw Phyu Mar Lwin	Senior Manager	Myanmar Ahlone Power Plant	Tharkata Township	09798234609	
41.	Daw Khin Myo Thant	Finance Manager	Myanmar Ahlone Power Plant	Sanchaung Township	09790956010	
42.	U Phone Myint Tun	Consultant	MSR	North Dagon Township	09448012390	
43.	U Htay Aung Pyae	〃	MSR	Tharkata Township	09254103028	
44.	Daw Mon Mon Tin Oo	〃	MSR	Mingalartaungnyunt Township	09454919225	
45.	U Myo Nyunt Aung	Deputy Director	EPGE	North Dagon Township	09424685463	
46.	Daw Wutyi Soe	Librarian	MSR	Kyaukmyaung, Tamwe Township	09420070247	
47.	Daw Aye Aye Mar	E E	Ahlone Power Plant	Moekaung Electicity Staff Housing Compound, Ahlone Township	0943082210	
48.	Daw Kwethwei Tin	AE	GT (Ahlone)	Moekaung Electicity Staff Housing Compound, Ahlone Township	09787177029	
49.	Daw Thae Nu Aye	Electronic Technician (3)	GT (Ahlone)	Moekaung Electicity Staff Housing Compound, Ahlone Township	09782554458	
50.	Daw Nay Thwe Nwe	AE	Ahlone Power Plant	153, Moekaung Electicity Staff Housing Compound, Ahlone Township	0973120106	
51.	Daw Phyu Mar Tun	Electronic Technician (5)	Ahlone Power Plant	Insein Township	09440658338	
52.	Dw Nan Thu Hlaing	Store Keeper (2)	Ahlone Power Plant	Ahlone Township	09780062524	
53.	U Aung Khine Myint	Ward Administrator	Sawyanpaing(west) Ward	Sawyanpaing(west) Ward , Ahlone Township	09756457758	

Appendix – 6: Audiences and Attendance List of Pubic Consultation (EIA Report Presentation)

The list of attendees to the Public Consultation Meeting for the ESIA Report on Ahlone Combined Cycle Power Plant on 06.01.2023

No.	Name	Position	Department/organization	Contact no.
	The government staff			
1	U Kyaw Khin	Head of the plant (Deputy Chief Engineer)	Ahlone Power Station	09 761 313 037
2	U Tin Maung Maung Oo	Superintending Engineer	Ahlone Power Station	-
3	Daw Hlaing Lin Latt	Chief officer (Admin)	Ahlone Power Station	09 421 718 200
4	Daw Myat Myat Maw	Office superintendent	Ahlone Power Station	09 952 687 742
5	Daw Tin Tin Hla	Brach clerk	Ahlone Power Station	09 443 145 520
6	Daw Tin Tin Maw	Senior clerk	Ahlone Power Station	09 420 138 515
7	Daw Naw Htoo Gay	Office assistant	Ahlone Power Station	09 420 984 702
8	Daw Aye Aye Khine	Technician 4	Ahlone Power Station	09 448 038 995
9	Daw Phyu Mar Tun	Technician 4	Ahlone Power Station	09 445 658 338
10	Daw Than Than Myaing	Cleaner	Ahlone Power Station	-
11	U Myint Aung	Interpreter	MAPP	09 788 090 096
12	Daw Khin Myo Thant	Finance manager	MAPP	09 790 956 010
13	U Myo Zaw Win	Deputy Director	ECD	09 431 432 41
14	Daw Aye Khine Kyaw	Executive Officer	ECD	09 977 825 665
15	U Zaw Min Tun	EE	APS	09 448 429 258
16	Daw Phyu Mar Lwin	AGM	MAPP	09 798 234 609
17	U Aung Myo Zaw	EE	Ahlone S/S	09 428 354 885
18	U Ye Min Thein	AE	Ahlone S/S	09 257 045 611
19	U Myat Min Hwme	BC	GT Ahone	09 960 519 365
20	Daw Aye Aye Mar	EE	GT Ahlone	09 430 822 10
21	U Tin Ko Win	Security	MAPP	09 421 013 282
22	U Htet Paing	Security	MAPP	09 683 076 483
23	Daw Kaythwe Tin	AE	MEPE	09 787 177 029
24	Zhang Hitao	GM	MAPP	09 770 437 886
25	U Htet Myo Hlaing	Assistant Head of Fire Station	Fire Station, Ahlone Township	09 264 809 056
26	U Aung Khant Thu	Lance Corporal	Fire Station, Ahlone Township	09 457 871 909
27	U Myint Aung	Manager	MAPP	09 755 207 284
28	U San Tun	Chairman	Township Admin Council	09 440 183 032
29	U Maung Maung	Member 2	General Administrator, Ahlone Township	09 505 017 16
	Residents in wards			
30	Daw Swe Swe Win		43 B2, Pwalsa Street, Kyimyindine	09 444 786 800
31	Daw Myo Thida		Sagasein Street, Ahlone	-
32	Daw May Thazin Oo		20, 6th floor, Sabai Street	-
33	Daw Hsu Mon Wine		20, 5th floor, Sabai Street	09 420 317 193

No.	Name	Position	Department/organization	Contact no.
34	Daw Ei Ei Aung		Ground floor, Sagasein Street, Ahone	09 250 503 490
35	U Aung Soe	Head of administration	Thittaw Ward, Ahlone	09 510 9855
36	U Soe Naing		Thittaw Ward, Ahlone	09 450 450 855
37	U Kyaw Oo		Thittaw Ward, Ahlone	09 254 449 055
38	U Htwe Myint		Thittaw Ward, Ahlone	09 760 215 436
39	U Aung Aung		Thittaw Ward, Ahlone	09 696 877 671
40	U Khin Hlaing Win		Thittaw Ward, Ahlone	09 895 011 294
41	U Sein Win		Thittaw Ward, Ahlone	-
42	U Zaw Win		Thittaw Ward, Ahlone	-
43	U Kyaw Win		Thittaw Ward, Ahlone	09 769 744 015
44	U Soe		Thittaw Ward, Ahlone	09 795 148235
45	U Kyaw Min Sann		Thittaw Ward, Ahlone	09 769 808 38
46	U Nay Aung Khin		Thittaw Ward, Ahlone	09 421 026 504
47	U Myo Ko Ko		Thittaw Ward, Ahlone	09 425 296 328
48	U Myint Swe		Thittaw Ward, Ahlone	09 777 337 313
49	U Tin Maung Aye		Sabai Street, Ahlone	09 794 440 979
50	U Aung Lwin		Sabai Street, Ahlone	09 510 9682
	MSR			
51	U Htay Min	HIA (member)	MSR, Yangon	09 250 609 662
52	U Win Min Han	Driver	MSR, Yangon	09 255 333 811
53	U Thar Moe Aung	Physical Environment (member)	MSR, Yangon	09 971 104 770
54	Daw Wutyi Soe	Social Environment Team (member)	MSR, Yangon	09 420 070 247
55	Daw Nyein Nyein Myo	Document Control	MSR, Yangon	09 250 349 016
56	Dr. Mon Mon Tin Oo	Consultant, HIA	MSR, Yangon	09 454 919 225
57	U Ye Nyunt	Vice President	MSR, Yangon	09 795 004 701
58	U Ko Ko Soe Lwin Thaw	Director	MSR, Yangon	09 517 6519
59	U Aung Lin	Social Environment Team (Leader)	MSR, Yangon	09 400 977 121
60	U Kyan Dyne Aung	Consultant	MSR, Yangon	09 421 133 218
61	U Htay Aung Pyae	Consultant	MSR, Yangon	09 254 103 025
62	U Ohn Kyaing	Social Environment Team (Member)	MSR, Yangon	09 440 085 497
63	Dr. Aung Myint Thein	Consultant	MSR, Yangon	09 797 108 646
64	U Phone Myint Tun	Consultant	MSR, Yangon	09 448 012 390
65	U Ye Min Aung	Physical Environment Team (Member)	MSR, Yangon	09 798 256 552

Appendix – 7: Laboratory Test Results

1- Surface Water

2- Plant Effluent

3- Soil

ALARM Ecological Laboratory

Water Testing Result Report

Report Number : EL-WR-20-01012 **Date : 02-12-20**

Client Information

Client Name : **MSR**
Organization : **Myanmar Survey Research (MSR)**
Client ID : **LC-10-023**
Registration Date & Time : **20-11-20**
Contact : **01370464**
Testing Purpose : **For Stnadard**

Sample Information

Sample ID : WS-20-00959
Sample Name : **SW-1**
Sample Type / Source : **Surface Water**
Sampling Date & Time : **20-11-20**
Sample Location : **Yangon River (Up Stream), Alone Tsp, Yangon**
Latitude :
Longitude :

Testing Results

This laboratory analysis report is based solely on the sample submitted by the client unless client took our sampling service.
This report shall not be reproduced except in full, without written approval of the laboratory

Sr.	Quality Parameters	Results	Units	Drinking Standards	Remarks
1	TSS	132	mg/L	-	-
2	Ammonia	<0.02	mg/L	-	-
3	BOD5	4	mg/L	-	-
4	COD	<30	mg/L	-	-
5	Total Chlorine	0.05	mg/L	≤4 (c)	Normal
6	Free Cyanide	<0.01	mg/L	-	-
7	Arsenic	0	mg/L	≤0.05 (c)	Normal
8	Cadmium	ND	mg/L	≤0.003 (c)	LOD=0.01
9	Copper	ND	mg/L	≤2 (c)	LOD=0.02
10	Iron	1.89	mg/L	≤1(c)	Above DW limit
11	Lead	ND	mg/L	≤0.01 (c)	LOD=0.1
12	Zinc	<0.02	mg/L	≤3 (c)	Normal
13	Nickel	ND	mg/L	≤0.07 (c)	LOD=0.2
14	Phenol	ND	mg/L	-	LOD=0.1
15	Fluoride	0	mg/L	≤1.5 (c)	Normal
16	Oil & Grease	2	mg/L	-	-
17	Total Nitrogen	<0.5	mg/L	-	-
18	Chromium (Hexavalent)	0	mg/L	≤0.05 (c)	Normal
19	Total Phosphorous	0.05	mg/L	-	-

"ND"= Not Detected "LOD"= Lower limit of detection "-" = No Reference Standard

Tested by	Checked by	Approved by
Daw May Myat Khine Lab. Technician II Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory ALARM	Dr. Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

531-D, Marlar Myaing Yeik Thar Street, 8 Ward, Kamayut Tsp, Yangon. Tel: 01-503301, 01-503302, 09 407496078
Email: aelab@alarmmyanmar.org, alarm.myanmar@gmail.com, Website: www.alarmmyanmar.org

Baseline Water Quality Sampling – Phase 1

ALARM Ecological Laboratory

Water Testing Result Report

Report Number : EL-WR-20-01013 **Date** : 02-12-20

Client Information

Client Name : **MSR**
Organization : **Myanmar Survey Research (MSR)**
Client ID : **LC-10-023**
Registration Date & Time : **20-11-20**
Contact : **01370464**
Testing Purpose : **For Standard**

Sample Information

Sample ID : WS-20-00960
Sample Name : **SW-2**
Sample Type / Source : **Surface Water**
Sampling Date & Time : **20-11-20**
Sample Location : **Yangon River (Down Stream), Alone Tsp, Yangon**
Latitude :
Longitude :

Testing Results

This laboratory analysis report is based solely on the sample submitted by the client unless client took our sampling service.
This report shall not be reproduced except in full, without written approval of the laboratory

Sr.	Quality Parameters	Results	Units	Drinking Standards	Remarks
1	TSS	127	mg/L	-	-
2	Ammonia	<0.02	mg/L	-	-
3	BOD5	7	mg/L	-	-
4	COD	<30	mg/L	-	-
5	Total Chlorine	0.04	mg/L	≤4 (c)	Normal
6	Free Cyanide	<0.01	mg/L	-	-
7	Arsenic	0	mg/L	≤0.05 (c)	Normal
8	Cadmium	ND	mg/L	≤0.003 (c)	LOD=0.01
9	Copper	ND	mg/L	≤2 (c)	LOD=0.02
10	Iron	2.05	mg/L	≤1(c)	Above DW limit
11	Lead	ND	mg/L	≤0.01 (c)	LOD=0.1
12	Zinc	<0.02	mg/L	≤3 (c)	Normal
13	Nickel	ND	mg/L	≤0.07 (c)	LOD=0.2
14	Phenol	ND	mg/L	-	LOD=0.1
15	Fluoride	0	mg/L	≤1.5 (c)	Normal
16	Oil & Grease	3	mg/L	-	-
17	Total Nitrogen	<0.5	mg/L	-	-
18	Chromium (Hexavalent)	0	mg/L	≤0.05 (c)	Normal
19	Total Phosphorous	0.02	mg/L	-	-

"ND"= Not Detected "LOD"= Lower limit of detection "-" = No Reference Standard

Tested by	Checked by	Approved by
Daw May Myat Khine Lab. Technician II Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory ALARM	Dr. Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

531-D, Marlar Myaing Yeik Thar Street, 8 Ward, Kamayut Tsp, Yangon. Tel: 01-503301, 01-503302, 09 407496078
Email: aelab@alarmmyanmar.org, alarm.myanmar@gmail.com, Website: www.alarmmyanmar.org

Baseline Water Quality Sampling – Phase 1

ALARM Ecological Laboratory

Water Testing Result Report

Report Number : EL-WR-20-01014 **Date : 02-12-20**

Client Information

Client Name : **MSR**
Organization : **Myanmar Survey Research (MSR)**
Client ID : **LC-10-023**
Registration Date & Time : **20-11-20**
Contact : **01370464**
Testing Purpose : **For Standard**

Sample Information

Sample ID : **WS-20-00961**
Sample Name : **SW-3**
Sample Type / Source : **Surface Water**
Sampling Date & Time : **20-11-20**
Sample Location : **Harbi Creek (Down Stream), Alone Tsp, Yangon**
Latitude :
Longitude :

Testing Results

This laboratory analysis report is based solely on the sample submitted by the client unless client took our sampling service.
This report shall not be reproduced except in full, without written approval of the laboratory

Sr.	Quality Parameters	Results	Units	Drinking Standards	Remarks
1	TSS	28	mg/L	-	-
2	Ammonia	<0.02	mg/L	-	-
3	BOD5	6	mg/L	-	-
4	COD	<30	mg/L	-	-
5	Total Chlorine	0.19	mg/L	≤4 (c)	Normal
6	Free Cyanide	<0.01	mg/L	-	-
7	Arsenic	0	mg/L	≤0.05 (c)	Normal
8	Cadmium	ND	mg/L	≤0.003 (c)	LOD=0.01
9	Copper	ND	mg/L	≤2 (c)	LOD=0.02
10	Iron	1.47	mg/L	≤1(c)	Above DW limit
11	Lead	ND	mg/L	≤0.01 (c)	LOD=0.1
12	Zinc	<0.02	mg/L	≤3 (c)	Normal
13	Nickel	ND	mg/L	≤0.07 (c)	LOD=0.2
14	Phenol	ND	mg/L	-	LOD=0.1
15	Fluoride	0	mg/L	≤1.5 (c)	Normal
16	Oil & Grease	3	mg/L	-	-
17	Total Nitrogen	2	mg/L	-	-
18	Chromium (Hexavalent)	0	mg/L	≤0.05 (c)	Normal
19	Total Phosphorous	0.1	mg/L	-	-

"ND"= Not Detected "LOD"= Lower limit of detection "-" = No Reference Standard

Tested by	Checked by	Approved by
Daw May Myat Khine Lab. Technician II Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory ALARM	Dr. Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

531-D, Marlar Myaing Yeik Thar Street, 8 Ward, Kamayut Tsp, Yangon. Tel: 01-503301, 01-503302, 09 407496078
Email: aelab@alarmmyanmar.org, alarm.myanmar@gmail.com, Website: www.alarmmyanmar.org

Baseline Water Quality Sampling – Phase 1

ALARM Ecological Laboratory

Water Testing Result Report

Report Number : EL-WR-20-01015 **Date : 02-12-20**

Client Information

Client Name : **MSR**
Organization : **Myanmar Survey Research (MSR)**
Client ID : **LC-10-023**
Registration Date & Time : **20-11-20**
Contact : **01370464**
Testing Purpose : **For Standard**

Sample Information

Sample ID : WS-20-00962
Sample Name : **SW-4**
Sample Type / Source : **Surface Water**
Sampling Date & Time : **20-11-20**
Sample Location : **Harbi Creek (Up Stream), Alone Tsp, Yangon**
Latitude :
Longitude :

Testing Results

This laboratory analysis report is based solely on the sample submitted by the client unless client took our sampling service.
This report shall not be reproduced except in full, without written approval of the laboratory

Sr.	Quality Parameters	Results	Units	Drinking Standards	Remarks
1	TSS	7	mg/L	-	-
2	Ammonia	0.14	mg/L	-	-
3	BOD5	5	mg/L	-	-
4	COD	<30	mg/L	-	-
5	Total Chlorine	0.29	mg/L	≤4 (c)	Normal
6	Free Cyanide	<0.01	mg/L	-	-
7	Arsenic	0	mg/L	≤0.05 (c)	Normal
8	Cadmium	ND	mg/L	≤0.003 (c)	LOD=0.01
9	Copper	ND	mg/L	≤2 (c)	LOD=0.02
10	Iron	0.75	mg/L	≤1(c)	Normal
11	Lead	ND	mg/L	≤0.01 (c)	LOD=0.1
12	Zinc	<0.02	mg/L	≤3 (c)	Normal
13	Nickel	ND	mg/L	≤0.07 (c)	LOD=0.2
14	Phenol	ND	mg/L	-	LOD=0.1
15	Fluoride	0	mg/L	≤1.5 (c)	Normal
16	Oil & Grease	2	mg/L	-	-
17	Total Nitrogen	3.4	mg/L	-	-
18	Chromium (Hexavalent)	0	mg/L	≤0.05 (c)	Normal
19	Total Phosphorous	0.2	mg/L	-	-

"ND"= Not Detected "LOD"= Lower limit of detection "-" = No Reference Standard

Tested by	Checked by	Approved by
Daw May Myat Khine Lab. Technician II Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory ALARM	Dr. Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

531-D, Marlar Myaing Yeik Thar Street, 8 Ward, Kamayut Tsp, Yangon. Tel: 01-503301, 01-503302, 09 407496078
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Baseline Water Quality Sampling – Phase 1

ALARM Ecological Laboratory

Water Testing Result Report

Laboratory Testing Methods		
Parameters	Instruments / Methods	References / Descriptions
pH	pH Meter	Electrode method (Approved by EPA, ISO, ASTM), Hanna electrode meter Certified by 2014 EMS, Certified by QMS
Temperature, DO	DO Meter	Electrochemical probe method, Dissolved Oxygen Probe Measurement (Approved by EPA, ISO, ASTM) Horiba DO electrode certified with IP67 standards and measures
All Others parameters	SpectroDirect Methods	Lovibond Brand and Hana Brand, reagent testing methods, precision of the methodsare identical to the precision specified in the standard literature of AWWA and ISO
TDS	TDS Meter	Electrode method (Approved by EPA, ISO, ASTM), Hanna electrode meter Certified by 2014 EMS, Certified by QMS
Conductivity	Conductivity Meter	Electrode method, conductivity cell (Approved by EPA, ISO, ASTM),Hanna electrode meter Certified by 2014 EMS, Certified by QMS
BOD	BOD Testing Method	Method 405.1, USEPA Method for Chemical Analysis of Water and Waste water
Lead, Copper, Cadmium, Sodium	Atomic Adsorption Spectrophotometer	Shimadzu AA-6200, which is based on the Japan Water Standard Testing Method also approved by EPA and ASTM
Arsenic	Arsenic Test Kit	Lovibond brand Arsenic Test kit certified by DIN ISO 1997/ Follow Procedure: Meets WHO requirements:

Standards References		
Index	Standard Names	References
a	WHO Standard for Drinking Water (2011)	Guidelines for Drinking-water Quality 4rd edition, World Health Organization, 2011.
b	US EPA Drinking Water Standard (2018)	2018 Edition of the Drinking Water Standards and Health Advisories, EPA 822-F-18-001, Office of Water, USEPA, Washington, DC, March 2018
c	Myanmar Drinking Water Standard (2019)	National Drinking Water Standards, Department of Research & Innovation, Ministry of Education, 2019
d	Myanmar Emission Guideline (2015)	National Environmental Quality (Emission) Guidelines, Order No. (615/2015) MOECAF, 2015, December 29.
*	At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and assimilative capacity; when the zone is not defined, use 100 meters from the point of discharge.	

Quality Parameters Descriptions

pH: Although pH usually has no direct impact on consumers, it is one of the most important operational water quality parameters. Water generally becomes more corrosive with decreasing pH; however, excessively alkaline water also may be corrosive.

Temperature: will have an impact on the acceptability of a number of other inorganic constituents and chemical contaminants that may affect taste. High water temperature enhances the growth of microorganisms and may increase problems related to taste, odor, color and corrosion.

Color: Drinking-water should ideally have no visible color. Color in drinking-water is usually due to the presence of colored organic matter (primarily humic and fulvic acids) associated with the humus fraction of soil. Color is also strongly influenced by the presence of iron and other metals, either as natural impurities or as corrosion products. It may also result from the contamination of the water source with industrial affluents and may be the first indication of a hazardous situation.

Turbidity: Turbidity in water is caused by suspended particles or colloidal matter that obstructslight transmission through the water. It may be caused byinorganic or organic matteror a combination of the two. Microorganisms (bacteria, viruses and protozoa) are typicallyattached to particulates, and removal of turbidity by filtration will significantlyreduce microbial contamination in treated water.

Total Dissolved Solid (TDS): The total of all dissolved mineral constituents, usually expressed in milligrams per liter. The concentration of dissolved solids may affect the taste of water. Water that contains more than 1,000 mg/L is unsuitable for many industrial uses. Some dissolved mineral matter is desirable, otherwise the water would have no taste. The dissolved solids concentration commonly is called the water's salinity and is classified as follows: fresh, 0-1,000 mg/L; slightly saline, 1,000-3,000 mg/L; moderately saline, 3,000-10,000 mg/L; very saline, 10,000-35,000 mg/L; and briny, more than 35,000 mg/L.

Total Suspended Solid (TSS): Both organic and inorganic particles of all sizes can contribute to the suspended solids concentration. These solids include anything drifting or floating in the water, from sediment, silt and sand to plankton and algae. TSS are particles that are larger than 2 microns found in the water column. Anything smaller than 2 microns (average filter size) is considered a dissolved solid.

Total Solid: Total solids are dissolved solids plus suspended solids in water.

Conductivity: is nothing but the measure of the capability of water to pass the flow of electric current. This ability of conductance is said to be directly proportional to the concentration of the ions present in the water.

Chloride: Large concentrations increase the corrosiveness of water and, in combination with sodium, give water a salty taste.

Hardness: Related to the soap-consuming characteristics of water; results in formation of scum when soap is added. May cause deposition of scale in boilers, water heaters, and pipes. Hardness contributed by calcium and magnesium, bicarbonate and carbonate mineral species in water is called carbonate hardness; hardness in excess of this concentration is called noncarbonate hardness. Water that has a hardness less than 61 mg/L is considered soft; 61-120 mg/L, moderately hard; 121-180 mg/L, hard; and more than 180 mg/L, very hard.

Dissolved Oxygen: is required by higher forms of aquatic life for survival. Depletion of dissolved oxygen in water supplies can encourage themicrobial reduction of nitrate to nitrite and sulfate to sulfide. It can also cause anincrease in the concentration of ferrous iron in solution.

Biological/Chemical Oxygen Demand (BOD&COD): BOD is similar in function to chemical oxygen demand (COD), in that both measure the amount of organic compounds in water. However, COD is less specific, since it measures everything that can be chemically oxidized, rather than just levels of biologically active organic matter.

Aluminium: No known necessary role in human or animal diet. Nontoxic in the concentrations normally found in natural water supplies. Elevated dissolved aluminum concentrations in some low pH waters can be toxic to some types of fish.

Manganese: Causes gray or black stains on porcelain, enamel, and fabrics. Can promote growth of certain kinds of bacteria that clog pipes and wells.

Sodium & Potassium: Large concentrations may limit use of water for irrigation and industrial use and, in combination with chloride, give water a salty taste. Abnormally large concentrations may indicate natural brines, industrial brines, or sewage.

Zinc: Essential and beneficial in metabolism; its deficiency in young children or animals will retard growth and may decrease general body resistance to disease. Seems to have no ill effects even in fairly large concentrations (20,000-40,000 mg/L), but can impart a metallic taste or milky appearance to water. Zinc in drinking water commonly is derived from galvanized coatings of piping.

Iron: Forms rust-colored sediment; stains laundry, utensils, and fixtures reddish brown. Objectionable for food and beverage processing. Can promote growth of certain kinds of bacteria that clog pipes and well openings.

Arsenic: is toxic. A cumulative poison that is slowly excreted. Can cause nasal ulcers; damage to the kidneys, liver, and intestinal walls; and death. Recently suspected to be a carcinogen.

Chlorine: is added to water supplies to kill bacteria. Short term exposure to chlorine comes primarily from bathing and other activities that use hot water rather than from drinking. Short term exposure irritates the eyes and lungs, and within 15 minutes of exposure victims experience coughing, shortness of breath and headaches. Regular exposure to chlorine in the home has been associated with asthma and other respiratory diseases.

Cyanide: is highly acutely toxic. It is detoxified in the liver by first-pass metabolism following oral exposure. As a consequence, exposure to a dose spread over a longer period, through a day, for example, will result in lower toxicity, or higher tolerance, than the same dose given in a single bolus dose.

Nitrite: Commonly formed as an intermediate product in bacterially mediated nitrification and denitrification of ammonia and other organic nitrogen compounds. An acute health concern at certain levels of exposure. Nitrite typically occurs in water from fertilizers and is found in sewage and wastes from humans and farm animals. Concentrations greater than 1.0 mg/L, as nitrogen, may be injurious when used in feeding infants.

Nitrate& Nitrate-N: Concentrations greater than local background levels may indicate pollution by feedlot runoff, sewage, or fertilizers. Concentrations greater than 10 mg/L, as nitrogen, may be injurious when used in feeding infants.

Phosphorus & ortho-phosphate: Dense algal blooms or rapid plant growth can occur in waters rich in phosphorus. A limiting nutrient for eutrophication since it is typically in shortest supply. Sources are human and animal wastes and fertilizers.

Ammonia: Plant nutrient that can cause unwanted algal blooms and excessive plant growth when present at elevated levels in water bodies. Sources include decomposition of animal and plant proteins, agricultural and urban runoff, and effluent from waste-water treatment plants.

Lead: A cumulative poison, toxic in small concentrations. Can cause lethargy, loss of appetite, constipation, anemia, abdominal pain, gradual paralysis in the muscles, and death.

Copper: Essential to metabolism; copper deficiency in infants and young animals results in nutritional anemia. Large concentrations of copper are toxic and may cause liver damage. Moderate levels of copper (near the action level) can cause gastro-intestinal distress.

Cadmium: A cumulative poison; very toxic. Not known to be either biologically essential or beneficial.Believed to promote renal arterial hypertension. Elevated concentrations may cause liver and kidney damage, or even anemia, retarded growth, and death.

Nickel: Very toxic to some plants and animals. Toxicity for humans is believed to be very minimal.

Sulfide: The "rotten eggs" odor of hydrogen sulfide is particularly noticeable in some ground waters and in stagnant drinking-water in the distributionsystem, as a result of oxygen depletion and the subsequent reduction of sulfate by bacterial activity. Sulfide is oxidized rapidly to sulfate in well-aerated or chlorinated water, and hydrogen sulfide levels in oxygenated water supplies are normally very low.

Sulfate: Sulfates of calcium and magnesium form hard scale. Large concentrations of sulfate have a laxative effect on some people and, in combination with other ions, give water a bitter taste.

Alkalinity: A measure of the capacity of unfiltered water to neutralize acid. In almost all natural waters alkalinity is produced by the dissolved carbon dioxide species, bicarbonate and carbonate.

Phenol: The presence of phenol in drinking water probably results from using contaminated surface water or groundwater as a source. Its presence in groundwater is probably the result of release to soil, often industrial releases or leachate from waste dumps, and the subsequent leaching of phenol through the soil to the groundwater. Chlorophenols are present in drinking-water as a result of the chlorination of phenols,as by-products of the reaction of hypochlorite with phenolic acids, as biocides or as degradationproducts of phenoxy herbicides.IARC has classified 2,4,6-trichlorophenol in Group2B (possibly carcinogenic to humans).

Boron: Essential to plant growth, but may be toxic to crops when present in excessive concentrations in irrigation water. Sensitive plants show damage when irrigation water contains more than 670 µg/L and even tolerant plants may be damaged when boron exceeds 2,000 µg/L. The recommended limit is 750µg/L for long-term irrigation on sensitive crops.

Fluoride: To produce signs of acute fluoride intoxication, minimum oral doses of about 1 mg of fluoride per kilogram of body weight were required. Concentrations above this guideline value (1.5mg/L) carry an increasing risk of dental fluorosis and that progressively higher concentrations lead to increasing risks of skeletal fluorosis.

~ ~ ~ Thank you so much for using our testing services ~ ~ ~

531-D, Marlar Myaing Yeik Thar Street, 8 Ward, Kamayut Tsp., Yangon. Tel: 01-303301, 01-303302, 09-407496078
Email: aelab@alarmmyanmar.org, alarm.myanmar@gmail.com , Website: www.alarmmyanmar.org

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E(Delft) Lecturer of YIT (Retd). Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

ISO 9001:2015 Cert. No. 688600

WTL-RE-001
Issue Date - 01-1-2016
Effective Date - 01-1-2016
Issue No - 1.0/Page 1 of 1

M1120 057

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client: MSR Co.,Ltd.
Nature of Water: Surface Water (2)
Location: Ahlone Township Yangon, Yangon River (Down Stream)
Date and Time of collection: 20.11.2020
Date and Time of arrival at Laboratory: 20.11.2020
Date and Time of commencing examination: 20.11.2020
Date and Time of completing: 21.11.2020

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	80	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	20	CFU/100ml	Not detected
pH	7.8		6.5 - 8.5
Turbidity	432	NTU	5 NTU
Colour (True)	240	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Than Than Swe
B.E (Civil), Dip Env.E
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18. Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-30339681, 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

Baseline Water Quality Sampling – Phase 1

ISO TECH LABORATORY

ISO 9001:2015 Cert. No. 688600

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E(Delft) Lecturer of YIT (Retd). Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-1-2016
Effective Date - 01-1-2016
Issue No - 1.0/Page 1 of 1

M1120 058

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client: MSR Co.,Ltd.
Nature of Water: Surface Water (3)
Location: Horbi Creek (Down Stream)
Date and Time of collection: 20.11.2020
Date and Time of arrival at Laboratory: 20.11.2020
Date and Time of commencing examination: 20.11.2020
Date and Time of completing: 21.11.2020

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	30	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	10	CFU/100ml	Not detected
pH	7.3		6.5 - 8.5
Turbidity	135	NTU	5 NTU
Colour (True)	80	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Than Than Swe
B.E (Civil), Dip Env.E
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
No.18. Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-30339681, 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

Baseline Water Quality Sampling – Phase 1

ISO TECH LABORATORY

ISO 9001:2015 Cert. No. 688600

Laboratory Technical Consultant: U Saw Christopher Maung
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WTL-RE-001
Issue Date - 01-1-2016
Effective Date - 01-1-2016
Issue No - 1.0/Page 1 of 1

M1120 059

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client: MSR Co.,Ltd.
Nature of Water: Surface Water (4)
Location: Horbi Creek (Up Stream)
Date and Time of collection: 20.11.2020
Date and Time of arrival at Laboratory: 20.11.2020
Date and Time of commencing examination: 20.11.2020
Date and Time of completing: 21.11.2020

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	20	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	8	CFU/100ml	Not detected
pH	7.5		6.5 - 8.5
Turbidity	20	NTU	5 NTU
Colour (True)	10	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by

Signature:

Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:

Name: Than Than Swe
B.E (Civil), Dip Env.E
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)

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Baseline Water Quality Sampling – Phase 1

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E(Delft) Lecturer of YIT (Retd). Consultant (Y.C.D.C), LWSE 001.
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ISO 9001:2015 Cert. No. 688600

WTL-RE-001
Issue Date - 01-1-2016
Effective Date - 01-1-2016
Issue No - 1.0/Page 1 of 1

M1120 057

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client: MSR Co.,Ltd.
Nature of Water: Surface Water (2)
Location: Ahlone Township Yangon, Yangon River (Down Stream)
Date and Time of collection: 20.11.2020
Date and Time of arrival at Laboratory: 20.11.2020
Date and Time of commencing examination: 20.11.2020
Date and Time of completing: 21.11.2020

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	80	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	20	CFU/100ml	Not detected
pH	7.8		6.5 - 8.5
Turbidity	432	NTU	5 NTU
Colour (True)	240	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.
: This certificate is issued only for the receipt of the test sample.
: < - Less than

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Than Than Swe
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Baseline Water Quality Sampling – Phase 1

ISO TECH LABORATORY

ISO 9001:2015 Cert. No. 688600

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E(Delft) Lecturer of YIT (Retd). Consultant (Y.C.D.C), LWSE 001.
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WTL-RE-001
Issue Date - 01-1-2016
Effective Date - 01-1-2016
Issue No - 1.0/Page 1 of 1

M1120 056

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client: MSR Co.,Ltd.
Nature of Water: Surface Water (1)
Location: Ahlone Township Yangon, Yangon River (Up Stream)
Date and Time of collection: 20.11.2020
Date and Time of arrival at Laboratory: 20.11.2020
Date and Time of commencing examination: 20.11.2020
Date and Time of completing: 21.11.2020

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	40	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	10	CFU/100ml	Not detected
pH	7.7		6.5 - 8.5
Turbidity	416	NTU	5 NTU
Colour (True)	200	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Than Than Swe
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Ph: 01-640955, 09-73225175, 09-30339681, 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

Baseline Water Quality Sampling – Phase 1

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
စိုက်ပျိုးရေး၊ မွေးမြူရေးနှင့်ဆည်မြောင်းဝန်ကြီးဌာန
စိုက်ပျိုးရေးဦးစီးဌာန
(မြေအသုံးချရေးဌာနခွဲ)
ရန်ကုန်မြို့

စာအမှတ်- ခခ-၂/(၂)/၂၀ - ၂၁ (119)
နေ့စွဲ၊ ၂၀၂၁ ခုနှစ်၊ စက်တင်ဘာလ (15)ရက်

အကြောင်းအရာ။ မြေနမူနာ ဓာတ်ခွဲအဖြေပေးပို့ခြင်း။

ရည် ညွှန်း ချက် ။ **Myanmar Survey Research** မှ (20.1.2021) နေ့တွင် ပေးပို့သော နမူနာ။

အထက်အကြောင်းအရာပါ ကိစ္စနှင့်ပတ်သက်၍ ရည်ညွှန်းစာဖြင့် ပေးပို့လာသော **မြေနမူနာ(၁)**မျိုးအား ဓာတ်ခွဲစစ်ဆေးပြီးဖြစ်၍ ဓာတ်ခွဲတွေ့ရှိချက် အဖြေများကို ဤစာနှင့်အတူပူးတွဲပေးပို့ပါသည်။

