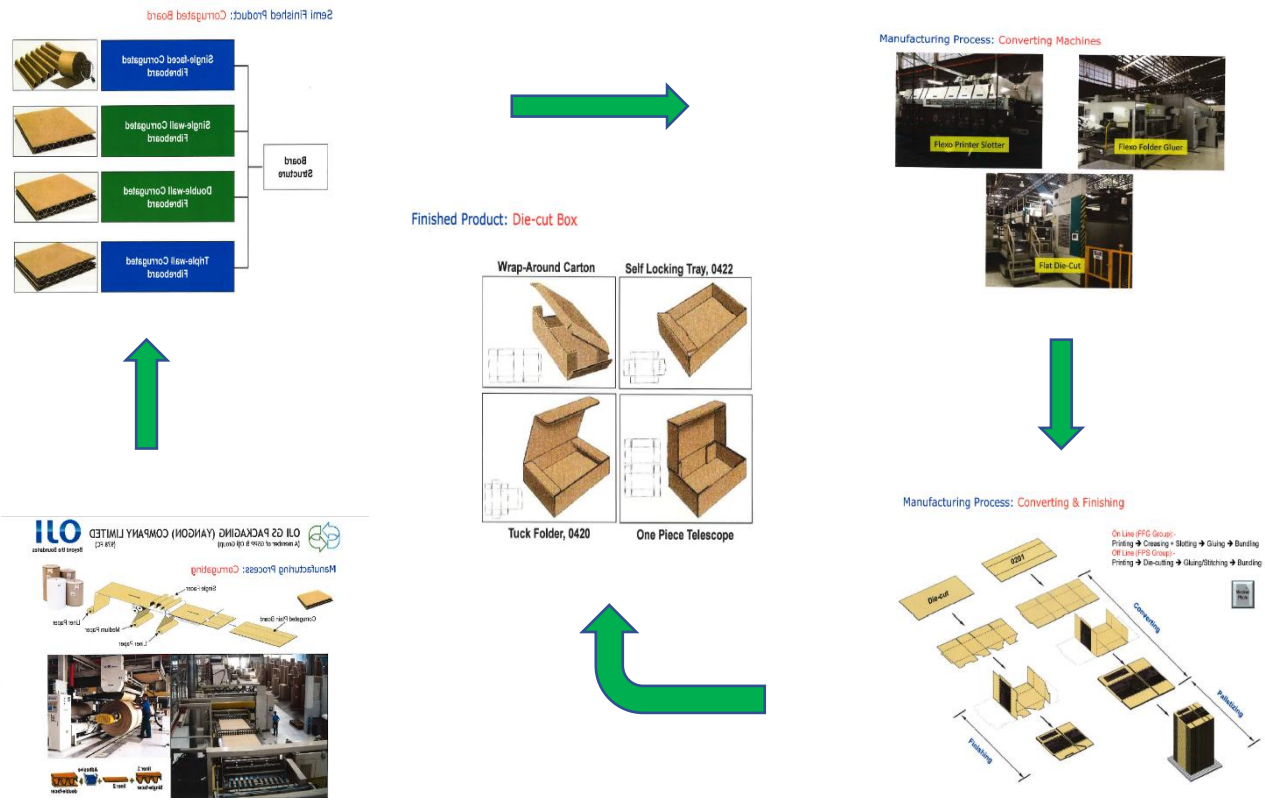
The Environmental Management Plan

of

OJI GS Packaging (Yangon) Company Limited

OJI GS PACKAGING (YANGON) COMPANY LIMITED
(A member of GSPP & Oji Group)
(97& FC)
OJI
Beyond the Boundaries



(Revised Final EMP Report)
Prepared
By
Environmental Quality Management (EQM) Co., Ltd

Acronyms

BOD	Bio-Chemical Oxygen Demand
COD	Chemical Oxygen Demand
CER	Certified Emission Reductions
CGI	Computer-generated Imagery
CPR	Cardiopulmonary Resuscitation
CSR	Cooperate Social Responsibility
DO	Dissolved Oxygen
ECC	Environmental Compliance Certificate
ECD	Environmental Conservation Department
EIA	Environmental Impact Assessment
ELV	Exposure Limit Value
EMP	Environmental Management Plan
EMT	Emergency Management Team
EQEG	Environmental Quality (Emission) Guideline
EQM	Environmental Quality Management Co.,ltd
ERP	Emergency Response Plan
FAO	Food and Agriculture Organization
FESR	Framework for Economic and Social Reform
HSE	Health, Safety and Environment
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KBAs	Key Biodiversity Areas
MIC	Myanmar Investment Commission
MONREC	Ministry of Natural Resources and Environmental Conservation
MSDS	Material Safety Data Sheet
MSW	Municipal Solid Waste
NAAQS	National Ambient Air Quality Standards
NCDP	National Comprehensive Development Plan
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
$PM_{10}/PM_{2.5}$	Particulate Matter
PPE	Personal Protection Equipment
SIA	Social Impact Assessment
SPSS	Statistical Package for the Social Sciences
SW	Solid Waste
TA	Technical Assistance
TDS	Total Dissolved Solid
TSS	Total Suspended Solid
UK	United Kingdom
UN	United Nations
US EPA	United State Environmental Protection Agency
VOC	Volatile Organic Compound

WARM	Waste Reduction Model
WB	World Bank
WBG EHS	World Bank Group Environmental, Health and Safety Guidelines
WBV	Whole-Body Vibration
WDPA	World Database Protected Area
WHO	World Health Organization
WMP	Waste Management Plan
3Rs	Reduce, Reuse and Recycle

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OJI GS PACKAGING (YANGON) COMPANY LIMITED
(A member of GSPP & Oji Group) (111477353)
Plot No. B-1-2, Corner Of No.(3),Highway Road and Khayebin Road, Mingaladon Industrial Park, Mingaladon Township, Yangon, Republic of Union of Myanmar

The Letter of Commitment

As per the Administrative Instruction of Environmental Impact Assessment procedure, OJI GS Packaging Co., Ltd (Yangon) required Environmental Management Plan (EMP) for the OJI GS Packaging factory project to be prepared and submitted to the Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation Department (MONREC) for approval.

Thus, this EMP study has been completed in accordance with Article 8, 9, 10, 1, 23, 24, 25 and 26 of the Myanmar EIA procedure (2015) by the Myanmar registered consultant company Environmental Quality Management Co. Ltd. (EQM).

OJI GS Packaging Co., Ltd (Yangon) endorses and confirms to the Environmental Conservation Department, Ministry of Natural Resource and Environmental Conservation the following:

- The accuracy and completeness of the EMP
- The EMP has been prepared in compliance with applicable Environmental Conservation Law, Rules and Procedures, and
- That all the information contained in the report is accurate and a truthful representation of all findings as relating to the Project.
- Will comply fully with the commitments and obligations including all laws and regulations as detailed in the EMP determined to be relevant with the planned project, mitigation measures and plans set out in the EMP.

The undersigned is authorized to issue this Letter of Commitment on behalf of the OJI GS Packaging Co., Ltd (Yangon)

Yours sincerely,

Goh Ling Ling
General Manager
OJI GS Packaging (Yangon) Co., Ltd.

OJI GS Packaging Co., Ltd
(Yangon)

Environmental
Quality
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The Letter of Commitment

As per the Administrative Instruction of Environmental Impact Assessment procedure, the OJI GS Packaging (Yangon) Company Limited required Environmental Management Plan (EMP) for the corrugated cardboard packaging factory project to be prepared and submitted to the Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation Department (MONREC) for approval.

The proposed project is located at the No.(B-1-2) in the Mingaladon Industrial Zone, Mingaladon Township, Yangon Region.

This EMP study has been completed in accordance with the following articles:
Chapter (2) Article 8, 9, 10, 11,
Chapter (3) Article 23, 24, 25, 26
Chapter (7) Article 76,77, 82 of the Myanmar EIA procedure (2015) by the Myanmar registered consultant company Environmental Quality Management Co. Ltd. (EQM).

Environmental Quality Management Co. Ltd. (EQM) endorses and confirms to the Environmental Conservation Department, Ministry of Natural Resource and Environmental Conservation the following:

- The accuracy and completeness of the EMP
- The EMP has been prepared in compliance with applicable Environmental Conservation Law, Rules and Procedures, and
- That all the information contained in the report is accurate and a truthful representation of all findings as relating to the project.
- The commitments and obligations including all laws and regulations as detailed in the EMP determined to be relevant with the planned project, mitigation measures and plans set out in the EMP has been prepared in compliance with the respective Laws and Regulations.

The undersigned is authorized to issue this Letter of Commitment on behalf of the Environmental Quality Management Co. Ltd. (EQM), Yangon.

Yours sincerely,

Dr Ohnmar May Tin Hlaing
Managing Director/Environmental Health Consultant

အခန်း (၁)

အကျဉ်းချုပ်အစီရင်ခံစာ

၁.၁ အကျဉ်းချုပ်အစီရင်ခံစာ

၁.၁ နိဒါန်း

OJI GS ကုမ္ပဏီသည် GS Paper & Packaging Sdn. Bhd နှင့် ဖက်စပ်လုပ်ငန်းတစ်ခုဖြစ်၍ မလေးရှားနိုင်ငံမှ (၉၉%) မြန်မာနိုင်ငံမှ ဦးမောင်စစ် (၁%) တို့ ပိုင်ဆိုင်ကြပါသည်။ အမှတ် (ဘီ-၁-၂) ၊ မင်္ဂလာဒုံစက်မှုဇုန်၊ မင်္ဂလာဒုံမြို့နယ်၊ ရန်ကုန် ၊ မြန်မာနိုင်ငံတွင် တည်ရှိပြီး ကိုဩဒီနိတ်မှာ 16°56'46.11"N နှင့် 96° 9'25.55"E ဖြစ်ပါသည်။ ***OJI GS ကုမ္ပဏီ*** အတွက် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP) ကို ***Environmental Quality Management Co., Ltd (EQM)*** မှ အတိုင်ပင်ခံအဖွဲ့က ဆောင်ရွက်ပါသည်။

စီမံကိန်းအတွက် အစိုးရ၏ မှတ်ပုံတင် / ခွင့်ပြုချက်ကို အောက်တွင်ဖော်ပြထားပါသည်။

၁	သဘာဝပတ်ဝန်းကျင်ကုမ္ပဏီ မှတ်ပုံတင်အမှတ်	2690/2012-2013
၂	ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၊ သဘာဝအရင်းအမြစ်၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး နှင့် သစ်တောဝန်ကြီးဌာနမှ EMP လုပ်ဆောင်ရန် အကြံပြုသည့်ရက်စွဲ	17th/June/2021

EMP လုပ်ဆောင်ခြင်း၏ အဓိကရည်ရွယ်ချက်မှာ ***စက်ရုံ၏ ဆိုးကျိုးသက်ရောက်မှုများ***နှင့် ***ကျန်းမာရေးနှင့် ပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှုများ***ကို ***လျော့ချ၍ စက်ရုံ၏ ရေရှည်တည်တံ့ခိုင်မြဲသော ဖွံ့ဖြိုးတိုးတက်မှုအား မြှင့်တင်ရန်*** ဖြစ်ပါသည်။

၁.၂ ရည်မှန်းချက်များ

ရည်မှန်းချက်များကိုအကောင်အထည်ဖော်ရန် အောက်ပါနည်းလမ်းများအား အသုံးပြုခဲ့ပါသည်။

- ပြည်တွင်းနှင့် နိုင်ငံတကာအဆင့် မူဝါဒများ၊ ဥပဒေများနှင့်စည်းမျဉ်းများအတွက် သက်ဆိုင်သည့် စာရွက်စာတမ်းများအား လေ့လာခြင်း
- စက်ရုံနှင့် ပတ်သက်ဆက်နွယ်သည့် သူများနှင့် သက်ဆိုင်ရာ အစိုးရအဖွဲ့များမှ တာဝန်ရှိသူများအား တွေ့ဆုံမေးမြန်းခြင်း
- သတင်းအချက်လက်များစုဆောင်းခြင်း
- ပတ်ဝန်းကျင်အခြေခံအချက်အလက်များအား စောင့်ကြည့်လေ့လာခြင်း
- ပတ်သက်ဆက်နွယ်သူများနှင့် တွေ့ဆုံဆွေးနွေးခြင်း နှင့် စီမံကိန်းအကြောင်းထုတ်ဖော်ခြင်း
  (အဓိကပတ်သက်ဆက်နွယ်သူများနှင့် အုပ်စုဖွဲ့ဆွေးနွေးခြင်း)
- ပြန်လည်အစီရင်ခံတင်ပြခြင်း

၁.၃ မူဝါဒ၊ ဥပဒေနှင့် ဖွဲ့စည်းပုံမူဘောင်

ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုအစီအစဉ် (EMP)အား သက်ဆိုင်ရာဥပဒေများနှင့်အညီ ပြင်ဆင် ဆောင်ရွက်ပါသည်။ အောက်ပါတို့သည် ***သက်ဆိုင်ရာ လမ်းညွှန်ချက်များ၊ စံချိန်စံညွှန်းများနှင့် ဥပဒေများ*** ဖြစ်ပါသည်။

- ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော် ဖွဲ့စည်းပုံအခြေခံဥပဒေ (၂၀၀၈)မှ အပိုဒ် ၃၇ (က) နှင့် အပိုဒ် (၄၅)

- ကမ္ဘာ့ ကျန်းမာရေးအဖွဲ့(WHO)၏ လမ်းညွှန်ချက်များ၊ အမေရိကန် ပြည်ထောင်စု ပတ်ဝန်းကျင် ထိန်းသိမ်းကာကွယ်ရေး အေဂျင်စီ(USEPA)နှင့် နိုင်ငံတကာ ငွေကြေးကော်ပိုရေးရှင်း(IFC) စံနှုန်းများကဲ့သို့သော နိုင်ငံတကာ မူဝါဒများ၊ အခြေခံမူများနှင့် စံနှုန်းများ
- သက်ဆိုင်ရာ ဒေသတွင်း လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် လုံခြုံရေးဆိုင်ရာ ဥပဒေများနှင့်စည်းမျဉ်းများ
- သယံဇာတနှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန လက်အောက်ရှိ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန မှ သဘောတူလက်မှတ်ရေးထိုးထားသော နိုင်ငံတကာ သဘောတူညီချက်များ
- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂)
- နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှုဥပဒေ (၂၀၁၃)
- ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း နည်းဥပဒေမူကြမ်း (၂၀၁၃)
- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး စည်းမျဉ်းစည်းကမ်းများ (၂၀၁၄)
- ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း လုပ်ထုံးလုပ်နည်းများ (၂၀၁၅)
- အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန် (၂၀၁၅)
- ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း လုပ်ထုံးလုပ်နည်းဆိုင်ရာ အုပ်ချုပ်ရေးညွှန်ကြားချက်မူကြမ်း (၂၀၁၅)
- မြန်မာနိုင်ငံ၏ EIA လုပ်ငန်းစဉ်များ၌ လူထုပါဝင်မှုဆိုင်ရာ လမ်းညွှန်ချက်မူကြမ်း (၂၀၁၇)
- စီမံကိန်း၏ ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာ စီမံခန့်ခွဲမှုနှင့် တိုက်ရိုက်ဖြစ်စေ သွယ်ဝိုက်၍ ဖြစ်စေ သက်ဆိုင်သည့် အခြားဥပဒေများ

၁.၄ စီမံကိန်းဖော်ပြချက်နှင့် အခြားနည်းလမ်းများ

အဆိုပြုထားသောစီမံကိန်းသည် အမှတ် (ဘီ-၁-၂) မင်္ဂလာဒုံစက်မှုဇုန်၊ မင်္ဂလာဒုံမြို့နယ်၊ ရန်ကုန်တိုင်း၊ မြန်မာနိုင်ငံတွင် တည်ရှိပြီး ကိုဩဒီနိတ်မှာ 16°56'46.11"N နှင့် 96° 9'25.55"E ဖြစ်ပါသည်။

OJI GS ကုမ္ပဏီလီမိတက်သည် Mingaladon Industrial Park ကုမ္ပဏီလီမိတက်သို့ မြေအသုံးချခကို သုံးကြိမ်ခွဲ၍ ပေးဆောင်ကာ Security Deposit (အာမခံငွေ)ကိုလည်း ပေးရပါမည်။

၁.၄.၁ လက်ရှိနေရာအသုံးပြုမှု

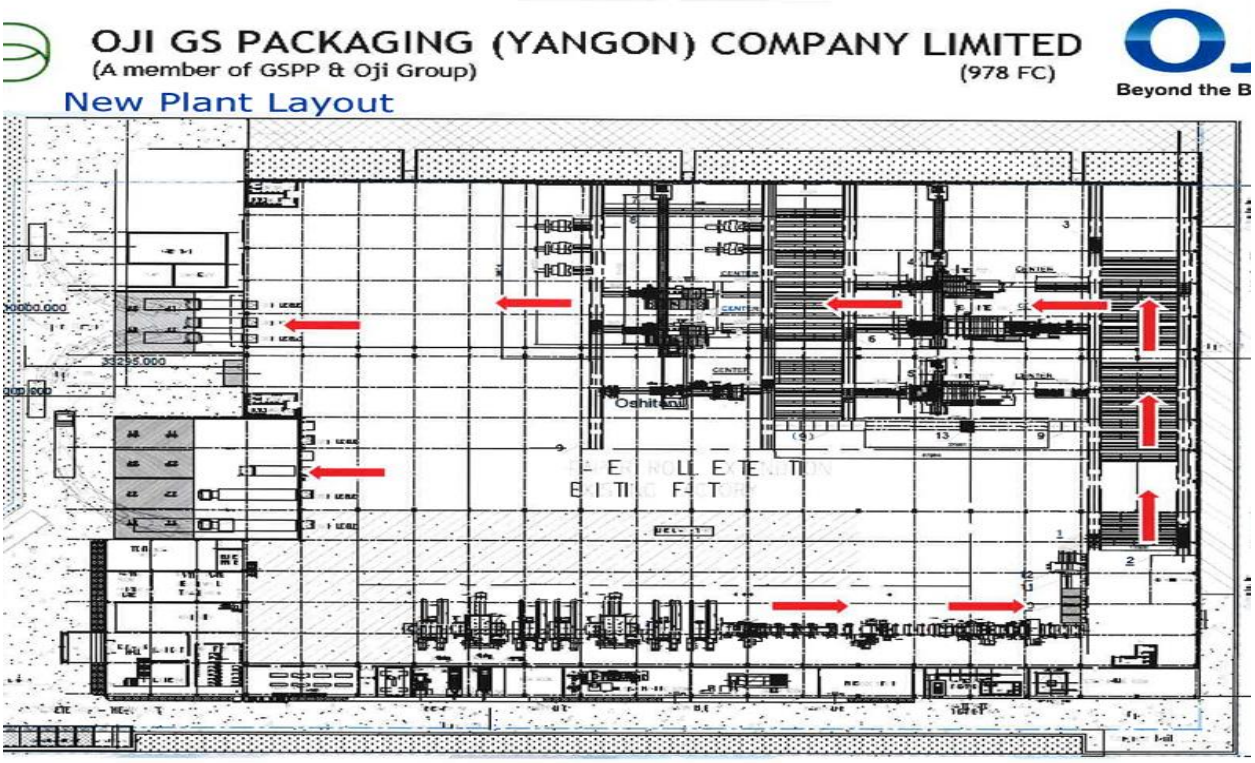
OJI GS ကုမ္ပဏီ၏ အဓိကအစိတ်အပိုင်းများမှာ အုပ်ချုပ်ရေးရုံးခန်း၊ ၊လုပ်ငန်းလည်ပတ်မှုပြုလုပ်သည့် အဆောက်အအုံ ၊ အလုပ်သမား ထမင်းစားဆောင် ၊ ကုန်လှောင်ရုံများ၊ အခြားအဆောက်အအုံများနှင့် မြေနေရာလွတ်များ ဖြစ်ပါသည်။

ဧယား ၁.၁ စက်ရုံရှိ အဆောက်အဦး များ

လုပ်ငန်းဧရိယာ ဧယား	
B1-1	**14,500.2 M^2**
B1-2	**25,000.0 M^2**
စုစုပေါင်း လုပ်ငန်းဧရိယာ	**39,500.0 M^3**

မြေအသုံးချမှု ဇယား				
မြေနေရာအသုံးချမှု	လက်ရှိအသုံးချမှု	ထပ်တိုး	စုစုပေါင်း ဧရိယာ	သိပ်သည်းဆ
စက်ရုံနှင့် ရုံးခန်း	11,918	5,728	17,645	44.70%
ရုံးခန်း၏ ဒုတိယအလွှာ	876	-	876	2.20%
ကားရပ်နားရန်နေရာ	70	-	70	0.20%
G/H, Pump room, အလုပ်သမားထမင်းစားဆောင်, အစရှိသည်	223	83	306	0.70%
စုစုပေါင်းကြမ်းခင်းဧရိယာ	13,086	5810	18,896	47.80%
အဆောက်အအုံများရှိသောဧရိယာ	12,140	5810	17,951	45.40%
မြက်ခင်းဧရိယာ 13,376 M^2 = စုစုပေါင်း မြေဧရိယာ၏ 33.9%				

အဆိုပြုထားသောစက်ရုံ စီမံကိန်းသည် ထုတ်လုပ်မှုပြုလုပ်နေသည့် အဆင့်တွင်ရှိပါသည်။



အဆိုပြုထားသော စက်ရုံစီမံကိန်း၏ အသေးစိတ် ရေးဆွဲထားသည့် ပုံစံ

၁.၄.၂ လုပ်ငန်းလည်ပတ်သည့်အဆင့်

၁.၄.၂.၁ ကုန်ကြမ်းပစ္စည်းများ

နောက်ဆုံး ထုတ်ကုန် ဖြစ်သော ဆေးရိုက်ထားသည့် ကတ္တူစက္ကူ ရရှိရန်အတွက် အဓိကကုန် ကြမ်းများမှာ စက္ကူလိပ်များ၊ ကစီဓာတ်နှင့် မှင်များဖြစ်သည်။

(က) စက္ကူလိပ်

နောက်ဆုံးထုတ်ကုန်အတွက် စက္ကူလိပ်များကို ပြည်တွင်းနှင့် ပြည်ပကုမ္ပဏီများမှ ဝယ်ယူပါသည်။ စုစုပေါင်းစက္ကူလိပ် ၁,၁၀၀တန်ခန့်ကို တစ်လကြာ အသုံးပြုပြီး ထိုပမာဏသည် ဖောက်သည်၏ မှာယူမှု (လိုအပ်ချက်များ) အပေါ် မူတည်ပြီး ကွဲပြားမည် ဖြစ်ပါသည်။

ကုန်ကြမ်းပစ္စည်းများကို OJI GS ကုမ္ပဏီသို့ ပို့ဆောင်ပေးမည့် နိုင်ငံခြား ကုမ္ပဏီများနှင့် ပတ်သက်၍ OJI GS ကုမ္ပဏီသည် ISO 9001:2015 (Quality Management) နှင့် ISO (4001:2015 (Environmental Management System) လက်မှတ်များရှိသော ကုမ္ပဏီများထံမှသာ ဝယ်ယူပါသည်။ ကုန်ကြမ်းအားလုံးကို မှာယူရာတွင် သဘာဝပတ်ဝန်းကျင်ကို ထည့်သွင်းစဉ်းစားပြီးမှ မှာယူပြီး စနစ်တကျ ထိန်းသိမ်းထားပါသည်။

(ခ) ပုံနှိပ်ရာတွင် သုံးသည့်မှင်

နောက်ဆုံးထုတ်ကုန်အတွက် ပုံနှိပ်ရာတွင်သုံးသည့်မှင်များကို ပြည်တွင်းကုမ္ပဏီမှ ဝယ်ယူပါသည်။ စုစုပေါင်းပုံနှိပ်မှင် ၄.၅တန်ခန့်ကို တစ်လကြာ အသုံးပြုပြီး ထိုပမာဏသည် ဖောက်သည်၏ မှာယူမှု (လိုအပ်ချက်များ) အပေါ် မူတည်ပြီး ကွဲပြားမည် ဖြစ်ပါသည်။

မှင်အမျိုးအစားမှာ ရေအခြေခံ Flexo Ink Series ဖြစ်ပြီး မှင်ထဲတွင် ပါဝင်သော ပစ္စည်းများမှာ သဘာဝပတ်ဝန်းကျင်ကို ထိခိုက်မှုနည်းစေသည့် သဘာဝအတိုင်း ဖြစ်သော အရာများ ပါဝင်ပါသည်။

(ဂ) ကစီခါတ်

နောက်ဆုံးထုတ်ကုန်အတွက် ကစီခါတ်များကို ပြည်တွင်းကုမ္ပဏီမှ ဝယ်ယူပါသည်။ စုစုပေါင်းကစီခါတ် ၁၈,၀၀၀ကီလိုဂရမ်ခန့်ကို တစ်လကြာ အသုံးပြုပြီး ထိုပမာဏသည် ဖောက်သည်၏ မှာယူမှု (လိုအပ်ချက်များ) အပေါ် မူတည်ပြီး ကွဲပြားမည် ဖြစ်ပါသည်။

၁.၄.၂.၂ စွမ်းအင်လိုအပ်ချက်

အဆိုပြုထားသော စက်ရုံအတွက် စုစုပေါင်း ဓာတ်အားလိုအပ်ချက်မှာ တစ်နှစ်လျှင် ***1,865 MWh*** ဖြစ်ပါသည်။ လျှပ်စစ်ဓာတ်အား လိုအပ်ချက်ကို အစိုးရလျှပ်စစ် ဓာတ်အားလိုင်းမှ အသုံးပြုပါမည်။ သို့သော် လျှပ်စစ်ဓာတ်အား ပြတ်တောက်သည့်အချိန်နှင့် ဖောက်သည်များထံမှ ဝယ်လိုအား ပိုမိုများပြားလာသည့် အခါတို့တွင် အရေးပေါ် ဓာတ်အားလိုအပ်ချက် များအတွက် မီးစက် (၃) လုံးထားရှိကာ တစ်လုံးချင်းစီ အသုံးပြု သွားမည်ဖြစ်ပါသည်။

၁.၄.၂.၃ ရေလိုအပ်ချက်

စီမံကိန်း ဧရိယာအတွက် အဓိကရေအရင်းအမြစ်မှာ ***ရေတွင်း နှင့် စည်ပင်ရေပေးဝေရေးစနစ်***တို့မှ ဖြစ်ပါသည်။ ရေနွေးငွေ့အပူဖြင့် ကတ်ထူပြားများအား တွန့်ခေါက်စေသည့် စက်အတွက် ရေအသုံးပြုရန် လိုအပ်ပါသည်။ ထို့အပြင် မီးဖိုချောင်သုံးရန်နှင့် သန့်ရှင်းရေးပြုလုပ်ရန် အတွက်လည်း ရေလိုအပ်ပါသည်။ စက်ရုံ၏ စုစုပေါင်းရေလိုအပ်ချက်မှာ တစ်ရက်လျှင် ***27026*** ဂါလံဖြစ်ပါသည်။

၁.၄.၂.၄ လုပ်အားလိုအပ်ချက်နှင့် ဝန်ထမ်းခန့်ထားမှု

အလုပ်သမားအားလုံးသည် လစဉ်လစာရသော အမြဲတမ်းဝန်ထမ်းများ ဖြစ်ကြပါသည်။

အမြဲတမ်းဝန်ထမ်းအုပ်စုတွင် စာရင်းကိုင်များ၊ ပြုပြင်ထိန်းသိမ်းရေး ဝန်ထမ်းများ၊ အင်ဂျင်နီယာများ၊ ဂိုဒေါင် ဝန်ထမ်းများ၊ ထုတ်လုပ်ရေး ဝန်ထမ်းများ၊ ထောက်ပံ့ပို့ဆောင်ရေးဝန်ထမ်းများ ၊ ယာဉ်မောင်းများ၊ ကောင်တာဝန်ထမ်းများ နှင့် အုပ်ချုပ်ရေးဝန်ထမ်းများ စသည်တို့ပါဝင်ကြပါသည်။

ဇယား ၁.၂ OJIGS ကုမ္ပဏီ၏ ဝန်ထမ်းအင်အား

ဝန်ထမ်းအမျိုးအစား	ဝန်ထမ်းအရေအတွက်
ယာယီ ဝန်ထမ်း	-
အမြဲတမ်း ဝန်ထမ်း	၂၁၆

၁.၄.၂.၅ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု

OJI GS ကုမ္ပဏီသည် စီမံကိန်းနေရာတွင် ရေဆိုးသန့်စင်သည့်စနစ် တပ်ဆင်ထားပါသည်။

စီမံကိန်းလည်ပတ်နေစဉ် ထွက်ရှိသည့်အစိုင်အခဲ စွန့်ပစ်ပစ္စည်းများမှာ အစားအစာ စွန့်ပစ်ပစ္စည်းများ၊ ခြံထွက်အမှိုက်များ၊ ပလတ်စတစ်၊ စက္ကူ၊ သားရေ / အထည် / ရာဘာ၊ ဖန်၊ သတ္တုနှင့် အလူမီနီယမ် (ဘူး)၊ အမျိုးသမီးလစဉ်သုံးပစ္စည်းများနှင့် အခြားစွန့်ပစ်ပစ္စည်းများ ဖြစ်ပါသည်။ အမှိုက်ပုံးများကို သင့်တော်သောနေရာတွင် ထားရှိပါမည်။ စွန့်ပစ်ပစ္စည်းများကို YCDC မှ ကောက်ယူ၍ အမှိုက်ပုံများ၌ စွန့်ပစ်မည်ဖြစ်ပါသည်။

၁.၄.၂.၆ လုံခြုံရေးနည်းလမ်းများ

လုပ်ငန်းလည်ပတ်နေစဉ် ဝန်ထမ်း / အလုပ်သမားများ၏ လုံခြုံရေးအတွက် အောက်ပါတို့အား တပ်ဆင်အသုံးပြုထားရမည်ဖြစ်ပါသည်။

- နားကြပ်များ
- လက်အိတ်များ
- ဘွတ်ဖိနပ်များ
- ဖုန်မှုန့်ကာကွယ်ရန် နှာခေါင်းစည်းများ
- ဦးထုပ်အမာများ
- ကာကွယ်ရေးဝတ်စုံ ယူနီဖောင်းများ

၁.၅ အခြားရွေးချယ်စရာကဏ္ဍ

OJI GS ကုမ္ပဏီ အား ***အကောင်အထည်မဖော်ပါက*** ထုတ်လုပ်မှုနှင့်ဖြန့်ဖြူးမှုကြောင့်ဖြစ်ပေါ်လာမည့် ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာသက်ရောက်မှုများ ရှိလာမည်မဟုတ်ပါ။

သို့သော်လည်း ***စီမံကိန်းလုပ်ဆောင်သူနှင့်ရပ်ရွာလူထုအကြား ကောင်းမွန်သောပူးပေါင်းဆောင်ရွက်မှုရှိပါက*** စက်ရုံလည်ပတ်မှုကြောင့် အလုပ်အကိုင်အခွင့်အလမ်းများတိုးမြှင့်လာခြင်း၊ အခြေခံအဆောက်အအုံအဆင့်တိုးတက်မြင့်မားလာခြင်းများနှင့် အခြားသော ရပ်ရွာအကျိုးကျေးဇူးရရှိခြင်းများကဲ့သို့ ***ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာအကျိုးကျေးဇူးများ*** ရရှိပါလိမ့်မည်။

OJI GS ကုမ္ပဏီသည် ***ကတ်ထူပြားတွန့်ခေါက်မှုပြုလုပ်သောစက်ရုံ***ဖြစ်သဖြင့် ပတ်ဝန်းကျင်ညစ်ညမ်းမှုကို သိသာစွာထုတ်လွှတ်သော အခြားစက်ရုံများနှင့်နှိုင်းယှဉ်ပါက ပတ်ဝန်းကျင်အပေါ် ***ဆိုးကျိုးသက်ရောက်မှုနည်းပါး***ပါသည်။

ထို့အပြင် စီမံကိန်းလုပ်ဆောင်သူသည် EMP တွင် ဖော်ပြထားသော ***လျော့ချရေးနည်းလမ်းများနှင့် စီမံခန့်ခွဲမှုအစီအစဉ်ကို*** အသိအမှတ်ပြုလိုက်နာပါက သက်ရောက်မှုများကို ***နိမ့်သောအဆင့်*** အဖြစ် သတ်မှတ်နိုင်မည်ဖြစ်ပါသည်။

၁.၆ ပတ်ဝန်းကျင် အခြေအနေဖော်ပြချက်၊ လျော့ချရေးနည်းလမ်းများ အပါအဝင် သက်ရောက်မှုနှင့် ဘေးအန္တရာယ်အကဲဖြတ်ခြင်း

၁.၆.၁ ပတ်ဝန်းကျင်လေထုအရည်အသွေး

ဒေသဆိုင်ရာရာသီဥတု စောင့်ကြည့်စစ်ဆေးမှုနှင့်အတူ လက်ရှိလေထုအရည်အသွေး ကောက်ယူမှုအား OJI GS စက်ရုံအတွင်းနှင့် ပတ်ဝန်းကျင်ရှိ နေရာ(၉)နေရာ၌ ၂၀၂၀ ဂျွန်လတွင် ကောက်ယူခဲ့ပါသည်။

ထို့အပြင် နှိုင်းယှဉ်ကြည့်ရန်အတွက် တင်ပြထားသော သက်ဆိုင်ရာစံချိန်စံနှုန်းများကို အသုံးပြုပါသည်။

စောင့်ကြည့်လေ့လာခြင်းတွင် တိုင်းတာသည့်နေရာများ၌ ၂၄ နာရီပျမ်းမျှ ***(PM10) အမှုန်များ ၊ (PM2.5) အမှုန်များ ၊ ကာဗွန်မိုနောက်ဆိုဒ် (CO)၊ Volatile Organic Compounds (VOC)၊ ဆာလ်ဖာဒိုင်အောက်ဆိုဒ် (SO2) ၊ နိုက်ထရိုဂျင်ဒိုင်အောက်ဆိုဒ် (NO2)၊ အမိုးနီးယား (NH3)၊ မီသိန်း (CH4)၊ အိုဇုန်း (O3)၊ အနုမြူဓါတ်ရောင်ခြည်နှင့် မိုးလေဝသအခြေအနေ*** တို့အား တိုင်းတာခဲ့ပါသည်။

တိုင်းတာချက်များအရ စက်ရုံ၌ကုန်ထုတ်လုပ်မှုပြုလုပ်စဉ် ထွက်ရှိသော ***PM10 နှင့် PM2.5 အမှုန်များ***သည် အဓိက လေထုညစ်ညမ်းစေသောအရာများ ဖြစ်ပါသည်။ ယေဘုယျအားဖြင့် ပျမ်းမျှ ၂၄ နာရီအတွက် PM10 နှင့် PM2.5 ထုတ်လွှတ်မှုစုစုပေါင်းသည် ***21 µg/m3*** နှင့် ***12 µg/m3*** အသီးသီးရှိကြပါသည်။ PM10 နှင့် PM2.5 ထုတ်လွှတ်မှုသည် ***ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့ (WHO) ၏လမ်းညွှန်ချက်*** (PM10 အတွက်50µg / m3) နှင့် (PM2.5 အတွက် 25µg / m3) ***ထက်လျော့နည်းပါသည်*** ။

နောက်ထပ် တိုင်းတာသောလေထုညစ်ညမ်းမှုမှာ စက်မှုလုပ်ငန်းမှထုတ်လွှတ်သည်ဟု ယူဆရသော ဆာလ်ဖာဒိုင်အောက်ဆိုဒ် (SO2) ဖြစ်၍ ***11 µg/m3*** ရှိကာ ***WHO ၏လမ်းညွှန်ချက်*** (SO2 အတွက် 20ug / m3) ***ထက်လျော့နည်းပါသည်***။

VOC, NH4 နှင့်methane တို့အား ယေဘုယျပတ်ဝန်းကျင် (စက်မှုလုပ်ငန်းမဟုတ်သော အခြေအနေများ) အတွက် အဆင့်သတ်မှတ်ထားခြင်းမရှိသော်လည်း လက်ရှိ ပမာဏအဆင့်ကိုဖော်ပြရန် နှင့် နောင်အခါတွင် ဆက်လက်စောင့်ကြည့်အကဲဖြတ်၍ နှိုင်းယှဉ်ရန်အလို့ငှာ တိုင်းတာခဲ့ပါသည်။

လေထုညစ်ညမ်းစေသော ထုတ်လွှတ်မှုအားလုံး၏ သက်ရောက်မှုကို စီမံကိန်းအဆင့်များဖြစ်ကြသည့် (ဆောက်လုပ်ရေး လုပ်ဆောင်နေစဉ်၊ လုပ်ငန်းလည်ပတ်နေစဉ် နှင့် ပိတ်သိမ်းခြင်း အဆင့်များ) အတွက် ***သက်ရောက်မှုဆန်းစစ်ချက်အရ အလယ်အလတ်အဆင့်*** သတ်မှတ်ထားသော်လည်း ဖော်ပြထားသော ***လျှော့ချရေးအစီအစဉ်များ***ကို လိုက်နာပါက ***သိသိသာသာလျော့နည်းသွား***ပါလိမ့်မည်။

လေထုအရည်အသွေးတွေ့ရှိချက်မှ အသေးစိတ်အချက်အလက်များကို အောက်ပါအခန်းတွင် ဖော်ပြထားပါသည်။

ထို့အပြင် ထွက်ရှိလာသော လေထုညစ်ညမ်းမှုဖြစ်စေသည့် အမှုန်များမှကာကွယ်ရန် အလုပ်သမားများနှင့် အခန်းအတွင်း အလုပ်လုပ်သော ဝန်ထမ်းအဖွဲ့များသည် ထုတ်လုပ်မှုလုပ်ငန်းများ ဆောင်ရွက်နေစဉ်အတွင်း ***အလေ့အကျင့်ကောင်းတစ်ခု***အဖြစ် ***သင့်လျော်သော နာခေါင်းစည်းများ***ကို တပ်ဆင်ရပါမည်။

စက်ရုံတွင်စက်အသစ်များတပ်ဆင်ထားပါက ***စောင့်ကြည့်စစ်ဆေးခြင်းလုပ်ငန်းစဉ်ကို နှစ်စဉ်*** ပြုလုပ်ရပါမည်။ လျှော့ချရေးအစီအစဉ်များကို သက်ဆိုင်ရာကဏ္ဍများတွင် အသေးစိတ်ဖော်ပြထားပါသည်။

လေထု အရည်အသွေးအပေါ် သက်ရောက်နိုင်သော ရာသီဥတု အခြေအနေသည် ယေဘူယျအားဖြင့် ကောင်းမွန်ပါသည်။

၁.၆.၂ ကာဗွန်ထုတ်လွှတ်မှု

OJIGS ကုမ္ပဏီမှ CO2 ထုတ်လွှတ်မှုနှင့်စပ်လျဉ်း၍ လျှပ်စစ်ကဏ္ဍမှ CO2 နှင့် ဖန်လုံအိမ်ခာတ်ငွေ့ တိုက်ရိုက် ထုတ်လွှတ်ခြင်း မရှိပါ။ ဖြစ်နိုင်ခြေရှိသော ခာတ်ငွေ့ထုတ်လွှတ်အရင်းအမြစ်မှာ အရံအဖြစ်ထားသော မီးစက်များမှဖြစ်သောကြောင့် “လျစ်လျူရှုနိုင်သောအဆင့်” ဟု သတ်မှတ်ပါသည်။

အဆိုပြုထားသောစက်ရုံသည် လျှပ်စစ်ခာတ်အားပြတ်တောက်သွားမှသာ ***မီးစက်များကိုသာအသုံးပြုပါလိမ့်မည်။***

OJIGS ကုမ္ပဏီ၌ ဒီဇယ်လောင်စာသုံးမီးစက် သုံးခု ရှိပါသည်။ မီးစက်များမှ စုစုပေါင်းCO2 ထုတ်လွှတ်မှု ပမာဏသည် တစ်နှစ်လျှင် ***58,960 kg (58.96 metric tons)*** ဖြစ်ပါသည်။ ***လျှပ်စစ်ကဏ္ဍမှ*** စုစုပေါင်းCO2 ထုတ်လွှတ်မှုသည် တစ်နှစ်လျှင် ***1639.46 metric tons*** ဖြစ်ပါသည်။

သယ်ယူပို့ဆောင်ရေးကဏ္ဍမှ CO2 စုစုပေါင်းထုတ်လွှတ်မှုသည် တစ်နှစ်လျှင် ***224.279 metric tons*** ဖြစ်ပါသည်။ စွန့်ပစ်အမှိုက်အား အမှိုက်ကျင်းတွင်စွန့်ပစ်သည့်အစား ပြန်လည်အသုံးပြုခြင်းကြောင့် CO2 လျော့နည်းသော ပမာဏသည်တစ်နှစ်လျှင် ***5301 metric ton*** ဖြစ်ပါသည်။

စက်ရုံမှ ***ကဏ္ဍအားလုံး*** (လျှပ်စစ် နှင့် သယ်ယူပို့ဆောင်ရေး) မှ စုစုပေါင်း CO2 ထုတ်လွှတ်မှုသည် ***စွန့်ပစ်အမှိုက်အား အမှိုက်ကျင်းတွင်စွန့်ပစ်သည့်အစား ပြန်လည်အသုံးပြုခြင်းကြောင့်*** လျော့နည်းသော CO2 ***ပမာဏထက်နည်းပါး၍ 3437.261 မက်ထရစ်တန်*** ဖြစ်ပါသည်။

၁.၆.၃ ဆူညံသံ

OJIGSကုမ္ပဏီ၏ ဆူညံသံ ပမာဏကို ***အဓိကတည်နေရာများတွင် လေထု တိုင်းတာခြင်းနှင့် အတူ*** တိုင်းတာခဲ့ပါသည်။

နေ့အချိန် တိုင်းတာမှုရလာဒ် (***69 dB***) နှင့် ***ညအချိန်*** တိုင်းတာမှုရလာဒ် (***66.5 dB***) သည် ပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက် (EQEG) အရသတ်မှတ်ထားသော ***ဆူညံသံစံနှုန်း 70dB ထက် ကျော်လွန်ခြင်းမရှိပါ။***

ပတ်ဝန်းကျင် ဆူညံမှုအကဲဖြတ်ခြင်း တွင် "***နိမ့်သော***" အဆင့်ဖြစ်သည်ကို တွေ့ရှိရပါသည်။ သို့သော်လည်း စက်ရုံလုပ်ငန်းဆောင်ရွက်မှုများမှ မှ ဆူညံသံအားကာကွယ်ရန် အလုပ်သမားများနှင့် ပန်ထမ်းများသည် ***ကုန်ထုတ်လုပ်မှုဆောင်ရွက်နေစဉ် နားအုပ်များကို အလေ့အကျင့်ကောင်းတစ်ခုအဖြစ်*** ဝတ်ဆင်ရပါမည်။ စက်ရုံတွင် စက်အသစ်များတပ်ဆင်ပါက ***စောင့်ကြည့်လေ့လာခြင်းလုပ်ငန်းစဉ်ကို နှစ်စဉ်*** ပြုလုပ် ရပါမည်။ လျှော့ချရေးအစီအစဉ်များကို သက်ဆိုင်ရာကဏ္ဍများတွင် အသေးစိတ်ဖော်ပြထားပါသည်။

၁.၇ မြေဆီလွှာအရည်အသွေး

စီမံကိန်းဧရိယာတွင် စက်ရုံများသည် (၁၀) နှစ်ကြာ တည်ရှိထားပြီးဖြစ်ပါသည်။
ဆင်ခြေဖုံးရုပ်ကွက်ဖြစ်၍ လယ်ယာစိုက်ပျိုးရေးလုပ်ကိုင်မှု မရှိပါ။ စက်မှုဇုန်တွင်မြေ၏ ၉၀ ရာခိုင်နှုန်းခန့်သည် ကွန်ကရစ်ဖြစ်ပါသည်။ ကျန်ရှိသောမြေ၏ ရုပ်ပိုင်းဆိုင်ရာအသွင်အပြင်မှာ ကြမ်းတမ်းသောသဲမြေ ဖြစ်ပါသည်။

၁.၈ အစိုင်အခဲစွန့်ပစ်ပစ္စည်း

စက်ရုံခြံတစ်ခုလုံးမှ တစ်နေ့တာထွက်ရှိသော ***အိမ်ထွက်နှင့် စက်မှုဆိုင်ရာ အစိုင်အခဲစွန့်ပစ်ပစ္စည်း***နှစ်မျိုးလုံးအား နောက်ဆုံးအမှိုက်စုပုံသည့်နေရာ၌ အလေးချိန်၍ စစ်ဆေးခဲ့ပါသည်။
အလေးချိန်တိုင်းတာချက်အရ အလုပ်သမားများနေထိုင်ရာနေရာမှ အိမ်ထွက်စွန့်ပစ်ပစ္စည်း ထုတ်လုပ်မှုသည် ***တစ်နေ့လျှင် 74kg*** ရှိပြီး ***တစ်နှစ်လျှင် 21 tonnes ခန့်*** ရှိပါသည်။

ထို့ကြောင့် အလုပ်ချိန်အဆိုင်း နှစ်ခုမှ စုစုပေါင်းလူဦးရေ ၂၁၆ နီးပါး၏ ***တစ်နေ့လျှင် လူတစ်ဦးချင်းစီမှ စွန့်ပစ်ပစ္စည်းထွက်ရှိမှုသည် (0.3) kg*** ဖြစ်ပါသည်။
ဖွံ့ဖြိုးဆဲနိုင်ငံများရှိ တစ်နေ့လျှင်လူတစ်ဦးချင်းမှ စွန့်ပစ်ပစ္စည်းထုတ်လုပ်မှုနှုန်း 0.5 မှ 1.5 kg ဖြင့်နှိုင်းယှဉ်ပါက ၎င်းသည် ***သိသာစွာလျော့နည်း*** ပါသည်။

OJI GS စက်ရုံမှ ***တစ်နေ့လျှင် စက်မှုလုပ်ငန်းသုံးစွန့်ပစ်ပစ္စည်း 775 kg*** (တစ်နှစ်လျှင် **225 tonnes** ခန့်) ထွက်ရှိပါသည်။ အချို့ကို စွန့်ပစ်ပစ္စည်းပြန်လည်အသုံးပြုသူများထံသို့ပို့၍ အချို့ကို စည်ပင်မှတဆင့် စွန့်ပစ်ပါသည်။
စွန့်ပစ်ပစ္စည်းအများစုမှာ ***အစားအစာစွန့်ပစ်ပစ္စည်း ၃၅%၊ စက္ကူ ၃၀%၊ ပလပ်စတစ် ၂၀% ၊ ဖန်နှင့်သတ္တုဘူးများ ၁၀% ဝန်းကျင်၊ အမျိုးသမီးလစဉ်သုံးပစ္စည်း ၂%၊ ခြံတွင်းစွန့်ပစ်ပစ္စည်း ၂% နှင့် LTR (သားရေ၊ အထည်အလိပ်နှင့်ရာဘာ) ၁%*** ရှိပါသည်။

စက်မှုလုပ်ငန်းများမှထွက်သော အဓိက အစိုင်အခဲစွန့်ပစ်ပစ္စည်းအမျိုးအစား နှစ်မျိုးမှာ ***ဓာတုစွန့်ပစ်ပစ္စည်းများ***နှင့် ***စွန့်ပစ်ရေ သန့်စင်စက်မှထွက်သော အနည်များ*** ဖြစ်၍ ၎င်းတို့အား ***စည်ပင်သို့ပို့ဆောင်***ပါသည်။ ကျန်ရှိသော စွန့်ပစ်ပစ္စည်းများကို ပြန်လည်အသုံးပြုပါသည်။
အလေးချိန်အားဖြင့် ***ဓာတုစွန့်ပစ်ပစ္စည်း***သည် ***၅၁%*** ဝန်းကျင်နှင့် ***စွန့်ပစ်ရေ သန့်စင်စက်မှထွက်သောအနည်*** သည် ***၄၉%*** ဖြစ်ပါသည်။
စက်ရုံတွင် ထွက်ရှိလာသော စွန့်ပစ်ပစ္စည်းများအားလုံးကို အလုပ်သမားများမှ နေ့စဉ် သန့်ရှင်းရေးပြုလုပ်ပါသည်။

၁.၉ သောက်သုံးရေနှင့် ရေဆိုးစွန့်ပစ်မှု
စက်ရုံအတွက်ရေသည် မရှိမဖြစ်လိုအပ်သောကုန်ကြမ်းတစ်ခုဖြစ်ပါသည်။ စက်မှုလုပ်ငန်းစဉ်များနှင့် အိမ်တွင်းအသုံးပြုမှုများအတွက် ***အများသုံးရေပေးဝေမှုမှ***ရေကို အသုံးပြုပါသည်။
စက်ရုံမှရေအသုံးပြုမှုသည် ***တစ်နေ့လျှင် 27026 gallon ခန့်*** ဖြစ်ပါသည်။ ရေအသုံးပြုမှု၏ ***၆၀% သည် ထုတ်လုပ်မှုလုပ်ငန်း***အတွက်ဖြစ်ပြီး ***၄၀% သည် အိမ်တွင်းသုံးစွဲရန်*** ဖြစ်ပါသည်။

သောက်သုံးရေအတွက် အဓိကအရင်းအမြစ်မှာ ***အများသုံးရေပေးဝေရေး***မှဖြစ်ပါသည်။ သောက်သုံးရေအတွက် စက်ရုံတွင် ***ရေသိုလှောင်ကန်တစ်ခု***ရှိပါသည်။ ထိုသိုလှောင်ကန်မှ သောက်သုံးရေအရည်အသွေးဆန်းစစ်ရန် နမူနာတစ်ခုကောက်ယူခဲ့ပါသည်။

ရေဆိုးဆန်းစစ်ခြင်းအရ စက်ရုံတစ်ဝန်းလုံးတွင် ရေနုတ်မြောင်း (၂) ခုရှိပါသည်။ နေရာအမျိုးမျိုးမှ စွန့်ပစ်ရေများသည် ထိုရေနုတ်မြောင်းများမှတဆင့် စီးဆင်းပါသည်။
ရေနမူနာများကို ကျန်းမာရေးနှင့် ပတ်ဝန်းကျင်အတွက် သိသိသာသာအရေးကြီးသော ဓာတုဗေဒနှင့်ရုပ်ပိုင်းဆိုင်ရာ parameters (၅)မျိုးဖြင့် ဆန်းစစ်ခဲ့ပါသည်။ ထို (၅) မျိုးမှာ ***စုစုပေါင်းဆိုင်းကြွေအနယ်(TSS)၊ BOD5 ၊ COD၊ နိုက်ထရိတ် - နိုက်ထရိုဂျင်*** နှင့် ***စုစုပေါင်း Coliform အရေအတွက်*** တို့ဖြစ်ပါသည်။

ရလဒ်များအရ စက်ရုံ၏ရေတိုင်ကီမှရေသည် ***စုစုပေါင်း Coliform အရေအတွက်*** မှအပ စံနှုန်းများနှင့် ကိုက်ညီမှုရှိပါသည်။ စုစုပေါင်း Coliform ရလဒ်သည် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များထက် အနည်းငယ်ကျော်လွန်ပါသည်။

စက်ရုံ၏ ရေဆိုးဆန်းစစ်ခြင်းရလဒ်များအားလုံးသည် ***BOD5*** နှင့် ***စုစုပေါင်း Coliform အရေအတွက်*** မှလွဲ၍ စံနှုန်းများနှင့် ကိုက်ညီမှုရှိပါသည်။ ***BOD5*** သည် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန (ECD) ၏ အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်များထက် အနည်းငယ်ကျော်လွန်၍ ***စုစုပေါင်း Coliform အရေအတွက်***သည် အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များထက် ကျော်လွန်နေပါသည်။

စက်ရုံစီမံကိန်းနေရာတွင် ***စွန့်ပစ်ရေသန့်စင်စနစ်*** ရှိပါသည်။ ဆန်းစစ်တိုင်းတာသည့် parameter များကို ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန (ECD) မှ အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များကို အခြေခံ၍ရွေးချယ်ပါသည်။
ထိုparameter များမှာ ***ငွေ၊ ဆယ်လီနီယမ်၊ ခရိုမီယမ်၊ ကဒ်မီယမ်၊ မာကျူရီ၊ စုစုပေါင်းနိုက်ထရိုဂျင်၊ Hexavalent ခရိုမီယမ်၊ စုစုပေါင်း ဖော့စ်ဖောရပ်၊ Apparent Colour3၊ ဆိုင်းကြွအနယ်၊ BOD5၊ COD၊ Free Cyanide၊ အလူမီနီယမ်၊ Arsenic ၊ ကြေးနီ၊ သံ၊ ခဲ၊ သွပ်၊ ဆာလဖိုက်၊ ဖီနော၊ ဖလူအိုရိုက်၊ အဆီများ နှင့်***
စုစုပေါင်း Coliform အရေအတွက် တို့ဖြစ်ပါသည်။
စွန့်ပစ်ရေသန့်စင်စနစ် မှ ***စုစုပေါင်းနိုက်ထရိုဂျင်ပမာဏ***သည် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များထက် ကျော်လွန်နေပါသည်။ အခြားတိုင်းတာချက်များမှာ WHO လမ်းညွှန်ချက်၊ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်၊ IFC ရေဆိုးလမ်းညွှန်ချက်များနှင့် ကိုက်ညီမှုရှိပါသည်။

၁.၁၀ စုပေါင်းသက်ရောက်မှုများအား အကဲဖြတ်ခြင်း

ဤအပိုင်းသည် OJIGS ကုမ္ပဏီ၏လုပ်ငန်းဆောင်ရွက်မှုများကြောင့် ဒေသတွင်းပတ်ဝန်းကျင်အပေါ် လေထုထုတ်လွှတ်မှု၊ ဆူညံသံ၊ ရေဆိုးစွန့်ပစ်မှုနှင့် အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများ၏ စုပေါင်းသက်ရောက်မှုများအား ဆန်းစစ်ခြင်းဖြစ်ပါသည်။ စက်ရုံလုပ်ငန်းအမျိုးမျိုးတို့ကြောင့် ထပ်တိုးသက်ရောက်မှုများအား ဆန်းစစ်သည့် လုပ်ငန်းစဉ်ဖြစ်ပါသည်။
စက်ရုံအနီး ကွင်းဆင်းလေ့လာမှုအရ OJIGS ပန်းကျင်ရှိ စက်ရုံအများစုသည် ***လက်ကိုင်အိတ်များထုတ်လုပ်သည့် EMC စက်ရုံ*** နှင့် ***ဆံပင်တုထုတ်လုပ်သည့် Macdo Wig*** စက်ရုံ တို့ဖြစ်ပါသည်။
ထို့အပြင် အခြားစက်ရုံများမှာ ***အီလက်ထရောနစ် ပစ္စည်းများ ထုတ်လုပ်သည့် စက်ရုံများ***နှင့် ***အဝတ်အထည် စက်ရုံများ*** ဖြစ်ပါသည်။
ဒေသအဆင့်တွင် စုပေါင်းသက်ရောက်မှုများမှာ ***အလယ်အလတ်အရေးပါ*** ပါသည်။

စက်ရုံအများစုသည် အဝတ်အထည်စက်ရုံများဖြစ်၍ လေထုထုတ်လွှတ်မှုများနှင့် စွန့်ပစ်ရေများထွက်ရှိသော စက်ရုံများ မဟုတ်သည့်အတွက် ***ပြည်နယ်/တိုင်းဒေသကြီးအဆင့်နှင့် နိုင်ငံတော်အဆင့်*** သဘာဝ ပတ်ဝန်းကျင်အပေါ် ***သိသာသော စုပေါင်းသက်ရောက်မှုများ မရှိနိုင်***ဟု ယူဆရပါသည်။

(က) ဖုန်မှုန့်များနှင့်လေထုညစ်ညမ်းမှု

အနီးရှိအခြားစက်ရုံများမှ ထုတ်လွှတ်မှုများနှင့် ယာဉ်များဖြတ်သန်းသွားလာမှု ကြောင့် စက်ရုံဝန်းကျင်ရှိကာလတို ဖုန်မှုန့် ထွက်ရှိမှု နှင့် စက်ရုံလုပ်ငန်းစဉ်မှ အမှုန်များထုတ်လွှတ်မှုသည် ပိုမိုများပြားလာပါလိမ့်မည်။

(ခ) ဆူညံသံ

အနီးဆုံးခွဲရှိသော စက်ရုံများမှ မော်တော်ယာဉ် သွားလာမှုများ၊ မီးစက်များ အသုံးပြုခြင်း၊ စက်များလည်ပတ်သည့်လုပ်ငန်းစဉ်များမှ ဆူညံသံများနှင့် ပေါင်းစပ်၍ စက်ရုံ၏ လက်ရှိအခြေခံဆူညံသံသည် ပိုမိုမြင့်တက်နိုင်ပါသည်။

(ဂ) စွန့်ပစ်ရေ

စက်ရုံမှစွန့်ပစ်ရေကို အများသုံးရေနုတ်မြောင်းထဲသို့ စွန့်ပစ်ခြင်းသည် ***အခြားစက်မှုရုံများမှ ရေဆိုးများနှင့်ပေါင်းပြီး စုပေါင်းသက်ရောက်မှုများ***ဖြစ်စေနိုင်ပါသည်။

(ဃ) အစိုင်အခဲစွန့်ပစ်ပစ္စည်း

OJIGS ကုမ္ပဏီမှ အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများသည် စက်မှုဇုန်အတွင်းရှိ အခြားစက်ရုံများ၏ လုပ်ဆောင်မှုများနှင့် ပေါင်း၍ အတော်အသင့်ထပ်တိုးသက်ရောက်မှုများ ဖြစ်စေနိုင်ပါသည်။

၁.၁၁ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်

ဆောက်လုပ်ရေးလုပ်ဆောင်စဉ်၊ လုပ်ငန်းလည်ပတ်စဉ်နှင့် ဝိတ်သိမ်းခြင်းအဆင့် တစ်လျှောက်လုံးတွင် ***လေထုညစ်ညမ်းမှုထိန်းချုပ်ခြင်း၊ ဆူညံသံ၊ တုန်ခါမှု၊ မြေဆီလွှာ၊ ရေအရင်းအမြစ်၊ အစိုင်အခဲစွန့်ပစ်ပစ္စည်း၊ ရေဆိုးစွန့်ပစ်ခြင်း၊ ဂေဟဗေဒအရင်းအမြစ်၊ ကျန်းမာရေးနှင့်ဘေးကင်းလုံခြုံရေး***တို့အတွက် ဆောင်ရွက်ရမည့် အဓိကအရေးပါသည့် ပတ်ဝန်းကျင်ဆိုင်ရာစီမံခန့်ခွဲမှုအစီအစဉ်ကို ***လျှော့ချရေးအစီအစဉ်များ၊ ဆက်လက်စောင့်ကြည့်စစ်ဆေးခြင်း၊ အကောင်အထည်ဖော်ခြင်း၊ ကြီးကြပ်ခြင်း၊ အစီရင်ခံစာစနစ်***တို့နှင့်အတူ အသေးစိတ်ဖော်ပြထားပါသည်။

ဘွိုင်လာ(အထူးသဖြင့် အပူချိန်လွန်ကဲသောဘွိုင်လာများ) အတွက် EMP ကိုအသေးစိတ် ဖော်ပြထားပါသည်။

ထို့အပြင် စက်ရုံ၏မူဝါဒနှင့်အညီ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်များကို ထိထိရောက်ရောက် ဆောင်ရွက်နိုင်ရန်အတွက် ***လုပ်ငန်းလည်ပတ်မှုမန်နေဂျာ / HSE အရာရှိ၊ လုပ်ငန်းခွင် စီမံကိန်းစီမံခန့်ခွဲမှုအဖွဲ့နှင့် HSE အဖွဲ့၏ တာဝန် ဝတ္တရားများကို*** သတ်မှတ်ဖော်ပြထားရပါမည်။

အစီရင်ခံခြင်းစနစ်၌ ***စောင့်ကြည့်စစ်ဆေးမှု အကြိမ်အရေအတွက်ကို*** အခြေအနေတစ်ခုချင်းစီအပေါ်မူတည်၍ ***အပတ်စဉ်မှ နှစ်စဉ်အထိ*** အမျိုးအစားသတ်မှတ်ခွဲခြားထားရပါမည်။