(ဒေါက်တာသန္တာညီ)
ဒုတိယညွှန်ကြားရေးမှူး
ဓာတ်ခွဲခန်းတာဝန်ခံ
မြေအသုံးချရေးဌာနခွဲ

Myanmar Survey Research

DEPARTMENT OF AGRICULTURE (LAND USE)

SOIL INTERPREATATION OF RESULTS

Myanmar Survey Research (20.1.2021)

Division – yangon

Township –

Sheet No. 1

Sr No. S 1 / 2021

Sr No.	Sample	pH Soil:Water 1:2.5	EC	Texture	Organic Carbon	Total N	Available Nutrients	
							P	K_2O
1	မြေနမူနာ	Slightly alkaline	Very Low	Loamy Sand	Very Low	High	Low	Low

(ဒေါက်တာသန္တာညီ)

ဒုတိယညွှန်ကြားရေးမှူး

ဓာတ်ခွဲခန်းတာဝန်ခံ

မြေအသုံးချရေးဌာနခွဲ

DEPARTMENT OF AGRICULTURE (LAND USE)

SOIL ANALYTICAL DATA SHEET

Myanmar Servey Research(20.1.2021)

Division – yangon

Township –

Sheet No. 1

Sr No. S 1 / 2021

Sr No.	Sample	Moisture %	pH Soil:Water 1:2.5	EC Soil:Water 1:5 mS/cm	Texture				Organic Carbon %	Humus %	Total N %	Exchangeable Cations meq/100gm			Available Nutrients	
					Sand %	Silt %	Clay %	Total %				Ca^{++}	Mg^{++}	K^{+}	P ppm	K_2O mg/100gm
1	မြေနမူနာ	0.66	7.24	0.14	85.70	6.70	7.60	100.00	0.44	0.76	0.11	10.06	2.01	0.17	6.45	7.85

O = Olsen Method

(ဒေါက်တာသန်းညီ)

ဒုတိယညွှန်ကြားရေးမှူး

ဓာတ်ခွဲခန်းတာဝန်ခံ

မြေအသုံးချရေးဌာနခွဲ

DEPARTMENT OF AGRICULTURE (LAND USE)

SOIL ANALYTICAL DATA SHEET

Myanmar Survey Research (20.1.2021)

Division – yangon

Township –

Sheet No. 1

Sr No. S 1 / 2021

Sr No.	Sample	Lead(Pb) ppm	Nickel(Ni) ppm	Chromium(Cr) ppm	Cadmium(Cd) ppm	Iron(Fe) ppm
1	မြေနမူနာ	1.0	Not detected	Not detected	Not detected	12.81

မှတ်ချက် ။ ။မြေနမူနာခါတ်ခွဲအဖြေများအရ Lead (Pb), Nickel(Ni), Chromium(Cr),Cadmium(Cd),Iron(Fe)ပါဝင်မှုသည် MPL (Maximum permissiable Limit)ထက် မကျော်လွန်ပါ။ (ASEAN Soil&Nutrient Management Guidline (2017); Berson(2014);IRRI (2013)

(ဒေါက်တာသန္တာညီ)

ဒုတိယညွှန်ကြားရေးမှူး

ဓာတ်ခွဲခန်းတာဝန်ခံ

မြေအသုံးချရေးဌာနခွဲ

PRO LAB
ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd
Address : No. (9), Sabae Housing, Pyi Htaung Su Road,
(26) Ward, South Dagon Tsp, Yangon, Myanmar.
Tel : 09-893 767 424
E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

1 Client Name : Myanmar Survey Research Company Limited
2 Location : Yangon Central Railway Station Building, Mingalartaungnyunt Township
3 Type of Sample : Surface Water SW1 Up-Stream Yangon River
4 Sample No. : 00990/2022
5 Contact Person : Ko Ye Min Aung
6 Phone No. : 09-798256552, 09451245264
7 Date Received : 08.12.2022
8 Date of Test Performed : 08.12.2022
9 Date of Issued : 20.12.2022
10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	1.2	mg/L	-	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Arsenic	0.01	mg/L	-	Hach Test Kits
3	Biochemical Oxygen Demand	64.27	mg/L	-	[a] 5210B, 5 - Day BOD Test Method
4	Cadmium	< 0.02	mg/L	-	Hach DR 3900 Spectrophotometer, Cadion Method
5	Chemical Oxygen Demand $_{Cr}$	191	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA Reactor Digestion Method
6	Chromium (Hexavalent)	< 0.010	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA 1, 5 - Diphenylcarbohydrazide Method
7	Color	5925	PCU	-	Hanna HI97727 - Color of Water Photometer
8	Copper	4.88	mg/L	-	Hach DR 3900 Spectrophotometer, Bathocuproine Method
9	Cyanide	< 0.002	mg/L	-	Hach DR 3900 Spectrophotometer, Pyridine - Pyrazalone Method
10	Fluoride	< 0.02	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA SPADNS2 Method
11	Free Chlorine	0.06	mg/L	-	Hanna HI97104 - Free & Total Chlorine Photometer
12	Iron	36.63	mg/L	-	[a] 3500-F B, Phenanthroline Method
13	Lead	ND	mg/L	-	Atomic Adsorption Spectrophotometer
14	Nickel	0.263	mg/L	-	Hach DR 3900 Spectrophotometer, 1 - (2 - Pyridylazo) - 2 - Napthol (PAN) Method
15	Oil and Grease	1	mg/L	-	[a] 5520D, Soxhlet Extraction Method

LAB-FO-024-00 Page 1 of 2

Baseline Water Quality Sampling – Phase 2

PRO LAB
ANALYTICAL LABORATORY

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(26) Ward, South Dagon Tsp, Yangon, Myanmar.
Tel : 09-893 767 424
E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

1 Client Name : Myanmar Survey Research Company Limited
2 Location : Yangon Central Railway Station Building, Mingalartaungnyunt Township
3 Type of Sample : Surface Water SW1 Up-Stream Yangon River
4 Sample No. : 00990/2022
5 Contact Person : Ko Ye Min Aung
6 Phone No. : 09-798256552, 09451245264
7 Date Received : 08.12.2022
8 Date of Test Performed : 08.12.2022
9 Date of Issued : 20.12.2022
10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
16	Phenols	0.08	mg/L	-	[a] 5530D, Direct Photometric Method
17	Total Chlorine	0.14	mg/L	-	Hanna HI97104 - Free & Total Chlorine Photometer
18	Total Nitrogen	9	mg/L	-	Hach DR 3900 Spectrophotometer, Persulfate Digestion Method
19	Total Phosphorus	12.9	mg/L	-	Hach DR 3900 Spectrophotometer, Molybdovanadate with Acid Persulfate Digestion
20	Total Suspended Solids	720	mg/L	-	[a] 2540D, Total Suspended Solids Dried at 103-105°C
21	Turbidity	942	NTU	-	Milwaukee Mi415 - Turbidity Meter
22	Zinc	< 0.01	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA Zincon Method
23	Fecal Coliform	4.45×10^5	cfu/100ml	-	FDA-BAM: Membrane Filtration Method
24	Total Coliform	5.9×10^5	cfu/100ml	-	FDA-BAM: Membrane Filtration Method

Remark:
This certificate is issued only for the receipt of the test sample.
Dispose treated waste water according to state and local regulations.
[a] American Public Health Association, Standard Methods for the Examination of Water and Wastewater.
ND = Not Detected

Tested By
Name : MAY THU NAING
Position : Laboratory Technician
Signature :.....

Approved By
Name : KYAWT KYAWT YIN
Position : Technical Consultant Manager
Signature :.....

LAB-FO-024-00 Page 2 of 2

Baseline Water Quality Sampling – Phase 2

PRO LAB
ANALYTICAL LABORATORY

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(26) Ward, South Dagon Tsp, Yangon, Myanmar.
Tel : 09-893 767 424
E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

1 Client Name : Myanmar Survey Research Company Limited
2 Location : Yangon Central Railway Station Building, Mingalartaungnyunt Township
3 Type of Sample : Surface Water SW2 Down-Stream Yangon River
4 Sample No. : 00991/2022
5 Contact Person : Ko Ye Min Aung
6 Phone No. : 09-798256552, 09451245264
7 Date Received : 08.12.2022
8 Date of Test Performed : 08.12.2022
9 Date of Issued : 20.12.2022
10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	1.3	mg/L	-	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Arsenic	0.01	mg/L	-	Hach Test Kits
3	Biochemical Oxygen Demand	62.18	mg/L	-	[a] 5210B, 5 - Day BOD Test Method
4	Cadmium	< 0.02	mg/L	-	Hach DR 3900 Spectrophotometer, Cadion Method
5	Chemical Oxygen Demand $_{Cr}$	142	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA Reactor Digestion Method
6	Chromium (Hexavalent)	< 0.010	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA 1, 5 - Diphenylcarbohydrazide Method
7	Color	5375	PCU	-	Hanna HI97727 - Color of Water Photometer
8	Copper	4.71	mg/L	-	Hach DR 3900 Spectrophotometer, Bathocuproine Method
9	Cyanide	< 0.002	mg/L	-	Hach DR 3900 Spectrophotometer, Pyridine - Pyrazalone Method
10	Fluoride	< 0.02	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA SPADNS2 Method
11	Free Chlorine	0.04	mg/L	-	Hanna HI97104 - Free & Total Chlorine Photometer
12	Iron	36.63	mg/L	-	[a] 3500-F B, Phenanthroline Method
13	Lead	ND	mg/L	-	Atomic Adsorption Spectrophotometer
14	Nickel	0.286	mg/L	-	Hach DR 3900 Spectrophotometer, 1 - (2 - Pyridylazo) - 2 - Napthol (PAN) Method
15	Oil and Grease	2	mg/L	-	[a] 5520D, Soxhlet Extraction Method

LAB-FO-024-00 Page 1 of 2

Baseline Water Quality Sampling – Phase 2

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LABORATORY ANALYSIS REPORT

1	Client Name	: Myanmar Survey Research Company Limited
2	Location	: Yangon Central Railway Station Building, Mingalartaungnyunt Township
3	Type of Sample	: Surface Water SW2 Down-Stream Yangon River
4	Sample No.	: 00991/2022
5	Contact Person	: Ko Ye Min Aung
6	Phone No.	: 09-798256552, 09451245264
7	Date Received	: 08.12.2022
8	Date of Test Performed	: 08.12.2022
9	Date of Issued	: 20.12.2022
10	Result	:

No.	Parameter	Result	Unit	WHO STD 2018	Method
16	Phenols	0.11	mg/L	-	[a] 5530D, Direct Photometric Method
17	Total Chlorine	0.05	mg/L	-	Hanna HI97104 - Free & Total Chlorine Photometer
18	Total Nitrogen	4	mg/L	-	Hach DR 3900 Spectrophotometer, Persulfate Digestion Method
19	Total Phosphorus	18.6	mg/L	-	Hach DR 3900 Spectrophotometer, Molybdovanadate with Acid Persulfate Digestion
20	Total Suspended Solids	700	mg/L	-	[a] 2540D, Total Suspended Solids Dried at 103-105°C
21	Turbidity	924	NTU	-	Milwaukee Mi415 - Turbidity Meter
22	Zinc	< 0.01	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA Zincon Method
23	Fecal Coliform	1.7×10^5	cfu/100ml	-	FDA-BAM: Membrane Filtration Method
24	Total Coliform	3.8×10^5	cfu/100ml	-	FDA-BAM: Membrane Filtration Method

Remark:
This certificate is issued only for the receipt of the test sample.
Dispose treated waste water according to state and local regulations.
[a] American Public Health Association, Standard Methods for the Examination of Water and Wastewater.
ND = Not Detected

Tested By
Name : MAY THU NAING
Position : Laboratory Technician
Signature :.....

Myanmar Innovation Group Co., Ltd. PRO LAB ANALYTICAL LABORATORY

Approved By
Name : KYAWT KYAWT YIN
Position : Technical Consultant Manager
Signature :.....

LAB-FO-024-00 Page 2 of 2

Baseline Water Quality Sampling – Phase 2

PRO LAB
ANALYTICAL LABORATORY

Myanmar Innovation Group of Co., Ltd
Address : No. (9), Sabae Housing, Pyi Htaung Su Road, (26) Ward, South Dagon Tsp, Yangon, Myanmar.
Tel : 09-893 767 424
E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

1 Client Name : Myanmar Survey Research Company Limited
2 Location : Yangon Central Railway Station Building, Mingalartaungnyunt Township
3 Type of Sample : Surface Water SW3 Down-Stream Harbi Creek
4 Sample No. : 00992/2022
5 Contact Person : Ko Ye Min Aung
6 Phone No. : 09-798256552, 09451245264
7 Date Received : 08.12.2022
8 Date of Test Performed : 09.12.2022
9 Date of Issued : 20.12.2022
10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	7.4	mg/L	-	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Arsenic	0.01	mg/L	-	Hach Test Kits
3	Biochemical Oxygen Demand	19.40	mg/L	-	[a] 5210B, 5 - Day BOD Test Method
4	Cadmium	< 0.02	mg/L	-	Hach DR 3900 Spectrophotometer, Cadion Method
5	Chemical Oxygen Demand $_{Cr}$	38	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA Reactor Digestion Method
6	Chromium (Hexavalent)	< 0.010	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA 1, 5 - Diphenylcarbohydrazide Method
7	Color	640	PCU	-	Hanna HI97727 - Color of Water Photometer
8	Copper	0.591	mg/L	-	Hach DR 3900 Spectrophotometer, Bathocuproine Method
9	Cyanide	< 0.002	mg/L	-	Hach DR 3900 Spectrophotometer, Pyridine - Pyrazalone Method
10	Fluoride	0.17	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA SPADNS2 Method
11	Free Chlorine	0.08	mg/L	-	Hanna HI97104 - Free & Total Chlorine Photometer
12	Iron	2.25	mg/L	-	[a] 3500-F B, Phenanthroline Method
13	Lead	0.1	mg/L	-	Atomic Adsorption Spectrophotometer
14	Nickel	0.049	mg/L	-	Hach DR 3900 Spectrophotometer, 1 - (2 - Pyridylazo) - 2 - Napthol (PAN) Method
15	Oil and Grease	5	mg/L	-	[a] 5520D, Soxhlet Extraction Method

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Baseline Water Quality Sampling – Phase 2

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LABORATORY ANALYSIS REPORT

1 Client Name : Myanmar Survey Research Company Limited
2 Location : Yangon Central Railway Station Building, Mingalartaungnyunt Township
3 Type of Sample : Surface Water SW3 Down-Stream Harbi Creek
4 Sample No. : 00992/2022
5 Contact Person : Ko Ye Min Aung
6 Phone No. : 09-798256552, 09451245264
7 Date Received : 08.12.2022
8 Date of Test Performed : 09.12.2022
9 Date of Issued : 20.12.2022
10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
16	Phenols	0.04	mg/L	-	[a] 5530D, Direct Photometric Method
17	Total Chlorine	0.11	mg/L	-	Hanna HI97104 - Free & Total Chlorine Photometer
18	Total Nitrogen	5	mg/L	-	Hach DR 3900 Spectrophotometer, Persulfate Digestion Method
19	Total Phosphorus	2.3	mg/L	-	Hach DR 3900 Spectrophotometer, Molybdovanadate with Acid Persulfate Digestion
20	Total Suspended Solids	40	mg/L	-	[a] 2540D, Total Suspended Solids Dried at 103-105°C
21	Turbidity	46.59	NTU	-	Milwaukee Mi415 - Turbidity Meter
22	Zinc	0.06	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA Zincon Method
23	Fecal Coliform	1.0×10^5	cfu/100ml	-	FDA-BAM: Membrane Filtration Method
24	Total Coliform	1.1×10^5	cfu/100ml	-	FDA-BAM: Membrane Filtration Method

Remark:
This certificate is issued only for the receipt of the test sample.
Dispose treated waste water according to state and local regulations.
[a] American Public Health Association, Standard Methods for the Examination of Water and Wastewater.

Tested By
Name : MAY THU NAING
Position : Laboratory Technician
Signature :.....

Approved By
Name : KYAWT KYAWT YIN
Position : Technical Consultant Manager
Signature :.....

LAB-FO-024-00 Page 2 of 2

Baseline Water Quality Sampling – Phase 2

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Tel : 09-893 767 424
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LABORATORY ANALYSIS REPORT

1 Client Name : Myanmar Survey Research Company Limited
2 Location : Yangon Central Railway Station Building, Mingalartaungnyunt Township
3 Type of Sample : Surface Water SW4 Up-Stream Harbi Creek
4 Sample No. : 00993/2022
5 Contact Person : Ko Ye Min Aung
6 Phone No. : 09-798256552, 09451245264
7 Date Received : 08.12.2022
8 Date of Test Performed : 09.12.2022
9 Date of Issued : 20.12.2022
10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	18.9	mg/L	-	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Arsenic	0.01	mg/L	-	Hach Test Kits
3	Biochemical Oxygen Demand	47.62	mg/L	-	(a) 5210B, 5 - Day BOD Test Method
4	Cadmium	< 0.02	mg/L	-	Hach DR 3900 Spectrophotometer, Cadion Method
5	Chemical Oxygen Demand $_{Cr}$	74	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA Reactor Digestion Method
6	Chromium (Hexavalent)	< 0.010	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA 1, 5 - Diphenylcarbohydrazide Method
7	Color	1245	PCU	-	Hanna HI97727 - Color of Water Photometer
8	Copper	0.968	mg/L	-	Hach DR 3900 Spectrophotometer, Bathocuproine Method
9	Cyanide	< 0.002	mg/L	-	Hach DR 3900 Spectrophotometer, Pyridine - Pyrazalone Method
10	Fluoride	0.07	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA SPADNS2 Method
11	Free Chlorine	0.03	mg/L	-	Hanna HI97104 - Free & Total Chlorine Photometer
12	Iron	4.08	mg/L	-	(a) 3500-F B, Phenanthroline Method
13	Lead	ND	mg/L	-	Atomic Adsorption Spectrophotometer
14	Nickel	0.091	mg/L	-	Hach DR 3900 Spectrophotometer, 1 - (2 - Pyridylazo) - 2 - Napthol (PAN) Method
15	Oil and Grease	2	mg/L	-	(a) 5520D, Soxhlet Extraction Method

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Baseline Water Quality Sampling – Phase 2

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2 Location : Yangon Central Railway Station Building, Mingalartaungnyunt Township
3 Type of Sample : Surface Water SW4 Up-Stream Harbi Creek
4 Sample No. : 00993/2022
5 Contact Person : Ko Ye Min Aung
6 Phone No. : 09-798256552, 09451245264
7 Date Received : 08.12.2022
8 Date of Test Performed : 09.12.2022
9 Date of Issued : 20.12.2022
10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
16	Phenols	0.08	mg/L	-	[a] 5530D, Direct Photometric Method
17	Total Chlorine	0.14	mg/L	-	Hanna HI97104 - Free & Total Chlorine Photometer
18	Total Nitrogen	20	mg/L	-	Hach DR 3900 Spectrophotometer, Persulfate Digestion Method
19	Total Phosphorus	6.1	mg/L	-	Hach DR 3900 Spectrophotometer, Molybdovanadate with Acid Persulfate Digestion
20	Total Suspended Solids	Nil	mg/L	-	[a] 2540D, Total Suspended Solids Dried at 103-105°C
21	Turbidity	105	NTU	-	Milwaukee Mi415 - Turbidity Meter
22	Zinc	0.04	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA Zincon Method
23	Fecal Coliform	6.0×10^5	cfu/100ml	-	FDA-BAM: Membrane Filtration Method
24	Total Coliform	12.0×10^5	cfu/100ml	-	FDA-BAM: Membrane Filtration Method

Remark:
This certificate is issued only for the receipt of the test sample.
Dispose treated waste water according to state and local regulations.
[a] American Public Health Association, Standard Methods for the Examination of Water and Wastewater.
ND = Not Detected

Tested By
Name : MAY THU NAING
Position : Laboratory Technician
Signature :.....

Approved By
Name : KYAWT KYAWT YIN
Position : Technical Consultant Manager
Signature :.....

LAB-FO-024-00 Page 2 of 2

Baseline Water Quality Sampling – Phase 2

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Tel : 09-893 767 424
E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

1 Client Name : Myanmar Survey Research Company Limited
2 Location : Yangon Central Railway Station Building, Mingalartaungnyunt Township
3 Type of Sample : Power Plant Effluent Water PE
4 Sample No. : 00994/2022
5 Contact Person : Ko Ye Min Aung
6 Phone No. : 09-798256552, 09451245264
7 Date Received : 08.12.2022
8 Date of Test Performed : 09.12.2022
9 Date of Issued : 20.12.2022
10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	Ammonia	< 0.4	mg/L	-	Hach DR 3900 Spectrophotometer, Salicylate Method
2	Arsenic	0.01	mg/L	-	Hach Test Kits
3	Biochemical Oxygen Demand	2.07	mg/L	-	(a) 5210B, 5 - Day BOD Test Method
4	Cadmium	< 0.02	mg/L	-	Hach DR 3900 Spectrophotometer, Cadion Method
5	Chemical Oxygen Demand $_{Cr}$	5	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA Reactor Digestion Method
6	Chromium (Hexavalent)	< 0.010	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA 1, 5 - Diphenylcarbohydrazide Method
7	Color	20	PCU	-	Hanna HI97727 - Color of Water Photometer
8	Copper	< 0.1	mg/L	-	Hach DR 3900 Spectrophotometer, Bathocuproine Method
9	Cyanide	0.002	mg/L	-	Hach DR 3900 Spectrophotometer, Pyridine - Pyrazalone Method
10	Fluoride	0.33	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA SPADNS2 Method
11	Free Chlorine	Nil	mg/L	-	Hanna HI97104 - Free & Total Chlorine Photometer
12	Iron	Nil	mg/L	-	(a) 3500-F B, Phenanthroline Method
13	Lead	ND	mg/L	-	Atomic Adsorption Spectrophotometer
14	Nickel	0.013	mg/L	-	Hach DR 3900 Spectrophotometer, 1 - (2 - Pyridylazo) - 2 - Napthol (PAN) Method
15	Oil and Grease	3	mg/L	-	(a) 5520D, Soxhlet Extraction Method

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Baseline Water Quality Sampling – Phase 2

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Tel : 09-893 767 424
E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

1 Client Name : Myanmar Survey Research Company Limited
2 Location : Yangon Central Railway Station Building, Mingalartaungnyunt Township
3 Type of Sample : Power Plant Effluent Water PE
4 Sample No. : 00994/2022
5 Contact Person : Ko Ye Min Aung
6 Phone No. : 09-798256552, 09451245264
7 Date Received : 08.12.2022
8 Date of Test Performed : 09.12.2022
9 Date of Issued : 20.12.2022
10 Result :

No.	Parameter	Result	Unit	WHO STD 2018	Method
16	Phenols	0.05	mg/L	-	[a] 5530D, Direct Photometric Method
17	Total Chlorine	0.01	mg/L	-	Hanna HI97104 - Free & Total Chlorine Photometer
18	Total Nitrogen	< 2	mg/L	-	Hach DR 3900 Spectrophotometer, Persulfate Digestion Method
19	Total Phosphorus	0.7	mg/L	-	Hach DR 3900 Spectrophotometer, Molybdovanadate with Acid Persulfate Digestion
20	Total Suspended Solids	Nil	mg/L	-	[a] 2540D, Total Suspended Solids Dried at 103-105°C
21	Turbidity	1.90	NTU	-	Milwaukee Mi415 - Turbidity Meter
22	Zinc	0.08	mg/L	-	Hach DR 3900 Spectrophotometer, USEPA Zincon Method

Remark:
This certificate is issued only for the receipt of the test sample.
Dispose treated waste water according to state and local regulations.
[a] American Public Health Association, Standard Methods for the Examination of Water and Wastewater.
ND = Not Detected

Tested By
Name : MAY THU NAING
Position : Laboratory Technician
Signature :.....

Approved By
Name : KYAWT KYAWT YIN
Position : Technical Consultant Manager
Signature :.....

LAB-FO-024-00 Page 2 of 2

Baseline Water Quality Sampling – Phase 2

PRO LAB
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(26) Ward, South Dagon Tsp, Yangon, Myanmar.
Tel : 09-893 767 424
E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

1	Client Name	: Myanmar Survey Research Company Limited
2	Location	: Yangon Central Railway Station Building, Mingalartaungnyunt Township
3	Type of Sample	: Surface Water SW1 Up-Stream Yangon River
4	Sample No.	: 00990/2022
5	Contact Person	: Ko Ye Min Aung
6	Phone No.	: 09-798256552, 09451245264
7	Date Received	: 08.12.2022
8	Date of Test Performed	: 08.12.2022
9	Date of Issued	: 20.12.2022
10	Result	:

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	pH	7.18	-	-	Hanna HI2211 - pH & Temperature Meter

Remark:
This certificate is issued only for the receipt of the test sample.
Dispose treated waste water according to state and local regulations.

Tested By
Name : MAY THU NAING
Position : Laboratory Technician
Signature :.....

Approved By
Name : KYAWT KYAWT YIN
Position : Technical Consultant Manager
Signature :.....

Myanmar Innovation Group Co., Ltd. PRO LAB ANALYTICAL LABORATORY

LAB-FO-024-00

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(26) Ward, South Dagon Tsp, Yangon, Myanmar.
Tel : 09-893 767 424
E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

1	Client Name	: Myanmar Survey Research Company Limited
2	Location	: Yangon Central Railway Station Building, Mingalartaungnyunt Township
3	Type of Sample	: Surface Water SW2 Down-Stream Yangon River
4	Sample No.	: 00991/2022
5	Contact Person	: Ko Ye Min Aung
6	Phone No.	: 09-798256552, 09451245264
7	Date Received	: 08.12.2022
8	Date of Test Performed	: 08.12.2022
9	Date of Issued	: 20.12.2022
10	Result	:

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	pH	6.83	-	-	Hanna HI2211 - pH & Temperature Meter

Remark:
This certificate is issued only for the receipt of the test sample.
Dispose treated waste water according to state and local regulations.

Tested By
Name : MAY THU NAING
Position : Laboratory Technician
Signature :.....

Approved By
Name : KYAWT KYAWT YIN
Position : Technical Consultant Manager
Signature :.....

Myanmar Innovation Group Co., Ltd. PRO LAB ANALYTICAL LABORATORY

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Tel : 09-893 767 424
E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

1	Client Name	: Myanmar Survey Research Company Limited
2	Location	: Yangon Central Railway Station Building, Mingalartaungnyunt Township
3	Type of Sample	: Surface Water SW3 Down-Stream Harbi Creek
4	Sample No.	: 00992/2022
5	Contact Person	: Ko Ye Min Aung
6	Phone No.	: 09-798256552, 09451245264
7	Date Received	: 08.12.2022
8	Date of Test Performed	: 09.12.2022
9	Date of Issued	: 20.12.2022
10	Result	:

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	pH	7.24	-	-	Hanna HI2211 - pH & Temperature Meter

Remark:
This certificate is issued only for the receipt of the test sample.
Dispose treated waste water according to state and local regulations.

Tested By
Name : MAY THU NAING
Position : Laboratory Technician
Signature :.....

Approved By
Name : KYAWT KYAWT YIN
Position : Technical Consultant Manager
Signature :.....

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LABORATORY ANALYSIS REPORT

1	Client Name	: Myanmar Survey Research Company Limited
2	Location	: Yangon Central Railway Station Building, Mingalartaungnyunt Township
3	Type of Sample	: Surface Water SW4 Up-Stream Harbi Creek
4	Sample No.	: 00993/2022
5	Contact Person	: Ko Ye Min Aung
6	Phone No.	: 09-798256552, 09451245264
7	Date Received	: 08.12.2022
8	Date of Test Performed	: 09.12.2022
9	Date of Issued	: 20.12.2022
10	Result	:

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	pH	6.82	-	-	Hanna HI2211 - pH & Temperature Meter

Remark:
This certificate is issued only for the receipt of the test sample.
Dispose treated waste water according to state and local regulations.

Tested By
Name : MAY THU NAING
Position : Laboratory Technician
Signature :.....

Approved By
Name : KYAWT KYAWT YIN
Position : Technical Consultant Manager
Signature :.....

Myanmar Innovation Group Co., Ltd. PRO LAB ANALYTICAL LABORATORY

LAB-FO-024-00

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Tel : 09-893 767 424
E-mail : info@prolabmyanmar.com

LABORATORY ANALYSIS REPORT

1	Client Name	: Myanmar Survey Research Company Limited
2	Location	: Yangon Central Railway Station Building, Mingalartaungnyunt Township
3	Type of Sample	: Power Plant Effluent Water PE
4	Sample No.	: 00994/2022
5	Contact Person	: Ko Ye Min Aung
6	Phone No.	: 09-798256552, 09451245264
7	Date Received	: 08.12.2022
8	Date of Test Performed	: 09.12.2022
9	Date of Issued	: 20.12.2022
10	Result	:

No.	Parameter	Result	Unit	WHO STD 2018	Method
1	pH	8.11	-	-	Hanna HI2211 - pH & Temperature Meter

Remark:
This certificate is issued only for the receipt of the test sample.
Dispose treated waste water according to state and local regulations.

Tested By
Name : MAY THU NAING
Position : Laboratory Technician
Signature :.....

Approved By
Name : KYAWT KYAWT YIN
Position : Technical Consultant Manager
Signature :.....

Myanmar Innovation Group Co., Ltd. PRO LAB ANALYTICAL LABORATORY

LAB-FO-024-00

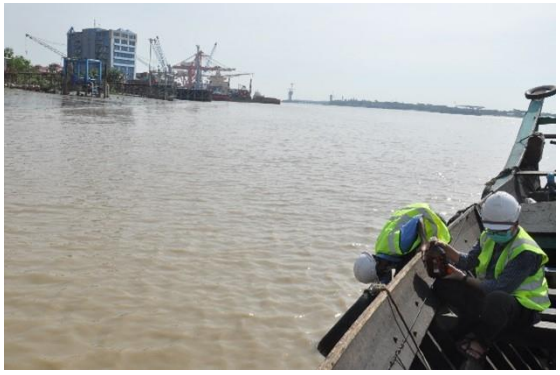
Appendix – 8: Photo Logs

Photos: Photo Documentation on Site Inspection (2020 Aug) During Construction Phase

Photos: Photo Documentation on Site Inspection (2020 Aug) During Construction Phase

Photos: Photo Documentation for Habitat at Project Site and Vicinity

Photos: Photo Snaps During Baseline Environmental Data Collection



Photos: Health and Safety Supplies Arrangement and Provisions

Photos: Health and Safety Supplies Arrangement and Provisions	
	
	
	

Appendix – 9: Key Informant Interview Questions

လူမှုစီးပွားထိခိုက်မှုဆန်းစစ်ခြင်း စစ်တမ်းမေးခွန်း (Key Informant များအတွက်)

(၁) MSR ကုမ္ပဏီမှ ESIA လုပ်ငန်းအတွက် လာရောက်ရခြင်းအကြောင်းကိုရှင်းပြပြီး မိတ်ဆက်စကား ပြောကြားခြင်း။

(၂) လူကြီးမင်း၏အမည်၊ အလုပ်အကိုင်၊ ရာထူးနှင့် ဖုန်းနံပါတ်တို့ကို သိပါရစေ။

(၃) လူကြီးမင်းတို့ ဒီရပ်ကွက်မှာနေတာ(သို့မဟုတ်)တာဝန်ကျနေတာ ဘယ်လောက်ကြာပါပြီလဲ။

(၄) လူကြီးမင်းတို့ရပ်ကွက်အနီးပတ်ဝန်းကျင်တွင် အလုံဂတ်စ်တာဘိုင်စက်ရုံအနီးတွင် ဂတ်စ်တာဘိုင်စက်ရုံ အသစ်တစ်ခု တည်ဆောက်လည်ပတ်နေတာကိုသိပါသလား။ သိလျှင် ထိုစီမံကိန်းအကြောင်းကို သိသလောက် ပြောပြပါ။

(၅) မသိသေးလျှင် ယခုဆောင်ရွက်သည့် စီမံကိန်းအကြောင်းကို အကျဉ်းချုပ်ရှင်းပြခြင်း။

(၆) မိမိတို့ကုမ္ပဏီသည် တတိယအဖွဲ့အစည်းဖြစ်ကြောင်းနှင့် ESIA လုပ်ငန်းဆောင်ရွက်မှု အဆင့်ဆင့်ကို ရှင်းပြပြီး အသိပေးခြင်း။

(၇) ယခုတည်ဆောက်မည့် စက်ရုံစီမံကိန်းအပေါ်မှာ လူကြီးမင်းတို့၏အမြင်သဘောထား ဘယ်လိုရှိပါသလဲ။

(က) ဒီဂတ်စ်တာဘိုင်စက်ရုံသစ်တည်ဆောက်ခြင်းကြောင့် ဒေသခံပြည်သူများ၏ မြေယာတွေကို အသိမ်းခံရတာကိုကြားသိရပါသလား။

(ခ) ဒေသခံပြည်သူများ၏ စီးပွားရေးလုပ်ငန်းများအပေါ် ကောင်းကျိုး၊ ဆိုးကျိုး သက်ရောက်မှုတွေ ရှိတာကိုတွေ့ရပါသလား။ ထိခိုက်နစ်နာမှုတွေရှိနိုင်မယ်လို့ကော ထင်ပါသလား။

(ဂ) ဒေသခံပြည်သူများ၏ ကျန်းမာရေးအပေါ် ကောင်းကျိုး၊ ဆိုးကျိုး သက်ရောက်မှုတွေရှိတာကိုတွေ့ရပါသလား။ ထိခိုက်နစ်နာမှုတွေရှိနိုင်မယ်လို့ကော ထင်ပါသလား။

(ဃ) ဒေသခံပြည်သူများ၏ ပညာရေးနှင့်လူမှုရေးများအပေါ် ကောင်းကျိုး၊ဆိုးကျိုးသက်ရောက်မှုတွေ ရှိတာကိုတွေ့ရပါသလား။ ထိခိုက်နစ်နာမှုတွေရှိနိုင်မယ်လို့ကော ထင်ပါသလား။

(၈) အများပြည်သူနှင့်တွေ့ဆုံ၍ စီမံကိန်းအကြောင်း အသေးစိတ်ရှင်းလင်းတင်ပြသည့်ပွဲ ပြုလုပ်ရာတွင် တက်ရောက်ပြီး လူကြီးမင်းတို့အနေဖြင့် ထပ်မံအကြံပြုပေးနိုင်ကြောင်းဖိတ်ခေါ်ခြင်း။

(၉) နှုတ်ဆက်ကျေးဇူးတင်စကားပြောကြားခြင်း။

Appendix – 10: Gas Turbine Fuel Gases Specification

GE Energy Products – Europe

OPERATION AND MAINTENANCE MANUAL

COMPONENT AND SYSTEM LITERATURE

EQUIPMENT DEFINITION

GE DEVICE	:	
DESIGNATION	:	GAS TURBINE FUEL GASES SPECIFICATION
SUPPLIER	:	
TYPE	:	
LITERATURE REFERENCE	:	GEI 41 040 G

GEI 41040G
Revised, January 2002

GE Power Systems
Gas Turbine

Specification for Fuel Gases for Combustion in Heavy-Duty Gas Turbines

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes the matter should be referred to the GE Company.

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I. INTRODUCTION

General Electric heavy-duty gas turbines have the ability to burn a wide classification of gaseous fuels as shown in Table 1. The properties of these gases can vary significantly due to the relative concentrations of the reactant and inert constituents. In order to protect the gas turbine and to burn these fuels in an efficient and trouble free manner, allowable ranges are defined in this specification for physical properties, constituents and contaminants.

Table 2a specifies the allowable limits for the fuel properties and constituents and Table 2b lists the limitation on contaminants. These tables provide a screen for fuels that are acceptable for all frame sizes and combustor types. Fuels that fall outside of these limits may be acceptable for specific applications e.g. a high hydrogen fuel can be used with standard combustors in most cases. Contact GE for further evaluation of these fuels.

Table 3 identifies the acceptable test methods to be used for determining gas fuel properties shown in Tables 2a and 2b.

TABLE 1
FUEL GAS CLASSIFICATION

FUEL	LHV Btu/scft	MAJOR COMPONENTS
Natural Gas and Liquefied Natural Gas	800-200	Methane
Liquefied Petroleum Gas	2300-3200	Propane, Butane
Gasification Gases *-Air Blown*	100-150	Carbon Monoxide, Hydrogen, Nitrogen, Water Vapor
-Oxygen Blown	200-400	Carbon Monoxide, Hydrogen, Water Vapor
Process Gases	300-1000	Methane, Hydrogen, Carbon Monoxide, Carbon Dioxide

TABLE 2a
GAS FUEL SPECIFICATION (see notes 1 and 2)

FUEL PROPERTIES	MAX	MIN	NOTES
Gas Fuel Pressure	Varies with unit and combustor type	Varies with unit and combustor type	See note 3
Gas Fuel Temperature, °F	see note 4	Varies with gas pressure	See note 4
Lower Heating Value, Btu/scft	None	100-300	See note 5
Modified Wobbe Index (MWI)			See note 6
- Absolute Limits	54	40	See note 7
- Range Within Limits	+5%	-5%	See note 8
Flammability Ratio	See Note 9	2.2:1	Rich:Lean Fuel/Air Ratio volume basis. See Note 10
Constituent Limits, mole %			
Methane	100	85	% of reactant species
Ethane	15	0	% of reactant species
Propane	15	0	% of reactant species
Butane + higher paraffins (C4+)	5	0	% of reactant species
Hydrogen	Trace	0	% of reactant species
Carbon Monoxide	Trace	0	% of reactant species
Oxygen	Trace	0	% of reactant species
Total Inerts (N2+CO2+Ar)	15	0	% of total (reactants + inerts).
Aromatics (Benzene, Toluene etc.)	Report	0	See Note 11
Sulfur	Report	0	See Note 12

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Table 2b
Allowable Gas Fuel Contaminant Levels

	Turbine Inlet Limit, Xe ppbw		Fuel Equivalent Limit, XFe, See notes 13 ppmw			
	Machine Model		Machine Model			
	MS3000 MS5000 B, E and F-Class	FB, H-CLASS	MS3000 MS5000 B, E and F-Class			FB, H-Class
			Turbine inlet flow/fuel flow (E/F)			The limits for Pb, V, Ca, Mg for FB,
Trace Metals			50	12	4	H–Class machines
Lead (Pb)	20	20	1.00	.240	.080	are identical to the
Vanadium (V)	10	10	.5	.120	.040	limits for other
Calcium (Ca)	40	40	2.0	.480	.160	machines.
Magnesium (Mg)	40	40	2.0	.480	.160	
Sodium+Potassium see Note 14						
(Na/K)=28	20	3	1.00	.24	.080	For Alkali metal
(Na/K)=3	10	3	.50	.12	.040	limits (Na and K)
(Na/K)=<1	6	3	.30	.072	.024	see GEI 107230(1)
Particulates see note 15						
Total	600	400	30	7.2	2.4	Consult GE For
Above 10 Microns	6	4	0.3	.072	.024	particulate limits
Liquids No Liquids allowed, gas must be superheated. See note 16						

Fuel Property and Contaminant Notes:

1. All fuel properties must meet the requirements from ignition to base load unless otherwise stated.
2. Values and limits apply at the inlet of the gas fuel control module, typically the purchaser's connection, FG1.
3. Minimum and maximum gas fuel supply pressure requirements are furnished by GE as part of the unit proposal.
4. The minimum fuel gas temperature must meet the required superheat as described in section III–C. Separate requirements are included for hydrocarbon and moisture superheat. The maximum allowable fuel temperature is defined in GEK 4189(2).
5. Heating value ranges shown are provided as guidelines. Specific fuel analysis must be furnished to GE for proper analysis. (See section III–A)

6. See section III–B for definition of Modified Wobbe Index (MWI).

7. The upper and lower limits for MWI shown are what can be accommodated within the standard dry low NOx fuel system designs. Fuels outside of this range may need additional design and development effort. Performance fuel heating may be restricted on fuel with high inert content to stay above the minimum MWI limit.

8. Variations of MWI greater than + 5% or –5% may be acceptable for some applications, (i.e. on units that incorporate gas fuel heating). GE must analyze and approve all conditions where the 5% variation is to be exceeded.

9. There is no defined maximum flammability ratio limit. Fuel with flammability ratio significantly larger than those of natural gas may require a start–up fuel.

10. Candidate fuels which do not meet these limits should be referred to GE for further review. All fuels will be reviewed by GE on a case by case basis. (see section III–G)

11. When fuel heating for thermal efficiency improvements is utilized (e.g. T_{gas} > 300°F) there is a possibility of gum formation if excess aromatics are present. Contact GE for further information.

12. The quantity of sulfur in gas fuels not limited by this specification. Experience has shown that fuel sulfur levels up to 1% by volume do not significantly affect oxidation/corrosion rates. Hot corrosion of hot gas path parts is controlled by the specified trace metal limits. Sulfur levels shall be considered when addressing HRSG Corrosion, Selective Catalytic Reduction (SCR) Deposition, Exhaust Emissions, System Material Requirements, Elemental Sulfur Deposition and Iron Sulfide. (refer to Section IV–D)

13. The contamination limits identified represent the total allowable limit at the inlet to the turbine section. These limits will be reduced if comparable contaminants are present in the compressor inlet air and combustion steam/water injection. Consult with GE for limits for specific applications.

14. Sodium and potassium, from salt water, are the only corrosive trace metal contaminants normally found in natural gases. Na/K =28 is nominal sea salt ratio. Other trace metal contaminants may be found in Gasification and Process Gases. GE will review these on a case-by-case basis.

15. The fuel gas delivery system shall be designed to prevent the generation or the admittance of solid particulate to the gas turbine gas fuel system. This shall include but not be limited to particulate filtration and non-corrosive (i.e. stainless steel) piping from the particulate filtration to the inlet of the gas turbine equipment. Fuel gas piping systems shall be properly cleaned/flushed and maintained prior to gas turbine operation. (See section IV–A)

16. The fuel gas supply shall be 100% free of liquids. Admission of liquids can result in combustion and/or hot gas path component damage. (See section III–C)

TABLE 3
TEST METHODS FOR GASEOUS FUELS

PROPERTY	METHOD
Gas Sampling Procedure	GPA 2166(3)
Gas Composition to C6+ (gas chromatography)	ASTM D 1945
Extended Gas Composition to C14	GPA 2286(4)
Heating Value	ASTM D 3588
Specific Gravity	ASTM D 3588
Compressibility Factor	ASTM D 3588
Dew Point (see Test Method note 1)	ASTM D 1142
Sulfur (see Test Method note 2)	ASTM D 3246

Test Method Notes:

1. Hydrocarbon and water dew points shall be determined by direct dew point measurement (Chilled Mirror Device). If dew point cannot be measured, an extended gas analysis, which identifies hydrocarbon components from C1 through C14, shall be performed. This analysis must provide an accuracy of greater than 10 ppmv. A standard gas analysis to C6+ is normally not acceptable for dew point calculation unless it is known that heavier hydrocarbons are not present, as is most often the case with liquefied natural gases.

2. This test method will *not* detect the presence of condensable sulfur vapor. Specialized filtration equipment is required to measure sulfur at concentrations present in vapor form. Contact GE for more information.

II. FUEL GAS CLASSIFICATION

A. Natural Gas, Liquefied Natural Gas (LNG) And Liquefied Petroleum Gas (LPG)

Natural gases are predominantly methane with much smaller quantities of the slightly heavier hydrocarbons such as ethane, propane and butane. Liquefied petroleum gas is propane and/or butane with traces of heavier hydrocarbons.

1. Natural Gas

   Natural gases normally fall within the calorific heating value range of 800 to 1200 Btu per standard cubic foot. Actual calorific heating values are dependent on the percentages of hydrocarbons and inert gases contained in the gas. Natural gases are found in and extracted from underground reservoirs. These "raw gases" may contain varying degrees of nitrogen, carbon dioxide, hydrogen sulfide, and contain contaminants such as salt water, sand and dirt. Processing by the gas supplier normally reduces and/or removes these constituents and contaminants prior to distribution. A gas analysis must be performed to ensure that the fuel supply to the gas turbine meets the requirements of this specification.

2. Liquefied Natural Gas (LNG)

Liquefied natural gas is produced by drying, compressing, cooling and expanding natural gas to approximately -260° F at 14.7 psia. The product is transported as a liquid and delivered as a gas after pressurizing and heating to ambient temperature. The composition is free of inerts and moisture and can be treated as a high quality natural gas. LNG can pick up moisture that is present in the pipeline but it is not a source of the moisture.

The hydrocarbon dew point is typically less than -10° F at 500 psia but, depending on the processing steps and tankage size, the dew point may increase if the boil–off is continuously extracted between deliveries. Cooling and recompression of the boil–off will avoid this potential problem. The expected range in component concentrations should be obtained from the gas supplier to determine the potential change in dew point.

3. Liquefied Petroleum Gases

The heating values of Liquefied Petroleum Gases (LPGs) normally fall between 2300 and 3200 Btu/scft (LHV). Based on their high commercial value, these fuels are normally utilized as a back-up fuel to the primary gas fuel for gas turbines. Since LPGs are normally stored in a liquid state, it is critical that the vaporization process and gas supply system maintains the fuel at a temperature above the minimum required superheat value. Fuel heating and heat tracing are required to meet these requirements.

B. Gasification Fuels

Gasification fuels are produced by either an oxygen blown or air blown gasification process and are formed using coal, petroleum coke or heavy liquids as a feedstock. In general, the heating values of gasification fuel are substantially lower than other fuel gases. The reduced heating value of gasification fuels result in the effective areas of the fuel nozzles being larger than those utilized for natural gas fuels.

1. Oxygen Blown Gasification

The heating values of gases produced by oxygen blown gasification fall in the range of 200 to 400 Btu/scft. The hydrogen (H_2) content of these fuels are normally above 30% by volume and have H_2/CO mole ratio between 0.5 to 0.8. Oxygen blown gasification fuels are often mixed with steam for thermal NOx control, cycle efficiency improvement and/or power augmentation. When utilized, the steam is injected into the combustor by an independent passage. Due to the high hydrogen content of these fuels, oxygen blown gasification fuels are normally not suitable for Dry Low NO_x (DLN) applications (see Table 2a). The high flame speeds resulting from high hydrogen fuels can result in flashback or primary zone re-ignition on DLN pre-mixed combustion systems. Utilization of these fuels requires evaluation by GE.

2. Air Blown Gasification

Gases produced by air blown gasification normally have heating values between 100 and 150 Btu/scft. The H_2 content of these fuels can range from 8% to 20% by volume and have a H_2/CO mole ratio 0.3 to 3:1. The use and treatment of these fuels is similar to that identified for oxygen blown gasification.

Gasification fuels provide a significant fraction of the total turbine mass flow rate. With oxygen blown fuels the diluent addition (typically nitrogen) also assists with NO_x control. Careful integration of the gas turbine with the gasification plant is required to assure an operable system. Due to

the low volumetric heating value of both oxygen an air blown gases, a special fuel system and fuel nozzles are required.

C. Process Gases

Many chemical processes generate surplus gases that may be utilized as fuel for gas turbines. (e.g. tail or refinery gases). These gases often consist of methane, hydrogen, carbon monoxide, and carbon dioxide that are normally byproducts of petrochemical processes. The hydrogen and carbon monoxide content, these fuels result in a high rich-to-lean flammability limit. These types of fuels often require inerting and purging of the gas turbine gas fuel system upon unit shutdown or a transfer to more a more conventional fuel. When process gas fuels have extreme flammability limits such that the fuel will auto ignite at turbine exhaust conditions, a more "conventional" start-up fuel is required. Additional process gases that are utilized as gas turbine fuels are byproducts of steel production. These are:

1. Blast Furnace Gases

   Blast Furnace Gases (BFGs), alone, have heating values below the minimal allowable limits. These gases must be blended with other fuels such as coke oven gas, natural gas or hydrocarbons such as propane or butane to raise the heating value above the required lower limit.

2. Coke Oven Gases

   Coke oven gases are high in hydrogen and methane and may be used as fuel for non-DLN combustion systems. These fuels often contain trace amounts of heavy hydrocarbons, which may lead to carbon buildup on the fuel nozzles. The heavy hydrocarbons must be "scrubbed" or removed from the fuel prior to delivery to the gas turbine.

3. COREX Gases

   COREX gases are similar to oxygen blown gasified fuels, and may be treated as such. They are usually lower in H_2 content and have heating values lower than oxygen blown gasified fuels. Further combustion related guidelines may be found in Bureau of Mines Circulars 503[5] and 622[6].

III. FUEL PROPERTIES

A. Heating Values

The heat of combustion, heating value or calorific value of a fuel is the amount of energy generated by the complete combustion of a unit mass of fuel. The US system of measurement uses British thermal units (Btu) per pound or Btu per standard cubic foot when expressed on a volume basis. The heating value of a gas fuel may be determined experimentally using a calorimeter in which fuel is burned in the presence of air at constant pressure. The products are allowed to cool to the initial temperature and a measurement is made of the energy released during complete combustion. All fuels that contain hydrogen release water vapor as a product of combustion, which is subsequently condensed in the calorimeter. The resulting measurement of the heat released is the higher heating value (HHV), also known as the gross heating value, and includes the heat of vaporization of water. The lower heating value (LHV), also known as the net heating value, is calculated by subtracting the heat of vaporization of water from the measured HHV and assumes that all products of combustion including water remain in the gaseous phase. Both the HHV and LHV may also be calculated from the gas compositional analysis using the procedure described in ASTM D 3588. For most gas fuels, a standard gas analysis to C6+ is adequate for determination of heating value, but an extended C14 analysis[4] may also be used if available. Gas

turbines do not operate with condensing exhaust systems and it is common gas turbine industry practice to utilize the LHV when calculating the overall cycle thermal efficiency.

B. Modified Wobbe Index (MWI)

Gas turbines can operate with fuel gases having a very wide range of heating values, but the amount of variation that a specific fuel system design can accommodate is limited. The fuel nozzles are designed to operate within a fixed range of pressure ratios and changes in heating value are accommodated for by increasing or decreasing the fuel nozzle area or gas temperature. A measure of the interchangeability of gas fuels for a given system design is the MWI[7]. This term is used as a relative measure of the energy injected to the combustor at a fixed pressure ratio and is calculated using the fuel lower heating value, the specific gravity with respect to air and the fuel temperature. The mathematical definition is as follows:

$$\text{Modified Wobbe Index} = \frac{LHV}{\sqrt{SGgas \; x \; Tgas}} \qquad (1)$$

This is equivalent to:

$$\text{Modified Wobbe Index} = \frac{LHV}{\sqrt{\frac{MWgas}{28.96} \; x \; Tgas}} \qquad (2)$$

Where:

LHV = Lower Heating Value of the Gas Fuel (Btu/scf)
SG_{gas} = Specific Gravity of the Gas Fuel relative to Air
MW_{gas} = Molecular Weight of the Gas Fuel
T_{gas}= Absolute Temperature of the Gas Fuel (°Rankine)
28.96 = Molecular Weight of Dry Air

The allowable MWI range is established to ensure that required fuel nozzle pressure ratios are maintained during all combustion/turbine modes of operation. When multiple gas fuels are supplied and/or if variable fuel temperatures result in a MWI that exceed the 5% limitation, independent fuel gas trains, which could include control valves, manifolds and fuel nozzles, may be required for standard combustion systems. For DLN systems, an alternate control method may be required to ensure that the required fuel nozzle pressure ratios are met. An accurate analysis of all gas fuels, along with fuel gas temperature-time profiles shall be submitted to GE for proper evaluation.

C. Superheat Requirement

The superheat requirement is establish to ensure that the fuel gas supply to the gas turbine is 100% free of liquids. Superheat is the temperature difference between the gas temperature and the respective dew point. The requirement is independent of the hydrocarbon and moisture concentration.

Dependent its constituents, gas entrained liquids could cause degradation of gas fuel nozzles, and for DLN applications, premixed flame flashbacks or re-ignitions. Condensation of moisture must be

avoided to prevent the formation of gas hydrates and collection of water in low points of the gas fuel system. The superheat requirement is specified to provide enough margin to compensate for the temperature reduction as the gas expands across the gas fuel control valves. The requirements are applicable at all operating conditions and apply to all units including those installed with either standard or DLN combustion systems. Exceptions are units burning coal derived low Btu fuels, the requirements for which must be determined on a case-by-case basis. The superheat requirements take into account the gas temperature drop and the relationship of the moisture and hydrocarbon dew point lines to the gas fuel pressure. Because of differences between the dew point line characteristics in the region of interest (less than 700 psia), the opportunity for moisture condensation as the gas expands is less than that for hydrocarbons. Advantage has been taken of this physical property to provide users with two separate requirements in order to minimize the cost of superheating. In addition, the superheat requirements depend on the expansion ratio across the control valves and are therefore be expressed as a function of the incoming gas pressure at the inlet to the gas fuel control system.

To avoid hydrocarbon condensation the superheat requirement is:

$$T_{sh} = 2.33 \times \left(\frac{P_{gas}}{100}\right)^2 - 2.8 \times \left(\frac{P_{gas}}{100}\right) \quad (3)$$

where:

T_{sh} is the hydrocarbon superheat requirement in °F (incremental temperature above the hydrocarbon dew point)
P_{gas} is the gas fuel delivery pressure at the inlet to the gas turbine control system, psia

To avoid moisture and hydrate formation the superheat requirements is:

$$T_{sm} = 5.15 \times \left(\frac{P_{gas}}{100}\right) - 7 \quad (4)$$

where :

T_{sm} is the moisture superheat requirement in °F (incremental temperature above the moisture dew point)

The superheat requirements are shown graphically on Figure 1 for moisture and hydrocarbons. Both should be determined and added to the respective dew points (moisture and hydrocarbon) at the gas turbine fuel delivery pressure. The higher of the two values, superheat plus dew point, will determine the minimum gas fuel temperature that is required in order to meet the superheat requirements. See Appendix 4 for a sample calculation. In some cases the hydrocarbon dew point may be low enough that the requirement for meeting the moisture superheat will dominate and vice-versa. In rare cases the gas may be delivered in a wet condition at temperatures exceeding 75° F. Under these conditions the addition of superheat may result in the final gas temperature exceeding the allowable maximum for start up conditions. These limits are contained in GEK 4189 (2). Contact GE for further evaluation if wet gas is delivered at a temperature above 75°F.

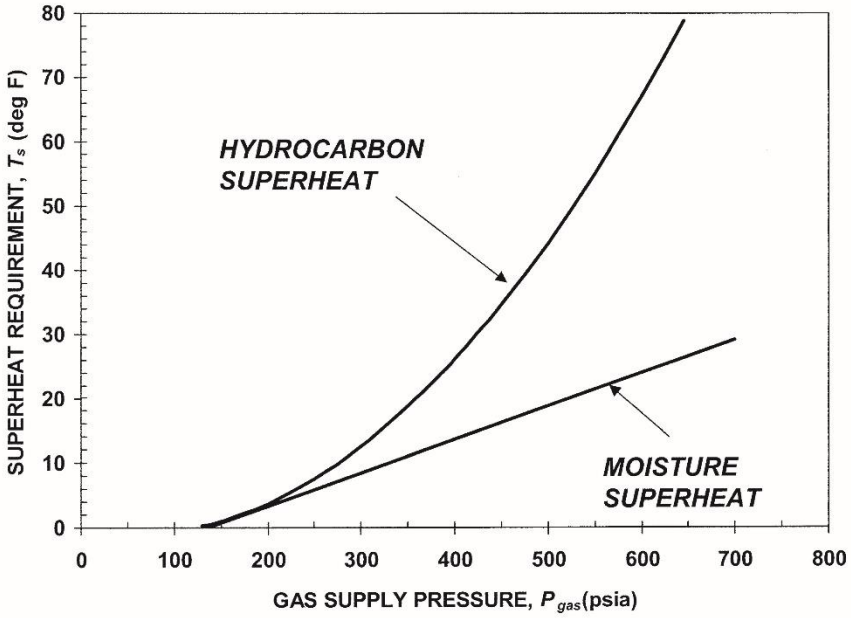

Figure 1. Hydrocarbon and Moisture Superheat Requirements

D. Hydrocarbon Dew Point

The hydrocarbon dew point is the temperature at which the first droplet of hydrocarbon forms as the gas temperature is reduced at a given pressure and is analogous to the moisture dew point. The hydrocarbon dew point is very sensitive to small concentrations of heavy hydrocarbons (C6+) and contamination of the gas sample during sampling can be an issue. The use of a sample probe and following the sampling procedure described in GPA 2166[3], particularly with respect to sample cylinder purging, can avoid these problems. For this reason the recommended method for hydrocarbon dew point determination is by direct measurement using a chilled mirror instrument (ASTM D 1142). If a direct measurement cannot be performed, the dew point may be calculated from the extended C14 gas fuel analysis[4]. Use of a C6+ analysis for dew point determination may result in an under-estimation of 30°F to 40°F or more. Exceptions are fuels that do not contain heavy hydrocarbons such as liquefied natural gas.

E. Moisture Dew Point

The gas fuel moisture dew point is dependent upon the moisture concentration and the gas fuel pressure. When expressed in units of lbs/mmscft (pounds per million standard cubic feet), the resulting dew point is practically independent of the gas fuel composition (other than moisture). Typically, many pipeline tariffs limit the maximum allowable moisture content to 7 lbs/mmscft while the actual value may be significantly less. It is the maximum allowable value, however, that determines the design requirements for superheat. Figure 2 is included to provide a guide for determining the expected moisture dew point from the moisture concentration and gas fuel pressure of a typical natural gas. The actual dew point will vary slightly with gas composition changes.

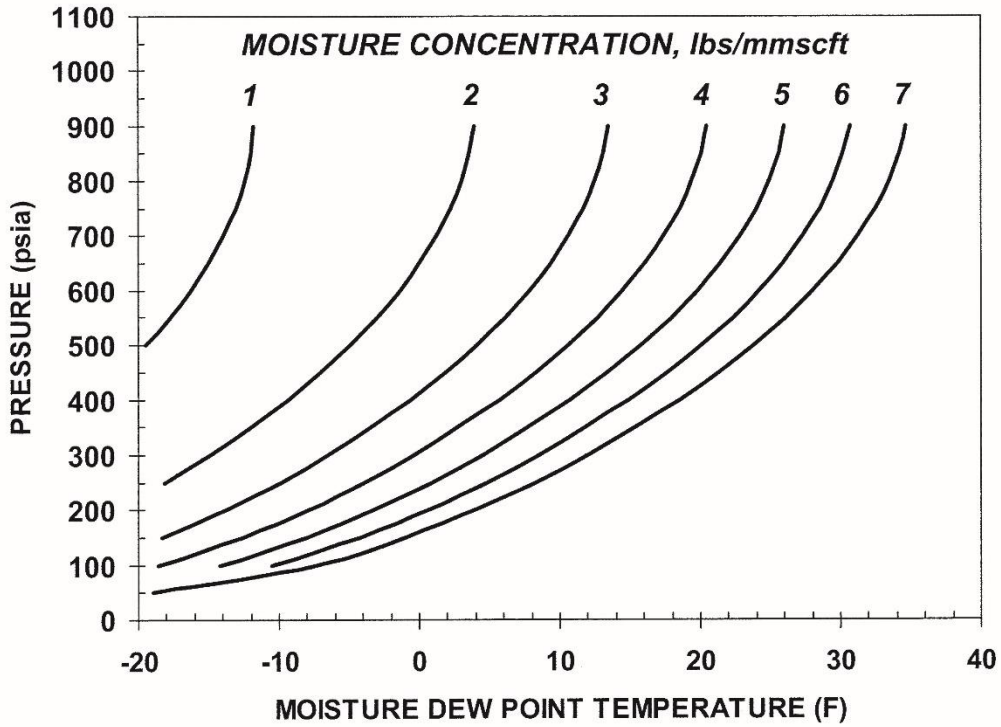

Figure 2. Moisture Dew Point as a Function of Concentration and Gas Pressure for a Typical Natural Gas Fuel

F. Flammability Ratio

Fuel gases containing hydrogen and/or carbon monoxide will have a ratio of rich-to-lean flammability limits that is significantly greater than that of natural gas. Typically, gases with greater than 5% hydrogen by volume fall into this range and require a separate startup fuel. GE will evaluate the gas analysis to determine the requirement for a start-up fuel. Fuel gases with large percentages of an inert gas such as nitrogen or carbon dioxide will have a ratio of rich-to-lean flammability limits less than that of natural gas. Flammability ratios of less than 2.2 to 1 based on volume at ISO conditions (14.696 psia and 59° F), may experience problems maintaining stable combustion over the full operating range of the turbine.

G. Gas Constituent Limits

Gas constituent limits are specified to assure stable combustion through all gas turbine loads and modes of operation. A detailed gas analysis must be furnished to GE for proper evaluation. See reference [3] for the recommended sampling procedure and ASTM D1945 for a C6+ analysis procedure.

H. Gas Fuel Supply Pressure

Gas fuel supply pressure requirements are dependent on the gas turbine model, the combustion system design, the fuel gas analysis and unit specific site conditions. As part of the unit proposal, GE will furnish minimum and maximum gas fuel supply pressure requirements.

IV. CONTAMINANTS

Dependent on the type of fuel gas, the geographical location and the forwarding means there is the potential for the "raw" gas supply to contain one or more of the following contaminants:

1. Tar, lamp black, coke
2. Water, salt water
3. Sand, clay
4. Rust
5. Iron sulfide
6. Scrubber oil or liquid
7. Compressor Lube oil
8. Naphthalene
9. Gas Hydrates

It is critical that the fuel gas is properly conditioned prior to being utilized as gas turbine fuel. This conditioning can be performed by a variety of methods. These include, but are not limited to: media filtration, inertial separation, coalescing and fuel heating. Table 2b identifies the trace metal, particulate and liquid contamination limits. It is critical that fuel gas conditioning equipment be designed and sized so that these limits are not exceeded. For further information on gas fuel conditioning, see publication GER 3942[8].

A. Particulates

Contamination limits for particulates are established to prevent fouling and excessive erosion of hot gas path parts, erosion and plugging of combustion fuel nozzles and erosion of the gas fuel system control valves. The utilization of gas filtration or inertial separation is instrumental in ensuring that the particulate requirements as defined in Table 2b are met. GE recommends the use of stainless steel piping downstream of this last level of filtration to prevent the generation of corosion-derived particulates.

B. Liquids

As identified in Table 2b, zero liquids are allowed in the gas turbine fuel gas supply. The introduction of liquids with gas fuel can result in nuisance and/or hardware damaging conditions. These include rapid excursions in firing temperature and gas turbine load, primary zone re-ignition and flashback of premixed flames. In severe conditions, liquid carryover to the first stage turbine nozzle may result in damage to downstream hot gas path components. When liquids are identified in the gas fuel supply, phase separation and heating must be employed to achieve the required superheat level.

C. Sulfur

There are several concerns relative to the levels of sulfur contained in the fuel gas supply. Many of these are not directly related to the gas turbine but to associated equipment and emissions requirements. These concerns include but not limited to:

1. Hot Gas Path Corrosion

   Typically, use of sulfur bearing fuels will not be limited by concerns for corrosion in the turbine hot gas path. Experience has shown that fuel sulfur levels up to about 1% sulfur do not significantly affect oxidation/corrosion rates. Specifying the fuel alkali levels to values shown in Table 2b controls hot corrosion of hot gas path parts resulting from alkali sulfate formation. Unless sulfur levels are extremely low, alkali levels are usually limiting in determining hot corrosion of hot gas path materials. For low Btu gases, the fuel mass flow rate at the turbine inlet is increased over that for natural gas, and the alkali limit in the fuel is therefore decreased.

2. HRSG Corrosion

   If heat recovery equipment is used, the gas fuel sulfur concentration must be known so that the appropriate design for the equipment can be specified. Severe corrosion from condensed sulfurous acid results if a heat recovery steam generator (HRSG) has metal temperatures below the acid dew point.

3. Selective Catalytic Reduction (SCR) Deposition

   Units utilizing ammonia injection downstream of the gas turbine for NOx control can experience the formation of deposits containing ammonium sulfate and bisulfate on low temperature evaporator and economizer tubes. Such deposits are quite acidic and therefore corrosive. These deposits and the corrosion that they cause may also decrease HRSG performance and increase backpressure on the gas turbine. Deposition rates of ammonium sulfate and bisulfate are determined by the sulfur content of the fuel, ammonia content in the exhaust gas, tube temperature and boiler design. Fuels having sulfur levels above those used as odorants for natural gas should be reported to GE. In addition, the presence of minute quantities of chlorides in the compressor inlet air may result in cracking of ANSI 300 series stainless steels in the hot gas path.

4. Exhaust Emissions

   Sulfur burns mostly to sulfur dioxide, but 5%-10% oxidizes to sulfur trioxide. The latter can result in sulfate formation, and may be counted as particulate matter in some jurisdictions. The remainder will be discharged as sulfur dioxide. To limit the discharge of acid gas, some localities may restrict the allowable concentration of sulfur in the fuel.

5. System Material Requirements

   When considering fuel gases containing H_2S (sour gas fuels) material selection for system piping and components shall comply with NACE Standard, MR0175[9].

6. Elemental Sulfur Deposition

   Solid elemental sulfur deposits can occur in gas fuel systems downstream of pressure reducing stations or gas control valves under certain conditions. These conditions may be present if the gas fuel contains elemental sulfur vapor, even when the concentration of the vapor is a few parts per billion by weight. Concentrations of this magnitude cannot be measured by commercially available instrumentation and deposition cannot therefore be anticipated based on a standard gas analysis. Should deposition take place, fuel heating will be required to maintain the sulfur in vapor phase and avoid deposition. A gas temperature of 130°F or higher may be required at the inlet to the gas control valves to avoid deposition, depending on the sulfur vapor concentration. The sulfur vapor concentration can be measured by specialized filtering equipment. Contact GE for further information on this subject.

7. Iron Sulfide

The presence of sulfur in the gas may promote the formation of iron sulfides. Under certain conditions, iron sulfide is a pyrophoric material that can auto ignite at atmospheric pressure and temperature when exposed to air. Extreme care must be taken when servicing gas fuel cleanup equipment to avoid accidental exposure to oxygen and subsequent combustion of filter material.

D. Trace Metals

Sodium is the only trace metal contaminant normally found in natural gas. The source of sodium in natural gas is salt water. Limits on trace metals are established to prevent the formation of corrosive deposits on hot gas path components. These deposits can be detrimental to gas turbine parts life.

In addition to sodium, additionally harmful trace metal contaminants can be found in gasification and process gases. GE will determine limits on these contaminants on a case-by-case basis.

V. SOURCES OF CONTAMINANTS

A. Particulates

The major source of particulates is from corrosion products in the pipeline. These products are conitinuously formed over the life of the pipeline at rates that are determined by the corrosive components and water content of the gas. For this reason most gas suppliers control moisture content to avoid the possibility of water condensing and forming acid with CO_2 or H2S.

B. Liquids

Gas at the wellhead is typically produced in a wet saturated condition and is treated to remove water and heavy hydrocarbon liquids. Depending on the degree of treatment and the supply pressure, the gas may be delivered in a dry condition. After pressure reduction it is possible for condensates to form as the gas cools during expansion. The condensates may be either water or hydrocarbons or both. Carry over of lubricating oil from compressor stations is another source of liquids.

C. Sulfur

Sulfur is usually combined with either hydrogen as H_2S or carbon as COS. It is produced with the natural gas. Typically the gas supplier will limit H_2S to a concentration of less than approximately 20 ppmv by removing sulfur in a treatment system. Sulfur may also be present in very low concentrations (< 100 ppbv) in the form of elemental sulfur vapor.

D. Trace Metals

The details of various sources of alkali contaminants in the following text apply to MS 3000, MS 5000, B, E and F class machines. The sources of contaminants for F and H-class machines are discussed in GEK 107230(1).

Contributions to the alkali content of the combustion gases can come from any of the material streams supplied to the combustor; fuel, air, water or steam. The basic parameter which can be used to define the allowable alkali metal content admitted to the turbine is Xt, the combined sodium and potassium content of the combustion gas at the entry to the first stage nozzle. This concentration must not exceed the values stated in Table 2b. Since there is no simple test method for measuring Xt in an operating turbine, it must be calculated from the alkali metal contents of the fuel, air, water and steam flows.

$T(Xt) = A(Xa) + F(Xf) + S(Xs) + W(Xw)$

Where T = total flow to turbine (= A + F + S + W):

Xt = alkali contaminant concentration in total flow as Na.
A = Air flow,
Xa = contaminant concentration in air.
F = Fuel flow,
Xf = contaminant concentration in fuel.
S = Steam flow,
Xs = contaminant concentration in steam.
W = water flow
Xw = contaminant concentration in water.

The allowable levels of alkali contamination in the different flows entering the gas turbine are discussed below:

E. Air

There are four sources of alkali metal contained in the compressor discharge air, (a) Inlet filter carry over of sodium chloride in ambient air (b) carry over of sodium dissolved in water used for evaporative cooling (c) carry over of sodium dissolved in water used for inlet fogging and (d) carry 0ver of sodium from water used for on-line water washing.

When concentrations of trace metals in fuel, water or steam are not precisely known, a value of 0.005 ppmw, GER 3419(10), can be used for systems with or without evaporative coolers. This value, based on experience, would cause an insignificant contribution to the overall contamination level and have a minor impact on parts lives.

For systems with inlet foggers, the water carry over is 100% compared with approximately 0.003% for evaporative coolers and the potential sodium carry over is therefore proportionally higher. The maximum inlet fogging water flow rate is approximately 1/3 of the natural gas flow rate and, depending on the sodium concentration, could use up a significant portion of the total allowed at the turbine inlet. Refer to GEK 101944(11) for information on water purity requirements. If it is anticipated that the specification could be exceeded, General Electric should be consulted for recommendations on the selection of the water source and use of proper air filtration equipment.