အကြမ်းဖျဉ်းစစ်ဆေးမှု၏ရလဒ်အနေဖြင့် စီမံကိန်းကိုဆက်လက်မလည်ပတ်စေနိုင်သော အဓိကပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာပြဿနာများ မတွေ့ရပါ။ သို့သော် COVID 19 ကူးစက်ရောဂါသည် အထူးအာရုံစိုက်ရန်လိုအပ်သည့် သိသာထင်ရှားသောပြဿနာတစ်ရပ် ဖြစ်ပါသည်။ ဤစီမံကိန်းကို ဆက်လက်လုပ်ဆောင်ရန်အတွက် COVID 19 ကူးစက်ရောဂါ ကာကွယ်ရေးနှင့်တုံ့ပြန်မှုအစီအစဉ်ကို ရေးဆွဲရပါမည်။

အဓိကလျော့ချရေးနည်းလမ်းများနှင့် တိကျသောလုပ်ဆောင်လိုက်နာမှုကတိကဝတ်များကို အကျဉ်းချုပ်အားဖြင့် ***ဇယား ၁-၃*** တွင် ဖော်ပြထားပါသည်။ စောင့်ကြပ်စစ်ဆေးရေးနည်းလမ်းများကို ***ဇယား ၁-၄*** တွင်ဖော်ပြထားပါသည်။

ဇယား၁-၃: အဓိက လျော့ချရေးနည်းလမ်းများ

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ/ ဖြစ်ရပ်များ	လုပ်ငန်းစဉ်	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ
ရုပ်ပိုင်းဆိုင်ရာ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း			
၁။ လေ အရည် အသွေး	၁.၁ ဆောက်လုပ်ရေးလုပ်ငန်းများ ၁.၂ တွန့်ခေါက်သည့်လုပ်ငန်း၊ ပုံနှိပ်လုပ်ငန်း၊ ဖြတ်တောက်သည့်လုပ်ငန်းများနှင့် ရာဘာသားအသုံးပြုသော ဘွိုင်လာများအပါအဝင် လုပ်ငန်းလည်ပတ်မှုများမှ ထုတ်လွှတ်မှုများ	၁.၁.၁ ဖုန်မှုန့်ကြောင့် လေထုအရည်အသွေး ယိုယွင်းပျက်စီးစေခြင်း။	• ဘွိုင်လာသန့်စင် နည်းပညာများ နှင့် ညစ်ညမ်းမှုထိန်းချုပ်စနစ် တပ်ဆင်အသုံးပြုခြင်း။ • ပုံနှိပ်စက်မှုင်မှ ရောင်ခြယ်အမှုန့်များနှင့် အခြား အညစ်အကြေးများအား ဖုန်စစ်ထုတ်ကိရိယာများနှင့် စစ်ထုတ်၍ သီးသန့် စွန့်ပစ်ခြင်း။ • ပုံနှိပ်စက်မှုင်မှ အနံ့များ အတွက် အကာအကွယ်များ တပ်ဆင်ထားခြင်း။ • ပိုမိုသန့်ရှင်း၍ လေထုထုတ်လွှတ်မှု နည်းစေသော နည်းပညာများအသုံးပြုခြင်း။ • ဘွိုင်လာ၊ မီးစက် / အင်ဂျင်နှင့် အခြားစက်များမှ ထွက်လာသောဓာတ်ငွေ့များနှင့် လေထုညစ်ညမ်းစေသော အရာများကို ခေါင်းတိုင်မှ ဖြတ်၍ ပို့နှုံးစေခြင်း။ (မြေမျက်နှာပြင်အထက်သုံးမီတာခန့်) • စက်ကိရိယာများအားလုံးကို အသုံးမပြုသည့်အချိန်တွင် စက်သတ်ထားရန်။

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ/ ဖြစ်ရပ်များ	လုပ်ငန်းစဉ်	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ
			• လိုအပ်ပါက ခြောက်သွေ့ရာသီဥတုနှင့် ယာဉ်မကြာခဏသွားလာသည့် အချိန်ကာလအတွင်း ဖုန်ထူခြင်းကိုထိန်းထားရန်အတွက် လမ်းများပေါ်တွင် ရေဖြန်းရန်။ • ဖုန်နှင့်ဓာတ်ငွေ့ထုတ်လွှတ်မှုအား ထိန်းချုပ်ခြင်းလုပ်ငန်းများကို ပုံမှန်ပြုလုပ်ခြင်း။ • စီမံကိန်း ဧရိယာအတွင်းရှိ စွန့်ပစ် ပစ္စည်းများကိုမီးရှို့ခြင်းအား တားမြစ်ခြင်း။
	၁.၃ မော်တော်ယာဉ်သွားလာမှုနှင့် စက်ယန္တရားများ သယ်ယူပို့ဆောင်ခြင်း	၁.၃.၁ မော်တော်ယာဉ်များမှ ထုတ်လွှတ်မှုကြောင့် လေထုအရည်အသွေး ယိုယွင်းပျက်စီးစေခြင်း။	• ထုတ်လွှတ်မှု နည်းသော ပစ္စည်းနှင့်ယာဉ်များ သုံး၍ လေထုညစ်ညမ်းမှုကို လျှော့ချခြင်း။ • လုပ်ငန်းခွင်တွင် သတ်မှတ်ထားသော ယာဉ်အမြန်နှုန်း စည်းကမ်းများကို တင်းကြပ်စွာလိုက်နာစေခြင်း။ • မတော်တဆမှု ဖြစ်ပွားမှုများအား အစီရင်ခံခြင်း။
၂။ ဆူညံသံ	၂.၁ ဆောက်လုပ်ရေးလုပ်ငန်းများ၊ ယာဉ်များနှင့် စက်ကိရိယာများ လည်ပတ်ခြင်း။ ၂.၂ တွန့်ခေါက်စက်၊ ပုံနှိပ်စက်၊ ဖြတ်တောက်သည့်စက်၊ မီးစက်၊ ဘွိုင်လာနှင့် မော်တော်ယာဉ်များ အသုံးပြုခြင်း။	၂.၁.၁ စက်များ/အင်ဂျင်များ ကြောင့် ဆူညံသံ မြင့်တက်စေခြင်း။	• ဆူညံသံများကို လျော့ချရန် စက်ပစ္စည်း များအား အသံတိတ်ကိရိယာများ တပ်ဆင်အသုံးပြုခြင်း။ • ဆူညံသော စက်ရုံလည်ပတ်မှုများနှင့် ယာဉ်သွားလာမှုများကို နေ့အချိန်၌သာ ဆောင်ရွက်ခြင်း။ • ဆူညံသံနည်းသော ပစ္စည်းများကို အသုံးပြုခြင်း။ • ပစ္စည်းများအတင်အချပြုလုပ်ရာတွင် ဂရုတစိုက် ကိုင်တွယ်ခြင်း။

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ/ ဖြစ်ရပ်များ	လုပ်ငန်းစဉ်	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ
			• ယာဉ်များ နှင့်ကိရိယာများကို ပုံမှန်စစ်ဆေးခြင်းနှင့်ထိန်းသိမ်းခြင်း။ • စက်ကိရိယာများကို အသုံးမပြုချိန်တွင် စက်သတ်ထားခြင်း
၃။ ရေ အရည်အသွေး	၃.၁ ဆောက်လုပ်ရေးလုပ်ငန်းများ ၃.၂ လုပ်ငန်းလည်ပတ်မှုမှ ရေဆိုးထွက်ရှိမှု။ ၃.၃ ပုံနှိပ်စက်၊ ကော်စက်၊ ကြမ်းခင်းနှင့်ပစ္စည်းကိရိယာများ သန့်ရှင်းရေးပြုလုပ်စဉ် စွန့်ပစ်ရေဆိုးထွက်ရှိမှု။ ၃.၄ မှင်များ၊ ကော်များ၊ လောင်စာဆီများ၏ မတော်တဆယိုဖိတ်မှု / ယိုစိမ့်မှု။	၃.၁.၁ ရေ အရည်အသွေး ကျဆင်းစေခြင်း။	• ပုံနှိပ်စက်၊ ကော်စက်၊ ကြမ်းခင်းနှင့် ပစ္စည်းကိရိယာများ ဆေးကြောရာမှ ထွက်ရှိသောစွန့်ပစ်ရေကိုသန့်စင်ရန် ရေဆိုးသန့်စင်စက်အသုံးပြုခြင်း • ရေကိုအခြေခံသော (သို့) သဘာဝပတ်ဝန်းကျင်အား ထိခိုက်မှုနည်းစေသော ဓာတုပစ္စည်းများကို ပိုမိုအသုံးပြုခြင်း • ရေဆိုး၏ပါဝင်မှုပြင်းအား လျော့နည်းစေရန်ပြုလုပ်ခြင်း။ • အမျိုးသား စွန့်ပစ်ရေအရည်အသွေး စံနှုန်းများအားလိုက်နာခြင်း။ • မှင်နှင့် ကော်ကဲ့သို့သောအရာများ ရေလမ်းကြောင်းထဲသို့ တိုက်ရိုက်မဝင်စေရန် အမိုးအကာ အောက်တွင် စနစ်တကျသိုလှောင်ထားရှိခြင်း • ရေပိုက်နှင့်တိုင်ကီ ယိုစိမ့်မှုများအား ချက်ချင်းရှာဖွေပြုပြင်ခြင်း။ • ဓာတုပစ္စည်းများ၊မှင်များ၊ ဆီသိုလှောင်ကန်များ အားလုံးကို သေချာစွာ ဖုံးအုပ်ထား၍ ယိုစိမ့်ခြင်း/ယိုဖိတ်ခြင်းမရှိစေရန် ကာကွယ်ထားခြင်း။

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ/ ဖြစ်ရပ်များ	လုပ်ငန်းစဉ်	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ
			• အန္တရာယ်ရှိသောပစ္စည်းများအား စနစ်တကျကိုင်တွယ်သည့် လုပ်ထုံးလုပ်နည်းများဖြင့် ယိုဖိတ်မှုအား လျော့ချရန် နှင့် မတော်တဆယိုဖိတ်မှုများကို လျင်မြန်စွာနှင့်လုံခြုံစွာ ဖယ်ရှားရန်အတွက် အရေးပေါ်တုန့်ပြန်မှုအစီအစဉ်များ ထည့်သွင်းအသုံးပြုခြင်း။ • ရေစီးဆင်းမှုအား ကောင်းစေရန် ရေနုတ်မြောင်းများတွင် အမှိုက်များကင်းရှင်းစေခြင်း။
၄။ မြေအရည်အသွေး	၄.၁ မှုတ်များ၊ ကော်များ၊ လောင်စာဆီများ၊ ဓာတုပစ္စည်းများ၊ အန္တရာယ်ရှိသောအရည်များ မတော်တဆယိုဖိတ်မှု / ယိုစိမ့်မှု။ ၄.၂ မလျော်ကန်သော စက်မှုလုပ်ငန်းစွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု	၄.၁.၁ မြေအရည်အသွေး ကျဆင်းစေခြင်း	• ယိုဖိတ်မှု / ယိုစိမ့်မှုမရှိစေရန် အတွက် ဓာတုပစ္စည်း သိုလှောင်ရာ နေရာများကိုပုံမှန်စစ်ဆေးခြင်း။ • အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများ အားလုံးကို အညွှန်းတွင် ပါသည့် အတိုင်း လုံခြုံစိတ်ချရသောနေရာ၌ ထားရှိခြင်း။ • ဘွိုင်လာလောင်စာ ပြာမှုန့်များကို စနစ်တကျကိုင်တွယ်ခြင်း ၊ ပြာအကြွင်းအကျန်များအား စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု ကုမ္ပဏီ (သို့) မြို့တော် စည်ပင်သာယာရေး ကော်မတီ (CDC) တွင်စနစ်တကျ စွန့်ပစ်ခြင်း။ • မတော်တဆယိုဖိတ်မှုများကို လျင်မြန်စွာနှင့်လုံခြုံစွာ ဖယ်ရှားရန် အတွက်

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ/ ဖြစ်ရပ်များ	လုပ်ငန်းစဉ်	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ
			အရေးပေါ်တုန့်ပြန်မှုအစီအစဉ်များ ထည့်သွင်းအသုံးပြုခြင်း။ • မှင်၊ ကော်နှင့် လောင်စာသိုလှောင်သည့် ကန်များအောက်တွင် အကာအကွယ်များ စနစ်တကျထားရှိခြင်း။ • ကြမ်းပြင်သန့်ရှင်းရေးကို သင့်တော်သောနည်းဖြင့် ပုံမှန် ပြုလုပ်ခြင်း။
၅။ စွန့်ပစ်ပစ္စည်း ထွက်ရှိခြင်းနှင့် စွန့်ပစ်ခြင်း	၅.၁ စက္ကူဖြတ်တောက်ခြင်းနှင့် ညှိခြင်းမှ ထွက်ရှိသော ဖြတ်စများ။ ဘွိုင်လာမှ ထွက်သောပြာများ။ လုပ်ငန်းခွင်အတွင်းရှိ လောင်စာဆီများ၊ ချောဆီ၊ ဓာတုပစ္စည်းများနှင့် အန္တရာယ်ရှိသော အရည်များအား မလျော်ကန်စွာ သိုလှောင်ခြင်း၊ ကိုင်တွယ်ခြင်း နှင့် ထိုပစ္စည်းများမှ ယိုဖိတ်မှုများ။ ၅.၂ အလုပ်သမားနေရာစခန်းမှ ထွက်ရှိသော စွန့်ပစ်ပစ္စည်းများ	၅.၁.၁ ဘေးအန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းများကြောင့် ပတ်ဝန်းကျင်ကို ညစ်ညမ်းစေခြင်း။ ၅.၂.၁ အိမ်သုံးအမှိုက်များ သည် လေနှင့်အတူ လွင့်ပါနိုင်သော အမှိုက်များကို ဖြစ်ပေါ်စေခြင်း၊ ပိုးမွှားများကို	• ယိုဖိတ်မှု / ယိုစိမ့်မှု မရှိစေရန် အတွက်ဓာတုပစ္စည်း သိုလှောင်ရာ နေရာများကို ပုံမှန်စစ်ဆေးခြင်း။ • အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများ အားလုံးကိုအညွှန်းတွင် ပါသည့် အတိုင်း လုံခြုံစိတ်ချရသောနေရာ၌ ထားရှိခြင်း။ • ဘွိုင်လာလောင်စာ ပြာမှုန့်များကို စနစ်တကျကိုင်တွယ်ခြင်း၊ ပြာအကြွင်းအကျန်များအား စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု ကုမ္ပဏီ (သို့) မြို့တော် စည်ပင်သာယာရေး ကော်မတီ (CDC) တွင်စနစ်တကျ စွန့်ပစ်ခြင်း။ • မတော်တဆယိုဖိတ်မှုများကို လျင်မြန်စွာနှင့် လုံခြုံစွာ ဖယ်ရှားရန်အတွက် အရေးပေါ်တုန့်ပြန်မှုအစီအစဉ်များ ထည့်သွင်းအသုံးပြုခြင်း။

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ/ ဖြစ်ရပ်များ	လုပ်ငန်းစဉ်	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ
		ဆွဲဆောင်ခြင်းနှင့် ရောဂါဖြစ်ပွားစေခြင်း။	• ကတ်ထူ ဖြတ်စများကို ပြန်လည်အသုံးပြုသည့်နေရာများတွင် ရောင်းချခြင်း (သို့မဟုတ်) အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများကို ပြန်လည်အသုံးပြုခြင်း။ ဥပမာ-စက္ကူဖြတ်စများနှင့် အကြွင်းအကျန်များ • အစိုးရမှ သတ်မှတ်ထားသော စည်းမျဉ်းစည်းကမ်းများအတိုင်း စွန့်ပစ်ပစ္စည်းများအားကိုင်တွယ်ခြင်း။ • သံမဏိအပိုင်းအစများ၊ သတ္တု၊ ပလတ်စတစ်နှင့် စက္ကူများအား ပြန်လည်အသုံးပြုခြင်း။ • စီမံကိန်းဧရိယာအတွင်းရှိ စွန့်ပစ်ပစ္စည်းများကို မီးရှို့ ခြင်းအား တားမြစ်ခြင်း။ • အလုပ်သမားစခန်းများတွင် စွန့်ပစ်ပစ္စည်းများကို ခွဲခြားစွန့်ပစ်ခြင်းနှင့် လျှော့ချခြင်း၊ ထပ်မံအသုံးပြုခြင်းနှင့် ပြန်လည်အသုံးပြုခြင်းစနစ်ကို ကျင့်သုံးခြင်း။
၆။ ဘွိုင်လာကြောင့် ပတ်ဝန်းကျင် အပေါ် သက်ရောက်မှု	၆.၁ လေထုထဲသို့ ဘွိုင်လာမှထုတ်လွှတ်ခြင်းများ ၆.၂ ဘွိုင်လာကြောင့် လုံခြုံရေးအန္တရာယ်ရှိစေခြင်း။ ၆.၃ ဘွိုင်လာလောင်စာမှ ထွက်သည့်ပြာများ	၆.၁.၁ လေထု ညစ်ညမ်းခြင်း ၆.၂.၁ ဘွိုင်လာအပူချိန်လွန်ကဲခြင်း၊ မီးလောင်ခြင်း၊ ပေါက်ကွဲခြင်း	• ဘွိုင်လာသန့်စင် နည်းပညာများ နှင့်ညစ်ညမ်းမှုထိန်းချုပ်စနစ် တပ်ဆင်အသုံးပြုခြင်း။ • ဘွိုင်လာလောင်စာ ပြာမှုန့်များကို စနစ်တကျကိုင်တွယ်ခြင်း၊ ပြာအကြွင်းအကျန်များအား စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု ကုမ္ပဏီ (သို့) မြို့တော် စည်ပင်သာယာရေး

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ/ ဖြစ်ရပ်များ	လုပ်ငန်းစဉ်	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ
			ကော်မတီ (CDC) တွင်စနစ်တကျ စွန့်ပစ်ခြင်း။ • သတ်မှတ်ထားသော အရည်အချင်း ပြည့်မီသူဖြင့် ဘွိုင်လာအား ပုံမှန်ထိန်းသိမ်းခြင်း နှင့် စစ်ဆေးခြင်း • မီးလောင်ခြင်းနှင့် ဘွိုင်လာ ပေါက်ကွဲမှုမှ ကာကွယ်ရန် ကြိုတင်ကာကွယ်မှုများ ပြုလုပ်ထားခြင်း။ • မတော်တဆမှု ဖြစ်ပွားမှုများအား အစီရင်ခံခြင်း။ • ထွက်လာသောဓာတ်ငွေ့များနှင့် လေထုညစ်ညမ်းစေသောအရာများကို ခေါင်းတိုင်မှ ဖြတ်၍ ပျံ့နှံ့စေခြင်း (မြေမျက်နှာပြင်အထက်သုံးမီတာခန့်) • ဘွိုင်လာအား ထုတ်လုပ်သူ၏ အကြံပြုချက်များနှင့်အညီ ထိန်းသိမ်းအသုံးပြုခြင်း • ဘွိုင်လာအား လုံခြုံရေးကိရိယာများ တပ်ဆင်ထားပြီး သတ်မှတ်ထားသော အရည်အချင်းပြည့်မီသူများကသာ လည်ပတ်စေခြင်း
ဇီဝဗေဒဆိုင်ရာ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း			
၇။ ဂေဟဗေဒ အရင်းအမြစ်များ အပေါ် သက်ရောက်မှု	စီမံကိန်းသည် စက်မှုဇုန်တွင်တည်ရှိသဖြင့် ဂေဟဗေဒ အရင်းအမြစ်များ အပေါ် သက်ရောက်မှုမှာ “***လျစ်လျူရှုနိုင်သော***” အဆင့် ဖြစ်ပါသည်။	-	-
လူမှုပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း			

ပတ်ဝန်းကျင်ဆိုင်ရာ အချက်များ/ ဖြစ်ရပ်များ	လုပ်ငန်းစဉ်	ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများ	လျော့ချရေးနည်းလမ်းများ
၈။ လုပ်ငန်းခွင် ကျန်းမာရေးနှင့် လုံခြုံရေး	၈.၁ မြေပျက်စီးမှုနှင့် ယာဉ်သွားလာမှုမှ ဖုန်မှုန့်များ။ ၈.၂ ဘွိုင်လာနှင့် အခြားလုပ်ငန်းခွင် ဘေးအန္တရာယ်များ။	၈.၁.၁ ထိတွေ့မှုများကြောင့် ကျန်းမာရေးနှင့် လုံခြုံမှု ထိခိုက်ခြင်း ၈.၂.၁ မတော်တဆ ဖြစ်ပွားမှုများမှ ဒဏ်ရာရရှိမှု (သို့မဟုတ်) သေဆုံးမှု	• လုံလောက်သော လေဝင်လေထွက် ရှိစေခြင်း • လုပ်ငန်းခွင်တွင်းရှိ အလုပ်သမားများကို လုပ်ငန်းခွင်သုံး တစ်ကိုယ်ရေကာကွယ်ရေးပစ္စည်းများ (PPE) ထောက်ပံ့ပေးထားခြင်း။ • First aid ပစ္စည်းများကို အလွယ်တကူရရှိ အသုံးပြုနိုင်ရန် စနစ်တကျ ထားရှိခြင်း။

ဇယား ၁-၄ ပတ်ဝန်းကျင်၊ လူမှုရေးနှင့်ကျန်းမာရေးစောင့်ကြည့်လေ့လာရေးအစီအမံအချက်များ

အချက်	အညွှန်းကိန်း / အတိုင်းအတာ	လုပ်ထုံးလုပ်နည်း	အဆိုပြုထားသော ကြာချိန်နှင့်	စောင့်ကြည့်လေ့လာမည့် အကြိမ်နှုန်း	တည်နေရာ
လေအရည်အသွေး	PM2.5 Ozone NO2 PM10 SO2 NOx	<u>နည်းလမ်း</u> မြန်မာနိုင်ငံ အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး လမ်းညွှန်ချက်များ အထွေထွေ လမ်းညွှန်ချက်များ အခန်း ၁.၁: ***လေထုထဲသို့ ထုတ်လွှတ်ခြင်း- မြန်မာနိုင်ငံ အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်များ(၂၀၁၅)***မှ အသေးစား လောင်ကျွမ်းခြင်းအတွက် ထုတ်လွှတ်မှုလမ်းညွှန်ချက်၌ လျှပ်စစ်(သို့)စက်မှုစွမ်းအား၊ ရေနွေးငွေ့၊ အပူ သို့မဟုတ် ထိုစွမ်းအင်များအား	**ကာလ -** ၂၄ နာရီ စဉ်ဆက်မပြတ် **ကြိမ်နှုန်း-** စက်ရုံလည်ပတ်စဉ်ကာလအတွင်း နှစ်စဉ် တိုင်းတာသည်။ စီမံကိန်း ပိတ်သိမ်းချိန်တွင် တစ်ကြိမ် တိုင်းတာသည်။ ရပ်ရွာလူထု နေထိုင်ရာ 1 km အတွင်းတွင် ပုံမှန်စောင့်ကြပ်ကြည့်ရှုရန်လိုအပ်ပါသည်။ လေထုအရည်အသွေး နှင့် ပတ်သက်၍ တိုင်ကြားချက်ရှိပါက တိကျသောတိုင်ကြားမှုများကို တုံ့ပြန်ရန် အတွက် နောက်ထပ်	စောင့်ကြည့်လေ့လာရေး အစီရင်ခံစာများကို ဝန်ကြီးဌာနမှ သတ်မှတ်ထားသည့် အတိုင်း ၆ လတစ်ကြိမ် (သို့မဟုတ်) အခါအားလျော်စွာ ဝန်ကြီးဌာနသို့ တင်ပြရပါမည်။	ထိခိုက် လွယ်သော နေရာများ၏ အနီးဆုံးနေရာ (သို့) တိုင်ကြားခံရသော ဧရိယာ၏ လေညာအရပ်။ (လိုအပ်ပါက)

အချက်	အညွှန်းကိန်း / အတိုင်းအတာ	လုပ်ထုံးလုပ်နည်း	အဆိုပြုထားသော ကြာချိန်နှင့်	စောင့်ကြည့်လေ့လာမည့် အကြိမ်ရှုနှုန်း	တည်နေရာ
		စုပေါင်းလုပ်ဆောင်ရန် (မည်သည့်လောင်စာအား အသုံးပြုသည်ဖြစ်စေ) စုစုပေါင်းထည့်သွင်းနိုင်သည့် အပူ ၃-၅၀ မဂ္ဂါဝပ်ရှိသော စွမ်းအင်စနစ်များအတွက် အကျုံးဝင်ပါသည်။ ဘွိုင်လာ၏ လောင်ကျွမ်းသော နည်းပညာ / လောင်စာသည် အစိုင်အခဲ ရာဘာအမျိုးအစားဖြစ်သောကြောင့် စံချိန်စံညွှန်းများနှင့် parameters များအား ဒုတိယကော်လံတွင် ဖော်ပြထားပါသည်။ **<u>ဘွိုင်လာ</u>** ဘွိုင်လာ၏ လုံခြုံရေးအတွက် အဆို့ရှင်သည် spring loaded valve ဖြစ်ပြီး ၁၆ ကီလိုဂရမ် / cm2 ထက် မပိုစေရပါ။ အများဆုံး ခွင့်ပြုထားသည့် အလုပ်လုပ်သော ဖိအား (MAWP) မည်သို့ပင် ဖြစ်စေကာမူ လုံခြုံရေးအတွက် အဆို့ရှင်များကို တပ်ဆင်ထားသင့်ပါသည်။	လေထု အရည်အသွေး တိုင်းတာခြင်းကိုပြုလုပ်နိုင်သည်။		
ဆူညံသံ	L_{eq}24 hr. L_{max} L_{dn}	<u>နှည်းလမ်း</u> မြန်မာနိုင်ငံအမျိုးသားသဘာဝ ပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ၊ (၂၀၁၅ ခုနှစ်မှစတင်ကာ ထိရောက်သည်) နှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ၊ ၂၀၁၂ ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့ (WHO) ၁၉၉၉ ၏ လူထုဆူညံသံအတွက် လမ်းညွှန်ချက်များကိုလိုက်နာခြင်း၊	**ကာလ -** ၂၄ နာရီ စဉ်ဆက်မပြတ် **ကြိမ်နှုန်း-** စက်ရုံလည်ပတ်စဉ်ကာလအတွင်း နှစ်စဉ် တိုင်းတာသည်။ စီမံကိန်း ပိတ်သိမ်းချိန်တွင် တစ်ကြိမ် တိုင်းတာသည်။ ရပ်ရွာလူထု နေထိုင်ရာ 1 km အတွင်းတွင် ပုံမှန်စောင့်ကြပ်ကြည့်ရှုရန်လိုအပ်ပါသည်။		ရပ်ရွာလူထု နေထိုင်ရာ 1 km အတွင်း

အချက်	အညွှန်းကိန်း / အတိုင်းအတာ	လုပ်ထုံးလုပ်နည်း	အဆိုပြုထားသော ကြာချိန်နှင့်	စောင့်ကြည့်လေ့လာမည့် အကြိမ်ရှုနှုန်း	တည်နေရာ
			ဆူညံသံအရည်အသွေး နှင့် ပတ်သက်၍ တိုင်ကြားချက်ရှိပါက တိကျသောတိုင်ကြားမှုများကို တုံ့ပြန်ရန် အတွက် နောက်ထပ် ဆူညံသံ အရည်အသွေး တိုင်းတာခြင်းကိုပြုလုပ်နိုင်သည်။		
ရေဆိုး	**Physical parameters:** • Silver (mg/L as Ag) • Selenium (mg/L as Se) • Chromium (mg/L as Cr) • Cadmium (mg/L as Cd) • Mercury (mg/L as Hg) • Total Nitrogen (mg/L) • Hexavalent Chromium (mg/L as Cr6+ • Total Phosphorus (mg/L as P) • Apparent Colour3 • TSS • BOD5 • COD • Free Cyanide • Aluminium • Arsenic • Copper • Iron • Lead	<u>နည်းလမ်း</u> အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) (NEQG) မှ အကြံပြုထားသော ရေနှင့်ရေဆိုးများကို ဆန်းစစ်ခြင်းအတွက် စံနည်းလမ်းများ အတိုင်း လိုက်နာ၍ ခွဲခြမ်းစိတ်ဖြာသည့် နည်းလမ်းများဖြင့် တိုင်းတာသည်။	စက်ရုံလည်ပတ်စဉ်ကာလအတွင်း နှစ်စဉ် တိုင်းတာသည်။ စီမံကိန်း ပိတ်သိမ်းချိန်တွင် တစ်ကြိမ် တိုင်းတာသည်။	စောင့်ကြည့်လေ့လာရေး အစီရင်ခံစာများကို ဝန်ကြီးဌာနမှ သတ်မှတ်ထားသည့် အတိုင်း လစဉ် (သို့မဟုတ်) အခါအားလျော်စွာ ဝန်ကြီးဌာနသို့ တင်ပြရပါမည်။	ရေနုတ်မြောင်း အနီး

အချက်	အညွှန်းကိန်း / အတိုင်းအတာ	လုပ်ထုံးလုပ်နည်း	အဆိုပြုထားသော ကြာချိန်နှင့်	စောင့်ကြည့်လေ့လာမည့် အကြိမ်ရှုနှုန်း	တည်နေရာ
	• Zinc • Sulfide • Phenol • Fluoride • Oil & Grease • Total coliform count				
	<u>ဆောက်လုပ်ရေး ကာလအတွင်း</u> • Biological oxygen demand • Chemical oxygen demand • Oil and grease • pH • Total coliform bacteria • Total nitrogen • Total phosphorus • Total suspended solids	<u>နှုန်းလမ်း</u> အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) (NEQG) မှ အကြံပြုထားသော ရေဆိုးများကို ဆန်းစစ်ခြင်းအတွက် စံနှုန်းလမ်းများ (အခန်း ၁.၂) စီမံကိန်းမှ ရေစီးဆင်းမှုများနှင့် စွန့်ပစ်ရေ ထုတ်လွှတ်မှုများ (ဆောက်လုပ်ရေး ကာလအတွင်း)	ဆောက်လုပ်ရေး ကာလအတွင်း	ဆောက်လုပ်ရေး အဆင့်တွင် တိုင်းတာပါသည်။	စီမံကိန်းနေရာ အားလုံးမှ ရေစီးဆင်းမှုများ
အန္တရာယ် ရှိသော /အန္တရာယ် မရှိသော စွန့်ပစ်ပစ္စည်းများ	စွန့်ပစ်ပစ္စည်း ရှင်းလင်းမှု စာရင်းနှင့် ခြေရာခံမှု အစီရင်ခံစာ	စွန့်ပစ်ပစ္စည်းပမာဏအား အမျိုးအစားနှင့် စွန့်ပစ်သည့်နေရာအလိုက် နေ့စဉ်စစ်ဆေးခြင်း	စီမံကိန်း တစ်လျှောက် အဆင့်အားလုံး	ပုံမှန်စစ်ဆေးခြင်း၊ မလိုလားအပ်သော ဖြစ်ပွားမှုများ အစီရင်ခံစာ (အကယ်၍ ဖြစ်ပွားမှုရှိပါက)	စီမံကိန်းနေရာ အားလုံး
လူမှုရေး	တိုင်ကြားချက်များ စောင့်ကြည့် စစ်ဆေးခြင်းနှင့် ဖြေရှင်းခြင်း	တိုင်ကြားမှုအား မှတ်တမ်းတင်ထားခြင်း စောင့်ကြည့်လေ့လာခြင်း၊ စုံစမ်းစစ်ဆေးခြင်းနှင့် သင့်လျော်သော			စီမံကိန်း ဧရိယာ၊ စီမံကိန်း ဧရိယာတဝိုက် လူထုအသိုင်းအဝိုင်းနှင့် သယ်ယူ ပို့ဆောင်ရေး လမ်းကြောင်း

အချက်	အညွှန်းကိန်း / အတိုင်းအတာ	လုပ်ထုံးလုပ်နည်း	အဆိုပြုထားသော ကြာချိန်နှင့်	စောင့်ကြည့်လေ့လာမည့် အကြိမ်ရှုနှုန်း	တည်နေရာ
		ဖြေရှင်းနည်းများကို အကောင်အထည်ဖော်ခြင်း			
ရပ်ရွာလူထုနှင့် လုပ်ငန်းခွင် ကျန်းမာရေး၊ လုံခြုံရေး	မတော်တဆ ဖြစ်ပွားမှု စာရင်းဇယား မတော်တဆ ဖြစ်ပွားရ ခြင်း အကြောင်း အရင်း လျှော့ချရေး အစီအမံများ	မတော်တဆမှု စုံစမ်းစစ်ဆေးမှု အတွက် အကျဉ်းချုပ် အစီရင်ခံစာ ရေးသားခြင်း			စီမံကိန်း ဧရိယာ၊ စီမံကိန်း ဧရိယာတဝိုက် လူထုအသိုင်းအဝိုင်းနှင့် သယ်ယူ ပို့ဆောင်ရေး လမ်းကြောင်း

OJI GS Packaging ကုမ္ပဏီသည် သဘာဝပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဉ် (EMP) ကုန်ကျစရိတ်အတွက် ရင်းနှီးမြှုပ်နှံမှု ပမာဏ၏ ၂-၃ % ကို အသုံးပြုမည် ဖြစ်ပါသည်။ သဘာဝပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဉ် (EMP) အတွက် ရည်မှန်းထားသည့် အသုံးစရိတ်မှာ တစ်နှစ်လျှင်USD 12,000 ဖြစ်ပါသည်။ စုစုပေါင်း ကုန်ကျစရိတ်များထဲမှ ၆၀% ကို သဘာဝပတ်ဝန်းကျင် ထိခိုက်မှု လျော့ပါးစေရေး အတွက် အသုံးပြုမည်ဖြစ်ပြီး ကျန် ၄၀% ကို စောင့်ကြည့်ရေး အစီအစဉ်များအတွက် အသုံးပြုမည် ဖြစ်ပါသည်။

စီမံကိန်း၏ တည်ဆောက်ရေးကာလမှာ တစ်နှစ်ခန့်ဖြစ်ပြီး မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှု ကော်မရှင်၏ ၃၅ နှစ်တာ ရင်းနှီးမြှုပ်နှံမှု ကာလအတွင်း စက်ရုံကို လည်ပတ်နိုင်မည် ဖြစ်ပါသည်။

၁.၁၂ အရေးပေါ်တုံ့ပြန်မှုအစီအစဉ်

ရည်ရွယ်ချက်မှာ စက်ရုံလုပ်ငန်းစဉ်များမှ ဖြစ်ပေါ်လာနိုင်သော အရေးပေါ်အခြေအနေများ၊ မတော်တဆဖြစ်ရပ်များ နှင့် သဘာဝဘေးအန္တရာယ်များကို တုန့်ပြန်နိုင်ရန်အတွက် အရင်းအမြစ်များ (ဝန်ထမ်းများနှင့်ကိရိယာများ) ကိုပြင်ဆင်ထားရန်ဖြစ်ပါသည်။

OJIGS ကုမ္ပဏီတွင် အရေးပေါ်အခြေအနေများအတွက် ယေဘုယျအားဖြင့် ***Emergency service in charge*** (သို့မဟုတ်) ***HSE မန်နေဂျာ*** နှင့် ***Response Team*** ရှိသင့်ပါသည်။ အဖွဲ့သည် အောက်ပါတို့ကို ပြင်ဆင်ထားသင့်ပါသည်။

- အဖွဲ့သားများကို အရေးပေါ်ပစ္စည်းများ အသုံးပြုစေကာ ၎င်းတို့တာဝန်နှင့် သက်ဆိုင်သည့် သင်တန်းများပို့ချခြင်း
- အရေးပေါ်နည်းလမ်းများကို ဖော်ဆောင်ရေးသားခြင်းနှင့် ပြဋ္ဌာန်းခြင်း
- အရေးပေါ်တုံ့ပြန်မှုအစီအစဉ် (ERP) ကို ဝန်ထမ်းများနှင့် စက်ရုံအလုပ်သမားများအားလုံး သိရှိနားလည်စေပြီး အသုံးချနိုင်စေရန် စာရွက်စာတမ်းဖြင့်ထုတ်ကာ ကြေငြာထားသင့်ပါသည်။
- အရေးပေါ်ကယ်ဆယ်ရေး muster points များ၏ တည်နေရာများအား သတ်မှတ်ထားခြင်း
- အချက်ပြစနစ်နှင့် မီးငြိမ်းသတ်ကိရိယာများ ထောက်ပံ့ထားခြင်း

- ရေးဦးသူနာပြု ပစ္စည်းကိရိယာများ ထောက်ပံ့ထားခြင်း
- မတော်တဆဖြစ်ရပ်များ (သို့မဟုတ်) အရေးပေါ် အခြေအနေတွင် ထိရောက်ပြီး အကျိုးရှိသောဆောင်ရွက်မှုများဖြင့် လူ့အသက်၊ ပတ်ဝန်းကျင်၊ ပိုင်ဆိုင်မှုနှင့် စီးပွားရေးလုပ်ငန်းများအပေါ် ထိခိုက်နိုင်မှုများကို လက်တွေ့ကျကျလျော့ချခြင်း
- ကောင်းမွန်သော ဆက်သွယ်ရေးစနစ်ဖြင့် အရေးပေါ် အခြေအနေများတွင်လုံလောက်သော သတင်းအချက်အလက်များကို ရရှိစေခြင်း
- ထိရောက်ပြီးအကျိုးရှိသောတုံ့ပြန်မှုဖြင့် ထိရောက်သောအရေးပေါ်စီမံခန့်ခွဲမှုကို သေချာမှုရှိစေခြင်း
- ဆက်သွယ်ရန် အစိုးရအာဏာပိုင်များ၊ မီဒီယာနှင့် အခြားသက်ဆိုင်သူများကို သတ်မှတ်ထားခြင်း နှင့် ၎င်းတို့အား ဆက်သွယ်ဆောင်ရွက်ရန် လမ်းစဉ်များအား ဖော်ပြထားခြင်း

စက်ရုံတွင်ဖြစ်နိုင်ဖွယ်ရှိသော အရေးပေါ်အခြေအနေများမှာ-

- မီး / ပေါက်ကွဲခြင်း
- အဆိပ်ငွေ့ပျံ့ခြင်း၊ ဆီယိုဖိတ်ခြင်း
- အမြင့်မှ လူပြုတ်ကျခြင်း
- ပစ္စည်းများပြုတ်ကျခြင်း၊ အဆောက်အအုံများ၊ ဂိုဒေါင်များပြိုကျခြင်း
- ဘိလပ်မြေဖုန်မှုန့်များ ပျံ့လွင့်ခြင်း
- ယာဉ်မတော်တဆမှုနှင့် ထိခိုက်ဒဏ်ရာများရရှိခြင်း

ဤအခန်းတွင် ဖြစ်နိုင်ချေရှိသော အရေးပေါ်အခြေအနေများကို စီမံခန့်ခွဲရမည့် နည်းလမ်းများ၊ ထုတ်လုပ်မှု လုပ်ငန်းစဉ်အတွင်း ပေါ်ပေါက်လာနိုင်သည့် အရေးပေါ်အခြေအနေများအားလုံးကို တုန့်ပြန်နိုင်ရန်အတွက် လုပ်ဆောင်ရမည့် အစီအစဉ်များနှင့် ရေးသားထားသော လုပ်ထုံးလုပ်နည်းများကို ဖော်ပြထားပါသည်။

၎င်းသည် အရေးပေါ်အခြေအနေတွင် ဆောင်ရွက်ချက်များနှင့် ဆက်သွယ်ရေးနည်းလမ်းများကို လမ်းညွှန်ပေးပြီး စက်ရုံ၏ သက်ဆိုင်ရာတာဝန်ဝတ္တရားများကို အဓိကထား ဖော်ပြထားပါသည်။

ထို့အပြင် ယေဘုယျပြဋ္ဌာန်းချက်များနှင့် First aid အရေးပေါ်ကုသမှုများ၊ ဖုန်မှုန့်နှင့်မတုပစ္စည်းများ ထိတွေ့ခြင်းအတွက် အရေးပေါ်တုန့်ပြန်မှု အစီအစဉ်များ အပါအဝင် ဆေးဘက်ဆိုင်ရာ အရေးပေါ်တုံ့ပြန်မှု အစီအစဉ်ကို ဖော်ပြထားပါသည်။

၁.၁၃ အများပြည်သူတိုင်ပင်ဆွေးနွေးခြင်းနှင့်ထုတ်ဖော်ခြင်း

စီမံကိန်းအဆိုပြုသူ နှင့် ***ပတ်ဝန်းကျင်အရည်အသွေးစီမံခန့်ခွဲမှုကုမ္ပဏီလီမိတက် (EQM)*** တို့သည်

စီမံကိန်းနှင့်အဓိကသက်ဆိုင်သူများနှင့် လူထုတွေ့ဆုံဆွေးနွေးမှုများ ပြုလုပ်၍ စီမံကိန်းလုပ်ငန်းစဉ်များကို သိရှိစေပြီး ၎င်းတို့၏ စီမံကိန်းအပေါ် သဘောထားမှတ်ချက်များကို ***ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP)*** တွင် ထည့်သွင်းသွားပါမည်။

လူထုတွေ့ဆုံ ဆွေးနွေးခြင်းအတွက် ***အစည်းအဝေးနှစ်ခုကို စီစဉ်ကျင်းပခဲ့ပြီး ပထမအကြိမ် အစည်းအဝေး***ကို ၂၀၂၀၊ အောက်တိုဘာလတွင် ***ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန (ECD၊ရန်ကုန်)နှင့် မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှု ကော်မရှင်တို့ဖြင့် zoom meeting*** ပြုလုပ်ခဲ့ပါသည်။

ထို့နောက် ***၂၀၂၁ခုနှစ် ဇွန်လတွင် စီမံကိန်းနှင့်ပတ်သက်ဆက်နွယ်သူများ***နှင့် အစည်းအဝေးတစ်ခု ကျင်းပခဲ့ပါသည်။

၁.၁၃.၁ လူထုတွေ့ဆုံဆွေးနွေးခြင်းနည်းစနစ်များနှင့် လုပ်ဆောင်ချက်များ

စီမံကိန်းသည် ***စက်မှုဇုန် (Myanmar Industrial Park)*** အတွင်းတွင် တည်ရှိရုံသာမက ***စီမံကိန်းအနီး ၂ ကီလိုမီတာအတွင်း အနီးစပ်ဆုံး ရပ်ကွက်လည်း မရှိသည့်အတွက်*** လူထုတွေ့ဆုံဆွေးနွေးပွဲကို ***မြန်မာစက်မှုဇုန်တာဝန်ခံအပါအဝင် အနီးဆုံးစက်ရုံများမှကိုယ်စားလှယ်များ၊ OJI GS စက်ရုံမှ ကိုယ်စားလှယ်များနှင့်*** EMP ဖော်ဆောင်ရန်အတွက် ***တတိယအဖွဲ့အစည်း ဖြစ်သည့် EQM တို့သည်*** ကျန်းမာရေးနှင့်အားကစား ဝန်ကြီးဌာန (MOHS) မှထုတ်ပြန်ထားသော ***COVID 19 ကာကွယ်ရေး အစီအစဉ်များ*** အတိုင်း ကျင်းပခဲ့ပါသည်။

ဇယား ၁. ၅ တွေ့ဆုံဆွေးနွေးပွဲကျင်းပသည့် ဇယား

ခန်းမ	OJI GS ရုံး
တည်နေရာ	မင်္ဂလာဒုံစက်မှုဇုန်၊ရန်ကုန်မြို့
နေ့စွဲ	၁၀ရက် ဇွန်လ ၂၀၂၁
အချိန်	နေ့လည် ၂ နာရီ

OJIGSကုမ္ပဏီနှင့် ***EQM***ကိုယ်စားလှယ်များသည် ***ကုမ္ပဏီ၏ သတင်းအချက်အလက်များ၊ ဆက်လက်ဆောင်ရွက်မည့် အစီအစဉ်များ*** နှင့် ***EMP အကြောင်းအရာ၊ ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများ၊ လျော့ချရေးအစီအစဉ်များအား*** power point အသုံးပြု၍ အသီးသီး တင်ပြခဲ့ကြပါသည်။

တင်ပြဆွေးနွေးပြီးနောက် ***အမေးအဖြေကဏ္ဍ***၌ စီမံကိန်းနှင့် ***ပတ်သက်ဆက်နွယ်သူများ၏ ပတ်ဝန်းကျင်ဆိုင်ရာ အမြင်များ***ကို မှတ်တမ်းတင်ခဲ့ပါသည်။ အစည်းအဝေးမှတ်တမ်း အသေးစိတ်ကို **အခန်း-၁၀ တွင်** ဖော်ပြထားပါသည်။

တွေ့ဆုံဆွေးနွေးချက်များအရ ***ဘွိုင်လာမှထွက်ရှိသော ပြာမှုန့်ပြဿနာ*** နှင့် စက်ရုံရှိ***ရေနုတ်မြောင်းစနစ် ထိန်းသိမ်းရန်မှ*** လွဲ၍ အဓိကအရေးပါသော ***အနုတ်လက္ခဏာဆောင်သည့် တုံ့ပြန်မှုများမရှိပါ။***

တက်ရောက်လာသူ တစ်ဦးမှ ***OJI GS စက်ရုံဘွိုင်လာမှ ထုတ်လွှတ်သော ပြာမှုန့်*** ပြဿနာကိုထောက်ပြခဲ့ပါသည်။ ***EQM***သည် အဆိုပြုထားစက်ရုံအား ဘွိုင်လာခေါင်းတိုင်အမြင့်အားစစ်ဆေးရန်နှင့် အနီးဆုံးရှိစက်ရုံများသို့ ပြာများမလွင့်စေရန် ဘွိုင်လာအင်ဂျင်နီယာမှ ခေါင်းတိုင်အမြင့်အား တိုင်းတာတွက်ချက်ရန် အကြံပြုခဲ့ပါသည်။ ***OJIGSစက်ရုံ***မှလည်း ***လိုအပ်သောအပူချိန်ရောက်အောင် ပြာမှုန်များအား အအေးခံပြီးမှ*** ပတ်ဝန်းကျင်လေထုထဲသို့ ထုတ်လွှတ်နိုင်သည့် နည်းပညာရှိကြောင်း ထပ်လောင်းပြောကြားပါသည်။

နောက်ထပ် တက်ရောက်သူတစ်ဦးမှ စက်ရုံများနှင့် အိမ်များအတွက် ***လုံလောက်သော ရေနုတ်မြောင်းစနစ် မရှိကြောင်း*** ပြောကြားခဲ့ပါသည်။

Myanmar Industrial Park မှ ကိုယ်စားလှယ်မှ ရေနုတ်မြောင်းစီးဆင်းရန် လိုင်းရှိကြောင်း၊ ရေဆိုးသည် ထိုလိုင်းမှ ကန်ထဲသို့ စီးဆင်းကြောင်းနှင့် ပြဿနာမှာ ရေဆိုးသည် ထိုလိုင်းထဲသို့မဝင်ခြင်းဖြစ်ကြောင်း ဖြေကြားခဲ့ပါသည်။ ***EQM*** သည် ***ရေနုတ်မြောင်းစနစ်အား ပြုပြင်ရန်*** အကြံပေးခဲ့ပါသည်။

ဤပြဿနာများနှင့် အကြံပြုချက်များကို ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်(EMP) ကိုရေးသားရာတွင် ထည့်သွင်းရေးဆွဲသွားမည် ဖြစ်ပါသည်။ ***EMP ၏နောက်ဆုံးအစီရင်ခံစာကို စက်ရုံ၏ဝက်ဘ်ဆိုက်***နှင့် ***Myanmar Industrial Park ကော်မတီရုံး***တို့တွင် အသိပေးထုတ်ဖော်ကြေညာသွားပါမည်။

နိဂုံးချုပ်အနေဖြင့် ဤအစီရင်ခံစာသည် ရေရှည်တည်တံ့ခိုင်မြဲ၍ စိမ်းလန်းစိုပြည်သော ဖွံ့ဖြိုးတိုးတက်မှုကို ထိန်းသိမ်းရန်၊ အလုပ်သမားများအား ဘေးအန္တရာယ်များမှကင်းလွတ်သော လုပ်ငန်းခွင်ရရှိစေပြီး မြန်မာနိုင်ငံ ပတ်ဝန်းကျင်ဆိုင်ရာ စည်းမျဉ်းစည်းကမ်းများတွင် ပါဝင်သည့် ပတ်ဝန်းကျင်ဆိုင်ရာစီမံခန့်ခွဲမှု အစီအစဉ်များ၊လျော့ချရေး အစီအစဉ်များ၊ စောင့်ကြည့်လေ့လာရေးအစီအစဉ်များနှင့် ကိုက်ညီမှုရှိမရှိ ပြန်လည်သုံးသပ်ရန်အတွက် OJIGS ကုမ္ပဏီအား လမ်းညွှန်မှုနှင့်မူဘောင်ကို ထောက်ပံ့ပေးထားပါသည်။

Chapter 1

Executive summary

1.Executive summary (OJI GS Packaging)

1.1 Introduction

The OJI GS Packaging (Yangon) Company Limited is a Joint Venture between GS Paper & Packaging Sdn. Bhd. (99%) from Malaysia and U Maung Sitt (1%) from the Republic of the Union of Myanmar which is situated at the No.(B-1-2) in the Mingaladon Industrial Zone, Mingaladon Township, Yangon Region, the Republic of the Union of Myanmar, at the coordinates of 16°56'46.11"N and 96° 9'25.55"E. The Environmental management Plan (EMP) has been conducted by the consultant team of ***Environmental Quality Management Co., Ltd*** for the **OJI GS Packaging (Yangon) Company**.

In terms of the ***government registration/approvals*** for the project is as shown below:

1	Environmental Company Registration Number	2690/2012-2013
2	Date of Recommendation from Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation and Forestry to conduct the EMP.	17th/June/2021

The main aim of this work is ***to reduce adverse impacts*** of the factory and its activities on the ***health and environment*** together with ***the promotion of factory's sustainable development.***

1.2 Objective

In order to implement the objective, the following materials and methods were used:

- ***Literature review*** on the documents related to policies, laws and regulations of both national and international level
- ***Interviews with people concerned*** with the factory as well as the respective government bodies
- Both ***primary and secondary data*** collection
- ***Environmental baseline*** monitoring
- ***Stakeholders consultation and disclosure*** through focus group meetings
- Reporting back

1.3 Policy, legal and institutional framework

The EMP has been prepared in accordance with the ***respective laws*** accordingly. These are the ***relevant guidelines, standards and regulations***:

- The article 37 (a) and 45 of the Constitution of the Republic of the Union of Myanmar (2008)
- International policies, principles and standards such as WHO guidelines USEPA, IFC Standards
- Relevant local Occupational Health and Safety related laws and regulations
- International conventions, treaties and agreements ratified by Environmental Conservation Department (ECD), Ministry of Natural Resource and Environmental Conservation (MONREC)
- Environmental Conservation Law (2012)
- Foreign Investment Law (2013)
- The draft of Environmental Impact Assessment Rules (2013)
- Environmental Conservation Rules (2014)
- Environmental Impact Assessment Procedure (2015)

- National Environmental Quality (Emission) Guideline (2015)
- Draft Administrative Instruction of Environmental Impact Assessment Procedure (2015)
- Draft Guideline on Public Participation in Myanmar's EIA Processes (2017)
- Project-Relevant Laws including a number of other laws exists which, either directly or indirectly, relate to environmental and social management of the project

1.4 Project description and alternatives selection

The proposed project is located at the No.(B-1-2) in the Mingaladon Industrial Zone, Mingaladon Township, Yangon Region, the Republic of the Union of Myanmar, at the coordinates of 16°56'46.11"N and 96° 9'25.55"E.

OJI GS Packaging (Yangon) Company Limited shall provide the land use premium in three instalments as well as a security deposit to the Mingaladon Industrial Park Co., Ltd..

1.4.1 Current use of the location

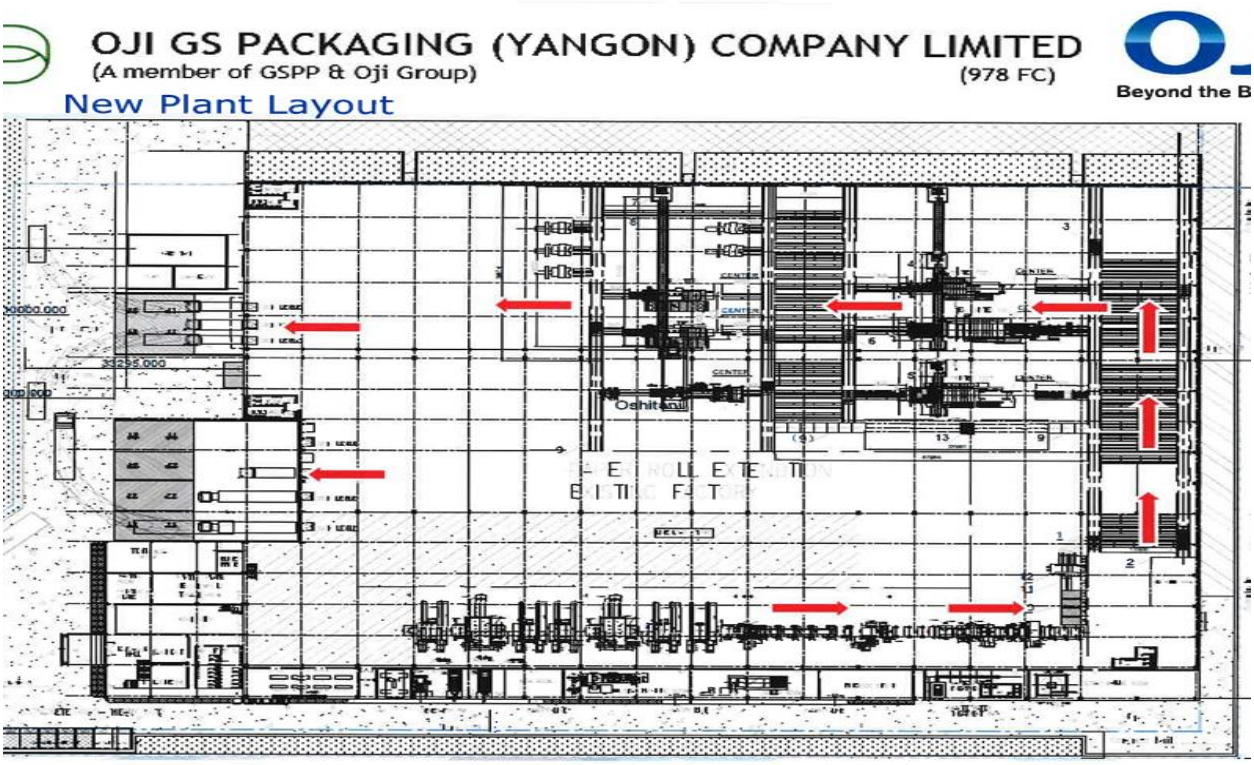
The main part of the project of the OJI GS Packaging (Yangon) Company is being occupied by the admin office, operation process building, canteen, storage buildings, other type of building and open space.

Table 1.1 Plant facilities

Site Area Table		
B1-1	14,500.2 M^2	
B1-2	25,000.0 M^2	
Total Site Area	39,500.0 M^3	

Land-Used Table				
Function	Existing	Expansion 1	Total area	Density
Factory&Office	11,918	5,728	17,645	44.70%
Office 2nd Floor	876	-	876	2.20%
Car Parking	70	-	70	0.20%
G/H, Pump room, Canteen, etc	223	83	306	0.70%
Total Floor Area	13,086	5810	18,896	47.80%
Building Coverage Area	12,140	5810	17,951	45.40%
Green area 13,376 M^2 = 33.9% of total lot area				

The project of the establishment of a proposed factory is at the manufacturing phase



General layout plan of the proposed project

1.4.2 Operation phase

1.4.2.1 Raw Materials

The major raw materials are Paper rolls, starch and ink for the final product which is the cardboard with printing.

(i) Paper roll

The paper rolls for the final product are purchased from both local and oversea companies accordingly. Total average 1,100 tons will be utilized for a month and the amount will be ranging depending on the client's orders (requirements).

Regarding the oversea companies which will consign the raw materials to OJI GS, the OJI GS company purchases only from the company which has the certificate of ISO 9001:2015 (Quality Management) and ISO (4001:2015 (Environmental Management System). All raw materials are kept in well order taking into account environmental protection.

(ii) Printing Ink

The printing ink for the final product is purchased from local company. Total average 4.5 tons will be utilized for a month and the amount will be ranging depending on the client's orders (requirements).

The type of ink is Water Based Flexo Ink Series which is comprised of naturally occurring substances causing less impact on environment.

(iii) Starch

The Starch for the final product is purchased from local company. Total average 18,000 kg will be utilized for a month and the amount will be ranging depending on the client's orders (requirements).

1.4.2.2 Power requirement

The total power required for the proposed unit is 1***,865 MWh /year***. The power requirement will be from the ***government electricity grid***. However, 3 power generators sets and each are used for the emergency power requirements if the electricity cut off and there are more demands from customers.

1.4.2.3 Water requirement

The main source of water supply of the project area is from ***tube well and public supply***. Water supply is required in the proposed plant for the corrugator, where it is steam-heated and pressed to form corrugated cardboard. In addition, it is used for canteen purpose and sanitation. The total water requirement of the plant is around ***27026 gallon per day.***

1.4.2.4 Workforce requirement and staff categories

All workers are permanent staff who is paid monthly. The group of permanent staff includes accountants, maintenance staffs, engineers, warehouse staff, production staffs, logistic, drivers, counter, administration staffs, etc.

Table 1.2 The capacity of staff in OJIGS Packaging Co.,Ltd

Type of Staff	Number of Staff
Temporary Staff	**-**
Permanent Staff	**216**

1.4.2.5 Waste management

Regarding the solid waste, the OJI GS Packaging (Yangon) Company Ltd. is generating food waste, yard waste, plastic, paper, leather/textile/rubber (LTR), glass, metal and aluminium (can), and others during the operation process. The generated wastes are collected separately before disposal. The waste bins are placed in the suitable areas accordingly. And then, YCDC collected the domestic wastes as well as factory wastes including Boiler ash and sludge from the wastewater treatment system set up in the factory.

The details are presented in the chapter (4) appropriately.

1.4.2.6 Safety measures

As ***safety measures for staff / workers*** during operation, employees will be equipped with:

- Ear plugs
- Gloves
- Boots

- Dust Masks
- Helmets
- Protective uniform

1.5 Alternatives selection

The ***no development option*** for the OJI GS Packaging (Yangon) Company would prevent all potential environmental and social impacts due to manufacturing and distribution.

However, if there is a ***good cooperation between the project proponent and the community***, there will be ***specific environmental and social benefits*** such as increased employment opportunities, infrastructure upgrades, and other community benefits would occur as a result of the factory operation.

It is widely recognized that ***being the corrugated cardboard factory***, OJI GS Packaging (Yangon) Company has ***less negative impact*** on the environment compared to other factories which are significantly emitting and releasing the pollutants into the environment.

Moreover, if the project proponent recognizes and ***complies with the mitigation measures and management plan*** described in the EMP accordingly, the overall impacts become rated as ***low.***

1.6 Description of the surrounding environment, impact and risk assessment, and mitigation measures

1.6.1 Ambient air quality

The existing baseline ambient air quality along with the local climate monitoring was conducted at ***(9)*** locations including outside of the factory and inside of the factory, downwind of the project site and at the project compound in June, 2020 in the OJI GS Packaging (Yangon) Myanmar.

Additionally, applicable standards are presented and used for comparison.

The monitoring includes 24-hour average of ***Particulate Matter (PM10), Particulate Matter (PM2.5), Carbon Monoxide (CO), Volatile Organic Compounds (VOC), Sulphur Dioxide (SO2) and Nitrogen Dioxide (NO2), Ammonia (NH3), Methane (CH4), Ozone (O3), Atomic Radiation along with meteorology*** condition at the monitoring site.

Among these parameters, the major pollutants are particulate matters ***(PM10 and PM2.5)*** which are mostly emitting from the production process of factory. Generally, the total emissions of PM10 and PM2.5 for averaged 24-hours were 21µg/m3 and 12µg/m3 respectively. The emission of ***PM10*** and ***PM2.5*** was ***below*** the ***WHO guidelines*** (50µg/m3 for PM10) and (25µg/m3 for PM2.5).

Another parameter was ***SO2 (11 µg/m3)*** which is assumed as the emission from the industry process and is ***below the WHO guidelines*** (20ug/m3 for SO2).

VOC, NH4 and methane were measured to reveal the existing level and as comparison for the post monitoring assessments as well although these levels have not been set for general environment (non-industrial settings).

Although the ***impacts of all air pollutants emissions*** throughout the project phase (construction, operation and decommission) were rated as ***medium according to the impact assessment***, it will become ***less significant*** if the ***mitigation measures stated*** are followed accordingly. The detail information of air quality findings is presented in the following section. Moreover, to protect air pollutants mainly in particulates from production process, the workers and a group staff working indoor must wear ***appropriate masks*** *as a* ***good working practice during production process***. ***Monitoring process must be conducted annually*** particularly if the new machineries are installed in the factory. Mitigation measures will be detailed in the respective sections.