F. Steam

Steam for gas turbine injection is typically taken from a suitable extraction point on a steam turbine or HRSG. The limiting purity requirements for this steam are those for the steam turbine. These limits are defined in GEK 72281.(12)

G. Water

The maximum alkali metal (sodium plus potassium) content of water to be used for injection is discussed In GEK 101944(11). The maximum water injection rate is approximately equal to the fuel injection rate. If the alkali content approaches the maximum allowable value stated in GEK 101944(11), it may use all of the allowable margin at the turbine inlet, leaving none available for the fuel. If it is anticipated that the specification could be exceeded, General Electric should be consulted for recommendations on the selection of the water source.

NOTE

The concentration of sodium in steam and water, at the levels specified, can be measured directly using an on-line sodium analyzer or, in the laboratory, with an ion or pH meter fitted with a "sodium specific" electrode or by an atomic absorption spectrometer fitted with a graphite furnace.

H. Fuel

The final source of contamination to be considered is the fuel. Most cases of alkali metal contamination and corrosion of hot gas path components are related to liquid fuel contamination. It is rare that natural gas will contain trace metals but gasification fuels may contain alkalis carried over from the gas clean up system. The issues and requirements with gas fuels are discussed separately in the prior sections.

APPENDIX 1

DEFINITIONS

Dew Point

This is the temperature at which the first liquid droplet will form as the gas temperature is reduced. Common liquids found in gas fuel are hydrocarbons, water and glycol. Each has a separate and measurable dew point. The dew point varies considerably with pressure and both temperature and pressure must be stated to properly define the gas property. Typically, the hydrocarbon dew point will peak in the 300 to 600 psia range.

Dry Saturated Conditions

The gas temperature is at, but not below or above, the dew point temperature. No fee liquids are present.

Gas Hydrates

Gas hydrates are semi-solid materials that can cause deposits that plug instrumentation lines, control valves and filters. They are formed when free water combines with one or more of the C1 through C4 hydrocarbons. Typically the formation will take place downstream of a pressure reducing station where the temperature drop is sufficient to cause moisture condensation in a region of high turbulence. Because hydrates can cause major problems in the gas distribution network, the moisture content is usually controlled upstream at a dehydration process station.

Gas Hydrate Formation Line

This is similar to the dew point line. A potential for hydrate formation exists if free water is present. Calculations performed using the commercial software Hysys[15] show that the hydrate formation line is approximately 10°F above the moisture dew point line. Maintaining the required degree of superheat above the moisture dew point will eliminate hydrate formation problems. (see section III–C Superheat Requirement)

Glycol

Glycol is not a natural constituent of natural gas but is introduced during the dehydration process. Various forms of glycol are used, di-ethylene and tri-ethylene glycol being two most common. In some cases

glycol is injected into the pipeline as a preservative. In most cases, glycol may only be a problem during commissioning of a new pipeline or if an upset has taken place at an upstream dehydration station.

Odorant

Odorants are injected into natural and LP gas to make leaks readily detectable. The oderant commonly used for natural gas is tertiary butyl mercaptan, while ethyl mercaptan is used for LP gas.

Superheat

This is defined as the difference between the gas temperature minus the liquid dew point. The difference is always positive or zero. A negative value implies that the value is being measured at two differing states of pressure and temperature and is not valid. A measured gas temperature below the theoretical dew point means that the gas is in a wet saturated state with free liquids present.

Saturation Line

This is the same as the dew point line.

Wet (Saturated) Conditions

A mixture consisting of both vapor and liquids.

APPENDIX 2

PARTICLE SIZE LIMITATIONS

The effective particle size for erosion considerations is determined by a particle's terminal settling velocity. The size and density distribution of the solid particles must be such that not more than 1.0 percent by weight of the particles shall have a terminal settling velocity in air (70°F (21°C) and 30 inches Hg, absolute) greater than 14 inches per minute, and not more than 0.1 percent shall have a terminal settling velocity in excess of 23 inches per minute. For a solid spherical particle, Stoke's Law of settling permits calculating the terminal settling velocity if the particle size and shape and particle specific gravity are known. The following tabulation gives the spherical particle diameters equivalent to the limiting terminal settling velocities for particles of specific gravity 2.0 and 4.

Settling Velocity (inches/min)	Specific Gravity (based on water	Equivalent Spherical Particle Diameter (microns)
14	2	10
23	2	13
14	4	7
23	4	9

APPENDIX 3

EQUIVALENT CONTAMINANT RELATIONSHIPS (ALL MACHINES EXCEPT FB, H-CLASS)

The following relationships can be used to determine turbine inlet contaminant and fuel equivalent contaminant concentrations to compare to limits given in Table 2b. In general, for mass balances on the flows and on the contaminants from fuel, air and steam/water at the turbine inlet

$$E = F + A + S \quad (5)$$

$$(XE)E = (XF)F + (XA)A + (XS)S \quad (6)$$

where:

A, F, S and E are the mass flows of air, fuel, injected steam/water and combustion gases at the turbine inlet, respectively

XA, XF, XS, and XE are the contaminant concentrations (ppm by weight) in the inlet air, in the fuel, in the injected steam/water, and in the combustion gases at the turbine inlet, respectively.

The fuel equivalent concentration of contaminants (XFe) is (dividing (5) and (6) by F)

$$XFe = XE(1+A / F+S / F)= XF + XA(A / F) + XS(S / F) \quad (7)$$

For example for a natural gas contaminated with salt at a sodium concentration of 0.1 ppm, an air sodium contamination of 5 ppb, and a steam contamination of 5 ppb, the equivalent sodium in the fuel for A/F =50 and S/F=1 is from equation (7)

$$XFe = 0.1 + 0.005(50) + 0.005(1) = 0.355 \text{ ppm} \quad (8)$$

This is the amount of sodium considered to come from a fuel source only, which gives the same sodium concentration at the turbine inlet as from the combined three sources.

The turbine inlet concentration, XE, is found by rearranging (7)

$$XE = XFe / (1 + A / F + S / F) = 0.355 / (1 + 50 + 1) = 0.006827 \text{ ppm} = 6.827 \text{ ppb} \quad (9)$$

These values are well within the sodium specification values of 1 ppm on a fuel basis (XFe), and 20 ppb for the turbine inlet concentration (XE). XE and XFe values for all contaminants are given in Table 2B.

For equivalent contaminant relationships in FB, H-Class machines, refer GEK 107230(1).

APPENDIX 4

MINIMUM GAS FUEL TEMPERATURE REQIREMENT CALCULATIONS

The gas fuel pressure at the purchaser's connection FG1 should first be determined. The hydrocarbon and moisture superheat can then be calculated from the equations shown on Figure 1. For example, at a gas fuel pressure of 490 psia, the moisture and hydrocarbon superheat requirements are 18° and 42°F respectively.

For a typical pipeline gas the maximum allowable moisture content is 7 lbs/mmscft. At 490 psia the moisture dew point can be determined from figure 2 and is equal to 23°F. The minimum gas temperature to avoid moisture condensation is equal to the moisture dew point plus the required superheat, or 23° + 18° = 41°F.

For hydrocarbons, the maximum expected hydrocarbon dew point should be determined by consultation with the gas supplier and a review of historical data if available. The hydrocarbon dew point will be dependent on the source of the gas, the degree of gas processing and may vary seasonally with overall gas demand and the economics associated with liquids removal and recovery. For a fuel with a maximum hydrocarbon dew point of, for example, 35°F at 490 psia, the minimum gas fuel temperature is 42° + 35° = 77° F. As this temperature in this example is higher than the minimum required to avoid moisture condensation, it establishes the minimum gas temperature to avoid both hydrocarbon and moisture condensation. In cases where the hydrocarbon dew point is typically less than about 8°F, the minimum gas temperature will be determined by the moisture requirement, assuming a moisture content of 7 lbs/mmscft is applicable.

APPENDIX 5

RELATED SPECIFICATION DOCUMENTS

GER 3419(10) - Includes specifications for compressor inlet air quality

GEK 4189(2) - Includes heated gas fuel temperature limits

GER 72281(12) - Includes steam purity requirements in steam turbines

GER 101944(11) - Includes water and steam purity requirements in gas turbines

GEK 106669(13) - Includes cooling steam purity requirements for H class gas turbines

GEK 107230(1) - Includes allowable alkali metal concentrations for FB and H class gas fuels

REFERENCES

1. GEK 107230 Specification for Alkali Metal Contamination in Fuels for the FB and H Model Gas Turbines
2. GEK 4189 Design Considerations for Heated Gas Fuel
3. Obtaining Natural Gas Samples for Analysis by Gas Chromatography, GPA Standard 2166, Gas Producers association, 6526 East 60th Street, Tulsa, Oklahoma
4. Tentative Method of Extended Analysis for Natural Gas and Similar Gaseous Mixtures by Temperature Programmed Gas Chromatography, GPA Standard GPA 2286, Gas Producers association, 6526 East 60th Street, Tulsa, Oklahoma 74145
5. Bureau of Mines Bulletin 503, Flammability Characteristics of Combustible Gases and Vapors, 1950
6. Bureau of Mines Bulletin 622, Flammability Characteristics of Combustible Gases and Vapors, 1965
7. Natural Gas, E. N. Tiratsoo, Scientific Press Ltd., Beaconsfield, England, 1972
8. GER 3942 Gas Fuel Clean-up System Design Considerations for GE Heavy-Duty Gas Turbines
9. MR0175, NACE Standard, Sulfide Stress Cracking Resistant Metallic Material for Oilfield Equipment
10. GER 3419 Gas Turbine Inlet Air Treatment
11. GEK 101944 Requirements for Water/Steam Purity in Gas Turbines

12. GEK 72281 Steam Purity Recommendations for Utility Steam Turbines

13. GEK 106669 Specification for Cooling Steam Purity for Closed Circuit Steam Cooled Gas Turbine

14. ASME Handbook "Water Technology for Thermal Power Systems", chapter 12.

15. Hysys, a gas process simulation program. Hyprotech Corporate Headquarters, Suite 800, 707 – 8th Avenue SW, Calgary, Alberta T2P 1H5, Canada, Phone:403 520 6000

Appendix – 11: Fire Safety Cleaning

Myanmar Ahlone Power Plant Co., Ltd.
No.20, Sabal Street, Saw Yan Paing Quarter Ahlone Township, Yangon.

ပူးတွဲ (၁)

သန့်ရှင်းရေး(သို့မဟုတ်)မီးဘေးအန္တရာယ် ကာကွယ်ရေးဆိုင်ရာ ပြင်ဆင်ထားရှိမှု စီမံချက်

ရည်ရွယ်ချက်

၁။ Myanmar Ahlone Power Plant Co.,Ltd အောက်ရှိ အမှတ်(၃၉) ၊ ကမ်းနားလမ်း ၊ ဧရာဝတီရပ်ကွက် ၊ အလုံမြို့နယ် ၊ ရန်ကုန်တိုင်းဒေသကြီးတွင် တည်ရှိသည့် Myanmar Ahlone Power Plant (151.54MW) တွင် သိုလှောင်ရုံထားရှိရန်နှင့် သိုလှောင်ရုံအတွင်း သန့်ရှင်းကောင်းမွန်စွာ ထားရှိရန်နှင့် မော်တော်ယာဉ်ဖြင့် သယ်ယူပို့ဆောင်စဉ် ဓာတုပစ္စည်း ၊ ဆက်စပ်ပစ္စည်းများအား မီးဘေးအန္တရာယ် ကင်းရှင်းစွာ ဆောင်ရွက်နိုင်ရေး ဖြစ်ပါသည်။

လုပ်ဆောင်မည့်နည်းလမ်းများ

၂။ သန့်ရှင်းရေး(သို့မဟုတ်)မီးဘေးအန္တရာယ် ကာကွယ်ရေးဆိုင်ရာလုပ်ငန်းများ ၊ နည်းလမ်းများကို အောက်ပါအချက်များဖြင့် ဆောင်ရွက်ထားရှိပါမည်။

(က) သိုလှောင်ရုံအတွင်း သန့်ရှင်းမှု ရှိစေရန်နှင့် အပတ်စဉ်ဝန်ထမ်းများအား အလှည့်ကျ သန့်ရှင်းရေး ဆောင်ရွက်စေခြင်း ၊ အမှိုက်ပုံများစနစ်တကျထားရှိခြင်းနှင့် လုပ်ငန်းသုံး ပစ္စည်း ကိရိယာများ ပျက်စီး ဆုံးရှုံးမှု ထိခိုက်မှု မရှိစေရေးအတွက် သီးသန့်နေရာဖြင့် စနစ်တကျထားရှိပါမည်။ တာဝန်ရှိသူမှလည်း လိုက်လံစစ်ဆေးခြင်းများ ပြုလုပ်သွားပါမည်။ ဓာတုပစ္စည်းနှင့် ဆက်စပ်ပစ္စည်းများ သိုလှောင်ထားရှိသည့်နေရာအား အေးချမ်းခြောက်သွေ့ပြီး လေဝင်လေထွက် ကောင်းမွန်စွာ ရရှိစေရန် ပြတင်းများ အား မှန်များဖြင့် တပ်ဆင်ထားခြင်းများပြုလုပ်ထားပါသည်။

(ခ) မီးဘေးအန္တရာယ် ကာကွယ်နိုင်ရန်အတွက် သိုလှောင်ရုံနှင့် မော်တော်ယာဉ်ဖြင့် သယ်ယူရွှေ့ပြောင်းစဉ် ဓါတ်ပြုပေါက်ကွဲစေနိုင်သည့် ရုပ်ပိုင်းဆိုင်ရာ အန္တရာယ်များဖြစ်သော လေထဲ၌အလိုအလျောက် မီးစွဲလောင်ခြင်း၊ ရေဖြင့်ထိတွေ့လျှင် မီးလောင်နိုင်ခြင်းများ ဖြစ်စေနိုင်သည့် ဓာတုပစ္စည်းများ စနစ်တကျထုပ်ပိုးခြင်း ပြုလုပ်ပြီးမှ ထားရှိခြင်းနှင့် သယ်ယူပို့ဆောင်ခြင်းများ ပြုလုပ်ပါမည်။ မီးဘေးလုံခြုံရေးအတွက် ဓာတုပစ္စည်း နှင့် ဆက်စပ်ပစ္စည်းများ အမျိုးအစားအလိုက် လိုအပ်သော မီးဘေးကြိုတင်ကာကွယ်ရေးပစ္စည်းများနှင့် မီးငြှိမ်းသတ်ပစ္စည်းများကို ဝင်ပေါက် ထွက်ပေါက်လမ်းများနှင့် အနီးဆုံးနေရာတွင် အလွယ်တကူအသုံးပြုနိုင်ရန် လုံလောက်စွာ ထားရှိပါမည်။ မော်တော်ယာဉ်အတွင်းတွင်လည်း မြို့နယ်ဦးစီးဌာနမှ ညွှန်ကြားထားသည့်အတိုင်း ထားရှိခြင်းများ ပြုလုပ်ထားပါသည်။ အသုံးပြုပုံကို ဝန်ထမ်းများအား သင်ကြားပြသပေးထားပါသည်။

(ဂ) ပစ္စည်းထားသိုသည့်နေရာအနီးတဝိုက်တွင် ဆေးလိပ်သောက်၍ သွားလာခြင်း ၊ မီးခြစ် ယူဆောင်လာခြင်း များကို ကန့်သတ်နယ်မြေအဖြစ် သတ်မှတ်ထားခြင်းများ ပြုလုပ် ထားပါသည်။ အလွယ်တကူ ကူးစက်လောင်ကျွမ်းနိုင်သည့် လောင်စာများအားလည်း စနစ်တကျ ထားရှိပါမည်။

Myanmar Ahlone Power Plant Co., Ltd.

No.20, Sabal Street, Saw Yan Paing Quarter Ahlone Township, Yangon.

ရက်စွဲ ။ ၂၀၂၄ ခုနှစ်၊ ဧပြီလ ( ) ရက်

ဖြန့်ဝေခြင်း

Management Department

Admin & HR Department

Operation Department

မိတ္တူ ကို

- ရုံးလက်ခံ

Myanmar Ahlone Power Plant Co., Ltd.
No.20, Sabal Street, Saw Yan Paing Quarter Ahlone Township, Yangon.

မီးဘေးလုံခြုံရေးစီမံချက်များ

မီးဘေးလုံခြုံရေးစီမံချက်များသည် စက်ရုံလုပ်ငန်းခွင်ဘေးကင်းရေး၏ အစိတ်အပိုင်းတစ်ခုဖြစ်သည့်အားလျော်စွာ ၎င်းစီမံချက်များအား လိုက်နာဆောင်ရွက်ခြင်းဖြင့် မီးဘေး အန္တရာယ်မှကြိုတင်ကာကွယ်နိုင်မည်ဖြစ်ပြီး မီးဘေးအန္တရာယ်ကျရောက်ခဲ့ပါက မိမိတို့၏ အသက်အန္တရာယ်ကို ကာကွယ်နိုင်မည်ဖြစ်သည်။ မီးဘေးလုံခြုံရေးစီမံချက်များတွင် -

၁။ ကြိုတင်ကာကွယ်ခြင်း

၂။ မီးဘေးအန္တရာယ်ကျရောက်ပါက လိုက်နာရမည့်အစီအမံများ နှင့်

၃။ မီးငြိမ်းသတ်ပြီးနောက် စီစဉ်ရမည့်အချက်များ ပါဝင်ပါသည်။

၁။ ကြိုတင်ကာကွယ်ခြင်း

(က) ဖြစ်နိုင်ချေရှိသော မီးဘေးအန္တရာယ်များကို ဖော်ထုတ်ခြင်း

မီးလောင်လွယ်သော ပစ္စည်းများထားရှိသော သိုလှောင်ခန်းများ၊ ပလပ်များ များစွာ ပါရှိသည့် ပလပ်ပေါက်များ၊ အမှတ်အသားမကောင်းသော ဝင်/ထွက်ပေါက်များ၊ အသုံးပြုထား ပြီးသော၊ ပျက်စီးနေသော မီးသတ်ဆေးဘူးများ၊ အချက်ပေးကိရိယာများ ကဲ့သို့သော မီးငြိမ်းသတ်ကိရိယာများ အလုပ်လုပ်ဆောင်ခြင်းရှိ/မရှိ စသည့် ဖြစ်နိုင်ချေရှိသော အန္တရာယ်များကို ရှာဖွေဆန်းစစ်ပါ။

(ခ) မီးသတ်ဆေးဘူးများ အလုံအလောက်ရှိခြင်း

လုပ်ငန်းခွင်အတွင်း မီးသတ်ဆေးဘူးများ အမျိုးအစားခွဲခြားထားရှိသင့်ပြီး ဝန်ထမ်း များအား ၎င်းတို့၏ အသုံးပြုမှုကို လေ့ကျင့်သင်ကြားပေးရမည်။ စက်ရုံအတွင်း ကြိုတွေ့ ရနိုင်ဖွယ်ရှိသည့် မီးအမျိုးအစားများ အတွက် အဆင့်သတ်မှတ်ထားသော မီးသတ်ဆေးဘူး များကို ခွဲခြားထားရှိရမည်။ Myanmar Ahlone Power Plant စက်ရုံတွင် အသုံးပြုနေသော မီးသတ်ဆေးဘူး အမျိုးအစားများမှာ Dry Chemical Powder (DCP) နှင့် Co_2 တို့ဖြစ်သည်။ DCP မီးသတ်ဆေးဘူး အမျိုးအစားသည် မီးလောင်လွယ်သောပစ္စည်းများ၊ မီးလောင် လွယ်သော ဓါတုဗေဒအရည်များ၊ Gas ကြောင့် မီးလောင်မှုများ၊ သံ၊ သတ္တုပစ္စည်းများ မီးလောင်ခြင်းနှင့် လျှပ်စစ်ကြောင့်မီးလောင်မှုတို့တွင် အသုံးပြုနိုင်သည်။ Co_2 မီးသတ်ဆေးဘူး အမျိုးအစားသည် ဓါတုဗေဒအရည်များကြောင့် မီးလောင်ခြင်းနှင့် လျှပ်စစ်ကြောင့် မီးလောင်မှု ဖြစ်ပွားခဲ့လျှင် အသုံးပြုနိုင်သည်။

(ဂ) မီးဘေးအချက်ပေးစနစ် နှင့် သတိပေးဆိုင်းဘုတ်များထားရှိခြင်း

စက်ရုံလုပ်ငန်းခွင်အတွင်း မီးဘေးအချက်ပေးစနစ်များကို တပ်ဆင်အသုံးပြုရမည်။ မီးဘေးအချက်ပေးစနစ်မှ အချက်ပေးအသံသည် လုပ်ငန်းခွင်ဆူညံသံထက် ပိုမို ကြားနိုင်ရမည်ဖြစ်ပြီး အရေးပေါ်အချက်ပေး အချက်ပြမှုအတွက် အသုံးပြုနိုင်ရမည် ဖြစ်သည်။ မီးသတ်ဌာန၏ ညွှန်ကြားချက်များ ၊ အလုံမီးသတ်ဌာနသို့ ဆက်သွယ်ရမည့် ဖုန်းနံပါတ်များ ၊ မီးသတိပြု

ဆိုင်းဘုတ်များ ၊ အန္တရာယ်ရှိသည့်ပစ္စည်းများအတွက် သတိပေးဆိုင်းဘုတ်များ စသည်တို့ကို လုပ်ငန်းခွင် အနေအထားအပေါ်မူတည်၍ ထားရှိရမည်ဖြစ်သည်။

(ဃ) ဝန်ထမ်းများလေ့ကျင့်ရေးအစီအစဉ်

စက်ရုံနေဝန်ထမ်းများအားလုံးအား မီးဘေးလုံခြုံရေးအတွက် မီးဘေးအန္တရာယ်နှင့် ပတ်သက်သည့် အသိပညာပေးသင်တန်းများအား စီစဉ်သင်ကြားပေးရမည်ဖြစ်သည်။ ဝန်ထမ်းများ အား မီးဘေးလွတ်ရာသို့ ရှောင်တိမ်းနိုင်မည့် လမ်းကြောင်းများ ၊ မီးသတ် ဆေးဘူးများ အသုံးပြုပုံ၊ မီးလောင်လွယ်သော ခါတုပစ္စည်းများအား ကိုင်တွယ်အသုံးပြုနေသော ဝန်ထမ်းများအား အဆိုပါခါတုပစ္စည်းများကို ဘေးကင်းလုံခြုံစွာ ကိုင်တွယ် အသုံးပြုစေခြင်း စသည့်သင်တန်းများကို မီးသတ်ဦးစီးဌာန၏ လမ်းညွှန်ချက်များအတိုင်း ပို့ချပေးသင့်သည်။

၂။ မီးဘေးအန္တရာယ်ကျရောက်ပါက လိုက်နာရမည့်အစီအမံများ -

အရေးပေါ်အခြေအနေများအား တုန့်ပြန်ရန်

(က) အခြေအနေကိုအကဲဖြတ်ပါ

အရေးပေါ်အခြေအနေတွင် ဖြစ်နိုင်ချေရှိသော အန္တရာယ်များကို လျင်မြန်စွာ အကဲဖြတ်ခြင်း ဖြင့် စတင်ရမည်ဖြစ်သည်။ မီးလောင်မှု၏ အရွယ်အစား ၊ အမျိုးအစားနှင့် တည်နေရာကို သုံးသပ်ပြီး မီးကိုမည်ကဲ့သို့ လျင်မြန်စွာငြိမ်းသတ်နိုင်မည်ကို ခန့်မှန်းပါ။ မီးသတ်ဆေးဘူးဖြင့် မီးငြိမ်းသတ်ရန် မကြိုးစားမီ မီးသတ်ဌာနသို့ ဦးစွာအကြောင်းကြားရန် လိုအပ်သည်။ အန္တရာယ် မရှိနိုင်သော အသေးစားမီး လောင်မှုနှင့် လောင်စာဆီသိုလှောင်ရုံ မီးလောင်မှုများတွင် သိုလှောင်ရုံ မီးလောင်မှု သည် ပို၍အန္တရာယ်ကြီးမားသည်။ ထိုကြောင့် မီးငြိမ်းသတ်မည်လား? ဝန်ထမ်းများအား ဘေးလွတ်ရာကို ကယ်ထုတ်မည်လား? စသည်တို့ကို မိမိတို့၏အတွေ့အကြုံ ၊ စီမံခန့်ခွဲနိုင်သည့် ဉာဏ်စွမ်းအားတို့ဖြင့် Safety and Security Manager မှ လျင်မြန်စွာသုံးသပ်ဆုံးဖြတ်ကာ ညွှန်ကြားမှုများပြုလုပ်ရမည်။ ဝန်ထမ်းများ အားလုံးသည် သက်ဆိုင်ရာတာဝန်ရှိသူများအားလုံးမှ အပြုသဘောဆောင်သော ညွှန်ကြားချက်များကို လိုက်နာရမည်ဖြစ်ပြီး မိမိတို့၏ဉာဏ်ကို အသုံးချကာ ဘေးအန္တရာယ် ကင်းရှင်းရေးအတွက် ဦးစားပေး ဆောင်ရွက်ရမည်ဖြစ်သည်။

(ခ) Fire Alarm (မီးအချက်ပေးစနစ်)

မီးတောက်(သို့မဟုတ်) မီးခိုးများတွေ့ပါက မီးလောင်ကျွမ်းမှုအား အတည်ပြုပြီး Fire Alarm System ကို အသက်သွင်းပါ။ မီးသတ်ဌာနကို ချက်ချင်းအကြောင်းကြားပါ။ လုပ်ငန်းခွင်များတွင် အဆောက်အဦးတစ်လျှောက် ထိရောက်သော မီးအချက်ပေးစနစ်လည်း ရှိသင့် သည်။ အရေးပေါ်သတိပေးချက်တွင် အသံဖြင့်အမိန့်ပေးချက်များ ၊ ကြိုတင် အစီအစဉ် ချထားသည့် ဖုန်းနှင့်

ကွန်ပျူတာမက်ဆေ့ချ်များ အချက်ပေး Alarm များ ၊ သတိပေးစနစ် ဟွန်းများ နှင့် မိုက်တုတ် မိုက်တုတ်မီးများ အား ပေါင်းစပ်ပါဝင်အသုံးပြုရမည်ဖြစ်သည်။

(ဂ) အဆောက်အဦးများအတွင်းမှ ဖယ်ရှားခြင်း

မီးလောင်မှုဖြစ်ပွားလျှင် အရေးပေါ်ထွက်ပေါက်များနှင့် လမ်းကြောင်းများမှ စနစ်တကျ ထွက်ခွာပြီး သတ်မှတ်ထားသော စုရုပ်များနေရာသို့ သွားရမည်။ အလွယ်တကူ လက်လှမ်းမှီ နိုင်သည့် မရှိမဖြစ် လိုအပ်သော ဆေးဝါးများနှင့် ဆေးဘက်ဆိုင်ရာ ကိရိယာများမှ လွဲ၍ ကိုယ်ပိုင်ပစ္စည်းများ ကို ချန်ထားခဲ့ရန် ဝန်ထမ်းများအား အကြံပေးရမည်။ မီးခိုးငွေ့ရှူရှိုက်မိ ခြင်းအား လျော့ချရန် စိုစွတ်သော မျက်နှာသုတ်ပဝါဖြင့် နှာခေါင်းနှင့်ပါးစပ်တို့ကို အုပ်ထားပါ။ ဘေးလွတ်ရာ ပြေးလမ်း တစ်လျှောက် စုပြုံတိုးဝှေ့မနေဘဲ စနစ်တကျတန်းစီပြီး စုရုပ်ကို လျင်လျင်မြန်မြန် ရောက်အောင် သွားရမည်။

(ဃ) သတ်မှတ်ထားသောစုရုပ်တွင် ပြန်လည်စုဖွဲ့ပါ

မီးဘေးအရေးပေါ် အစီအစဉ်အရ ဝန်ထမ်းများသည် ဘေးလွတ်ရာသို့ ရွှေ့ပြောင်း ပြီးနောက် သတ်မှတ်ထားသော ဆုံမှတ်နေရာတွင် စုဝေးရမည်။ ဝန်ထမ်းတိုင်း ဘေးလွတ်ရာ စုရုပ်တွင် ရှိနေကြောင်း သေချာစွာစစ်ဆေးရမည်။ ထိခိုက်ဒါဏ်ရာရသူများ ရှိလာပါက ဆေးဘက် ဆိုင်ရာ အကူအညီကို ချက်ချင်းအကြောင်းကြားခေါ်ယူရမည်။ ဝန်ထမ်း တစ်စုံတစ်ယောက် ပျောက်ဆုံး နေပါက သက်ဆိုင်ရာတာဝန်ရှိသူများကို ချက်ချင်း အကြောင်းကြားပြီး ကူညီကယ်ဆယ်ရေး အစီအစဉ်များ ချမှတ်ဆောင်ရွက်ရမည်။ တရားဝင်မီးငြိမ်းသတ်ရှင်းလင်းမှု ညွှန်ကြားချက်မရရှိမချင်း မည်သည့်အကြောင်းကြောင့်မှ စက်ရုံအတွင်းသို့ ပြန်လည်ဝင်ရောက်ရန်မကြိုးစားရ။

၃။ မီးငြိမ်းသတ်ပြီးနောက် စီစဉ်ရမည့်အချက်များ

မီးလောင်မှုအား စတင်တွေ့ရှိပါက အန္တရာယ်ရှိအဆင့်ကိုလိုက်၍ မီးသတ်ဌာန ၊ စက်ရုံမှူး နှင့် Management Team အားချက်ချင်း အကြောင်းကြားရမည်။ ပျက်စီးဆုံးရှုံးမှု အားလုံး ကို အသေးစား မီးလောင်မှုပင်ဖြစ်လင့်ကစား သတင်းပို့အကြောင်းကြားရမည်။ မီးသတိပေးစနစ်များ အသုံးပြု ပြီးပြီးချင်း မီးငြိမ်းသတ်ကိရိယာများအပြင် အခြား အသုံးအဆောင်ပစ္စည်းများကို ပြန်လည် အသုံးပြုရန်အတွက် အဆင်သင့်ဖြစ်စေရမည်။ မီးလောင်ကျွမ်းမှုအမျိုးအစားအလိုက် ထပ်မံ လောင်ကျွမ်းနိုင်သည့်အခြေအနေရှိ/မရှိ အား အဘက်ဘက်မှ သေချာစွာစစ်ဆေး အတည်ပြုရမည် ဖြစ်သည်။ အသုံးပြုပြီးသော မီးသတ် ဆေးဘူးများကို စနစ်တကျစိစစ်ပြီး Gas ပြန်လည်ဖြည့်သွင်း ပြီးမှသာ အသုံးပြုနိုင်မည် ဖြစ်သည်။ လျှပ်စစ်နှင့်ပတ်သက်သော စနစ်များနှင့် ပစ္စည်းများကို လျှပ်စစ် ပညာရှင် စစ်ဆေးပြီးမှ ပြန်လည်အသုံးပြုရမည်။ စက်ရုံမှူး၏ခွင့်ပြုချက်ရရှိမှသာ စက်ရုံ အဆောက် အဦများအတွင်းသို့ ပြန်လည်ဝင်ရောက်နိုင်မည်ဖြစ်သည်။ မီးဘေးလုံခြုံရေး စည်းမျဉ်း စည်းကမ်း

Myanmar Ahlone Power Plant Co., Ltd.

No.20, Sabal Street, Saw Yan Paing Quarter Ahlone Township, Yangon.

များကို လိုက်နာခြင်းမရှိပါက စည်းကမ်းပိုင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းများ အတိုင်း အရေးယူ ဆောင်ရွက်နိုင်သည်။

ရက်စွဲ ။ ၂၀၂၄ ခုနှစ် ၊ ဧပြီလ ( ) ရက်

ဖြန့်ဝေခြင်း
Management Department
Admin & HR Department
Operation Department
မိတ္တူ ကို
- ရုံးလက်ခံ

Myanmar Ahlone Power Plant Co., Ltd.

No.20, Sabal Street, Saw Yan Paing Quarter Ahlone Township, Yangon.

ပူးတွဲ (၁)

မီးဘေးအန္တရာယ် ကာကွယ်ရန်အတွက် ပြင်ဆင်ထားရှိမှု ဓာတုပစ္စည်း နှင့် ဆက်စပ်ပစ္စည်းများ ထားရှိသည့်အဆောက်အဦးအတွင်းနှင့်အပြင် တွင် မီးသတ်ဆေးဗူးများ ထားရှိထားမှု

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ပူးတွဲ (၁)

မီးဘေးအန္တရာယ် ကာကွယ်ရန်အတွက် ပြင်ဆင်ထားရှိမှု ဓာတုပစ္စည်း နှင့် ဆက်စပ်ပစ္စည်းများ ထားရှိသည့်အဆောက်အဦးအတွင်းနှင့်အပြင် တွင် မီးသတ်ဆေးဗူးများ ထားရှိထားမှု






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သယ်ယူပို့ဆောင်မည့် ယာဉ်အမျိုးစားနှင့် ဘေးအန္တရာယ် ကာကွယ်ရေးဆိုင်ရာ စီမံချက်

<u>ရည်ရွယ်ချက်</u>

၁။ ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းများ သယ်ယူပို့ဆောင်မည့် မော်တော်ယာဉ် အမျိုးအစား သတ်မှတ်ခြင်းနှင့် သယ်ယူမည့်ပစ္စည်းများအား ဘေးအန္တရာယ်တစ်စုံတစ်ရာ မဖြစ်စေရေး အပြည့်အဝ စီစဉ်ဆောင်ရွက်သွားရန်။

<u>လုပ်ဆောင်ရမည့်နည်းလမ်းများ</u>

၂။ သယ်ယူပို့ဆောင်သည့် ယာဉ်အမျိုးအစားနှင့် ဘေးအန္တရာယ်ကာကွယ်ရေးဆိုင်ရာလုပ်ငန်းများ ၊ နည်းလမ်းများ ကို အောက်ပါအချက်များဖြင့် ဆောင်ရွက်ထားရှိပါမည်။

(က) သယ်ယူပို့ဆောင်မည့် မော်တော်ယာဉ်အမျိုးအစား သတ်မှတ်ခြင်း ၊

(၁) ဓာတုပစ္စည်းနှင့်ဆက်စပ်ပစ္စည်းများတင်ဆောင်မည့် ကုန်တင်ယာဉ်များအား ကြိုတင် သတ်မှတ် ထားရှိဆောင်ရွက်သွားပါမည်၊

(၂) ကုန်တင်ယာဉ်များအား မောင်းနှင်မည့်ယာဉ်မောင်းအား ကုန်းလမ်းသယ်ယူ ပို့ဆောင်မည့်ဦးစီးဌာန မှ ချမှတ်ထားသည့် ယာဉ်မောင်းလိုင်စင်အနီ ရှိသူကိုသာ ခန့်အပ် ထားပါသည်။

(ခ) သယ်ယူပို့ဆောင်စဉ် ဘေးအန္တရာယ်ကင်းရှင်းစေရန် စီစဉ်ဆောင်ရွက်ခြင်း။

(၁) ယာဉ်မောင်းနှင့် ယာဉ်အကူတာဝန်ခံတို့ကို ယာဉ်မောင်းနှင်စဉ် နှင့် မီးပွိုင့်များ၌ ခေတ္တ ရပ်တန့်ချိန်များတွင် ဆေးလိပ်သောက်ခြင်း ၊ မီးခြစ်အသုံးပြုခြင်း မရှိစေရေး စီမံကြပ်မတ် သွားပါမည်။

(၂) ယာဉ်မောင်းနှင်ချိန်တွင် အရှိန်ပြင်းမောင်းနှင်ခြင်း ၊ ဘရိတ်အား ရုတ်တရက်အုပ်မိခြင်း ၊ လမ်းကွေ့များတွင် အရှိန်ဖြင့် မကွေ့စေလိုဘဲ လိုအပ်သလောက်အမြန်နှုန်းဖြင့်သာ မောင်းနှင် စေခြင်းတို့ကို မှာကြား ထားရှိပါမည်။

(၃) ယာဉ်များမောင်းနှင်စဉ် ချိုင့်ခွက်များအပေါ် မောင်းနှင်ခြင်းမပြုရန်နှင့် ချိုင့်ခွက်များ ကိုလည်း လျင်မြန်သည့်အရှိန်ဖြင့် ဝင့်ဝိုက်မောင်းနှင်ခြင်းမရှိစေရန် မှာကြားသွားပါမည်။

(ဂ) အန္တရာယ်ပြ အမှတ်အသားများ စာများ ရေးသားသတိပေးခြင်း

(၁) ကုန်တင်ယာဉ်ဖြင့် သယ်ယူရွှေ့ပြောင်းစဉ် ဓာတုပစ္စည်း အန္တရာယ်ပြ အမှတ်အသားကို အလွယ်တကူ မြင်သာသည့်နေရာတွင် လှည့်ထားခြင်းကို ဆောင်ရွက်သွားပါမည်။

(၂) သယ်ယူလာသည့် ဓာတုဗေဒ နှင့် ပစ္စည်းအမည်အား မြင်သာအောင် ရေးသား ဖော်ပြခြင်း

Myanmar Ahlone Power Plant Co., Ltd.

No.20, Sabal Street, Saw Yan Paing Quarter Ahlone Township, Yangon.

အား ဆောင်ရွက်သွားပါမည်။

(၃) "သတိ" ၊ "အန္တရာယ်ရှိသည်" စသည့် စာသားများကိုလည်း ဖော်ပြထားရှိပါမည်။

သို့လျောင်ရုံ Manager (Admin & HR) တာဝန်ခံ ၊ Labour နှင့် မော်တော်ယာဉ် ယာဉ်မောင်း ၊ ယာဉ်အကူများအား Hand Phone ကြိုးဖုန်းများဖြင့်လည်းကောင်း ၊ E mail ဖြင့်လည်းကောင်း ဆက်သွယ်၍ ညွှန်ကြားမှု ခံယူဆောင်ရွက်စေခြင်းများ ပြုလုပ်သွားပါမည်။ ဓာတုပစ္စည်းနှင့် ဆက်စပ် ပစ္စည်းများ အန္တရာယ်မှ တားဆီးကာကွယ်ရေး ဗဟိုကြီးကြပ်ရေးအဖွဲ့မှ ထုတ်ပြန်ချက်နှင့် ညွှန်ကြားမှုများ ကို လိုက်နာဆောင်ရွက် သွားပါမည်။

ရက်စွဲ ။ ၂၀၂၄ ခုနှစ် ၊ ဧပြီလ ( ) ရက်

ဖြန့်ဝေခြင်း
Management Department
Admin & HR Department
Operation Department
မိတ္တူ ကို
- ရုံးလက်ခံ

Myanmar Ahlone Power Plant Co., Ltd.
No.20, Sabal Street, Saw Yan Paing Quarter Ahlone Township, Yangon.

ပူးတွဲ (၃)

သက်ဆိုင်ရာဝန်ထမ်းများအတွက်လုပ်ငန်းခွင် ဘေးအန္တရာယ် ကာကွယ်ရေးကိရိယာများ ပြင်ဆင်ထားရှိမှုစီမံချက်

- သက်ဆိုင်ရာ ဝန်ထမ်းများအတွက် ဘေးအန္တရာယ်မှ ကာကွယ်ရန် နှာခေါင်းစည်း Mask ၊ ဝတ်စုံ ၊ ဖိနပ် ၊ လက်အိတ် ၊ ဆေးသေတ္တာများ နှင့် မျက်စိ ၊ လက် ၊ ခန္ဓာကိုယ်တစ်ခုလုံး ဆေးချ၍ရသော ရေပန်းများ ထားရှိပေးထားခြင်း
- PPE ဝတ်စုံများ အဆင်သင့်ထားရှိခြင်း
- First Aid Training များပေးထားခြင်း ၊ First Aid Kit များ လုံလောက်စွာထားပေးခြင်း
- ဝန်ထမ်းများအား ကျန်းမာရေး စစ်ဆေးခြင်း
- Chemical Handling & Storage အတွက် Chemical Safety Awareness သင်တန်းများပေးခြင်း
- စွန့်ပစ်ပစ္စည်းများကိုလည်း စည်ပင်သာယာရေးကော်မတီမှ ပြဋ္ဌာန်းထားသော ရေပေးဝေရေးနှင့် အညစ်အကြေးသန့်ရှင်းရေးဆိုင်ရာ နည်းဥပဒေများနှင့် ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဆိုင်ရာ ဥပဒေ ၊ နည်းဥပဒေများနှင့် အညီ ဆောင်ရွက်ခြင်း
- အရေးပေါ် ဝင်ပေါက် ၊ ထွက်ပေါက်များ ညွှန်ပြထားခြင်း
- အန္တရာယ်အဆင့်လိုက် သတိပေးအမှတ်အသားများ ကပ်ထားခြင်း
- လုံခြုံရေးကိရိယာများကို သိုလှောင်သောနေရာများတွင် ထားရှိခြင်း
- မီးဘေးအန္တရာယ် ကြိုတင်ကာကွယ်ရေး စီမံချက်ထားရှိပြီး သင်တန်းများပေးထားခြင်း
- မီးဘေးအန္တရာယ် ကြိုတင်ကာကွယ်ရေးအတွက် လုံလောက်သော မီးသတ်ဆေးဗူးများ ထားရှိခြင်းနှင့် ဆက်သွယ်ရန် ဖုန်းနံပါတ်များ ညွှန်ကြားထားခြင်း
- နီးကပ်စွာထားရှိပါက ဓါတ်ပြုပြီးအန္တရာယ်ဖြစ်စေနိုင်သည့် ဓာတုပစ္စည်းများအား အဆင့်အတန်း နှင့်အမျိုးအစားအလိုက် ထားသိုခြင်း
- ဆက်သွယ်ရမည့် ဖုန်းနံပါတ်များပေးထားခြင်း
- ဝန်ထမ်းများအား အလှည့်ကျ တာဝန်များပေးထားခြင်း
- ဝန်ထမ်းများအတွက် အိမ်သာ ၊ ရေချိုးခန်း ၊ နားနေခန်း ၊ ထမင်းစားခန်းများ သန့်ရှင်းစွာ သီးသန့်ထားခြင်း

Myanmar Ahlone Power Plant Co., Ltd.

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ပူးတွဲ (၃)

သက်ဆိုင်ရာဝန်ထမ်းများအတွက် ဘေးအန္တရာယ်ကာကွယ်ရေးကိရိယာများ ထားရှိမှု အခြေအနေ

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ပူးတွဲ (၅)

မတော်တဆဖြစ်ပွားပါက ဘေးအန္တရာယ်လျော့နည်းစေရေးနှင့် အန္တရာယ်ကင်းရှင်းစေရေး ပြင်ဆင်ထားရှိမှု စီမံချက်

နိဒါန်း

၁။ ဓာတုပစ္စည်း နှင့် ဆက်စပ်ပစ္စည်းများ သယ်ယူရွှေ့ပြောင်းစဉ် ဘေးအန္တရာယ် ပေါ်ပေါက်လာပါက အန္တရာယ်လျော့နည်းစေရေးနှင့် ကင်းရှင်းစေရေး ဆောင်ရွက်သွားရန် ဖြစ်ပါသည်။

<u>ရည်ရွယ်ချက်</u>

၂။ ဓာတုပစ္စည်း နှင့် ဆက်စပ်ပစ္စည်းများ သယ်ယူရွှေ့ပြောင်းခြင်းများ ဆောင်ရွက်စဉ် မတော်တဆ ဖြစ်ပွားပါက ဘေးအန္တရာယ် လျော့နည်းစေရေး နှင့် အန္တရာယ်ကင်းရှင်းရေးအတွက် ပြင်ဆင် ထားရှိရန်။

<u>လုပ်ဆောင်မည့်နည်းလမ်းများ</u>

၃။ လုပ်ဆောင်မည့်နည်းလမ်းများမှာ အောက်ပါအတိုင်းဆောင်ရွက်သွားပါမည်။

(က) သယ်ယူရွှေ့ပြောင်းစဉ်လိုက်နာဆောင်ရွက်မည့်အချက်များ

(၁) ဓာတုပစ္စည်း နှင့် ဆက်စပ်ပစ္စည်းများကို တည့်မတ်စွာ သယ်ယူရွှေ့ပြောင်းစေခြင်း။

(၂) သယ်ယူပို့ဆောင်စဉ် ဘယ်ညာကွေ့၍ သယ်ယူရသည့်အချိန်တိုင်းတွင် ဓာတုဗေဒ ပစ္စည်းအား တည့်သည့်အနေအထားမြဲစေရန် သတိပေးထားရှိခြင်း။

(ခ) အန္တရာယ်အဆင့်အလိုက် သတိပေးအမှတ်အသားကပ်ခြင်းနှင့် လုံခြုံရေးကိရိယာများကို သိလှောင်သော နေရာများတွင် ထားရှိခြင်းများ ပြုလုပ်သွားပါမည်။ နီးကပ်စွာထားရှိပါက ခါတ်ပြုံပြီး အန္တရာယ်ဖြစ်စေနိုင်သည့် ပစ္စည်းအဆင့်အတန်း အမျိုးအစားအလိုက် ထားသိုခြင်းများ ပြုလုပ်ထား ပါသည်။

(ဂ) လုပ်ငန်းခွင်တွင် ထူးဆန်းသောအခြေအနေဖြစ်ပေါ်က အသုံးပြုနိုင်ရန် အရေးပေါ်ထွက်ပေါက် ၊ အရေးပေါ်ဆက်သွယ်ရန် တယ်လီဖုန်းတို့ကို လုပ်ငန်းခွင်တွင် ထားရှိပါမည်။

ရက်စွဲ ။ ၂၀၂၄ ခုနှစ် ၊ ဧပြီလ ( ) ရက်

ဖြန့်ဝေခြင်း

Management Department

Admin & HR Department

Operation Department

မိတ္တူ ကို

- ရုံးလက်ခံ

Myanmar Ahlone Power Plant Co., Ltd.

No.20, Sabal Street, Saw Yan Paing Quarter Ahlone Township, Yangon.

ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ စီမံခန့်ခွဲမှု စီမံချက် (Action Plan)

ရည်ရွယ်ချက်

၁။ Myanmar Ahlone Power Plant Co.,Ltd အောက်ရှိ အမှတ်(၃၉) ၊ ကမ်းနားလမ်း ၊ ဧရာဝတီရပ်ကွက် ၊ အလုံမြို့နယ် ၊ ရန်ကုန်တိုင်းဒေသကြီးတွင် တည်ရှိသည့် သိုလှောင်ရုံမှ ထွက်ရှိသည့် စွန့်ပစ်ပစ္စည်းများ လျော့နည်းစေရန် နှင့် မရှိစေရန် ပတ်ဝန်းကျင်ထိခိုက်မှု မဖြစ်ပေါ်စေရန်။

လုပ်ဆောင်မည့်နည်းလမ်းများ

၂။ သိုလှောင်ရုံမှ ထွက်ရှိသည့်စွန့်ပစ်ပစ္စည်းများမှ ပတ်ဝန်းကျင်ထိခိုက်မှုမရှိစေရန် စွန့်ပစ်ပစ္စည်းများ ထိန်းသိမ်းမှုဆိုင်ရာ လုပ်ငန်းများကို အောက်ပါအချက်အလက်များဖြင့် ဆောင်ရွက်ထားရှိပါသည်။

(က) ပတ်ဝန်းကျင်မှ ဓာတုပစ္စည်းနှင့် ဆက်စပ်ပစ္စည်းများ၏ အဆိပ်ဖြစ်စေမည့်အန္တရာယ်များ မရှိစေရေးအတွက် ကိုင်တွယ်သိုလှောင်ပါမည်။ MSDS ပါဖော်ပြထားသော အချက်အလက်များ နှင့်အညီ ဓာတုပစ္စည်းများ မပျက်စီးစေရေး ၊ မဖိတ်စင်စေရေး ၊ ယိုစိမ့်မှုမဖြစ်စေရေးအတွက် စနစ်တကျသိုလှောင်သိမ်းဆည်းလျက်ရှိပါသည်။

(ခ) ဂိုဒေါင်ရှိဝန်ထမ်းများကို ပစ္စည်းများ၏ အန္တရာယ်ဖြစ်ပေါ်စေနိုင်မှုနှင့် ဓာတုပစ္စည်းကိုင်တွယ်ခြင်း ၊ သယ်ယူခြင်း လုပ်ငန်းစဉ်များအား သင်တန်းပေး၍ သင်ကြားထားပါသည်။

(ဂ) ဓာတုပစ္စည်းများနှင့် စပ်လျဉ်း၍ မဝယ်မီသက်တမ်းလွန်မည့် ရက်စွဲမရှိစေရန် Demand ရှိမှသာ မှာယူပါသည်။ လျှောက်ထားသည့် ဓာတုကုန်ကြမ်းတချို့အား ဂိုဒေါင်၌ မသိုလှောင်ဘဲ ဆိပ်ကမ်းမှတဆင့် End user တိုက်ရိုက်ပို့ခြင်းကြောင့် အလေလွင့်ဆုံးရှုံးမှု မရှိနိုင်ပါ။

(ဃ) သက်တမ်းလွန်သော ဓာတုပစ္စည်းများရှိပါကလည်း ဘူး ၊ ပုလင်းများကို "အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်း" ဆိုသည့် စာတမ်းကို ကပ်ထားပြီး ခွဲခြားထားရန် စီမံထားပါသည်။ ယခုအချိန်ထိ မရှိသေးပါ။

(င) အမျိုးအမည်ပျက်နေသော သက်တမ်းလွန်နေသော ဓါတုပစ္စည်းများနှင့် ဆက်စပ်ပစ္စည်းများကို ဆက်လက်သိုလှောင်ထားခြင်းမပြုဘဲ သက်ဆိုင်ရာ တာဝန်ရှိသူထံအကြောင်းကြားပြီး လုပ်ထုံးလုပ်နည်း နှင့် အညီ စနစ်တကျစုပုံဖျက်ဆီးခြင်း ပြုလုပ်ပါမည်။

(စ) ဓာတုပစ္စည်းများ သိုလှောင်ရာ ဂိုဒေါင်အား လေဝင်လေထွက် ကောင်းမွန်ပြီး စံချိန်စံညွှန်းနှင့် လိုက်လျောညီထွေစွာ ပြုလုပ်ထားသော ဂိုဒေါင်၌သာ ပစ္စည်းများ သိုလှောင်ထားခြင်းဖြစ်ပါသည်။

(ဆ) ပတ်ဝန်းကျင်ဆူညံသံမဖြစ်ပေါ်စေရေးအတွက် အလုပ်ချိန်အတွင်း၌ ပစ္စည်းများ အတင်အချကို အလှည့်ကျစနစ်ဖြင့်သာ ဆောင်ရွက်ပါသည်။

(ဇ) သိုလှောင်ထားသည့် ဓါတုပစ္စည်းများကြောင့် အလုပ်သမားများအား ပတ်ဝန်းကျင်ထိခိုက်မှု မဖြစ်ပေါ်စေရေးအတွက် အစဉ်အလေးထားဆောင်ရွက်သွားမည်ဖြစ်ပါကြောင်း နှင့် ပတ်ဝန်းကျင်

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ထိန်းသိမ်းရေးဦးစီးဌာန၏ ဥပဒေ ၊ နည်းဥပဒေနှင့် ညွှန်ကြားချက်များနှင့်အညီ လိုက်နာဆောင်ရွက်မည်ဖြစ်ပါကြောင်း တင်ပြအပ်ပါသည်။

သိုလှောင်ရုံ Manager (Admin & HR) တာဝန်ခံ ၊ Labour နှင့် မော်တော်ယာဉ် ယာဉ်မောင်း ၊ ယာဉ်အကူများအား Hand Phone ကြိုးဖုန်းများဖြင့်လည်းကောင်း ၊ E mail ဖြင့်လည်းကောင်း ဆက်သွယ်၍ ညွှန်ကြားမှု ခံယူဆောင်ရွက်စေခြင်းများ ပြုလုပ်သွားပါမည်။ ဓာတုပစ္စည်းနှင့် ဆက်စပ်ပစ္စည်းများ အန္တရာယ်မှ တားဆီးကာကွယ်ရေးဗဟိုကြီးကြပ်ရေးအဖွဲ့မှထုတ်ပြန်ချက်နှင့် ညွှန်ကြားမှုများကို လိုက်နာဆောင်ရွက်သွားပါမည်။

ရက်စွဲ ။ ၂၀၂၄ ခုနှစ် ၊ ဧပြီလ ( ) ရက်

ဖြန့်ဝေခြင်း
Management Department
Admin & HR Department
Operation Department
မိတ္တူ ကို
- ရုံးလက်ခံ

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ပူးတွဲ (၅)

ပတ်ဝန်းကျင်ထိခိုက်မှုမရှိစေရန် ဘေးထွက်စွန့်ပစ်ပစ္စည်းများ ထိန်းသိမ်းမှု အစီအစဉ်

MAPP Company အနေဖြင့် ပတ်ဝန်းကျင် ထိခိုက်မှုမရှိစေရန် ဘေးထွက်စွန့်ပစ်ပစ္စည်းများ ထိန်းသိမ်းမှု အစီအစဉ်များကို အောက်ပါအတိုင်းဆောင်ရွက်လျက်ရှိပါသည်။

၁။ ပတ်ဝန်းကျင်ထိခိုက်မှုမရှိစေရန် ဘေးထွက်စွန့်ပစ်ပစ္စည်းများကို မစွန့်ပစ်မီ အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး(ထုတ်လွှတ်မှု) (National Environmental Quality (emissions) Guidelines) ၏ လုပ်ငန်းကဏ္ဍအလိုက် (Industrial specific guidelines) လမ်းညွှန်ချက်များ ကိုလိုက်နာပြီး စနစ်တစ်ကျတိုင်းတာခြင်း၊သန့်စင်ခြင်းများ ပြုလုပ်ပြီးမှ စွန့်ထုတ် အရည်အဆင့် သတ်မှတ်ချက်များနှင့်အညီ စွန့်ပစ်ခြင်း

၂။ သက်ဆိုင်ရာဘာသာရပ်အထူးပြု ကျွမ်းကျင်ဝန်ထမ်းများခန့်အပ်ပြီး ထိုကျွမ်းကျင်ဝန်ထမ်းများမှ အခြားသက်ဆိုင်ရာ Department မှ ဝန်ထမ်းများကို Environmental awareness ရှိစေရန် သင်တန်းပို့ချခြင်းဖြင့်ဘေးထွက်စွန့်ပစ်ပစ္စည်းထွက်ရှိမှုလျော့နည်းစေခြင်း-

ဘေးထွက်စွန့်ပစ်လျော့နည်းစေရန် သက်ဆိုင်ရာကျွမ်းကျင်ဝန်ထမ်းများမှ Waste minimization Program(Reduce, Reuse and Recycle)တွင် ပါဝင်သော 3RS ကို အဆင့်ဆင့် လက်တွေ့အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း

-Reduce

ကုန်ထုတ်မှုမှ ထွက်ပေါ်လာသော စွန့်ပစ်ပစ္စည်းများကို နည်းနိုင်သမျှနည်းအောင် ပြုလုပ်ခြင်းဖြင့် ဘေးထွက်ပစ္စည်းထွက်ရှိမှုလျော့နည်းစေခြင်း

ဝန်ထန်းများလုပ်ငန်းကျွမ်းကျင်စေရန် သင်တန်းပို့ချခြင်းဖြင့် ဘေးထွက်စွန့်ပစ္စည်းလျော့နည်းစေခြင်း

-Reuse

ကုန်ထုတ်လုပ်ငန်းတွင် အသုံးပြလျက်ရှိသော ထုပ်ပိုးပစ္စည်းများ ရေနှင့်ရေနွေးငွေ့အပူစွမ်းအင်များ အခြားလုပ်ငန်းသုံးပစ္စည်းများကို တစ်ကြိမ်မက ပြန်လည်အသုံးပြုခြင်းဖြင့် ဘေးထွက် ပစ္စည်းထွက်ရှိမှု ကို လျော့ချခြင်း

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-Recycle

ကုန်ထုတ်မှုအဆင့်ဆင့်အတွက် ထွက်ပေါ်လာသော ကုန်ပစ္စည်းများ၊ ရေနှင့်ရေနွေးငွေ့များကို အခြား process တွင်ပြန်လည်အသုံးပြုခြင်းဖြင့် ဘေးထွက်စွန့်ပစ္စည်း ထွက်ရှိမှုပမာဏ လျော့ချခြင်းတို့ဖြင့် ပတ်ဝန်းကျင်ထိခိုက်မှုမရှိစေရန် ဘေးထွက်စွန့်ပစ်ပစ္စည်းများကို စနစ်တကျ စီမံခန့်ခွဲလျက်ရှိပါသည်။

ရက်စွဲ ။ ၂၀၂၄ ခုနှစ်၊ ဧပြီလ ( ) ရက်

ဖြန့်ဝေခြင်း
Management Department
Admin & HR Department
Operation Department
မိတ္တူ ကို
- ရုံးလက်ခံ

Appendix – 12: Grievance Redress Form

Grievance Redress Form for Myanmar Ahlone Power Plant Co., Ltd

Name: {not compulsory}			☐ **Male**	☐ **Female**
Title or Occupation:				
Please mark how you wish to be contacted	☐ Post	☐Telephone	☐ E-mail	☐ Personally
Please specify:				
Contact number:				
Address:				
E-mail Address:				
Description of incident or Grievance: **(What happened? Where did it happen? Who did it happen to? What is the result of the problem?)**				
Date of Incident / Grievance:				
☐ **One time incident /grievance**			Date:	
☐ **Happened more than once**	How many times happen?			
☐ **On-going (currently experiencing problem)**				
Do you have suggestions on how to solve the problem?				
☐ **I requested you not to disclose my identity to third parties without my previous written consent**				
Signature: **(Please do not sign if you would like to remain anonymous)**				
Location:				
Date:				

Myanmar Ahlone Power Plant Co., Ltd မှတည်ဆောက်သော (၁၅၁.၅၄) မဂ္ဂါဝပ် ဓာတ်အားပေးစက်ရုံ နှင့် ပတ်သက်၍ တိုင်ကြားရန် ပုံစံ။

အမည် (မဖော်ပြလိုပါက ဖြည့်ရန်မလိုပါ) -			**☐ အမျိုးသား**	**☐ အမျိုးသမီး**
ရာထူး/ အလုပ်အကိုင် -				
သင့်အား မည်သို့ ဆက်သွယ်စေလို သည်ကို အမှတ်သားပြပါ။	☐ စာတိုက်မှတဆင့်	☐ တယ်လီဖုံးဖြင့်	☐ အီးမေးလ်ဖြင့်	☐ လူကိုယ်တိုင်
အခြားဆက်သွယ်နိုင်သည့်နည်းလမ်း -				
ဆက်သွယ်ရန်ဖုံးနံပါတ် -				
နေရပ်လိပ်စာ -				
အီးမေးလ်လိပ်စာ -				
ထိခိုက်နစ်နာသည့် အဖြစ်အပျက်ကို ရှင်းလင်းဖော်ပြပါ။ (ဘာဖြစ်ခဲ့သလဲ၊ ဘယ်မှာဖြစ်ခဲ့သလဲ၊ ဘယ်သူဖြစ်ခဲ့သလဲ၊ ဖြစ်ခဲ့သည့်ပြဿနာကြောင့် ဘယ်လိုအကျိုးဆက် ဖြစ်လာခဲ့သလဲ)				
ထိခိုက်နစ်နာမှု ဖြစ်ပျက် ခဲ့သော နေ့စွဲ -				
☐ ထိခိုက်နစ်နာမှု တစ်ကြိမ် တစ်ခါ ဖြစ်ပျက်ခဲ့သည်။			**နေ့စွဲ -**	
☐ ထိခိုက်နစ်နာမှု တစ်ကြိမ် ထက်ပို ဖြစ်ပျက်ခဲ့သည်။			**အကြိမ်အရေအတွက် -**	
☐ လက်ရှိခံစားနေရသော ထိခိုက်နစ်နာမှု ဖြစ်သည်။				
ဖြစ်ခဲ့သည့်ပြဿနာကို ဖြေရှင်းရန်နည်းလမ်း အကြံပြုချက်ရှိပါက ရေးသားဖော်ပြပါ။				
☐ ကျွန်ုပ်၏ သဘောတူညီချက်လက်မှတ်မပါဘဲ၊ ကျွန်ုပ်၏ အကြောင်းအရာကို ဖော်ပြခြင်းမပြုရန် မေတ္တာရပ်ခံပါသည်။				
လက်မှတ် (သင့် အကြောင်းကိုမဖော်ပြလိုလျှင် လက်မှတ်မရေးထိုးဘဲထားနိုင်ပါသည်။)				
နေရာ -				
နေ့စွဲ -				

Appendix – 13: Continuous Emission Monitoring System (CEMS)

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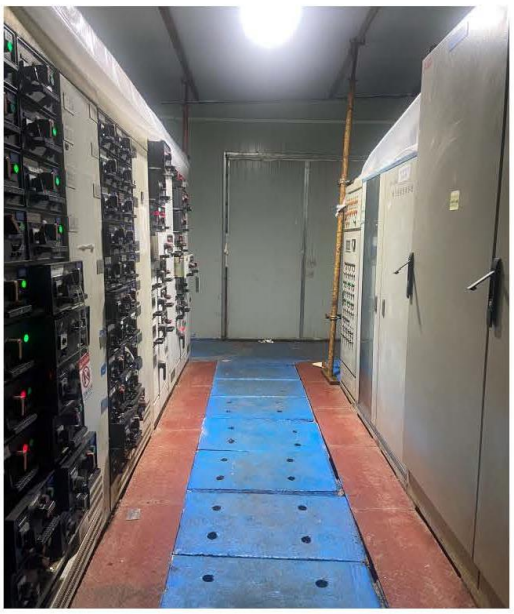
Monitoring System for Gas Analyzer in 151.54MW CCPP (Ahlone)



Monitoring Device (YX-CEMS)

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Gas Analyzer Control Room

Myanmar Ahlone Power Plant Co., Ltd.

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Table-1. The atmospheric pollution emission concentration and emission monitoring results in 2022 and 2023 in 151.54 MW CCPP (Ahlone)

Monitoring Time	Frequency	Flue Gas Volume (MMCF)	Oxygen Content (%)	Measured emission concentration(mg/m³)			Emission concentration(mg/m³) coverted to excess air coefficient of 3.5 (mg/m³)			Emission (kg/h)			Chinmey outlet smoke Air Blackness (Ringer the Man black Degree, Level)
				smoke	sulphur dioxide	nitrogen oxide	smoke	sulphur dioxide	nitrogen oxide	smoke	sulphur dioxide	nitrogen oxide	
2022-11-24	1st	1.576	16.0	0.9	0.298	35	1.1	0.358	42	0.79	0.25	9.7	<1
	2nd	1.563	15.7	1.0	0.267	40	1.2	0.302	45	0.84	0.22	33.2	<1
	3rd	1.567	15.7	1.0	0.333	40	1.1	0.377	45	0.83	0.28	33.4	<1
2023-12-12	1st	1.562	15.4	1.4	0.314	38	1.5	0.336	41	1.22	0.27	32.2	<1
	2nd	1.567	15.4	1.3	0.218	35	1.4	0.234	38	1.06	0.10	29.0	<1
	3rd	1.578	15.3	1.3	0.197	40	1.3	0.207	42	1.08	0.17	33.7	<1
Compliance							Reaching the standard						Reaching the standard

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Gas Analyzer Modeling

Housing selection guide

Rosemount X-STREAM *Enhanced* XEGP

The 19-inch General Purpose Housing with three rack units height can be installed in cabinets or used as tabletop. It allows up to five measurements featuring NDIR/UV photometer, paramagnetic and electrochemical O_2, thermal conductivity, electrochemical H_2S, and moisture sensors. The front panel features a large LCD display and six soft keys to navigate the menu structure. The backside gives access to the gas and electrical connections which are available as submin sockets or screw terminals. The Rosemount XEGP has a thermostat control option to handle sample gas dew points up 122 °F (50 °C).

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Modern communication

Rosemount X-STREAM *Enhanced* Continuous Gas Analyzers offer a unique integrated web interface for configuration and monitoring capabilities without the need to install additional software.

Figure 1: Analyzer Measured Concentration and Secondaries

Rosemount X-STREAM *Enhanced* Continuous Gas Analyzers provide four status signal relay outputs (according to NAMUR NE 107), Modbus® TCP protocol over Ethernet (RJ45), and optional Modbus RTU over serial (RS-232/RS-485) communication. On-board SD card, USB ports, and FTP client enable storage of:

- Measurement data, calibration, and event logger files
- Analyzer configuration files
- PLC and calculator programs

The Rosemount XEGP, XEXF, and XEFD can have up to two IO boards, the XEGK only one. IO boards to integrate are: DIO board with nine outputs and seven outputs and AIN board with two analog inputs.

Easy-to-use tools

The software of the Rosemount X-STREAM *Enhanced* Continuous Gas Analyzers provides several tools that make complex process analyzer systems easier and help eliminate additional expenses for third-party equipment:

- Time-controlled programmable routines for auto-calibration and auto-validation using internal and external valves
- Automated valve assignment verification to avoid miscalibration
- Programmable logic controller (PLC) for things such as sample handling control/sample gas line switching or programming of customized alarms (PLC can also switch between NO and NO_x mode)
- Calculator for heating values, reference to certain oxygen content, NO_x as sum of NO and NO_2, etc.
- Limit alarms with reports for concentrations and secondary measurements, such as flow, temperature, and pressure
- Clear text messages (available in several languages) and industry-standard symbols provide information about the measurement and analyzer status on the front panel of the analyzer
- Optional pre-engineered DeltaV™ module helps integrate into an existing DeltaV environment via serial Modbus RTU

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Rosemount X-STREAM October 2021

Features

Rosemount X-STREAM *Enhanced* Series of Continuous Gas Analyzers combines powerful analytical technology with modern communication functionality to help you address your toughest analytical challenges.

Analytical flexibility

Get more out of your process gas analyzer with the Rosemount X-STREAM *Enhanced* platform which enables the combination of up to five channels of non-dispersive infrared, ultraviolet photometers (NDIR/UV), paramagnetic and electrochemical oxygen (pO_2/eO_2) detectors, a thermal conductivity detector (TCD), electrochemical hydrogen sulfide (eH_2S), trace moisture (tH_2O), and trace oxygen (tH_2O) sensors. The NDIR and NDUV photometer can be combined on one chopper, resulting in a compact design and cost savings. For each channel, up to four cross compensations are available to handle cross interferences in complex sample gas compositions and ensure reliable, selective detection and monitoring of gases.

Enhanced performance

Rosemount NDIR gas detectors are equipped with proprietary micro-flow sensors, the smallest gas-filled sensors on the market to facilitate measurement frequencies of up to 154 Hz with proven vibration resistance. These micro-flow sensors ensure high target gas selectivity and exceptional long term stability (lifetime) of the NDIR gas detector due to a unique glass-soldering technology that provides a gas-tight seal of the detector.

With Emerson's patented X-STREAM IntrinzX photometer technology that operates at 30 Hz, the Rosemount X-STREAM *Enhanced* Continuous Gas Analyzers ensure repeatable, accurate measurement for enhanced process control, product quality, and plant safety. IntrinzX photometer technology also reduces total cost of ownership by delivering:

- Large dynamic ranges to allow measurement in front of and behind adsorber with one photometer, as well as measurement of the magnitude of an adsorber breaktrough
- Very low temperature dependency to allow field installation close to the process down to -4 °F (-20 °C) ambient temperature
- High resistance to vibrations produced by utilities such as large compressors to reduce measurement uncertainty
- Outstanding long-term stability
- Simplified calibration

Three-year warranty

All of the analyzer's relevant measurement performance components including the chopper, IR source, and NDIR gas detector pass extensive testing. The complete analyzer is run through a variety of test procedures including long-term stability, linearity, and temperature behavior in a 48-hour climate chamber test. This enables us to provide a three-year warranty for the analyzer, excluding sample-wetted parts and externally connected electronic boards.

Process approved cells

Stainless steel process cells with Pd/Rh or TiN coating are available for toxic and corrosive sample gases. Glass soldering technology provides exceptional leak tightness. The process cells are also available with purged cell heads for applications with higher safety requirements. Solvent-resistant and corrosion-resistant paramagnetic sensors are also available.