The weather condition is generally fine which can affect the air quality situation.

1.6.2 Carbon emission

In terms of the CO2 emission from OJIGS Packaging Co.,Ltd, the electricity sector does not directly produce the emission of CO2 and GHG. The potential gas emissions source from generators which are only standby has been considered as negligible.

The proposed factory will only use generators when the electricity generation is cut off. OJIGS Co.,Ltd has three generators and is using diesel fuel to generate electricity. Total amount of CO2 emission from ***generator*** is ***58,960 kg of CO2/ year (58.96 metric tons of CO2/ year).*** Total emission of CO2 from ***electricity sector*** is ***1639.46 metric tons of CO2/year.***

The total emission of CO2 from ***transportation sector*** is ***224.279 metric tons per year.*** The equivalent of CO2 ***reduction due to recycle instead of landfill*** is ***5301 metric ton per year.***

Total emission of CO2 from proposed factory of ***all of the sectors*** (electricity and transportation) are ***less than the equivalent of CO2 reduction due to recycle instead of landfill in the value of 3437.261 metric tons.***

1.6.3 Noise

The noise level of OJIGS Packaging Co.,Ltd was measured at the ***main different locations along with air monitoring.*** The noise levels of ***day time (69 dB)*** and ***night time (66.5 dB)*** which do ***not exceed the noise standard level 70dB*** by Environmental Quality (Emission) Guideline (EQEG).

According to the ***impact assessment of noise on surrounding***, generally it is rated as ***low***. Moreover, to protect noise from factory process, the workers and staff must wear ***ear muffs as a good working practice during production process***. ***Monitoring process must be conducted for annually*** particularly if the new machineries are installed in the factory. Mitigation measures are detailed in the respective sections.

1.7 Soil Quality

The project area includes mostly the industries already for 10 years. The area is suburban flat area along with rare cultivated (about 90% of land is concrete in the industrial zone). The physical appearance of the remaining soil is Coarse sandy soil.

1.8 Solid Waste

Both ***domestic and industrial solid waste***s were examined by weighing the waste from entire compound for a day at the final stage which are at dumping station. According to the manual weighting analysis, ***domestic solid waste*** generation from the labour camp is ***74kg/day*** which is approximately ***21 tonnes per year***. Thus, the waste generation ***per capital per day is (0.3) kg*** per person per day based on total population nearly 216 totals from two shift staff. When it is compared with the waste generation per capital in the developing countries which is 0.5 to 1.5 kg per person per day, this indicated that it was ***significantly less than the national rate of waste generation from developing country.***

Estimated ***industrial waste generation*** from the OJI GS factory is ***775 kg per day*** which is proximately **225 tonnes per year**, some of them will be sent to the waste recycler. Some of them will be disposed in collection system from the Municipal.

The top waste components is identified as; Food waste (35%), paper 30%, plastic 20% and the combination of others wastes (glass and metal can is around 10%, sanitary napkins is 2%, yard waste is 2% and LTR(Leather, textile and rubber) is 1%).

In terms of ***industrial solid waste***, two main types of waste are ***chemical wastes*** and ***waste water treatment sludge*** which are sent to the ***Municipal***. Others are ended in the recycling activities.
As the result of weight basis result, ***chemical waste*** is around ***51 %*** and ***waste water treatment sludge*** is ***49%***.
Within the factory, all the wastes that generated is cleaned everyday by the workers.

1.9 Potable water and wastewater

According to the observation, water is one of the essential raw materials for the process. It is used in both industrial process and domestic usage from public water supply.

According to the information provided by the factory, the ***water usage*** in this ***factory*** is around ***27026 gallon per day***. Based on the analysis, ***60% of water*** usage is for the ***manufacturing process*** and ***40%*** of the water usage is for ***the domestic usage***.

The main sources of potable water come from the ***public water supply***. In terms of the potable water sources, there is ***water storage tank*** in the factory. From that storage tank, one sample was taken for potable water analysis***.*** According to storm water analysis, there are two drain systems in the whole compound and all the wastewater from different sources are flowing through those drainage system. Those sample were analyzed for 5parameters each including chemical and physical parameters which are significantly important for the human health and surrounding environment. These are ***Total Suspended Solid (TSS) , BOD5, COD, Nitrate-Nitrogen and Total Coliform Count***.

According to the results, the tank water of the proposed factory meets the standards, ***except from the Total Coliform***. The Total Coliform result is slightly over the National Environmental Quality (Emission) Guidelines.

According to the results, the storm water of the proposed factory, all parameters meet the standards ***except from the BOD5 and Total coliform***. BOD5 is slightly over the National Environmental Quality (Emission) Guidelines by Environmental Conservation Department (ECD). Total Coliform count is exceed over the National Environmental Quality (Emission) Guidelines.

Regarding wastewater, ***the factory has wastewater treatment system*** in the project site. The parameters were selected mainly based on National Environmental Quality(Emission) Guidelines by Environmental Conservation Department (ECD).These are ***Silver, Selenium, Chromium, Cadmium, Mercury, Total Nitrogen, Hexavalent Chromium, Total Phosphorus, Apparent Colour3, TSS, BOD5, COD, Free Cyanide, Aluminium, Arsenic, Copper, Iron, Lead, Zinc, Sulfide, Phenol, Fluoride, Oil & Grease and Total coliform count.***
Based on the findings, the effluent level of ***Total Nitrogen*** from the wastewater treatment plant are ***higher than the National Environmental Quality (Emission) Guidelines***. The other parameters meet the WHO guideline, National Environmental Quality (Emission) guideline and IFC effluent guideline.

1.10 Cumulative impact assessment
This section assessed the cumulative impacts of air emissions, noise, waste water discharge and solid wastes resulting from the activities of the OJIGS Packaging Co., Ltd on the local environment. It is the process of assessing the incremental effects of various actions of the factory.

According to the onsite surveys, most of the factories around the OJIGS Packaging Co., Ltd are ***EMC factory producing handbags, Macdo Wig facory producing wigs. Moreover, other factories which are manufacturing and electronics production factories and garment factories.***

At the ***local level,*** cumulative impacts identified were of ***medium significance.*** It was assumed that there will be ***no significant cumulative impacts*** on the environment were found at the ***national and regional levels*** as most factories are Garment factories rather than the factories producing emissions and waste water discharge.

(i) Cumulative fugitive dusts and air pollutants
Short term generation of dust around the factory area and the particulates emission from the factory process would increase when the other ***nearby factories emissions and mobile vehicles*** run the nearest surrounding areas.

(ii) Noise
The existing baseline noise level of the factory would intensify due to noise generation of the existing mobile vehicles, generators operation and the process of operation machinery by the ***nearest factories***.

(iii) Waste water
Discharge of wastewater by the factory into the common drainage could ***compound any impact*** that occurs from ***other effluents*** from the other industries.

(iv) Solid Waste

The impact of solid wastes from OJIGS Packaging Co.,Ltd would likely to be moderately contributing the incremental effects of various activities of the other factories running in the industrial zone.

1.11 Environmental Management Plan (EMP)

Major environmental management plan to be conducted ***throughout construction, operation and decommission phase*** were detailed in ***proposed mitigation measures*** along with ***monitoring implementation, supervision and report*** system for ***air pollution control, noise, vibration, soil, water resource, solid waste, wastewater, ecological resource and health and safety*** accordingly. The EMP for Boiler especially for Overheated Boilers were detailed.

Furthermore, the ***roles and responsibilities*** of the ***Operation Manager/ HSE officer***, ***Project Management Team*** on site and/or ***Designated HSE Team*** will be identified so that the environmental management plans can be carried out in accordance with the factory's policy effectively.

In regard to reporting system, the ***frequency of monitoring*** is classified ranging from ***weekly to annually*** based on the individual issue.

As a result of the screening undertaken, it appears that no major environmental or social issues are present that would keep the project from proceeding. However, COVID19 is a significant issue that requires particular attention. A COVID19 Protection and Response Plan must be developed to allow this project to proceed.

A summary of the key mitigation measures and specific action commitments are presented in ***Table 1.3***. Monitoring measures are included in ***Table 1.4***.

Table 1.3 Key Mitigation Measures

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures
Physical Environmental Impact Assessment			
1. Air Quality	1.1 Construction activities. 1.2 Emissions from operation processes including corrugating Process, Printing Process, Die-cut Process, rubber-wood fired boiler.	1.1.1 Deterioration of air quality due to dust.	• Installation of boiler cleaner technologies with pollutant control system. • Utilization of dust filters that captures any pigment dust from printer inks and other impurities from workplaces and send for specialist disposal. • Ensure odor traps are fitted for inks of printers. • Selection and use of environmentally friendly and low emission system. • Exhaust gases and pollutants from boiler,

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures
			generators/engines and any other machines should be channeled through a pipe to allow dispersal. (about three meters above the ground surface to allow dispersal) • Turn equipment off when not in use. • Spray water on roads when necessary keep dust down during time of dry climate and periods of frequent site traffic. • Dust and gas emission control activities are performed on a regular basis. • Rejecting the common practice of burning any waste in the project area.
	1.3 Vehicles movements and equipment transportation.	1.3.1 Deterioration of air quality due to vehicle emissions.	• Air pollution from vehicles will be minimized by using low emission equipment and vehicles. • Ensure strict enforcement of on-site speed limit regulations. • Report the incidents.
2. Noise	2.1 Construction activities, vehicles movement and machinery operations. 2.2 Operation activities and machinery such as corrugator, printer, cutters, generators, boiler and transportation vehicles.	2.1.1 Increase in noise levels from machines/engines	• Noise generating sources and their platforms such as boiler, corrugator, printer, exhaust pipes of these machines/equipment and generators should also be fitted with well-functioning silencers to reduce noise levels. • Noisy operation activities and vehicular trips should be performed only during daytime hours as possibly. • Use low noise equipment. • Careful handling of material loading and unloading.

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures
			• Perform regular inspection and maintenance of preparation vehicles and equipment. • Turn equipment off when not in use.
3. Impact on Water Quality	3.1 Construction activities 3.2 Effluent emission from the operation processes. 3.3 Emission of wastewater from cleaning of printer, gluer, floors and equipment. 3.4 Accidental spills/ leaks of painter inks, glue, fuel oil.	3.1.1 Reduced water quality	• Use of waste water treatment plant to treat wastewater from cleaning of floors and machineries, especially printers and gluer. • Use of water-based or environmental-friendly chemicals are preferred. • Storm water will be managed by dilution method accordingly. • Comply with the national effluent quality standards. • Materials such as inks and glues should be properly stored under the roof to prevent dumping into the water courses directly. • Promptly detect and repair of water pipe and tank leaks. • All chemicals, paint, and fuel containers will be properly sealed and rigorous spill prevention will be employed. • Hazardous-materials handling procedures to reduce the potential for a spill, and will include an emergency response program to ensure quick and safe cleanup of accidental spills • Ensure that all storm drains are cleared of debris so as to ensure free flow of water.
4. Soil quality	4.1 Spills/ leaks/ Contamination of painter inks, glue, fuel oil, chemicals and hazardous liquid on-site.	4.1.1 Degradation of soil quality.	• Regular inspection of storage areas of the chemicals for the assurance of the spill/leak proof. • Ensure all the hazardous waste are in secured area followed by the instruction showed in label. • Hazardous waste and ash remains of boiler fuel wood will be handled properly by waste

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures
	4.2 Improper waste management from industrial activities.		management company or deal directly with City Development Committee (CDC) without improper disposal. • An emergency response program will be applied to ensure quick and safe cleanup of accidental spills. • Ensure liners are been under printer ink, glue and fuel storage tanks. • Conduct proper floor cleansing regularly.
5.Waste Generation and Disposal	5.1 Off-cuts from Paper Cutting and Trimming. Ash remains from boiler fuel wood. Improper storage and handling of fuels, lubricants, chemicals and hazardous liquid on-site, and potential spills from these liquid materials. 5.2 Domestic waste from staff quarters.	5.1.1 Hazard waste contaminate to environment. 5.2.1 Domestic waste result in windblown litter, attract vermin and be a vector for disease	• Regular inspection of storage areas of the chemicals for the assurance of the spill/leak proof. • Ensure all the hazardous waste are in secured area followed by the instruction showed in label. • Hazardous waste and ash remains of boiler fuel wood will be handled properly by waste management company or deal directly with City Development Committee (CDC) without improper disposal. • An emergency response program will be applied to ensure quick and safe cleanup of accidental spills. • The off-cuts from paperboard should be sold or sent to the recycling facilities. Or Reuse of the solid waste remains e.g. off-cuts from paper and the remains. • Waste handling practice will comply with applicable regulation of the government. • Recyclables such as scrap steel, metals, plastics, and paper items will be collected for recycling wherever possible. • Prohibit open burning of any waste at project site. • Waste segregation should be practiced at the workers camps

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures
			with an emphasis placed on reducing, reusing and recycling of waste streams as appropriate.
6. Impact by Boiler	6.1 Emission of boiler in wastewater treatment plant 6.2 Safety Threat by boiler in wastewater treatment plant 6.3 Ash Remains from boiler fuel wood	6.1.1 Air Pollution 6.2.1 Overheated Boiler and Fire/Explosion hazards	• Installation of boiler cleaner technologies with pollutant control system. • Treat properly ash remains from boilers or send to the waste management company or deal directly with City Development Committee (CDC). • Ensure a suitable program of maintenance and testing boiler by competent person. • Ensure that precautions are taken to prevent fire and boiler explosion. • Report the incidents if any. • Exhaust gases and pollutants from boiler, generators/engines and any other machines should be channeled from at least three meters above the ground surface to allow dispersal through a pipe) • Ensure that boiler is maintained in accordance with manufacturer's recommendations. • Boiler must be fitted and operated with adequate safety and monitoring control devices and operated by competent persons.
Biological Impact Assessment			
7. Impact on Ecological Resources	As the proposed project is located in industrial zone, the impact on ecological resources is "negligible" significance.	-	-

Environmental Factors/Events	Activity	Potential Impacts	Mitigation Measures
Social Impact Assessment			
8. Impact on Occupational Health and Safety	8.1 Dust from soil disturbances and vehicle movement. 8.2 Safety Threat by Boiler and other working conditions.	8.1.1 Reduced health and safety due to exposure 8.2.1 Possible injury or death from accident	• Adequate ventilation should also be provided. • All workers will be provided with personal protection equipment (PPE) and will be obliged to wear them in work zones. • Well stocked first aid box which is easily available and accessible should be provided

Table 1.4 Environmental, Social, and Health Monitoring Measures

Factors	Index/Parameter	Procedure	Proposed Duration	Frequency of Monitoring	Location
Air Quality	• PM2.5 • Ozone • NO2 • PM10 • SO2 • NOx	Method Myanmar National Environmental Quality (Emission) Guidelines • General Guidelines • In section 1.1: Air Emission of Myanmar National Environmental Quality (Emission) Guidelines(2015), small-combustion facilities emission guideline applies to project systems designed to deliver electrical or mechanical power, steam, heat, or any combination of these, regardless of fuel type, with a total, rated heat input capacity of	**Duration:** 1 day continuously **Frequency:** • Annually during operation and once during decommissioning phase • As within 1 km of a community regular monitoring will be required. • In case of any complaint regarding air quality, an additional air quality measurement may be conducted in response to specific complaints (if necessary)	Will submit monitoring reports to the Ministry not less frequently than every six (6) months or periodically as prescribed by the Ministry.	Nearest sensitive receptor or downwind of complaint area (if necessary)

Factors	Index/Parameter	Procedure	Proposed Duration	Frequency of Monitoring	Location
		3-50 megawatt thermal. As the combustion technology/ fuel of the boiler is rubber wood as the type of solid, the standards and parameters are described in the second column . **<u>Boiler</u>** A boiler safety valve is a spring loaded valve and shall not be more than 16 kg/cm^2 Safety valves should be installed wherever the maximum allowable working pressure (MAWP) of a system			
Noise	• L_{eq}24 hr. • L_{max} • L_{dn}	<u>Method</u> • Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012, and • Following the Guidelines for Community Noise, World Health Organization (WHO), 1999	**Duration:** 1 day continuously **Frequency:** • Annually during operation and once during decommissioning phase • If within 1 km of a community regular monitoring will be required • In case of a complaint regarding noise from project site, an additional noise		Within 1km of a community

Factors	Index/Parameter	Procedure	Proposed Duration	Frequency of Monitoring	Location
			measurement may be conducted (if necessary)		
Effluent	**Physical parameters:** • Silver (mg/L as Ag) • Selenium (mg/L as Se) • Chromium (mg/L as Cr) • Cadmium (mg/L as Cd) • Mercury (mg/L as Hg) • Total Nitrogen (mg/L) • Hexavalent Chromium (mg/L as Cr6+ • Total Phosphorus (mg/L as P) • Apparent Colour3 • TSS • BOD5 • COD • Free Cyanide • Aluminium • Arsenic • Copper • Iron • Lead • Zinc • Sulfide • Phenol • Fluoride • Oil & Grease • Total coliform count	<u>Method</u> • Analytical Methods followed to Standard Methods for the Examination of Water and Wastewater, recommended by National Environmental Quality (Emission) Guideline (NEQG)	• Annually during operation and once during decommissioning phase	Will submit monitoring reports to the Ministry not less frequently than every month or periodically as prescribed by the Ministry.	Near effluent source

Factors	Index/Parameter	Procedure	Proposed Duration	Frequency of Monitoring	Location
	For construction phase, • Biological oxygen demand • Chemical oxygen demand • Oil and grease • pH • Total coliform bacteria • Total nitrogen • Total phosphorus • Total suspended solids	Method Section 1.2 Waste Water of National Environmental Quality (Emission) Guideline (NEQG) • Site Runoff and Wastewater Discharges (construction phase)	• During construction phase	Apply during the construction phase	• Discharges from all project locations
Hazardous and Non-hazardous waste	• Manifest Disposal and Tracking Report	• Track waste volume by type and disposal location daily	• Throughout all phases	Regular Check-up If any , Incident Report	• At all project locations
Social	• Complaint monitoring and solving	• Record complaint • Monitor, investigate and implement suitable solutions			• Project area, community around project area, and transportation route
Public and Occupational health and safety	• Accidental statistics • Cause of accidents • Mitigation measures	• Conduct summary report for accident investigation			• Project area, community around project area, and transportation route

The OJIGS packaging company will use *2-3%* of the investment amount for the EMP cost. The target expenditure is USD 12,000 per year for an environmental management plan. Out of total, 60% will be used for environmental mitigation and the remaining 40% will be used for monitoring programs.
The construction period of the project is approximately one year and the plant will be operational within the 35-year investment period of the Myanmar Investment Commission.

1.12 Emergency response plan

The objective is ***to prepare the resources (personnel and equipment)*** available to respond emergency situations and accidents which can be resulted by the factory activities and major disasters as well.

In the OJIGS Packaging Co.,Ltd, in general, there should be either ***Emergency service in charge*** or ***HSE manager*** and ***Response Team*** for the emergencies. The team should be prepared as follows:

- Training of the team members along with their responsibility and equipped with the emergency materials
- Establishment and provision of the written emergency procedures
- Description and Availability of the Emergency Response Plan (ERP) in all employees and factory workers and there should be documented and posted
- Identification of the locations of the emergency evacuation Muster points
- Provision of alarm system and fire fighting equipments
- Supporting of first aid equipments
- Minimizing that should be reasonably practicable the risk to human life, the environment, assets and business in the event of an accident or emergency situation by ensuring effective and efficient intervention
- Ensuring the availability of adequate information on the emergency situations through a good communication system
- Ensuring efficient management of the emergency through the effective and efficient response of all dedicated resources
- Identification of the governmental authorities, media and other relevant stakeholders to be notified and production of a description of the procedures for communicating with them.

The potential emergencies that likely occur at the factory:

- Fire/ Explosion
- Toxic release, Oil spill
- Person(s) falling from the height
- Collapse of lifting appliances, buildings, sheds
- Cement Dust
- Vehicles accidents and injuries

Thus, this chapter described the strategy how to manage all possible emergencies along with actions required and written procedures to be carried out in order to respond the emergency situations that may arise during the production process. It provided guidance on actions and lines of communication in the event of an emergency and outlined the respective responsibilities of the factory. Furthermore, Medical emergency response plan including general provisions and first aid emergency treatment and Emergency response plan for dust and chemical exposure were described.

1.13 Public consultation and disclosure

Project proponent together with ***Environmental Quality Management Co., Ltd*** (***EQM)*** completed public consultation meetings to ensure that key stakeholders are aware of the planned project activities and any comments and concerns that have made will be considered as part of ***Environmental Management Plan (EMP)***.

Throughout the EMP development, the ***two public consultation meetings*** were organised and the ***first meeting*** was conducted by the ***zoom meeting attending Environmental Conservation Department (ECD, Yangon) and Myanmar Investment Commission*** in ***October, 2020***.

And then, another ***stakeholders meeting*** was held in ***June 2021***.

1.13.1 Methodology and approach

Being not only located at the ***Industrial Zone (Myanmar Industrial Park)*** but also there is ***no nearest local community within 2 km*** around the project site, the public consultation meeting was held organizing the project stakeholders including in charge of the ***Myanmar Industrial Park, the representatives of nearest factories*** and ***the respective members of OJI GS factory*** and ***the EQM*** which is the ***3rd party*** for the EMP development following the ***COVID 19 measures*** stated by Ministry of Health and Sports (MOHS).

Table 1.5 Stakeholders Meeting Schedule

Venue	OJI GS's office
Location	Mingalardon Industrial Zone, Yangon
Date	10th June 2021
Time	14:00 PM

Representatives from ***OJI GS*** and ***EQM*** presented the ***company information with upcoming future plans*** and ***EMP, environmental impacts with mitigation measures*** respectively using the power point materials.

After the presentation, ***questions and answers session*** was continued along with recording of the ***stakeholders' environmental perception*** for project.

The detailed meeting minutes are included in **Chapter-10**.

Based on the comments of public consultation meetings, it was found out that there is ***no major negative response*** from the surrounding factories ***except some boiler ash issues*** and to ***maintain the proper drainage system*** in the factory.

An attendee pointed out the ***ash problem which is emitted from OJI GS factory boiler*** with nearest factories.
EQM recommended the proposed factory to ***check the stack height of the boiler*** and the boiler engineer to ***calculate the stack height*** for not dispersing the ash to the nearest factories.
OJIGS added that there is a technology which can ***cool ash at the required temperature*** and then emit to the surrounding air.

Another attendee mentioned that ***sewage system*** of some factories and houses are ***not adequate***.

Myanmar Industrial Park Co., Ltd answered that there is sewage drainage line. The sewage is discharged from the sewage drainage line into the pond. The problem is that sewage does not enter to the sewage drainage line.

EQM suggested ***fixing the drainage system***.

Taking into account these issues and recommendations, the environmental management plan will be written accordingly. The ***EMP final report*** will be notified at ***the factory website*** as well as the ***Myanmar Industrial Park committee office***.

In conclusion, this report gives the guidance and framework for the OJIGS Packaging Co.,Ltd employers to maintain the sustainable green development, provide their employees with a workplace free from recognized hazards and review the compliance with Myanmar environmental rules and regulations; environmental management plans, mitigation measures and monitoring programs.

Chapter 2

Introduction

2. Introduction

2.1 Background

This Environmental Management Plan (EMP) has been prepared for the OJIGS Packaging (Yangon) Company Limited based on the site assessment of the proposed project along with the primary and secondary data. The location of this factory is No.(B-1-2) in the Mingalardon Industrial Zone, Mingalardon Township, Yangon Region, the Republic of the Union of Myanmar, at the coordinates of 16°56'46.11"N and 96° 9'25.55"E. The Mingalardon Industrial Park is located at the corner of No.3 Highway Road and Khayepin Street and the proposed project covers the total area of 6.18 acres.

According to the Myanmar Environmental Conservation Law (2012), it requires that the proponents of every development project in the country to conduct either Environmental Management Plan (EMP), Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA), to the Ministry of Natural Resource and Environmental Conservation (MONREC) depending upon the nature of the project which can impact on the environment.

The proposed project requires an EMP to meet the environmental assessment requirements of Myanmar Environmental Conservation Law. Therefore, OJIGS Packaging (Yangon) Company Limited commissioned Environmental Quality Management (EQM) Co., Ltd to conduct the Environmental Management Plan (EMP).

This EMP report is prepared to initially assess the potential impacts of the proposed project on environmental components and communities nearby. It is also necessary to develop adequate and feasible management plan together with the monitoring plan including the budget plan for environmental mitigation measures according to the project proposal as well as cooperate social responsibility (CSR) plan.

This Environmental Management Plan (EMP) is formulated in accordance with the existing environmental policy, laws, rules, regulations and instructions. It is submitted as a partial fulfillment to receive the Environmental Compliance Certificate (ECC) from the Environmental Conservation Department (ECD).

The consultant team of Environmental Quality Management Co., Ltd had carried out Environmental Management Plan (EMP) for this OJIGS Packaging (Yangon) Company Limited in accordance with the appropriate procedures stated by Environmental Conservation Department (ECD), Ministry of Natural Resources and Environmental Conservation (MONREC).

In terms of the ***government registration/approvals*** for the project is as shown below:

Table 2.1: Company registration details

1	Environmental Company Registration Number	2690/2012-2013
2	Date of Recommendation from Myanmar Investment Commission to conduct the EMP	13th, March, 2014

The OJI GS packaging company is a joint venture business between Malaysia GS Paperboard and packaging Sdn Bhd.

MR. SEIRO TOKUNAGA is not the investor and one of Board Directors who started/promoted submission for MIC permit on behalf of the OJI GS's principal organization.

The OJI GS's principal organization is situated at GS PAPER & PACKAGING SDN.BHD. LOT 7090, MUKIM TAN JUNG 12 DAERAH, KUALA LANGAT, 42700 BANTING SELANGOR, DARUL EHSAN, MALAYSIA.

The contact details of the project proponent are as follows:

- Company name : OJIGS Packaging (Yangon) Company Limited
- Investors : Malaysia GS Paperboard & Packaging Sdn Bhd
- Board of Director : MR. SEIRO TOKUNAGA
- Registration No : 687/13.03.14
- Registration Date : 13/03/2014
- Expiry Date : 13/03/2044
- Address : 6-54-205, Tsutsujigaoka, Aoba-ku, Yokohama, Kanagawa, Japan
- Type of Business : Manufacturing and marketing of corrugated carton box and sheet
- Investment location : No.(B-1-2) corner of No.3 Highway Road and Khayepin road, Mingalardon Industrial Zone, Mingalardon Township, Yangon Region

Person in charge who is now fully taking care of the factory is U Aung Kyi Myint
Position: Factory Manager
Address: Mingalardon Township, Yangon Region
Contact phone number : 09 963820249

The Consultancy firm is based in Yangon, Myanmar and has got strong background and knowledge in the area of Environmental Assessment, and a track record of over 6 years for conducting studies of Environmental, Social and Health Impact Assessment (ESHIA) for development projects across the country.

The contact detail of the environmental survey team is as follows:

- Environmental Quality Management Co., Ltd
- Dr. Ohnmar May Tin Hlaing, Managing Director & Environmental Consultant
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- Email – contact@eqmmyanmar.com, ohnmarmay@gmail.com
- www.eqm-myanmar.com
- No 233, Block 23, Sayee Pin Lane, Thuwunna, Thingungyun, Yangon, Myanmar
- Company registration no: 2690 Expiry date: 2.11.2020

2.2 Objectives of the project

In order to be sustainable development, the environmental and social impacts shall be necessarily reduced accordingly. Moreover, along with resources which become limited and polluted, environmental assessment has become of ever increasing importance as a tool for development and decision making. This role is formally recognized in principle 17 of the Rio Declaration on Environment and Development (UNCED 1992).

As a national instrument, this proposed project needs “Social Impact Assessment (SIA) along with Environmental Management Plan (EMP)” as the project is likely to have adverse impact on the environment.

This EMP can be applied not only to prevent or minimize the adverse effects of major development project but also used as a planning tool to promote sustainable development by integrating environmental considerations.

There are two categories in this EMP objective.

1. To identify the potentially significant environmental impacts likely affected by the corrugated carton box and sheet factory

2. To promote sustainable development by ensuring that the project activities do not undermine critical resource and ecological functions or the wellbeing, lifestyle and livelihood of the communities and people who depend on them. (Long-term aim)

The main objectives of this project are the following:

1. To reveal the **existing environment and activities** in the area of the project;
2. To detect the **impacts of the project activities on neighboring environment including** air atmosphere, water bodies, soil, people and infrastructure
3. To propose the **mitigation measures** where adverse effects may have occurred;
4. To set up **an environmental management plan** that will govern all activities of the project for the better protection of the environment.
5. To reveal the community perception and impacts by conducting socio-eco surveys.

2.3 Methodology for the study

Based on the EMP procedures issued by the Environmental Conservation Department (ECD), Ministry of Natural Resources and Environmental Conservation (MONREC), the methodology used by the consultants consisted of the followings below:

a) **Literature review**: Documentation on the existing and relevant policies, laws, regulations and guidelines related to environmental assessment process and management, factory service, waste management, land use etc. at the national level as well as the international level have been done.
b) **Interviews**: The consulting team has interviewed the community residing near the proposed project as well as in the administrative personnel related to this project.
c) **Data collection**: Through site visit, required qualitative and quantitative data have been collected
d) **Stakeholder consultation**: the consultants conducted stakeholder meetings and door to door household questionnaire surveys on the neighboring communities, to find out their perception on this project.
e) **Environmental baseline monitoring** on air, water, waste and soil
f) **Environmental impacts assessment along with the mitigation measures on the issues including** air, noise, visual, potable water, waste water, waste, etc.
g) **Environmental Management plan** on the environment likely affected by the project activities was developed accordingly.
h) **Reporting:** the data and information collected were organized and compiled in a report.

Chapter 3

Policy, legal and institutional framework

3. Policy and Legal Framework

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

- Policy & Legal Framework (Section 3.1)
- Contractual and other Commitments (Section 3.2)
- Institutional Framework (Section 3.3)
- Project's Environmental and Social Standards (Section 3.4)

3.1 Policy and Legal Framework

3.1.1 Environmental Policy & Framework

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

At present, all laws relating to the environment are being formulated and administered by the sectorial ministries and departments concerned. Section 3.2.2 provides a list of environmental legislation relevant to the Project activities.

3.1.2 National Environmental Legislation

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

- The Constitution of the Republic of the Union of Myanmar (2008);
- The Myanmar Investment Law (2016);
- Myanmar Environmental Conservation Laws (2012);
- Environmental Conservation Rules (2014);
- Environmental Impact Assessment Procedure (2015);
- National Environmental Quality (Emission) Guideline (2015).
- Draft Administrative Instruction of Environmental Impact Assessment Procedure (2015);
- Draft Guideline on Public Participation in Myanmar's EIA Processes (2017);

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

The latest enacted Constitution of the Republic of the Union of Myanmar (May 2008) provides the most up to date information on governing laws and regulations in Myanmar. The Constitution prevails over any other national legislation or international agreements.
It guarantees every citizen equal right before the law, and requires enactment of necessary laws that recognize citizens' freedom, equality, rights to liberty and justice, benefits, responsibilities, and restrictions (Article 347, and 21 (a) and (d)).

Article (45) states that The Union shall protect and conserve natural environment. Article 390, calls on the duty of its citizens to assist the Union on the following issues:

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

3.1.2.2 Myanmar Investment Law (2016)

The Myanmar Investment Law, enacted in 2016, vastly simplified the process for investment applications and offers a number of tax breaks, incentives, guarantees, rights and protections for

business ventures. The Myanmar Investment Commission (MIC) is a government-appointed body formed under the Myanmar Investment Law.

The law includes provisions to restrict or prohibit investment activities which affect public health, the environment and ecosystems, which produce toxic waste or which engage with toxic chemicals; duties of investors to conduct business in such a way as to avoid environmental damage, air and water pollution, in accordance with existing laws as per the following sections.

Chapter (12) Rights to Use Land, Section 50.
(a) An Investor who obtains a Permit or an Endorsement under this Law has the right to obtain a long-term lease of land or building from the private owned or from the relevant government departments, governmental organizations managed by the Government, or owned by the State in accordance with the stipulations in order to do investment. Citizen investors may invest in their own land or building in accordance with relevant laws.

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

Chapter (13), Section 51
(c) shall appoint only citizens for works which does not require skill;

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

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

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

Chapter (16) Responsibilities of Investors, Section 65. The Investor –
(e) shall immediately inform the Commission if it is found that natural mineral resources or antique objects and treasure trove not related to the investment permitted above and under the land on which the investor is entitled to lease or use and not included in the original contracts. If the Commission allows, the investor shall continue to carry out the investment in such land, and if not allowed, the investor shall transfer and carry out, by obtaining the permission, at the substituted place which is selected and submitted by him;

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

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

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

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

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

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

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

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

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

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

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

3.1.2.3 The Environment Conservation Law (2012)

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

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

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

Section 7 of the law, the rights of the Committee are as follows:
(o) managing to cause the polluter to compensate for environmental impact, cause to contribute fund by the organizations which obtain benefit from the natural environmental service system, cause to contribute a part of the benefit from the businesses which explore, trade and use the natural resources in environmental conservation works;

Chapter V
Environmental Emergency
Section 9(a) If the Committee is aware that an event of environmental emergency has occurred or may occur in the entire Myanmar or any Region or state or any area, it shall immediately report to the Union Government so as to declare the occurrence of such event;

Chapter VI
Environmental Quality Standards
Section 10 The Ministry may, with the approval of the Union of the Government and the Committee, stipulate the following environmental quality standards:
(a) Suitable surface water quality standards in the usage in rivers, streams, canals, springs, swamps, lakes, reservoirs, and other inland water sources of the public;

(b) Underground water quality standards;

(c) Atmospheric quality standards;

(d) Noise and vibration standards;

(e) Emission standards;

(f) Effluents standards;

(g)Solid wastes standards;

Chapter VII
Environmental Conservation
Section 13. The Ministry shall, under the guidance of the Committee, maintain a comprehensive monitoring system and implement by itself or in co-ordination with relevant Government department and organizations in the following matters:

(b) Transport, storage, use, treatment and disposal of pollutants and hazardous substances in industries;
(c) Disposal of wastes come out from exploration, production and treatment of minerals, industrial mineral raw material and gems;
(d) Carrying out waste disposal and sanitation works;
(f) Carrying out other necessary matters relating to environmental pollution.

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

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

Section 16 (a) is responsible to carry out by contributing the stipulated cash or kind in the relevant combined scheme for the environmental conservation including the management and treatment of waste;

(b) shall contribute the stipulated users' charges or management fees for the environmental conservation according to the relevant industrial estate, special economic zone and business organization;

(c) shall comply with directives issued for environmental conservation according to the relevant industrial estate, special economic zone or business.

Chapter VIII
Management of Urban Environment
Section 17 The Ministry shall, for the management of urban environment, advise as may be necessary to the relevant Government departments and Government organizations, private organizations and individuals in carrying out the following matters in accord with the guidance laid down by the Committee:

(a) Land use planning and management including zoning;
(b) Management of wastes;
(c) Pollution control including land, water, air and noise pollution;
(d) Other necessary environmental management

Chapter XII
Prohibitions
Section 28 No one shall, without the prior permission, operate business, work-site or factory, workshop which is required to obtain the prior permission under this Law.

Section 29 No one shall, without violate contained in the rules, notification, orders, directives and procedures issued under this Law.

Section 30. No one shall, without permission of the Ministry, import, export, produce, store, carry or trade any material which causes impact on the environment prohibited by the Ministry.

Chapter XIII
Offences and Penalties
Section 34. Whoever imports, exports, produce, store, carry or trade any material prohibited by the Ministry due to its impact on environment shall, on conviction, be punished with imprisonment for a term from a minimum of three years to a maximum of five years, or with fine from a minimum of kyats, or with both. Moreover, he shall incur the expenditure for the treatment and disposal of such material until the process that has no impact on the environment.

Chapter XIII
Offences and Penalties

Section 31 Whoever, without the prior permission, operates business, work-site or factory, workshop which is required to obtain the prior permission under this Law shall, on conviction, be punished with imprisonment for a term not exceeding three year, or with fine from a minimum of one hundred thousand kyats to a maximum of one million kyats, or with both.

Section 32 Whoever violates any prohibition contained in the rules, notifications, orders, directives and procedures issued under this Law shall, on conviction, be punished with imprisonment for a term not exceeding one year, or with fine, or with both.

Section 33 Whoever shall:

(a) If convicted under section 32, be passed an order to compensate for damage due to such act or omission;
(b) If ordered under sub-section (a), and fails to pay the compensation to be paid, be recovered in accord with the existing revenue laws.

3.1.2.4 Environmental Conservation Rules (June 2014)

The Environmental Conservation Rules relating to the Environmental Conservation Law, were enacted in 2014 which contain specific items relating to IEE and pollution prevention which fall under the powers of the Ministry Natural Resources and Environmental Conservation.

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

(a) shall carry out environmental impact assessment for his plan, business or activity;
(b) submit to the Ministry in advance by which organization or person, the environmental impact assessment is intended to be carried out;
(c) submit the environmental impact assessment report to the Ministry.

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

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

Section 69.

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

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

3.1.2.5 Environmental Impact Assessment Procedure (2015)

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

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

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

Responsibility for all Adverse Impacts

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

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

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

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

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

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

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

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

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

Section 109. The monitoring reports shall include:
a) documentation of compliance with all conditions;
b) progress made to date on implementation of the EMP against the submitted implementation schedule;
c) difficulties encountered in implementing the EMP and recommendations for remedying those difficulties and steps proposed to prevent or avoid similar future difficulties;
d) number and type of non-compliance with the EMP and proposed remedial measures and timelines for completion of remediation;
e) accidents or incidents relating to the occupational and community health and safety, and the environment; and
f) monitoring data of environmental parameters and conditions as committed in the EMP or otherwise required.

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

Section 113. For purposes of monitoring and inspection, the Project Proponent:
a) shall grant to the Ministry and/or its representatives, at any time during normal working hours, access to the Project's offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed; and
b) from time to time as and when the Ministry may reasonably require, shall grant the Ministry access to the Project's offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed.

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

3.1.2.6 National Environmental Quality (Emission) Guideline (2015)

MONREC has established environmental quality standards, the National Environmental Quality Standard [Legal Reference: ECL 2012 (Article 2c) and EQS 2016].

Section 1. These national Environmental Quality (Emission) Guidelines (hereafter referred to as Guidelines) provide the basis for regulation and control of noise and vibration, air emissions, and

liquid discharges from various sources in order to prevent pollution for purposes of protection of human and ecosystem health.

Section 4. Unless otherwise indicated, these Guidelines refer to emission sources, and are intended to prevent or minimize adverse impacts to environmental quality or human health by ensuring that pollutant concentrations do not reach or exceed ambient guidelines and standards. The Guidelines apply to projects that generate noise or air emissions, and / or that have either direct or indirect discharge of process water, wastewater from utility operations or storm water to the environment.

Section 5. General and industry-specific Guidelines as set out in Annex 1 – Emissions Guidelines shall apply to any project subject to IEE Procedure, as adopted by the Ministry, in order to protect the environment and to control pollution in the Republic of the Union of Myanmar. These Guidelines specifically apply to all project types listed in the IEE Procedure under 'Categorization of Economic Activities for Assessment Purposes' which sets out projects that are subject to initial environmental examination.

Section 6. Provisions of the general and applicable industry-specific Guidelines shall be reflected in project environmental management plan (EMP) and environmental compliance certificate (ECC) and together constitute a project's commitment to take necessary measures to avoid, minimize and control adverse impacts to human health and safety, and the environment through reducing the total amount of emissions generation; to adopting process modifications, including waste minimization to lower the load of pollutants requiring treatment; and as necessary, to apply treatment techniques to further reduce the load of contaminants prior to release or discharge.

Section 7. Recognizing that these Guidelines are intended to prevent pollution through reducing the mass of pollutants emitted to the environment, dilution of air emissions and effluents to achieve maximum permitted values is not acceptable. Specified guideline values should be achieved, without dilution, at least 95 percent of the time that a project is operating, to be calculated as a proportion of annual operating hours.

Section 9. As specified in the IEE Procedure, all projects are obliged to use, comply with and refer to applicable national guidelines or standards or international standards adopted by the Ministry. These Guidelines will henceforth be applied by the Ministry in satisfying this requirement until otherwise modified or succeeded by other guidelines or standards.

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

Section 11. As specified in the IEE Procedure, projects shall engage in continuous, proactive and comprehensive self-monitoring of the project and comply with applicable guidelines and standards. For purposes of these Guidelines, projects shall be responsible for the monitoring of their compliance with general and applicable industry-specific Guidelines as specified in the project EMP and ECC.

Section 12. Air emissions, noise, odor, and liquid / effluent discharges will be sampled and measured at points of compliance as specified in the project EMP and ECC.

3.1.2.7 Draft Administrative Instruction of Environmental Impact Assessment Procedure (2015)

In exercise of the power conferred under Section 42 b) of Myanmar Environmental Conservation Law (Law No. 9,2012), the following Administrative Instruction of Environmental Impact Assessment Procedure:

The objectives of the Instruction are to provide a common framework and formats to project proponent/practitioners of relevant study for IEE type project should be considered as to ensure a minimum quality level of the report sand/or documents to be submitted to the Ministry (i.e. Project Proposal, Scoping Report and TOR, IEE Report, and EMP) for Project Proponents and their Study Team.

Section 4. IEE studies should:
(a) Present the characteristics of a project and its justification;
(b) Describe the environmental and social baseline data of the study area as well as the changes that will occur during and after project implementation;
(c) Analyze project alternatives and define measures that will minimize negative impacts on environmental, social, health and cultural components, and maximize benefits to affected communities; and
(d) Propose environmental, social, health and cultural management and monitoring plans to ensure that the requests from the government and the commitments of the Project Proponent are implemented.

Section 11. The Project Proposal, IEE Report, Scoping Report and TOR, IEE Report, EMP report and the other documents determined in the IEE Procedure shall be written in Myanmar language or in English language. In case where the reports/documents are written in English language, at least the executive summary of the reports/documents shall be translated into Myanmar language.

Section 12. Every material to be distributed to local stakeholders in Public Consultations Meetings shall be in Myanmar language.

Section 15. Prior to commencement of the IEE investigation, the Project Proponent shall carefully select the consultants from the list of registered consultants published by the Ministry and organize the study team, and inform to the Ministry along with the filled Official Application Form A3 of Annex 6 of this Instruction as to identify the study team, in accordance with Article 32 of the IEE Procedure and Article 32 of the Consultant Registration Scheme for the Concerning Organizations or Persons Undertaking Environmental Impact Assessment and Initial Environmental Examination.

Section 16. Prior to commencement of the IEE investigation, the Project Proponent shall carefully select the consultants from the list of registered consultants published by the Ministry and organize the study team, and inform to the Ministry along with the filled Official Application Form A5 of Annex 6 of this Instruction as to identify the study team, in accordance with Article 45 of the IEE Procedure and Article 32 of the Consultant Registration Scheme for the Concerning Organizations or Persons Undertaking Environmental Impact Assessment and Initial Environmental Examination.

3.1.2.8 Draft Guideline on Public Participation in Myanmar's IEE Processes (2017)
Section 1.2. Objectives and application

a) This Guideline provide an indication of the type, level and approach to public participation expected to give effect to the requirements for meaningful public participation in the EIA Procedure.

b) For the purposes of this Guideline, the term public participation is used to encompass the minimum requirements in the IEE Procedure, and recommendations on good practice that go beyond these minimum requirements, relating to:

(i) information disclosure;
(ii) consultation, including through meetings; and
(iii) the consideration of public views, concerns and inputs at all stages of the IEE process, including the decision-making steps.

c) In accordance with the IEE Procedure, this Guideline applies to the preparation, review, implementation and monitoring of the IEE process, which comprises:

(i) Initial Environmental Examinations (IEEs)
(ii) Environmental Impact Assessments (EIAs) and
(iii) Stand-alone Environmental Management Plans (EMPs)

d) The Guideline has been structured in line with the IEE Procedure and in the following way to enable users to focus on the parts of the IEE process relevant to a particular Project Proposal:

(i) Chapter 1 provides general provisions about the Guideline and its application
(ii) Chapter 2 provides information about planning public participation that should apply to all types of Project Proposals under the IEE Procedure
(iii) Chapter 3 applies to IEE Type Projects
(iv) Chapter 4 applies to IEE Type Projects (v) Chapter 5 applies to Project Proposals requiring a stand-alone EMP
(vi) Chapter 6 applies to the implementation of all projects that are approved following the IEE process.

e) This Guideline promotes public participation as early as possible in the development of project proposals and undertaking of IEE processes possible in order to maximize the benefits of relationship building between Project Proponents and local communities.

(i) In this context, while the IEE Procedure does not mandate public participation at the screening step, Project Proponents are encouraged to undertake public participation before and during screening in accordance with the principles and approaches in this Guideline.
(ii) Public participation is also important at this step because the screening decision may result in no further formal IEE process and therefore this may be the only opportunity for communities to contribute to a government decision in the IEE process.

f) This Guideline is to be adapted by Project Proponents, IEE Consultants and government agencies to the particular circumstances when implementing the public participation requirements under the IEE Procedure.

g) The Guideline is also intended to provide all stakeholders, including project affected people (PAP), with an understanding of the type of public participation that can be expected, subject to adaptation to fit the particular circumstances.

h) The Guideline may also be used to guide public participation processes in circumstances where public participation is not legally required, but is recognized to be beneficial to the development of the project proposal and relationships with PAP and other stakeholders.

i) Throughout this Guideline, a reference to a task or responsibility of the IEE Consultant should be understood as applying ultimately to the Project Proponent as the responsible and accountable party.

3.1.3 Project-Relevant Laws

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

- Private Industrial Enterprise Law, 1990
- The Factories Act, 1951
- Myanmar Citizen Investment Law, 2013
- Public Health Law, 1972
- The Prevention and Control of Communicable Disease Law, 1995
- The Control of Smoking and Consumption of Tobacco Product Law, 2006 (Section 9)
- The Myanmar Fire Force Law, 2015 (Section 25)
- The Protection and Prevention of Antique Objective Law, 2015 (Section 12)
- The Protection and Prevention of Ancient Monument Law, 2015 (Section 12, 20(f) (c), 15(c))
- Labor Organization Rule
- Employment and Skill Development Law, 2013 (Section 5, 14, 30)
- Labor Organization Law, 2012
- The Workmen Compensation Act, 1951
- Settlement of Labor Dispute Law, 2012
- Minimums Wages Law, 2013
- Payment of Wages Law, 2016- (3,4,8,7(ii),9,10(a) to e
- Social Security Law, 2012 - 11, 16(a), 48(a), 51(a) (b), 54
- Leaves and Holidays Act, 1951
- The Motor Vehicles Law, 2015 and Rules, 1987
- Myanmar Insurance Law, 1993 (Section 16)
- The Underground Water Act, 1930
- The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013 (Section 16,17,23,27)
- Import and Export Law, 2012 (Section 7)
- Conservation of Rivers, Creeks and Water Resources Law, 2006 (Section 24 (b), 21(a)(b), 19, 11(a) (b))

3.1.3.1 Private Industrial Enterprise Law, 1990

Section 3. Private Industrial Enterprises shall be conducted in accordance with the following basic principles:

(a) to enhance the higher proportion of the manufacturing value added in the gross national product and value of services, and to increase the production of the respective economic enterprises which are related to the industrial enterprise;

(b) to acquire modern technical know-how for raising the efficiency of industrial enterprises and to establish the sale of finished goods produced by the industrial enterprise not only in the local market, but also in the foreign market;
(c) to cause utilization by relying mainly as local natural resources;
(d) to cause narrowing down of the gap between rural development and urban development by causing the development and improvement of industrial enterprises;
(e) to cause opening up of more employment opportunities;
(f) to cause avoidance of or reduction of the use of technical know-how which cause environmental pollution;
(g) to cause the use of energy in the most-economical manner.

3.1.3.2 The Factories Act, 1951

The Factories Act, 1951 and Law Amending the 1951 Factories Act -Pyidaungsu Hluttaw Law No. 12/2016 contains provisions for the proper disposal of waste and effluents in factories; treatment of waste water; regulations for health and cleanliness in factories, and the prevention of hazards.

Section 23: Fencing of Machinery

(1) In every factory the following shall be securely fenced by safe-guards of substantial construction which shall be constantly maintained and kept in position while the machinery is in operation: -

Section 30: Hoists and Lifts

(1) Every hoist or lift shall be of good mechanical construction, sound material and strength and shall be properly maintained.

(2) Every hoist or lift shall be thoroughly examined by an authorized examiner at least once in every period of six months and a register shall be kept containing the prescribed particulars for every such examination.

(3) Every hoist-way or lift-way shall be sufficiently protected by an enclosure fitted with gates. The hoist or lift and every such enclosure shall be so constructed as to prevent any person or thing from being trapped between any part of the hoist or lift and any fixed structure or moving part.
(4) The maximum safe working load shall be clearly marked on every hoist or lift and no load greater than that shall be carried thereon.
(5) The cage of every hoist and lift used for carrying persons shall be fitted with a gate on each side which provides access to a landing.

Section 32: Revolving Machinery

(1) In every factory in which the process of grinding and abrading is carried on there shall be permanently affixed to or placed near each machine in use a notice indicating the maximum safe working peripheral speed of every grinding of abrading wheel. The speed of the shaft or spindle upon which the wheel is mounted, and the diameter of the pulley necessary to secure such safe working peripheral speed.
(2) The speeds indicated in notice under sub section (1) shall not be exceeded.
(3) Effective measures shall be taken in the factory to ensure that the safe working peripheral speed of every revolving vessel, cage, basket fly wheel, pulley, discs or similar appliance driven by power is not exceeded.

Section 33 (1): Pressure Plant

(1) If in any factory, any part of the machinery or plant used in a manufacturing process is operated at a pressure above atmospheric pressure, effective measures shall be taken to ensure that safe working pressure of such parts is not exceeded.

(2) The President may make rules providing for the examination and testing of any plant or machinery refer to in sub section (1) and prescribing such other safety measures in relation thereto as may in his opinion be necessary in any factory or class of factories.

Section 35: Heavy Lifting

(1) No woman adolescent or child shall be employed in any factory to lid or carry or move any load so heavy as to be likely to cause injury.

(2) The President may make rules prescribing the maximum weights that may be lifted, carried or moved ordinarily by persons employed in factories or in any class or description of factories or in carrying on specified process.

Section 37: Protection of Eyes

In respect of any such manufacturing process carried on in any factory as may be prescribed, being a process, which involves-

(a) risks of injury to the eyes from particles or fragments thrown off in the course

(b) of the process; or

(c) risk to the eyes of exposure to excessive light, the President may make rules that require that effective screens or suitable goggles shall provide for the protection of persons employed on, or in the immediate vicinity of the process.

Section 37: Protection from Fumes

(1) In any factory no person shall enter or be permitted to enter any chamber, tank, vat, pit, pipe, flue or other confined space in which dangerous fumes are liable to be present to such an extent as to asphyxiate persons, unless it is provided with a man-hole of adequate size, or other effective means of egress.

(2) No portable electric light of voltage exceeding 24 volts shall be permitted in any factory for use inside any confined space referred to in sub-section (1), and where the dangerous fumes present are likely to be inflammable, no lamp or light other than that of flame-proof construction shall be permitted to be used in such confined space.

(3) No person in any factory shall enter or be permitted to enter any such confined space referred to in sub-section (1) unless all possible measures have been taken to remove any fumes which may be present and to prevent any ingress of fumes and unless either,

(a) a certificate in writing has been given by an authorized examiner, based on a test carried out by himself, that the space is free from dangerous fumes and fit for persons to enter; or

(b) the person entering is wearing a suitable breathing apparatus and a belt securely attached to a rope the free end of which is held by a person standing outside the confined space.

(4) In every factory suitable breathing apparatus, reviving apparatus and belts and ropes shall be kept ready for immediate use in the vicinity of any such confined space which any person has entered. All such apparatus shall be examined at regular intervals and certified by an authorized examiner to be fit for use; and a sufficient number of the persons from amongst the employed in every factory shall be trained in the use of all such apparatus and in artificial respiration.

(5) In any factory no person shall be permitted to enter any boiler, boiler furnace, boiler flue, chamber, tank, vat, pipe, or other confined space for the purpose of working or making any of examination therein until it has been sufficiently cooled by ventilation or otherwise so as to be safe for persons to enter.

(6) The President may make rules prescribing the minimum dimensions of the manholes referred to in sub-section (1), and may by order in writing exempt or subject to such conditions as he may think fit, any factory or class or description of factories from compliance with any of the provisions of this section.

Section 39: Explosive or Inflammable Dust, Fume, Etc.

(1) Where in any factory any manufacturing process produces dust, fume or vapor of such nature and to such an extent as to be liable to explode on ignition. All possible measures shall be taken to prevent any such explosion by –

(a) effective enclosure of the plant or machinery used in the manufacturing process;

(b) removal or prevention of accumulation of dust, fume or vapor;

(c) isolation or effective enclosure of all possible sources of ignition

(2) Where in any factory the plant or machinery used in a process referred to in sub-section (1) is not so constructed as to withstand the force of such an explosion, all possible measures shall be taken to prevent the spread of the explosion and to minimize the damage caused thereby, by providing chokes, baffles, vents or other effective appliances in the plant or machine.

(3) Where in any factory any part of a plant or machinery that contains any explosive or inflammable fumes and vapor under pressure greater than atmospheric pressure, such part shall not be opened except in accordance with the following provisions, namely: -

a) before the fastening of any joint of any pipe connected with such part is loosened, any flow of gas or vapor into the part or into any such pipe shall be effectively stopped by a stop-valve or other means;

b) before any such fastening of any joint or any pipe or the firmly fastened cover is removed, all measures shall be taken to reduce the pressure of the fume or vapor in the part or pipe to atmospheric pressure;

c) where any such fastening has been loosened or removed effective measures shall be taken to prevent any explosive or inflammable fume or vapor from escaping from the pipe plant or parts of machinery until such cover or joint has been firmly re-fastened or firmly refaxed.

(4) No plant, tank or vessel which contains, or has contained any explosive or inflammable substance, shall be subjected in any factory to any welding, brazing, soldering or cutting operation involving the application of heat, unless adequate measures have been taken to remove such substance and fumes arising therefrom, or to render such substance and fumes non- explosive or non-flammable, and unless a certificate in writing has been given by a competent examiner after a test carried out by himself that the plant, tank, or vessel is free from explosive or flammable vapor. No such substance shall be allowed to enter such plant, tank or vessel after any such operation, until the metal has cooled sufficiently to prevent any risk of igniting the substance.

Section 40: Arrangements to be Made in Case of Fire

(1) Every factory shall be provided with such means of escape in case of fire as may be prescribed, and if it appears to the Inspector that any factory is not so provided, he may serve on the manager of the factory an order in writing specifying the arrangements which, in his opinion, should be carried out to bring the factory into conformity with the provisions of this section and any rules made thereunder, and requiring them to be carried out before a date specified in the order.

(2) In every factory the doors affording egress from any room shall not be locked or fastened so that they cannot be easily and immediately opened from the inside while any person is within the room, and all such doors, unless they are of the sliding type, shall be constructed to open outwards.

(3) In every factory, every window, door or other exit affording a means of escape in case of fire, other than the means of exit in ordinary use, shall be distinctively marked in a language understood by the majority of workers and in red letters or by some other effective and clearly understood sign.

(4) In every factory there shall be installed apparatus to give warning in case of fire clearly audible to every person employed in the factory.

(5) A passage - way giving access to such means of escape in case of fire shall be kept clear for the use of all workers in every room of the factory.

(6) Effective measures shall be taken to ensure that in every factory-

(a) where more than twenty workers are ordinarily employed in any place on the lowest floor, or

(b) where explosive or highly flammable materials are stored or used, all the workers are familiar with the means of escape in case of fire and have been adequately trained in the procedure to be followed in such case.

3.1.3.3 Myanmar Citizen Investment Law, 2013

Section 4. The followings are the basic principles under this law:
(a) Supporting the main objectives of the national economic development plan;
(b) Safeguarding the citizen obtained, should obtain economic enterprise and opportunities;
(c) Developing employment opportunities;
(d) Acquisition of high technology and development of manufacturing business by high technology;
(k) Revealing less energy consuming businesses;
(p) Participating investments in local development work, by emigrant citizen, intellectuals, intelligentsia, entrepreneurs;
(q) Developing intellectual property manufacturing and services;
(r) Supporting environmental conservation and protection.
Section 11. The duties of the commission are as follows:
(a) In scrutinizing the proposals of the investment, taking into consideration on the facts such as affecting national security, financial credibility, economic justification of the business, appropriateness of technology, protection and conservation of environment.
Section 15. The duties of an investor are as follows:
(f) Carrying out not to cause environmental pollution, damage in accord with existing laws in respect of investment business;

3.1.3.4 Public Health Law, 1972

Section 3 of the Public Health Law empowers the Government of the Union of Myanmar to carry out measures relating to environmental health, such as garbage disposal, use of water for drinking and other purposes, radioactivity, protection of air from pollution, sanitation works and food and drug safety.
Provisions to promote and safeguard public health including measures and prohibitions regarding environmental health
Section 9 of this law empowers the Government to carry out measures relating to environmental health, such as garbage disposal, use of water for drinking and other purposes, radioactivity, protection of air from pollution, sanitation works and food and drug safety. However, detailed provisions do not exist to ensure more effective and comprehensive regulation of these areas.

3.1.3.5 The Prevention and Control of Communicable Disease Law, 1995

The Prevention and Control for Communicable Diseases Law (No. 01/1995) (Revised in No. 16/2011) includes Provisions to prevent the outbreak of communicable diseases; regulate environmental sanitation; and measures in the event of a disease epidemic.
Section 8
Aim: For the prevention and control of Communicable Disease.
Under the supervision and guidance of the Health Officer of the relevant area, undertake the responsibility of carrying out the following environmental sanitation measures: -
(a) in-door, out-door sanitation or inside the fence outside the fence sanitation;
(b) well, ponds and drainage sanitation;
(c) proper disposal of refuse and destruction thereof by fire;
(d) construction and use of san1tary latrines; and
(e) other necessary environmental sanitation measures.

3.1.3.6 The Control of Smoking and Consumption of Tobacco Product Law, 2006 (Section 9)

The Control of Smoking and Consumption of Tobacco Product Law (No. 05/2006)

Chapter IV - Non-Smoking Areas

Section 6. The following compounds, buildings, rooms and places are non-smoking areas:

(a) hospital buildings, offices, compounds and other buildings in the compound except staff houses and apartments in the hospital compound;
(b) medical treatment centers and clinics;
(c) stadium and indoor playing fields;
(d) children drill sheds and playgrounds;
(e) teaching buildings, classrooms, offices, compounds and other buildings in the compound except staff houses and apartments in the school compound;
(f) teaching buildings of universities, degree colleges, colleges and institutes, classrooms and offices;
(g) opera houses, cinema halls, video halls and other buildings of entertainment;
(h) marts, department stores, stores and market sheds;
(i) museums, archives, public libraries and reading rooms;
(j) elevators and escalators;
(k) motor vehicles and aircrafts for passenger transport;
(l) air-conditioned public rooms;
(m) public auditoriums;
(n) teaching buildings and classrooms of private tuition classes and training schools;
(o) other public compounds, buildings and places prescribed through notification by the Ministry of Health.

Section 7. Places to which the public have access in the following buildings, vehicles and crafts are non- smoking areas except the private offices and rooms. However, specific places where smoking is allowed, shall be arranged in such areas:

(a) buildings of offices and departments;
(b) buildings of factories and workshops;
(c) buildings of hotels, motels, guest houses and lodging houses;
(d) buildings of railway stations, airports, ports and highway bus terminals;
(e) restaurants;
(f) trains and vessels for passenger transport:
(g) other public buildings, rooms and places prescribed through notification by the Ministry of Health.

3.1.3.7 The Myanmar Fire Force Law, 2015 (Section 25)

The Myanmar fire force law, 2015 covers requirements for firefighting and fire protection as follows)

Chapter (2)	Section (3-a, b, c, d)	It is covered all the issue of man-made disaster to the nations
Chapter (8)	Section (15-a, b, c, d), Section (17- a, b, c, d, e, f)	It is covered all the steps how to protect the fire issues
Chapter (11)	Section (24) Section (25-a, b) Section (26) (27), (28), (29), (30), (31), (32), (33)	Issue of Prohibitions and plan how to manage for firefighting

Chapter (12)	Section (34), (35), (36), (37), (38), (39)	Penalties
Chapter (13)	Section (40), (41), (42), (43), (44), (45), (46), (47)	General Information to protect laws regulations and penalties

3.1.3.8 The Protection and Prevention of Antique Objective Law, 2015 (Section 12)
The Protection and Preservation of Antique Objects Law (No. 43/2015) covers requirements for the finding of antique objects.
Section 12. The person who finds any object which has no owner or custodian, he shall promptly inform the relevant Ward or Village-Tract Administrator if he knows or it seems reasonable to assume that the said object is an antique object.
Section 13.
(a) If the information is received under section 12, the Ward or Village- Tract Administrator shall keep the said object as may be necessary and shall forward the information to the relevant Township Administrative Office within 14 days. The Township Administrator shall promptly carry out the necessities and inform the Department within 7 days from the date on which the information is received;
(b) The Department shall inspect whether it is a real antique object or not and keep or cause to keep as may be necessary in accord with the stipulations when the information is received under sub-section (a).