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Rosemount X-STREAM October 2021

Applications

Chemical/Petrochemical
- Ammonia, urea, and fertilizer production
- Ethylene, Propylene, VCM, PTA production
- Inert gas blanketing control and safety measurements for flammable mixtures

Environmental
- Continuous Emission Monitoring Systems (CEMS)
- Greenhouse gas reduction
- Automotive emissions (ICE)

Metallurgical/Glass
- Metallurgical manufacturing, hardening
- Heat treatment processes
- Blast furnaces
- Direct ore reduction (MIDREX)

Power
- Hydrogen cooling of generators
- Exhaust measurements for burner efficiency
- Fuel cells
- Fast fuel gas analysis for turbine control

Gas Processing
- Natural gas and LNG production and distribution
- Air separation units
- Industrial gases, Hydrogen production, Pressure Swing Adsorption (PSA)
- Coal or wood gasification

Refining
- Hydrotreater
- BTX reforming and Fluid Catalyst Cracking (FCC)
- Hydrogen recycling streams

Biotechnologies
- Biogas/landfill
- Fermenter

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Rosemount X-STREAM October 2021

Functional specifications

Rosemount X-STREAM *Enhanced* Continuous Gas Analyzers

Parameters	XEGP	XEGK	XEXF	XEFD
Gas connections	PVDF compression fitting: 6/4 mm Stainless steel compression fitting 6/4 mm or ¼-in.			Stainless steel compression fitting 6/4 mm or ¼-in.
Rated voltage	100–240 V ~ 50/60 Hz, ±10%			
Rated voltage 24 V option	N/A	DC 24 V ±10%	N/A	DC 24 V ±10%
Rated input current (depending on configuration)	3-1.5 A	2-1 A 2.5 A (24 V)	3-1.5 A	
Power input	IEC C14 mains appliance	IEC C14 mains appliance 3 pin XLR connector (24 V)	Internal screw terminals	
Signal connections	Submin-D connectors or screw terminals (max. 1.5 mm^2), RJ45		Internal screw terminals (max. 1.5 mm^2), RJ45	
Enclosure	19-in. table-top or rack-mount	½ 19in. table-top, rack-mount or portable with handle	Wall-mountable stainless steel housing	Wall-mountable aluminum cast housing
Enclosure protection	IP 20 acc. EN 60529 for indoor installation, for pollution degree 2, protected against direct sunlight		NEMA 4X/ IP 66 acc. EN 60529 for outdoor installation, protected against direct sunlight	
Humidity (non-condensing)	< 90 % r.h. @ 20 °C (68 °F) < 70 % r.h. @ 40 °C (104 °F)			
Ambient temperature	Storage : -20 to 70 °C (-4 to 158 °F) Operation: 0 to 50 °C (32 to 122 °F), restriction by configuration might apply Allow 1 HU (44.5 mm; 1¾-in.) distance to other equipment in a cabinet		Storage : -20 to 70 °C (-4 to 158 °F) Operation: 0 (-20) to 50 °C (32 (4) to 122 °F), restriction by configuration might apply XEFD hazardous area safe for: -20 to 55 °C (32 to 131 °F)	
Elevation	0 – 2,000 m (6560 ft) above sea level			
Weight (depending on configuration)	Approx. 12–16 kg (26.5–35.3 lb)	Approx. 8–12 kg (7.6–26.5 lb)	Up to 25 kg (55.1 lb) (up to 45 kg (99.2 lb) for dual compartment)	Up to 63 kg (139 lb)
Options (availability depending on configuration)	Integrated flow measurement(s) with alarm(s)Barometric pressure sensor Thermostatically controlled box for physical components (60 °C / 140 °F); not for Rosemount XEGK Case purge; not for Rosemount XEGK Sampling pump(s) Solenoid valve block(s) for autocalibration Only for Rosemount XEGK: external 24 V power supply			

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Signal inputs, outputs, and interfaces

Signal type	Description
Analog signal outputs	1–5, Individually optically isolated (Rosemount XEGP, XEXF, XEFD) 1–4, Individually optically isolated (Rosemount XEGK) 4 (0)–20 mA (RB ≤ 500 Ω) 1 as standard, 2-5 as option NAMUR NE 43 and NE 44 compliance
Relay outputs	Four status relays acc. NAMUR NE 107 or e.g., concentration thresholds, valve status notification dry contacts: 1A, 30 V
Communication interface	Ethernet with Modbus® TCP RS-485 / RS-232C with Modbus RTU Two USB ports
Optional I/O boards for extension slots	
Digital in/out (I/O)	Seven digital inputs (for remote control): max. 30 Vdc, 2.3 mA, common ground Nine additional relay outputs (e.g. concentration thresholds, valve status notification, flow alarm, range ID) dry contacts: 1A, 30 V
Analog signal inputs	Two analog inputs 0–1(10) V (R_{in} - 100 kΩ) or 4 (0)–20 mA (R_{in} - 50 Ω)

Note
All signal lines need appropriate shielding and grounding as described in the Reference Manual.

Note
The Rosemount X-STREAM *Enhanced* XEGP, XEXF and XEFD can be upgraded with two additional I/O boards, whereas the Rosemount X-STREAM *Enhanced* XEGK has only one extension slot.

Requirements for sample gas

The sample gas into the analyzer must be conditioned by a sample handling system, especially for upset process conditions.

- Sample gas dew point more than 10 K below coldest spot in the analyzer (depending on configuration).
- To protect the analyzer from droplets, a coalescence filter in front of the analyzer is highly recommended.
- Install a particulate filter with 2 µm pore size (coalescence filter will also protect from particulates).
- Maintain constant flow and pressure within the specification of the respective measurement technology.
- The analyzer is not recommended for the measurement of explosive gases or gas mixtures.
- Flammable gases can be measured in general purpose area if stainless steel tubing and fittings are used. As an option, the analyzer can be equipped with a safe analyzer case purge to avoid explosive gas concentrations inside the analyzer housing (for more details, refer to the Analyzer Manual).
- For toxic gases, Emerson also recommends stainless steel tubing and fittings, and for highly toxic gases, additional safety features such as case purge (with vent to safe area), and process cells with purged windows should be taken into consideration.

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Special performance specifications for gas purity measurements

Table 7: Special Performance Specifications for Gas Purity Measurements (Suppressed Ranges O_2, N_2O, CO_2, CH_4, and H_2)

Measurement parameters	**CH_4: 90-100% H_2: 90-100% / 95-100% / 98-100%**	**CO_2: 90-100% / 95-100% / 98-100% O_2: 20-22% / 90-100% / 95-100% / 98-100% N_2O: 90-100 % / 95-100% / 98-100%**
Detection limit (4 σ)[1][2]	≤ 2%	
Linearity[1][2]	≤ 1%	
Zero-point drift[1][2][3]	≤ 2%	
Span (sensitivity) drift [1][2][4]	≤ 2%	
Repeatability[1][2]	≤ 2%	
Response time (t_{90})[5]	≤ 30 s	
Permissible gas flow	0.2 – 1.5 l/min	Defined by constant pressure at inlet
Permissible gas flow variation	0.05 l/min	
Influence of gas flow[1][2]	≤ 2%	
Maximum gas pressure	950 to 1050 hPa	1400 hPa (5.8 psig) – 1600 hPa (8.7 psig)
Influence of pressure[6]		
	≤ 2%	
Permissible ambient temperature[7]		
	15 to 35 °C (59 to 95 °F)	
Influence of temperature (at constant pressure)[1]		
On zero point	≤ 1% per 10 K	
On span (sensitivity)	≤ 2% (+15 to +35 °C / 59 to 95 °F)	
Thermostat control	60 °C (140 °F)	
Warm-up time	Approx. 2 h	
Purge gas flow[8]		
	N/A	0.1 – 0.2 l/min

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Sampling System (JES-301L)

APPLICATION

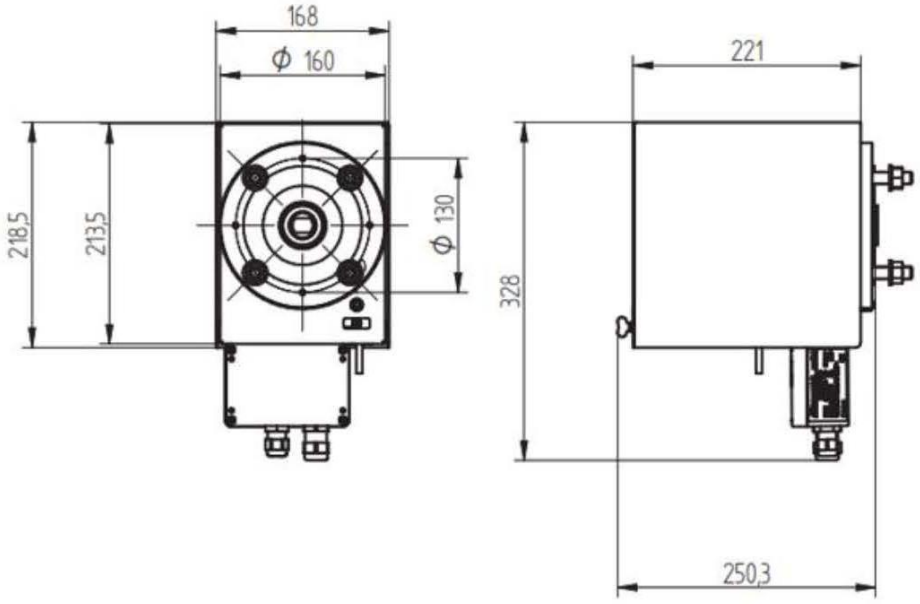
- Representative continuous gas sampling in processes containing dust and humidity
- Extractive gas analysis
- Emission (CEMS) and process monitoring
- Removal of dust from the sample gas

BENEFITS

- No condensation or chemical reactions of sample gas
- Convenient filter replacement
- Low maintenance
- Easy start-up
- Reliable protection of the analyzer system

FEATURES

- Homogeneous heating without cold spots
- Filtration from outside to inside
- Filter element change without tools
- Self limiting PTC heater
- Temperature status contact
- Weather protection housing
- Wide range of accessories
- Calibration port (option)



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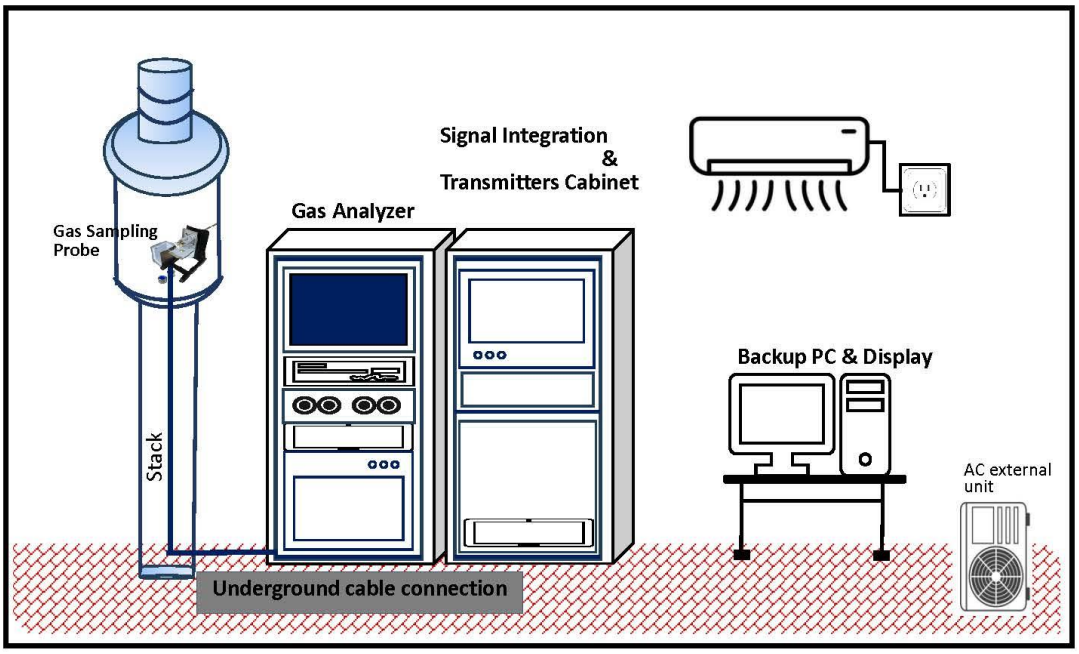

Schematic Layout Diagram of Continuous Emission Monitoring System (CEMS)

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Monitoring, Maintenance Plan and Data Collecting Procedure for CEMS Program

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Monitoring, Maintenance Plan and Data Collecting Procedure for CEMS Program

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Monitoring, Maintenance Plan and Data Collecting Procedure for CEMS Program

No	Description		Duration Plan
1	Monitoring Plan	Monitoring conducted by control room operator	24/7 continuous real-time emissions monitoring
		Data Collection	Twice a year Data collection will be conducted at random. The collected data will be submitted to the ECD in accordance with the requirements specified in the EIA report.
2	Maintenance Plan	Preventive Maintenance	Per Month [testing, checking record data, cleaning, troubleshooting(if)]
		Corrective Maintenance	Foreign Technician and In-house Maintenance Team are stand by position
		Minor Maintenance	According to the requirement of Power Plant Maintenance, at that time all the system will be checked.
		Major Maintenance	after 48,000 hours machine running time major maintenace has to be proceed. At that time all the system will be maintained.
		Emergency Maintenance	When the system is breakdown not by the user fault, the CEMS system will be restarted, check and maintain.
3	QA/QC Checklist		Monthly

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PROCEDURE . QUALITY ASSURANCE REQUIREMENTS FOR GAS CONTINUOUS EMISSION MONITORING SYSTEMS USED FOR COMPLIANCE DETERMINATION

Applicability and Principle

Applicability and Principle

Applicability. Procedure is used to evaluate the effectiveness of quality control (QC) and quality assurance (QA) procedures and the quality of data produced by any continuous emission monitoring system (CEMS) that is used for determining compliance with the emission standards on a continuous basis as specified in the applicable regulation. The CEMS may include pollutant (e.g., SO_2 and NO_x) and diluent (e.g., O_2 or CO_2) monitors.

This procedure specifies the minimum QA requirements necessary for the control and assessment of the quality of CEMS data submitted to the ECD with the 6 months report record. Source owners and operators responsible for one or more CEMS's used for compliance monitoring must meet these minimum requirements and are encouraged to develop and implement a more extensive QA program or to continue such programs where they already exist.

Data collected as a result of QA and QC measures required in this procedure are to be submitted to the ECD with the one year two times (6 months) report record and the CEMS operator in assessing the effectiveness of the CEMS QC and QA procedures in the maintenance of acceptable CEMS operation and valid emission data.

Principle. The QA procedures consist of two distinct and equally important functions. One function is the assessment of the quality of the CEMS data by estimating accuracy. The other function is the control and improvement of the quality of the CEMS data by implementing QC policies and corrective actions. These two functions form a control loop: When the assessment function indicates that the data quality is inadequate, the control effort must be increased until the data quality is acceptable. In order to provide uniformity in the assessment and reporting of data quality, this procedure explicitly specifies the assessment methods for response drift and accuracy.

Because the control and corrective action function encompasses a variety of policies, specifications, standards, and corrective measures, this procedure treats QC requirements in general terms to allow each source owner or operator to develop a QC system that is most effective and efficient for the circumstances.

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Sample Table of QA/QC Checklist for CEMS System

No	Task Description	Check/Action Required	Status (✓/X)	Remark
1	System Operation Checks	Monitor system status continuously (24/7)		
		Ensure alarms and alerts are functioning		
2	Data Quality Assurance	Conduct regular checks on data accuracy		
		Review data collection methods		
3	Monitoring System Calibration	Verify calibration of all monitors		
		Ensure calibration is performed as specified		
		Document calibration dates and results		
4	Preventive Maintenance	Schedule monthly preventive maintenance checks		
		Inspect sensors and components		
		Clean probes and sampling lines as needed		
5	Corrective Maintenance	Establish protocol for equipment malfunctions		
		Document corrective actions taken		
		Track recurring issues for root cause analysis		
6	Performance Testing	Perform required performance evaluations		
		Document results of all performance tests		
		Verify tests meet specified criteria		
7	Data Management and Reporting	Collect and store data securely		
		Validate data prior to submission		
		Maintain records of submitted data		
8	Training and Personnel Competency	Verify training of all personnel		
		Maintain training records		
9	Emergency Procedures	Review emergency maintenance protocols		
		Ensure staff familiarity with emergency plans		
		Conduct drills for emergency response		
10	Documentation and Record Keeping	Document all QA/QC activities		
		Maintain and Review logs of maintenance and tests		

[End of Document]

ECD Comments and Responses

Myanmar Ahlone Power Plant Co.,Ltd မှအကောင်အထည်ဖော်ဆောင်ရွက်မည့် (၁၅၁.၅၄)မဂ္ဂါဝပ် ဓာတ်အားပေးစက်ရုံစီမံကိန်းအတွက် တင်ပြလာသည့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာ(၇)စုံတွင် ပြန်လည်ဖြည့်စွက်ရမည့် RT Member များ၏ သဘောထားမှတ်ချက်များ

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
၁။	ရင်းနှီးမြှုပ်နှံမှုနှင့်ကုမ္ပဏီများညွှန်ကြားမှုဦးစီးဌာန	- မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုဥပဒေ(၂၀၁၆)၊ မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုနည်းဥပဒေများ(၂၀၁၇)နှင့် မြန်မာနိုင်ငံကုမ္ပဏီများဥပဒေ(၂၀၁၇)တို့ကို လိုက်နာဆောင်ရွက်ရန်။	အခန်း ၂၊ အပိုဒ် ၂.၄ စာမျက်နှာ ၁၂ တွင် ဖြည့်စွက် ဖော်ပြထားပါသည်။
၂။	ငါးလုပ်ငန်းဦးစီးဌာန	- Photo 4-7 showing the whole project area Layout ပုံများကို ကြည်လင်ရှင်းလင်းသောပုံဖြင့် အစားထိုးဖော်ပြရန်နှင့် A5 size ဖြင့် ဖော်ပြရန်၊	Photo 4-10, 4-11 project area Layout ပုံကို ကြည်လင် ရှင်း လင်းသောပုံ ဖြင့် စာမျက်နှာ ၁၃၈ - ၁၃၉ တွင်အစားထိုး ဖော်ပြ ထားပါသည်။
		- အစီရင်ခံစာရှိ Biodiversity အပိုင်းတွင် Fauna and Flora ဟူ၍ အပိုင်း (၂) ပိုင်းပါဝင်နေပါသည်၊ Flora အပိုင်းတွင် Aquatic Life များကိုအများအားဖြင့် ဖော်ပြ ရေးသားကြသော်လည်းယခုအစီရင်ခံစာတွင်ဖော်ပြထားခြင်းမရှိသောကြောင့် ယခုစီမံကိန်းဆောင်ရွက်မည့်နေရာသည် ဖော်ပြပါမြေပုံအရနှင့် Buffer Zone km များအရ ရန်ကုန် မြစ်ကမ်းနံဘေးတွင် တည်ရှိနေပြီး စီမံကိန်းအနီးဝန်းကျင်၌ မြစ်ချောင်း၊ ရေဝပ်ဒေသများ၊ ဒီရေတောများ၊ ရွံ့နွံတောများ၊ ရေဝေရေလဲဒေသများ နီးကပ်နေရာ ယေဘုယျအားဖြင့် အဆိုပါ ပတ်ဝန်းကျင်ဆိုင်ရာ သတင်းအချက်များကိုလည်း ဖော်ပြရန်၊	အခန်း ၄၊ အပိုဒ် ၄.၃.၁၀ စာမျက်နှာ ၁၁၆ မှ ၁၁၇ အထိ စီမံကိန်း အနီးဝန်းကျင်၌ မြစ်ချောင်းများကို ဖော်ပြထားပါသည်။ စာမျက်နှာ ၁၁၆ မှ ၁၂၀ အထိတွင် ရန်ကုန်မြစ် အရှေ့ဘက်ကမ်း ယခုစီမံကိန်းဆောင်ရွက်မည့် နေရာတွင် ရေဝပ် ဒေသများ၊ ရေဝေရေလဲဒေသများ၊ ရွံ့နွံတောများ မရှိပါ။ ဒီရေတောများကို ရန်ကုန်မြစ် အနောက်ဘက်ကမ်းရှိ တွံတေးဆိပ်ကြီးခနောင်တိုမြို့များတွင်တွေ့ရကြောင်းဖော်ပြထားပါသည် ။
		- စီမံကိန်းနေရာသည်ရေချိုရေငန်စပ်နေရာဖြစ်ခြင်း၊ရေဝေရေလဲဒေသဖြစ်ခြင်း၊ ဒီရေအတက်အကျရှိခြင်း၊ စီမံကိန်းမှ	အခန်း ၄.၄.၂ Biological Environment ခေါင်းစဉ် အောက်ရှိ အခန်းခွဲ ၄.၄.၂.၇ Aquatic Life ခေါင်းစဉ်ခွဲနှင့် Sub Topic များဖြင့် ကောက်ယူ

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		ရယူမည်ဖြစ်ပြီး ရေယူမည့်နေရာ ရေအောက် ကြမ်းပြင်ရှိ ရေနေသတ္တဝါများကို ထိခိုက်နိုင်သည်ဟု စာပိုဒ်ခွဲ (5.5.3.8) ဖော်ပြထားခြင်း၊ ရေပြန်လည် စွန့်ထုတ်မည့် နေရာသည်လည်း ရန်ကုန်မြစ်ထဲသို့ စွန့်ပစ်မည်ဖြစ်သည့်အပြင် Water Treatment System စနစ် အားနည်းချက် ပေါ်ပေါက်ပါက အဦးဆုံး ထိတွေ့ခံစားရသည်မှာ ရန်ကုန်မြစ်အတွင်းရှိ ရေနေသတ္တဝါများဖြစ်ခြင်း၊ ပတ်ဝန်းကျင် ဂေဟစနစ်များ လေ့လာခြင်းအား ကုန်းတွင်းပိုင်းတွင်သာ ဆောင်ရွက်ထားပြီး အစီရင်ခံစာရှိ ကွင်းဆင်းဆောင်ရွက်ရမည့် AOI ဧရိယာမှာ ဖော်ပြပါ မြေပုံများအရ ရန်ကုန်မြစ်ဝန်းကျင်မှာလည်း ပါဝင်နေပါသဖြင့် အဆိုပါ ဝန်းကျင်ဒေသရှိအထူးသဖြင့် မြစ်ချောင်းအတွင်းနှင့် ကမ်းစပ်နေရာများရှိ ရေနေသတ္တဝါများ ဖြစ်သည့် အပင်မျှော်လေးများ၊ သက်ရှိအကောင် မျှော်လေးများ၊ ရေအောက်ရှုံ့နှံများတွင် ဒီရေတက်ချိန်/ကျချိန်များတွင် တွေ့ရသော အခွံမာသတ္တဝါငယ်လေးများ၊ ငါးနေ ငါးထိုင်များ နေရာများအခြေအနေများကို Fauna ခေါင်းစဉ်အောက်ရှိ Aquatic Life ခေါင်းစဉ်ခွဲ ငယ်အဖြစ် Sub Topic များဖြင့် ကောက်ယူခဲ့သော ရာသီချိန်ကာလ၊ ကောက်ယူခဲ့သော ဒေတာအမျိုးအစား၊ ငါးမျိုးစိတ် ဇယား၊မျိုးသုဉ်းရှားပါးစာရင်းဝင်ရှိ/မရှိ၊ ရွှေ့ပြောင်းသွားလာတတ်သော ငါးမျိုးစိတ်များဖြတ်သန်းခြင်း ရှိ/မရှိ တို့အား စာရင်းဇယားများ၊ ဓာတ်ပုံမှတ်တမ်းများနှင့်အတူ ပူးတွဲဖော်ပြပေးရန်၊	ခဲ့သော ရာသီချိန်ကာလ၊ ကောက်ယူခဲ့သော ဒေတာ အမျိုးအစား၊ ငါးမျိုးစိတ်များ၊ Phytoplankton၊ Zooplankton၊ Benthosများ၊ မျိုးသုဉ်း ရှားပါး စာရင်းဝင်ရှိ/မရှိ၊ ရွှေ့ပြောင်းသွားလာတတ်သော ငါးမျိုးစိတ်များဖြတ်သန်းခြင်းရှိ/မရှိ တို့အား စာရင်းဇယားများ၊ ဓာတ်ပုံမှတ်တမ်း များနှင့်အတူ ပူးတွဲဖော် ပြထားပါသည်။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		- သို့မှသာစီမံကိန်းမစတင်မီ၊လည်ပတ်စဉ်၊ပိတ်သိမ်းချိန်များ၏ အခြေအနေများဖြင့်ပြန်လည်နှိုင်းယှဉ်နိုင်ခြင်း၊သက်ရောက်မှု လျော့ချမည့်အစီအစဉ်များ၊စောင့်ကြပ်ကြည့်ရှုခြင်းအစီအစဉ် များတွင်လည်းငင်းများစိတ်များ အတွက်လည်း Plan များထည့်သွင်းရေးဆွဲရန်၊	
		- အဆိုပါအပိုဒ်တွင်အထက်ဖော်ပြပါရေနေသတ္တဝါများ အပေါ် သက်ရောက်မှု သို့မဟုတ် ထိခိုက်မှု ရှိ/မရှိ လျော့ချ မည့်အစီအစဉ်များကို သီးခြားစာပိုဒ်ခွဲငယ် အနေဖြင့် အခန်း တစ်ခု နှင့် တစ်ခု အချိတ်အဆက် မိမိ ဖော်ပြရန် နှင့် EMP အခန်းငယ်တွင်လည်း ရေနေ သတ္တဝါများအပေါ် ထိခိုက်မှုမှ ကာကွယ်သွားမည့် အစီအမံများအား ဇယားအတွင်း ဖော်ပြပေးရန်။	EMP အခန်းငယ်တွင်လည်း ရေနေသတ္တဝါများအပေါ် ထိခိုက်မှုမှ ကာကွယ်သွားမည့် အစီအမံများအားဇယားအတွင်း ဖော်ပြထားပါသည်။
၃။	တိုင်းရင်းသားအခွင့်အရေး များ ကာကွယ်စောင့် ရှောက်ရေးဦးစီးဌာန	- 2.4.9 The Ethnic Rights Protection Law (2015) ကိုရေးသားဖော်ပြထားပြီး ဥပဒေ၏ ရည်ရွယ်ချက်ကို ဖော်ပြထားသည် ကို တွေ့ရပါသည်။ The Ethnic Rights Protection Rules (2019) ကို ထည့်သွင်း ဖော်ပြထား ခြင်းမရှိပါ။ သို့ဖြစ်ပါ၍ အောက်ပါ အတိုင်း ပြင်ဆင်ဖော်ပြရန်- • The Ethnic Rights Protection Rules (2019) Section 5 ကိုသာ ထည့်သွင်းဖော်ပြရမည်ဖြစ်ပြီး ဥပဒေ၏ ရည်ရွယ် ချက်ကို ရှင်းလင်းဖော်ပြရန် မလိုအပ်ပါ။	• အခန်း ၂၊ အပိုဒ် ၂.၄.၉ စာမျက်နှာ ၁၉-၂၀ တွင် ပြင်ဆင်ရေးသား ဖော်ပြ ထားပါသည်။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		• The Ethnic Rights Protection Rules (2019), Rule 20 and Rule 21 တို့ကို ထည့်သွင်းဖော်ပြရန်၊ တိုင်းရင်းသားလူမျိုးများ၏အခွင့်အရေး ကာကွယ်စောင့်ရှောက်သည့် ဥပဒေပုဒ်မ ၅ နှင့် နည်းဥပဒေ ၂၀ နှင့် ၂၁ တို့ကို လိုက်နာမည်ဖြစ်ကြောင်း ကတိကဝတ်ပြု ရေးသားရန်နှင့် ရေးထိုးကိုဥပဒေရေးရာ ဝန်ကြီးဌာန၏ အကြံပြုချက်များနှင့်အညီ ရေးသားဖော်ပြရန်၊	• Table 2-1 စာမျက်နှာ ၁၂-၁၅ တွင် The Ethnic Rights Protection Rules (2019), Rule 20 and Rule 21 တို့ကို ထည့်သွင်းဖော်ပြထားပါသည်။ တိုင်းရင်းသားလူမျိုးများ၏ အခွင့်အရေးကာကွယ်စောင့်ရှောက်သည့် ဥပဒေပုဒ်မ ၅ နှင့် နည်းဥပဒေ ၂၀ နှင့် ၂၁ တို့ကို လိုက်နာမည်ဖြစ်ကြောင်း အခန်း ၂.၄.၉ စာမျက်နှာ ၁၉-၂၀ တွင် ဖော်ပြထားပါသည်။
၃။	တိုင်ရင်းသားအခွင့်အရေးများကာကွယ်စောင့်ရှောက်ရေးဦးစီးဌာန	• 2.6 Pertinent Administrative and Regulatory Authorities ခေါင်းစဉ်အောက်တွင် for successful implementation of the 154.54 MW ဟူ၍ ရေး သားထားပြီး သဘောထားမှတ်ချက် တောင်းခံထား သည့် အစီရင်ခံစာတွင် (၁၅၁.၅၄) မဂ္ဂါဝပ် Combined Cycle Power Plant ဟူ၍ ရေးသားထား သည်ကို တွေ့ရှိရပြီး Table 2-2: Ministry and Administration Bodies and inter-coordination. တွင် Ministry of Ethnic Affairs, Ethnic Rights Protection Department ဟူ၍ရေးသားဖော်ပြထား သည်ကို တွေ့ရှိရသဖြင့် အကောင်အထည်ဖော်ဆောင်ရွက်မည့် မဂ္ဂါဝပ်အမှန်ကိုပြင်ဆင်ရေးသားဖော်ပြရန်နှင့် Ethnic Rights Protection Department အစား Department of Ethnic Rights ဟု ပြင်ဆင်ဖော်ပြရန်၊	• အခန်း ၂၊ အခန်းခွဲ 2.6 Pertinent Administrative and Regulatory Authorities ခေါင်းစဉ်အောက်တွင် 151.54 MW ဟု ပြင်ဆင်ရေးသားဖော်ပြထားပါသည်။ • Table 2-2: Ministry and Administration Bodies and inter-coordination. တွင် Department of Ethnic Rights ဟု ပြင်ဆင်ဖော်ပြထားပါသည်။
		• 2.8.5 International Finance Corporation Performance Standards Page 37- PS 7: Indigenous	• အခန်း ၂၊ တွင် အခန်းခွဲ 2.8.5 International Finance Corporation Performance Standards Indigenous Peoples ဟု

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		Peoples; and Page 39- PS T: Indigenous Peoples ဟု ရေးသားဖော်ပြထားသည့် နေရာတိုင်း၌ ဥပဒေပြဋ္ဌာန်းချက်နှင့်အညီ Ethnic ဟု သုံးနှုန်းဖော်ပြရန်။	ရေးသားဖော် ပြထား သည့် နေရာတိုင်း၌ Indigenous Peoples (Ethnic Minorities) ဟုသုံးနှုန်းဖော်ပြထားပါသည်။
၄။	ရှေးဟောင်းသုတေသန နှင့်အမျိုးသားပြတိုက် ဦးစီးဌာန	- စီမံကိန်းဆောင်ရွက်မည့် ဧရိယာနှင့် အနီးဝန်းကျင်အား ရှေးဟောင်းသုတေသနနှင့် အမျိုးသားပြတိုက်ဦးစီးဌာန၊ ရန်ကုန်ဌာနခွဲ၏ကွင်းဆင်းစစ်ဆေးချက်အရရှေးဟောင်းယဉ်ကျေးမှုအမွေအနှစ်များနှင့် သက်ဆိုင်သည့် အထောက်အထားများမရှိသည်ကိုစစ်ဆေးတွေ့ရှိရသော်လည်းစီမံကိန်းဆောင်ရွက်သည့်အခါမြေပေါ်မြေအောက်ရှိ၊ ရှေးဟောင်းဝတ္ထုပစ္စည်းများ၊ ရှေးဟောင်းအထောက်အထားများ တစ်စုံတစ်ရာ တွေ့ရှိပါက နီးစပ်ရာအုပ်ချုပ်ရေးမှူးရုံးနှင့် ရှေးဟောင်းသုတေသနနှင့် အမျိုးသားပြတိုက်ဦးစီးဌာန၊ ရန်ကုန်ဌာနခွဲသို့ အမြန်ဆုံးဆက်သွယ်အကြောင်းကြားရန်။	- အခန်း ၅၊ အခန်းခွဲ ၅.၂.၁၂ စာမျက်နှာ ၂၁၀ တွင် စီမံကိန်းဆောင်ရွက်သည့်အခါ မြေပေါ်မြေအောက်ရှိ၊ ရှေးဟောင်း ဝတ္ထုပစ္စည်းများ၊ ရှေးဟောင်းအထောက်အထားများ တစ်စုံတစ်ရာ တွေ့ရှိပါက နီးစပ်ရာ အုပ်ချုပ်ရေးမှူးရုံးနှင့် ရှေးဟောင်းသုတေသနနှင့် အမျိုးသားပြတိုက်ဦးစီးဌာန၊ ရန်ကုန်ဌာနခွဲသို့ စီမံကိန်းအဆိုပြုသူမှ အမြန်ဆုံးဆက်သွယ်အကြောင်းကြားမည်ဖြစ်ကြောင်း ဖော်ပြထားပါသည်။
၅။	မန္တလေးနည်းပညာတက္ကသိုလ်	- စီမံကိန်းဆောင်ရွက်နေသောစက်ရုံဧရိယာရှိ ကနဦးတွေ့ရှိရသောအပင်နှင့် သတ္တဝါမျိုးစိတ်များကို ၎င်းတို့၏ အချက်အလက်များနှင့် ခါတ်ပုံမှတ်တမ်းများကို ပြည့်စုံစွာဖော်ပြထားသည်ကို တွေ့ရှိရပါသည်။ ထပ်မံရရှိသောအပင်နှင့် သတ္တဝါမျိုးစိတ်အချက်အလက်များကို ထည့်သွင်းဖော်ပြပေးရန်၊	- ထပ်မံရရှိသောအပင်နှင့် သတ္တဝါမျိုးစိတ်အချက်အလက်များကို အခန်း ၄.၄.၂ တွင် ထပ်မံဖြည့်စွက်ထည့်သွင်း ထားပါသည်။
		- စက်ရုံမှ စွန့်ပစ်ရေများကို ပြန်လည်သန့်စင် (Recycle Treatment) ၍ချောင်းထဲသို့စွန့်ထုတ်ရာတွင် အမြဲ ကြီးကြပ်စစ်ဆေးပေးရန်၊	- အခန်း ၅ ၊ အခန်းခွဲ ၅.၃.၃.၁.၃ စာမျက်နှာ ၂၂၆ တွင် စက်ရုံမှ စွန့်ပစ်ရေများကို ချောင်းထဲသို့စွန့်ထုတ်ရာတွင် အမြဲကြီးကြပ်စစ်ဆေးရန် ဖော်ပြထားပါသည်။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		- တက္ကသိုလ်များ၊ နည်းပညာတက္ကသိုလ်များ နှင့် ပူးပေါင်း၍ ကျောင်းသား/ကျောင်းသူများကို စက်ရုံ၏ လုပ်ငန်းဆောင်ရွက်နေမှုများအား လေ့လာရေးနှင့် လုပ်ငန်းခွင် အတွေ့အကြုံ သင်ကြားမှုများဆောင်ရွက်ပေးရန်၊	- အခန်း ၇ ၊ အခန်းခွဲ ၇.၆ စာမျက်နှာ ၃၀၂ တွင် တက္ကသိုလ်များ၊ နည်းပညာတက္ကသိုလ်များ နှင့် ပူးပေါင်း၍ ကျောင်းသား / ကျောင်းသူများကို စက်ရုံ၏ လုပ်ငန်း ဆောင်ရွက်နေမှုများအား လေ့လာရေးနှင့် လုပ်ငန်းခွင် အတွေ့အကြုံသင်ကြားမှုများကို ညှိနှိုင်းဆောင်ရွက်ပေးမည် ဖြစ်ကြောင်း ဖော်ပြထား ပါသည်။
၆။	ရေအားလျှပ်စစ်အကောင်အထည်ဖော်ရေးဦးစီးဌာန	- EIA Repot Hard Copy Page No.89 (Soft Copy Page No.147) ၌ 3.12.6. Electric Power Transfer ခေါင်းစဉ်အောက်တွင် 400 kV double circuit lines ကို ဓာတ်အားပို့လွှတ်ရေးအတွက်အသုံးပြုမည်ဟုဖော်ပြထားပါသည်။ Voltage Level ကို ပြန်လည်စိစစ် ဖော်ပြရန်၊	- အခန်း ၄၊ စာမျက်နှာ ၁၀၇၊ အခန်းခွဲ 4.3.4. Electric Power Transfer ခေါင်းစဉ်အောက်တွင် ဓာတ်အားပို့လွှတ်ရေးအတွက် အသုံးပြုမည့် Voltage Level နှင့် ပတ်သက်သည်ကို ပြန်လည်ရှင်းလင်းဖော်ပြ ထားပါသည်။
		- EIA Report Hard Copy Page No.339 (Soft Copy Page No.397) တွင် 7.9 Green Belt Development ခေါင်းစဉ်ခွဲကို ဖော်ပြထားပါသည်။ Green Belt Development ဆောင်ရွက်ရန် မြေနေရာရရှိနိုင်မှု၊ စက်ရုံတွင်သုံးမည့် မီးခိုးခေါင်တိုင်အမြင့်၊ လက်တွေ့ အကောင်အထည်ဖော်နိုင်မှုအခြေအနေတို့ကိုရှင်းလင်းဖော်ပြရန်၊	- အခန်း ၇ ၊ အခန်းခွဲ 7.7 Green Belt Development ခေါင်းစဉ်ခွဲတွင် Green Belt Development ဆောင်ရွက်မည့်အစီအစဉ်နှင့် ပတ်သက်သည်ကို ပြန်လည်ရှင်းလင်းဖော်ပြထားပါသည်။ - စက်ရုံ တွင်သုံးမည့်မီးခိုးခေါင်တိုင်အမြင့်ကို အခန်း ၃.၃ Table 3-2 စာမျက်နှာ ၄၀ နှင့် စာမျက်နှာ ၃၇၄ Air Modelling Report တွင် ဖော်ပြထားပါသည်။
		- EIA Report Hard Copy Page No.339 m (Soft Copy Page No.397) ၌ ၇.၈ Corporate Social Responsibility (CSR) ခေါင်းစဉ်ခွဲကို ဖော်ပြထားပါသည်။ စီမံကိန်း၏ အသားတင်အကျိုးအမြတ်၏ ရာခိုင် နှုန်း မည်မျှကို CSR	- အခန်း ၇ ၊ အခန်းခွဲ ၇.၅.၅ တွင် Corporate Social Responsibility (CSR) ခေါင်းစဉ်ခွဲတွင် စီမံကိန်း၏ အသားတင်အကျိုးအမြတ်၏ ၂ ရာခိုင်နှုန်းကို CSR အတွက် အသုံးပြုမည်ဖြစ်ကြောင်း ဖြည့်စွက်ဖော်ပြ ထားပါသည်။ ထို့အပြင် CSR အဖြစ် စီမံကိန်းအနီးရှိ ပြည်သူတို့

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		အတွက် အသုံးပြုမည်ဖြစ်ကြောင်း ဖြည့်စွက် ဖော်ပြရန် လိုအပ်ပါသည်။ ထို့အပြင်CSR အဖြစ် စီမံကိန်းအနီးရှိ မည်သည့်ဧရိယာတွင် မည်သည့်ကိစ္စများ ဆောင်ရွက်ပေးရန် လျာထားကြောင်း ဖြည့်စွက်ဖော်ပြရန်။	လူမှုရေး၊ ပညာရေး၊ ဘာသာရေးကိစ္စများ ဆောင်ရွက်ပေးရန် လျာထားကြောင်း ဖြည့်စွက်ဖော်ပြထားပါသည်။
၇။	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန	- သွယ်တန်းရယူမည့်ဓာတ်ငွေ့ပိုက်လိုင်း၏ဓာတ်ငွေ့ယိုစိမ့်မှုမရှိ စေရေးဆောင်ရွက်ထားရှိမှု အစီအစဉ်များ၊ Natural Gas ၏ composition နှင့် ဓာတ်ငွေ့ ပိုက်လိုင်း ကြောင့် ပတ်ဝန်းကျင်၊ လူမှုပတ်ဝန်းကျင်အား ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ၊ လျော့ပါးစေရေး အစီအစဉ်များ၊ ဆောင်ရွက်မည့် အစီအစဉ်များနှင့် စောင့်ကြပ်ကြည့်ရှုမှု အစီအစဉ်များအား ဖော်ပြရန်၊	- အခန်းခွဲ ၃.၅.၃, စာမျက်နှာ ၇၅ တွင် The Compositions of Natural Gas ခေါင်းစဉ်ဖြင့် Natural Gas ၏ composition ကို ဖော်ပြထားပါသည်။ အခန်းခွဲ ၅.၄ စာမျက်နှာ ၂၃၁ မှ Risks and Hazards Assessment ခေါင်းစဉ်အောက် တွင် Natural Gas leakage ဓာတ်ငွေ့ ပိုက်လိုင်းကြောင့် ဓာတ်ငွေ့ယိုစိမ့်မှုနှင့်၊ ယင်းကြောင့် ပတ်ဝန်းကျင်၊ လူမှုပတ်ဝန်းကျင်အား ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများ Impact on environment and health ကို ဖော်ပြထားပါသည်။ လျော့ပါးစေရေး အစီအစဉ်များ၊ mitigation measures များ တဆက်တည်း ဖြည့်စွက်ဖော်ပြ ထားပါသည်။ - အခန်း ၇ ၊ အခန်းခွဲ ၇.၄.၂ Table 7.7 Environmental monitoring plan during operation phase တွင်လည်း ဖြည့်စွက်ဖော်ပြ ထားပါသည်။
		- အဆိုပါ ဓာတ်ငွေ့ပိုက်လိုင်း ယိုစိမ့်မှု ဖြစ်ပေါ်နိုင်သော အခြေအနေများ (ဥပမာ- Hydrostatic pressure) ကို ထည့်သွင်းစဉ်းစားကာ ပြုပြင်ထိန်းသိမ်းမှုလုပ်ငန်းစဉ်များကို ထည့်သွင်းရေးဆွဲ၍ ပြုပြင်ထိန်းသိမ်းမှု လုပ်ငန်းများ ဆောင်ရွက်စဉ်ကာလအတွင်း ဖြစ်ပေါ်နိုင်သော သက်	- Gas Pipeline Network, Transporting Gas ဓာတ်ငွေ့ သယ်ယူပို့ဆောင်ရေး တာဝန်များနှင့် ဓာတ်ငွေ့ပိုက်လိုင်းတစ်လျှောက် Pressure test - Hydrostatic Testing စမ်းသပ်ခြင်း၊ ပြုပြင် ထိန်းသိမ်းခြင်း လုပ်ငန်းစဉ်များကို မြန်မာ့ရေနံနှင့် သဘာဝဓါတ်ငွေ့ လုပ်ငန်း (MOGE) မှ တာဝန်ယူ ဆောင်ရွက်လျက်ရှိသည်

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		ရောက်မှုများကိုထည့်သွင်းဆန်းစစ်ရန်၊ လျော့ပါးစေရေးနည်းလမ်းများနှင့်အတူ ထည့်သွင်းဖော်ပြရန်၊	ဖြစ်သည့်အတွက် Myanmar Ahlone Power Plant Co., Ltd အနေဖြင့် ရေးဆွဲထားခြင်းမရှိပါ။
		- Wastewater Treatment System တွင် သန့်စင်နိုင်မှုပမာဏများ၊ လုပ်ဆောင်နိုင်စွမ်းများ စသည့် နည်းပညာပိုင်းဆိုင်ရာ အချက်အလက်များအား ပြည့်စုံစွာထည့်သွင်း ဖော်ပြ၍ ဓာတ်ပုံများ၊ အင်ဂျင် နီယာပုံများအား A3 Size ဖြင့် ပုံများအား ထည့်သွင်းဖော်ပြရန်၊	- Power Plant သည် water treatment plant အားဖြင့် မြစ်ရေကို သန့်စင်ပြီး GTG, STG နှင့် HRSG များတွင် လည်ပတ်သုံးပြီး ပြန်လည်အသုံးပြုပါသည်။ - Effluent (wastewater) Treatment Plant (ETP)အကြောင်း အခန်း ၃ အခန်းခွဲ ၃.၄.၈. တွင် ဖေါ်ပြထားပါသည်။ - Domestic wastewater နှင့် Sewage တို့ကို Bio septic tank များတပ်ဆင်၍ အသုံးပြုထားကြောင်းကို ၄င်းအခန်းတွင် ဖြည့်စွက်ဖော်ပြထားပါသည်။
		- ရေပိုက်လိုင်းနှင့် ပတ်သက်၍ Intake Structure (အသုံးပြုမည့် အဆောက်အအုံ အမျိုးအစား၊ ရေသွယ်ယူရာတွင် သေးငယ်သောရေနေသတ္တဝါများ ထိခိုက်မှုမရှိအောင် ဆောင်ရွက်ထားရှိမှု၊ ရေရယူသည့် Structure ၏ ဧရိယာ) အား ဆောင်ရွက်ထားရှိမှုကို ဖော်ပြပေးရန်၊	- အခန်း ၃ ၊ အခန်းခွဲ ၃.၄.၆.၁ တွင် Intake Structureနှင့် ပတ်သက်၍ အသုံးပြုမည့် အဆောက်အအုံ အမျိုးအစား၊ သေးငယ်သော ရေနေသတ္တဝါများ ထိခိုက်မှု မရှိအောင် ဆောင်ရွက်ထားရှိမှု၊ ရေရယူသည့် Structure ၏ ဧရိယာတို့ကို ဖြည့်စွက်ဖော်ပြထားပါသည်။
		- ရေအသုံးပြုမှုအနေဖြင့် လှိုင်မြစ်မှ ရေအားရယူမည်ဖြစ်သည့် အတွက် ရေရယူခြင်း ကြောင့် မြစ်၏ ရေထွက်ရှိနှုန်း၊ မြစ်အပေါ် မှီခိုနေရသည့် စိုက်ပျိုးရေးလုပ်ငန်းများ၊ အများပြည်သူ၏ ရေအသုံးပြုမှုအား သက်ရောက်နိုင်မည့် အခြေအနေများကို ဆန်းစစ်ဖော်ပြရန်။	- လှိုင်/ရန်ကုန်မြစ်မှ ပုံမှန်ထုတ်ယူသုံးစွဲရန်လိုသော ရေပမာဏမှာ တစ်ပတ်လျင် ၁၁၃၅ ကုဗမီတာသာ ဖြစ်သောကြောင့် မြစ်၏ ရေထွက်ရှိနှုန်းကို သိသာလောက်အောင် ထိခိုက်မှု မရှိပါ။ စီမံကိန်းဒေသသည် မြို့ပြဧရိယာဖြစ်သောကြောင့် မြစ်အပေါ် မှီခိုနေရသည့် စိုက်ပျိုးရေး လုပ်ငန်းများမရှိပါ။ ရေအသုံးပြုမှုလည်း မရှိကြောင်း လေ့လာတွေ့ရှိ ခဲ့ပါ သည်။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		- ၎င်းစွန့်ထုတ် အပူသုံးလျှပ်စစ်ဓာတ်အားပေးစနစ်တွင် အသုံးပြုသည့်အခြားဓာတုဗေဒပစ္စည်းနှင့်စက်ယန္တရားများမှ ထွက်ရှိမည့် စွန့်ပစ်စွန့်ပစ်ပစ္စည်း(သို့)အရည်ကြောင့် ဖြစ်ပေါ်နိုင်သည့် သက်ရောက်မှုများ သတ်မှတ်ဖော်ထုတ်၍ သက်ရောက်မှုဆန်းစစ်ခြင်းအခန်းတွင် ဆန်းစစ်ရန်၊	- အခန်း ၅ ၊ အခန်းခွဲ ၅.၂.၁.၆ တွင် အသုံးပြုသည့် အခြား ဓာတုဗေဒပစ္စည်းများနှင့် ထိမိ၊ ကိုင်မိ၊ ရှူရှိုက်မိလျှင် ဖြစ်ပေါ်နိုင်သည့် ကျန်းမာရေးသက်ရောက်မှုများကို ဖြည့်စွက် ဖော်ပြထားပါသည်။
		- စီမံကိန်းတွင် အသုံးပြုမည့်ရေများအား သန့်စင်ရန် အတွက် Water Treatment System နှင့်ရေဆိုးများအား သန့်စင်ရန် အတွက် Wastewater Treatment System တို့တွင် တပ်ဆင်ဆောင်ရွက်ထားသည့် သန့်စင်သည့် နည်းလမ်းများ၊ အသုံးပြုထားသည့် နည်းပညာများ၊ သန့်စင်နိုင်မှု ပမာဏများ၊ လုပ်ဆောင်နိုင်စွမ်းများစသည့် နည်းပညာပိုင်းဆိုင်ရာ အချက်အလက်များအား ပြည့်စုံစွာ ထည့်သွင်းဖော်ပြ၍ ဓာတ်ပုံများ၊ အင်ဂျင်နီယာပုံများနှင့်တကွ ဖော်ပြရန်။	- စီမံကိန်းတွင် အသုံးပြုမည့်ရေများအား သန့်စင်ရန် အတွက် Water Treatment System အကြောင်းကို အခန်း ၃ ၊ အခန်းခွဲ ၃.၄.၆.၂ တွင် ဖော်ပြထားပြီး Wastewater from Power Plant (Close Cycle Cooling System) နှင့် Domestic wastewater system ကို အခန်း ၃.၄.၈.၂ တို့တွင် ဖော်ပြထားပါသည်။ - Gas Combine Cycle Power Plant မှ ရေဆိုးများထွက်ရှိခြင်း မရှိပါ။ - Domestics wastewater နှင့် Sewage တို့ကို Bio septic tank များ တပ်ဆင်၍ အသုံးပြုထားပါသည်။
		- စာမျက်နှာ ၁၂၅ တွင် တိုင်းတာထားသည့် Baseline တွင် တိုင်းတာ ကောက်ယူခဲ့သည့် မြစ်အရည်အသွေးများ၏ အပူချိန်အား တိုင်းတာဖော်ပြရန်။	- အခန်း ၄ ၊ အခန်းခွဲ ၄.၄.၁.၁. စာမျက်နှာ ၁၂၉၊ Table 4-11 တွင် မြစ်ရေအပူချိန်များကို ဖြည့်စွက်ဖော်ပြထားသည်။
		- စီမံကိန်းအသုံးပြုမည့် ဓာတုပစ္စည်း (Cleaning Agents) ၏ပမာဏ၊ အမျိုးအစားနှင့်မည်သို့ သိုလှောင်ထားရှိမည့် နည်းစနစ်အား ဖော်ပြရန်၊	- စာမျက်နှာ ၆၁ မှ ၆၃၊ အခန်းခွဲ ၃.၄.၇ တွင် စီမံကိန်း အသုံးပြုမည့် ဓာတုပစ္စည်း (Cleaning Agents) ၏ အမျိုးအစားနှင့် မည်သို့ သိုလှောင်ထားရှိမည့် နည်းစနစ်အား အခန်းခွဲ ၃.၄.၇.၁ တွင်ဖော်ပြထားပါသည်။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		- E-Waste ထွက်ရှိမှုပမာဏ၊ စွန့်ပစ်မည့်နည်းလမ်း ပါဝင်သော Sub-Plan ရေးဆွဲဖော်ပြရန်၊	- ဤစက်ရုံမှ electronic products များထုတ်လုပ်မှု မရှိဘဲ၊ ရုံးသုံးပစ္စည်းမျှသာရှိသော ကြောင့်၊ e waste အနေဖြင့် ပမာဏ ပြောပလောက်အောင် မရှိပါ။ သို့သော်၊ အခန်း ၇ ၊ အခန်းခွဲ ၇.၅.၄.၁၊ စာမျက်နှာ ၂၉၃ တွင် E-Waste ထွက်ရှိမှု စွန့်ပစ်မည့်နည်းလမ်း ပါဝင်သော Sub-Plan ဖော်ပြထားပါသည်။
		- စာမျက်နှာ ၂၅၁ တွင် “Since the gas turbine intakes excess air to the tune of 127% more than required for combustion, and if a fully premixed burner (dry low NOx burner DLN) is used there will be no NOx since the combustion temp. Premixed NOx Burner/Low NOx Burner” ဟု ဖော်ပြ ထားရာ NOx emission အား စက်ရုံတွင် လက်ရှိ အသုံး ပြုနေသည့် နည်းပညာ (Low NOx Burner) ၏ အချက် အလက်များ (ထုတ်လွှတ်သော အခိုးအငွေ့၏ အမြင့် ဆုံးအပူချိန်၊ ထုတ်လုပ်သည့် ကုမ္ပဏီမှ ဖော်ပြထားသော Technical Specification များ၊ လည်ပတ်ပုံလုပ်ငန်းစဉ်) အား အသေးစိတ် ထည့်သွင်း ဖော်ပြရန်၊	Ambient Air Quality တွင် NO_x Emission ကို control လုပ်ရန်၊ Multi stage burner နည်းပညာ ကို သုံးပါသည်။ gas turbine တွင် built-in ပါပြီးသား ဖြစ်၍ သီးခြား Technical Specification များမရှိပါ၊ သို့သော် ၎င်း လုပ်ဆောင်ချက်ကို အခန်းခွဲ ၃.၅.၃ စာမျက်နှာ ၇၆ နှင့် ၇၇ တို့တွင် ဖော်ပြထားပါသည်။ - Low NOx Burner နည်းပညာကို အသုံးပြု ခြင်းဖြင့် လည်း air pollution နှင့် NO_x ထွက်ခြင်းကို လျှော့ချ နိုင်သည်ဟု Alternative method အနေဖြင့်သာ ဖော်ပြထားခြင်း ဖြစ်ပါသည်။ - ဤစက်ရုံတွင် Low NO_x Burner နည်းပညာကို အသုံးပြုရန် မလိုအပ်ပါ။ သို့ဖြစ်ပါ၍ Technical Specification များ လည်ပတ်ပုံ လုပ်ငန်းစဉ်များ တင်ပြရန်မရှိပါ။ - သို့ဖြစ်ပါ၍ ထို အချက်သည် နားလည်မှုလွဲသွားနိုင်သည့်အတွက် (may lead to misunderstandings) ဤ အချက်အလက်ကို report အခန်း ၅ ၊ အခန်းခွဲ ၅.၂.၃.၁.၁ Ambient Air Quality ခေါင်းစဉ်အောက်တွင် မထည့်သွင်းတော့ပါ။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		- Waste water treatment plant မှ waste water များ မတော်တဆယိုဖိတ်ခြင်း၊ နှင့်ပတ်ဝန်းကျင်သို့ထုတ်လွှတ် ခြင်း မဖြစ်စေရန်အတွက် လုပ်ငန်းလည်ပတ်မည့် နည်းလမ်းများ၊ ဖြေရှင်းမည့် နည်းလမ်း များကိုဖော်ပြရန်၊	- Waste water treatment plant မှ wastewater ဆိုရာတွင် အညစ်အကြေးအရည်များမဟုတ်ဘဲ၊ အခါအားလျော်စွာ ဆေးကြော ရေ၊ Water from service water, သန့်စင်ပြီးသော Demineralized (DM) water များသာဖြစ်ပါသည်။ Central Monitoring Basin (CMB) collection system. သို့ တင်ရာတွင် ဖိတ်စင်ခြင်းမရှိပါ။
		- လှိုင်မြစ်မှရေများကို စက်ရုံတွင် အသုံးမပြုခင် သန့်စင် သည့် Treatment Facility တွင် အသုံးပြုမည့် chemical များ ထွက်ရှိနိုင်မည်ဟု ယူဆရသောကြောင့် ယင်းဓာတု ပစ္စည်းများ အားထားရှိ သိုလှောင်သည့် အခြေအနေနှင့် ယင်းအန္တရာယ်ရှိ ဓာတုပစ္စည်းများအား စွန့်ပစ်ရာတွင် ပတ်ဝန်းကျင်နှင့် လူမှု အသိုင်းအဝန်းအား အန္တရာယ်မရှိစေရန်အတွက် စွန့်ပစ်မည့် နည်းလမ်းများကို ဆန်းစစ်ဖော် ပြရန်၊	- မြစ်ရေများကို စက်ရုံတွင် အသုံးမပြုခင် သန့်စင်သည့် Treatment Facility တွင်အသုံးပြုမည့် chemical ဓာတုပစ္စည်းများအား ထားရှိ သိုလှောင်သည့် အခြေအနေ ကို အခန်း ၃၊ အခန်းခွဲ ၃.၄.၇.၁ တွင် ဖော်ပြထားသည်။ - အခန်း ၇၊ အခန်းခွဲ ၇.၅.၃ တွင် စွန့်ပစ်မည့်နည်းလမ်းများ ဖော်ပြထား ပါသည်။
		- ဆက်စပ် သက်ရောက်မှုများအား ဆန်းစစ်ခြင်းအခန်း သည် အကျဉ်းချုပ်သာဖော်ပြ ထားသဖြင့် ပတ်ဝန်းကျင် ထိခိုက်မှု ဆန်းစစ်ရေဆိုင်ရာ လုပ်ထုံးလုပ်နည်း အပိုဒ် ၆၃ ၊ (ဆ) တွင် ဖော်ပြထားသည်နှင့်အညီ ဆောင်ရွက်မည့် နည်းလမ်းနှင့် ချဉ်းကပ်မှု၊ လက်ရှိနှင့် အနာဂတ်တွင် ပုဂ္ဂလိကနှင့် ပြည်သူပိုင် စီမံကိန်းများနှင့် ဖွံ့ဖြိုးမှုများ အကြောင်းအရာ အကျဉ်းချုပ် ဖော်ပြချက်နှင့် မြေပုံ၊ အနီးပတ်ဝန်းကျင်တွင် ဖြစ်ပေါ်လာနိုင် သည့် ဆက်စပ်သက်ရောက်မှုဆိုင်ရာ အကြောင်းအချက် များနှင့် ထို သက်ရောက်မှုများဖြစ်ပေါ်စေရန် စီမံကိန်း၏ ပါဝင်	- လုပ်ထုံးလုပ်နည်း အပိုဒ် ၆၃ ၊ (ဆ) တွင် ဖော်ပြထားသည်နှင့်အညီ ဖော်ပြထားပါသည်။ - Myanmar Ahlone Power Plant လျှပ်စစ်ဓါတ်အားပေး စက်ရုံသည် နိုင်ငံတော်အစိုးရပိုင် လျှပ်စစ်ဓာတ်အားပေး စက်ရုံဝင်းအတွင်း တည်ရှိပြီး အနီးပတ်ဝန်းကျင်တွင် အခြား လျှပ်စစ်ထုတ်လုပ်ရေး စက်ရုံများ၊ တည်ဆောက်ဆဲနှင့် လုပ်ငန်းလည်ပတ်လျက်ရှိသော စက်မှုကုန်တင်ကုန်ချဆိပ်ကမ်းကြီးများ၊ ကုန်ပစ္စည်းသိုလှောင်ရုံများ တည်ရှိနေပြီး ထိခိုက်မှုဆန်းစစ်ရေဆိုင်ရာဆက်စပ် သက်ရောက်မှုများ အား ဆန်းစစ်ခြင်းလုပ်ငန်းများ ဆောင်ရွက်ရာတွင် စက်ရုံတည်နေရာ

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		ကူညီမှုတို့ကို သတ်မှတ်ဖော်ထုတ်ရန်၊ စီမံကိန်း၏ အရေးကြီးအဆင့်ထက် ကျော်လွန်နိုင်ကြောင်းနှင့် ဆက်စပ်သက်ရောက်မှုများနှင့် ဆက်စပ်နေကြောင်း၊ ဆက်စပ်သက်ရောက်မှုများအား စီမံကိန်း၏ ပါဝင်ကူညီမှုကို လျော့နည်းစေရန် ဆောင်ရွက်မည့် လုပ်ငန်းများ ဖော်ပြရန်၊	အနီးဝန်းကျင်ရှိပုဂ္ဂလိကလုပ်ငန်းများမှတာဝန်ရှိသူများ၊သက်ဆိုင်ရာအစိုးရဌာနတာဝန်ရှိသူများမှပူပေါင်းပါဝင်၍သက်ဆိုင်ရာထိခိုက်သက်ရောက်မှုများကိုခွဲခြမ်းစိတ်ဖြာသင့်ပြီး၊ ထိခိုက်မှုများလျော့ပါးစေရေးလုပ်ငန်းများကို အတူတကွ ပူးပေါင်း ဆောင်ရွက်ရန်လိုအပ်ပါသည်။ - လက်ရှိအခြေအနေ၌ အနီးပတ်ဝန်းကျင်ရှိ စီမံကိန်းများမှာ စီမံကိန်းအကြောင်းအရာများကို မရရှိနိုင်သေးသည့်အတွက် Cumulative Impact Assessment ကို အကျဉ်းချုပ်ဖြင့်သာ ဖော်ပြ၍ရနိုင်ပါသည်။ အနီးပတ်ဝန်းကျင်ရှိလုပ်ငန်းများကို အခန်းခွဲ ၄.၂ တွင် မြေပုံနှင့်တကွ ရှင်းလင်းဖော်ပြထားပါသည်။
		- ရေအရည်သွေးအားစောင့်ကြပ်ကြည့်ရှုတွင် Parameters များအား အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်ပါ ၂.၁.၁ ပါ အပူငွေ့သုံး လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ရေးလုပ်ငန်းပါ စွန့်ထုတ်ရေသတ်မှတ်ချက်များနှင့် အညီ ဆောင်ရွက်ရန်၊	- အခန်း ၇၊ အခန်းခွဲ ၇.၄.၂ တွင် ရေအရည်သွေးအား စောင့်ကြပ်ကြည့်ရှုခြင်း thermal power များအတွက် သတ်မှတ်ချက် Parameters များအား အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် ၂.၁.၁ ပါ အပူငွေ့သုံး လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ရေးလုပ်ငန်းမှ စွန့်ထုတ်ရေများနှင့် နှိုင်းယှဉ် တိုင်းတာဆောင်ရွက်မည်ဖြစ်ကြောင်း ဖော်ပြထားပါသည်။
		- Floral နှင့်ပတ်သက်၍ စာမျက်နှာ 135တွင် “Two types of habitats namely terrestrial and wetland have occurred at the survey area. The tidal forest is located at the back of the Power Plant on Yangon River Bank.” ဟုဖော်ပြထားကြောင်း စိစစ် တွေ့ ရှိရ သဖြင့် အဆိုပါ ဒီရေေတာနှင့် စီမံကိန်း၏ အကွာအဝေး အားဖော်ပြရန်နှင့်	- အဆိုပါ ဒီရေတောနှင့် စီမံကိန်း၏ အကွာအဝေးမှာ ၁.၆ ကီလိုမီတာခန့်ဖြစ်ပါသည်။ အဆိုပါ ဒီရေတောများသည် နာဂစ် မုန်တိုင်းကျရောက်စဉ်က လုံးဝ ပျက်စီးသွားခဲ့ပါသည်။ - စီမံကိန်းမှထွက်ရှိမည့် စွန့်ပစ်ရာ နေရာ၌ အဆိုပါ ဒီရေတောများတည်ရှိခြင်းမရှိပါ။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		စီမံကိန်းမှထွက်ရှိမည့် စွန့်ပစ်ရာ နေရာ ၌ အဆိုပါ ဒီရေတောများ တည်ရှိခြင်း ရှိ/မရှိ ဆန်းစစ် ဖော်ပြရန်နှင့် အပေါ် စီမံကိန်းကြောင့် ဒီရေ တောများ အပေါ် ထိခိုက်မှု ရှိမရှိ၊ အဆိုပါ ဒီရေတော ထိခိုက်သက်ရောက်ပါက လျော့ပါးစေရေး နည်းလမ်း သို့မဟုတ် ပြန်လည် စိုက်ပျိုးမည့် အစီအစဉ်အား ဖော်ပြရန်၊	- ဒီရေတောများနှင့် သက်ဆိုင်သော သတင်းအချက်အလက်သည်၊ desk-top study နှင့် ဒေသခံတို့ဖြင့် တွေ့ဆုံ မေးမြန်းခြင်းမှ ရရှိသော အချက်အလက်များ ဖြစ်ပါသည်။ သစ်တောဦးစီးဌာနတွင် မေးမြန်းစုံစမ်းရာ၊ စီမံကိန်း၏ ၂ ကီလိုမီတာ အဝန်းအဝိုင်းအတွင်း ပတ်ဝန်းကျင်တွင် ဒီရေတောများ ရှိခဲ့ခြင်း မှတ်တမ်းများ မရှိပါ။ မြစ်ကမ်းတစ်လျှောက်တွင်လည်း နိုင်ငံတော်စီမံကိန်းများ တည်ဆောက်နေသည် ဖြစ်၍ ဒီရေတော ပြန်လည်စိုက်ပျိုးမည့် အစီအစဉ်မရှိပါ။
		- စာမျက်နှာ 132 တွင် 4.4.2.3 Study sites ၌ လေ့လာမည့် နေရာအား နှစ်နေရာသာတိုင်းတာ ဖော်ပြ ထားပါကြောင်း၊ စာမျက်နှာ ၁၆၉တွင် "The fourth and final survey was undertaken on Friday 25-3-2022. In fourth time survey, four plant species were collected. The collected plant species were identified and classified. In fourth time study, the study areas were front of plant compound and back of it's to Yangon River Bank." ဟုဖော်ပြထားသဖြင့် Flora နှင့် ပတ်သက်၍ တိုင်းတာ ကောက်ယူခဲ့သည့် အကြိမ်အရေအတွက်၊ တိုင်းတာ ကောက်ယူခဲ့သည့် နေရာများနှင့် မြေပုံများအား ပြန်လည် ဆန်းစစ်ဖော်ပြရန်၊	အခန်းခွဲ ၄.၄.၂.၃ တွင်ထပ်မံ ဖြည့်စွက်ဖော်ပြထားပါသည်။
		- စာမျက်နှာ ၁၃၂ တွင် Aquatic နှင့်ပတ်သက်၍ "Fishes would be collected from the small creek and tributaries. The presence and absence of other aquatic organisms	စာမျက်နှာ ၁၇၃ အခန်းခွဲ ၄.၄.၂.၇ Aquatic Life study တွင် ဖြည့်စွက်ဖော်ပြထားပါသည်။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		were examined from the local inhabitants at the time of baseline study" ဖော်ပြထားကြောင်း စိစစ်တွေ့ရှိရပြီး ငါးမျိုးစိတ်အား တိုင်းတာမည်ဟုသာ ဖော်ပြထားပြီး မည်သည့် ငါးမျိုး စိတ်ရှင်သန် ပေါက်ရောက်ခြင်းရှိကြောင်း ဖော်ပြထားခြင်း မရှိသည့်အတွက် ဟာဘိချောင်း နှင့်ရန်ကုန်မြစ်၏ Plankton Zooplankton ၊ Fishes များအား ကောက်ယူ ဖော်ပြရန် ယခင်သဘောထားမှတ်ချက်တွင် ပြောကြားခဲ့သော် လည်း ဆောင်ရွက်ခြင်းမရှိသည့်အတွက် ဆောင်ရွက်ရန်၊	
		- စီမံကိန်းမှ စွန့်ထုတ်ရေသည် ဟာဘိချောင်းသို့ စီးဝင်နိုင် သဖြင့် Aquatic အားထိခိုက်နိုင်သောကြောင့် Aquatic နှင့် ပတ်သက်၍ ဆောင်ရွက်မည့် အစီအစဉ်အား ဆန်းစစ် ဖော်ပြရန်၊	- စီမံကိန်းမှ စွန့်ထုတ်ရေသည် ဟာဘိချောင်းသို့ စီးဝင်နိုင်သဖြင့် Aquatic အားထိခိုက်နိုင်မှုနည်းသော်လည်း မထိခိုက်အောင် အစီအစဉ်များကို အခန်း ၅.၃ တွင် ဆွေးနွေးထားပါသည်။
		- လေအရည်အသွေးနှင့် ပတ်သက်၍ ယခင်အောက်ပါ သဘောထားမှတ်ချက်များအား ထည့်သွင်းဆောင်ရွက်ခြင်း မရှိသည့်အတွက် ထည့်သွင်းဖော်ပြရန်။ • စာမျက်နှာ၂၄၉တွင်လေအရည်အသွေးနှင့်ပတ်သက်၍ "Use wet scrubber system (lime water dozing or water sprinkling) for desulphurization). Use dry bagasse as burner to achieve complete combustion and reduce NO_2, PM_{10} and $PM_{2.5}$ no need for coal - Regularly collect bagasse ash and dispose/collection in ash pond and use as fertilizer" ဖော်ပြထားရာ စီမံကိန်းသည်	• ယခင်အစီရင်ခံစာ စာမျက်နှာ ၂၄၉ တွင် ဖော်ပြထားသော လေအရည်အသွေးနှင့်ပတ်သက်၍ "Use wet scrubber system (lime water dozing or water sprinkling) for desulphurization). Use dry bagasse as burner to achieve complete combustion and reduce NO_2, PM_{10} and $PM_{2.5}$ no need for coal - Regularly collect bagasse ash and dispose/collection in ash pond and use as fertilizer" ဟုရေးသားထားခြင်းသည် NO_2, PM_{10} and $PM_{2.5}$ တို့ကို လျော့ချ နိုင်သည့် အကြောင်းများကို