3.1.3.9 The Protection and Prevention of Ancient Monument Law, 2015 (Section 12, 20(f), (c), 15(c))
The Protection and Preservation of Ancient Monuments Law (No. 51/2015)
Section 12. If a person who finds an ancient monument of over one hundred years old and above or under the ground or above or under the water which has no owner or custodian knows or it seems reasonable to assume that the said monument is an ancient monument, he shall promptly inform the relevant Ward or Village-Tract Administrative Office.

Section 13. (a) If the information is received under Section 12, the Ward or Village- Tract Administrator shall keep the said monument as may be necessary and shall forward the information to the relevant Township Administrative Office within 14 days. The Township Administrator shall promptly carry out the necessities and inform the Department within 7 days from the date on which the information is received.

(b) The Department shall inspect whether it is a real ancient monument or not and keep or cause to protect as may be necessary in accord with the stipulations when the information is received under sub-section (a).

Chapter VII. Applying for prior Permission, Scrutiny and Issue
Section 14. Any Department, any organization or any person desirous of any of the followings shall abide by the provisions of other existing laws and apply for the prior permission under this Law to the Department in accord with the stipulations:
(a) repairing and maintaining the whole or a part of an ancient monument without altering its original form or its original workmanship or altering the boundary of its enclosure;
(e) surveying, digging and researching places where an ancient monument is situated;
Section 15. A person aiming at realizing any of the followings within the specified area of an ancient monument shall apply to get prior permission to the Department:

(b) constructing or extending or repairing new buildings including hotels, factories and residential buildings or fencing or extending a fence;
(c) digging to search petroleum, natural gas, gem or mineral, piping petroleum and natural gas, constructing factories, connecting national grid, constructing communication tower, constructing or extending infrastructures such as road, bridge, airfield, irrigation and embankment;
(d) connecting underground electric cable, communication cable and other underground works;
(f) gold sieving, digging, burning bricks, digging well, lake, creek, ditch, gully, pit digging, refilling, levelling, mining, quarry, gravel digging and unearth sand, removing the mounds and hills which can damage the physical feature of the land;
Chapter VIII Prohibitions
Section 19. No one shall carry out any of the following acts within the specified campus of an ancient monument without the written permission of the Department:
(a) destroying or damaging an ancient monument;
(b) carrying out to alter the original form or the original workmanship of an ancient monument;
(c) digging to search for remains;
(d) looting and removing original elements and artefacts from an ancient monument.
Section 20. No one shall carry out any of the following acts which are assumed to cause damage to an ancient monument within the specified area of an ancient monument or of a listed ancient monument without a written prior permission:
(b) using machines which causes vibration within the specified place of an ancient monument and running various types of vehicles;
(c) cultivating, gardening, breeding, fencing by blocking nearby an ancient monument or doing any other act which can affect an ancient monument;
(d) emission of gas such as hot-air balloon which can affect an ancient monument;
(e) landing and taking off and, flying aero-plane and helicopter which can directly or indirectly affect an ancient monument;
(f) discarding chemical substance and rubbish which can affect an ancient monument and the environment.

3.1.3.10 Labor Organization Law, 2012

The Labor Organization Law, (No. 07/2011) and The Labor Organization Rules, 2012 were enacted to protect the rights of the workers, to have good relations among the workers or between the employer and the worker, and to enable to form and carry out the labor organizations systematically and independently.
Section 3. Every worker, who has attained the age prescribed in respective existing law to work in any trade or activity shall have the right to:
(a) join as a member in a labor organization and to resign from a labor organization according to their own desire;
(b) join as a member only in a labor organization formed according to the category of trade or activity relating to them.
Section 29. The employer shall recognize the labor organizations of his trade as the organizations representing the workers.
Section 30. The employer shall allow the worker who is assigned any duty on the recommendation of the relevant executive committee to perform such duty not exceeding two days per month unless they have agreed otherwise. Such period shall be deemed as if he is performing the original duty of his work.
Section 31. The employer shall assist as much as possible if the labor organizations request for help for the interest of his workers. However, the employer shall not exercise any acts designed to promote the establishment or functioning of labor organizations under his domination or control by financial or other means.

Section 49. No person shall coerce, threaten, use undue influence or seduce by illegal means any worker to participate or not to participate in a labor organization.
Section 50. No person shall:
(a) interfere or obstruct the executive committees in performing duties and powers contained in this Law;
(b) in respect of labor affairs, carry out demonstrations within 500 yards from hospitals, schools, religious buildings, airports, railways, bus terminals, ports or diplomatic missions and military or police installations.

3.1.3.11 The Development of Employees and Expertise (Skill), 2013 (Section 5, 14, 30)
Employment and Skill Development Law (No 29/2013)
Section 5.
(a) (1) If the employer has appointed the employee to work for an employment, the employment agreement shall be made within 30 days. But it shall not be related with government department and organization for a permanent employment.
(2) If pre-training period and probation period are stipulated before the appointment the said trainee shall not be related with the stipulation of sub-section (1).
(b) The following particulars shall be included in the employment agreement:
(1) the type of employment;
(2) the probation period;
(3) wage, salary;
(4) location of the employment; (5) the term of the agreement; (6) working hour;
(7) day off, holiday and leave; (8) overtime;
(9) meal arrangement during the work hour;
(10) accommodation;
(11) medical treatment;
(12) ferry arrangement to worksite and travelling;
(13) regulations to be followed by the employees;
(14) if the employee is sent to attend the training, the limited time agreed by the employee to continue to work after attending the training;
(15) resigning and termination of service;
(16) termination of agreement;
(17) the obligations in accord with the stipulation of the agreement;
(18) the cancellation of employment agreement mutually made between employer and employee;
(19) other matters;
(20) specifying the regulation of the agreement, amending and supplementing;
(21) miscellaneous.
(c) The worksite regulations contained in the employment agreement shall be in compliance with any existing law and the benefits of the employee shall not be less than those of the any existing law.
(d) According to the employment agreement, the Ministry shall issue the notification for paying the stipulated compensation to the employee by the employer, if the work is completed earlier than the stipulated period or the whole work or any part of it have to be terminated due to unexpected condition or the work has to be terminated due to various conditions.
(e) The employment agreement made under sub-section (a) shall be related with daily wage workers, piece rate workers who are appointed temporarily in the government department and organization.
(f) The worksite regulations and benefits contained in the employment agreement mutually made between the employer and employee or among the employees shall be amended as necessary, in accord with the existing law.
(g) The employer shall send a copy of the employment agreement made between the employer and employee, to the relevant employment and labor exchange office within the stipulated period and shall get the approval of it.

(h) The employment agreement made before the enforcement of this law shall be confirmed up to the end of the term of the original agreement.
Section 14. The employer shall carry out the training program in accord with the work requirement in line with the policy of the skill development team to develop the skill relating to the employment for the workers who are proposed to appoint and working at present.
Section 30.
(a) The employer of the industry and service business shall put in to the fund monthly as put in fees without fail for the total wages of the subordinates and the supervisors' salary for not less than 0.5%;
(b) Put in money paid under sub-section (a) shall not be deducted from the wage and salary of the employees.

3.1.3.12 The Workmen Compensation Act, 1951

Workman's Compensation Act (1923) Amended by Law No 4/2005
Section 10 (A): Power to Require from Employers, Statements Regarding Fatal Accidents
(1) Where a commissioner receives information from any source that a workman has died as a result of an accident arising out of, and in the course of, his employment, he may send by registered post a notice to the workman's employer requiring him to submit, within thirty days of the service of the notice, a statement, in the prescribed form, giving the circumstances of the death.
(2) If the employer is of opinion that he is liable to deposit compensation, he shall make the deposit within thirty days of the service of the notice.
(3) If the employer is of the opinion that he is not liable to deposit compensation, he shall in his statement indicate the grounds on which he disclaims liability.
(4) Where the employer has so disclaimed liability, the Commissioner after such inquiry as he may think fit, may inform any of the dependents of the deceased workman that it is open to the dependents to prefer a claim for compensation, and may give them such other further information as he may think fit.
Section 10 (B): Reports of Fatal Accidents
(1) Where, by any law for the time being in force, notice is required to be given to any authority, by or on behalf of an employer of any accident occurring on his premises which results in death, the person required to give the notice shall, within seven days of the death, send a report to the Commissioner, giving the circumstances attending the death;
(2) Provided that, where the President of the Union has so prescribed, the person required to give the notice may, instead of sending such report to the Commissioner. Send it to the authority to whom he is required to give the notice.
(3) The President of the Union, may by notification in the Gazette, extend the provisions of subsection (1) to any class of premises other than those coming within the scope of that sub-section, and may by such notification, specify the persons who shall send the report to the Commissioner.
Section 11: Medical Examination
(a) Where a workman has given notice of an accident, he shall, if the employer, before the expiry of three days from the time at which service of the notice has been effected, offers to have him examined free of charge by a qualified medical practitioner, submit himself for such examination; and any workman who is in receipt of a half-monthly payment under this Act shall, if so required, submit himself for such examination from time to time:

(b) If the commissioner considers it necessary for the settlement of any question arising in any proceedings under this Act, he may require a workman who has given notice of an accident to submit himself for examination by a medical practitioner, and the cost of such medical examination, if any, shall be payable by the employer; Provided that a workman shall not be required to submit himself for examination by a medical practitioner otherwise than in accordance with rules made under this Act or at more frequent intervals than may be prescribed.

(1) If a workman, on being required to do so by the employer under sub-section (I) or by the Commissioner at any time refuses to submit himself for examination by a qualified medical practitioner or in any way obstructs the same, his right to compensation shall be suspended during the continuance of such refusal or obstruction unless, in the case of refusal he was prevented by sufficient cause from so submitting himself.

(2) If a workman, before the expiry of the period within which he is liable under subsection (1) to be required to submit himself for medical examination voluntarily leaves without having been so examined, his right to compensation shall be suspended until he returns and offers himself for such examination.

(3) Where a workman, whose right to compensation has been suspended under sub-section (2) or subsection (3), dies without having submitted himself for medical examination as required by either of those sub-sections, the Commissioner may, if he thinks fit direct the payment of compensation to the dependents of the deceased workman.

(4) Where under sub-section (2) or sub-section (3) a right to compensation is suspended, no compensation shall be payable in respect of the period of suspension.

(5) Where an injured workman has refused to be attended by a qualified medical practitioner whose services have been offered to him by the employer free of charge, or having accepted such offer has deliberately disregarded the instructions of such medical practitioner then if it is thereafter proved that the workman has not been regularly attended by a qualified medical practitioner and that such refusal, failure or disregard was unreasonable in the circumstances of the case, and that the injury has been aggravated thereby, the injury and resulting disablement shall be deemed to be of the same nature and duration as they might reasonably have been expected to be if the workman had been regularly attended by a qualified medical practitioner, and compensation, if any, shall be payable accordingly.

3.1.3.13 Settlement of Labor Dispute Law, 2012

Settlement of Labor Dispute Law (No. 05/2012) Amended by Law No. 40/2014 was enacted for the settlement of labor disputes:

Section 23. A party, employer or worker, may complain individual dispute relating to his grievance to the Conciliation Body and if he is not satisfied with the conciliation of such body in accord with stipulated manners, may apply to the competent court in person or by the legal representative.

Section 38. No employer shall fail to negotiate and coordinate in respect of the complaint within the prescribed period without sufficient cause.

Section 39. No employer shall alter the conditions of service relating to workers concerned in such dispute at the consecutive period before commencing the dispute within the period under investigation of the dispute before the Arbitration Body or Tribunal, to affect the interest of such workers immediately.

Section 40. No party shall proceed to lock-out or strike without accepting negotiation, conciliation and arbitration by Arbitration Body in accord with this law in respect of a dispute.

Section 41. No person shall carry out lock-out or strike to amend such decision or agreement within the effective period of the decision of the Arbitration Body or the Arbitration Council or any collective agreement.

Section 42. No person shall prohibit the right to work independently of the workers who are not desirous to participate in the strike nor impede the right of a worker to strike.

Section 43. No person shall fail to abide by or carry out any condition contained in agreement concluded before the Conciliation Body in respect of individual dispute or collective dispute.

Section 44. No person, after having informed in advance by the Arbitration Body or Tribunal for settling the dispute, shall fail to arrange to enable to examine the trade under dispute or to produce the documents which is considered by the Arbitration Body or Tribunal that it concerns with the dispute or to appear as a witness when he is so summoned.

Section 45. No person, if he is sent notice for examination before the Arbitration Body or Tribunal, shall fail without sufficient cause to appear in person or to send legal representative within the stipulated period.

3.1.3.14 Minimums Wages Law, 2013

The Minimum Wages Law, No. 07/2013 was enacted on 22nd March 2013 (The Minimum Wages Rules, 2013). Section 12 (d) of the law provides that the employer shall pay the minimum wage to the workers working in the commercial, production business and service in cash.

Section 12. The employer:

(a) shall not pay wage to the worker less than the minimum wage stipulated under this Law;

(b) may pay more than the minimum wage stipulated under this Law;

(c) shall not have the right to deduct any other wage except the wage for which it has the right to deduct as stipulated in the notification issued under this Law;

(d) shall pay the minimum wage to the workers working in the commercial, production and service business in cash. Moreover, if the specific benefits, interests or opportunities are to be paid, it may be paid in cash or partly in cash and partly in property, with prevailing regional price, jointly according to the desire of the worker;

(e) in paying minimum wage to the workers working in the agricultural and livestock business, some cash and some property at prevailing regional price may be paid jointly according to local custom or desire of the majority of workers or collective agreement. Such payment shall be for any personal use and benefit of the worker and his family and the value shall also be considerable and fair.

Section 13. The employer:

(a) shall inform the workers the rates of minimum wage relating to the business among the rates of minimum wage stipulated under this Law and advertise it at the workplace to enable to be seen by the relevant workers;

(b) shall prepare and maintain the lists, schedules, documents and wages of the workers correctly;

(c) shall report the lists, schedules and documents prepared and maintained under sub- section(b) to the relevant department in accord with the stipulations;

(d) shall accept the inspection when summoned by the inspection officer. Moreover, he shall produce the said lists and documents upon asking to submit;

(e) shall allow the entry and inspection of the inspection officer to the commercial, production and service businesses, agricultural and livestock breeding workplaces and give necessary assistances;

(f) if the workers cannot work due to sickness, shall give them holiday for medical treatment in accord with the stipulations;

(g) if the funeral matter of the member of the family of worker or his parent occurs, shall give holiday without deducting from the minimum wage, in accord with the stipulations.

Section 22. Any employer:

(a) shall not fail to pay the workers the minimum wage stipulated under this Law;

(b) shall not pay to the workers less than the minimum wages and other benefits which is entitled by the worker under section 14;
(c) relating to the accounts, schedules, documents and lists of wage of the workers: (i) shall not make false entry, deceitful recording or false and deceitful reporting; (ii) shall not fail to report to the relevant department in accord with the stipulations; (iii) shall not fail to produce when required by the inspection officer;
(d) shall not fail to go and accept inspection when summoned by the inspection officer;
(e) shall not obstruct or interfere with the inspection officer who comes and inspects on duty.
Section 24. Any employer:
(a) shall not violate any term and condition contained in the minimum wage notification;
(b) shall not fail to inform the workers relating to the rates of minimum wage concerning to his workers among the rates of minimum wage stipulated under this Law and announce at the place where the workers are able to see it in the work center and workplace;
The Minimum Wages Rules, 2013 include:

Chapter 9 - The power and obligations of the employers
Section 43.
The employer:
(a) shall increase the remuneration depending on the skill, to promote the productivity and the employment skill of the employees;
(b) shall perform in accord with the factory act 1951, leave and holiday act 1951 under section 13 (b) at the law for the list, schedule and document, remunerations;
(c) when the employees are not able to work due to ill health, injury at work site:
(i) if they are under premium paid insurance to the health and social care fund, the insurance under health and social security care 2012, or
(ii) if they are not entitled to enjoy social security law 2012, they must be arranged to enjoy the leave and holiday act 1951.
(d) in the event of family or parent's funeral affairs, his entitled remuneration should not be deducted and shall be arranged to enjoy according to leave and holiday act 1951;
(e) before fixing of the minimum wage by the National Committee under this rule, if his remuneration is less than the prescribed amount, he should be paid up to the full amount;
(f) part time, hourly job employees shall be paid the prescribed minimum wage for the working hours;
(g) for the salary employees one day day-off shall be allowed in a week. If he has to work on the off day, overtime wage shall be paid in accord with the existing law;
(h) if the employee has to work less than the prescribed working hour and if it is not due to his will or he has to stop the work due to the shortage of work from the employer, he shall be entitled to enjoy the remuneration as if he has to work full time;
(i) the prescribed minimum wage shall be paid without discrimination of the male or female;
(j) although he has the obligation to pay the minimum wage in cash, separate entitlement, benefit in accord with the stipulation shall be given due to the employee's will, majority of the employees' will, collective consent, in cash or partial in cash or prevailing regional rate or regional tradition;
(k) overtime work shall be allowed according to the law after negotiation with the employees;
(l) the employee who is not capable to fulfill the standard norm or production norm prescribed in accord with the factory, workshop, department, shall be trained to be skillful in the probation period. If necessary, the relevant factory, workshop, departments under this law shall be paid for not less than 50% of the remuneration within three months. In the probation period 75% of the remuneration shall be paid.

3.1.3.15 Payment of Wages Law, 2016- (3, 4, 8, 7(ii), 9, 10 (a) to e

Payment of Wages Law (No 17/2016) covers the following requirements:

Chapter (2)	Section (3-a), Section (4-a, b, Cc-i, c-ii, d, e, f, g) Section (5), (6)	It is covered all the issue of strategies for payment and timeline between Employer and Employee.
Chapter (3)	Section (7-a, b, c, d) Section (8) Section (9), Section (10-a, b, c, d, e, f, g, h, i, j,), Section (11- a, b), Section (12-a, b) Section (13)	It is covered all the issue of deducted salary based on different categories.
Chapter (4)	Section (14)	Wages issue related with Overtime
Chapter (6)	Section (19-a, b, c), Section (20-a, b, c), Section (21-a, b, c)	Prosecutions policy issue based on salary and wages
Chapter (7)	Section (22), Section (23)	Prohibitions
Chapter (8)	Section (24), (25), (26), (27), (28), (29), (30)	General Information to protect laws regulations and penalties

3.1.3.16 Social Security Law, 2012 - 11, 16(a), 48(a), 51(a) (b), 54

The objectives of the Social Welfare Law (2012) and accompanying Social Welfare Rules (2014) include providing workers with the right to draw back some of the contributions paid by employers and workers as savings in accordance with the stipulations, and to obtain the right to continue medical treatment, family assistance benefit, superannuation benefit, survivors' benefit, unemployment benefit, the right to residency and ownership of housing after retirement in addition to health care and pecuniary benefit for sickness, maternity, death, employment injury of the workers.

Section 11 of the Social Welfare Law (2012) requires the following establishments to comply with the provisions for compulsory registration with the social security system and benefits (indicated in the Social Welfare Law) if they employ a minimum number of workers as determined by the Ministry of Labor in co-ordination with the Social Security Board: Industries which carry out business whether or not they utilize mechanical power or a certain kind of power; businesses of manufacturing, repairing and servicing; or engineering businesses, factories, warehouses and establishments.

Section 16. (a) The following employers shall affect insurance for the workers working at their establishments by compulsorily registering at the relevant township social security office and contribute to the social security fund contained in clauses (1), (3), (4), and (5) of sub-section (a) of **section 15** in accord with the stipulations to enable to enjoy social security benefits:

(i) employers of establishments;

(ii) employers of establishments employing the number of workers, including the relatives of the employers except at least one worker and their wife, husband, children and parents depending upon them, under sub-section(a) of section 11;

(iii)employers of unpaid apprentices and trainees.

Section 48 (a) The employer shall affect insurance by registering for employment injury benefit insurance system contained in section 45 at the relevant township social security office and pay contribution to employment injury benefit fund in accord with stipulations in order that workers applied to provisions of compulsory registration may obtain the employment injury benefits
Section 51. The employer:
(a) shall pay contribution monthly to Employment Injury Benefit Fund at the rates stipulated under section 50. Moreover, he shall also bear the expenses for paying as such;
(b) shall pay defaulting fee stipulated under section 88, in addition to the contribution if fails to **contribute after effecting insurance for employment injury benefit.**
Section 54
(a) The employer shall report to the relevant township social security office immediately if a serious employment accident occurs to his insured worker. There shall not be any delay without sufficient cause to report as such.
(b) A team of officers and other staff who inspect the establishments, if it is found out the employment injury, death, and contracting disease, shall report to the relevant township social security office in accord with the stipulations.

3.1.3.17 Leaves and Holidays Act, 1951

The Leave and Public Holiday Act, 1951 Amended by Law No. 06/2006 and No. 30/2014 include:
Section 3 (1) Every employee shall be granted by his employer the following public holidays with full wages or pay (as the case may be); namely:

- Independence Day – one day
- Full Moon of TaBuang – one day
- Thingyan – three days
- Burmese New Year – one day
- May Day – one day
- Full Moon of Kason – one day
- Resistance Day – one day
- Beginning of Buddhist lent – one day
- Full Moon of TanSaunMom – one day
- National Day – one day

Section 4 (1) Every employee who has completed a period of twelve months continuous service shall be granted earned leave with average wages or average pay for a period of ten consecutive days by his employer during the subsequent period of twelve months.

3.1.3.18 The Motor Vehicles Law, 2015 and Rule 1987

The Motor Vehicle Law No. 55/15. The Union Parliament has enacted this law.
Section 49. No one shall do the following in public places:
(a) Driving above the speed limit or below the minimum speed.
(b) Driving a dangerous motor vehicle.
(c) Driving a motor vehicle under the influence of drugs and intoxicants or alcohol.
Section 54. No one shall do the following:
(c) Driving a motor vehicle loaded above the loading capacity.
(f) Driving a motor vehicle in violation of any provisions of the by-laws related to the pedestrian crossing.
(g) Changing, without legal permission or reasons backed up by evidence, a vehicle to lose its original type and physical appearance, altering parts of machinery equipment, or changing the conditions stated in the motor vehicle inspection certificate.

Section 65. If anyone is found guilty of breaching any provisions stated in the by-laws issued in accordance with this law, he/she shall bare a punishment of a fine worth not more than thirty thousand kyats.
Section 75. The ministry shall include one or all of the following in releasing the by-laws.
(c) Issues relating to the building of a motor vehicle, building of a carriage, installation of parts and equipment, and maintenance.
(d) Specifying the type of motor vehicle, the weight and the maximum load.
(f) Private industry of motor vehicle inspection
(h)Matters to be carried out by the responsible person for the driver and motor vehicle in the event of an accident caused by the motor vehicle.
(j) Matters related to the reduction of the environmental impact caused by the motor vehicle.

3.1.3.19 Myanmar Insurance Law, 1993 (Section 16)

Requires any business which may pollute the environment to effect compulsory general liability insurance.
Section 16
An entrepreneur or an organization operating an enterprise which may cause loss to State-owned property or which may cause damage to the life and property of the public or which may cause pollution to the environment shall affect compulsory general liability insurance with Myanmar government.

3.1.3.20 The Underground Water Act, 1930

The Underground Water Act, 1930 provides measures for systematic and sustainable use of underground water and prohibitions on accessing and using underground water without a license.
Whereas it is expedient to conserve and protect underground sources of water supply in the Union of Burma; it is hereby enacted as follows:
Section 1. This Act extends to such areas as the President of the Union may, by notification,1 direct and shall apply only to tubes exceeding a depth to be prescribed by the President of the Union: Provided that the President of the Union may prescribe different depths for different local areas.
Section 3. No person shall sink a tube for the purpose of obtaining underground water except under and in accordance with the terms of a license granted by the water officer. Every person owning a tube which was in existence before the extension of this Act to the local area concerned shall apply to the water officer for a license for the said tube, and such license shall be granted free of charge.
Section 4.
(1) Any Magistrate taking cognizance of an offence under section 3 may at any time order the tube in respect of which the offence has been or is alleged to have been committed to be forthwith closed until such time as a license for the same has been taken out in accordance with the provisions of the said section.
(2) If the order for the closure of a tube under sub-section (1) is not complied with, the Deputy Commissioner, Sub divisional Officer or Township Officer exercising jurisdiction over the local area concerned may cause the said tube to be closed, and the expense of such closure shall be recoverable from the owner of the tube as if it were an arrear of land-revenue.
Section 5. Every person obtaining or attempting to obtain underground water shall supply the water officer with such information as the President of the Union may by rule prescribe.

3.1.3.21 The Prevention of Danger of Hazardous Chemical and related Substances Law, 2013 (Section 16, 17, 23, 27)

The Prevention of Hazard from Chemicals and Related Substances Law was enacted on 26th August 2013. The objectives of this Law include: protecting natural resources from decrease and

loss, and safeguarding living things from endangerment caused by chemical and chemical related substances; and systematically controlling safety in carrying out approved chemical and associated materials businesses. The Law requires continuous development of worksite safety, health and environmental conservation.

The Prevention of Hazard from Chemicals and Related Substances Law (2013) defines Chemical as: imposing danger to the health or life of man or animal or chemical element, chemical compound and chemical mixture which cause bad consequences to the environment naturally or appearing after created by man. This definition includes the vapor, liquid, waste materials of oily and solid which act chemically and technically.

Section 16. A person who has obtained a license: -

(a) shall abide the license regulations;

(b) shall perform to abide strictly the instructions for being safety in using the chemical and related substances by himself and also the persons who serve the work;

(c) shall keep the required safety equipment enough in the chemical and related substances businesses, furthermore shall grant the personal protection equipment and dresses free of charge to the working persons;

(d) shall make the course of training and study and instruction if necessary, to the working persons for using the occupational safety equipment, the personal protection equipment and the dresses systematically in the chemical and related substances business;

(e) shall be inspected by the respective Supervisory Board and Boards of Inspection in respect of whether or not the hazard may impact on the Human Being and Animals' health and the environment;

(f) shall make medical checkup the working persons who will work in the chemical and related substances business and shall permit to serve in that work after obtaining the recommendation that his health is suitable for that work. This medical checkup records shall be kept systematically;

(g) shall send the copy of informative letter of the permission to the respective Department of Township Administration, if the hazardous chemical or related substances are permitted to store;

(h) shall acquire in advance the guidance and agreement of the respective Department of Fire Brigade, if the business that is worried to fire hazard is operated by using the fire hazard substances or the explosive substances;

(i) shall transport only the permitted amount of the chemical and related substances in accordance with the prescriptive stipulations, if they are transported in local;

(j) shall take the permission from the Central Supervisory Board if the chemical and related substance is altered and transferred from one place to any other place which contained in the license;

(k) shall abide and perform in accordance with the related environmental laws not to impact and damage to the environment in operating the chemical and related substances business.

Section 17. A person who has obtained a license, shall put the insurance in accordance with the prescriptive stipulations to be able to pay the compensation, if the impact and damage is occurred on the Human Being and Animals or the environment in respect of the chemical and related substances businesses.

Section 23. A person who has obtained the registration certificate: -

(a) shall apply to register again, to the Central Supervisory Board if the chemical and related substances, which are not contained in the registered list, are used;

(b) shall inform and submit the unused chemical and related substances list to the Central Supervisory Board, although which are contained in the registered list.

Section 27. A person who has obtained the license to be complied the following matters to control and decrease the hazard of the chemical and related substances: -

(a) classifying the hazard level to protect in advance the hazard according to the properties of the chemical and related substances;
(b) expressing the Material Safety Data Sheet and Pictogram;
(c) providing the safety equipment, the personal protection equipment to protect and decrease the accident and attending to the training to be used systematically;
(d) performing in accordance with the stipulations in respect of transporting, possessing, storing, using, discharging the chemical and related substances;
(e) not being imported or exported the chemical and related substances banned by the Central Supervisory Board and the machinery and equipment which are used them.

3.1.3.22 Import and Export Law, 2012 (Section 7)

Chapter IV Prohibitions

Section 5. No person shall export or import restricted, prohibited and banned goods.
Section 6. Without obtaining license, no person shall export or import the specified goods which is to obtain permission.
Section 7. A person who obtained any license shall not violate the conditions contained in the license.

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

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

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

Section 11. No person shall:
(a) dispose of engine oil, chemical, poisonous material and other materials which may cause environmental damage, or dispose of explosives from the bank or from a vessel which is plying, vessel which has berthed, anchored, stranded or sunk.
(b) catch aquatic creatures within river-creek boundary, bank boundary or waterfront boundary with poisonous materials or explosives.
Section 19. No one shall dispose of any substance into the river-creek that may cause damage to waterway or change of watercourse from the bank or vessel which is plying, vessel which has berthed, anchored, stranded or sunk.
Section 21. No one shall:
(a) build lavatories unsuitable to the urban and rural community lifestyle in the bank area and watercourse area.
(b) drill well or pond or dig earth without the permission of the Directorate.
Section 24. No one shall:
(a) violate the conditions relating to navigation of vessels in rivers and creeks prescribed by the Directorate for conservation of water resources, rivers and creeks.
(b) violate the conditions prescribed by the Directorate so as not to cause water pollution and change of watercourse in rivers and creeks.

3.1.3.24 Notification No. 37/2014 for usage and handling of substances that deplete the ozone layer

Order relating to the usage and handling of substances that deplete the ozone layer.
Paragraph 3 of this Order indicates that any individual or organization who intends to import or export ozone-depleting substances or products and/or which are used by ozone-depleting substances must apply to MONREC.

3.1.4 International Environmental Conventions, Protocols and Agreements

Myanmar has ratified several international and regional conventions. Those relevant to the project are provided in **Table 3.1**.

Table 3.1: Relevant International and Regional Agreements and Conventions

No.	Conventions	Year (Ratified/Acceded/ Accepted)
Environment		
1	ICAO: ANNEX 16 to the Convention on International Civil Aviation Environmental Protection Vol. I and II, Aircraft Noise and Aircraft Engine Emission	Accession
2	Vienna Convention for the Protection of the Ozone Layer, Vienna 1985	1993 (Ratification)
3	Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal 1987	1993 (Ratification)
4	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London 1990	1993 (Ratification)
5	United Nations Framework Convention on Climate Change (UNFCCC), New York 1992	1994 (Ratification)
6	Convention on Biological Diversity, Rio de Janeiro 1992	1994 (Ratification)
7	The Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris 1972	1994 (Acceptance)
8	United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought, Paris 1994	1997 (Accession)
9	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington DC 1973; and as amended in Bonn, Germany 1979	1997 (Accession)

No.	Conventions	Year (Ratified/Acceded/ Accepted)
10	ASEAN Agreement on Conservation of Nature and Nature Resources, Kuala Lumpur, 1985	1997 (Signatory)
11	Kyoto Protocol to the Convention on Climate Change, Kyoto 1997	2003 (Accession)
12	ASEAN Agreement on Trans-boundary Haze Pollution	2003 (Ratification)
13	Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	2004 (Accession)
14	Ramsar Convention on Wetlands of International Importance	2005 (Accession)
15	Establishment of ASEAN Regional Centre for Biodiversity	2005 (Signatory)
16	Declaration on ASEAN Heritage Parks	2003 (Signatory)
17	United Nations Convention on the Law of the Sea (UNCLOS), Montego Bay, 1982	1996 (Ratified)
18	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1992)	2015 (Acceptance)
Social, Labor and Health		
19	Universal Declaration of Human Rights (UNDHR)	signed
21	Convention on the Rights of the Child	1991 (acceded)
22	Convention on Elimination of All Forms of Discrimination against Women (CEDAW)	1997 (acceded)
23	Relevant ILO Conventions in force in Myanmar: • C1 Hours of Work (Industry) • C14 Weekly Rest (Industry) • C17 Workmen's Compensation (Accidents)	

No.	Conventions	Year (Ratified/Acceded/ Accepted)
	• C19 Equality of Treatment (Accident Compensation) • C26 Minimum Wage Fixing Machinery • C29 Forced Labor Convention • C42 Workmen's Compensation (Occupational Diseases) Revised 1934 • C52 Holidays with Pay • C87 Freedom of Association and Protection of the Right to Organize • C182 - Worst Forms of Child Labor	

3.1.5 International Standards & Guidelines

The Project will also follow International Environmental guidelines and standards including World Bank /IFC (International Finance Corporation) Guidelines & Industry Standards as detailed in **Table 3.2.**

Table 3.2: International Guidelines

Applicable International Standards & Guidelines	
1	Equator Principles (2013)
2	International Financial Cooperation/ World Bank (IFC/WB) General Environmental Health and Safety (EHS) Guidelines (April 30, 2007)
4	IFC Environmental, Health, and Safety Guidelines for Onshore Oil and Gas Development (2017).
6	IFC Performance Standards on Environmental and Social Sustainability (2012);

3.2 Contractual and other Commitments

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

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

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

3.3 Institutional Framework

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

1) Administrative Divisions

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

Myanmar has a three levels administrative structure, as described below.
The first level subdivision includes:

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

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

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

The Constitution states that Naypyidaw is a Union Territory under the direct administration of the President. The Naypyidaw Council, led by a Chairperson, carries out general functions on behalf of

the President. The Chairpersons of the Naypyidaw Council are appointed by the President, and include civilians and representatives of the military.

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

The proposed factory is located in Mingalardon Township in the Yangon Region of Myanmar.

2) Environmental Conservation Department (ECD), Ministry of Natural Resources and Environmental Conservation (MONREC) is mandated to draft the regulations to enact the law, including regulations and standards on environmental safeguards on environmental pollution abatement (i.e., for industrial or urban pollution discharge standards and procedures) and on environmental quality standards for air, water, heavy metals, and toxic substances.
There shall be established a system of environmental impact assessment which shall require any proposed project or business or activity or undertaking in Myanmar by any ministry, government department, corporation, board, development committee, local authority, company, cooperative, institution, enterprise, firm or individual likely to have a significant impact on the environment to obtain approval for its implementation in accordance with these rules (EIA, 2012).

3) Yangon City Development Committee (YCDC), At the local level, the YCDC has a critical role. For instance, it is responsible for planning, development, and general management of the city and is the authorized body for urban environmental management of Yangon. It has responsibilities for the provision of municipal services to the 33 townships making up the city area. **Urban, Environmental Conservation and Cleansing Department (UECCD), YCDC** used to conduct environmental inspections whether adherence to the regulations regarding disposal of waste water and other waste products in Yangon's 18 industrial zones.

4) Directorate of Industrial Supervision and Inspection, Ministry of Industry
It is the one of the departments under Ministry of Industry which is responsible for registration of the private industries, Inspection, Boiler and electricity safety and environmental impacts likely affected by the factories.

5) Directorate of Industry Collaboration
It is under the Ministry of Industry and one of its concerns is registration of chemical and related substances.

3.4 Project's Environmental and Social Standards

MONREC has established environmental quality standards, the National Environmental Quality Standard [Legal Reference: ECL 2012 (Article 2c) and EQS 2016]. ECD / MONREC have indicated that the discharge standards shown in Table 3-3 are applicable for confectionary activities. These are in accordance with international standards.

Table 3.3: Myanmar Discharge Standards Applicable to Confectionary activities

Guideline	Standard
Effluent	Treatment and disposal in accordance with applicable standards provided in the General EHS Guidelines for discharge to surface waters or to land:

	- 5-day Biochemical oxygen demand 50 mg/L - Chemical oxygen demand 250 mg/L - Oil and grease 10 mg/L - pH 6-9 - Temperature <3[b] ℃ - Total coliform bacteria 400 per 100ml - Total nitrogen 10 mg/L - Total phosphorous 2 mg/L - Total suspended solids 50 mg/L - Active ingredients/Antibiotics to be determined on a case specific basis
Air emissions	Treatment as per General EHS Guidelines Emission concentrations as per General EHS Guidelines, and: PM_{10} 50mg/Nm3
Storm water drainage	Storm water runoff should be treated through an oil / water separation system able to achieve oil and grease concentration of 10 mg/L
Sewage	Sewage Treatment as per General EHS Guidelines, including discharge requirements

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). They are designed to provide relevant industry background and technical information. This information supports actions aimed at avoiding, minimizing, and controlling EHS impacts during the construction, operation, and decommissioning phase of a project or facility.

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 (Environmental Health and Social Guidelines, IFC 2007).

Table 3.4: Applicable IFC EHS Guidelines

Environmental topic	**Applicable EHS Guidelines**
Air quality	Section 1.1 provides guideline applies for facilities or projects that

	generate emissions to air at any stage of the project life-cycle. It presents information about common techniques for emissions management. This guideline provides an approach to the management of significant sources of emissions, including specific guidance for assessment and monitoring of impacts. Additional information on approaches to emissions management in projects located in areas of poor air quality, where it may be necessary to establish project-specific emissions standards are included. These Guidelines include the following key recommendations: • facilities and projects should avoid, minimize, and control adverse impacts to human health, safety, and the environment from emissions to air; • impacts should be estimated through qualitative or quantitative assessments by the use of baseline air quality assessments and atmospheric dispersion models to assess potential ground level concentrations; • the dispersion model applied should be internationally recognized, or comparable (examples of acceptable emission estimation and dispersion modelling approaches for point and fugitive sources are reported in these guidelines); • emissions from point sources should be avoided and controlled according to good international industry practice (GIIP) applicable to the relevant industry sector, depending on ambient conditions, through the combined application of process modifications and emissions controls (examples are provided in these guidelines); • a monitoring system should be implemented. For ambient air quality IFC refers to WHO Guidelines (Air Quality Guidelines Global Update, 2005.)
Noise and vibration emissions	Section 1.7 provides standards for daytime and night time noise emissions (for residential and industrial environments, WHO 1999) and recommends that noise prevention and mitigation measures are implemented with regard to predicted noise levels at sensitive receptors. Noise monitoring may be carried out for the purpose of establishing the existing ambient noise levels in the area of the proposed facility or for verifying operational phase noise levels. A key priority should be the implementation of noise control measures at source; the selected methods will depend on the source

	type and the proximity of sensitive receptors, and can include: equipment selection, acoustic enclosures, vibration isolation, traffic route selection, other.
Wastewater and Liquid effluent quality	Section 1.3 provides guidelines applied for projects that have either direct or indirect discharge of process wastewater or wastewater from utility operations. Section 1.3 provides guidelines for treatment approaches of process wastewater and wastewater from utility operations. These Guidelines include the following key recommendations: • points of discharge, rate of discharge, chemical use, dispersion and environmental risk should be considered in a disposal plan; • discharges should be planned away from environmentally sensitive areas, with specific attention to high water tables, vulnerable aquifers, wetlands, and community receptors, including water wells and intakes.
Waste management	Section 1.6 provides guidelines for projects/facilities that generate, store, or handle any quantity of industrial hazardous or not hazardous waste. Section 1.6 provides appropriate guidelines for hazardous waste storage, transport, treatment and disposal, in order to prevent harm to health, safety and environment. These Guidelines include the following key recommendations: • waste management should be addressed through a Waste management system that addresses issues linked to waste minimization, generation, transport, disposal, and monitoring; • in addition to the implementation of waste prevention strategies, the total amount of waste may be significantly reduced through the implementation of recycling plans; • if waste materials are still generated after the implementation of feasible waste prevention, reduction, reuse, recovery and recycling measures, waste materials should be treated and disposed and all measures should be taken to avoid potential impacts to human health and the environment.

Table 3.5 : Air Emission

Parameter	Averaging Period	Guideline Value $\mu g/m^3$
Nitrogen dioxide	1-year 1-hour	40 200
Ozone	8-hour daily maximum	100

Particulate matter PM10[a]	1-year 24-hour	20 50
Particulate matter PM2.5[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

Combustion Technology / Fuel	Particulate matter	Sulfur Dioxide	Nitrogen Oxides
Gas	-	-	200b mg/Nm3c 400d mg/Nm3 1,600e mg/Nm3
Liquid	100	3%	1,600-1,850f
Natural gas (3-<15	-	-	90h mg/Nm3 210i mg/Nm3
Natural gas (15-<50	-	-	50 mg/Nm3
Fuels other than natural gas (3-<15 MW)	-	0.5% sulfur	200h mg/Nm3 310j mg/Nm3
Fuels other than natural gas (15-<50 MW)	-	0.5% sulfur	150 mg/Nm3
Gas	-	-	320 mg/Nm3
Liquid	150	2,000	460 mg/Nm3
Solidj	150	2,000	650 mg/Nm3

a Particulate matter 10 micrometers or less in diameter
b Spark ignition; d dual fuel; e compression ignition
c Milligrams per normal cubic meter at specified temperature and pressure
f Higher value applies if bore size >400 mm
g Megawatt
h Electric generation; j mechanical drive
j Includes biomass

Table 3.6: Wastewater, Storm Water Runoff, Effluent and Sanitary Discharges

Parameter	Unit	Guideline Value
5-day Biochemical oxygen demand	mg/l	50
Ammonia	mg/l	10
Arsenic	mg/l	0.1
Cadmium	mg/l	0.1
Chemical oxygen demand	mg/l	250
Chlorine (total residual)	mg/l	0.2
Chromium (hexavalent)	mg/l	0.1
Chromium (total)	mg/l	0.5
Copper	mg/l	0.5
Cyanide (free)	mg/l	0.1
Cyanide (total)	mg/l	1
Fluoride	mg/l	20

Heavy metals (total)	mg/l	10
Iron	mg/l	3.5
Lead	mg/l	0.1
Mercury	mg/l	0.01
Nickel	mg/l	0.5
Oil and grease	mg/l	10
pH	S.U.a	6-9
Phenols	mg/l	0.5
Selenium	mg/l	0.1
Silver	mg/l	0.5
Sulphide	mg/l	1
Temperature increase	°C	<3b
Total coliform bacteria	100 ml	400
Total phosphorus	mg/l	2
Total suspended solids	mg/l	50
Zinc	mg/l	2

a Standard unit

b 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

Site Runoff and Wastewater Discharges (construction phase)

Parameter	**Unit**	**Maximum**
Biological oxygen demand	mg/l	30
Chemical oxygen demand	mg/l	125
Oil and grease	mg/l	10
pH	S.U.a	6-9
Total coliform bacteria4	100 ml	400
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Total suspended solids	mg/l	50

a Standard unit

Table 3.6: Noise level

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,	55	45
Industrial, commercial	70	70

a Equivalent continuous sound level in decibels

3.5 OJI GS Environmental Charter

3.5.1 Basic Policy

The Oji Group Environmental Charter requires the Oji Group to help create a truly enriched and sustainable society by developing business activities that harmonize with the environment from a global perspective. The Charter calls for the Oji Group to make

autonomous efforts to achieve further environmental improvement, and aggressively drive its forest recycling, paper recycling, and global warming countermeasures forward.

3.5.2 Action Guidelines '

(1) Promotion of Forest Recycling
(2) Promotion of Paper Recycling
(3) Promotion of Global Warming Countermeasures
(4) Reinforcement of Environmental Improvement Measures and Environmental Management Systems
(5) Development of Production Technologies and Products that Minimize Environmental Impact
(6) Reduction and Effective Utilization of Waste
(7) Transfer of Environmental Protection Technology to Other Countries
(8) Building Relationships of Trust with Stakeholders

Chapter 4

Description of the Project and Alternatives Selection

4. Project location and description

4.1. Project site location and description

The OJI GS Packaging (Yangon) Company Limited is located at the No.(B-1-2) in the Mingalardon Industrial Zone, Mingalardon Township, Yangon Region, the Republic of the Union of Myanmar, at the coordinates of 16°56'46.11"N and 96° 9'25.55"E. The Mingalardon Industrial Park is located at the corner of No.3 Highway Road and Khayepin Street and the proposed project covers the total area of 6.18 acres. The project site has also a close boundary with North Okkalarpa Township and Dagon Myo Thit (East) township at the South and South East respectively.

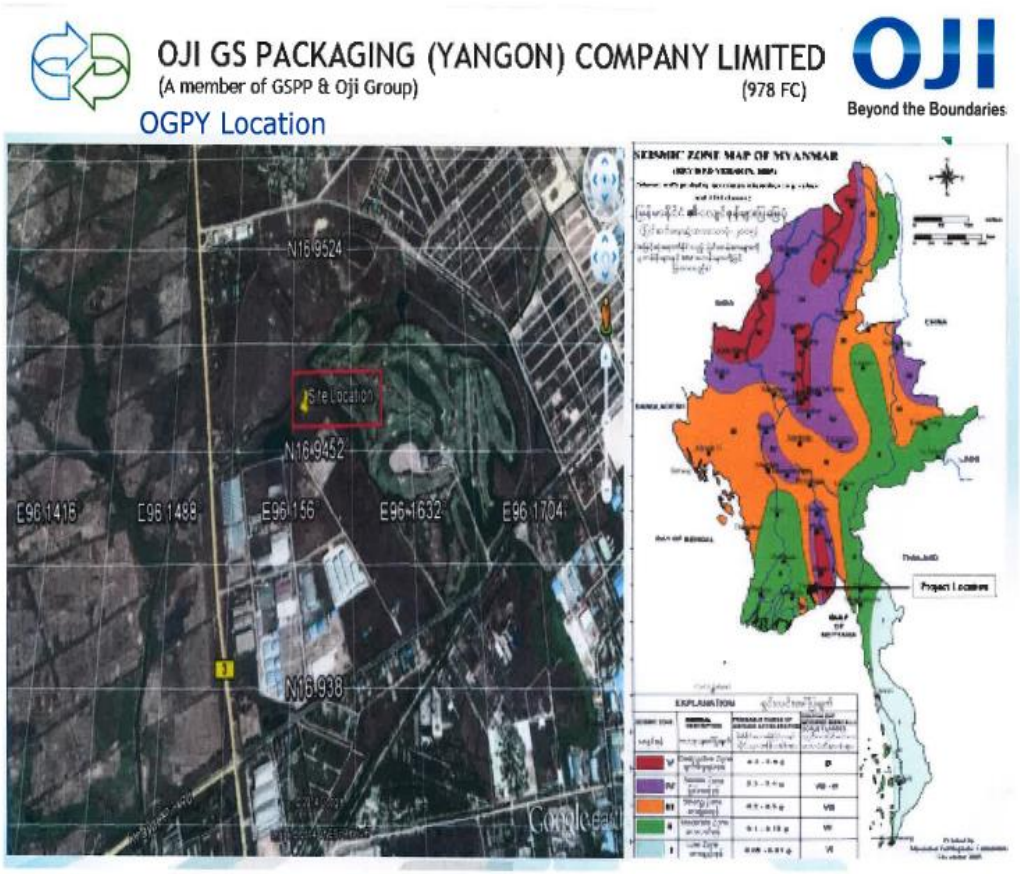


Figure 4.1 Location of OJI GS Packaging (Yangon) Company and surrounding environment

Figure 4.2 The topography map

Figure 4.3: The Google map of the OJIGS factory and its surroundings

4.2 The project schedule plan

In order for the OJIGS factory to meet the project's objectives, the project has a time schedule indicating establishment, commercial operation and completion. The proposed factory OJIGS has scheduled as follows:

Table 4.1 Project schedule

Project Establishment	Project operation	Completion
MIC approved in March 2014		
Lease term starts: 7th May, 2014		
Company established in June 24, 2014	Commercial operation in June 03, 2015	
	B-1-1 Ground Breaking Ceremony on June 14 2017	
The proposed duration of investment is 35 years		
		Completion 7th Feb, 2048

Land area: 6.18 acre (25000m^2) built up 14500m^2
Make Up Total Capital Investment USO 29.532 Mil

Figure 4.4 (a) The lay out plan of the proposed design OJI GS Packaging (Yangon) Company

Figure 4.5 (b) The lay out plan of the proposed design OJI GS Packaging (Yangon) Company

Site Area Table	
B1-1	14,500.2 M^2
B1-2	25,000.0 M^2
Total Site Area	39,500.0 M^3

Land-Used Table				
Function	**Existing**	**Expansion 1**	**Total area**	**Density**
Factory&Office	11,918	5,728	17,645	44.70%
Office 2nd Floor	876	-	876	2.20%
Car Parking	70	-	70	0.20%
G/H, Pump room, Canteen, etc	223	83	306	0.70%
Total Floor Area	13,086	5810	18,896	47.80%
Building Coverage Area	12,140	5810	17,951	45.40%
Green area 13,376 M^2 = 33.9% of total lot area				

Figure 4.6 : Site Area Table and Land-Used Table of the OJIGS Packaging (Yangon) Company

4.3 Objectives of the proposed project

The objectives of the OJIGS Packaging factory are as follows:

Packaging Business

To enter packaging business of Myanmar by leveraging the experience/human resources/network gained and accumulated in Southeast Asia

.

Establishment of OGPY is one example of Overseas Development Model" in which the acquired company develops new market

GSPP (Acquired in 2010, Malaysia's container board/corrugated container company) took the lead to work together with local company in setting up OGPY.

To push forward this model in the future to develop new market in Myanmar and Southeast Asia region.

To start business as the First Major Foreign Corrugated Containers Company.

To meet local demands of good quality products and services.

Going forward, Oji would continue investments in Myanmar to contribute towards the development of its economy and culture.

- Development of industries and manufacturing
- Improvement in living standards
- Increase in employment opportunities

4.4 Project proponent information

The project proponent of the OJI GS Packaging (Yangon) Company Limited are a Joint Venture between GS Paper & Packaging Sdn. Bhd. (99%) from Malaysia and U Maung Sitt(1%) from the Republic of the Union of Myanmar. Under the Foreign Investment Law, the investment of the proposed project has been submitted to Myanmar investment Commissions (MIC) since 2014. The project concerns with the manufacturing and marketing of corrugated cardboard and sheet. The proposed duration of investment is 35 years with the joint venture investment.

There are three foreigner Staff who are comprised of General Manager and the others are Managers. In the company, total local male and female workers are 120 and 65 respectively. The following chart describes the detail information of the organization structure of OJI GS Packaging Yangon) Company Limited operation phase.

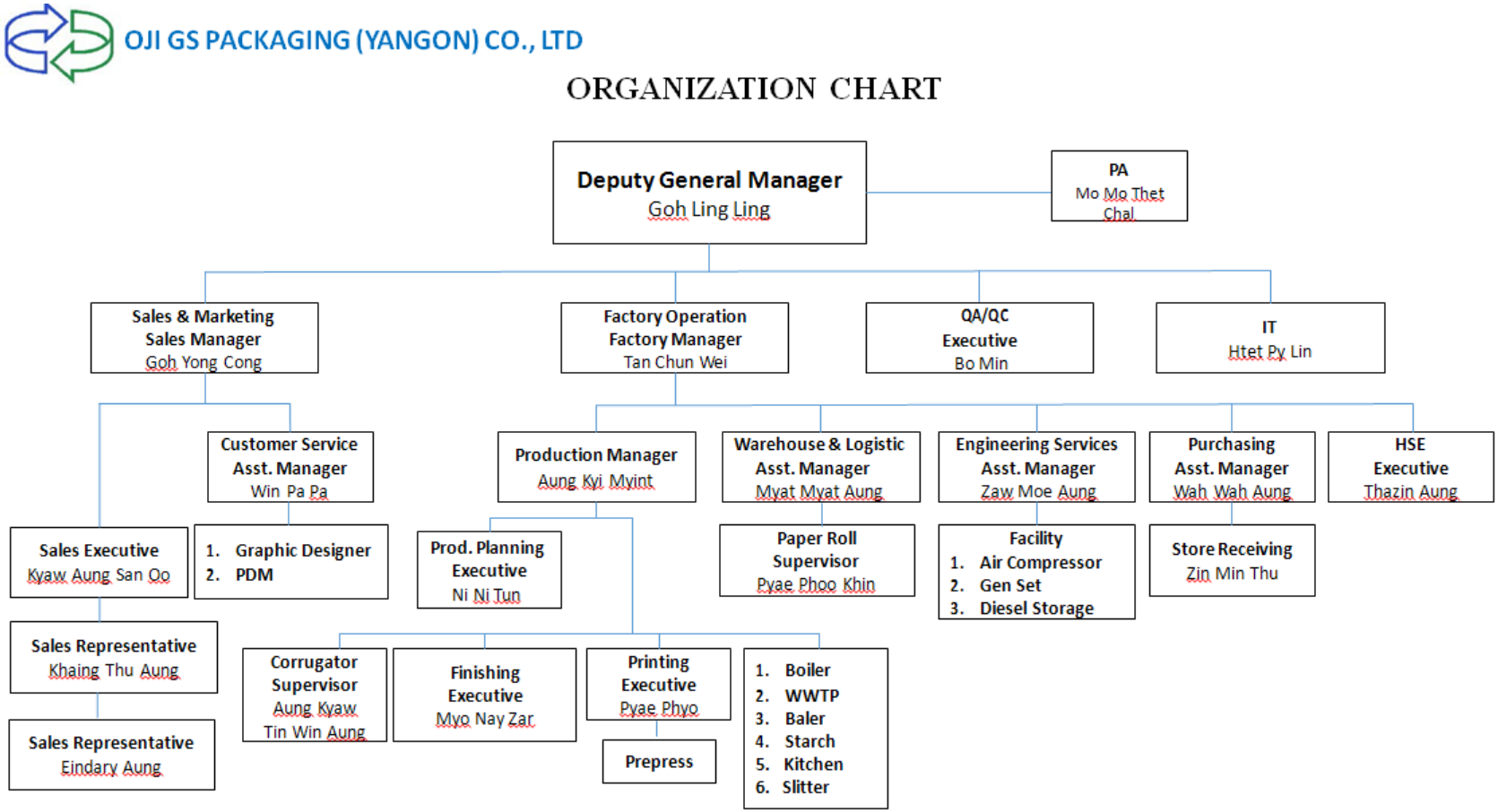
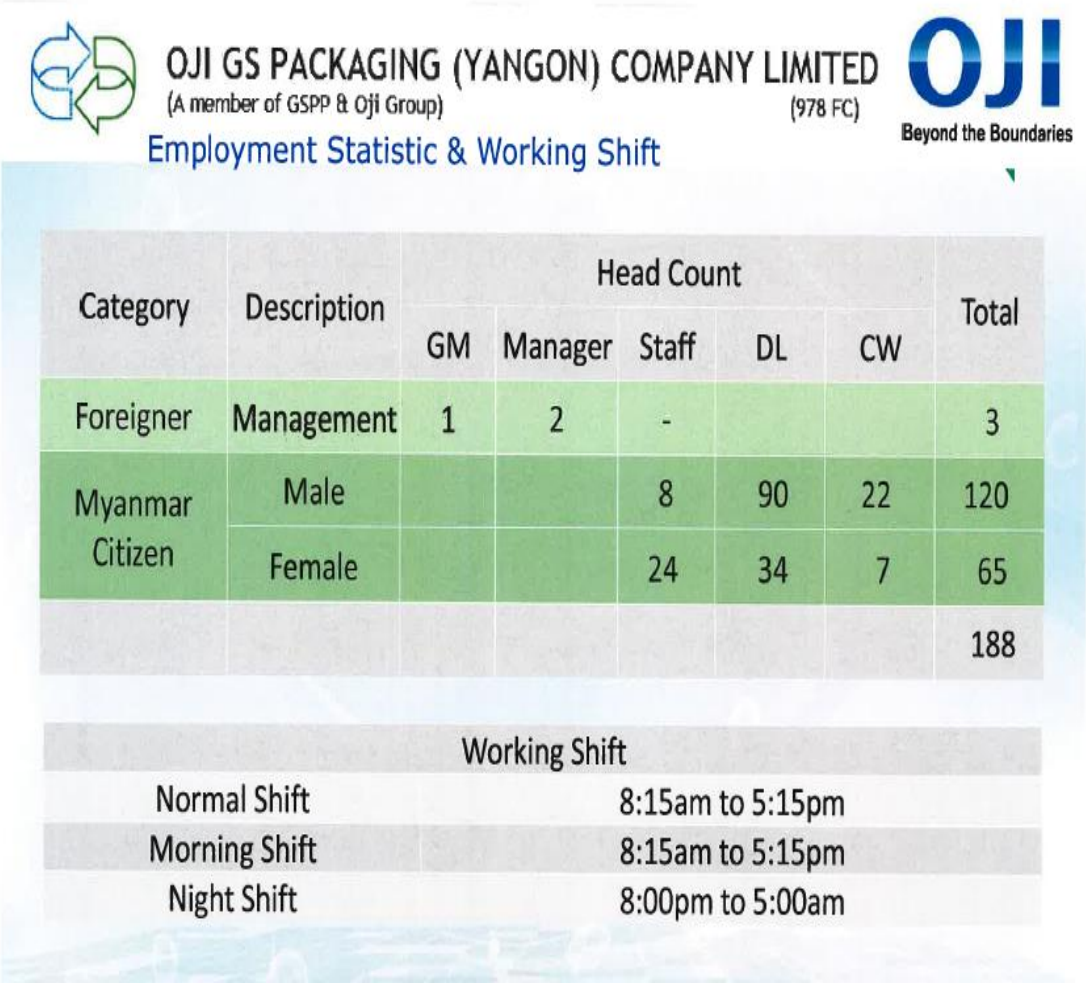


Figure 4.7: The organization chart of the OJIGS Packaging (Yangon) Company Limited



OJI GS PACKAGING (YANGON) COMPANY LIMITED
(A member of GSPP & Oji Group)
(978 FC)
OJI
Beyond the Boundaries

Employment Statistic & Working Shift

Category	Description	Head Count					Total
		GM	Manager	Staff	DL	CW	
Foreigner	Management	1	2	-			3
Myanmar Citizen	Male			8	90	22	120
	Female			24	34	7	65
							188

Working Shift	
Normal Shift	8:15am to 5:15pm
Morning Shift	8:15am to 5:15pm
Night Shift	8:00pm to 5:00am

Figure 4.8: Organization structure of OJI GS Packaging (Yangon) Company Limited

4.5 Project site description

4.5.1 Description of the building

The OJI GS Packaging factory operates within No. B-1-2 of 25,000 square meter (6.178 acres). The main part of the project of the OJI GS Packaging factory is being occupied by the production and storage buildings, main office, parking yard, canteen, warehouse and open spaces. The factory buildings are planned to be equipped with up-to-date electrical and communication system, fire protection system, water supply and sanitation system also waste water treatment tank, air conditioning and ventilation system as well

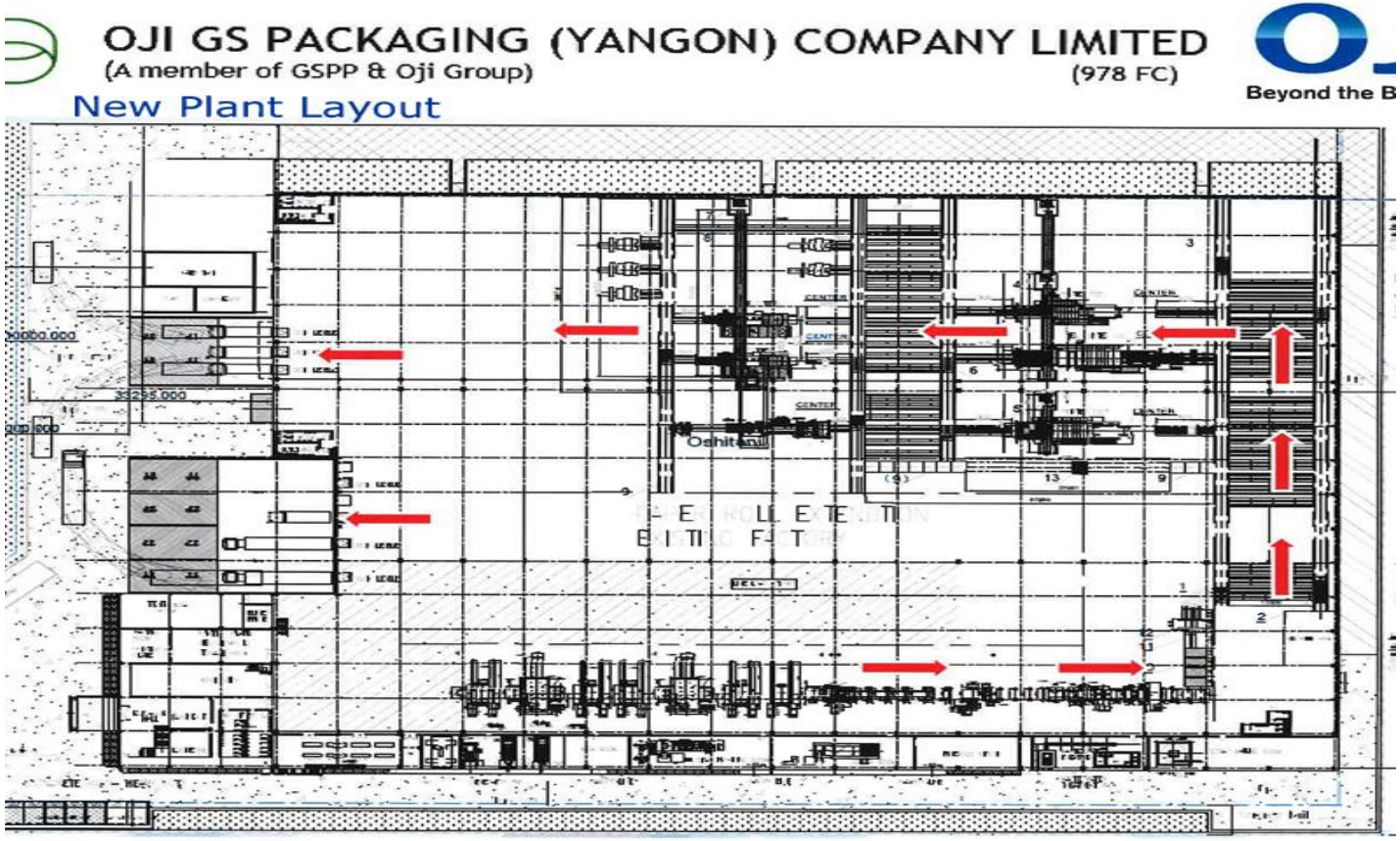


Figure 4.9: General layout plan of the proposed project

4.5.2 Water Supply

The main source of water supply of the project area is from tube well and public supply. Water supply is required in the proposed plant for the corrugator, where it is steam-heated and pressed to form corrugated cardboard. In addition, it is used for canteen purpose and sanitation. The total water requirement of the plant is 59,4576 gal/month.