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		Sulphur dioxide ထွက်ရှိခြင်း မရှိကြောင်း ဖော်ပြချက် အရ scrubber system အားအသုံးပြု၍ လျော့ချရခြင်း အား ရှင်းလင်းဖော်ပြရန်၊ ကုန်ကြမ်း လောင်စာအဖြစ် Natural gas အား အသုံးပြုမည်ဖြစ်ရာ စီမံကိန်းတွင် Coal အသုံးပြု ရခြင်းအကြောင်းအားရှင်းလင်းဖော်ပြရန်၊	ဖော်ပြရာတွင်ဤစီမံကိန်းအကြောင်းအရာနှင့် သွေဖယ်သွားပါသဖြင့် ပယ်ဖျက်လိုက်ပါသည်။
		• current noise combustion technology အား ဆန်းစစ်ဖော်ပြရန်၊	- စာမျက်နှာ ၆၇ မှ ၆၉၊ အခန်းခွဲ ၃.၅ System Configuration and Technical setting တွင် ပြင်ဆင်ဖော်ပြထားပါသည်။
		• Project phase အလိုက် လေအရည်အသွေးအပေါ် ထိခိုက်နိုင်မှုအား ဆန်းစစ်ရာတွင် စီမံကိန်းတွင် အသုံးပြုမည့် ယာဉ်/ ယန္တရားများ၏ အရေအတွက် ၊အမျိုးအစား၊ တစ်ရက်လျှင် အလုပ်ချိန်အပေါ် မူတည်၍ ထွက်ရှိမည့် Greenhouse Gas Emission ပမာဏကို ခန့်မှန်း တွက်ချက် ဖော်ပြရန်၊	- Operation ကာလ Greenhouse Gas Emission ထွက်ရှိမည့် ပမာဏကို အခန်း ၃.၅.၃ နှင့် ၅.၂.၃.၁ တိုတွင် IFC Standard နှင့် နှိုင်းယှဉ်တွက်ချက် ဖော်ပြထားပါသည်။ Air Modelling Report တွင်လည်း ဖော်ပြထားပါသည်။ ယခု အစီရင်ခံစာ စတင်ရေးသား နေသည့် ကာလသည်ပင် Operation ကာလဖြစ်နေပြီဖြစ်၍ Construction ကာလကိုတွက်ချက် ဖော်ပြနိုင်ခြင်းမရှိပါ။
		• CEMS အားတပ်ဆင်၍ လေအရည်အသွေးအား စောင့်ကြပ် ကြည့်ရှုမည်ဖြစ်ကြောင်း ဖော်ပြချက်အရ တပ်ဆင်မည့် ထိန်းချုပ်ကိရိယာနှင့် စောင့်ကြပ်ကြည့်ရှုမှုစနစ်များ၏ Quality Assurance (QA)/ Quality Control (QC) လုပ်ငန်းများ ဆောင်ရွက်မည့် အစီအစဉ်များကို ထည့်သွင်း ဖော်ပြရန်။	- Continuous Emission Monitoring System (CEMS)၏ နည်းပညာ ပိုင်းဆိုင်ရာ အချက်အလက်များ (Technical Specifications) များ တပ်ဆင်မည့်ထိန်းချုပ်ကိရိယာနှင့်စောင့်ကြပ်ကြည့်ရှုမှုစနစ်များ၏ Quality Assurance (QA)/ Quality Control (QC) လုပ်ငန်းများ ဆောင်ရွက်မည့် အစီအစဉ်များကို အခန်း ၃.၅.၄ နှင့် နောက်ဆက်တွဲ ၁၃ တွင် ဖြည့်စွက်ဖော်ပြထားပါသည်။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		• CEMS တွင်အသုံးပြုမည့်စနစ်များ (ဥပမာ Data Acquisition and Handling System) အကြောင်းများအား ထည့်သွင်းဖော်ပြရန်၊	- စီမံကိန်းလည်ပတ်သည့်ကာလအတွင်းစက်ရုံမှထွက်ရှိမည့်အခိုးအငွေ့နှင့်ပတ်သက်၍ စောင့်ကြပ်စစ်ဆေးမည့် အစီအစဉ်အား အခန်း ၇.၄.၂ EMoP ဇယား ၇.၇ တွင်ဖော်ပြထားပါသည်။
		• စီမံကိန်းလည်ပတ်သည့်ကာလအတွင်းစက်ရုံမှထွက်ရှိမည့် အခိုးအငွေ့နှင့်ပတ်သက်၍ စောင့်ကြပ်စစ်ဆေးမည့် အစီအစဉ်အား ဖော်ပြထားခြင်း မရှိသည့်အတွက် စောင့်ကြပ်စစ်ဆေးသည့်စနစ် တပ်ဆင်မည့် Continuous Emission Monitoring System (CEMS)၏ နည်းပညာ ပိုင်းဆိုင်ရာ အချက်အလက်များ (Technical Specifications) များ နှင့် Drawings including Schematic Diagram and Layout များကို ထည့်သွင်း ဖော်ပြရန်။	
		• Project phase အလိုက် လေအရည်အသွေးအပေါ် ထိခိုက်နိုင်မှုအား ဆန်းစစ်ရာတွင် စီမံကိန်းတွင် အသုံးပြုမည့် ယာဉ်/ယန္တရားများ၏ အရေအတွက် ၊အမျိုးအစား၊ တစ်ရက်လျှင် အလုပ်ချိန်အပေါ် မူတည်၍ ထွက်ရှိမည့် Greenhouse Gas Emission ပမာဏကို ခန့်မှန်း တွက်ချက်ဖော်ပြရန်၊	- အထက်တွင် ဖော်ပြထားပြီးဖြစ်ပါသည်၊
		• PM, SO_2, NO_x, CO_2 estimate emission amount at source and ထွက်ရှိမည့် လေအရည်သွေးကြောင့် ထိခိုက်သက်ရောက်နိုင်မည့် Sensitive receptors ဖော်ပြရန်၊	- Estimate emission amount at source ကို Air Modelling Report ၏ Emission Estimation အခန်း ၃.၁.၁ တွင် ဖော်ပြထားပြီး၊ သက်ရောက်နိုင်မည့် Sensitive receptors ကိုလည်း Modelling ပုံများဖြင့် ဖော်ပြထားပါသည်။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		- ရေအရည်အသွေးနှင့်ပတ်သက်၍ ယခင်အောက်ပါ သဘောထားမှတ်ချက်များအား ထည့်သွင်းဆောင်ရွက်ခြင်း မရှိသည့်အတွက် ထည့်သွင်းဖော်ပြရန်။ • လှိုင်မြစ်မှ ရေများကို စက်ရုံတွင် အသုံးမပြုခင် သန့်စင်သည့် Treatment Facilityတွင် အသုံးပြုမည့် chemicalများ ထွက်ရှိနိုင်မည်ဟု ယူဆရသောကြောင့် ယင်းဓာတုပစ္စည်းများအား ထားရှိသိုလှောင်သည့် အခြေအနေနှင့် ယင်းအန္တရာယ်ရှိ ဓာတုပစ္စည်းများ အားစွန့်ပစ်ရာတွင် ပတ်ဝန်းကျင်နှင့် လူမှုအသိုင်းအဝန်းအား အန္တရာယ်မရှိ စေရန်အတွက် စွန့်ပစ်မည့် နည်းလမ်းများကို ဆန်းစစ်ဖော်ပြရန်၊	• မြစ်ရေများကို စက်ရုံတွင် အသုံးမပြုခင် သန့်စင် သည့် Treatment Facility တွင်အသုံးပြုမည့် chemical ဓာတုပစ္စည်းများအား ထားရှိသိုလှောင်သည့် အခြေအနေ ကို အခန်း ၃၊ အခန်းခွဲ ၃.၄.၇ တွင် ဖော်ပြထားသည်။ • အခန်း ၇၊ အခန်းခွဲ ၇.၅.၃ ၊ ၇.၅.၄ တို့တွင် စွန့်ပစ်မည့် နည်းလမ်းများ ဖော်ပြထားပါသည်။
		• Cooling Towerမှ ရေလှည့်လည်အသုံးပြုမည့် ရေ အရည်အသွေး၊ ရေအရည်အသွေး ပြောင်းလဲမှုများကြောင့် ဖြစ်ပေါ် နိုင်မည့် သက်ရောက်မှုများ ဆန်းစစ်ဖော်ပြရန်။	- Cooling Towerမှ ရေလှည့်လည်အသုံးပြုမည့် ရေ အရည်အသွေးကို မြစ်ရေစတင်ယူကတည်းက ဆင့်ကဲ ရေကိုသန့်စင်ပြီးမှ cooling tower နှင့် gas turbine တွင်အသုံးပြုပါသည်။ Water Treatment System ကို အခန်း ၃.၄.၆ တွင်ဖော်ပြထားပါသည်။
		• ထို့အပြင် ရေအေးများစွန့်ထုတ်မည့် နေရာရှိပါက ဖော်ပြရန် ရေအရည် အသွေး ထိန်းညှိခြင်း (ဥပမာ pH level ထိန်းညှိ မှုများ) ဆောင်ရွက်ရန် လိုအပ်ပါက ၎င်းလုပ်ငန်းစဉ်များကို ထည့်သွင်းဖော်ပြရန်။	Cooling Tower System of a PG9171E Gas Turbine မှ ရေအေးများကို စွန့်ထုတ်လုပ်မှုမရှိပါ။ ရေအရည် အသွေး ထိန်းညှိခြင်း (ဥပမာ- pH level ထိန်းညှိမှုများ) သည် demineralized water အဖြစ် အဆင့်ဆင့်သန့်စင်ပြီး ဖြစ်သည့်အပြင် CMB စနစ်ဖြင့် ထပ်မံထိန်းညှိ ပြီးမှ စွန့်ထုတ်သည်ဖြစ်ပါသည်။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		• စီမံကိန်းမှ ထွက်ရှိမည့် စွန့်ပစ်ရေနှင့်ပတ်သက်၍ Thermal Plume modelling ဆောင်ရွက်ရန်၊	- အခန်း ၃.၄.၈.၂ Wastewater from Close Cycle Cooling System တွင်ဖော်ပြချက်အရ စီမံကိန်းမှ စွန့်ပစ်ရေသည် မြစ်ရေကို ထိခိုက်နိုင်ခြင်းမရှိသည့်အတွက် Thermal Plume modellingကို ဆောင်ရွက်ထားခြင်းမရှိပါ။ - လိုအပ်ပါက Thermal Plume modelling ကို လာမည့် Monitoring report တွင် တွက်ချက် ဖော်ပြသွားပါမည်။
		• စာမျက်နှာ 360 တွင် Ensure that all activities do not impact the Doe Gon stream.” ပါရှိ ရာ စွန့်ပစ်ရေအား ဟာဘိချောင်းသို့ စွန့်ပစ်မည်ဖြစ်ကြောင်း ဖော်ပြထားချက်နှင့် ကွဲလွဲနေပါသဖြင့် ပြန်လည် စိစစ် ဖော်ပြရန်။	• အခန်း ၇၊ အခန်းခွဲ ၇.၅.၃ စာမျက်နှာ ၂၈၆ တွင် Ensure that all activities do not impact the Harbi Creek ဟာဘိချောင်းဟု အမှားပြင်ဆင်ဖော်ပြထားပါသည်။
		- စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးခြင်း အစီအစဉ်နှင့်ပတ်သက် ၍ စာမျက်နှာ ၃၁၄ Table 7-4 Identification of impacts, Mitigation measures, Monitoring and Management during operation period လည်း ကောင်း၊ စာမျက်နှာ ၃၃၂ မှ ၃၃၆ တွင် လည်းကောင်း။ စာမျက်နှာ ၃၇၈-၃၈၀ တွင် လည်းကောင်း များပြားစွာ ဖော်ပြထားသည့်အတွက် စီမံကိန်းကြောင့် ထိခိုက်နိုင်သည့် သက်ရောက်မှု အားလုံးအား ခြုံငုံပါဝင်သည့် အောက်ပါ အတိုင်း ဆန်းစစ်ဖော်ပြရန်- • တိုင်းတာရမည့်အမျိုးအစားတစ်ခုချင်းစီအတွက် တိုင်းတာရာတွင်အသုံးပြုမည့်နည်းစနစ်များ၊ Methodology နမူနာကောက်ယူမည့် နည်းလမ်းများ၊ တိုင်းတာမည့် နေရာများ၏	- Impacts, Mitigation measures, Monitoring and Management များ ရော နှောနေသောကြောင့် Table 7-3, Table 7-4, Table 7-5 တွင် Environmental Management Planများ သီးခြားခွဲ၍ ဖော်ပြထားပါသည်။ - စောင့်ကြပ် ကြည့်ရှု စစ်ဆေးခြင်း အစီအစဉ်များကို အခန်းခွဲ ၇.၄ Environmental Monitoring Plan and Budget ခေါင်းစဉ် အောက်တွင်၊ Table 7-6, Table 7-7, Table 7-8 တို့ ဖြင့် သီးခြားခွဲ၍ ဖော်ပြထားပါသည်။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		ကိုဩဒိနိတ်များ၊ တိုင်းတာရရှိသည့် ရလဒ်များကို သက်ဆိုင်ရာ လမ်းညွှန်ချက်တန်ဖိုးများနှင့် နှိုင်းယှဉ်ဖော်ပြချက်များ၊ • Parameter ၊ Location ၊ -Institutional Responsibility Monitoring Frequency ၊ Budget	
		- စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးခြင်းအစီအစဉ်နှင့်ပတ်သက်၍ စာမျက်နှာ ၃၁၄ Table 7-4 Identification of impacts, Mitigation measures, Monitoring and Management during operation period တွင် Ambient air quality affected by emissions from the power plant as Implementation Schedule Life time of plant operation ဟုဖော်ပြပြီး Table 7-9: Monitoring plan during operational phase of the project တွင် Monitoring Frequency 32: Once in 6 months at four locations, seasonal or quarterly monitoring at other sensitive receptors ဟုလည်းကောင်း ဖော်ပြထားချက်အရ ဆောင်ရွက် မည့် အချိန်များသည် ကွဲလွဲမှုရှိသည့်အတွက် ဆောင်ရွက်မည့် အချိန်အား ပြင်ဆင်ဖော်ပြရန်၊	- အခန်း ၇၊ အခန်းခွဲ ၇.၄ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးခြင်း အစီအစဉ် Monitoring plan ကို Table 7-6 Table 7-7 Table 7-8 တို့ ဖြင့် သီးခြားခွဲထုတ်ရေးသားပြီး Ambient air quality Monitoring Frequency – Every 6 months ဟု ပြင်ဆင်ဖော်ပြထားပါသည်။
		- စာမျက်နှာ ၃၁၄ Table 7-4 Identification of impacts, Mitigation measures, Monitoring and Management	- အခန်း ၇၊ အခန်းခွဲ ၇.၄ Table 7-7 Environmental monitoring plan during operation phase တွင် Stack emissions monitoring

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		during operation period တွင် Air Quality Emissions from stack are not expected to exceed standards 3 monitoring parameters :: Standards for noise Gaseous emission from Industries or projects waste ဟုဖော်ပြချက်အရ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု)လမ်းညွှန်ချက်ပါအပိုဒ် ၂.၁.၁ အပူငွေ့သုံး လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ခြင်း လုပ်ငန်း၊ ထုတ်လွှတ်အခိုးအငွေ့အဆင့် သတ်မှတ်ချက်များပါ စံချိန်စံနှုန်းနှင့်အညီတိုင်းတာမည်ဖြစ်ကြောင်း ဖော်ပြရန်။	results will be compared with the standards air emission level for thermal power plant of energy sector development provided by National Environmental Quality (Emission) Guidelines ဟု ပြင်ဆင် ဖော်ပြထားပါသည်။
		- Aquatic Environment Discharge of process water အား ဆောင်ရွက်ရာ၌ Monitoring Indicators အား အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ် လွှတ်မှု) လမ်းညွှန်ချက်ပါအပိုဒ် ၂.၁.၁ အပူငွေ့သုံးလျှပ်စစ်ဓာတ် အား ထုတ်လုပ်ခြင်းလုပ်ငန်း၊စွန့်ထုတ်ရည်အဆင့်သတ်မှတ်ချကf များပါစံချိန်စံနှုန်းနှင့်အညီတိုင်းတာဖော်ပြရန်၊	အပိုဒ် ၂.၁.၁ အပူငွေ့သုံးလျှပ်စစ် ဓာတ်အားထုတ်လုပ်ခြင်းလုပ်ငန်း၊ စွန့်ထုတ်ရည်အဆင့် သတ်မှတ်ချက်များပါ စံချိန်စံနှုန်းနှင့်အညီ တိုင်းတာဖော်ပြထားပါသည်။
		စာမျက်နှာ ၃၃၅ တွင် Table 7-7: Monitoring plan during operational phase of the project ၌ River water အား river water guideline နှင့်တိုင်းတာရန်၊ Effluent Quality နှင့်ပတ်သက်၍ တိုင်းတာမည့် parameter များအား အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်ပါ အပိုဒ် ၂.၁.၁ အပူငွေ့သုံးလျှပ်စစ်ဓာတ်အား	Table 7-7: Monitoring plan during operational phase of the project တွင် River water အား river water guideline နှင့်အညီ တိုင်းတာရန်ဖော်ပြထားပါသည်။ Effluent Quality အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်ပါ အပိုဒ် ၂.၁.၁ အပူငွေ့သုံး လျှပ်စစ်

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		ထုတ်လုပ်ခြင်းလုပ်ငန်း၊ စွန့်ထုတ်အရည်အဆင့် သတ်မှတ်ချက်များပါ စံချိန်စံနှုန်းနှင့်အညီ တိုင်းတာဖော်ပြရန်၊ Noise level အား အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်ပါ အပိုဒ် ၁.၁ ဆူညံသံနှင့်အညီ တိုင်းတာဖော်ပြရန်၊	ဓာတ်အား ထုတ်လုပ်ခြင်းလုပ်ငန်း၊ စွန့်ထုတ်အရည် အဆင့်သတ်မှတ်ချက်များပါ စံချိန်စံနှုန်းနှင့်အညီ တိုင်းတာ ဖော်ပြထားပါသည်။ Noise level အား အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်ပါ အပိုဒ်၁.၁ ဆူညံသံနှင့်အညီ တိုင်းတာဖော်ပြထားပါသည်။
		- စာမျက်နှာ ၃၆၇တွင် Table 7-18 Summary of monitoring plan during the operation phase ဟုလည်းကောင်း၊ စာမျက်နှာ ၃၇၅ တွင် Table Description for periodical monitoring for environmental compliance တွင် လည်းကောင်း monitoring plan များအား ဖော်ပြထားပြီး ဖော်ပြ ထားမှုသည် ကွဲလွဲမှုရှိနေသဖြင့် ပြန်လည် ဆန်းစစ် ဖော်ပြရန်၊	- ဖော်ပြပါ အကြောင်းအရာများထပ်နေသဖြင့် ရှင်းလင်းမှုရှိစေရန် - Monitoring plan EMoP များကို အခန်း ၇ အခန်းခွဲ ၇.၄ တွင်၊ Table 7-6, Table 7-7 Table 7-8 တို့တွင် ဖော်ပြထားပါသည်။
		- Mitigation measures ၊ EMP နှင့် EMop များအား Table အမျိုးမျိုး၊ ခေါင်စဉ်အမျိုးမျိုးဖြင့် ဖော်ပြထားပြီး ဆောင်ရွက်မည့် လုပ်ငန်းစဉ်ဖော်ပြချက်များသည် ကွဲလွဲမှုရှိကြောင်း စိစစ်တွေ့ရှိရသဖြင့် အမှန်တကယ် ဆောင်ရွက်မည့် လုပ်ငန်းစဉ်များကို ထည့်သွင်း၍ ရှုပ်ထွေး ကွဲပြားမှု မရှိစေဘဲ ရှင်းလင်းစွာဖော်ပြရန်၊	- အခန်း ၅ အခန်းခွဲ ၅.၄ တွင် Mitigation measures ၊ များကို ရှင်းလင်းဖော်ပြထားပါသည်။ - အခန်း ၇ အခန်းခွဲ ၇.၃ တွင် (EMP) Environmental Management Plan ဖြင့်၊ ဆောင်ရွက်မည့် measures များကို Table 7-3, Table 7-4 Table 7-5 တို့တွင် ဖော်ပြထားပါသည်။ - အခန်း ၇ အခန်းခွဲ ၇.၄ တွင် (EMoP) Environmental Monitoring Plan များကို Table 7-6, Table 7- Table 7-8 တို့တွင် ဖော်ပြထားပါသည်။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		- စာမျက်နှာ ၃၆၇ တွင် Table 7-18 Summary of monitoring plan during the operation phase တွင် Stack မှ ထွက်သော လေအရည်အသွေးအား တိုင်းတာ စောင့်ကြပ်ကြည့်ရှု စစ်ဆေး၍ EQEG 2.1.1 နှင့်အညီ နှိုင်းယှဉ်ဖော်ပြရန်၊	- Stack မှ ထွက်သော လေအရည်အသွေးအား monitoring စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးသည့်အခါ၊ EQEG 2.1.1 နှင့်အညီ နှိုင်းယှဉ်ဖော်ပြမည် ဖြစ်ကြောင်း အခန်းခွဲ ၇.၄.၂ Table 7-7 တွင်ဖော်ပြထားပါသည်။ - monitoring subplan တွင်လည်းဖော်ပြထားပါသည်၊
		- ရေအရည်အသွေးနှင့်ပတ်သက်၍လှိုင်မြစ်တွင်တစ်နေရာ၊ စက်ရုံမှ ထွက်ရှိမည့် စွန့်ပစ်ရေအား ဟာဘိချောင်းသို့ စွန့်ပစ်မည့်တစ်နေရာအားတိုင်းတာစောင့်ကြပ်ကြည့်ရှုစစ်ဆေး၍ EQEG 2.1.1 နှင့်အညီ နှိုင်းယှဉ်ဖော်ပြရန်၊	- ရေအရည်အသွေး စောင့်ကြပ်ကြည့်ရှု စစ်ဆေးရန် လှိုင်မြစ်တွင် တစ်နေရာနှင့် စက်ရုံမှ ထွက်ရှိမည့် စွန့်ပစ်ရေအား ဟာဘိချောင်းသို့ စွန့်ပစ်မည့်တစ်နေရာမှ ရေ နမူနာများ ယူ၍ EQEG 2.1.1 နှင့်အညီ နှိုင်းယှဉ် တိုင်းတာမည် ဖြစ်ကြောင်း အခန်းခွဲ ၇.၄.၂ Table 7-7 တွင် ဖော်ပြထားပါသည်။ - monitoring subplan တွင်လည်းဖော်ပြထားပါသည်၊
		- ဆူညံသံနှင့်ပတ်သက်၍ဆူညံသံအခြေပြုတိုင်းတာခဲ့သည့် နေရာများတွင် ဆူညံသံအား စောင့်ကြပ်ကြည့်ရှုတိုင်းတာရန်၊	- ဆူညံသံအား စောင့်ကြပ်ကြည့်ရှုတိုင်းတာရာတွင် အခြေပြု တိုင်းတာခဲ့သည့် နေရာများတွင် တိုင်းတာမည်ဖြစ်ကြောင်း အခန်းခွဲ ၇.၄.၂ Table 7-7 တွင်ဖော်ပြထားပါသည်။ - monitoring subplan တွင်လည်းဖော်ပြထားပါသည်၊
		- Impact Assessment များတွက်ချက်ရာတွင် Significance of impact/risk= consequence x probability ကို တွက်ချက်ဖော်ပြထားသောလည်း consequence နှင့် probability၏ rating အား ဖော်ပြထားခြင်းမရှိသည့်အတွက် without mitigation တွင် ရလဒ်သည် Low ဖြစ်နေရခြင်း သည်	- Impact Assessment များတွက်ချက်ရာတွင် ပိုမို ရှင်းလင်းသော score ပေးခြင်း၊ တွက်ချက်ခြင်းဖြင့် ပြင်ဆင်ဖော်ပြထားပါသည်။ - ၎င်းတွက်ချက်မှုများကို အခန်း ၅၊ အခန်းခွဲ ၅.၂၊ စာမျက်နှာ ၂၀၉ မှ ၂၂၂ ထိ ဖော်ပြထားပါသည်။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		မရှင်းလင်းပါ။ ထို့အတူ စာမျက်နှာ ၂၀၁တွင် Significance Impact Level x Receptor Sensitivity ဟုလည်းကောင်း၊ Impact Level = Magnitude + Extent + Duration ဟုလည်းကောင်း တွက်ချက်မှုများ ဖော်ပြထားသောကြောင့် တွက်ချက်မှုများအား ရှင်းလင်းစွာဖော်ပြရန်၊	
		- တွေ့ဆုံဆွေးနွေးပွဲများကျင်းပရာတွင်ဖိတ်ကြားခဲ့သူများသည် လူမှုစစ်တမ်းကောက်ယူရာတွင် ပါဝင်သူများ ဟုတ် / မဟုတ် စသည့် အခြေအနေများကို ရှင်းလင်းဖော်ပြရန်။ စီမံကိန်း အကောင်အထည်ဖော် ဆောင်ရွက်စဉ်အတွင်းတွင် အများပြည်သူနှင့်တွေ့ဆုံဆွေးနွေးခြင်း လုပ်ငန်းအား ထပ်မံဆောင်ရွက်ရန် လိုအပ်သည့်အတွက် ထပ်မံဆောင်ရွက်ခဲ့ပါက ဆောင်ရွက်ခဲ့သည့် လုပ်ငန်းစဉ် အသေးစိတ်အား အစီရင်ခံစာတွင် ထည့်သွင်းဖော်ပြရန်၊	ပထမအကြိမ်ပြည်သူများနှင့် တွေ့ဆုံဆွေးနွေးပွဲကျင်းပရာတွင် ဖိတ်ကြားခဲ့သူများ အချို့သည် လူမှုစစ်တမ်း ကောက်ယူ တွေ့ဆုံခဲ့ရာတွင် ပါဝင်သူများဖြစ်ကြပြီး အချို့မှာပါဝင်သူများ မဟုတ်ကြပါ။ စီမံကိန်း အကောင်အထည်ဖော် ဆောင်ရွက်စဉ်အတွင်းတွင် အများပြည်သူနှင့် တွေ့ဆုံဆွေးနွေးခြင်း လုပ်ငန်း အား ဒုတိယ အကြိမ်ထပ်မံဆောင်ရွက်ခဲ့ရာ ဆောင်ရွက်ခဲ့သည့် လုပ်ငန်းစဉ် အသေးစိတ်အား ယခုအစီရင်ခံစာ အခန်း ၉.၇.၅ တွင် ထည့် သွင်းဖေါ်ပြထားပြီးဖြစ်ပါသည်။
		- စာမျက်နှာ ၁၈၃ တွင် “Although proposed power plant is inside the premises of Ministry of Electric Power, there exist mixed communities which befall within the scope of 2 km radius boundary of focused social environment assessment. In term of township, they are Ahlone, Lamadaw, Seikkan and part of Sanchaung, Dagon, Kyee Myin Daing, Seik Gyi Kanaungto, and Dala township.” ဟုဖော်ပြထားရာ စီမံကိန်းသို့ ဖိတ်ကြား	စီမံကိန်းတည်နေရာမှာကီလိုမီတာအဝန်းအဝိုင်းအတွင်းရှိဆက်စပ်သက်ရောက်နိုင်ချေရှိသောမြို့နယ်များမှဒေသခံများ၏လူမှုစီးပွားရေးအပေါ်ထိခိုက်မှုများအားထည့်သွင်းစဉ်းစားရန် ဖော်ပြထားသော်လည်း စီမံကိန်းအပေါ်အခြေခံ၍ကောက်ယူရရှိခဲ့သော ပတ်ဝန်းကျင်ထိခိုက်နိုင်မှုဆိုင်ရာ အခြေခံဒေတာအချက်အလက်အဖြေများ၊ သုံးသပ်စံပြုတွက်ချက်ထားသော Modelling ရလဒ်အဖြေများအရ စီမံကိန်းမှ အဓိက ထိခိုက်သက်ရောက်နိုင်သောဒေသခံများမှာစီမံကိန်းအနီးဝန်းကျင်၌နေထိုင်သော အလုံမြို့နယ်ရှိဒေသခံများဖြစ်ပြီး အခြားမြို့နယ်များမှဒေသခံများအပေါ် စီမံကိန်းမှသက်ရောက်မှုများ မရှိလောက်အောင် နည်းပါးသည်ဖြစ်၍

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		တက်ရောက်ခဲ့သည့် ဒေသခံများသည် အလုံမြို့နယ်၌ နေထိုင်ကြောင်း စိစစ်တွေ့ရှိရပြီး အခြား ၂-ကီလိုမီတာအတွင်းရှိ မြို့နယ်များအား ဖော်ပြထားခြင်း မရှိသည့်အတွက် အခြားမြို့နယ်ရှိ ဒေသခံပြည်သူများ ပါဝင်နိုင်ခြင်းမရှိခြင်းအား ရှင်းလင်းဖော်ပြရန်၊	စီမံကိန်းမှ အဓိကထိခိုက်သက်ရောက်နိုင်သော ဒေသခံများဖြစ်သည့် အလုံမြို့နယ်တွင်နေထိုင်သောဒေသခံများသာလူထုတွေ့ဆုံဆွေးနွေးပွဲသို့ တက်ရောက်ခဲ့ခြင်းဖြစ်ပါသည်။
		- စာမျက်နှာ ၄၃၅ တွင် "U Aung Soe, Ward Administrator of Thittaw Ward, mentioned his - concern about the possible blockage of water flow in the creek, and consequential occurrence of inundation in the residential wards. He said if the soil, mud and wastewater, discharged by the plant, are discarded into the creek, they will accumulate as time goes by, and eventually cause blockage of the flow of water and inundation in the wards." ဖော်ပြထားရာ ဒေသခံများအနေဖြင့် စီမံကိန်းမှထွက်ရှိမည့် ရေကြောင့် မြစ်ချောင်းများအပေါ် ထိခိုက် သက်ရောက် မည်ကို စိုးရိမ်ပူပန်မှုရှိကြောင်းစိစစ်တွေ့ရှိရပြီး ၎င်းစိုးရိမ်မှု နှင့် ပတ်သက်၍ စီမံကိန်းအနေဖြင့် မည်သို့ ဆောင်ရွက်ဆန်းစစ်ထားကြောင်း ရေအရည်အသွေးစီမံခန့်ခွဲမှု အစီအစဉ်နှင့်ချိတ် ဆက်၍ဖော်ပြရန်၊	- ဟာဘိချောင်းရေသည် အမြဲတစေ စီးဆင်းနေသော ရေစီးကြောင်းဖြစ်ပါသည်။ စီမံကိန်းမှထွက်ရှိမည့် ရှဲ့အနယ် ဆိုသည်မှာ ရေလှောင်ကန်ဆေးသည့်အခါမှသာ ရေအလုံးအရင်းဖြင့် စီးထုတ်သည်ဖြစ်၍ မြစ်ချောင်း ပိတ်ဆို့နိုင်ခြင်း မရှိပါ။ ရေစီးကိုပိတ်ဆို့ခြင်းသည် ရပ်ကွက်နေ ပြည်သူတို့၏ အိမ် ဈေးတို့မှ ချောင်းအတွင်း စွန့်ပစ်သော အမှိုက်များ ပိတ်ဆို့မှုကြောင့်သာ ဖြစ်ပါသည်။

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		- နစ်နာသူမှ တိုင်ကြားလာသည့် အပေါ်တာဝန်ယူဆောင်ရွက်ပေးသည့် အစီအစဉ် (Grievance Redress Mechanism -GRM) နှင့်ပတ်သက်၍ Pre-Construction, Construction, Operation အဆင့်(၃) ဆင့်လုံးအတွက် လွှမ်းခြုံသည့် နစ်နာသူမှ တိုင်ကြားလာ သည့်အပေါ် ဆောင်ရွက်မည့် အစီအစဉ် (ရည်ရွယ်ချက် ၊ Grievance Committee၏ အဖွဲ့ဝင်များ၏ အမည်၊ တာဝန်ယူ ဆောင်ရွက်မည့် လုပ်ငန်းတာဝန်များ၊ နစ်နာသူမှ တိုင်ကြားနိုင်မည့် အင်္ဂလိပ် ၊ မြန်မာဘာသာ ဖြင့် ဖော်ပြထားသည့် တိုင်ကြားစာနမူနာများ၊ နစ်နာသူမှ တိုင်ကြားလာသည့် မကျေနပ်ချက်များအပေါ် ဆောင် ရွက်ပေးမည့် အစီအစဉ်) အား ထည့်သွင်း တင်ပြရန်၊	- အခန်း ၉ တွင် နစ်နာသူမှ တိုင်ကြားလာ သည့်အပေါ် ဆောင်ရွက်မည့် အစီအစဉ် (ရည်ရွယ်ချက်၊ Grievance Committee၏ အဖွဲ့ဝင်များ ၏ အမည်၊ လုပ်ငန်းတာဝန် များ၊ ဖော်ပြ ထားပါသည်။ - တိုင်ကြားစာနမူနာများ၊ Appendix 12 တွင် ဖော်ပြထားပါသည်။
		- အငြင်းပွားမှုများ၊ မကျေနပ်မှုများ ဖြေရှင်းရေးအတွက် Grievance Mechanism ဆိုင်ရာ အချက် အလက်များ၊ တာဝန်ယူဖြေရှင်းမည့် ပုဂ္ဂိုလ်၏ အမည်နှင့် ဖုန်းနံပါတ်၊ ဆက်သွယ်ပေးပို့ရမည့် လိပ်စာစသည်တို့ကို စီမံကိန်း တည်ရှိရာနေရာနှင့် နီးစပ်သည့်မြို့နှင့် ကျေးရွာများရှိ အုပ်ချုပ်ရေးမှူးရုံးများ၊မြို့နယ်အထွေထွေအုပ်ချုပ်ရေးရုံး များသို့ ဖြန့်ဝေဆောင်ရွက်သွားရန်၊ - ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာလုပ်ထုံးလုပ်နည်း အပိုဒ် ၆၅ နှင့်အညီ စီမံကိန်း အဆိုပြုသူသည် ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်း အစီရင်ခံစာကို လူမှုအဖွဲ့အစည်း၊	- အခန်း ၉၊ အခန်းခွဲ ၉.၁၃ တွင် အငြင်းပွားမှုများ၊ မကျေနပ်မှုများ ဖြေရှင်းရေးအတွက် Grievance Mechanism ဆိုင်ရာ အချက် အလက်များ၊ တာဝန်ယူ ဖြေရှင်းမည့် ပုဂ္ဂိုလ်၏ အမည်နှင့် ဖုန်းနံပါတ်၊ ဆက်သွယ် ပေးပို့ရမည့် လိပ်စာစသည်တို့ကို စီမံကိန်း တည်ရှိရာ နေရာနှင့် နီးစပ်သည့်မြို့နှင့် ကျေးရွာများရှိ အုပ်ချုပ်ရေးမှူး ရုံးများ၊ မြို့နယ်အထွေထွေအုပ်ချုပ်ရေးရုံးများသို့ ဖြန့်ဝေဆောင်ရွက်သွားရန် ဖော်ပြထားပါသည်။ - အခန်း ၉၊ အခန်းခွဲ ၉.၁၅ တွင် ပတ်ဝန်းကျင် ထိခိုက်မှု ဆန်းစစ်ခြင်း ဆိုင်ရာ လုပ်ထုံး လုပ်နည်း အပိုဒ် ၆၅ နှင့် အညီ စီမံကိန်း အဆိုပြုသူ သည် ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း အစီရင်ခံစာကို လူမှု

စဉ်	ဌာနအမည်	သဘောထားမှတ်ချက်များ	ပြန်လည်ပြင်ဆင်ဖော်ပြချက်များ
		စီမံကိန်းကြောင့် ထိခိုက်ခံစားရသူများ၊ သက်ဆိုင်ရာ အစိုးရ အဖွဲ့အစည်းများ၊ ဒေသခံအဖွဲ့အစည်းများနှင့် အခြားအကျိုး သက်ဆိုင်သူများ သိရှိနိုင်ရန် သတင်းစာ ကဲ့သို့သော နိုင်ငံပိုင် မီဒီယာများမှ လည်းကောင်း၊ စီမံကိန်း သို့မဟုတ် စီမံကိန်း အဆိုပြုသူ၏ဝက်ဘ်ဆိုဒ်မှလည်းကောင်း၊ စာကြည့်တိုက်များ၊ ပြည်သူ့ခန်းမများ စသည့်အများပြည်သူ စုဝေးရာ နေရာများတွင် လည်းကောင်း၊ စီမံကိန်းအဆိုပြုသူ၏ ရုံးဌာနများတွင် လည်းကောင်း ထုတ်ဖော်ကြေညာရန်၊	အဖွဲ့အစည်း၊ စီမံကိန်းကြောင့် ထိခိုက်ခံစားရသူများ၊ သက်ဆိုင်ရာ အစိုးရအဖွဲ့အစည်းများ၊ ဒေသခံအဖွဲ့အစည်းများနှင့် အခြားအကျိုး သက်ဆိုင်သူများ သိရှိနိုင်ရန် သတင်းစာကဲ့သို့သော နိုင်ငံပိုင် မီဒီယာများမှလည်းကောင်း၊ စီမံကိန်း သို့မဟုတ် စီမံကိန်း အဆိုပြုသူ၏ ဝက်ဘ်ဆိုဒ်မှလည်းကောင်း၊ စာကြည့်တိုက်များ၊ ပြည်သူ့ခန်းမများ စသည့် အများပြည်သူစုဝေးရာ နေရာများတွင် လည်းကောင်း၊ စီမံကိန်းအဆိုပြုသူ၏ ရုံးဌာနများတွင် လည်းကောင်း ထုတ်ဖော်ကြေညာမည် ဖြစ်ကြောင်း တင်ပြထားပါသည်။