4.5.3 Electricity

The main source of electricity supply for this project is the national grid line, which is also utilized by generating for the water supply system for the whole project, lighting and production process operation, etc.

The total requirement of electricity supply is a capacity of 190.98 MWh per month. The total diesel and gasoline requirement for vehicles is approximately 8,513.06 L per month. That diesel and gasoline are purchased from the local market and transported to the project area by cars.

4.5.4 Firefighting system

Fire extinguishers are being placed next to the exist and special purpose areas for emergency situations. In case of a fire emergency, the volume of 66,580 gallons water is stored in the concrete
tank within the factory area. With the installation of compressor, air valve and fire hoses for fire protection in suitable places of the projected site, water for firefighting will be used from the water tank. The fire safety training module is also designed to all staff for preventive measures to eliminate causes of fire or fire hazards in the workplace.

4.5.5 Requirement of human resources and equipment

All workers are permanent staff who is paid monthly. The group of permanent staff includes accountants, maintenance staffs, engineers, warehouse staff, production staffs, logistic, drivers, counter, administration staffs, etc.

Table 4.2: The capacity of staff in the OJI GS Packaging (Yangon) Company Limited

Type of Staff	Number of Staff
Temporary Staff	-
Permanent Staff	216

4.5.6 Safety measures

As safety measures for staff / workers during operation, employees will be equipped with:

- Earmuffs
- Gloves
- Boots
- Dust Masks
- Helmets
- Eye goggles

4.5.7 Raw Materials

The major raw materials are Paper rolls, starch and ink for the final product which is the cupboard with printing.

(i) Paper roll

The paper rolls for the final product are purchased from both local and oversea companies accordingly. Total average 1,100 tons will be utilized for a month and the amount will be ranging depending on the client's orders (requirements).

Regarding the oversea companies which will consign the raw materials to OJI GS, the OJI GS company purchases only from the company which has the certificate of ISO 9001:2015 (Quality Management) and ISO (4001:2015 (Environmental Management System). All raw materials are kept in well order taking into account environmental protection.

The following figure (4.8) shows the storage of the paper rolls at the oversea company before shipping to the OJI GS, Yangon, Myanmar.

Figure 4.10: The storage of paper rolls (raw materials) before shipping to OJI GS

Figure 4.11: The storage of paper rolls (raw materials) at the OJI GS factory

(ii) Printing Ink

The printing ink for the final product is purchased from local company. Total average 4.5 tons will be utilized for a month and the amount will be ranging depending on the client's orders (requirements).

The type of ink is Water Based Flexo Ink Series which is comprised of naturally occurring substances causing less impact on environment.

The following figure (4.9) shows the storage of the paper rolls at the oversea company before shipping to the OJI GS, Yangon, Myanmar.

Figure 4.12: The storage of printing ink at the OJI GS factory

(iii) Starch

The Starch for the final product is purchased from local company. Total average 18000 kg will be utilized for a month and the amount will be ranging depending on the client's orders (requirements).

The following figure (4.10) shows the storage of the starch at the OJI GS, Yangon, Myanmar.

Figure 4.13: The storage of Starch at the OJI GS factory

4.6 Production phase

The OJIGS Packaging (Yangon) Company Limited is composed of five main steps, corrugating process, printing process, diecut process, stitching process and gluing process. The following flow chart describes the manufacturing process of OJI GS Packaging (Yangon) Company Limited.

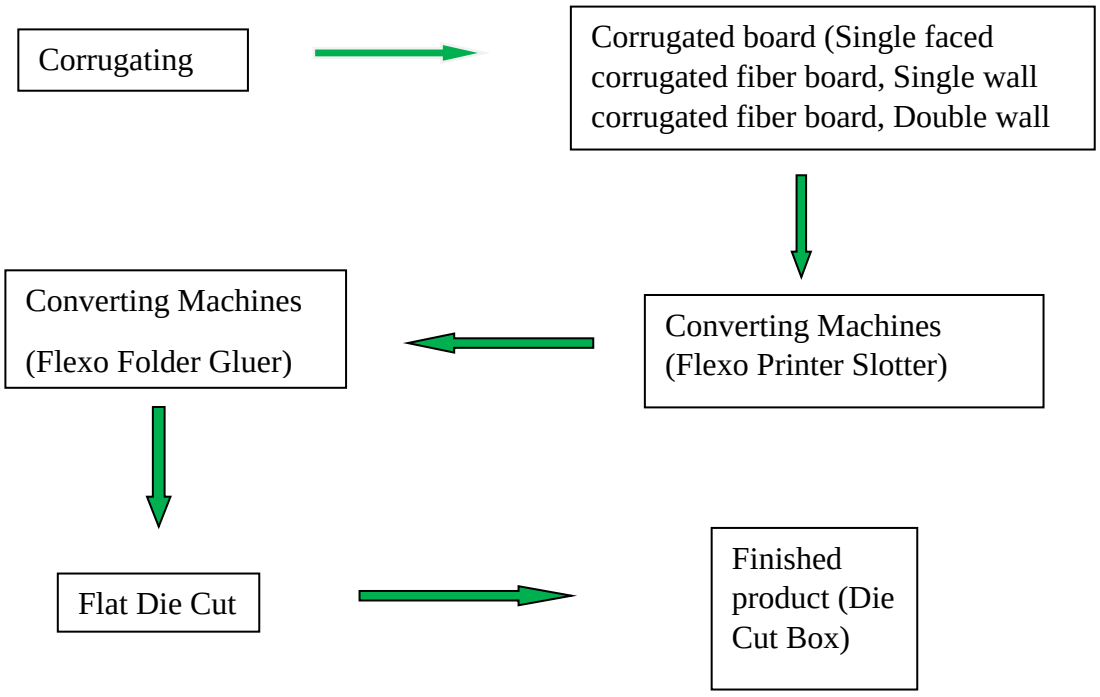


Figure 4.14: Production flow chart of OJI GS Packaging (Yangon) Company Limited

4.6.1 Corrugating Step

In corrugating step, there are two rolls, one with the fluting paper and one with the liner paper. Both are glued in place and then the paper is rolled on the delivery roll.

Figure 4.15: Corrugating step in operation phase

4.6.2 Semi Finished Product (Corrugated board)

After corrugating, four kinds of corrugated board structure are produced namely Single-faced Corrugated Fiberboard, Single-wall Corrugated Fiberboard, Double-wall Corrugated Fiberboard and Triple-wall Corrugated Fiberboard.

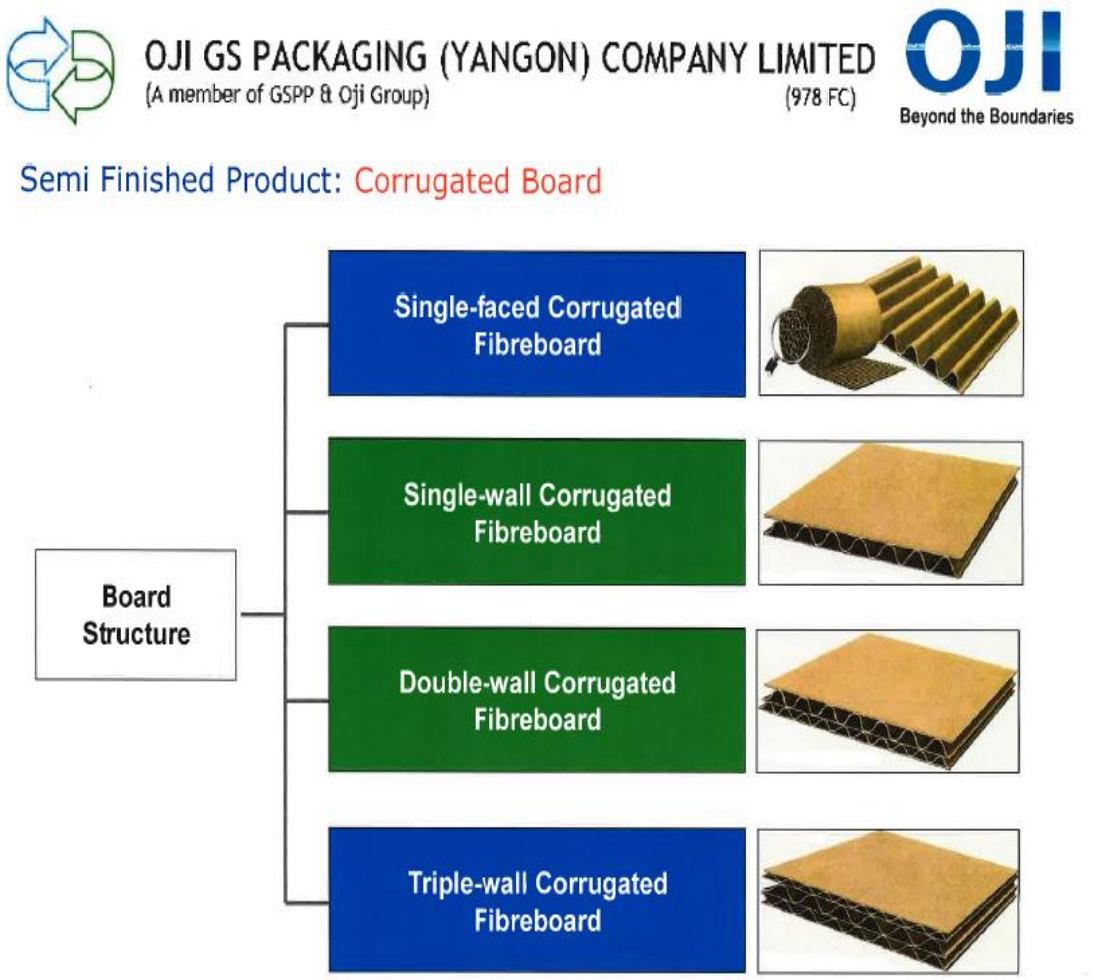


Figure 4.16: Four kinds of corrugated board structure

4.6.3 Converting Steps

Converting machines (Flexo Printer Slotter, Flexo Folder Gluer and Flate Die-Cut) are used in converting steps. The process Flexo Printer Slotter is that the printing plate is located above the working surface. The function of the stamp is performed by an elastic rubber plate. The pattern is applied by chemical engraving. Flexo Folder Gluer is and automated machine that combines printing, slotting, scoring, folding, and gluing. A Flat-Die cutter uses a tool to cut and score a sheet of corrugated board to create a shaped box blank.

For the printing process, Water bases Flexo Ink Series which has less impact on environment is utilized for the process. Detail manufacture company's Material Safety Data Sheet is presnted in the annex.

Figure 4.17: Converting Machines

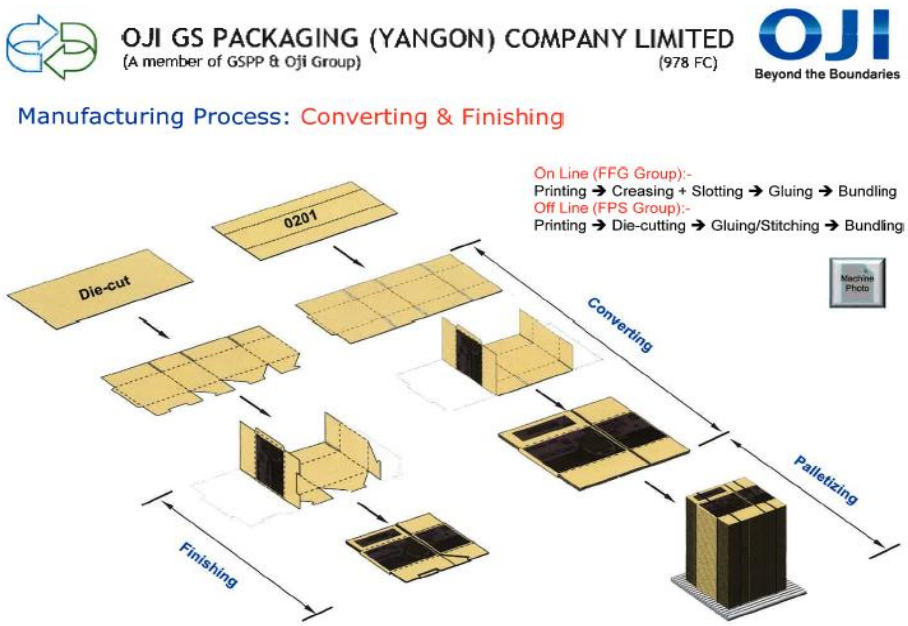


Figure 4.18: Converting & Finishing

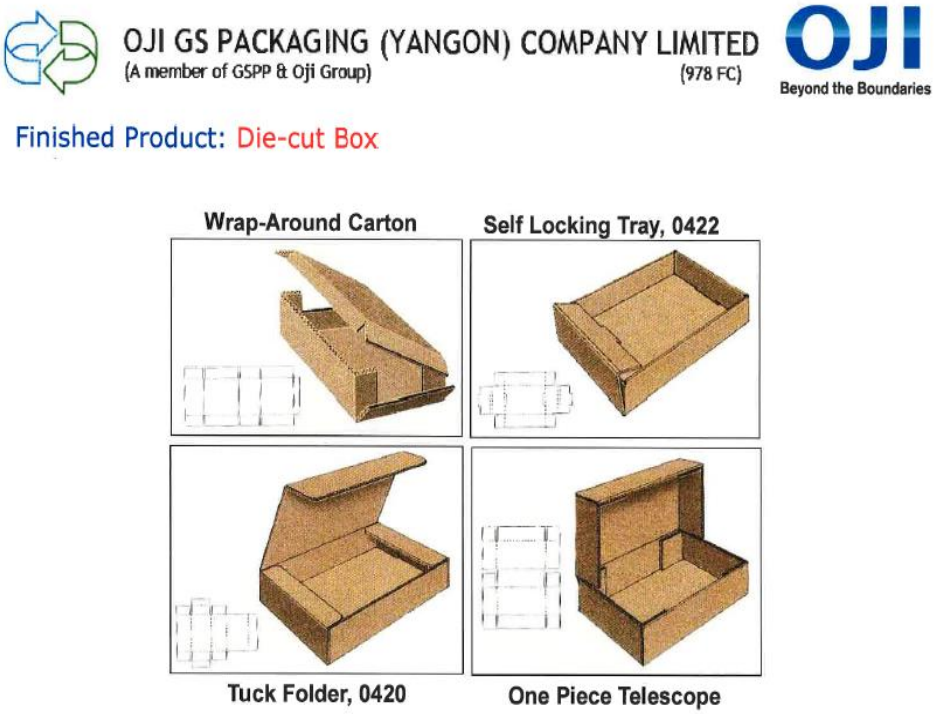


Figure 4.19: Die-cut Box

Figure 4.20: The Final Products

4.7 Carbon emission

4.7.1 Introduction

Carbon dioxide (CO2) is the primary greenhouse gas emitted through human activities. Many industrial processes emit CO2 through fossil fuel combustion. Several processes also produce CO2 emissions through chemical reactions that do not involve combustion, for example, the production and consumption of mineral products such as cement, the production of metals such as iron and steel, and the production of chemicals. The main human activity that emits CO2 is the combustion of fossil fuels (coal, natural gas, and oil) for energy and transportation, although certain industrial processes and land-use changes also emit CO2.

In terms of the CO2 emission from the OJI GS Packaging (Yangon) Company, the electricity sector of OJI GS Packaging (Yangon) Company does not directly produce the emission of CO2 and GHG. The proposed factory is directly consuming electricity from government. However, when the electricity cut off, the proposed factory has to use Wood fired boiler and generators to generate electricity. This generation of electricity produces CO2 and GHG by using diesel fuel for generators and fuel wood for boiler.

Transportation sector is one of the major sources of emission of CO2 and GHG by using diesel fuel for transportation trucks which carry raw materials to proposed factory and distribute products to consumers. Waste recycling practice instead of landfill is to reduce the CO2emission from the proposed factory.

4.7.2 Emission from electricity

Electricity is a significant source of energy and is used to power homes, business, and industry. The combustion of fossil fuels and fuel wood to generate electricity is the largest single source of CO2 emissions. The type of fossil fuel and fuel wood used to generate electricity by using generator and boiler which will emit different amounts of CO2 and other gas impact on human health and environment.

This OJI GS Packaging (Yangon) Company is based on the government electricity and therefore indirectly causes the greenhouse gas emissions (GHG) emissions from the electricity production. Emissions from the proposed factory increase substantially when emissions from electricity are included, due to their relatively large share of electricity consumption (e.g., production, lighting and air conditioning). Total annual electricity usages of the proposed factory are 2292 MWh.

Carbon dioxide (CO2) makes up the vast majority of greenhouse gas emissions from the sector, but smaller amounts of methane (CH4) and nitrous oxide (N2O) are also emitted. These gases are released during the combustion of fuel wood and fossil fuels, such as coal, oil, and wood, to produce electricity. The proposed factory uses the diesel generators and boiler as standby when the current is cut off.

(a) Plant and equipment power requirement

Carbon emissions from the proposed factory would be predominantly associated with the electrical energy required for the operation of the production and equipment. The proposed factory is utilized wood fired boiler during the process. Electricity also would be used on site to operate processing and equipment.

The electrical energy is required to operate the production, conveyers, machinery and air conditioning in the proposed factory. Values of electrical energy usage were estimated form the electrical bills of government sector and the usage of generator to produce the electric when power source was not available from government support. The power required for production and equipment was based on the following assumptions.

- **All plant and equipment would operate 16 hours per day.**
- **The plant would operate for 4,640 hours per year with a corresponding annual electricity consumption of approximately 1,*865 MWh.***

(b) Lighting power requirements

Lighting systems:

The electricity required for lighting was calculated based on the following assumptions:

- **The typical lighting requirement for industrial or factory buildings, of 2 W/m2 of floor area.**
- **Total floor area of proposed factory is approximately 18,896 m^2 which consists of office, corrugator, finishing, printer, loading/unloading, boiler, baler, WWTP, start kitchen, canteen and open space.**
- **The open space area is 6421.5 m2 which is not required to use electricity.**
- **The net area of electricity require is only 12474.5m2.**

- **There had floors in the building would require lighting at any given time.**
- **That lighting would be required during maintenance shut downs.**

The operation of lighting on one floor for 24 hours per day, 290 days per year equates to a total of 6,960 hours annually, with an electricity requirement of close to *174MWh* calculated as:

Lighting Power (MWh) = (Floor area x lighting requirement x hours/year) / 1,000,000
= (12474.5m2 x 2 W/m2x 6,960 hrs/year) / 1,000,000
= 174MWh

Another major electricity annual usage for proposed factory is air conditioning. The production processes and some raw material storage are being processed under 24 hour air conditioning system. The amount of air conditioning system usage for proposed factory is assumed as *253 MWh.*

(c) Carbon emission of electricity energy usage from plant and equipment power requirement and lighting and air-condition power requirement

To convert reductions of kilowatt-hours into avoided units of carbon dioxide emissions, the Greenhouse Gas Equivalencies Calculator uses the Emissions & Generation Resource Integrated Database (eGRID) U.S. annual non-baseload CO2 output emission rate.

Total electricity usage = 1,865 MWh + 174 MWh + 253 MWh
=2292 *MWh (2,292,000 kWh)*

kWh = 6.89551×10-4 metric tons CO2 ---------- eq (1)

(eGRID, U.S. annual non-baseload CO2 output emission rate, year 2010 data)

CO2 emission (metric tons) = 2,292,000 kWh x (6.89551×10-4)
= 1580.5metric tons of CO2

The annual emission of CO2from electricity usage of lighting system, other usage of proposed factory and plant equipment are 1580.5 metric tons of CO2.

1 Liters of Diesel = 2.68 kg of CO2 ---------- eq (2)

CO2 emission (kg) = 22,000Liters x 2.68

= 58960 kg of CO2 (58.96 metric tons of CO2)

Total amount of CO2 emission from generator is 58960 kg of CO2/ year (58.96 metric tons of CO2/ year).

Total emission from electricity sector = (Electricity energy usage from plant and equipment power requirement and lighting and

air-condition power requirement) +(Generator usage)
= 1580.5 metric tons + 58.96 metric tons
= 1639.46 metric tons

Total emission of CO2 from electricity sector is 1639.46 metric tons of CO2.

4.7.3 Emission from transportation

Regarding the combustion of fossil fuels from the OJIGS Packaging Company Limited, diesel is mainly utilized by tracks for loading and unloading, ferry bus, office car, forklift and clamp lift which are for transportation of employees and goods of the proposed factory. These are the largest sources of transportation-related greenhouse gas emissions of the factory. Transportation and distribution systems of the proposed factory are maximized in a given geographic area – private cars for usage of staff, trucks which deliver raw materials to a plant, pick up finished product and then transport the products to either the distribution center or directly to the customers. This strategy optimizes network efficiency and allows trucks to run in a continuous loop with a high level of fuel utilization. Types and amounts of fuel usage (gasoline, diesel and CNG) are based on the type of the car.

Table 4.3: Characteristics of distribution trucks from OJIGS Packaging Company Limited

No	Type of car	Type of fuel	Quantity of car	Fuel usage per year (liter)
1	W.H	Premium diesel	11	58360.4
2	Office cars	95 Petrol	4	10182.6
3	Forklift and Clamp lift	Premium diesel	4	2727.6
4	Ferry	Premium diesel	5	13860
Total			24	85131

The amount of fuel consumption for raw material transportation is 58360.4 liter per annual. Total amount of fuel consumption from transportation sector is 85131 liter per year.

To obtain the number of grams of CO2 emitted per gallon of gasoline combusted, the heat content of the fuel per gallon is multiplied by the kg CO2 per heat content of the fuel.

1Litre of gasoline = 2.3 kg of CO2
CO2 emission (gasoline usage) = 10182.6 x 2.3
= 23419 kg of CO2 (23.419 metric tons of CO2)

1Litre of Diesel = 2.68 kg of CO2

CO2 emission (diesel usage) = 74,948 liters x 2.68
= 200,860 kg of CO2 (200.860 metric tons of CO2)

The *total emission of CO2 from transportation sector is 224.279 metric tons of CO2.*

4.7.4 Emission from waste

Currently, waste released from the factory are being recycled and collect by YCDC. To develop the conversion factor for recycling rather than landfill waste, emission factors from EPA's Waste Reduction Model (WARM) were used (EPA 2012). These emission factors were developed following a life-cycle assessment methodology using estimation techniques developed for national inventories of greenhouse gas emissions.

According to WARM, the net emission reduction from recycling mixed recyclables (e.g., paper, metals, plastics), compared with a baseline in which the materials are landfilled, is 0.76 metric tons of carbon equivalent per short ton. This factor was then converted to metric tons of carbon dioxide equivalent by multiplying by 44/12, the molecular weight ratio of carbon dioxide to carbon. Total tons of waste instead of landfill from the proposed factory is 1900 ton/year.

Ton of waste recycled instead of landfill = 0.76 metric tons of CO2 E × 44 kg CO2/12 kg C
Ton of waste recycled instead of landfill = 2.79 metric tons CO2 equivalent
The equivalent of CO2 from waste recycled = 1900 x 2.79 metric tons CO2
Instead of landfill

= 5301 metric tons

The equivalent of CO2 from waste recycled instead of landfill is 5301 metric ton per year.

4.7.5 Emission from Boiler

Wood based boiler is a sustainable fuel source and it is a low carbon heating system. It will not produce carbon dioxide emissions to harm the environment. The amount of the carbon dioxide emitted during the burning process is equivalent to the amount absorbed during the growth of the trees. Wood chips are composed of leftovers wood material and is economically competitive with other fuels used for heating. Price of wood chips are often stable because they do not depend on exogenous factors such as fossil fuels. They are produced from wood waste and forest-thinning byproducts. According to research and wood chip boiler reviews, wood chip heating will remain indefinitely as a renewable energy source. Most of the used wood chips are produced locally which means that they provide more jobs for local people that can lead to energy independence. Wood based boiler requires frequent maintenance. Even if the majority of the modern boilers include self-cleaning systems, the heat exchanger must often be brushed in order to have the highest working proficiency. Additionally, ash bins need to be regularly emptied. If the burning process within the boiler is faulty or the system has not been set up correctly, then the emissions (due to the incomplete combustion of the fuel) can produce carbon monoxide (CO), benzene and volatile organic gases, amongst other toxic substances that can be carcinogenic, so please ensure the boiler is serviced well and is operating inside the manufacturers guidelines at all times. The ash produced by the wood based boiler is considered to be a compostable component. This can be used by horticulturalists for compost or simply be sent to landfill as this is a harmless natural material.

4.7.6 Total CO2 emission from all sectors

Total emission of CO2 from proposed factory =(Total emission of CO2 from electricity sector + Total emission of CO2 from transportation sector) – The equivalent of

CO_2 from waste recycled instead of landfill
= (*1639.46 metric tons +224.279 metric tons)-5301 metric tons*
= 3437.261 metric tons (Total emission of CO_2 from all sectors is less than the equivalent of CO_2 from waste recycled instead of landfill)

Total emission of CO_2 from proposed factory of all of the sectors (electricity, transportation and waste recycle) are less than the equivalent of CO_2 from waste recycled instead of landfill in the value of 3437.261 metric tons.

4.8 Existing situation of solid waste generation
4.8.1 Introduction
Corrugated cardboard is the packaging material of choice for many brands and industries. Its high-tech construction ensure the materials can carry a wide range of weight, protect against moisture and provides sustainable packaging solutions.

4.8.2 Current waste generation from OJI GS Packaging (Yangon) Company
(a) Domestic solid waste (DSW) generation from the OJI GS Packaging (Yangon) Company
Looking at domestic Solid waste generation from the OJI GS Packaging (Yangon) Company corrugated cardboard process was measured by both automatically and manually weighing the waste from entire compound for a day at the final stage which is send to the YCDC.
The type of domestic solid waste from the proposed factory is personal left over, food residues (organic wastes), glasses, tins, bottles, papers. According to the manual weighting analysis, domestic solid waste generation from the proposed factory is 74kg/day which is approximately 21tonnes per year which come from the operation areas. Thus, from the total population nearly 216 total from two shift staff, waste generation per capital per day is (0.3) kg per person per day. When it is compared with the waste generation per capital in the developing countries which is 0.5 to 1.5 kg per person per day, this indicated that it was significantly less than the national rate of waste generation from developing country. Therefore, it is noted that in the operation system, there has some systematic waste generation.

(b) Industrial solid waste generation from the OJI GS Packaging (Yangon) Company
Estimated industrial waste generation from the OJI GS Packaging (Yangon) Company is 775 kg per day which is proximately 225 tonnes per year, some of them are being sent to the waste recycler. According the analysis, some waste is ended in the recycling action. Some of them are ended in collection system from the Municipal. Mostly, all the waste from the manufacturing are being recycled, when it is analyzed, it is the result of recycling within the Manufacturing Compound.

(c) Physical composition of domestic solid waste from the OJI GS Packaging (Yangon) Company

Physical composition analysis of solid waste in OJI GS Packaging (Yangon) Company was carried out randomly. Individual components that typically make up most of the municipal solid wastes were categorized into 10 categories: food waste, yard waste, plastic, paper, leather/textile/rubber (LTR), glass, metal and aluminum (can), sanitary napkins, and others. The following figure 5.26 shows the physical composition of domestic solid waste that produce from the compound.

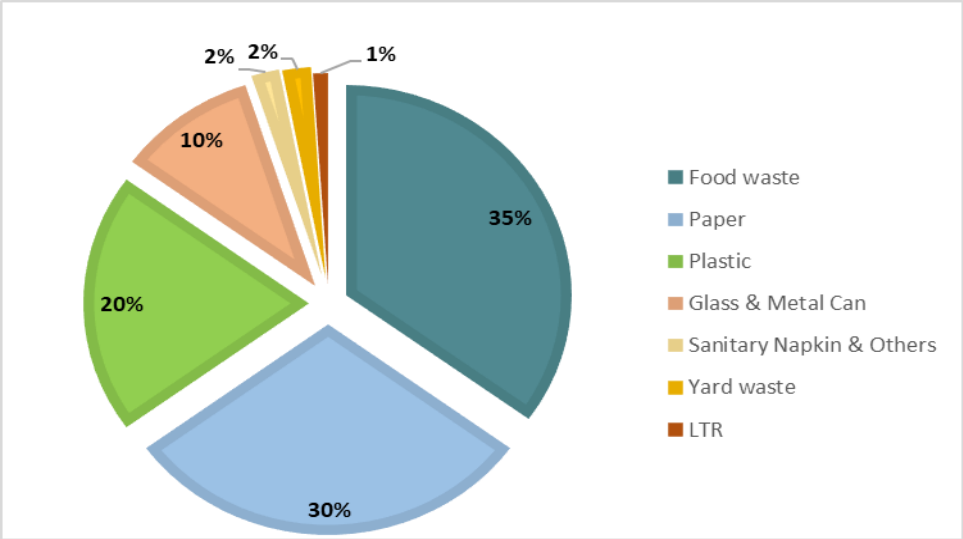


Figure 4.21: Physical composition of domestic solid waste

Figure: 4.19 shows percentage (%) of Domestic Solid Waste from the OJI GS Packaging (Yangon) Company Compound Weight Basis.

The top waste components is identified as; Food waste (35%), paper 30%, plastic 20% and the combination of others waste are less than 15% of the total domestic waste. Among 15%, glass and metal can is around 10%, sanitary napkins and other is 2%, yard waste is 2% and LTR(Leather, textile and rubber) is 1%.

(d) Physical Composition of industrial solid waste from OJI GS Packaging (Yangon) Company

Like the domestic solid waste, physical composition of industrial solid waste was also carried randomly. According to the survey and analysis, there are two types of waste has been sent to the Municipal. Others are ended in the recycling activities. The two main types of waste are chemical wastes and waste water treatment sludge. In the following figure 5.12 show the percentage of chemical wastes and waste water treatment sludge wastes generate from the industry.

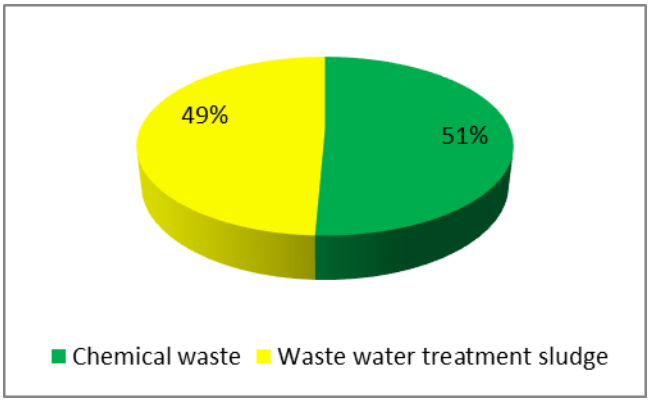


Figure 4.22: Physical composition of industrial solid waste

Figure 4.20 shows percentage (%) of industrial solid waste from the OJIGS Packaging (Yangon) Company Limited. As the result of weight basis result, generation of chemical waste and waste water treatment sludge are more or less the same. Chemical waste is around 51 % and waste water treatment sludge is 49%. All waste is transported to the Yangon City Development Committee (YCDC).

4.8.3 Existing waste handling in the factory

OJIGS Packaging (Yangon) Company Limited is combined with two sections which is industrial and residential parts. Thus, from this industry, both industrial and domestic solid wastes are generated every day. Within the industry, all the waste that generated is cleaned everyday by the workers.

According to observation within the industry, all the wastes generating from the industry have been taken by the municipal under Yangon City Development Committee, (YCDC).

For domestic waste, it has been taken by YCDC four times per month. For industrial waste, two times per month. Before wastes were collected from the municipal, all the wastes were disposed in the five bins and the domestic waste and industrial waste are disposed separately. The proposed factory applies recycle system from 3R method. Since the factory open, they started the recycle activities. They contacted to the recycle agent to sell out the paper.

Table 4.4: Weight of waste recycling rate % and sent to recycling agent and YCDC %

No.	Types	% by wieght
1.	Total amount of Recycling waste (Paper)	91
2.	Total amount of waste sent to YCDC	9
3.	Total waste generated from the factory	100

As the total, the total amount of waste that generate from the recycling nearly 91% of the total waste and only 9% of the total waste from the factory was sent to the YCDC. As the regarding result, it is significantly seen that the recycling activities in this factory is happened.

4.8.4 Waste water treatment plant

Waste water treatment plant has two types of system. They are chemical system and activated sludge system. There are 1750 kg of waste water sludge is generated in a month.

The process of the wastewater treatment system is detailed as follow:

1) Collection the glue waste and ink waste in Equalizer Tank
2) Ink and glue waste from Equalizer tank are mixed with Aluminium, Polymer and Caustic to adjust the pH, reduce the color and settle down the sludge in Slow Mixer Tank.
3) Sending to sedimentation Tank-1 to separate the clear water and sludge.

4.1) The sediment from Sedimentation Tank-1 is collected in the Sludge

4.2) Clear water from Sedimentation Tank-1 is sent to the Buffer Tank and then to the Anthracite Filter to filter out solid particles Thicker Tank and sent to the Filter Press to filter the sludge then the clear water is returned to the Equalization Tank.

5. After passing through the Anthracite Filter, send to the Aeration Tank to reduce the COD and BOD.)

6. Sending again to Sedimentation Tank-2 via Aeration Tank to separate the clear water and sludge

7.1 Re-transferred the sediment to the Aeration Tank.)

7.2 The clear water from Sedimentation Tank-2 is sent to Anthracite Filter-2 to filter out solid particles and then drain as a final rinse.)

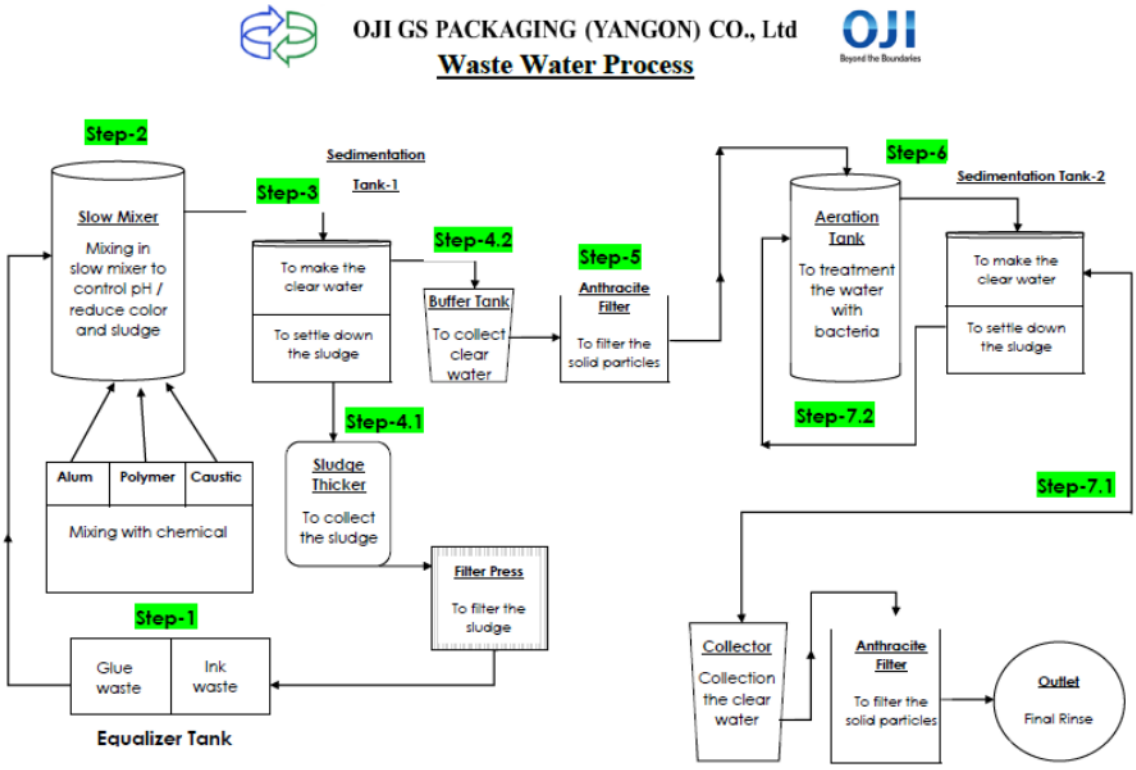


Figure 4.23: Wastewater Treatment Block Flow Diagram

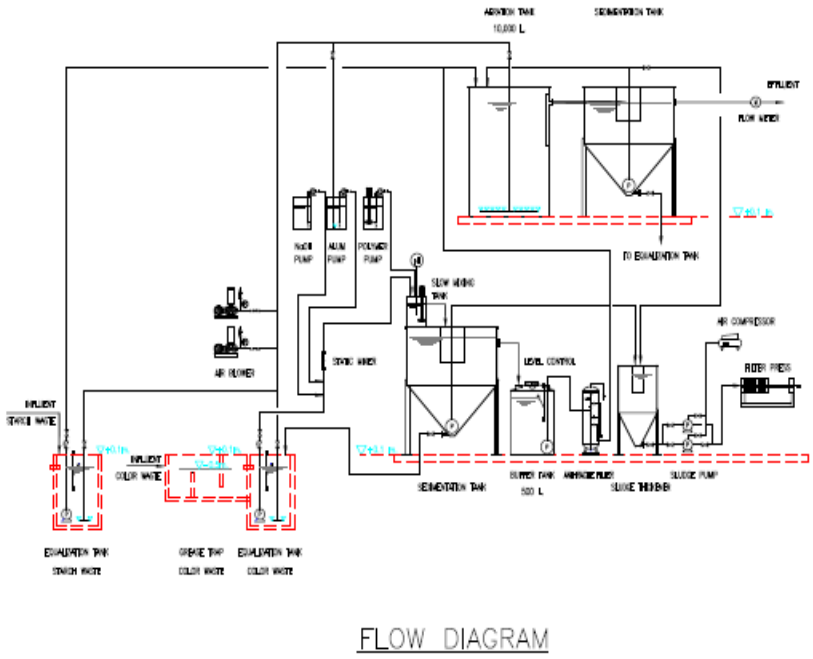


Figure 4.24: Wastewater Treatment Plant Flow Diagram


Figure 4.25: Storage of waste water sludge before collected by YCDC

4.9 Boiler

The proposed factory used wood-based boiler. Wood based boiler is a sustainable fuel source and it is a low carbon heating system. It will not produce carbon dioxide emissions to harm the environment. The amount of the carbon dioxide emitted during the burning process is equivalent to the amount absorbed during the growth of the trees. The purpose of boiler usage is " To dry the glue making carton board". The boiler run 214 hours per month. There are 7500 kg of fuel used for boiler per day.

Boiler Fuel Storage Condition

Figure 4.26: The boiler fuel (rubber wood)

Figure 4.27: Storage of Boiler ash before collected by YCDC

4.10 Alternatives Selection

The no development option for the OJI GS Packaging (Yangon) Company would prevent all potential environmental and social impacts due to manufacturing and distribution.

However, if there is a good cooperation between the project proponent and the community, there will be specific environmental and social benefits such as increased employment opportunities, infrastructure upgrades, and other community benefits would occur as a result of the factory operation.

It is widely recognized that being the corrugated cardboard factory, OJI GS Packaging (Yangon) Company has less negative impact on the environment compared to other factories which are significantly emitting and releasing the pollutants into the environment.

Moreover, if there is a good cooperation between the project proponent and the community, there will be specific environmental and social benefits such as increased employment opportunities, infrastructure upgrades, and other community benefits would occur as a result of the factory development.

Chapter 5

Description of the Surrounding Environment

5. Description of the surrounding environment

This chapter reports a description of the project surrounding environment based on a review of the valuable data related to the existing baseline air, water, noise, soil and waste monitored at and around the proposed project site. The more detailed and in-depth analysis will be provided accordingly in the sub sections.

5.1 Existing air quality

5.1.1 Introduction

The baseline ambient air sampling was carried out at the OJI GS Packaging (Yangon) Company (Mingalardon Township) in May, 2020 in order to reveal the existing air quality status at and around the factory.

5.1.2 Objective

The objectives of the monitoring are:

- To reveal the existing baseline ambient air quality of the proposed factory
- To provide the data in order to assess the air impact likely affected by the project activities

5.2 Ambient air monitoring location

Locations of air sampling stations are listed in Table 5.1. **Among these, Factory Compound, Office room, Conference room and Canteen were selected in order to reveal the factory workers exposure.**

Production area, Storage area, Boiler, packaging and printing area are selected because of the main sources of emission.

The air quality sampling methodology used for this project is described in the subsection which follows,

Table 5.1: Air sampling locations for baseline survey

Points	Locations	Coordinates		Start Date	End Date
1	Factory Compound	16°56'46.18"N	96° 9'21.70"E	1.6.2020	2.6.2020
2	Production area	16°56'45.85"N	96° 9'24.83"E	2.6.2020	3.6.2020
3	Storage area	16°56'44.65"N	96° 9'24.89"E	3.6.2020	3.6.2020
4	Boiler	16°56'44.88"N	96° 9'27.64"E	4.6.2020	4.6.2020
5	Beside the packaging	16°56'47.98"N	96° 9'26.56"E	1.6.2020	2.6.2020
6	Beside the printing	16°56'47.68"N	96° 9'26.50"E	1.6.2020	2.6.2020
7	Office room	16°56'43.54"N	96° 9'25.14"E	2.6.2020	2.6.2020
8	Conference room	16°56'44.62"N	96° 9'25.70"E	2.6.2020	2.6.2020
9	Canteen	16°56'44.25"N	96° 9'26.23"E	3.6.2020	3.6.2020

Figure 5.1: Ambient air monitoring at OJIGS Packaging (Yangon) Company Limited

5.2.1 Existing baseline ambient air quality

The table 5.2 presents the findings which are averaged for all measurements carried out at the different places of the OJI GS Packaging (Yangon) Company.

Table 5.2: The 24hr average air parameters around the factory

Air Monitoring Location	**CO (µg/m^3)**	**VOC (ppb)**	**NO2 (µg/m^3)**	**SO2 (µg/m^3)**	**NH3 (ppm)**	**CH4 (ppm)**	**O3 (µg/m^3)**	**PM10 (µg/m^3)**	**PM2.5 (µg/m^3)**
OJI GS Packaging (Yangon) Company	**287a±57.5b 286.5c(0d-584e)**	**7a±2.5b6.5c (0d-110e)**	**74a±6.5b 73.5c (8d-98e)**	**11a±4b 11c (1d-20e)**	**31a±7b 31c (10d-85e)**	**67a±3b 67c (1d-190e)**	**2a±0.5b 1.5c (1d-10e)**	**21a±4b 21c (2d-58e)**	**12a±4b 12c (1d-60e)**
National Environmental Air Quality Guideline (ECD) guideline	30,000 (µg/m^3) (one hr) 10,000 (µg/m^3) (8 hr)	NA	40 (µg/m^3) (annual) /200 (µg/m^3) (one hour)	20 (µg/m^3) (24 hour)	NA	NA	100 (µg/m^3) (8hr)	50 (µg/m^3)	25 (µg/m^3)

available a Average b SE c Median d Min e Max ,NA – not available

5.2.2 Point (1) The existing baseline ambient air monitoring location (1), Factory Compound

Figure 5.2: Ambient air monitoring at Factory Compound

Figure 5.3: Air monitoring at Factory Compound

The point 1 is located at factory compound. Regarding particulates, Table 5.3 presents both the 24hr average levels of PM10 (17 µg/m^3) and PM2.5 (8 µg/m^3) met the National Environmental Quality (Emission) Guideline (ECD). In terms of gases level, 24hr average levels of SO2 (15

µg/m3), one hour average level of NO2 (79 µg/m3), one hour average of CO (1030 µg/m3), 8 hour average CO (573 µg/m3) and 8 hour average of O3 (1 µg/m3) met the guidelines.
The meteorology findings (Temperature, Relative Humidity, and Wind Speed Wind Direction) during the monitoring were presented below. (Table 5.3)

Table 5.3: Ambient air monitoring at point (1), Factory compound

Parameters	**Concentration (24hr average) except some Gases (NO2, CO and O3)***	**National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)**
PM10	$17^a(2^b\text{-}58^c)$ µg/m^3	50 µg/m^3
PM 2.5(µg/m^3)	$8^a(1^b\text{-}24^c)$ µg/ m^3	25 µg/m^3
NO_2*	67 ($11^b\text{-}83^c$) µg/m^3(24 hr) 79 µg/m^3 (one hr)	40 µg/m^3 (annual) /200 µg/m^3 (one hour)
SO_2	$15^a(1^b\text{-}20^c)$ µg/m^3	20 µg/m^3
CO *	$0.3^a(0^b\text{-}1^c)$ ppm / 344 µg/m^3 (24hr) 0.9 ppm/ 1030 µg/m^3 (one hr) 1.5 ppm/ 573µg/m^3 (8 hr)	30,000 µg/m^3 (one hr) 10,000 µg/m^3 (8 hr)
O_3*	$1^a(1^b\text{-}10^c)$ µg/m^3 (24hr) 1 µg/m^3 (8 hr)	100 µg/m^3 (8hr)
H2S	$72^a(0^b\text{-}183^c)$ ppb	NA
CO_2	$432^a(351^b\text{-}687^c)$ ppm	NA
VOC	$4^a(0^b\text{-}110^c)$ ppb	NA
NH_3	$38^a(11^b\text{-}86^c)$ppm	NA
CH_4	$64^a(1^b\text{-}190^c)$ppm	NA
Atomic Radiation	0	25-75 CPM(USEPA)
Meteorology		
T (Degree C)		$27^a(25^b\text{-}31^c)$
RH		$97^a(76^b\text{-}100^c)$
Wind Speed (kph)		$0.3^a(0^b\text{-}4.3^c)$
Wind Direction (Degree from East)		189(S)
Remark		
There were 10 times of car passing around the monitoring area. There were heavy rain during 3:00 pm to 5:00 pm.		

[a] Average [b] Min [c]Max

Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the project area.

Green – meets the standards
Yellow (slightly over)
Orange (exceeding)

5.2.3 Point (2) The existing baseline ambient air monitoring at Location (2), Production area

Figure 5.4: Ambient air monitoring at Production area

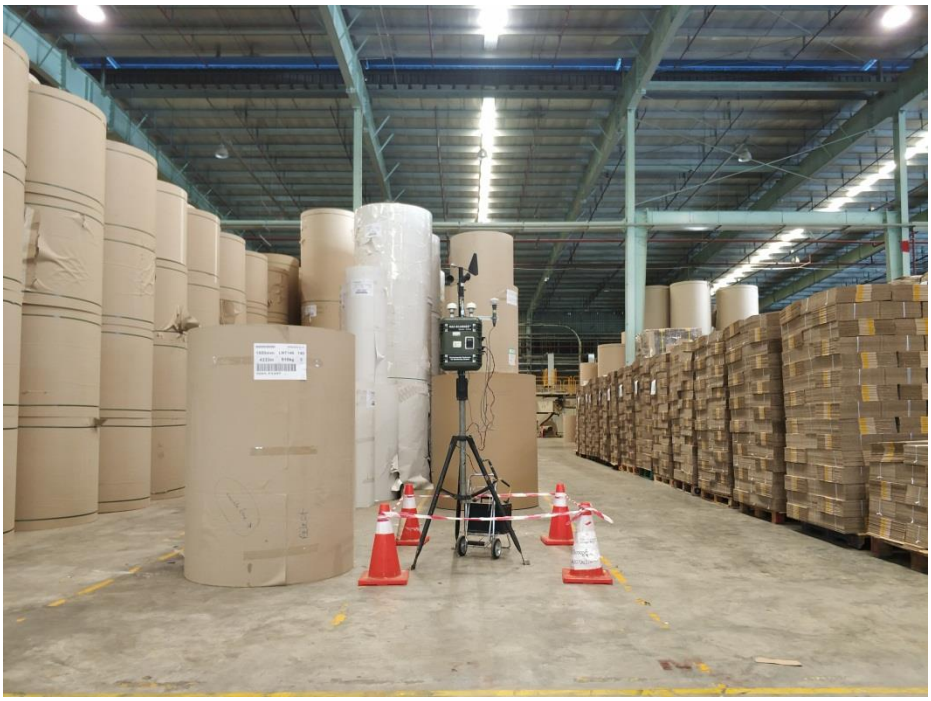


Figure 5.5: Ambient air monitoring at Production area

The point 2 is located production area of the factory. Regarding particulates, Table 5.4 presents both the 24hr average levels of PM10 (25µg/m^3) and PM2.5 (16 µg/m^3) met the National Environmental Quality (Emission) Guideline (ECD). In terms of gases level, 24hr average levels

of SO2 (7 µg/m3), one hour average level of NO2 (79 µg/m3), one hour average of CO (458 µg/m3), 8 hour average CO (332 µg/m3) and 8 hour average of O3 (1 µg/m3) met the guidelines.

The meteorology findings (Temperature, Relative Humidity, Wind Speed, Wind Direction) during the monitoring were presented below. (Table 5.4)

Table 5.4: Ambient air monitoring at the production area of the factory

Parameters	**Concentration (24hr average) except some Gases (NO2, CO and O3)***	**National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)**
PM10	$25^a(2^b\text{-}49^c)$ µg/m^3	50 µg/m^3
PM 2.5(µg/m^3)	$16^a(1^b\text{-}60^c)$ µg/ m^3	25 µg/m^3
NO_2*	80 ($8^b\text{-}98^c$) µg/m^3(24 hr) 79 µg/m^3 (one hr)	40 µg/m^3 (annual) /200 µg/m^3 (one hour)
SO_2	$7^a(1^b\text{-}10^c)$ µg/m^3	20 µg/m^3
CO *	$0.2^a(0^b\text{-}0.5^c)$ ppm / 229 µg/m^3 (24hr) 0.4 ppm/458 µg/m^3 (one hr) 0.29 ppm/332µg/m^3 (8 hr)	30,000 µg/m^3 (one hr) 10,000 µg/m^3 (8 hr)
O_3*	$2^a(1^b\text{-}10^c)$ µg/m^3 (24hr) 1 µg/m^3 (8 hr)	100 µg/m^3 (8hr)
H2S	$102^a(0^b\text{-}208^c)$ ppb	NA
CO_2	$394^a(319^b\text{-}499^c)$ ppm	NA
VOC	$9^a(0^b\text{-}67^c)$ ppb	NA
NH_3	$24^a(3.3^b\text{-}46^c)$ppm	NA
CH_4	$70^a(1^b\text{-}190^c)$ppm	NA
Atomic Radiation	0	25-75 CPM (USEPA)
Meteorology		
T (Degree C)		$29^a(27^b\text{-}31^c)$
RH		$69^a(60^b\text{-}82^c)$
Wind Speed (kph)		$0.02^a(0^b\text{-}1.1^c)$
Wind Direction (Degree from South)		248(WSW)
Remark		
The factory worker worked around the monitoring area.		

,[a] Average [b] Min [c]Max

Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the project area.

Green – meets the standards

Yellow (slightly over)

Orange (exceeding)

5.2.4 Point (3): The existing baseline ambient air monitoring at Location (3), Storage area

Figure 5.6: Ambient air monitoring at Storage area

Figure 5.7: Ambient air monitoring at Storage area

The point 3 is located at the storage area of the factory. Regarding particulates, Table 5.5 presents both the 24hr average levels of PM10 (8µg/m^3) and PM2.5 (5 µg/m^3) met the National Environmental Quality (Emission) Guideline (ECD). In terms of gases level, 24hr average levels of SO2 (7 µg/m3), one hour average level of NO2 (81 µg/m3), one hour average of CO

(229µg/m3), 8 hour average CO (195 µg/m3) and 8 hour average of O3 (1 µg/m3) met the guidelines.

The meteorology findings (Temperature, Relative Humidity, Wind Speed, Wind Direction) during the monitoring were presented below. (Table 5.5)

Table 5.5: Ambient air monitoring near by the storage area

Parameters	**Concentration (24hr average) except some Gases (NO2, CO and O3)***	**National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)**
PM10	$8^a(2^b\text{-}20^c)$ µg/m^3 (8hr)	50 µg/m^3
PM 2.5(µg/m^3)	$5^a(1^b\text{-}9^c)$ µg/ m^3 (8hr)	25 µg/m^3
NO_2*	77 ($70^b\text{-}86^c$) µg/m^3(8hr) 81 µg/m^3 (one hr)	40 µg/m^3 (annual) /200 µg/m^3 (one hour)
SO_2	$7^a(1^b\text{-}10^c)$ µg/m^3	20 µg/m^3
CO *	$0.2^a(0.03^b\text{-}4^c)$ ppm / 229 µg/m^3 (1hr) 0.17 ppm/ 195 µg/m^3 (8 hr)	30,000 µg/m^3 (one hr) 10,000 µg/m^3 (8 hr)
O_3*	$1^a(1^b\text{-}1^c)$ µg/m^3 (8hr) 1 µg/m^3 (8 hr)	100 µg/m^3 (8hr)
H2S	$24^a(0^b\text{-}151^c)$ ppb	NA
CO_2	$639^a(383^b\text{-}1545^c)$ ppm	NA
VOC	$8^a(0^b\text{-}81^c)$ ppb	NA
NH_3	$20^a(0^b\text{-}25^c)$ppm	NA
CH_4	$75^a(1^b\text{-}190^c)$ppm	NA
Atomic Radiation	0	25-75 CPM(USEPA)
Meteorology		
T (Degree C)		$30^a(28^b\text{-}30^c)$
RH		$81^a(74^b\text{-}97^c)$
Wind Speed (kph)		$0^a(0^b\text{-}0^c)$
Wind Direction (Degree from South-South-East)		91(E)
Remark		

,[a] Average [b] Min [c]Max

Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the project area.

Green – meets the standards
Yellow (slightly over)
Orange (exceeding)

5.2.5 Point (4): The existing baseline ambient air monitoring at Location (4), near by the boiler

Figure 5.8: Ambient air monitoring near by the boiler

Figure 5.9: Ambient air monitoring near by the boiler

The point 4 is located near the boiler of the factory. Regarding particulates, Table 5.6 presents both the 24hr average levels of PM10 (17µg/m^3) and PM2.5 (13 µg/m^3) met the National

Environmental Quality (Emission) Guideline (ECD). In terms of gases level, 24hr average levels of SO2 (23 µg/m3), one hour average level of NO2 (70 µg/m3), one hour average of CO (229µg/m3), 8 hour average CO (183 µg/m3) and 8 hour average of O3 (1 µg/m3) met the guidelines.
The meteorology findings (Temperature, Relative Humidity, Wind Speed, Wind Direction) during the monitoring were presented below. (Table 5.6)

Table 5.6: Ambient air monitoring near by boiler

Parameters	**Concentration (24hr average) except some Gases (NO2, CO and O3)***	**National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)**
PM10	$17^{a}(2^{b}\text{-}65^{c})$ µg/m^3 (8hr)	50 µg/m^3
PM 2.5(µg/m^3)	$13^{a}(1^{b}\text{-}63^{c})$ µg/ m^3 (8hr)	25 µg/m^3
NO_2*	55 ($33^{b}\text{-}83^{c}$) µg/m^3(8hr) 70 µg/m^3 (one hr)	40 µg/m^3 (annual) /200 µg/m^3 (one hour)
SO_2	$23^{a}(1^{b}\text{-}40^{c})$ µg/m^3	20 µg/m^3
CO *	$0.2^{a}(0.02^{b}\text{-}0.3^{c})$ ppm / 229 µg/m^3 (1hr) 0.16 ppm/ 183 µg/m^3 (8 hr)	30,000 µg/m^3 (one hr) 10,000 µg/m^3 (8 hr)
O_3*	$1^{a}(1^{b}\text{-}1^{c})$ µg/m^3 (8hr) 1 µg/m^3 (8 hr)	100 µg/m^3 (8hr)
H2S	$2^{a}(0^{b}\text{-}25^{c})$ ppb	NA
CO_2	$405^{a}(362^{b}\text{-}733^{c})$ ppm	NA
VOC	$55^{a}(0^{b}\text{-}161^{c})$ ppb	NA
NH_3	$22^{a}(16^{b}\text{-}26^{c})$ppm	NA
CH_4	$77^{a}(1^{b}\text{-}190^{c})$ppm	NA
Meteorology		
T (Degree C)		$31^{a}(28^{b}\text{-}33^{c})$
RH		$77^{a}(59^{b}\text{-}100^{c})$
Wind Speed (kph)		$0.9^{a}(0^{b}\text{-}4.3^{c})$
Wind Direction (Degree from South-South-East)		203(SSW)
Remark		

,[a] Average [b] Min [c]Max
Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the project area.
Green – meets the standards
Yellow (slightly over)
Orange (exceeding)

5.2.6 Point (5): The existing baseline ambient air monitoring at Location (5), beside the packaging

Figure 5.10: Ambient air monitoring beside the packaging

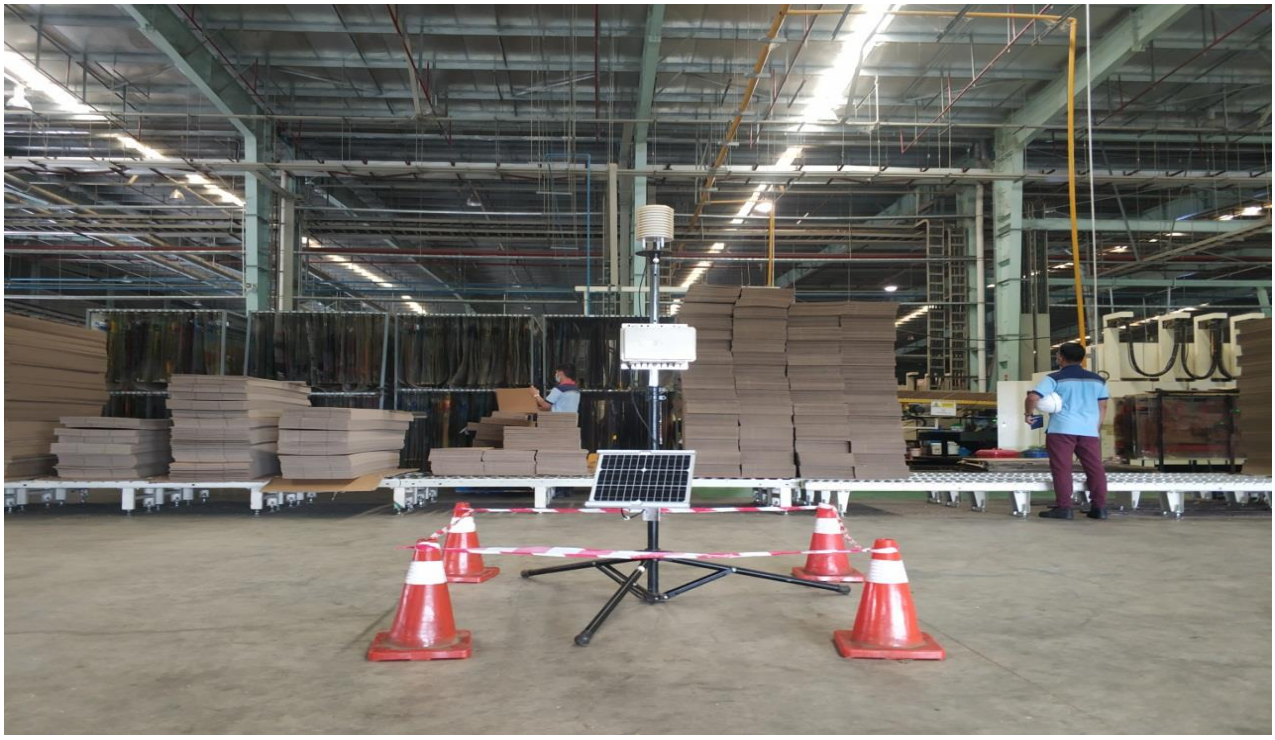


Figure 5.11: Ambient air monitoring beside the packaging

The point 5 is located beside the packaging site of the factory. Regarding particulates, Table 5.7 presents both the levels of PM10 (37µg/m^3) which met the National Environmental Air Quality

Guideline (ECD), except from PM2.5 (31 µg/m^3) which is slightly over the guideline. In terms of gases level, CO2 (24hr average) was 543 ppm.

The meteorology findings (Temperature, Relative Humidity) during the monitoring were presented below. (Table 5.7)

Table 5.7: Ambient air monitoring at point (5), Beside the packaging

Parameters	**Concentration (24hr average) except some Gases (NO2, CO and O3)***	**National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)**
PM10	37[a](13[b]-77[c]) µg/m^3	50 µg/m^3
PM 2.5	31[a](8[b]-66[c]) µg/ m^3	25 µg/m^3
PM1	23[a](2[b]-60[c]) µg/ m^3	NA
CO2	543[a](0[b]-10000[c])ppm	NA
Meteorology		
T (Degree C)		33[a](32[b]-33[c])
RH		71[a](69[b]-73[c])
Remark		
The factory workers worked around the monitoring area during working hour.		

[a] Average [b] Min [c]Max

Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the project area.

Green – meets the standards
Yellow (slightly over)
Orange (exceeding)

Ambient air monitoring point (5) was set up around the packaging area. According to the data, PM2.5 was slightly increased than the guideline which can be due to the particulate matters releasing from the packaging area.

5.2.7 Point (6): The existing baseline ambient air monitoring at Location (6), beside the printing

Figure 5.12: Ambient air monitoring beside the printing

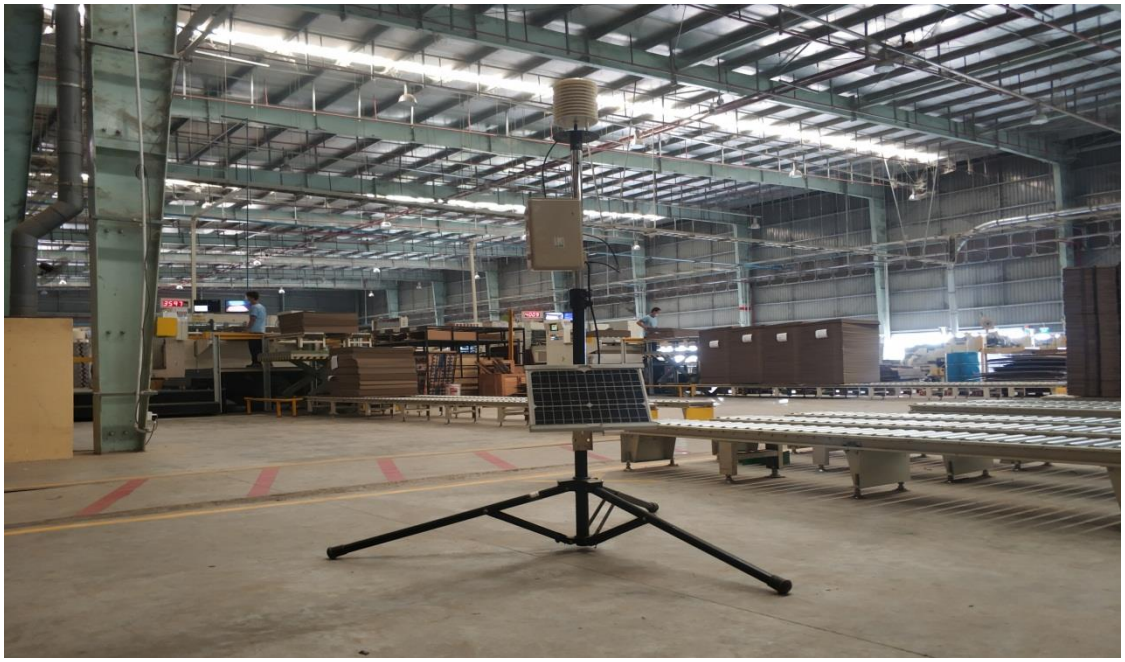


Figure 5.13: Ambient air monitoring beside the printing

The point 6 is located beside the printing site of the factory. Regarding particulates, Table 5.8 presents both the levels of PM10 (40µg/m^3) which met the National Environmental Air Quality

Guideline (ECD), except from PM2.5 (33 µg/m^3) which is slightly over the guideline. In terms of gases level, CO2 (24hr average) was 451 ppm.

The meteorology findings (Temperature, Relative Humidity) during the monitoring were presented below. (Table 5.8)

Table 5.8: Ambient air monitoring at point (6), beside the printing

Parameters	**Concentration (24hr average) except some Gases (NO2, CO and O3)***	**National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)**
PM10	40[a](2[b]-96[c]) µg/m^3	50 µg/m^3
PM 2.5	33[a](2[b]-59[c]) µg/m3	25 µg/m^3
PM 1	24[a](2[b]-45[c]) µg/m^3	NA
CO2	451[a](417[b]-545[c])ppm	NA
Meteorology		
T (Degree C)		34[a](32[b]-37[c])
RH		67[a](58[b]-72[c])
Remark		
The factory workers worked around the monitoring area during working hour.		

,[a] Average [b] Min [c]Max
Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the project area.
Green – meets the standards
Yellow (slightly over)
Orange (exceeding)

Ambient air monitoring point (6) was set up around the printing area. According to the data, PM2.5 was slightly increased than the guideline which can be due to the particulate matters releasing from the printing activities.

5.2.8 Point (7): The existing baseline ambient air monitoring at location (7), Office room

Figure 5.14: Ambient air monitoring at Office room

Figure 5.15: Ambient air monitoring at Office room

The point 7 is located at the office room of the factory. Regarding particulates, Table 5.9 presents both the levels of PM10 (0.2 µg/m^3) and PM 2.5 (0.1 µg/m^3) which met the National Environmental Air Quality Guideline (ECD) adopted from WHO Guideline (24hr average). In terms of gas level, CO2 (24hr average) was 538 ppm.

The meteorology findings (Temperature, Relative Humidity) during the monitoring were presented below. (Table 5.9)

Table 5.9: Ambient air monitoring at point (7), office room

Parameters	**Concentration (24hr average) except some Gases (NO2, CO and O3)***	**National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)**
PM10	0.2[a](0[b]-13[c]) µg/m^3	50 µg/m^3
PM 2.5	0.1[a](0[b]-13[c]) µg/m3	25 µg/m^3
PM 1	0.1[a](0[b]-12[c]) µg/m3	NA
CO2	538[a](495[b]-574[c])ppm	NA
Meteorology		
T (Degree C)		27[a](26[b]-29[c])
RH		58[a](55[b]-69[c])
Remark		

,[a] Average [b] Min [c]Max
Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the project area.
Green – meets the standards
Yellow (slightly over)
Orange (exceeding)

5.2.9 Point (8): The existing baseline ambient air monitoring at location (8), Conference room

Figure 5.16: Ambient air monitoring at Conference room

Figure 5.17: Ambient air monitoring at Conference room

The point 8 is located at the conference room of the factory. Regarding particulates, Table 5.10 presents both the levels of PM10 (0.3 µg/m^3) and PM 2.5 (0.24 µg/m^3) which met the National Environmental Air Quality Guideline (ECD) adopted from WHO Guideline (24hr average). In terms of gas level, CO2 (24hr average) was 523 ppm.

The meteorology findings (Temperature, Relative Humidity) during the monitoring were presented below. (Table 5.10)

Table 5.10: Ambient air monitoring at point (8), Conference room

Parameters	**Concentration (24hr average) except some Gases (NO2, CO and O3)***	**National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)**
PM10	0.3[a](0[b]-31[c]) µg/m^3	50 µg/m^3
PM 2.5	0.24[a](0[b]-31[c]) µg/m3	25 µg/m^3
PM 1	0.18[a](0[b]-18[c]) µg/m3	NA
CO2	523[a](458[b]-574[c])ppm	NA
Meteorology		
T (Degree C)		27[a](26[b]-31[c])
RH		64[a](55[b]-88[c])
Remark		

,[a] Average [b] Min [c]Max

Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the project area.

Green – meets the standards
Yellow (slightly over)
Orange (exceeding)

5.2.10 Point (9): The existing baseline ambient air monitoring at location (9), Canteen

Figure 5.18: Ambient air monitoring at Canteen

Figure 5.19: Ambient air monitoring at Canteen

The point 9 is at the canteen of the factory. Regarding particulates, Table 5.11 presents both the levels of PM10 (1 µg/m^3) and PM 2.5 (0.7 µg/m^3) which met the National Environmental Air Quality Guideline (ECD) adopted from WHO Guideline (24hr average). In terms of gas level, CO2 (24hr average) was 597 ppm.

The meteorology findings (Temperature, Relative Humidity) during the monitoring were presented below. (Table 5.11)

Table 5.11: Ambient air monitoring at point (9), Canteen

Parameters	**Concentration (24hr average) except some Gases (NO2, CO and O3)***	**National Environmental Air Quality Guideline (ECD)/WHO Guideline (24hr average)**
PM10	1[a](0[b]-106[c]) µg/m^3	50 µg/m^3
PM 2.5	0.7[a](0[b]-94[c]) µg/m3	25 µg/m^3
PM 1	0.4[a](0[b]-87[c]) µg/m3	NA
CO2	597[a](0[b]-10000[c])ppm	NA
Meteorology		
T (Degree C)		27[a](23[b]-31[c])
RH		76[a](62[b]-93[c])
Remark		

,[a] Average [b] Min [c]Max
Referring to National Environmental Air Quality Guideline (ECD), the color codes are categorized in order to reveal the general air quality status around the project area.
Green – meets the standards
Yellow (slightly over)
Orange (exceeding)

5.3 Existing noise quality

5.3.1 Introduction

Industrial noise refers to noise that is created in the factories which is jarring and unbearable. Sound becomes noise only when it becomes unwanted and if it becomes more than that it is referred to as "noise pollution". Noise pollution affects both health and behavior. Unwanted sound (noise) can damage physiological health. Industrial Noise resulting to noise pollution has many reasons such as industries being close to human habitats which prevent the noise from decaying before it reaches human ear. The purpose of this project was to ascertain industrial noise pollution and its impact on the immediate workers and nearby local community.

Figure 5.20: Google Map of noise sampling

5.3.2 Noise Levels

The following table 5.12 shows the overall noise level from the factory. The noise level around of the proposed factory is assumed as acceptable level.

Table 5.12: Baseline average noise data of the proposed factory (both day and night)

Area	Whole Day Noise Level (Db)	Day Time Noise Level (Db)	Night Time Noise Level (Db)	Noise standard value of EQG
OJIGS Packaging (Yangon) Company	$68.5^{a}\pm0.25^{b}$ $60^{c}(37^{d}\text{-}83^{e})$	$69^{a}\pm0.35^{b}$ $59^{c}(41.5^{d}\text{-}83^{e})$	$66.5^{a}\pm0.4^{b}$ $66.5^{c}(39.5^{d}\text{-}78^{e})$	**70**

aAveragebStandard Error cMediandMineMax

(a) Point (1) Factory compound

Based on the findings, the average noise levels (both day and night time) at OJI GS factory compound were meet the EQEG. Generally, these levels were mainly captured from vehicles (Cars), noise of the heavy raindrop and noise of the airplane landing.

Table 5.13: 24hr average noise level at factory compound

Area	Whole Day Noise Level (Db)	Day Time Noise Level (Db)	Night Time Noise Level (Db)	Noise standard value of EQG
Factory compound of the project site	$53^{a}\pm0.1^{b}$ $48^{c}(39^{d}\text{-}72^{e})$	$55^{a}\pm0.2^{b}$ $49^{c}(40^{d}\text{-}72^{e})$	$49^{a}\pm0.1^{b}$ $48^{c}(39^{d}\text{-}65^{e})$	**70**

aAverage bStandard cMedian dMin eMax

Figure 5.21: Noise monitoring station at OJI GS factory compound

(b) Point (2) Factory office room

Based on the findings, the average noise levels at the OJI GS factory office room were met the EQEG. Generally, these levels were mainly captured from people activities and corrugator.

Table 5.14: The noise level at factory office room

Area	**Working hour (8 hours) Average Noise Level (dB)**	**Noise standard value of EQG**
Factory office room	$63^{a}\pm0.2^{b}$ $62^{c}(49^{d}\text{-}75^{e})$	**70**

aAverage bStandard cMedian dMin eMax

Figure 5.22: Noise monitoring station at OJI GS factory office room

(c) Point (3) Factory conference room

Based on the findings, the average noise levels at the OJI GS factory conference room were met the EQEG. Generally, these levels were mainly captured from people activities and corrugator.

Table 5.15: 24hr average noise level at factory conference room

Area	**Working hour (8 hours) Average Noise Level (dB)**	**Noise standard value of EQG**
Factory conference room	$63^{a}\pm0.1^{b}$ $62^{c}(60^{d}\text{-}75^{e})$	**70**

aAverage bStandard cMedian dMin eMax

Figure 5.23: Noise monitoring station at OJIGS factory conference room

(d) Point (4) factory production area

Based on the findings, the average noise levels (both day and night time) at the point 3 were slightly over the EQEG because this point was very closely with corrugator machines. Generally, these levels were mainly captured from vehicles (Forklifts), people activities and noise of the corrugator machines.

Table 5.16: 24hr average noise level at factory production area

Area	Whole Day Noise Level (Db)	Day Time Noise Level (Db)	Night Time Noise Level (Db)	Noise standard value of EQG
Factory production area	$84^{a}\pm0.4^{b}$ $72^{c}(35^{d}\text{-}94^{e})$	$83^{a}\pm0.5^{b}$ $69^{c}(43^{d}\text{-}94^{e})$	$84^{a}\pm0.7^{b}$ $85^{c}(40^{d}\text{-}91^{e})$	**70**

aAverage bStandard cMedian dMin eMax

Figure 5.24: Noise monitoring station at factory production area

(e) Point (5) factory boiler area

Based on the findings, the average noise levels (both day and night time) at the point 3 were slightly over the EQEG because this point was very closely with corrugator machines. Generally, these levels were mainly captured from vehicles (Forklifts), people activities and noise of the corrugator machines.

Table 5.17: 24hr average noise level at factory boiler area

Area	**Working hour (8 hours) Average Noise Level (dB)**	**Noise standard value of EQG**
Factory boiler area	$77^{a}\pm0.5^{b}$ $63^{c}(52^{d}\text{-}85^{e})$	**70**

aAverage bStandard cMedian dMin eMax

Figure 5.25: Noise monitoring station at factory boiler area

5.4 Existing Vibration quality

5.4.1 Introduction

The ambient vibration level monitoring was carried out for 24hr continuously at selected point located at the Mingalardon township, Yangon region, Myanmar, where people are spending several hours working in weekdays and weekend.

5.4.2 Objective

It was aimed to reveal the existing baseline ambient vibration level.

5.4.3 Vibration monitoring locations

Location of vibration sampling station is listed in **Table 3.1.**

- Point 1 Production area

Table 5.18: Vibration sampling locations for baseline survey, June, 2021

Points	Locations	Coordinates		Start Date	End Date
		N	E		
1	Production area	16°56'45.85"N	96° 9'24.83"E	10.6.2021	11.6.2021

(a) Point (1) Production area

Table 5.19: The 24hr average vibration level at production area

Area	24hr Average Vibration Level (m/s^2)	whole-body vibration (WBV) Daily exposure limit value (ELV) (ms2) A (8).
Production area	Below the detection limit <0.5m/s^2	1.15 m/s^2

Speed measurement range: 0.5 ~ 199.9m / s2
Accelerometer area: 0.5 ~ 199.9 m /s2 (Peak)

Figure 5.26: Map of vibration monitoring at production area

Figure 5.27: Vibration monitoring station at production area

5.5 Existing Soil quality

5.5.1 Importance of soil

The project area includes mostly the industries already for 10 years. The area is suburban flat area along with rare cultivated (about ***90% of land*** is ***concrete*** in the industrial zone). The physical appearance of the remaining soil is ***Coarse sandy soil.*** Which is easy to cultivate, has plenty of serration for good root growth, and is easily wetted, but it also dries rapidly and easily looses plant nutrients, which are drained away rapidly with the water.
According to the field survey, the industrial zone itself and nearby surrounding have less practice of cultivation and farming likely due to the urban developments.

5.5.2 Flora and fauna

The analysis of biodiversity is focused on the project area. It was found out that there ***is no protected area and area of biodiversity importance, key biodiversity areas at national and local levels and sensitive areas*** in and around the industrial zone including the OJIGS packaging (Yangon) company Limited.

According to the traditional biodiversity related knowledge survey, there is ***no both negative and positive impact on the nature, local animals, plants and pasture*** etc. because of the industrial developments.

Thus, it can be assumed that there is less impact on the biological environment by the industry and its activities. According to screening and scoping results, there is no specific biodiversity assessment required.

5.5.3 Rainfall and Temperature

Study area has a tropical monsoon climate. The summer here have a good deal of rainfall while the winters have very little. The average annual temperature is 27.3°C and the average annual rainfall is2, 378 mm. The difference in precipitation between the driest month and the wettest month is 513mm. During the year, the average temperature varies by 5.5°C.

5.6 Existing situation of potable water and wastewater quality

5.6.1 Introduction

Water is not only necessary for Man's survival on Earth but also is an essential component for the improvement of the quality of life of the people living in developing countries (Biswas and Asce, 1980). Water is one of the essential needs for the industrialization process and human health. Industrialization has become an important factor to the development of a country's economy, through the establishment of plants and factories. However, the waste or by-products discharged from them are severely disastrous to the environment consists various kinds of contaminants which contaminate the surface water, ground water and soil.

Corrugated cardboard production is one of the most essential products around the world. In this factory, from the process of corrugated cardboard production, both solid wastes, wastewater and others environmental problems come out day to day in the surrounding.. The wastewater from the corrugated cardboard manufacturing factory has high concentration of organic pollutants. So it can impact on for the surrounding water bodies along with aquatic life and, human health if discharged directly into the surface water. The proposed factory has the waste water treatment plant. Therefore it will discharge waste water to the public drainage after treatment.

5.6.2 Objectives of the study

a. To reveal the baseline situation of water usage and wastewater production rate in the factory
b. To recommend suitable management plan both potable water and effluent waste water to reduce environment impact

5.6.3 Potable water analysis

According to the observation, water is one of the essential raw materials for the process. It is used in both industrial process and domestic usage. In the process of OJIGS packaging (Yangon) company, according to the information provided by the factory, the water usage in this manufacturing process is around 27026 gallon per day. It is from the two different main sources including manufacturing process and others activities. Based on the analysis, 60% of water usage is for the manufacturing process and 40% of the water usage is for the domestic. The factory installs wastewater treatment system in the project site. The main sources of potable water come from the public water supply.

In terms of the potable water sources, there is water storage tank in the factory. From that storage tank, one sample was taken for potable water analysis**.** That sample was analyzed for 5parameters each including chemical and physical parameters which are significantly important for the human health and surrounding environment.

Figure 5.28: Google map of water sampling

Figure 5.29: Tap water sampling

Table 5.20: The results along with the permissible limits of the factory's tap water

No.	Test Parameters	Unit	Tap Water	WHO Drinking Water Guideline	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	Remarks
1	TSS	mg/L	1	-	≤ 50		Normal
2	BOD5	mg/L	3.5	-	≤ 50		Normal
3	COD	mg/L	<30	-	≤ 250		Normal
4	Nitrate-Nitrogen	mg/L	1.4	-	-	-	
5	Total coliform count	MPN/100ml	460	0	400	-	Above the limit

All the analytical results were compared with three different guidelines namely WHO guidelines, National Environmental Quality (Emission) Guidelines and IFC Effluent Guidelines. Being situated at the factory premises, the findings are compared with the EQEG guideline in order to determine the contaminants released from the wastewater.

According to the drinking water guidelines, there are around 5 parameters of potable water was analyzed for the potable water of the factory. All of parameters are the important parameters such as both physical and chemical parameter which can affect on not only human health but also environment. These are Total Suspended Solid (TSS) , BOD5, COD, Nitrate-Nitrogen, Total Coliform Count.

According to the results, the tank water of the proposed factory meets the standards, except from the Total Coliform. The Total Coliform result is slightly over the National Environmental Quality (Emission) Guidelines. However, the significant parameters, such as Total Suspended Solid (TSS), BOD5, COD and Nitrate-Nitrogen meet the standards. Because of those water conditions, the potable water will not negatively affect not only on the environmental but also on the factory community (employees).

5.6.4 Storm water analysis

The main sources of storm water come from the domestic usage and the rest comes from the other industrial activities. According to the existing system, there are two drain systems in the whole compound and all the wastewater from different sources are flowing through those drainage system. All the combination of storm water from different sources finally flows into public drainage system. In the manufacturing process, the factory installs wastewater treatment system in the project site.

Looking at storm water analysis, both physical and chemical characteristics were analyzed. The parameters were selected mainly based on National Environmental Quality (Emission) Guidelines by Environmental Conservation Department (ECD). These are Total Suspended Solid (TSS) , BOD5, COD, Nitrate-Nitrogen and Total Coliform Count. The following table shows the results and the permissible limits for water discharges. The sample was taken from final drainage area of the proposed factory.

Figure 5.30: Storm water sample collection from drainage area

Table 5.21: The results along with the permissible limits of the factory's Storm water

No.	Test Parameters	Unit	Storm Water	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	Remark
1	TSS	mg/L	1		≤ 50		Normal
2	BOD5	mg/L	58		≤ 50		Above the limit
3	COD	mg/L	167		≤ 250		Normal
4	Nitrate-Nitrogen	mg/L	0.7	-	-	-	-
5	Total coliform count	MPN/100 ml	1100	-	400	-	Above the limit

According to the results, the storm water of the proposed factory, all parameters meet the standards except from the BOD5 and Total coliform. Especially, the significant parameters, such as Total Suspended Solid (TSS), COD, Nitrate-Nitrogen meet the standards. BOD5 is slightly over the National Environmental Quality (Emission) Guidelines by Environmental Conservation Department (ECD). Total Coliform count is exceeded over the National Environmental Quality (Emission) Guidelines. To reduce the Total Coliform, it is needed to turn off the taps and leave the system alone for 12 hours so the chlorine has enough time to kill the bacteria. To remove the bleach, pump the well water out through a hose attached to a tap (inside or out, but away from the septic system) until you can't smell the chlorine.

5.6.5 Wastewater analysis

In terms of the waste water, there is only wastewater effluent from canteen which flow into the septic tank inside the factory compound. For the industrial waste water which are treated by the wastewater treatment system. The treated wastewater finally flows into the public drainage system.

Looking at wastewater analysis, both physical and chemical characteristics were analyzed. The parameters were selected mainly based on National Environmental Quality(Emission) Guidelines by Environmental Conservation Department (ECD). These are Silver, Selenium, Chromium, Cadmium, Mercury, Total Nitrogen, Hexavalent Chromium, Total Phosphorus, Apparent Colour3, TSS, BOD5, COD, Free Cyanide, Aluminium, Arsenic, Copper, Iron, Lead, Zinc, Sulfide, Phenol, Fluoride, Oil & Grease and Total coliform count. The following table shows the results and the permissible limits for water discharges. The sample was taken from treated wastewater from the wastewater treatment plant.

Figure 5.31: Waste water sample collection from wastewater treatment plant

Table 5.22: The results along with the permissible limits of the factory's wastewater

No.	Test Parameters	Unit	Wastewater	WHO Guidelines	National Environmental Quality (Emission) Guidelines	IFC effluent guidelines	Remark
1	Silver (mg/L as Ag)		0.074	N/A	0.5		Normal
2	Selenium (mg/L as Se)		<0.01	0.04	0.1		Normal
3	Chromium (mg/L as Cr)		<0.01		0.5		Normal
4	Cadmium (mg/L as Cd)		<0.005	0.003	0.1		Normal
5	Mercury (mg/L as Hg)		≤0.002	N/A	0.01		Normal
6	Hexavalent Chromium (mg/L as Cr^{6+})		<0.05		0.1		Normal
7	Total Nitrogen (mg/L)		2.6	N/A	0.01		Above the limit
8	Total Phosphorus (mg/L as P)		1		2		Normal
9	Apparent Colour3	HU	138	N/A	N/A		
10	TSS	mg/L	17		≤ 50		Normal
11	BOD5	mg/L	49		≤ 50		Normal
12	COD	mg/L	103		≤250		Normal

13	**Free Cyanide**	**mg/L**	**< 0.01**		**≤ 0.1**		**Normal**
14	**Aluminium**	**mg/L**	**0.1**	**-**	**-**	**-**	**-**
15	**Arsenic**	**mg/L**	**0.025**	**-**	**≤ 0.1**		**Normal**
16	**Copper**	**mg/L**	**0.02**	**-**	**≤ 0.5**	**-**	**Normal**
17	**Iron**	**mg/L**	**0.11**	**-**	**≤ 3.5**	**-**	**Normal**
18	**Lead**	**mg/L**	**ND**	**-**	**≤ 0.1**	**-**	**LOD=0.1**
19	**Zinc**	**mg/L**	**0.02**		**≤2**	**-**	**Normal**
20	**Sulfide**	**mg/L**	**<0.04**	**-**	**≤1**	**-**	**Normal**
21	**Phenol**	**mg/L**	**<0.1**	**-**	**≤ 0.5**	**-**	**Normal**
22	**Fluoride**	**mg/L**	**<0.05**	**-**	**≤20**	**-**	**Normal**
23	**Oil & Grease**	**mg/L**	**4**	**-**	**≤10**	**-**	**Normal**
24	**Total coliform count**	**MPN/100 ml**	**>1100**	**-**	**400**		**Above the limit**

Based on the findings, the effluent level of Total Nitrogen and Total Coliform from the wastewater treatment plant are higher than the National Environmental Quality (Emission) Guidelines. The other parameters meet the WHO guideline, National Environmental Quality (Emission) guideline and IFC effluent guideline.

Total nitrogen can have damaging effects on the environment and particularly on aquatic life, the fish, shellfish and other creatures in our rivers, lakes and oceans because most nitrogen is leaked into waterways. Total nitrogen can also lead to toxic blue-green algal blooms.

The presence of fecal coliform bacteria in aquatic environments indicates that the water has been contaminated with the fecal material of man or other animals. Fecal Coliform bacteria indicate the presence of sewage contamination of a waterway and the possible presence of other pathogenic organisms.

Increased total nitrogen as well as Total coliform in the wastewater can be resulting from usage of Starch as the raw material in the production process.

However, the remaining important parameters such Silver, Selenium, Chromium, Cadmium, Mercury, Total Phosphorus, Hexavalent chromium, Apparent colour, TSS, BOD5, COD, Free Cyanide, Aluminium, Arsenic, Copper, Iron, Lead, Zinc, Sulfide, Phenol, Fluoride and Oil & Grease meet the guidelines.

Chapter 6

Impact and Risk Assessment and Mitigation Measures

6 Identification and assessment of potential environmental impacts

All potential environmental and social impacts from construction phase, operation phase and decommissioning phase are identified to develop preventive mechanisms and management plans. While short term impacts are assessed, compulsory regular monitoring and evaluation procedures by qualified independent body will address long term issues. This chapter comprises pollution types, sources, issues, affected parties, and finally, classifications of impacts. The objectives of this assessment are to identify the impacts of the printing and packaging process on the natural environment and human beings and to develop a proper management plan which is to eliminate or reduce adverse impacts on the surrounding environment.

The impacts on the environment from various project activities can be categorized as follow;
Impacts on Environmental Resource

- Impact on Air Quality
- Impact on Noise and Vibration Levels
- Impact on Surface Water Quality
- Impact on Ground Water Quality
- Impact on Soil
- Oil and Fuel Spills

Impacts on Ecological Resources

- Forest
- Wildlife
- Aquatic Animal/ Fish

Impact on Human Environment

- Health and Safety
- Socio- economics

Impact on Waste Disposal

Potential impacts have been differentiated into three main phases of development, i.e. Preparation phase/Construction Phase, Operation phase and Decommissioning/Closure phase.

6.1 Construction phase

Construction Phase includes site preparation and construction activities. The following potential environmental impacts are identified with varying degrees of effects.

6.1.1 Impact assessment and mitigation measures for air quality

6.1.1.1 Potential impacts on air

Air quality impacts associated with construction of the proposed project would include fugitive dust and emissions from fossil-fuel-fired construction equipment, open burning and temporary fuel transfer systems and associated storage tanks. There may also be gaseous emissions including PM_{10}, $PM_{2.5}$, NO_2, CO_2, SO_2, VOC, Methane O3 etc. from diesel generators and combustion of fuel for vehicle movements. Generally, this will adversely affect localized air quality for a short period and may lead to health risks associated with air pollution. Criteria pollutant and air emissions that would arise from the construction of the proposed project are quantified and summarized below.

- Land clearing, excavation, leveling and earth work
- Heavy construction equipment/vehicles such as diesel-powered bulldozers and loaders would be used throughout the entire construction phase
- Vehicle traffic on paved and unpaved roads
- Construction activities, concrete work
- Burning of slash materials such as hay, grass, trees, etc.

- Temporary fuel transfer systems and storage tanks have the potential to release VOC emissions
- Worker accommodation, including cooking operations

Adjacent to the construction site and along the transportation route, natural habitat, residents, and construction crew will be potentially affected.

6.1.1.2 Impact significance on air quality

a) Impact significance on air quality by particulates

The construction activities may lead to abundant of particulate matters such as the dusts from the transportation of materials and concrete particles used in construction.

The ***magnitude of impact*** on air quality by particulates was "***High***".
The area of impact will be not only within the area of construction activities but also in the vicinity area according to wind direction. Therefore, the ***extent of the air quality impact*** from particulates was "***Medium***".

The period of impact occurrence will be during within the construction period and the ***duration*** of the impact by particulate matters through construction was considered as "***Low***".

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be "***Medium".***
Particulate matter is directly linked to the potential for causing health problems. The ***importance*** of the impact on air was considered as "***Medium***".

Therefore, the impact from particulate matters by the OJIGS Packaging factory construction will be a little high and the ***significance of the impact*** would be "***Medium".***

Table 6.1 Impact significance on air particulates during construction period

Characteristics					
Magnitude	Extent	Duration			
3 (High)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 3+2+1 = 6			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

b) Impact significance on air quality by gas emission

Emission from machines and equipment, generator and emission from vehicles transporting construction materials will be occurred and they will affect ambient air quality during construction of OJIGS Packaging factory. Air quality degradation can be the main source of health effect on people.

The ***magnitude*** of impact on air quality by gas emission was "***Medium***".

The area of impact will be within the area of factory compound and vicinity area. Therefore, the ***extent of the impact*** on air quality was "***Medium***".

The period of impact occurrence will be within the project period and this impact will affect along the working hours. The ***duration*** of the impact of gas emission was considered as "***Low".***

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be ***"Medium***".

Air quality degradation can have adverse effect on human health and can also have damage to animal life and vegetation depending on volume of emission. Therefore, the importance of the impact on air quality by gas emission was considered as "Medium".

Therefore, the impact of gas emission by the OJIGS Packaging factory will be less and the ***significance of the impact*** would be "***Medium***".

Table 6.2 Impact significance on gas emission during construction period

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

6.1.1.3 Mitigation measures for air quality

During the construction phase, the following mitigation measures are recommended to minimize ambient air quality impacts.

- Wind breaks should be constructed around the main construction activities and in the locality of potentially dusty works.
- Avoid excavation works in extremely dry weathers.
- Prohibit open burning of any waste at project site.
- Soil erosion and dust control management measures also assist in the management of air pollution from construction operations.
- Air pollution from vehicles will be minimized by using low emission equipment and vehicles.
- Ensure that all construction equipment and vehicles are maintained in accordance with the manufacture's recommendations.
- Minimizing the movement of vehicles and construction machineries particularly outside the premise of the project site to avoid further destruction.
- Fuel efficient stoves and cooking equipment will be provided to reduce emission from food processing at the site during construction activities.
- Turn equipment off when not in use.
- Vehicle idling time shall be minimized.
- Alternatively, fueled construction equipment shall be used where feasible.
- Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles.
- Construction materials on site to be covered to prevent to be blown off by wind.
- Stockpiling of material, for example, rocks, sand and soils should be minimized.
- Stockpiles should be located as far away from receptors as possible.
- Vegetation of stockpiles should be used where a stockpile is not to be used for a month to stabilize the surface and prevent dust generation.
- Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
- Visual monitoring of dust deposition onto surfaces on and off-site should be regularly conducted.
- Ensure strict enforcement of on-site speed limit regulations.

After mitigation measure, the impact on air quality will become ***less significant***.

Table 6.3 after mitigation measures, impact significance on air quality during construction period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		1 ***(Low)***

6.1.2 Impact assessment and mitigation measures for noise level

6.1.2.1 Potential impacts on noise

The construction works on site will most likely result in noise nuisance due to mobilization and operation of construction machines (mixers, tippers, cranes, and back-hoe), incoming vehicles to deliver construction materials, and communicating workers.

Construction of the proposed project would increase noise levels. Construction noise levels are rarely steady in nature, but instead fluctuate depending on the number and type of equipment in use at any given time. There would be times when no large equipment is operating and noise would be at or near ambient levels. Flow of traffic, mobile heavy equipment and machinery, earthworks, pounding and impacting, shouting, loud radios, foundation and building works all cause noise and vibration. Construction noise impact is short term pollution to local ambient noise quality. Noise and vibration affect natural vegetation, animals, the workforce, and communities from the areas.

Noise impacts would be considered significant if the project would result in the following: -

- Exposure of person to, or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- Exposure of person to, or generation of, excessive ground-borne vibration or ground-borne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

6.1.2.2 Impact significance on noise levels

Noisy activities on construction sites include use of jackhammers, dump trucks, cement mixers, cement cutters, electric saws, tamping machines and welding machines, as well as noise generated from hand tools such as sledgehammers and drills. The ***magnitude*** of impact from noise was "***Medium"***

The ***area of impact*** will be not only within the factory but also in the vicinity area. Therefore, the extent of the impact on noise and vibration was "***Medium***".

The period of impact occurrence will be within the construction period. The construction workers and people in the vicinity area will have impact from noise and vibration of the proposed project and the ***duration*** of the impact from noise and vibration were considered as "***Low***".

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be ***"Medium".*** The ***importance of the impact*** was "***Medium***".

Therefore, the impact noise and vibration by the OJIGS Packaging factory will be a little high during the construction and the significance of the impact would be "Medium".

Table 6.4 Impact significance on noise quality during construction period

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

6.1.2.3 Mitigation measures for noise quality

During proposed project construction, the following mitigation measures are recommended to minimize noise impact on individuals, sensitive areas and livestock.

- Use quiet equipment (i.e. equipment designed with noise control elements)
- Limit pickup trucks and other small equipment to an idling time of five minutes, observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.
- Careful handling of material loading and unloading.
- Ensure use of silencers or mufflers on heavy construction equipment engines.
- Construction machinery and vehicles will undergo periodic maintenance to keep them in good working condition.
- Perform regular inspection and maintenance of preparation vehicles and equipment.
- Turn equipment off when not in use.
- Taking consideration to be careful sequencing and scheduling times.
- Schedule noisy construction activities and transportation during day-time hours.
- Combine noisy operations at the same time, but avoid combination of vibration
- Provide PPE particularly hearing protection devices for those working in noisy areas.
- Locate noisy plant as far away from receptors as practicable.
- Orientate equipment known to emit noise strongly in one direction so that the noise is directed away from receptors as far as practicable.
- Avoid institutions sensitive to noise such as settlement, schools, health institution or other offices close to the project site.

After mitigation measure, the impact on noise quality will become ***less significant.***

Table 6.5 after mitigation measures, impact significance on noise quality during construction period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1=3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		***1 (Low)***

6.1.3 Impact assessment and mitigation measures for water quality

6.1.3.1 Potential impacts on water quality

In the Construction phase, removal of vegetation, top soil level and ground surface for the production facilities and staff houses can cause sedimentation, and erosion to the nearby water courses. Sedimentation as a result of the erosion will reduce to water clarity and quality. In addition, potential sources of impacts to water during the construction phase include:

- Clearing land for operation purposes
- Constructing landforms that change water flow paths
- Chemicals/Oil spills from the storage, use of diesel and hazardous materials that lead to contamination of water resources
- Release of suspended soil to the water flows
- Leaks from on-site power generation facilities
- Improper solid waste and wastewater management in the construction site
- Improper wastewater disposal from cleaning vehicles and equipment and
- Poor sanitation facilities that may result into surface water pollution through improper sewage management.

The proposed project will create increased water demand during construction phase for site preparation, dust spraying, construction activities, and curing, domestic and other water requirements for labor and staff onsite. Increase in site runoff may also be ensued.

6.1.3.2 Impact significance on water quality

a) Impact significance on water quality

According to the result, the ***magnitude*** of the impact of physical, chemical and biological result of the water was considered as "***Low***".

The ***area of the potential impact*** will be within the immediate area of project activities and factory community however the result was not much higher than the standard guidelines except hardness.

The ***extent of all parameters*** for physical, chemical and biological results are noted as "***Low***" level.

The ***period of potential impact*** duration can be short term duration. The ***duration*** of the impact for water was set as "***Low"***.

Therefore, the ***characteristic of water impact*** by the proposed project was rated as ***"Low".***

The impact is expected to cause some disturbances potentially affecting communities locally and surrounding water bodies. The ***importance*** of the impact on water was set as "***Medium***".

The significant rating of impact was set as "***Low"***.

Table 6.6 Impact significance on water quality during construction phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		1 (Low)

6.1.3.3 Mitigation for water quality

The following mitigation measures should be practiced and used to reduce potential impacts for water resources from each specification.

- Limit water withdrawal to the amount that will not adversely affect the groundwater balance and the demand of the local community, by developing and conserving own source of water.
- Promote recycling and reuse of water as much as possible.
- Implement road drainage system and smooth road to limit erosion.
- Promptly detect and repair of water pipe and tank leaks.
- Ensure taps are not running when not in use.
- Proper recycling of water from other uses for sprinkling dusty pavements.
- Soil erosion and sediment control mechanisms will add positive effects on mitigation matters for water pollution.
- All chemicals, paint, and fuel containers will be properly sealed and rigorous spill prevention mechanisms will be employed. Spills will be immediately treated to stop subsequent water pollution.
- Conducting regular training, monitoring, and inspection schemes together with keeping track of water uses minimizes waste and leaks from faulty connections and faucets.
- Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms.
- Provide measures to prevent the washing away of construction materials, soil, silt or debris into any drainage system of open stockpiles of construction materials.
- Hazardous-materials handling procedures to reduce the potential for a spill during construction, and will include an emergency response program to ensure quick and safe cleanup of accidental spills.

6.1.4 Impact assessment and mitigation measures for soil quality

6.1.4.1 Potential impacts on soil quality

During this construction process, it may cause impact to soil system and its quality due to soil erosion, clearing and preparation of factory area. Earth moving and excavation activities will affect the natural surface flow regime of water.

Improper disposal of the excavated earth during installation of structures/equipment may result into temporary loss of topsoil productivity of that particular area. Further, clearing of vegetation and scarifying the site of topsoil with soil compaction during site preparation will result in reduced capacity of the land to retain water and increase surface water run-off during periods of rainfall. Accidental spillage of construction materials/chemicals during handling and leakage from the storage area may lead to soil contamination.

6.1.4.2 Impact significance on soil quality

In construction period, it may cause impact to soil system because the existing soil and vegetation had to be removed and consequently soil erosion can take place.
The ***magnitude*** of impact on soil quality was "***Medium"***

The ***area of impact*** will be only within the area of factory compound. Therefore, the ***extent*** of the impact on soil quality and structure was "Low".

The period of impact occurrence will be remained after the project period and the ***duration*** of the impact on soil quality and structure was considered as "***Medium"***.

According to magnitude, extent and duration of the impact, the ***impact characteristic*** was considered as ***"Medium".*** The ***importance of the impact*** was considered as "***Low"***.

Therefore, the impact on soil quality and structure by the OJIGS Packaging factory was less and the significance of the impact would be "Low".

Table 6.7 Impact significance on soil quality during construction period

Characteristics					
Magnitude	Extent	Duration	Equivalent Characteristics	Importance	
2 (Medium)	1 (Low)	2 (Medium)	2 (Medium)	1 (Low)	Significance
Characteristics = 2+1+2 = 5			Significance = Characteristics x Importance		1 (Low)

6.1.4.3 Mitigation measures for soil

Mitigation measures should be applied to minimize soil pollution and waste management impacts of a project depending upon site and project-specific conditions. Many impacts can be reduced or avoided when considered during the design and construction phase. The following mitigation measures should be used.

- All chemicals, paint, and fuel containers will be properly sealed and rigorous spill prevention mechanisms will be employed. Spills will be immediately treated to stop subsequent soil pollution.
- Careful planning to establish work zones, defining phases of construction, and active management of daily activities will be employed to minimize soil disturbance during the construction phase.
- The project area will be divided into smaller sectors and vegetation from the smaller sectors will be cleared sequentially to minimize soil exposure during construction.
- When required, topsoil will be carefully removed and saved for reuse.
- Frequent water sprinkling and appropriate scheduling for truck and heavy equipment movements will also be arranged throughout the construction period.
- A waste management plan (WMP) starting from waste reduction, waste separation, proper waste collection and transportation for the project should be developed that sets out plans and actions for construction wastes.
- Hazardous-materials handling procedures to reduce the potential for a spill during construction, and will include an emergency response program to ensure quick and safe cleanup of accidental spills.
- Avoid contamination of the surrounding environment by maintaining machines equipment and vehicles regularly and handling of fuel and lubricants with caution.
- Avoid leaks, spills or accidental releases into the soil, surface water and ground water resources by proper storage, handling and transport of hazardous materials.

6.1.5 Impact assessment and mitigation measures for waste disposal

6.1.5.1 Potential impacts by waste disposal

The construction activities generate substantial amounts of solid wastes including excavated materials from the earth work, bricks, concrete and other masonry materials, rock, wood, paints, treated and coated wood and wood products, land clearing debris and plaster.

In addition, lubricants and petroleum wastes, containers, cement paper bags and other packaging materials, scrap metal, glass, plastic containers and food remains will be created due to the construction activities. Filth generation can occur if waste/garbage generated during construction period is not handling.

6.1.5.2 Impact assessment on waste disposal

In construction phase of OJIGS Packaging factory, the ***magnitude*** of waste during construction phase was "***Medium***".

The area of impact will be only ***within the area of factory*** compound. Therefore, the ***extent*** of the impact by waste during construction phase set as "***Low***".

The period of impact occurrence will be within the packaging factory construction period and the ***duration of the impact*** by waste was considered as "***low".***

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be ***"Medium".*** The ***importance of the impact*** was considered as ***"Medium".***

Therefore, waste impact by the OJIGS Packaging factory during construction phase was less and the ***significance*** of the impact was considered as "***Medium***"

Table 6.8 Impact significance on waste disposal during construction period

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+1+1 = 4			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

6.1.5.3 Mitigation measures for waste disposal

Mitigation measures should be applied to reduce hazardous materials and waste management impacts of a project depending upon site and project-specific conditions. Many impacts can be reduced or avoided when considered during the design and construction phase. The following mitigation measures should be used for proper waste disposal.

- Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time.
- Construction materials will be managed in a way to avoid over-ordering, poor storage and maintenance, mishandling as well as improper operation procedures.
- Construction wastes will be separated into reusable items and materials to be disposed of or recycled whenever possible.

- Waste suitable for reuse will be stored on site and reintroduced to the construction process as and when required.
- Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements.
- A hazardous waste management system covering waste classification, separation, collection, storage, transfer and disposal should be set up and operated. The waste management system will comply with applicable regulation of the government, if any, or in its absence, good international practice.
- The waste management plan will identify disposal routes (including transport options and disposal sites) for all wastes generated during the construction phase.
- Hazardous waste will be stored in such a way as to prevent and control accidental release to the environment (e.g. secondary containment, sealed containers).
- Carefully select less hazardous materials and use the necessary amount only.
- Establish a designated hazardous waste collection site and make it secure.
- Do not clean the used hazardous material containers and mix wastes.
- Recyclables such as scrap steel, metals, plastics, and paper items will be collected for recycling wherever possible.
- Packaging materials, cans, and containers would be hauled back to manufactures for reuse in next shipments where economically feasible. Or sell back in local in which these will be recycled or reused for other commercial use.
- Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste.
- Use of plastic bags will be discouraged and explained to the workforce and local communities.
- Disposal of construction waste in or off the construction site should be prohibited.
- Prohibit open burning of any waste at project site.
- Regular collection times will be arranged to prevent overflow in waste collection bins.
- Chain of custody documents should be used for construction waste to monitor disposal.
- Waste segregation should be practiced at the workers camps with an emphasis placed on reducing, reusing and recycling of waste streams as appropriate.

After mitigation measure, the impact on waste disposal will ***become less significant.***

Table 6.9 after mitigation measures, impact significance on waste disposal during construction period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		1 ***(Low)***

6.1.6 Impact assessment and mitigation measures for ecological resources

6.1.6.1 Forest

There is no forest in the vicinity of the OJIGS Packaging factory project. Therefore, the impact on forest by the proposed project is “negligible” significance.

6.1.6.2 Wildlife

There is no wildlife existing in the proximity of the OJIGS Packaging factory project. Therefore, the impact on wildlife by the proposed project is “negligible” significance.

6.1.6.3 Aquatic animal/ fish

There is no impact on aquatic animal/ fish because the project is located in the developed Industrial Zone. Therefore, the impact on aquatic animal/ fish by the proposed project is "***negligible" significance.***

6.1.7 Impact assessment and mitigation measures on human environment

6.1.7.1 Impacts on human environment

a) Impacts on occupational health and safety

During construction of the proposed project, it is expected that ***construction workers*** are likely to have accidental injuries and hazards as a result of accidental occurrences, handling of hazardous waste, lack or negligence of the use of protective wear etc.

Significant hazards can be occurred due to the potential fall of materials or tools as well as temporary hazards such as physical hazards, dust emission and noise pollution. Moreover, accidents and injuries to workers can be caused by the heavy vehicle movement for the transport of construction materials and equipment. Workers are also likely to be exposed to diseases from contact with potentially harmful building materials.

The proposed project will appoint a lot of construction workers in construction phase. A potential social impact both during construction and operation of the project will be on the occupational health and Safety of the staff.

Mitigation measures are described in the next sections and on their working conditions. Before the construction activities, there is need for the materials to be well inspected and harmonized to the occupational health and safety standards.

b) Impacts on Socio- economic

One of the ***main positive impacts*** during projects construction phase is the availability of ***employment opportunities*** especially to casual workers and several other specialized workers. Employment opportunities are of benefit both economically and in a social sense. In the economic sense it means abundant unskilled labors will be used in construction hence economic production.

Several workers including casual laborers, masons, carpenters, joiners, electricians and plumbers are expected to work on the site from start to the end. Apart from casual labor, semi-skilled and unskilled labor and formal employees are also expected to obtain gainful employment during the period of construction. There may not have several informal businesses which come up during the construction periods of such projects, because the proposed project is located in the industrial zone.

Through the use of locally available materials during the construction phase of the project including cement, concrete and ceramic tiles, timber, sand, ballast electrical cables etc., the project will contribute towards growth of the economy by contributing to the gross domestic product.

Negative impact on local business in nearby due to shifting of local labors to the proposed project.

6.1.7.2 Impact assessment on human environment

a) Impact significance on occupational health and safety

There will be impact on health and safety and the ***magnitude of impact*** during construction phase of the factory was "***Medium***".

The impact of the project can affect health and safety of the workers and people in the vicinity area, but the factory is located beside the 2nd road inside the industrial zone. Therefore, the ***extent*** of the impact was "***Low***".

The ***period*** of impact occurrence will be during the construction period and the ***duration*** of the impact on residential area was considered as "***Low***".

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be "***Medium***". The ***importance of the impact*** was considered as "***Medium***".

Therefore, the impact on residential area by the OJIGS Packaging factory will be less and the ***significance of the impact*** would be "***Medium".***

b) Impact significance on socio- economic

OJIGS Packaging factory is located inside the Mingaladon Industrial Park in Mingaladon Township. The local people can get job opportunities as construction workers and skilled labor, therefore the impact by the proposed project on socio- economic may be positive impact.

At the same time, there can be negative impact on local business nearby community due to the shifting of workforce to the proposed project.

Table 6.10 Impact significance on occupational health and safety during construction period

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+1+1 = 4			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

6.1.7.3 Mitigation measures for occupational health and safety

The project will implement the following mitigation measures for Occupational Health and Safety:

- Suitable overalls, safety footwear, dust masks, gas masks, respirators, gloves, ear protection equipment etc. should be made available and construction personnel must be trained to use the equipment in work zones.
- Necessary health and safety rules shall be enforced by the site foreman to ensure that all staff members adhere to the standards and are thus safe.
- Training to personnel will be imparted to generate awareness about effects of noise and importance of using PPEs.
- Adequate collection and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated areas shall be provided.
- Particular works shall strictly follow work permit scheme.
- Promote safe and healthy working environment, health, and well-being of all employees.
- Implement all necessary measures to ensure health and safety of workers.
- Well stocked first aid box which is easily available and accessible should be provided.

After mitigation measure, the impact on occupational health and safety will become ***less significant***.

Table 6.11 after mitigation measures, impact significance on occupational health and safety during construction period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		1 (Low)

6.2 Operation phase

6.2.1 Environmental and social impacts during the operation phase

The operation phase of the packaging factory generates solid wastes, wastewater, and substances contributing to air pollution, a certain degree of noise, vibration, and hazardous wastes. Despite the project's optimum efforts to keep the pollutants at the lowest level by employing the best available technologies and management mechanisms, it continues to have lesser degree of footprint on the environment. Waste minimization procedures, including but not limited to careful selection of raw materials and less polluting chemicals, reuse of all possible resources, recovery of recycle materials, and energy efficient methods, are carried out as a part of the project's drive to further reduce the environmental footprint, the following will be activated:

6.2.1.1 Impacts on air quality

Printing and packaging have impacts in terms of operating process along with energy consumption as well as greenhouse gas emissions. Industrial vehicles emit smoke while factory plants generate gasses, fumes and paper dusts. The impact on the environment can be noticed in machinery equipment, boiler and vehicular traffic on industrial premises and when equipment is put in motion.

(a) Fugitive particulate emissions

The particulates will be emitted from the following process:

1) Corrugating Process
2) Printing Process
3) Die-cut Process
4) Use of rubber-wood fired boiler
6) Operating Machinery
7) Vehicles

(b) Gases emission

GHG emissions including fugitive methane emissions would arise from energy consumption for the production process, transportation and generator operations. Indirect operating emissions from the proposed project would be associated with electric generation from diesel generators when the government power supply is cut out to power the pump stations.

The gases will be emitted from the following process that will further escalate air pollution issues:

1) Operating Machinery
2) Boiler
3) Vehicle activities
4) Generators
5) Use of waste fuels such as solvents, waste oil, organic chemicals.

To reduce air pollution impacts, the facility adopts and implements the policy of maximum energy efficiency, manages well-coordinated traffic flows, encourages green vegetation, and establishes re-greening plan. These will serve as the facility's drive to minimize air pollution issues.

6.2.1.2 Impact assessment on air quality

a) Impact significance on air quality by particulates

There will have some impact from particulate matter caused by operating processes and boiler during the operation of the OJIGS Packaging factory.

The ***magnitude*** of impact by particulate matter will be "***Medium***".

The ***area of impact*** will be only within the project area. Therefore, the ***extent*** of the air quality impact from particulates will be considered as "***Medium***".

The period of impact occurrence will be during the operation period and the ***duration*** of the impact by particulate matters will be considered as "***Medium***".

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be "***Medium"***. The ***importance of the impact*** on air was considered as "***Medium"***.

Therefore, the impact from particulate matters by the OJIGS Packaging factory operation will be less and the ***significance of the impact*** would be "***Medium***".

Table 6.12 Impact significance on air quality during operation period

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 2+2+2= 6			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

b) **Impacts significance on air quality by gas emission**

In operation period of the factory, emergency power supply, boiler and transportation vehicles will emit gas and have impact on ambient air quality.

The ***magnitude of impact*** on air quality by this emission was "***Medium***".

The ***area of impact*** will be within the area of factory compound. Therefore, the ***extent of the impact*** on air quality was "***Medium***".

The period of impact occurrence will be during the project period and these impacts will affect the factory workers. The ***duration of the impact*** of gas emission will be ***"Medium".***

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be ***"Medium".***

The ***importance of the impact*** on air will be considered as ***"Medium***".

Therefore, the impact air quality by gas emission by the OJIGS Packaging factory operation will be less and the ***significance of the impact*** would be ***"Medium***".

Table 6.13 Impact significance on gas emission during operation period

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 2+2+2 = 6			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

6.2.1.3 Mitigation measures for air quality

During proposed project operation phase, the factory that would install diesel engines/generators due to the emergency power supply and such engines and boilers would generate fumes and the air pollutant. The following mitigation measures are recommended to minimize the impact on the ambient air quality.

- Exhaust gases and pollutants from boiler, generators/engines and any other machines should be channeled through a pipe to allow dispersal. (about three meters above the ground surface to allow dispersal)
- Any pigment dust from printer inks and other impurities from the air is captured by using dust filters and filter-cleaning system and sent for specialist disposal.
- Odor traps are fitted for inks of printers.
- Use cleaner technologies and investing in less polluting technologies;
- Use of dust extraction and recycling systems to remove dust from work areas.
- Use of air ventilation in packing areas.
- Ensure that all machines are maintained in accordance with manufacturer's recommendations.
- Spray water onto the compound's ground to control dust.
- Plant long trees around the project area to control air pollution (a green belt)
- Storage of waste-derived fuels in areas protected from wind and other weather conditions.
- Selection and use of environmentally friendly and low emission vehicles;
- Appropriate management of project traffic.
- Systematic arrangement of delivery operation schedules and times;
- Educating drivers and vehicle operators to stop engine idling;
- Education and training programs with competitions to encourage all employees to actively participate in energy saving
- Discouraging the common practice of burning the any waste in the field, and encouraging biodegradation.

After mitigation measure, the impact on air quality will become ***less significant***.

Table 6.14 after mitigation measures, impact significance on air quality during operation period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 1+1+2 = 4			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		1 (***Low)***

6.2.2 Impact assessment and mitigation measures on noise level

6.2.2.1 Potential impacts on noise quality

In operation phase of OJIGS Packaging factory, operation activities and machines such as corrugator, printer, cutters, generators, boiler, transportation vehicles and other machines can affect noise impact on workers. The potential sources of noise pollution include:

- Material handling equipment and operations
- Vehicles and factory operations
- Exposure of person to, or generation of, excessive ground-borne vibration or ground-borne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

6.2.2.2 Impact significance on noise quality

During the operational phase of the proposed factory, noise will be generated from the factory operations and transportation.

The ***magnitude of noise and vibration*** during the operation period will be "***Medium"***.

The area of impact will be only within the area of production. Therefore, the ***extent*** of the impact of noise and vibration will be "***Low***".

The period of impact occurrence will be during the operating period, but it may last around 8 hours per day. The ***duration of the impact*** of noise and vibration during operation will be considered as "***Medium***".

According to magnitude, extent and duration of the impact, the impact characteristics will be "Medium". The ***importance of the impact*** will be considered as "***Medium***".

Therefore, the impact of noise level by the OJIGS Packaging factory will be less and the ***significance of the impact*** would be "***Medium***".

Table 6.15 Impact significance on noise level during operation period

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 2+1+2 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

6.2.2.3 Mitigation measures on noise level

Following precautionary measures should be adopted to control the noise level.

- Noise generating sources and their platforms such as boiler, corrugator, printer, exhaust pipes of these machines/equipment and generators should also be fitted with well-functioning silencers to reduce noise levels.
- Schedule operation of noisy equipment at different times.
- Schedule noisy operation activities and transportation during day-time hours.
- All Carryout regular maintenance of the equipment to minimize the noise level.

- Employees operating such equipment are required to be provided with ear muffs to protect them from excessive noise.
- Using enclosure for all generator sets.
- Use low noise equipment.
- Carry out periodic monitoring of noise levels.
- Develop green belt to act as a noise barrier.
- Noise generating sources and their platforms will be maintained properly to minimize noise vibrations generated by them.
- Turn equipment off when not in use.
- Manage noisy operation activities and transportation during day-time hours.
- The noise generated must comply with national Environmental Quality Emission Guidelines (EQEG)
- Training to personnel will be imparted to generate awareness about effects of noise and importance of using PPEs.
- Traffic control measures to be enforced strictly.

After mitigation measure, the impact on noise level will become less significant.

Table 6.16 after mitigation measure, impact significance on noise level during operation period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 1+1+2 = 4			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		1 (Low)

6.2.3 Impact assessment and mitigation measures for water quality

6.2.3.1 Potential impacts on water quality

The effluent spillage contaminated with dye was to be generated in the operating process particularly printing process. Moreover, these industries could still have some wastewater comprised of floor and machine washings, that mainly contain detergents and contaminated solutions which are toxic.

The generation of sanitary wastewater discharges has no significant adverse impacts on the surrounding environment because the septic tank system is installed in the projected area.

However, printing and packaging need certain amount of water not only for cleaning machinery equipment but also for dying process. Thus, water consumption of the proposed factory ca affect the groundwater level and the impact is likely to be medium. The impact of water consumption could affect he groundwater pattern as the processes use water as the part of major consumption.

6.2.3.2 Impact significance on water quality

In operation phase, the ***magnitude of the impact*** of physical, chemical and biological result of the water quality will be considered as "***High***", especially for waste water from printing process, cleaning machines and floors.

The area of the potential impact will be beyond the area of project activities and factory community, and the ***extent of the impact*** would be "***Medium***".

The period of potential impact duration can be ***long term duration***. The ***duration of the impact*** for water quality during operation will be set as "***Medium***". Therefore, the ***characteristic of water quality impact*** by the proposed project was rated as "***High***".

The impact is expected to cause some disturbances potentially affecting communities locally and surrounding water bodies. The ***importance of the impact*** on water quality was set as "***Medium***". The significant rating of impact was set as "High.

Table 6.17 Impact significance on water quality during operation phase

Characteristics					
Magnitude	Extent	Duration			
3 (High)	2(Medium)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 3+2+2 = 7			3 (High)	2 (Medium)	Significance
			Significance = Characteristics x Importance		3 (High)

6.2.3.3 Mitigation measures for water resources

Specific measures that should be implemented include the followings:

- Use of waste water treatment plant to treat wastewater from cleaning of floors and machines, especially printers.
- Materials such as inks and glues should be properly stored under the roof to prevent dumping into the water courses directly.
- Use of water-based or environmental-friendly chemicals are preferred.
- Store, dispose and clean up all diesel and hazardous materials according to the procedures.
- Preventing leaks and spills of the chemicals.
- Ensure that adequate sanitary facilities such as septic tanks and soak pits are constructed to handle sanitary waste.
- Construct proper drainage channels to handle storm water and for sediment control.
- Promptly detect and repair of water pipes and storage tank leaks and fix leaking pipes.
- Promote awareness to employees on water conservation and reducing water wastage.
- Installing water meters and monitoring water use regularly.
- Installing water efficient toilets and shower heads.
- Reuse of treated grey water for dust control and plant watering.
- Limit water withdrawal to the amount that will not adversely affect the groundwater balance and the demand of the local community, by developing and conserving own source of water.
- Conducting regular training, monitoring, and inspection schemes together with keeping track of water uses minimizes waste and leaks from faulty connections and faucets.

Table 6.18 after mitigation measure, impact significance on water quality during operation period

After mitigation measure, the impact on water quality will become ***less significant.***

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 1+1+2 = 4			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		1 (Low)

6.2.4 Impact assessment and mitigation measures for soil quality

6.2.4.1 Potential impacts on soil quality

During the operation phase, there will be adverse impacts on soil related to accidental discharge of the printing and packaging-based products or waste from plant.

Paper off-cuts, trimmings, refuse dumps and junked materials as well as liquid wastes are major environmental effects of the printing and packaging industryWhen chemical wastes are drained from the machine and released to run on the ground, they are capable of being partly evaporated into the air while the rest are left to spread over the surface of the soil.

Thus, if care is not taken it could cause infertility of the soil, depletion of vegetables and loss of trees, which man depend on for agriculture and raw materials. Opines that land polluted by scattered wastes, refuse dumps and waste oils will result in a number of effects, which include breeding disease carriers (rat, flies, mosquitoes), killing of valuable or rare vegetation and wildlife by dumping of oil, rubble and similar materials as well as producing Aesthetics effects and unsightliness resulting from litter of waste products.

6.2.4.2 Impact significance on soil quality

In operation period, it may cause unusually impact to soil system due to the spill or contamination of printer inks, glue and boiler ash. The ***magnitude of impact*** on soil quality was ***"Medium"***

The ***area of impact*** will be only within the area of factory compound. Therefore, the ***extent of the impact*** on soil quality and structure was "***Low"***.

The ***period of impact*** occurrence will be remained after the project period and the ***duration*** of the impact on soil quality and structure was considered as "Medium.

According to magnitude, extent and duration of the impact, the ***impact characteristic*** was considered as "***Medium"***. The ***importance of the impact*** was considered as "***Medium***".

Therefore, the impact on soil quality and structure by the OJIGS Packaging factory was less and the ***significance of the impact*** would be "Medium.

Table 6.19 Impact significance on soil quality during operation period

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	1 (Low)	2(Medium	Equivalent Characteristics	Importance	
Characteristics = 2+1+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

6.2.4.3 Mitigation measures for soil quality

Mitigation measures should be applied to minimize soil pollution and waste management impacts of a project depending upon site and project-specific conditions. Many impacts can be reduced or avoided when considered during the design and construction phase. The following mitigation measures should be used.

- Ensure liners are properly placed under ink, glue and fuel storage tanks.
- Ash remains of boiler fuel wood will be handled properly / collected properly in the bag and send to waste management company or deal directly with City Development Committee (CDC) without improper disposal.

- Conduct proper floor cleansing regularly.
- Use of water-based or environmental-friendly chemicals are preferred.
- Avoid contamination of the surrounding environment by maintaining machines equipment and vehicles regularly and handling of fuel and lubricants with caution.
- Avoid leaks, spills or accidental releases into the soil, surface water and ground water resources by proper storage, handling and transport of hazardous materials.
- Hazardous-materials handling procedures to reduce the potential for a spill, and will include an emergency response program to ensure quick and safe cleanup of accidental spills.
- Inspect weekly the storage areas for the assurance of the spill/leak proof.

After mitigation measure, the impact on soil quality will become ***less significant***.

Table 6.20 after mitigation measure, impact significance on soil quality during operation period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		1 (Low)

6.2.5 Impact assessment and mitigation measures for waste disposal

6.2.5.1 Potential impacts on waste disposal

The printing and packaging industry uses large quantities of materials such as paper, cardboard, ink, as well as generate ash remains of boiler fuel wood. Many of these can be reused, recycled or even avoided. Typical waste generating processes include materials handling, printing, cleaning and finishing. Most solid waste from the factory was non-hazardous. Some waste was biodegradable such as paper remains, while the other was non-biodegradable. The remaining ash from boiler might affect the environment.

6.2.5.2 Impact significance on waste disposal

In operation phase of OJIGS Packaging factory, there are some kinds of solid wastes generated from materials, operating process and domestic solid waste of workers such as ash remains of boiler fuel wood, paper cuts and glue.

The ***magnitude of waste disposal*** during operation phase will be ***"Medium".***

The area of impact will be only within the area of factory compound. Therefore, the ***extent*** of the impact by waste during operation phase will be "***Low".***

The period of impact occurrence will be within the packaging factory and the ***duration*** of the impact by waste will be considered as "***Medium***.

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be "***Medium***". The ***importance of the impact*** will be considered as "***Medium***".

Therefore, waste impact by the OJIGS Packaging factory during operation phase will be less and the significance of the impact would be "Medium".

Table 6.21 Impact significance on solid waste during operation period

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 2+1+2 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

6.2.5.3 Mitigation measures for waste disposal

General mitigation practices and principles that could apply to the operation phase of the printing and packaging project include:

- Ash remains from boiler fuel wood will be handled properly/ collected properly in the bag and then send to waste management company or deal directly with City Development Committee (CDC) without improper disposal.
- The off-cuts from paperboard should be sold or sent to the recycling facilities. Or Reuse of the solid waste remains e.g. off-cuts from paper and the remains.
- Collect non-hazardous solid wastes for recycling or disposal at landfill.
- Non-hazardous solid waste should not be burnt but instead be disposed of in a skip and should be timely collected and disposed to administered disposal site.
- Deal directly with City Development Committee (CDC) to routinely handle hazardous waste.
- Ensure timely collection and disposal of all solid waste generated.
- Provide separate bins for food waste, metal and other wastes at the staff quarters and other facilities on site.
- Avoid contamination of the surrounding environment by maintaining machines equipment and vehicles regularly and handling of fuel and lubricants with caution.
- Avoid leaks, spills or accidental releases into the soil, surface water and ground water resources by proper storage, handling and transport of hazardous materials.
- Education and training will be offered to all factory employees and reward for innovative reduction and recovery approaches will be given to company departments in monthly competitions;
- All employees will be encouraged to take part in education and training programs, and cleanup activities in turn not only in the facility but also with the adjacent communities.
- Develop a hazardous materials management plan addressing storage, use, transportation and disposal for each item.

After ***mitigation measure***, the impact on waste disposal will become ***less significant***.

Table 6.22 after mitigation measures, impact significance on waste disposal during operation period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		1 (Low)

6.2.6 Impact assessment and mitigation measures for boiler emission

6.2.6.1 Potential Impact by Boiler

During the proposed project operations, the factory would install rubber-wood fired boiler for paper gluing process and wastewater treatment. Boilers would generate fumes, gas and air pollutants. Rubber-wood is a famous and widely used firewood or the biomass boiler. Most of the biomass boilers are taking rubber wood for the biomass source.

The smoke particles from the rubber-wood burning exhibit a single-mode size distribution consisting of a major part of fine particles smaller than 2 μm in which the mass median aerodynamic diameter (MMAD) is 0.68 μm. The total smoke concentration depends on the wood moisture content and wood burning period. An increase of the wood moisture content exponentially enhances the smoke concentration. The smoke particles were reduced as the combustion time progresses. The PAH concentration shows a similar dependence on wood moisture content and wood burning period. In addition, the PAH concentration exhibits a non-linear dependence on smoke particle concentration, underscoring the significance of wood moisture content and burning period with respect to both physical and chemical characteristics of smoke particles. Rubber wood has following characteristics.

- Moisture 4.13 wt%
- Volatile matter 86.30 wt%
- Ash content 0.6 wt%
- High heating value 22 MJ/ kg
- Sulphur content is very low.

The possible impacts by the boiler can be listed as follows:

- Deforestation to collect the amount of biomass demand
- CO2 emission to the atmosphere
- Atmospheric temperature increased
- Ash generated
- Air pollution particularly in particulate matters (PM2.5). PAH which are carcinogenic pollutants

6.2.6.2 Impacts significance by boiler

In operation period of the factory, boiler will be used in treatment of wastewater from cleansing floor and operating machines.

The ***magnitude of impact*** on air quality by boiler emission was "***Hig***h.
The area of impact will be beyond the area of factory compound. Therefore, the ***extent*** of the impact on air quality was "***High***".

The period of impact occurrence will be within the project period and these impacts will affect the factory workers. The ***duration*** of the impact of gas emission will be "***High***".

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be "High". The importance of the impact on air will be considered as "High".
Therefore, the ***impact air quality*** by boiler emission in OJIGS Packaging factory operation will be considerable and the significance of the impact would be "High.

Table 6.23 Impact significance by boiler during operation period

Characteristics				
Magnitude	Extent	Duration		
3 (High)	3 (High)	3 (High	Equivalent Characteristics	Importance

Characteristics = 3+3+3 = 9	3 (High	3 (High))	Significance
	Significance = Characteristics x Importance		3 (High

6.2.6.3 Mitigation measures for boiler

The following mitigation measures are recommended to minimize the impact on the ambient air quality.

- Keep the boiler system within the limited water pressure.
- Use boiler cleaner technologies and investing in less polluting technologies.
- Utilize pollutant control system in boiler.
- Selection and use of environmentally friendly and low emission system.
- Exhaust gases and pollutants from boiler, generators/engines and any other machines should be channeled from at least three meters above the ground surface to allow dispersal through a pipe)
- Ensure that boiler is maintained in accordance with manufacturer's recommendations.
- Treat properly ash remains from boilers or send to the waste management company or deal directly with City Development Committee (CDC).
- Boiler must be fitted and operated with adequate safety and monitoring control devices and operated by competent persons.
- Operating boiler must have appropriate security measures to prevent deliberate interference.
- Ensure that precautions are taken to prevent fire and boiler explosion.
- Ensure that boiler is identifiable and accessible for maintenance.
- Check and test the plant to prevent fatigue of pipeline or supporting structure or holding structure, pipeline and flange leaks, vapor lock, cavitation, stress – corrosion cracking, thermal expansion, cyclic stress, structural failure and over pressurizing pipe system.
- Records of maintenance and tests must be kept.
- Incidents involving death or hospitalization, fire or explosion of boiler must be reported to the Authority and records of such incidents must be kept.
- Education and training programs to encourage all employees to actively operate boiler.

After mitigation measure, the impact on air quality will become less significant.

Table 6.24 after mitigation measures, impact significance by boiler during operation period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance	
Characteristics = 1+1+2 = 4			2 (Medium)	1 (Low)	Significance
			Significance = Characteristics x Importance		1 (Low)

6.2.7 Impact assessment and mitigation measures for ecological resources

6.2.7.1 Forest

There is ***no forest*** in the vicinity of the OJIGS Packaging factory project. Therefore, the impact on forest by the proposed project is "***negligible" significance***.

6.2.7.2 Wildlife

There is ***no wildlife*** existing in the proximity of the OJIGS Packaging factory project. Therefore, the impact on wildlife by the proposed project is "***negligible" significance***.

6.2.7.3 Aquatic animal/ fish

There is no impact on ***aquatic animal/ fish*** because the project is located in Industrial Zone. Therefore, the impact on aquatic animal/ fish by the proposed project is "***negligible" significance***

6.2.8 Impact assessment and mitigation measures on human environment

6.2.8.1 Potential impact on human environment

a) Potential impact on occupational health and safety

Due to printers, the public alike can contact skin and nerve diseases as a result of inhalation of the inherent toxic odor in inks/paints/colors. Users of paints and inks are needed to take regular health monitor because of damage of nervous system. Skin diseases may result in moderate irritation to thickening/cracking of skin to severe skin damage from chemical burns. Inhalation of contaminated air, absorption of floating particulates in the surrounding air, and ingestion of pollutants during eating, smoking and drinking are significantly high in foods processing factory.

Improper lifting, awkward postures and repetitive motions can lead to sprains and other musculoskeletal disorders. Poorly maintained or improperly handled vehicles can lead to crushing injuries at the plant site.

Employees' health hazard is high if the protective devices are not provided to them.

b) Potential impacts on social benefits

During the operation and maintenance of the facility, employment opportunities created by the project will have social benefit besides the expected economic benefit. Employment income from the project will have a substantial role for social livelihood improvement in the project area. These will involve other sources of employment such as direct service provision to the domestic sector e.g. traders, office operators, engineers, security personnel etc. There will be positive gain for the revenue system arising from the tax being paid by the proponent to the government and other lead agencies.

At the same time, there can be negative impact on local business of nearby community due to shifting of workforce.

6.2.8.2 Impact significance on health and safety

There will be impact on health and safety and the ***magnitude*** of impact during operation phase of the factory was "***Medium***".

The impact of the project can affect health and safety of the workers. Therefore, the ***extent*** of the impact was "***Low***".

The period of impact occurrence will be within the operation period and the ***duration*** of the impact on employers was considered as "***Medium***".

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be "***Medium***". The ***importance of the impact*** was considered as "***Medium***.

Therefore, the impact on employees/workers by the OJIGS Packaging factory will be less and the ***significance of the impact*** would be "***Medium***.

After mitigation measure, the impact on waste disposal will become less significant.

Table 6.25 Impact significance on health and safety during operation period

Characteristics				
Magnitude	Extent	Duration		
2 (Medium)	1 (Low)	2 (Medium)	Equivalent	Importance

			Characteristics		
Characteristics = 2+1+2 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium

b) Impact significance on socio- economic

OJIGS Packaging factory is located inside the Mingaladon Industrial Park in Mingaladon Township. The local people can get job opportunities as factory workers as well as skilled labor. Therefore, the impact by the proposed project on socio- economic may be positive impact. There will be no negative impacts such as removing existing venders (or) influx of venders near the project area because the proposed project is located in the industrial zone.

However, there can be negative impact on the existing local business due to shifting of workforce.

6.2.8.3 Mitigation measures for human environment impact

Employees' health hazard will be high if protective devices are not provided to them.

- Adequate ventilation should also be provided.
- Extractor fans should be installed in industry to extract dust and other fumes.
- Keep in a clean and safe state, including floor, walls, work rooms, and ceilings.
- Have adequate space to avoid overcrowding and risks of injury to health of persons employed there in.
- Hazardous materials in any industry must be clearly labeled.
- Provide with protective wear such as earmuffs, gloves, gumboots, overall coats, nose masks and head gear for employees/workers.
- Provide first aid kits and adequate medical care to the employees in case on an accident.
- Regular inspection and maintenance of pollution control systems.
- All measures related to safety such as safety appliances, training safety posters, slogans, pictures should be posted readable clearly at the factory
- Adequate facilities for drinking water and toilets should be provided to the employees.
- The fire and safety equipment should be properly utilized and maintained regularly.
- The health of the workers should be regularly checked by a well-qualified doctor and proper records will be kept for each worker.
- Rinse eyes with water if they come into contact with dust and consult a physician.
- Use soap and water to wash off dust to avoid skin damage.
- Be sure that trucks and other vehicles are in good working order safely.
- Well stocked first aid box which is easily available and accessible should be provided within the building.
- Well-designed waste management system and storm water drainage systems have to be put in place so as to ensure that breeding grounds of disease carrying vectors such as rats, flies, mosquitoes, cockroaches etc are effectively controlled in work area.
-
-
- After mitigation measure, the impact on waste disposal will become ***less significant***

Table 6.26 after mitigation measures, impact significance on occupational health and safety during operation period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	1 (Low)	Significance
			Significance = Characteristics x		1 (Low)

	Importance	

6.3 Environmental and social impacts during the decommissioning phase

The activity of **Decommissioning/Closure Phase** is related to the use of decommissioning equipment. **Decommissioning/Closure Phase** includes site clearing and some earth work activities.

6.3.1 Impacts assessment and mitigation measures on air quality

6.3.1.1 Potential impact on air quality

During this phase, the operation of vehicles for facilities and decommissioning activities can also release dust particles and gaseous emissions which can affect the ambient air quality for the short periods. There may also be gaseous emissions from diesel generators and combustion of fuel for vehicle movements. Generally, this will adversely affect localized air quality for a short period. Criteria air pollutant and air emissions that would arise from the demolition of the proposed project are quantified and summarized below.

- Heavy machinery /vehicles such as diesel-powered bulldozers and loaders would be used throughout the entire decommissioning phase
- Vehicle traffic on paved and unpaved roads
- Demolition activities, earth work
- Worker accommodation

Adjacent to the demolition site and along the transportation route, natural habitat, residents, and construction crew will be potentially affected by the air pollution.

6.3.1.2 Impact significance on air quality

In demolition phase, there may have temporary impacts on air quality. The breaking down of the building can emit large amount of dusts but can vary depending on activities. There may also have gaseous emissions from diesel generators and fuel combustion.
The ***magnitude of impact*** on air quality will be ***"Medium".***

The area of impact will be not only within the area but also in the vicinity area according to wind direction. Therefore, the ***extent of the air quality impact*** from particulates was "**Medium**".

The period of impact occurrence will be within the demolition phase and the ***duration*** of the impact by demolition activities will be considered as "***Low***".

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be "***Medium***". The ***importance of the impact*** on air will be considered as ***"Medium***".

Therefore, the impact from particulate matters and gaseous emission by the OJIGS Packaging factory demolition will be a little high and the ***significance of the impact*** would be "***Medium***".

Table 6.27 Impact significance on air quality during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

6.3.1.3 Mitigation measures for air quality impact

The following mitigation measures should be practiced to reduce potential dust and gaseous emissions into the environment.

- Ensure strict enforcement of on-site speed limit regulations.
- Avoid demolitions works in extremely dry weathers.
- Sprinkle water on graded access routes when necessary to reduce dust generation by machines.
- Demolished materials on site to be covered to prevent to be blown off by wind
- Minimization of exhaust emissions.
- Air pollution from vehicles will be minimized by using low emission equipment and vehicles.
- Vehicle idling time shall be minimized.
- Alternatively, fueled construction equipment shall be used where feasible equipment shall be properly maintained
- Truck drivers should avoid unnecessary running of vehicle engines at loading/ offloading points and parking areas, and to switch off or keep vehicle engines at these points.
- Minimizing dust from material handling sources by using covers.
- Optimize vehicle movements to eliminate unnecessary vehicle movements.
- Spraying water to minimize dust from vehicle movements.
- Prohibit burning of domestic waste on site.
- Ensure strict enforcement of on-site speed limit regulations.
- Avoid excavation works in extremely dry weathers.
- Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles.
- Decommissioning waste on site to be covered to prevent to be blown off by wind.

After mitigation measure, the impact on air quality will become ***less significant***.

Table 6.28 after mitigation measures, impact significance on air quality during decommissioning period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		1 (Low)

6.3.2 Impact assessment and mitigation measures for noise and vibration

6.3.2.1 Potential impacts on noise and vibration level

The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas. It will involve less noise generation due to the absence of operational equipment. But there will be some noise generated from heavy machineries running for dismantling activities. The decommissioning noise impact is the short-term pollution to local ambient noise quality. Noise and vibration affect natural vegetation, animals, workforce, and communities from the areas. This will be as a result of the noise and vibration that will be experienced as a result of demolishing the proposed project.

6.3.2.2 Impact significance on noise and vibration

In decommissioning phase, noise and vibration will be experienced as a result of demolishing the proposed project. The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding area.
The ***magnitude of impact*** from noise will be "***Medium***".

The ***area of impact*** will be not only within the factory but also in the vicinity area. Therefore, the extent of the impact noise and vibration will be "***Medium***".

The ***period of impact*** occurrence will be within the demolition period. The construction workers and people in the vicinity area will have impact from noise and vibration of the demolition processes and so the ***duration of the impact*** from noise and vibration was considered as "***Low***".

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be "***Medium".***

The ***importance of the impact*** will be considered as ***"Medium***".

Therefore, the impact noise and vibration by demolition of the OJIGS Packaging factory will be a little high and the ***significance of the impact*** would be ***"Medium".***

Table 6.29 Impact significance on noise and vibration during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	2 (Medium)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+2+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

6.3.2.3 Mitigation measures on noise and vibration

The following mitigation measures should be used to reduce noise pollution.

- Machinery drivers and machinery operators should switch off engines of vehicles or machinery not being used.
- Schedule noisy decommission activities and transportation during day-time hours.
- Used good condition and insulated demolition machineries and other equipment should be used in good condition and insulated.
- Combine noisy operations at the same time, but avoid combinations of vibration
- Turn equipment off when not in use.
- Provide PPE, particularly hearing protection devices for those working in noisy areas.

After mitigation measure, the impact on noise and vibration will become ***less significant***.

Table 6.30 after mitigation measure, impact significance on noise and vibration during decommissioning period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	Low(1)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance

	Significance = Characteristics x Importance	1 (Low)

6.3.3 Impact assessment and mitigation measures on water quality

6.3.3.1 Potential impacts on water quality

In the decommissioning phase, the materials generated by the decommissioning activities such as clay, plaster, limestone, concrete, mercury containing light bulbs, old batteries can be accumulated in nearby water courses due to runoff of these materials during the rainy season. It may lead to degradation of groundwater quality.

6.3.3.2 Impact significance on water quality

In decommissioning phase, the ***magnitude of the impact*** on water will be considered as "***Low***".

The area of the potential impact will be within the immediate area of decommissioning activities, and the ***extent of the impact*** would be "***Low***".

The period of potential impact duration can be ***short term duration***. The duration of the impact for water quality during decommissioning will be set as "***Low".***
Therefore, the ***characteristic of water quality*** impact by the proposed project decommissioning phase is rated as "***Low***".

The impact is expected to cause some minor disturbances potentially affecting communities locally and surrounding water bodies. ***The importance of the impact*** on water quality was set as ***"Low***".
The ***significant rating of impact*** was set as ***"Low***".

Table 6.31 Impact significance on water quality during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 1			1 (Low)	1 (Low)	Significance
			Significance = Characteristics x Importance		1 (Low)

6.3.3.3 Mitigation measures for water resources

The following mitigation measures should be practiced and used to reduce potential impacts for water resources.

- Water should be used efficiently at the site by the workers carrying out decommissioning activities in order to avoid irresponsible water use.
- Soil erosion and sediment control mechanisms will add positive effects on mitigation matters for water pollution;
- Use leak proof containers for storage and transportation of oil and grease.
- Collect solid wastes in containers and disposed of properly.

After mitigation measure, the impact on noise and vibration will become ***less significant***.

Table 6.32 after mitigation measure, impact significance on water quality during decommissioning period

Characteristics				
Magnitude	Extent	Duration		
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)
			Significance = Characteristics x Importance	

Significance
1 (Low)

6.3.4 Impact assessment and mitigation measures on soil quality

6.3.4.1 Potential Impacts on Soil

During this decommissioning phase, it may cause impact on soil system and its quality due to soil erosion and clearing and preparation of factory area as same as construction phase. There may be potential contamination of soil resources from hazardous materials and leakage of fuels, lubricants during this phase. Dumping of waste, raw material residues can damage soil quality.

6.3.4.2 Impact significance on soil quality

In decommissioning period, it may not cause significant environmental impact. The ***magnitude of impact*** on soil quality was "***Medium"***

The area of impact will be only within the area of factory compound. Therefore, the ***extent*** of the impact on soil quality and structure was "***Low".***

The period of impact occurrence will be remained after the project period and the ***duration*** of the impact on soil quality and structure was considered as "***Medium***".

According to magnitude, extent and duration of the impact, the impact characteristic was considered as "Medium". The importance of the impact was considered as "Medium".

Therefore, the impact on soil quality and structure by the OJIGS Packaging factory was less and the significance of the impact would be "Low".

Table 6.33 Impact significance on soil quality during decommissioning period

Characteristics				
Magnitude	Extent	Duration		
2 (Medium)	1 (Low)	2 (Medium)	Equivalent Characteristics	Importance
Characteristics = 2+1+2 5			2 (Medium)	2 (Medium)
			Significance = Characteristics x Importance	

Significance
2 (Medium)

6.3.4.3 Mitigation measures for soil quality

General mitigation practices and principles that could apply to any or all phases of the printing and packaging industry include:

- Avoid contamination of the surrounding environment by maintaining destruction machines equipment and vehicles regularly and handling of fuel and lubricants with caution.
- Recycle of excavated earth materials.
- Disposal of debris to landfill sites.
- Avoid leaks, spills or accidental releases into the soil, surface water and ground water resources by hazardous materials.

- Provide frequent water sprinkling and appropriate scheduling for truck and heavy equipment movements.
- Manage hazardous-materials handling.
- Ensure quick and safe cleanup of accidental spills.

After mitigation measure, the impact on noise and vibration will become less significant.

Table 6.34 after mitigation measure, impact significance on soil quality during decommissioning period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		1 (Low)

6.3.5 Impact assessment and mitigation measures on waste disposal

6.3.5.1 Impacts on waste disposal

Demolition of the proposed project and related infrastructure will result in large quantities of solid waste. The waste will contain the various materials including concrete, drywall, wood, glass, paints, pipe and metals, garbage, containers, fluorescent light, carpeting, furniture, tires, drums, and any containers with residues remaining on the bottom and fuel tanks.

In addition to solid waste, lubricants and fuel from vehicles and machines and liquid wastes can cause contamination into the surrounding environment particularly air, water and soil. The generation of sanitary wastewater discharges has no significant adverse impacts on surrounding environment.

6.3.5.2 Impact significance on waste disposal

Solid Wastes from demolition include concrete, brick and clay tile, steel, drywall and wood products. But, some of these wastes have the potential to recycle in other construction. However, solid waste from demolition waste may still remain as large amount than other phases, construction and operation phase.

The ***magnitude*** of impact from solid waste during demolition phase will be "***High***".

The area of impact will be only within the area of factory compound. Therefore, the ***extent*** of the impact by solid waste during demolition will be "***Low***".

The period of impact occurrence will be within the packaging factory demolition period and the ***duration*** of the impact by solid waste will be considered as "***low".***

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be ***"Medium".*** The ***importance of the impact*** was considered as "***Medium***".

Therefore, solid waste impact by the OJIGS Packaging factory demolition will be less and the ***significance of the impact*** would be "***Medium***".

Table 6.35 Impact significance on waste disposal during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
3 (High)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 3+1+1 = 5			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

6.3.5.3 Mitigation measures on waste disposal

The following mitigation measures should be used to reduce potential impacts for waste disposal:

- Solid wastes should not be dumped into the drain.
- Encourage waste sorting by the facility users.
- Develop a hazardous materials management plan addressing storage, use, transportation and disposal for each item.
- Provide separate bins for food waste, metal and other waste at the temporary camp and other facilities on site.
- Fuel storage facilities should be removed immediately upon completion of the decommissioning phase.
- Wastes can be recycled or disposed at the landfill.
- The hazardous wastes should be disposed with proper disposal method and caution.
- Train employees to promptly clean up any oil or hazardous material spill.

After mitigation measure, the impact on waste disposal will become ***less significant***.

Table 6.36 after mitigation measure, impact significance on waste disposal during decommissioning period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 3+1+1 = 5			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		1 (Low)

6.3.6 Impact assessment and mitigation measures for ecological resources

6.3.6.1 Forest

There is ***no forest*** in the vicinity of the OJIGS Packaging factory project because the project is located in Industrial Zone. Therefore, the impact on forest by the proposed project is ***"negligible"*** significance.

6.3.6.2 Wildlife

There is ***no wildlife*** existing in the proximity of the OJIGS Packaging factory project because the project is located in Industrial Zone. Therefore, the impact on wildlife by the proposed project is ***"negligible"*** significance.

6.3.6.3 Aquatic animal/ fish

There is ***no impact on aquatic animal/ fish*** because the project is located in Industrial Zone. Therefore, the impact on aquatic animal/ fish by the proposed project is ***"negligible"*** significance.

6.3.7 Impact assessment and mitigation measures on human environment

6.3.7.1 Potential impacts on human environment

a) Potential impacts on occupational health and safety

Significant hazards can be occurred due to potential fall of materials or tools as well as temporary hazards such as physical hazards, dust emission and noise pollution. Moreover, accidents and injuries to workers can be caused by heavy vehicle movement for transport of materials and equipment in the demolition phase.

The proposed project will appoint some workers in decommissioning phase. A potential social impact during the decommissioning phase of the project will be on the occupational health and Safety of the staff. Mitigation measures are described in the next sections and on their working conditions.

b) Potential impacts on social benefits

For demolition to take place properly and in good time, several people will be involved. As a result, several employment opportunities will be created for the workers who will work for demolition during the demolition phase of the proposed project.

6.3.7.2 Impact significance on human environment

a) Impact significance on occupational health and safety

During decommissioning phase, there may have impact on occupational health and safety for breaking down the infrastructure or some other decommissioning activities. The ***magnitude*** of the impact will be "***Medium***".

The ***area of impact*** will be only within the decommissioning area and therefore, the ***extent*** of the impact on occupational health and safety will be "***Low"***.

The period of impact occurrence will be within the demolition process and the ***duration*** of the impact will be considered as "***Low***".

According to magnitude, extent and duration of the impact, the ***impact characteristics*** will be "***Medium***". The ***importance of the impact*** will be considered as "***Medium***".

Therefore, the impact on occupational health and safety by the OJIGS Packaging factory demolition would be "***Medium***.

Table 6.37 Impact significance on occupational health and safety during decommissioning phase

Characteristics					
Magnitude	Extent	Duration			
2 (Medium)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 2+1+1 = 4			2 (Medium)	2 (Medium)	Significance
			Significance = Characteristics x Importance		2 (Medium)

6.3.7.3 Mitigation measures for occupational health and safety

The project will implement the following mitigation measures for Occupational Health and Safety:

- Initial job trainings relevant to the assignments should be offered for the relevant staff
- All workers will be provided with personal protection equipment (PPE) and will be obliged to wear them in work zones

- Particular works shall strictly follow work permit scheme
- Promote safe and healthy working environment, health, and well-being of all employees.
- Rinse eyes with water if they come into contact with dust and consult a physician.
- Use soap and water to wash off dust to avoid skin damage.
- The fire and safety equipment should be properly utilized and maintained regularly.
- Well stocked first aid box which is easily available and accessible should be provided.

After mitigation measure, the impact on ***occupational health and safety*** will become ***less significant.***

Table 6.38 after mitigation measure, impact significance on occupational health and safety during decommissioning period

Characteristics					
Magnitude	Extent	Duration			
1 (Low)	1 (Low)	1 (Low)	Equivalent Characteristics	Importance	
Characteristics = 1+1+1 = 3			1 (Low)	2 (Medium)	Significance
			Significance = Characteristics x Importance		1 (Low)

Chapter 7

Cumulative Impacts Assessment

7 Cumulative impacts

7.1 Cumulative impact assessment

Cumulative impacts typically refer to those effects on local communities and ecosystems which result from incremental direct and indirect effects from the proposed project as well as added contributed effects from other projects or actions at and around the same projected site area.

As the proposed project is located in the industrial zone, there are some other factories in the surrounding area of the proposed project. According to the onsite surveys, most of the factories nearest to the OJI GS Factory are EMC factory producing handbags, Macdo Wig facory producing wigs. Moreover, other factories which are manufacturing and electronics production factories and garment factories.

The cumulative effects in relation to existing activities at the local environment were reviewed and assessed for significance.
The following **Figure 7.1** shows the factories including OJI GS Packaging Factory located in the Mingalardon Industrial Park.

Figure 7.1 OJI GS Packaging Factory with nearby factories

7.2 Cumulative impact on air quality

There will be cumulative increase in air quality as other projects such as handbags, wigs and electronics manufacturing factories and garment factories which will release air pollutants into the surrounding environment located in the surrounding area of the proposed OJI GS Packaging Factory. Cumulative impacts refer to the incremental effect of several projects that may have an individually minor, but collectively significant, impact on air quality.

7.3 Cumulative impact on noise quality

The cumulative noise impact at a residence is the noise received at that residence when two or more of the industries are operating simultaneously

In this regard, cumulative noise impacts on the nearest vicinity are likely affected by the proposed OJI GS Packaging Factory and other existing industries which are simultaneously operating in the industrial zone.The noise generated from the proposed factory and the process of other industries would increase the baseline noise level.

7.4 Cumulative impact on water quality

The OJI GS Packaging Factory is currently utilizing the water from the public water supply. The water usage in this manufacturing process is around 27,026 gallon per day. Whilst about 60% of total water usage is for the manufacturing process and 40% of the water usage is for the general/domestic use. Thus, there will be a cumulative increase in water usage.

7.5 Cumulative impact on traffic

There will be a cumulative increase in automobile and truck traffic in the vicinity of OJI GS Packaging Factory as a result of existing other factories.

It will be expected that there will be an increase number of vehicles at the main road during the hours of 8:00 a.m. to 5:00 p.m. However, based on the existing infrastructure, it is more than adequate to handle the increased number of vehicles. Therefore, the cumulative impact in terms of “congestion” is negligible.

7.6 Cumulative impact on solid waste and wastewater

Solid wastes particularly sludge released from the waste wat treatment and ash emitted from thr boiler from OJI GS Packaging Factory are collected by Yangon City Development Committee (YCDC) via on-call system.

However, the impact of solid waste disposal from the factory would likely to moderately contribute the incremental effects of various activities of the other factories running in the industrial zone.

The cumulative effect of wastewater disposal is limited to the construction phase of the project. During the operation phase, the factory installs wastewater treatment system along with the continuous monitoring in the project site. Therefore, discharge of wastewater by the factory can cause less significant cumulative impact into the common drainage that other effluents will be discharged from the other industries.

Chapter 8

Environmental Management Plan

8 Environmental management plan (EMP)

8.1 Introduction

Proper implementation of a comprehensive Environmental Management Plan (EMP) will ensure that the proposed OJIGS packaging company meets regulatory and operational performance (technical) criteria. This section describes the modalities provided in the project for the implementation of the proposed mitigation measures to its potential negative impacts.

It proposes the institutional responsibilities for the implementation of the mitigation measures, the implementation indicators, and the time frame for monitoring and follow-up for the implementation activities. Environmental Management Plan for each phase (Construction phase, operation phase and demolition phase) provides specific environmental guidance for each activity of a project. The intention of the Environmental Management Plan is to ensure that activities borne from the construction, operation and decommissioning phase of the project are managed and mitigated in order to ensure that the impacts will be within applicable national standards.

8.2 Objectives of the environmental management plan

Environmental Management Plan (EMP) for all the identified environmental impacts during construction and operational stages of OJIGS packaging company is prepared to ensure that sufficient procedural measures are in place to reduce and minimize associated adverse impacts to acceptable or manageable levels.

This environmental management plan aims at recommending improvements to management structures and procedures to ensure that future management recognizes the impacts assessed in this**.** The strict implementation of the EMP and project management's strict enforcement of the adequate construction practices and standards will greatly reduce the negative impacts of the Project.

Environmental and social consultants if necessary, will be engaged to support EMP implementation including monitoring. Mitigation measures presented in the following tables [**Table 8.1** for construction phase, **Table 8.2** for operational phase, **Table 8.3** for decommissioning phase] for all three phases are recommended for the impacts specified for the project.

8.3 Environmental and social management plan

Environmental and Social Management Plan Measures are prepared by the following three tables: **Table 8.1** for construction phase, **Table 8.2** for operational phase, **Table 8.3** for decommissioning phase.

8.3.1 Environmental and Social Management Plan for Construction Phase

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase.

8.3.1.1. Objective

To identify the potential impacts likely affected by the activities carried out throughout the construction phase.

8.3.1.2 Laws and Regulations required for the EMP

(I) The section (10) under the Chapter (5) in the Environmental Conservation Law (2012) stated the following Environmental Quality Standards:

Chapter VI
Environmental Quality Standards

Section 10 The Ministry may, with the approval of the Union of the Government and the Committee, ***stipulate the following environmental quality standards***:

(a) Suitable surface water quality standards in the usage in rivers, streams, canals, springs, swamps, lakes, reservoirs, and other inland water sources of the public;
(b) Underground water quality standards;
(c) Atmospheric quality standards;
(d) Noise and vibration standards;
(e) Emission standards;
(f) Effluents standards;
(g) Solid wastes standards;

(II) Environmental Conservation Rules (June 2014)

The Environmental Conservation Rules relating to the Environmental Conservation Law, were enacted in 2014 which contain specific items relating to IEE and pollution prevention which fall under the powers of the Ministry Natural Resources and Environmental Conservation.

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

Section 69.
(a) Any person ***shall not emit, cause*** to emit, dispose, cause to dispose, pile and cause to pile, by any means, the ***pollutants and the hazardous waste or hazardous material*** stipulated by notification under the Law and any of these rules at any place which may affect the public directly or indirectly.

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

(III) Private Industrial Enterprise Law, 1990

Section 3. Private Industrial Enterprises shall be conducted in accordance with the following basic principles:

(b) to acquire modern technical know-how for raising the efficiency of industrial enterprises and to establish the sale of finished goods produced by the industrial enterprise not only in the local market, but also in the foreign market;

(c) to cause utilization by relying mainly as local natural resources;

(f) to cause avoidance of or reduction of the use of technical know-how which cause environmental pollution;

(g) to cause the use of energy in the most-economical manner.

(IV) The Factories Act, 1951

The Factories Act, 1951 and Law Amending the 1951 Factories Act -Pyidaungsu Hluttaw Law No. 12/2016 contains provisions for the proper disposal of waste and effluents in factories; treatment of waste water; regulations for health and cleanliness in factories, and the prevention of hazards.

Section 23: Fencing of Machinery

(1) In every factory the following shall be securely fenced by safe-guards of substantial construction which shall be constantly maintained and kept in position while the machinery is in operation: -

Section 30: Hoists and Lifts

(1) Every hoist or lift shall be of good mechanical construction, sound material and strength and shall be properly maintained.

(2) Every hoist or lift shall be thoroughly examined by an authorized examiner at least once in every period of six months and a register shall be kept containing the prescribed particulars for every such examination.

(3) Every hoist-way or lift-way shall be sufficiently protected by an enclosure fitted with gates. The hoist or lift and every such enclosure shall be so constructed as to prevent any person or thing from being trapped between any part of the hoist or lift and any fixed structure or moving part.

(4) The maximum safe working load shall be clearly marked on every hoist or lift and no load greater than that shall be carried thereon.

(5) The cage of every hoist and lift used for carrying persons shall be fitted with a gate on each side which provides access to a landing.

Section 32: Revolving Machinery

(2) The speeds indicated in notice under sub section (1) shall not be exceeded.

(3) Effective measures shall be taken in the factory to ensure that the safe working peripheral speed of every revolving vessel, cage, basket fly wheel, pulley, discs or similar appliance driven by power is not exceeded.

Section 35: Heavy Lifting

(1) No woman adolescent or child shall be employed in any factory to lid or carry or move any load so heavy as to be likely to cause injury.

(2) The President may make rules prescribing the maximum weights that may be lifted, carried or moved ordinarily by persons employed in factories or in any class or description of factories or in carrying on specified process.

Section 37: Protection of Eyes

In respect of any such manufacturing process carried on in any factory as may be prescribed, being a process, which involves-

(a) risks of injury to the eyes from particles or fragments thrown off in the course

(b) of the process; or

(c) risk to the eyes of exposure to excessive light, the President may make rules that require that effective screens or suitable goggles shall provide for the protection of persons employed on, or in the immediate vicinity of the process.

Section 37: Protection from Fumes

(1) In any factory no person shall enter or be permitted to enter any chamber, tank, vat, pit, pipe, flue or other confined space in which dangerous fumes are liable to be present to such an extent as to asphyxiate persons, unless it is provided with a man-hole of adequate size, or other effective means of egress.

(2) No portable electric light of voltage exceeding 24 volts shall be permitted in any factory for use inside any confined space referred to in sub-section (1), and where the dangerous fumes present are likely to be inflammable, no lamp or light other than that of flame-proof construction shall be permitted to be used in such confined space.

(3) No person in any factory shall enter or be permitted to enter any such confined space referred to in sub-section (1) unless all possible measures have been taken to remove any fumes which may be present and to prevent any ingress of fumes and unless either,

(a) a certificate in writing has been given by an authorized examiner, based on a test carried out by himself, that the space is free from dangerous fumes and fit for persons to enter; or

(b) the person entering is wearing a suitable breathing apparatus and a belt securely attached to a rope the free end of which is held by a person standing outside the confined space.

(4) In every factory suitable breathing apparatus, reviving apparatus and belts and ropes shall be kept ready for immediate use in the vicinity of any such confined space which any person has entered. All such apparatus shall be examined at regular intervals and certified by an authorized examiner to be fit for use; and a sufficient number of the persons from amongst the employed in every factory shall be trained in the use of all such apparatus and in artificial respiration.

(5) In any factory no person shall be permitted to enter any boiler, boiler furnace, boiler flue, chamber, tank, vat, pipe, or other confined space for the purpose of working or making any of examination therein until it has been sufficiently cooled by ventilation or otherwise so as to be safe for persons to enter.

(6) The President may make rules prescribing the minimum dimensions of the manholes referred to in sub-section (1), and may by order in writing exempt or subject to such conditions as he may think fit, any factory or class or description of factories from compliance with any of the provisions of this section.

(V) The Myanmar Fire Force Law, 2015 (Section 25)

The Myanmar fire force law, 2015 covers requirements for firefighting and fire protection as follows)

Chapter (2) Section (3-a, b, c, d) It is covered all the issue of man-made disaster to the nations

Chapter (8) Section (15-a, b, c, d), Section (17- a, b, c, d, e, f) It is covered all the steps how to protect the fire issues

Chapter (11) Section (24) Section (25-a, b) Section (26) (27), (28), (29), (30), (31), (32), (33) Issue of Prohibitions and plan how to manage for firefighting

Chapter (12) Section (34), (35), (36), (37), (38), (39) Penalties

Chapter (13) Section (40), (41), (42), (43), (44), (45), (46), (47) General Information to protect laws regulations and penalties

Section 10 (B): Reports of Fatal Accidents

(1) Where, by any law for the time being in force, notice is required to be given to any authority, by or on behalf of an employer of any accident occurring on his premises which results in death, the person required to give the notice shall, within seven days of the death, send a report to the Commissioner, giving the circumstances attending the death;

Section 11: Medical Examination

(a) Where a workman has given notice of an accident, he shall, if the employer, before the expiry of three days from the time at which service of the notice has been effected, offers to have him examined free of charge by a qualified medical practitioner, submit himself for such examination; and any workman who is in receipt of a half-monthly payment under this Act shall, if so required, submit himself for such examination from time to time:

Table 8.1: Environmental and Social Management Plan for the Construction Phase

The potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action Plan	Responsibility	Report
Impact on Air Quality	Vehicles movements and equipment transportation. Construction activities emitting particulate and toxic gas, including cutting and welding activities. Earth works including excavation and site levelling.	• Wind breaks should be constructed around the main construction activities and in the locality of potentially dusty works. • Avoid excavation works in extremely dry weathers. • Prohibit open burning of any waste at project site. Soil erosion and dust control management measures also assist in the management of air pollution from construction operations. • Air pollution from vehicles will be minimized by using low emission equipment and vehicles. • Ensure that all construction equipment and vehicles are maintained in accordance with the manufacture's recommendations. • Minimizing the movement of vehicles and construction machineries particularly outside the premise of the project site to avoid further destruction. • Fuel efficient stoves and cooking equipment will be provided to reduce emission from food processing at the site during construction activities. • Turn equipment off when not in use. • Vehicle idling time shall be minimized. • Alternatively, fueled construction equipment shall be used where feasible. • Sprinkle water on graded access routes	• Dust and gas emission control activities are performed on a regular basis. • All trucks hauling soil are adequately protected. • Report the incidents.	Construction team and/or HSE team	Monitoring Report

The potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action Plan	Responsibility	Report
		when necessary to reduce dust generation by construction vehicles. • Construction materials on site to be covered to prevent to be blown off by wind. • Stockpiling of material, for example, rocks, sand and soils should be minimized. • Stockpiles should be located as far away from receptors as possible. • Vegetation of stockpiles should be used where a stockpile is not to be used for a month to stabilize the surface and prevent dust generation. • Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites. • Visual monitoring of dust deposition onto surfaces on and off-site should be regularly conducted. • Ensure strict enforcement of on-site speed limit regulations.			
Impact on Noise Quality	Construction activities, vehicles movement and machinery operations.	• Use quiet equipment (i.e. equipment designed with noise control elements) • Limit pickup trucks and other small equipment to an idling time of five minutes, observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines	• Avoid institutions sensitive to noise such as settlement, schools, health institution or other offices close to the project site. • Use quiet equipment (i.e. equipment designed with	Construction team and/or HSE team	Monitoring Report

The potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action Plan	Responsibility	Report
		whenever possible. • Careful handling of material loading and unloading. • Ensure use of silencers or mufflers on heavy construction equipment engines. • Construction machinery and vehicles will undergo periodic maintenance to keep them in good working condition. • Perform regular inspection and maintenance of preparation vehicles and equipment. • Turn equipment off when not in use. • Taking consideration to be careful sequencing and scheduling times. • Schedule noisy construction activities and transportation during day-time hours. • Combine noisy operations at the same time, but avoid combination of vibration. • Provide PPE particularly hearing protection devices for those working in noisy areas. • Locate noisy plant as far away from receptors as practicable. • Orientate equipment known to emit noise strongly in one direction so that the noise is directed away from receptors as far as practicable. • Avoid institutions sensitive to noise such as settlement, schools, health institution or other offices close to the project site.	noise control elements)		

The potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action Plan	Responsibility	Report
Impact on Water Quality	Solid waste, liquid waste and hazardous waste release and water usage.	• Limit water withdrawal to the amount that will not adversely affect the groundwater balance and the demand of the local community, by developing and conserving own source of water. • Promote recycling and reuse of water as much as possible. • Implement road drainage system and smooth road to limit erosion. • Promptly detect and repair of water pipe and tank leaks. • Ensure taps are not running when not in use. • Proper recycling of water from other uses for sprinkling dusty pavements. • Soil erosion and sediment control mechanisms will add positive effects on mitigation matters for water pollution. • All chemicals, paint, and fuel containers will be properly sealed and rigorous spill prevention will be employed. • Conducting regular training, monitoring, and inspection schemes together with keeping track of water uses minimizes waste and leaks from faulty connections and faucets. • Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms.	• All chemicals, paints, and fuel containers will be properly sealed and rigorous spill prevention will be employed. • Ensure that all storm drains are cleared of debris so as to ensure free flow of water. • Ensure regular visual checks for any leaks that may be present.	Construction team and/or HSE team	Monitoring Report

The potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action Plan	Responsibility	Report
		• Provide measures to prevent the washing away of construction materials, soil, silt or debris into any drainage system of open stockpiles of construction materials. • Hazardous-materials handling procedures to reduce the potential for a spill during construction, and will include an emergency response program to ensure quick and safe cleanup of accidental spills.			
Impact on Soil Quality	Improper storage, handling and disposal of fuels, lubricants, chemicals and hazardous liquid on-site, and potential spills from these liquid materials. Earth works such as excavation, site levelling and clearance, and run-offs.	• All chemicals, paint, and fuel containers will be properly sealed and rigorous spill prevention mechanisms will be employed. Spills will be immediately treated to stop subsequent soil pollution. • Careful planning to establish work zones, defining phases of construction, and active management of daily activities will be employed to minimize soil disturbance during the construction phase. • The project area will be divided into smaller sectors and vegetation from the smaller sectors will be cleared sequentially to minimize soil exposure during construction. • When required, topsoil will be carefully removed and saved for reuse. • Frequent water sprinkling and appropriate scheduling for truck and heavy equipment movements will also be arranged	• All chemicals, paints, and fuel containers will be properly sealed and rigorous spill prevention will be employed. • Inspect the storage areas for the assurance of the spill/leak proof. • Complete the incident report should any leak occur.	Construction team and/or HSE team	Monitoring Report

The potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action Plan	Responsibility	Report
		throughout the construction period. • Waste management should be developed that sets out plans and actions for construction waste. • Hazardous-materials handling procedures to reduce the potential for a spill during construction, and will include an emergency response program to ensure quick and safe cleanup of accidental spills. • Ensure site boundaries will be strategically placed in order to minimize surface runoffs especially during the monsoon season.			
Waste Generation	Improper storage and handling of fuels, lubricants, chemicals and hazardous liquid on-site, and potential spills from these liquid materials Solid waste, liquid waste and hazardous waste generation and disposal. .	• Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time. • Construction materials will be managed in a way to avoid over-ordering, poor storage and maintenance, mishandling as well as improper operation procedures. • Construction wastes will be separated into reusable items and materials to be disposed of or recycled whenever possible. • Waste suitable for reuse will be stored on site and reintroduced to the construction process as and when required. • Provision of facilities for proper handling and storage of construction materials to	• Ensure construction materials will be managed in a way to avoid over-ordering, poor storage and maintenance, mishandling as well as improper operation procedures. • Proper waste handling and disposal will be applied in compliance with the regulations. **Waste management** Wastes are separated into (2) types including (1) general domestic	Construction team and/or HSE team	Monitoring Report

The potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action Plan	Responsibility	Report
		reduce the amount of waste caused by damage or exposure to the elements. • A hazardous waste management covering waste classification, separation, collection, storage, transfer and disposal should be set up and operated. • Waste handling practice will comply with applicable regulation of the government. • Identify Disposal routes (including transport options and disposal sites) for all wastes generated during the construction phase. • Hazardous waste will be stored in such a way as to prevent and control accidental release to the environment (e.g. secondary containment, sealed containers). • Carefully select less hazardous materials and use the necessary amount only. • Establish a designated hazardous waste collection site and make it secure. • Do not clean the used hazardous material containers and mix wastes. • Recyclables such as scrap steel, metals, plastics, and paper items will be collected for recycling wherever possible. • Packaging materials, cans, and containers would be hauled back to manufactures for reuse in next shipments where economically feasible. • Use of building materials that have	Office wastes disposed in to the garbage bins before YCDC collection and the byproducts of the factory process including (paper scraps) . **Hazardous waste** In terms of hazardous wastes, The main hazardous waste is generating from the waste water which is being treated through the waste water treatment process. **Boiler ash** The boiler ashes are kept separately in the storage room and collected by YCDC three times/week. **Waste water treatment process** 1) Collection the glue waste and ink waste in Equalizer Tank 2) Ink and glue waste from Equalizer tank are mixed		

The potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action Plan	Responsibility	Report
		minimal packaging to avoid the generation of excessive packaging waste. • Use of plastic bags will be discouraged and explained to the workforce and local communities. • Disposal of construction waste in or off the construction site should be prohibited. • Prohibit open burning of any waste at project site. • Regular collection times will be arranged to prevent overflow in waste collection bins. • Chain of custody documents should be used for construction waste to monitor disposal. • Waste segregation should be practiced at the workers camps with an emphasis placed on reducing, reusing and recycling of waste streams as appropriate.	with Aluminium, Polymer and Caustic to adjust the pH, reduce the color and settle down the sludge in Slow Mixer Tank. 3) Sending to sedimentation Tank-1 to separate the clear water and sludge. 4.1) The sediment from Sedimentation Tank-1 is collected in the Sludge 4.2) Clear water from Sedimentation Tank-1 is sent to the Buffer Tank and then to the Anthracite Filter to filter out solid particles Thicker Tank and sent to the Filter Press to filter the sludge then the clear water is returned to the Equalization Tank. 5. After passing through the Anthracite Filter, send to the Aeration Tank to reduce the COD and BOD.)		

The potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action Plan	Responsibility	Report
			6. Sending again to Sedimentation Tank-2 via Aeration Tank to separate the clear water and sludge 7.1 Re-transferred the sediment to the Aeration Tank.) 7.2 The clear water from Sedimentation Tank-2 is sent to Anthracite Filter-2 to filter out solid particles and then drain as a final rinse.) **Sludge waste** Sludge wastes are kept in the bags and stored in the separate room and collected by YCDC.		
Impact on Ecological Resources	As the proposed project is located in industrial zone, the impact on ecological resources is "negligible" significance.	-	-	-	-
Impact on Occupational Health and Safety	Dust from soil disturbances and vehicle movement. Impairment of	• Suitable overalls, safety footwear, dust masks, gas masks, respirators, gloves, ear protection equipment etc. should be made available and construction personnel must be trained to use the equipment.	• Provision of safe and healthy working conditions for all employees. • Provision of PPEs for the particular work.	Construction team and/or HSE team	Incident Record

The potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action Plan	Responsibility	Report
	hearing capacity due to the exposure to high noise levels. Exposure to a number of health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases), risk factors resulting from human behavior (e.g. STD, HIV etc.) and road accidents from construction traffic;	• Necessary health and safety rules shall be enforced by the site foreman to ensure that all staff members adhere to the standards and are thus safe. • All workers will be provided with personal protection equipment (PPE) and will be obliged to wear them in work zones. • Training to personnel will be imparted to generate awareness about effects of noise and importance of using PPEs. • Adequate collection and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated areas shall be provided. • Particular works shall strictly follow work permit scheme. • Promote safe and healthy working environment, health, and well-being of all employees. • Implement all necessary measures to ensure health and safety of workers. • Well stocked first aid box which is easily available and accessible should be provided			

8.3.2 Environmental and Social Management Plan for Operational Phase

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the operational phase.

Table 8.2: Environmental and Social Management Plan for the Operational Phase

Potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action plan	Responsibility	Report
Impact on Air Quality	Emissions from operation processes including corrugating Process, Printing Process, Die-cut Process, rubber-wood fired boiler.	• Use boiler cleaner technologies and investing in less polluting technologies. • Utilize pollutant control system in boiler. • Selection and use of environmentally friendly and low emission system. • Exhaust gases and pollutants from boiler, generators/engines and any other machines should be channeled through a pipe to allow dispersal. (about three meters above the ground surface to allow dispersal) • Any pigment dust from printer inks and other impurities from the air is captured by using dust filters and filter-cleaning system and sent for specialist disposal. • Odor traps are fitted for inks of printers. • Use cleaner technologies and investing in less polluting technologies; • Use of dust extraction and recycling systems to remove dust from work areas. • All machines are maintained in	• Installation of boiler cleaner technologies with pollutant control system. • Utilization of dust filters that captures any pigment dust from printer inks and other impurities from workplaces and send for specialist disposal. • Ensure odor traps are fitted for inks of printers. • Comply with the national air emission quality standards.	Project Management Team, Workers and/or HSE Team	Monitoring report within every six months or periodically as prescribed by the Ministry

Potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action plan	Responsibility	Report
		accordance with manufacturer's recommendations. • Selection and use of environmentally friendly and low emission vehicles. • Appropriate management of project traffic. • Spray water onto the ground to control dust. • Plant long trees around the project area to control air pollution (a green belt) • Systematic arrangement of delivery operation schedules and times. • Educating drivers and vehicle operators to stop engine idling. • Education and training programs with competitions to encourage all employees to actively participate in energy saving • Rejecting the common practice of burning any waste in the project area.			
Impact on Noise Quality	Operation activities and machinery such as corrugator, printer, cutters, generators, boiler and transportation vehicles.	• Noise generating sources and their platforms such as boiler, corrugator, printer, exhaust pipes of these machines/equipment and generators should also be fitted with well-functioning silencers to reduce noise levels. • All Carryout regular maintenance of the equipment to minimize the noise level.	• Use of well-functioning silencers and dampers in noise-generating machineries to reduce noise levels. • Noisy operation activities and vehicular trips should be performed only during daytime hours as possibly. • Comply with the national	Project Management Team, Workers and/or HSE Team	Monitoring report within every six months or periodically as prescribed by the

Potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action plan	Responsibility	Report
		• Ensure use of mufflers on diesel/gas driven machinery. • Using enclosure for all generator sets. • Use low noise equipment. • Carry out periodic monitoring of noise levels. • Develop green belt to act as a noise barrier. • Schedule operation of noisy equipment at different times. • Schedule noisy operation activities and transportation during day-time hours. • Turn equipment off when not in use. • Training to personnel will be imparted to generate awareness about effects of noise and importance of using PPEs. • Traffic control measures to be enforced strictly. • Vehicular trips should be performed only during daytime hours in order to limit the impacts of any increased noise generated. • Consultation with nearby residential areas if extreme levels of noise are predicted.	noise quality standards.		Ministry
Impact on Water Quality	No effluent emission in the operation processes. Emission of wastewater from	• Use of waste water treatment plant to treat wastewater from cleaning of floors and machineries, especially printers and gluer. • Materials such as inks and glues	• Waste Water Treatment Plant will be used to treat wastewater from cleaning of floors and machineries, especially printers and	Project Management Team, Workers and/or HSE	Monitoring report within every six months

Potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action plan	Responsibility	Report
	cleaning of printer, gluer, floors and equipment. Accidental spills/ leaks of painter inks, glue, fuel oil.	should be properly stored under the roof to prevent dumping into the water courses directly. • No maintenance (where practicable) of equipment should be performed onsite that can potentially contaminate the soil and groundwater. • Water-based or environmental-friendly chemicals are preferred. • Store, dispose and clean up all diesel and hazardous materials according to the procedures. • Preventing leaks and spills of the chemicals. • Solid wastes should not be dumped into the drain. • Blocked drains should be cleaned properly and debris disposed at approved sites • Ensure that adequate sanitary facilities such as septic tanks and soak pits are constructed to handle sanitary waste. • Construct proper drainage channels to handle storm water and for sediment control. • Promptly detect and repair of water pipes and storage tank leaks and fix leaking pipes. • Installing water meters and monitoring water use regularly.	gluer. • Use of water-based or environmental-friendly chemicals are preferred. • Storm water will be managed by dilution method accordingly. • Comply with the national effluent quality standards.	Team	or periodically as prescribed by the Ministry

Potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action plan	Responsibility	Report
		• Reuse of treated grey water for dust control and plant watering. • Limit water withdrawal to the amount that will not adversely affect the groundwater balance and the demand of the local community, by developing and conserving own source of water. • Conducting regular training, monitoring, and inspection schemes together with keeping track of water uses minimizes waste and leaks from faulty connections and faucets. • Promote awareness to employees on water conservation and reducing water wastage.			
Impact on Soil Quality	Spills/ leaks/ Contamination of painter inks, glue, fuel oil. Improper waste management from industrial activities.	• Ensure liners are been under printer ink, glue and fuel storage tanks. • The storage of chemicals and fuel should be in a dedicated area provided with drip trays / walls with impermeable flooring. • Ash remains of boiler fuel wood will be handled properly by waste management company or deal directly with City Development Committee (CDC) without improper disposal. • Conduct proper floor cleansing regularly. • Avoid contamination of the	• Regular inspection of storage areas of the chemicals for the assurance of the spill/leak proof. • Ensure all the hazardous waste are in secured area followed by the instruction showed in label. • Hazardous waste and ash remains of boiler fuel wood will be handled properly by waste management company or deal directly with City Development	Project Management Team, Workers and/or HSE Team	Monitoring report within every six months or periodically as prescribed by the Ministry

Potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action plan	Responsibility	Report
		surrounding environment by maintaining machines equipment and vehicles regularly and handling of fuel and lubricants with caution. • Avoid leaks, spills or accidental releases into the soil, surface water and ground water resources by proper storage, handling and transport of hazardous materials and waste. • Hazardous-materials handling procedures to reduce the potential for a spill, and will be included an emergency response program to ensure quick and safe cleanup of accidental spills. • Ensure only well-maintained equipment and vehicles used for the operation phase. • Hygienic sanitary facilities and sewerage system. • Store inorganic wastes in a safe place within the site and clear organic wastes on daily basis to waste collector or compost the waste.	Committee (CDC) without improper disposal. • An emergency response program will be applied to ensure quick and safe cleanup of accidental spills.		
Waste Generation and Disposal	Off-cuts from Paper Cutting and Trimming. Ash remains from boiler fuel wood.	• The off-cuts from paperboard should be sold or sent to the recycling facilities. Or Reuse of the solid waste remains e.g. off-cuts from paper and the remains. • Ash remains from boiler fuel wood	• The off-cuts from paperboard should be sold or sent to the recycling facilities. Or Reuse of the solid waste remains e.g.	Project Management Team, Workers and/or HSE Team	Waste Record

Potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action plan	Responsibility	Report
	Domestic waste from staff quarters. Used containers of painter ink, glue, fuel oil, and lubricants. Improper waste management from industrial activities.	will be handled properly by waste management company or deal directly with City Development Committee (CDC) without improper disposal. • Ensure that all trash containers in the plant are properly sealed at all times to prevent waste being blown and scattered. • Non-hazardous solid waste should not be burnt but instead be disposed of in a skip and should be timely collected and disposed to administered disposal site. • Deal directly with City Development Committee (CDC) to routinely handle hazardous waste. • Ensure timely collection and disposal of all solid waste generated. • Provide separate bins for food waste, metal and other wastes at the staff quarters and other facilities on site. • Avoid contamination of the surrounding environment by maintaining machines equipment and vehicles regularly and handling of fuel and lubricants with caution. • Avoid leaks, spills or accidental releases into the soil, surface water and ground water resources by proper storage, handling and transport of	off-cuts from paper and the remains. • Hazardous waste and ash remains of boiler fuel wood will be handled properly by waste management company or deal directly with City Development Committee (CDC) without improper disposal. • Ensure all the hazardous waste are in secured area followed by the instruction showed in label.		

Potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action plan	Responsibility	Report
		hazardous materials. • All employees will be encouraged to take part in education and training programs, and cleanup activities in turn not only in the facility but also with the adjacent communities. • Develop a hazardous materials management plan addressing storage, use, transportation and disposal for each item.			
Impact by Boiler	Emission of boiler in wastewater treatment plant Ash Remains from boiler fuel wood Safety Threat by boiler in wastewater treatment plant	• Use boiler cleaner technologies and investing in less polluting technologies. • Utilize pollutant control system in boiler. • Exhaust gases and pollutants from boiler, generators/engines and any other machines should be channeled from at least three meters above the ground surface to allow dispersal through a pipe) • Treat properly ash remains from boilers or send to the waste management company or deal directly with City Development Committee (CDC). • Ensure that boiler is maintained in accordance with manufacturer's recommendations. • Boiler must be fitted and operated with adequate safety and monitoring	• Installation of boiler cleaner technologies with pollutant control system. • Treat properly ash remains from boilers or send to the waste management company or deal directly with City Development Committee (CDC). • Ensure a suitable program of maintenance and testing boiler by competent person. • Ensure that precautions are taken to prevent fire and boiler explosion. • Report the incidents if any.	Project Management Team, Workers and/or HSE Team	Maintenance Report Incident Report

Potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action plan	Responsibility	Report
		control devices and operated by competent persons. • Operating boiler must have appropriate security measures to prevent deliberate interference. • Ensure that precautions are taken to prevent fire and boiler explosion. • Ensure that boiler is identifiable and accessible for maintenance. • Check and test the plant to prevent fatigue of pipeline or supporting structure or holding structure, pipeline and flange leaks, vapor lock, cavitation, stress – corrosion cracking, thermal expansion, cyclic stress, structural failure and over pressurizing pipe system. • Records of maintenance and tests must be kept. • Incidents involving death or hospitalization, fire or explosion of boiler must be reported to the Authority and records of such incidents must be kept.			
Impact on Ecological Resources	As the proposed project is located in industrial zone, the impact on ecological resources is "negligible"	-	-	-	-

Potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action plan	Responsibility	Report
	significance.				
Impact on Occupational Health and Safety	Fugitive emissions from operation activities, vehicle movement. Exposure to solid waste, liquid waste and hazardous waste. Safety Threat by Boiler and other working conditions.	• Adequate ventilation should also be provided. • Extractor fans should be installed in industry to extract dust and other fumes. • Keep in a clean and safe state, including floor, walls, work rooms, and ceilings. • Have adequate space to avoid overcrowding and risks of injury to health of persons employed there in. • Hazardous materials in any industry must be clearly labeled. • Provide with protective wear such as earmuffs, gloves, gumboots, overall coats, nose masks and head gear for employees/workers. • Provide first aid kits and adequate medical care to the employees in case on an accident. • Regular inspection and maintenance of pollution control systems. • All measures related to safety such as safety appliances, training safety	• Provide safety of work places. • Provide PPEs appropriately for the particular work. • Ensure a suitable program of maintenance and testing boiler by competent person. • Ensure that precautions are taken to prevent fire and boiler explosion. • Provide staff training for boiler safety and fire safety measures and emergency response plan. • Report the incidents if any.	Project Management Team, Workers and/or HSE Team	Training Report Incident Report

Potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action plan	Responsibility	Report
		posters, slogans, pictures should be posted readable clearly at the factory • Adequate facilities for drinking water and toilets should be provided to the employees. • Operating boiler must have appropriate security measures to prevent deliberate interference. • Ensure that precautions are taken to prevent fire and boiler explosion. • Ensure that boiler is identifiable and accessible for maintenance. • The health of the workers should be regularly checked by a well-qualified doctor and proper records will be kept for each worker. • Rinse eyes with water if they come into contact with dust and consult a physician. • Use soap and water to wash off dust to avoid skin damage. • Well stocked first aid box which is easily available and accessible should be provided within the building. • Well-designed waste management system and storm water drainage systems have to be put in place so as to ensure that breeding grounds of disease carrying vectors such as rats, flies, mosquitoes, cockroaches etc are effectively controlled in work area.			

8.3.3 Environmental and Social Management Plan for Decommissioning Phase

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the decommissioning phase.

Table 8.3: Environmental and Social Management and Monitoring Measures for the Decommissioning Phase

Potential Impact	Environmental Aspects/ Activities	Mitigation and Management Measures	Action plans	Responsibility	Report
Air Quality	Fugitive emissions from decommissioning activities. Emissions from decommissioning vehicles and equipment usage.	• Ensure strict enforcement of on-site speed limit regulations. • Avoid demolitions works in extremely dry weathers. • Sprinkle water on graded access routes when necessary to reduce dust generation by machines. • Demolished materials on site to be covered to prevent to be blown off by wind • Minimization of exhaust emissions. • Air pollution from vehicles will be minimized by using low emission equipment and vehicles. • Vehicle idling time shall be minimized. • Alternatively, fueled equipment shall be used where feasible equipment shall be properly maintained • Truck drivers should avoid unnecessary running of vehicle	• Ensure that regular dust suppression activities are performed on a regular basis. • Ensure that all trucks hauling soil are adequately protected. • Ensure proper working condition of vehicles and Report the incidents to the Site Manager if any. • Ensure inspects the site and the housekeeping of the area.	Demolition Team and/or Designated HSE Team	Incident Record

		engines at loading/ offloading points and parking areas, and to switch off or keep vehicle engines at these points. • Minimizing dust from material handling sources by using covers. • Optimize vehicle movements to eliminate unnecessary vehicle movements. • Spraying water to minimize dust from vehicle movements. • Prohibit burning of domestic waste on site. • Ensure strict enforcement of on-site speed limit regulations. • Avoid excavation works in extremely dry weathers. • Sprinkle water on graded access routes when necessary to reduce dust generation by vehicles. • Decommissioning waste on site to be covered to prevent to be blown off by wind.			
Noise Quality	Noise from vehicles and demolition equipment usage.	• Machinery drivers and machinery operators should switch off engines of vehicles or machinery not being used. • Schedule noisy decommission activities and transportation during day-time hours. • Used good condition and	• Ensure No noisy activity to be carried out during night-time. • Ensure that noise levels meet guidelines and if necessary, put in place noise control measures • Ensure inspection the site and	Demolition Team and/or Designated HSE Team	Incident Record

		insulated demolition machineries and other equipment should be used in good condition and insulated. • Combine noisy operations at the same time, but avoid combinations of vibration.	the housekeeping of the area.		
Water Quality/Resource	Improper management for solid waste, waste water and hazardous waste Spills/ leaks of oil and lubricants from fuel equipment and vehicles.	• Water should be used efficiently at the site by decommissioning workers to avoid irresponsible water use. • Soil erosion and sediment control mechanisms will add positive effects on mitigation matters for water pollution. • Grey water (spent water from washing and shower) and water used for wheel washing will be recycled after removing sediments. Primary treatment may be used to treat the grey water. • Use leak proof containers for storage and transportation of oil and grease. • Collect solid wastes in containers and disposed of properly. • Septic tanks and soakage pits will be constructed having adequate capacity • Remaining sludge will be disposed as instructed by the	• Ensure all grey water will be reused, where practicable. • Ensure that all storm drains are cleared of debris so as to ensure free flow of water. • Ensure that waste management plan is implemented.	Demolition Team and/or Designated HSE Team	Incident Record

		environmental regulations.			
Soil Quality	Spills/ leaks of oil and lubricants from fuel equipment and vehicles. Improper management for solid waste, waste water and hazardous waste.	• Ensure proper liners are under chemical and fuel storage tanks. • Ensure only well-maintained equipment and vehicles used for the demolition phase. • Ensure boundaries will be strategically placed in order to minimize surface run-offs. • Careful planning process with regards to establishing work zones, minimize soil disturbance during the demolition phase. • Develop an erosion control and re-vegetation plan to delineate measures to minimize soil loss. • Clean and maintain drainage systems regularly. • Recycle of excavated earth materials. • Disposal of demolition debris to landfill sites. • Daily inspection of the project site and completion of logs. • Ensure that any waste is disposing correctly way.	• Inspect the storage areas for the assurance of the spill/leak proof system; • Complete the incident report should any leak occur. • Ensure that all site boundaries are strategically installed around the site. • Ensure that any waste is disposing correctly way.	Demolition Team and/or Designated HSE Team	Incident Record
Waste Disposal	Waste generation and disposal of the demolition site including solid waste, liquid waste and	• Fuel storage facilities should be removed immediately upon completion of the decommissioning phase. • The hazardous wastes should	• Ensure all the hazardous waste are in secured area. • Perform the visual inspection of the waste containers and complete the relevant log.	Demolition Team and/or Designated HSE Team	Incident Record

	hazardous waste.	be disposed with proper disposal method and caution. • Train employees to promptly clean up any oil or hazardous material spill. • Segregation of hazardous waste from solid waste shall be performed. • Solid wastes should not be dumped into the drain. • Encourage waste sorting by the facility users. • Provide separate bins for food waste, metal and other waste at the temporary camp and other facilities on site. • Wastes can be recycled or disposed at the landfill. • Ensure that any waste is disposing correctly way.	Ensure that any waste is disposing correctly way.		
Impact on Ecological Resources	As the proposed project is located in industrial zone, the impact on ecological resources is "negligible" significance.	-	-	Demolition Team and/or Designated HSE Team	Incident Record
Occupational Health and Safety	Fugitive emissions from decommissioning activities. Impairment of hearing	• Initial job trainings relevant to the assignments should be offered for staffs. • All workers will be provided with personal protection equipment (PPE) and will be	• Ensure the PPEs provided are sufficient / appropriate for the particular work. • Ensure that regular dust suppression activities are performed on a regular basis.	Demolition Team and/or Designated HSE Team	Incident Record

	capacity due to the exposure to high noise levels	obliged to wear them in work zones. • Particular works shall strictly follow work permit scheme. • Promote safe and healthy working environment, health, and well-being of all employees. • Rinse eyes with water if they come into contact with dust and consult a physician. • Use soap and water to wash off dust to avoid skin damage. • The fire and safety equipment should be properly utilized and maintained regularly. • Well stocked first aid box which is easily available and accessible should be provided.	• No unnecessary blowing of horns at any time. • Ensure PPEs are in stock. • Ensure proper working schedule for all employees.		

8.4 Environmental monitoring Plan

Table 8.4 Monitoring plan for environmental, social and health impact

Factors	Index/Parameter	Procedure	Proposed Duration	Frequency of Monitoring	Location
Air Quality	• PM2.5 • Ozone • NO2 • PM10 • SO2 • NOx	Method Myanmar National Environmental Quality (Emission) Guidelines • General Guidelines • In section 1.1: Air Emission of Myanmar National Environmental Quality (Emission) Guidelines(2015), small-combustion facilities emission guideline applies to project systems designed to deliver electrical or mechanical power, steam, heat, or any combination of these, regardless of fuel type, with a total, rated heat input capacity of 3-50 megawatt thermal. As the combustion technology/ fuel of the boiler is rubber wood as the type of solid, the standards and parameters are	**Duration:** 1 day continuously **Frequency:** • Annually during operation and once during decommissioning phase • As within 1 km of a community regular monitoring will be required. • In case of any complaint regarding air quality, an additional air quality measurement may be conducted in response to specific complaints (if necessary)	Will submit monitoring reports to the Ministry not less frequently than every six (6) months or periodically as prescribed by the Ministry.	Nearest sensitive receptor or downwind of complaint area (if necessary)

Factors	Index/Parameter	Procedure	Proposed Duration	Frequency of Monitoring	Location
		described in the second column . **Boiler** A boiler safety valve is a spring loaded valve and shall not be more than 16 kg/cm^2 Safety valves should be installed wherever the maximum allowable working pressure (MAWP) of a system			
Noise	• L_{eq}24 hr. • L_{max} • L_{dn}	Method • Myanmar National Environmental Quality (Emission) Guidelines, Effective since 2015 in accordance with The Environmental Conservation Law, 2012, and	**Duration:** 1 day continuously **Frequency:** • Annually during operation and once during decommissioning phase • If within 1 km of a community regular monitoring will be required • In case of a complaint regarding noise from project site, an additional noise measurement may be conducted (if necessary)		Within 1km of a community
Effluent	**Physical parameters:**	Method	• Annually during operation and once during	Will submit monitoring	Near effluent source

Factors	Index/Parameter	Procedure	Proposed Duration	Frequency of Monitoring	Location
	• Silver (mg/L as Ag) • Selenium (mg/L as Se) • Chromium (mg/L as Cr) • Cadmium (mg/L as Cd) • Mercury (mg/L as Hg) • Total Nitrogen (mg/L) • Hexavalent Chromium (mg/L as Cr6+ • Total Phosphorus (mg/L as P) • Apparent Colour3 • TSS • BOD5 • COD • Free Cyanide • Aluminium • Arsenic • Copper • Iron • Lead • Zinc • Sulfide • Phenol	• Analytical Methods followed to Standard Methods for the Examination of Water and Wastewater, recommended by National Environmental Quality (Emission) Guideline (NEQG)	decommissioning phase	reports to the Ministry not less frequently than every month or periodically as prescribed by the Ministry.	

Factors	Index/Parameter	Procedure	Proposed Duration	Frequency of Monitoring	Location
	• Fluoride • Oil & Grease • Total coliform count •				
	For construction phase, • Biological oxygen demand • Chemical oxygen demand • Oil and grease • pH • Total coliform bacteria • Total nitrogen • Total phosphorus • Total suspended solids	<u>Method</u> Section 1.2 Waste Water of National Environmental Quality (Emission) Guideline (NEQG) • Site Runoff and Wastewater Discharges (construction phase)	• During construction phase	Apply during the construction phase	• Discharges from all project locations
Hazardous and Non-hazardous waste	• Manifest Disposal and Tracking Report	• Track waste volume by type and disposal location daily	• Throughout all phases	Regular Check-up If any , Incident Report	• At all project locations
Social	• Complaint • Monitoring and solving	• Record complaint • Monitor, investigate and implement suitable solutions			• Project area, community around project area, and transportation route
Public and Occupational health and safety	• Accidental statistics • cause of accidents • Mitigation measures	• Conduct summary report for accident investigation			• Project area, community around project area, and transportation route

8.4.1 EMP Budgets and responsibilities for environmental monitoring

The OJIGS packaging company will use ***2-3%* of the investment amount** for the EMP cost. The target expenditure is USD 12,000 per year for an environmental management plan. Out of total, 60% will be used for environmental mitigation and the remaining 40% will be used for monitoring programs.

The construction period of the project is approximately one year and the plant will be operational within the 35-year investment period of the Myanmar Investment Commission.

Table 8.5 Budgets and responsibilities for environmental monitoring (USD 4800/yr)

Environmental Factors	Index/ Parameters	Responsibility	Estimated Budget
Operation phase (EMP)			
Air Quality	NO2*,SO2, CO *, O3*, H2S, CO2, VOC, PM2.5, PM10	Environmental Team (Third Party)	USD 2,000/ air monitoring
Noise	• L_{eq}24 hr. • L_{max} • L_{dn}	Environmental Team (Third Party)	USD 800/ noise monitoring
Effluent	Physical parameters: Tap water and storm water , TSS, BOD5, COD, Nitrate-Nitrogen, Total coliform count, Wastewater, Silver (mg/L as Ag), Selenium (mg/L as Se), Chromium (mg/L as Cr), Cadmium (mg/L as Cd), Mercury (mg/L as Hg), Total Nitrogen (mg/L), Hexavalent Chromium (mg/L as Cr6+, Total Phosphorus (mg/L as P), Apparent Colour, TSS, BOD5, COD, Free Cyanide, Aluminium, Arsenic, Copper, Iron, Lead, Zinc, Sulfide, Phenol, Fluoride, Oil & Grease, Total coliform count	Environmental Team (Third Party)	USD 1,000/ effluent monitoring
Hazardous and Non-hazardous waste	• Manifest Disposal and Tracking Report	The factory In charge and HSE Team	USD 1,000
Social	• Complaint • Monitoring and solving	The factory In charge and HSE Team	
Public and Occupational health and safety	• Accidental statistics • cause of accidents	The factory In charge and HSE Team	
	Mitigation measures	The factory In charge and HSE Team	USD 7,200

8.5 EMP Budget for the mitigation measures

The estimated costs for the Mitigation measure will be (60%) of the total which is USD 7200 per year.

These include the following costs:

a) Supervision on environment
b) Engineering supervision cost
c) Institutional Strengthening, Training and Capacity Building
d) Development of Manual of functions and procedures including HSE procedures
e) Equipment and logistics
f) The social welfare programs for the employees and the nearby community who needs

8.6 Corporate Social Responsibility

The OJIGS Company implements Corporate Social Responsibility (CSR) plan together with EMP during the operation period. The objective of CSR plan is to conduct the business in a way that is ethical, society friendly and beneficial to community in terms of development. The project proponent should contribute 2% of the net profit for Corporate Social Responsibility (CSR) for the development of local communities including living standards, their health, religious organizations and local's education. On the 2 % of the net profit of the project, 0.5% amount should be used for the community development such as transportation, 1% should be intended for the local's health and education and the remaining 0.5% of the net profit should be for the donation of pagodas and monasteries.

Chapter 9

Emergency Response Plan

9 Emergency response plan

9.1 Introduction

This chapter describes the strategy how to manage all possible emergencies along with actions required and written procedures to be carried out in order to respond the major hazards. Thus, an Emergency Response Plan (ERP) will be established for emergency situations that may arise during the production phase of OJIGS Packaging Factory. Moreover, it will give guidance on actions and lines of communication in the event of an emergency and outline the respective responsibilities of the OJIGS Packaging Factory and Health and Safety (HSE) contractor/Manager.

The objective is to prepare the resources (personnel and equipment) available to respond accidents all which can be resulted by the OJIGS Packaging Factory's activities, emergency situations (spill, fire, security incident, medical evacuation) and major disasters as well. This will lead to identification of potential accidents along with limitation of its consequences as well as high level of prevention of the potential negative consequences on humans and environment. At the same time, minimizing that should be reasonably practicable to reduce the risk to human life, the environment, assets and business in the event of an accident or emergency situation by ensuring effective and efficient intervention.

In the OJIGS Packaging Factory, in general, there should be either Emergency response in charge or HSE manager and Response Team for the emergencies. The team should be prepared as follows:

- Training of the team members along with their responsibility and equipped with the emergency materials
- Establishment and provision of the written emergency procedures
- Description and Availability of the Emergency Response Plan (ERP) in all employees and Factory workers and there should be documented and post it prominently on each floor
- Identification of the locations of the emergency evacuation Muster points
- Provision of alarm system and fire fighting equipment
- Supporting of first aid equipment
- Ensuring the availability of adequate information on the emergency situations through a good communication system
- Ensuring efficient management of the emergency through the effective and efficient response of all dedicated resources
- Identification of the governmental authorities, media and other relevant stakeholders to be notified and production of a description of the procedures for communicating with them.

The potential emergencies that likely occur at the OJIGS Packaging Factory:

- Overheated boiler
- Fire/ Explosion
- Chemical exposure
- Workplace accidents/ Injury

9.2 Emergency policy

The OJIGS Packaging factory needs to establish policies and oversee all matters of operation of the factory's activities. If as an emergency may occur at any time and, in all likelihood, without warning, it is essential to have policies and procedures in place to assure the orderly operation and recovery of the factory.

- The established policies and procedures will be set up together with roles and responsibility for making decisions and taking actions.
- Thus, emergency management plans described in the above sections should lie with either an emergency service in charge or the factory's designee and the onsite response team

9.3 Organization of emergency team

Phase I Emergency team shall be formed with senior persons available in shift and/or trained or experienced with environmental management issues. This team shall be constituted with Factory Shift- In charge (for factory emergencies) as Emergency response in charge/Site Incident Controller and pilot on duty. The numbers of the in charge will depend on the factory's decision and its capacity. The Workplace Health and Safety representative shall be designated.

Phase II Emergency team lead by emergency service in charge shall be formed with the response team occupying action group.

Phase III Emergency team shall be organized immediately in order to be well prepared to respond the emergency events that can happen either unexpectedly or accidently.

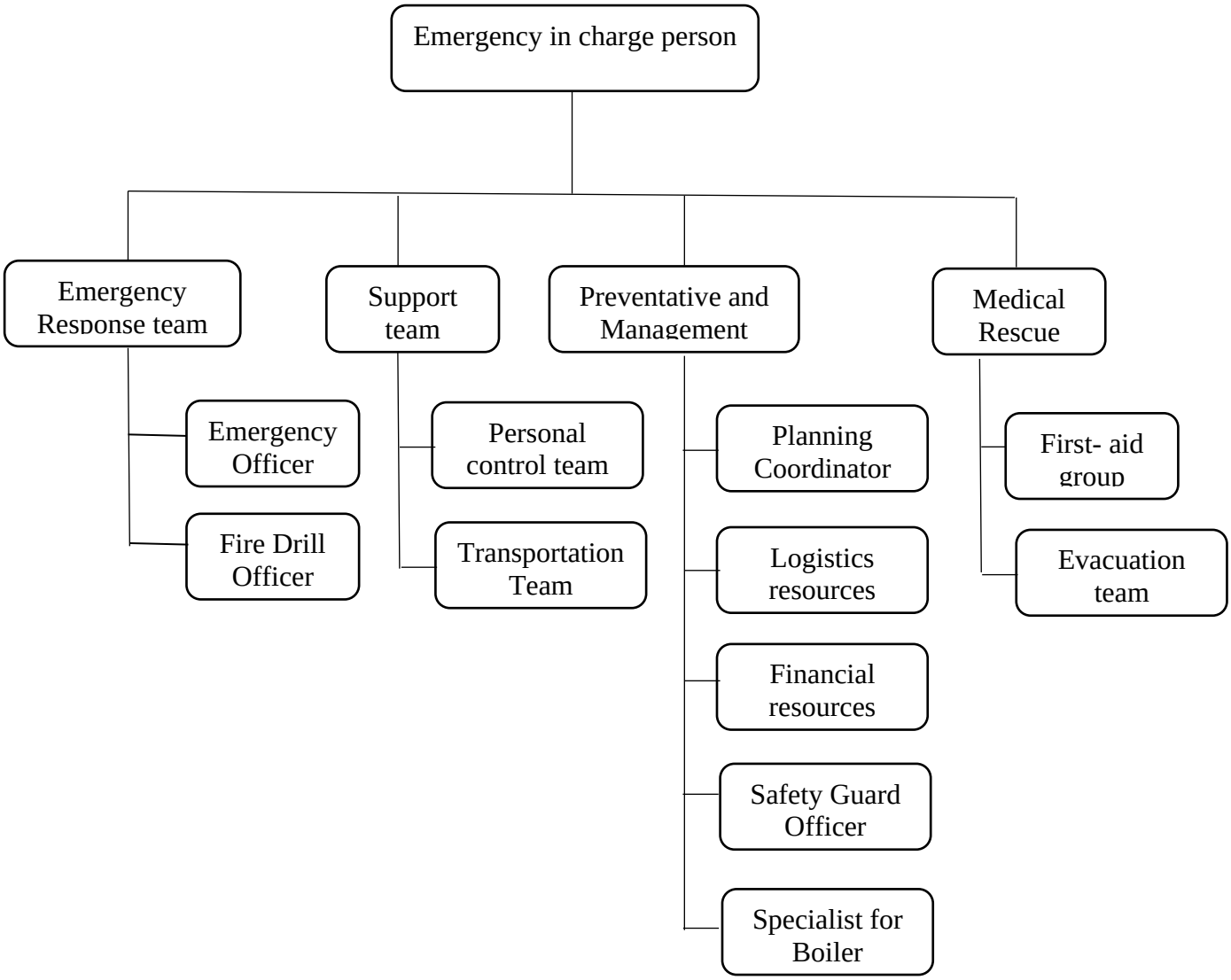


Figure 9.1 Organization chart for emergency team

9.4 Emergency response procedure

Before preparing a procedure, a risk assessment will be carried out for estimating how likely it is for an emergency event to occur and if it does, how serious or damaging the consequences would be. The emergency procedure should provide an appropriate and proportionate response to this situation.

9.4.1 Reporting an emergency

The person who discovered an emergency case shall immediately inform the emergency officer or Safety guard officer. Whenever there is an imminent or emergency situation, the building must immediately:

1. Activate facility alarms or communications systems to notify personnel to evacuate the building.
2. Notify the relevant department using the following outline:
    a. your name and name of department/company

b. Location of factory, i.e. No.(B-1-2), Mingalardon Township, Mingalardon Industrial Zone, Yangon.
c. Describe nature of the case, i.e. fire, chemical spill, boiler overheated or workplace accident.
d. any other requested information

3. Go to the parking lot or send someone to the parking lot to direct the relevant department to the emergency area.
4. Contact Yangon Electricity Supply Corporation (YESC) to secure electrical service to the affected area.

   Yangon Electricity Supply Corporation Offices
   197/199, Lower Kyee Myin Daing Rd., Saw Yan Paing (South) Ward, Ahlone Township, Yangon Region
   01-1717 [Hot Line], 01-2302285~9
5. Assist in assessing the extent of damage caused.
6. Assess the adequacy of the Emergency Plan and the response by personnel to determine if the Plan is in adequate and if additional training is needed.

Careful and complete details of all emergencies should be recorded in the appropriate log book, with each entry giving at least the following information:

- date of incident,
- item of equipment,
- details of emergency,
- details of immediately previous maintenance work carried out to the equipment,
- previous evidence or warnings of trouble,
- any special circumstances or other relevant details,
- Action taken to affect both temporary and permanent repairs.
-

9.5 Emergency response plan for overheated boiler

An “Overheated Boiler” condition is created when a heating unit reaches an exceedingly high temperature and pressure, and will not shut off. This condition, also commonly referred to as a “Runaway Boiler”, is considered unsafe and very hazardous to both emergency responders and building occupants.

This condition is primarily caused by coincidental failures of redundant safety controls that maintain safe temperature, pressure, gas supply, and water supply. Although an “Overheated Boiler” is an uncommon condition because it requires multiple control failures to occur simultaneously, the potential hazard does exist. When boilers experience an overheated condition, catastrophic damage to the heating unit, safety controls and components is likely.

This emergency condition should be treated with a similar response to an inside gas leak with open air gas readings 1% or greater. In these cases, service technicians are expected to evacuate all occupants (including themselves) from the premises, and keep the public a safe distance away from the building. Dispatch should be notified to report the situation to supervision and request assistance, as required.

9.5.1 Action plan for overheated boiler

OPERATING HAZARD	POSSIBLE CAUSES	LIKELY EFFECT	PREVENTIVE MEASURE
OIL FIRING:			
High fuel temperature	Improper setting of thermostat. Steam control valve stuck open in steam heater. Electrical supply contacts welded closed in electrical heater explosion.	Oil gasification. Poor atomization. Unstable flame. Fireside explosion. Fire. Damage to boiler and assets damage. Loss of life or injury.	Periodic check of heaters and controls.
Low fuel temperature	Faulty heater element. Low setting of oil temperature control. Steam supply disrupted or closed. Electric power of heater off. Explosion.	Smoky fire. Poor atomization. Discharge of unburned oil in the furnace. Fireside explosion Fire. Damage to boiler and assets damage. Loss of life.	Periodic checks of oil temperature and heaters.
Wet steam during atomizing	Steam line not insulated. Steam traps not working. Steam wet from source. Explosion.	Smoky fire. Poor atomization. Sparkles in flame. Unburned oil discharged in furnace. Fireside explosion. Fire. Damage to boiler and assets. Loss of life.	Ensure insulation of steam lines. Periodic check of trap operation
Low steam pressure	Improper setting of control valve. Supply line valves inoperative or not open. Low supply pressure. Explosion.	Smoky fire. Poor atomization. Unburned oil discharged in furnace. Fireside explosion. Fire. Damage to boiler and assets. Loss of life and/ or injury to personnel.	Insulate all steam lines. Check proper trap operation periodically. Follow manufacturer's instructions.
Worn or damaged atomizer	Normal wear and tear. Abrasive material in oil. Burner tip not serviced. Explosion.	Incomplete combustion. Flare back. Fire.	Regular service of tips. Gaskets should be replaced when cleaning or replacing tips.
GAS FIRING:			
Gas line leaks	Improperly assembled joints. Excessive pressure. Leaking	Explosion. Asphyxiation. Fire.	Ensure adequate ventilation. Piping, valves and fittings should be well

OPERATING HAZARD	POSSIBLE CAUSES	LIKELY EFFECT	PREVENTIVE MEASURE
	gasket. Damage to piping, valves and fittings carrying fuel.		maintained. Test of leaks and safety devices before operation.
Gas Line Repair	Damage Piping or valves	Explosion. Fire. Loss of life or injury. Damage to assets.	Accepted methods of r purging and recharging gas lines should be used
High Gas pressure	Defective gas pressure regulation.	Fuel rich mixture. Fireside explosion. Fire. Loss of life or injury. Damage to boiler and assets.	Monitor for regulator operation. Check operation and setting of pressure switch periodically. Repair or replace defective regulators and switches.
STEAM LEAKS			
Steam Leaks	Damaged or corroded pipes and pressure parts	Severe burns.	All joints and pipes should be secured.
HOT FLY ASH			
Accumulations of hot fly ash and fly ash in boiler flues and plenums. Workers stepping on hot fly ash. Fly ash may retain heat for several weeks. No visible difference between hot and cold fly ash. Explosive effect of water on hot fly ash.		Serious burn injury	Warnings to all workers about potential hazard. Allow sufficient cooling time before walking on fly ash. Hot fly ash should be removed with caution using equipment. Water should be sprayed on hot fly ash.
STEAM EXPLOSION			
Low water level	Defective low water cut off or low water cut off bypassed. Improper water column blows down procedure. Tampering with low water control. Defective boiler water feed system. Defective or inoperative gauge glass. Operator error.	Overheated boiler surfaces. Ruptured boiler. Loss of life and/or injury to personnel. Asset damage.	Periodic verification of boiler water feed system. Periodic check of low water cut-off operation. Water column blow down procedures should be correct. Do not tamper with low water controls. Replace defective low water controls. Periodic inspection of equalizing lines. Operators should be trained properly.
Defective safety	Obstruction between	No release of excess	Promptly replace or repair

OPERATING HAZARD	POSSIBLE CAUSES	LIKELY EFFECT	PREVENTIVE MEASURE
valves.	boiler and valves. Damaged or corroded valve. Level tied down. Valve outlet obstructed.	pressure. Excessive pressure on the boiler. Boiler ruptured. Loss of life and injury. Damage to assets.	safety valve. Remove obstructions. Periodic test of safety valves.
Defective steam pressure gauges.	Broken gauge or poor calibration of gauge. The line from boiler to gauge blocked. Gauge cock is closed. Conflict of multiple gauges.	Gauge will not show the correct pressure even when the boiler is under excessive pressure. The operator will not be aware of true operating conditions.	The gauge should be calibrated regularly. Defective gauges should be preplaced promptly. Periodic inspection of gauge connection and piping to boiler for blockage or closed cock.
Scaling or corrosion in boiler's internal surfaces.	Poor maintenance and test methods. Improper chemical cleaning. Improper water treatment and contaminated boiler water. Poor feed water control.	Ruptured boiler due to overheating. Loss of life or injury to workers. Assets damage.	Regular maintenance and inspections. Keep maintain log. Boiler water treatment should be appropriate
Bypassed controls.	Defective electrical wiring. Control and electrical wiring tampered.	Malfunctioning or no functioning of controls. Boiler ruptured. Explosion in furnace. Loss of life. Damage to assets.	Periodic test and verification of controls. Controls and wiring should not be tampered.
Tampering with controls	Lack of proper training to workers	Improper operation of boiler may lead to boiler rupture. Explosion in furnace. Loss of life. Damage to assets.	Only trained and authorized workers should have access. Operators should be properly trained.
Poor maintenance	Lack of maintenance policy and procedure. Poor or no training to workers.	Fatal risk for workers and assets. Low operating efficiency and poor operation. Leads to high repair and replacement cost.	Implement a well-documented maintenance policy and procedures. Keep maintenance log.
Condensate tank explosion.	Improperly vented tank or vent too small. Vent may be trapped. Trapped vent has frozen condensate.	Excessive tank pressure may lead to explosion. Loss of life. Damage to assets.	Traps in vent line should be eliminated. Vent should be of full size.

OPERATING HAZARD	POSSIBLE CAUSES	LIKELY EFFECT	PREVENTIVE MEASURE
Explosion in furnace			
Inadequate pilot/igniter.	Low pressure of oil or gas. Not correctly positioned. The nozzle may be too small. Improper setting of light-off. Damper. Plugged orifice.	Delay in ignition or may not ignite the main flame. Fireside explosion. Fire. Boiler damage. Loss of life and severe injury. Damage to assets.	Ensure periodic maintenance of pilot. Correct the pilot position, conduct periodic pilot verification test.
Ignition delayed.	Pilot or igniter is not adequate. Fuel pressure may be low or fuel rate may not be sufficient. Excessive air rate. Low oil temperature. Water in fuel.	Fire. Fireside explosion. Can damage the boiler. Loss of life and severe injury. Damage to assets.	Ensure adequate pilot. Light-off fuel/aeration. Pilot turndown test. Excessive restart attempts should be avoided.
Combustion air not sufficient.	Lack of adequate air openings in the boiler room. Dirty combustion air blower. Combustion air blower running too slow or slipping. Setting of fuel/aeration not proper. Blockage in blower inlet or in outlet damper. Boiler gas passage may be plugged	Delayed ignition. Combustion may be inadequate. Fireside explosion. Loss of life and severe injury. Damage to assets. Fire. Boiler damage. Enhanced emissions.	Ensure adequate air to boiler room. Combustion air fans should be clean and running properly. Periodic inspection of air inlets and outlets, combustion controls, boiler gas passages, hot fuel gas passage, dampers and hot flue gas temperature.
Combustion safety control tampered	Lack of knowledge or poor operator training.	Can lead to fireside explosion. Fire. Loss of life and serious injury. Damage to boiler and assets.	Only authorized personnel should conduct maintenance. Operators should be properly trained in maintenance and operation procedure.
Leaks in fuel safety shutoff valves.	Defective valve. Foreign objects under valve seat.	Fuel can flow to the boiler. Uncontrolled ignition of fuel. Fireside explosion. Loss of life and severe injury. Fire. Damage to boiler and assets.	Periodic inspection of valves. Defective valves should be replaced promptly. Regular leak test and verification of valves' operation.
IMPLOSIONS			
Excessive negative pressure	Flame out	Damage to equipment. Serious	Control equipment should be properly operated and

OPERATING HAZARD	POSSIBLE CAUSES	LIKELY EFFECT	PREVENTIVE MEASURE
		risk of injury.	should not be bypassed.
OPERATING HAZARD	**POSSIBLE CAUSES**	**LIKELY EFFECT**	**PREVENTIVE MEASURE**
MAINTENACE			
Equipment undergoing maintenance. Sudden starting of remotely controlled equipment. Release of fluid pressure. Electrical shock.	Lock out/ tag out not followed, equipment not in zero mechanical state, or not in zero energy state.	Can lead to severe injury or death of workers	The equipment should be replaced in zero energy state and zero mechanical state. Comply with lockout and tag out procedures. Workers should be trained for alertness. Post warning signs.
Cleaning	Neglecting safety procedures for maintenance cleaning	Can lead to severe injury or death of workers	Carefully follow all maintenance procedure cleaning. Provide appropriate protective clothing to workers. Regular cleaning and removal of ash, soot, slag etc can prevent excessive accumulation.
Entering a confined or enclosed space such as furnace, ducts, drums, shell, gas passes, flues, tanks, bunkers, hoppers, tec.	Can be extremely hazardous due to toxic or inflammable oxygen deficient atmosphere and hot material.	Can lead to severe injury or death of workers	Ensure sufficient ventilation for the fresh air. Conduct test for oxygen deficiency, toxic or inflammable gases before entering. Ensure adequate lights before entering an enclosed space. Follow all applicable safety rules.
Airborne contaminants such as gases, fumes, vapours, dust and mist.	Ventilation or exhaust not proper. Leakage.	Can lead to sever injury or death of workers	Ventilation or exhaust system should be in good working condition. Provide respiratory mask and protective clothing.
Moving equipment or parts and fan blades in exposed condition	Safety guards missing	Can lead to severe injury.	Ensure safety guards are installed. Loose clothing and long hair should be avoided.
Congestion in work area	Poor housekeeping.	Risk of falls, slips and trips leading to injury.	All equipment should have clear and unobstructed access. Maintain good housekeeping.

OPERATING HAZARD	POSSIBLE CAUSES	LIKELY EFFECT	PREVENTIVE MEASURE
Accidental opening of the access door.	Closed door is not locked or bolted.	Risk of bodily injury	Ensure all access doors are locked.
ELETRICAL			
Exposed/ naked electrical wiring	Damaged or no insulation. Poor maintenance.	Risk of severe electrical shock causing injury, burns or even death.	Ensure all electrical wiring is secured and insulated.
Exposed electrical boxes.	Negligence	Risk of severe electrical shock causing injury, burns or even death	Ensure electrical boxes are covered
Switch box opens without turning off powers.	Safety catch damaged allowing opening without shutting off power.	Risk of severe electrical shock causing injury, burns or even death.	Safety catch should be repaired immediately.

9.5.2 Emergency shutdown for overheated boiler

An "Overheated Boiler" condition is created when a heating unit reaches an exceedingly high temperature and pressure and will not shut off. This condition is considered unsafe and very hazardous to both emergency responders and building occupants. The Fire Department will evacuate occupants and ask them to stay a safe distance away from premises containing an overheated boiler (at least 300 feet) in case of an explosion or fire.

Service Technicians will shut off the gas and/or electric service to the house/building if they identify an overheated boiler to allow the heating system to safely cool down without causing significant damage or injury to anyone in the area. The premises may only be re-entered after a Fire Department representative has determined that the situation is safe to do so. Anyone re-entering a building prior to receiving clearance from the Fire Department may be exposed to severely hazardous conditions that could result in significant injury or death. Overheated boilers or furnaces must be replaced. When Service Technicians determine that an Overheated Boiler conditions exists, they will issue a Class 1 Red (Violation) Tag to indicate that a boiler has overheated, is defective and must be replaced.

The procedures described below must be followed when investigating and shutting down an Overheated Boiler. Gas emergency notification for "Appliance (Heating) Won't Shut Off", which requires a 60-minute emergency response. Key words in the notification may include the following descriptions: "Steam Leak, Rumbling Noise, Burning Smell, Red Glow, High Pressure, High Temperature and Overheated". If at any time during the course of a heating service call, a technician notices that the pressure gauge displays a pressure higher than the boiler relief rating, they shall remove themselves from the building. Technicians shall move immediately to step 2 described below.

1. Evaluate the situation.
   a) What type of system do you have? Where is it located?
   b) Did you smell smoke or a burning smell?

c) Is there excessive heat being produced in the basement or living areas?
d) Is the emergency switch in the off position?
e) How long has the unit been running out of control? What did it look like last? i.e. "cherry red" color, paint peeling off, position of temperature or pressure gauges, leaking water or steam?
f) Did you or anyone else touch any part of the heating system before it started overheating? i.e. – disturbed the wiring, installed a thermostat, lit a pilot, started the unit, turned a valve, repaired a water leak, etc.
g) What steps have you or others taken so far to control the situation? i.e., shut off thermostat, shut off emergency switch, shut off the gas, etc.
h) Has the heating system ever been exposed to flooding?

2. Initiate an evacuation of occupants if the conditions meet the criteria of an overheated boiler. Instruct occupants not to re-enter the building for up to 24 hours for a commercial boiler. Commercial boilers take longer to cool down due the size of the boiler and amount of water in the system. Dispatch should be notified immediately to report the situation to supervision and request Fire Department assistance to keep the public away, secure the building and monitor for fire.
3. Shut off the gas supply outside at the gas meter or curb valve. Stopping the flow of gas from outside will allow the heating unit to begin cooling off safely. If there is no curb valve available, contact Dispatch to request a Gas Distribution crew to disconnect the gas service at the curb.
4. If the gas supply cannot be immediately shut off outside, consider shutting off the electric supply from the emergency switch or breaker located in a remote location or outside at the electric meter in an attempt to control the flow of gas.
5. After shutting off the gas supply to the heating equipment, the decision to discontinue the electric service is based upon the type of heating system involved in the incident:
   a) Hot Water Boilers – Leave Power "On" - to circulate the hot water and cool the boiler.
   b) Steam Boilers – Disconnect Electric – to prevent automatic water feed from opening. If there is no access to an outside electric meter, notify Dispatch to request an emergency shut-off from the electric company.
6. After disconnecting the gas service, lock off the meter (if outside) and issue a Class I Violation for the "Overheated Boiler" condition. Place "Shut Off Overheated Boiler" remark in the Remark Screen. Contact the Dispatch Office to create an interaction memo on the customer account containing the time and date of the incident. A Municipal Notification will be provided for all Overheated Boiler violations, regardless of whether a residential or commercial system is affected.
7. Before allowing access to the building, overheated boilers should be given up to 24 hours (commercial) to safely cool down after the gas supply was shut off. After the building is evacuated, a supervisor will provide the customer with instruction and a letter that describes the dangers of re-entering a building evacuated due an overheated boiler. Heating system experts have indicated that the greatest risk for an explosion or fire will usually pass within 4 hours of shutting off the fuel source.
8. The technician shall caution any first responders (fire department) and others, including the homeowner, NOT to spray water on the surface of an overheated boiler in an attempt to cool it down at a faster rate. This caution should include the following safety reminders:

"NEVER attempt to cool the boiler in any way. NEVER ADD WATER to an overheated boiler." In both cases, water could flash into steam and cause severe injury or death.

9. Customers affected by the disconnected services must make arrangements to have returned to evaluate the situation after allowing the equipment to cool down. Heating equipment manufacturers recommend that a unit should be condemned if the temperature and/or pressure during the overheat period exceeded the equipment rating for safe operation.

9.5.3 These dangers are associated with Overheated Boilers

When a boiler overheats, the temperature and pressure reach very unsafe levels and the heating unit is beyond repair. The result can be an explosion or fire. When a boiler or furnace overheats, shutting off the gas supply and allowing the heating system to cool down are the safest ways to control the situation. The danger of an explosion or fire will continue to exist hours after the gas supply is shut off.

During the cooling off period, the heating unit may still be experiencing high temperatures and pressures that can cause an explosion or fire. Never attempt to cool down a hot boiler by spraying water on it.

This could result in an explosion or cracked boiler. If hot water or steam gets released from a cracked boiler, it can cause a severe burn (scalding) injury. Never add water to a hot boiler. When cooler water touches hot water or the inside of a dry boiler, it can immediately flash into steam that will create high pressure and release energy, causing the boiler to explode or crack. A boiler that is overheating may appear "cherry red" when it reaches very high temperatures. Touching the heating unit may result in a severe burn injury.

9.6 Emergency fire/ explosion response plan

The possibility of fire occurrence is mostly associated with "low". However, the probability of a fire cannot be ruled out completely. Thus, the fire fighting equipment should be available at all work area and warehouses of the factory and should be kept in good working state. The use of this fire-fighting equipment should be one of the key points during the training of the ERP team, workers and staff.

The personnel technician in charge of the maintenance and plant management should regularly check this equipment and ensure that they are always ready to be used.

Moreover, the fire alarm system should be installed both at the factory and admin office. Floor plan along with the emergency exits should be allocated.

Figure 9.2 Fire alarm and fire fighting equipment

9.6.1 Action plan for fire/ explosion

Responsible Person	Action Item
Anyone who notices fire	Immediately Inform Emergency officer or Safety guard officer available in shift and/or trained or experienced with environmental management issues along with the details of the information: fire source, the nature of fire etc. OR Inform directly to relevant department, such as Police Station or Fire Force near Mingalardon Industrial Zone. **Nearest police station** 1. Shwe Pauk Kan Police Station Address: Nyaung Yan St, Shwe Pauk Kan Township Phone: 01 969 5561 2. North Okkalapa Police Station Address: Khaymar Thi Rd, Yangon Phone: 01 969 9384 **Nearest Fire Station** 1. Fire station 2 .North okkalapa, 01 969 9151 2. Fire Station, 01 699 149 3. Pale Volunteer Fire Brigade, 09 431 80200 4. North Okkalapa Fire Station, 01 969 9378 5. North Dagon Township Fire department, 01 584 060 6. Fire Station, Bagan Street, Yangon. 01 695 506
Emergency in charge person	On receiving the information of an emergency, the Emergency officer shall immediately proceed to the scene of the incident to assess the seriousness of the emergency. If an emergency is confirmed, he shall: ➢ Immediately raise the alarm and inform all employees as follows: • Location of fire • Type of fire

	• Seriousness of fire ➢ Immediately inform emergency service in charge
Onsite emergency response team & Nearest township fire station	• Start the actions and activate Emergency Action Plan in consultation with Emergency response in charge and use proper personnel protective equipment • Carry out the required fire fighting emergency action as directed by Emergency Response Team leader/ in charge person. • Water borne fire fighting equipment such as fire fighting tugs with fire monitors, lifesaving equipment and medical equipment shall be available • Based on the type of factory area involved initiate relevant response • Use proper personal protection and extinguishing media • Assess the situation from time to time and use appropriate strategy • Remove unaffected containers/goods from the area if possible • Medical rescue team must be standing by for personal injury in case. ***Important*** **For substances, which becomes dangerous when wet/ violently react with water** • Use dry chemical for small fire. • use smother with dry inert material and dispose them off using relevant safety precautions for large fire

9.6.2 Fire extinguishers and fire drills

Fire extinguishers: In the event fire, extinguishers are used to fight a fire only when it is safe for the employee to do so and the employee has been trained on how to properly use a fire extinguisher, the factory manager should contact the service supplier to have the extinguisher(s) serviced and recharged.

***Fire drills*:** Fire drills will be held at least once per year to determine effectiveness of this emergency procedure. A written record of the drill will be kept on file at the facility by human resources.

9.7 Workplace accident

All of the workers for the operation of OJIGS Packaging Factory are well trained through the capacity building and training program provided by the factory. However, workplace accident is inestimable and can happen accidently. Factory provides first aid training for the workers, and medicines and materials needed in case of emergency.

The factory shall establish a workplace policy, where all unplanned or undesired occurrence which may or may not result in injury to person and or damage to property, must be reported immediately.

9.7.1 Action plan for workplace accidents

Responsible Person	Action Item
Nearby person (or) Colleague	• Immediately inform the emergency service in charge • In serious case, call doctor at once or transport to doctor or hospital. Hospitals near the project are as follows (**Open 24 hours**) ✓ Waibargi Hospital Telephone - 01 690 118 ✓ North Okkalapa General Hospital, Telephone - 01 969 9422 ✓ OSC Hospital (Private), Thudhamma Rd, Yangon Telephone - 01 656 176 • Take actions in consultation with Emergency service in charge/ Shift In Charge and activate Emergency Action Plan
The Emergency response in charge	• Clearing employees from the area. • Cut off electrical supply if necessary • Controlling or eliminating sources of imminent danger • Ensuring that there is minimal scene disturbance, aside from anything required to be disturbed to deliver first aid and/ or control or eliminate an imminent danger. • Cure the injured person with provided first aid kit by a first aider trained in Emergency First Aid before the ambulance arrives.

9.8 Medical emergency response plan

The OJIGS Packaging Factory shall provide First Aid, Emergency Treatment, and Administration of medication for the factory workers during the working activities.

9.8.1 General provisions

1) The provisions of this policy are intended to meet workers health which needs during minor and major injuries or medical emergencies.
2) To ensure workers safety, the factory shall adopt the position that workers shall administer medications at home whenever possible.
3) The factory shall recognize that accidents and medical emergencies can happen during working hours; therefore, factory shall adopt guidelines to prepare staff members to provide first aid and emergency care during these unexpected events.

9.8.2 First aid emergency treatment

1. First aid shall be provided to factory admin staff, and workers.
    - Either any factory staff member or licensed medical professional designated by the factory to render care that should complete training in CPR and First Aid provided by the nationally recognized training organization.
    - First aid supplies shall be kept in central locations in the factory where they will remain clean, dry, and available to all personnel.

2. When an emergency exists, factory staff members will implement appropriate emergency procedures, "activating the factory's Emergency Response Plan (ERP)."
    - Any worker can contact the Emergency medical treatment place
    - Either factory member or licensed medical professional at the factory should be trained to administer emergency procedures needed in life-threatening situations.

9.8.3 Work field trips

For field trips that are considered an extension of the work activities, first aid supplies shall be available on all vehicles during work trips.

Figure 9.3 First aid kit

9.9 Emergency response plan for chemical exposure

Regarding the chemical exposure issue, if the factory uses some kinds of soft chemicals used in packaging factory, the factory shall keep A **Material Safety Data Sheet** (**MSDS**) which is able to represent the chemicals that are being used in the factory. It will include information of the chemicals on the potential hazards (health, fire, reactivity and environmental) and how to work safely with the chemical product. Emergency eye wash station should be kept at the factory for emergency cases.

9.9.1 Toxic release/Oil spill

The general hazardous materials management shall be addressed at the factory as follows:

(i) Location of Oil and chemical-handling facilities

- These should be located with a certain distance away from the natural drainage systems, office, active traffic and environmentally-sensitive areas (e.g. community villages, agriculture, farms etc) providing physical separation.

(ii) Protection of the Oil and chemical-storage handling facilities

- These facilities shall be protected from vehicle accidents.
- Covered and ventilated

(iii) Collection of leaks and spills

- Making designs to facilitate collection of leaks and spills (e.g. slope surface to allow capture of spills, valve catch basins) that allow spills and releases to enter a dead-end sump from which spilled materials can be pumped.

9.9.2 Actions plans for Toxic release/Oil spill

1) Anyone who notices spillage ⬇	• Inform the factory Control Room & Fire Station along with the details of the information such as accidents (e.g., spill),
2) Factory control room ⬇	• Immediately inform Onsite response team
3) Onsite response team	• Start the actions and activate Emergency Action Plan in consultation with Emergency service in charge • Check type of leaked material • Refer response procedure • Use proper personal protective equipment **Remark:** Unignited vapour cloud of flammable material can explode due to static electricity generated by movement of fire vehicles. Use stop, watch & proceed policy before responding to such emergencies.
4) The Emergency response in charge	• Inform engine room and shut down electrical circuits if necessary • Arrange firefighting team • Use proper personal protection & extinguishing media • Stop the source of leak by taking proper precautions. • Remove unaffected containers/goods from the area if possible. • For substance, which becomes dangerous when wet/ violently react with water use dry chemical for small release. For large release smother with dry inert material and dispose them off using relevant safety precautions.

*Fueling equipment should be inspected daily to ensure all components are in satisfactory condition.

Figure 9.4 Emergency eye wash station

9.9.3 Person(s) falling from the height

Actions plans for Person(s) falling from the height

1) Anyone who notices ⬇	• Inform Factory Control Room
2) Factory control room ⬇	• Immediately inform Onsite response team
3) The Emergency response in charge & Onsite response team	• Immediately activate Emergency First Aid • Then send to the hospital in accordance with the emergence care procedures

9.9.4 Pedestrian / forklift / warehouse safety

In OGIJS factory, accidents involving forklifts are among those with the most serious consequences. Before a forklift driver can react to an imminent collision with a person, it is often too late. For this reason, the OGIJS ensurse the strict separation of forklifts and people wherever possible. These endeavours have also given rise to the warehouse safety regulations (paper and finished goods stores). It is strictly forbidden at all times for persons to enter stores when they do not work there (persons working there are e.g. forklift drivers). If someone must enter the stores for official reasons, observe the following:

- Notify the forklift drivers before entering. You may enter only after these have parked their forklifts and approved access.

- Forklifts may not be operated while there are persons in the stores.
- A warning vest must be worn by all persons in the stores.
- The following conditions must be observed if "pedestrians" in the stores are to be protected to the maximum possible extent from falling loads:
- Paper rolls less than 80 cm in diameter may not be stacked on other paper rolls.
- No more than four paper rolls may be stacked on top of each other.
- No more than three paper bales may be stacked on top of each other.
- The height and narrow side of stacks may not exceed the ratio 6:1.

9.9.4.1 Forklift trucks

Use a forklift suitable for the activity. Examine the forklift according to the specifications before use. Forklifts may be operated only by persons who have been instructed in and assigned to the use of the forklift and its attachments. Use the forklift only when this does not involve any risks, e.g. pedestrians nearby. Seatbelts must be worn. Safety bars or doors do not serve in lieu of seatbelts. Move only in the direction of travel and only when you have a clear view. Use the rear view camera. Heed the NO ZONE. Never drive under the influence of alcohol or drugs. Take special care on uneven or inclined floors. Always drive at a sensible speed, above all on sites obstructing vision. Do not lift more than the forklift's design load.

9.9.4.2 Loading and unloading

Raised loads are always at risk of falling off. Protect yourself by keeping at an adequate distance. Falling paper rolls can continue moving for several metres. In this case, keep at a distance greater than that for normal loads. Never try to stop a falling load. Step to one side. Loading and unloading trucks must always be secured against rolling away. When loading and unloading, always keep in safe areas. If provided, in those marked especially for this purpose.

9.9.5 Cutting risks

Packaging industry poses many cutting risks that can seriously injure employees: The largest accident potential lies in the cleaning/handling of the doctor blades on the printing presses. The doctor blades are razor sharp and cut to the bone. The same applies to the cross and furrow cutting blades on the corrugating system. Employees are exposed to other cutting risks e.g. when they handle punch blades, cutters, bundled strips, and corrugated sheets.
Wear the protective gloves specified on the gloves chart in order to protect from cutting injuries. A cut may look like a small matter. But if it becomes inflamed, it can lose a finger or even the whole hand.

9.9.6 Special equipment for emergency

Factory employees may need personal protective equipment to evacuate during an emergency. Personal protective equipment must be based on the potential hazards in the workplace and the

appropriate controls and protective equipment for those hazards. Personal protective equipment may include items such as the following:

- Safety glasses, goggles, or face shields for eye protection;
- Hearing protection
- Hard hats and safety shoes for head and foot protection;
- Proper respirators;
- Any other special equipment or warning devices necessary for boiler emergency case.

Table 9.1 Personal protective equipment (PPE) and their functions

Function of PPE	Feature and Characteristics
Protective goggles	
Goggles with direct vents are not suitable for protection from chemical splattering or smoke.	
Hearing Protection	
Cotton earplugs: disposable earplugs for short- term use – not suitable for high noise levels	
Elastic earplugs: washable, reusable earplugs	
Earmuffs: They offer a high level of sound reduction and are suitable for high noise levels. They can be used in combination with safety helmet.	 
Respiratory Protection	
Dust mask: lightweight mask that is fitted over the nose and mouth and secured behind the head with elastic	
Head Protection	
Use head gear which conforms to recognized safety standards	
Hand and Arm Protection	
Gloves for common tasks (cotton/ leather)	
Heat- resistant gloves	
Foot Protection	

Select footwear that fits the purpose and conforms to recognized safety standards.	
Body Protection	
Reflective clothing: For working in busy traffic: brightly- colored reflective clothing can increase the visibility of employees and reduce their chances of being struck by vehicles or machinery	

9.10 Emergency evacuation plan

OJIGS Packaging Factory prepare the emergency evacuation outlines basic procedures to follow in the event of an emergency such as fire or explosion, chemical spill, incident, or natural disaster that may require evacuation of the building.

9.10.1 Evacuation procedures

There is air horn method for notifying occupants and they may indicate an emergency or a test of the emergency systems.

When an alarm sounds, all personnel must immediately evacuate the building in accordance to the emergency evacuation procedure.

All departments will adhere to the following instructions in an emergency:

1. In the event of an evacuation, everyone should use the nearest exit if safe to do so. If an emergency situation prevents the use of the emergency exit nearest to your work station, proceed to the nearest alternate exit.
2. If safe to do so, zone marshals will walk through their zones to make sure all staffs have left and to close all doors.
3. The receptionist will take the visitor log book and the staff itinerary for a roll call.
4. All personnel should stay calm and proceed in an orderly fashion to prevent any injuries to themselves or other employees.
5. Once outside the building, assemble in the parking lot, keeping a safe distance away from the building. Immediately report to the factory manager or designate who will be taking headcount to ensure everyone is out of the building.
6. All personnel must await further instructions.
7.

9.11 Reporting Procedures

Reports shall be produced through the course of implementation of monitoring programs and collecting incident/emergency response forms as well and then submitted to the industrial zone representative.

The either Emergency response in charge or HSE manager will be responsible for ensuring that reporting and management procedures are being followed and documented accordingly.

9.11.1 Air quality

The onsite response team is needed to report any excessive emissions from the site to the Emergency response in charge. A community complaints register will be maintained in order to identify areas where dust management is a significant problem.

Moreover, the data of 24-hour continuous ambient air monitoring (Preferable period (dry weather) once a year) will be reported to the relevant regulatory agencies.

9.11.2 Noise quality

All operational phase complaints are to be reported to the Emergency response in charge and a record of any noise complaints along with the corrective action will be placed in a log book.
Moreover, the data of 24-hour continuous noise monitoring (once a year) will be reported to the relevant regulatory agencies.

9.11.3 Water Quality

9.11.3.1 Ground water and surface water quality

Annual report based on quarterly analysis along with the corrective actions will be reported through the emergency service in charge to the relevant regulatory agencies.

9.11.3.2 Waste water

Annual report based on quarterly analysis along with the corrective actions of point sources of negative impact will be reported through the emergency service in charge to the relevant regulatory agencies.

9.11.3.3 Waste management

Waste generation rate, waste auditing and bulk density will be reported once a week for the first parameter (waste generation) and once a month for the rest two to the emergency response in charge and shall be placed in a log book.

9.11.3.4 Emergency response plan

Immediately notify the emergency response in charge in the event of an unexpected boiler overheated.
Weekly reports (as appropriate) will be completed on-site and reviewed by the emergency service in charge.
In the event of a leak, the emergency response in charge is responsible for the preparation of an Environmental Incident Report, Corrective Action Report and for provision to the concerned industrial zone authority.
The Workplace Health and Safety representative will be responsible for enforcing all occupational and public health directives and keeping all related records and communications regarding this.

9.12 Documentation/Logbooks/ Environmental management file

The following documentation must be kept on site in order to record compliance with the EMP.
An Environmental File which includes:

- Copy of the EMP,
- Copy of the Environmental Approval,
- Copy of the health and safety regulations and measures
- Copy of all other licences/permits;
- Copy of the respective Emergency response Plans;
- Copy of relevant legislation;
- Environmental Method statements compiled by the Contractor;
- Non-conformance Reports;
- Environmental register which shall include:
    - Communications Register–including records of Complaints, and, minutes and attendance registers of all environmental meetings.
    - Monitoring Results including environmental monitoring reports, register of audits,

- Incident book including copies of notification of Emergencies and Incidents, this must be accompanied by a photographic record

- Waste manifests.
  - Waste Documentation such as waste generation, waste audit, waste water disposal and Sewerage Disposal Receipts;
- Material Safety Data Sheets for all hazardous substances;
- Air, Noise and Water Quality Monitoring reports;
- Written Corrective Action Instructions; and
- Notification of Emergencies and Incidents

Furthermore, the following information shall be posted at the office and working environment:

Important Phone Numbers

1. FIRE station:
2. MEDICAL emergency:
3. AMBULANCE
4. SECURITY – Township Police, Industrial zone security
6. Factory Control room
7. Arrangement of assembly points
8.

9.13 Actuating of Siren

1. ***Siren for declaring Emergency*:** Siren to be sounded continuously for 30 Seconds with an interval of 5 Seconds to be repeated 10 times.
2. ***Siren declaring Evacuation from the factory area*:** Siren to be sounded for 5 seconds till the area is evacuated by people or for ½ hour whichever is less.
3. ***Siren declaring*** All Clear and returning to the work: Siren to be sounded continuous for 5 minutes

9.14 Review of the EMP

The factory environmental personnel shall review the EMP to assess its effectiveness and relevance as follows:

- The full EMP shall be reviewed at least annually

Relevant parts of the EMP shall be reviewed periodically following a reportable incident, an addition, up-date or change or a sub-plan, reporting; non-compliances; and corrective actions implemented

9.15 Capacity building and training program

OJIGS Packaging Factory will educate the factory employees about the types of emergencies that may occur and train them in the proper course of action; such as awareness disaster training, firefighting training and first aid training. The size of the workplace and workforce, processes used, materials handled, and the availability of onsite or outside resources will determine the training requirements. Factory employees will be sure to understand the function and elements of the emergency action plan, including types of potential emergencies, reporting procedures, alarm systems and evacuation plans.

Training may include practising evacuations, identifying assembly points, location of emergency equipment, first aid arrangements and how to safely shut down machinery.

In determining training requirements, the following should be considered:

- inclusion of emergency procedure training in induction courses for new workers

- provision of refresher training for existing workers
- provision of training for short-term contractors or visitors at the workplace (this may not need to be as extensive as may be required for workers), and
- Provision of specific training for individuals who have a formal role in an emergency for example fire wardens, floor wardens, first aid officers.

General training for factory employees should address the following:

- Individual roles and responsibilities;
- Threats, hazards, and protective actions;
- Notification, warning, and communications procedures;
- Means for locating employee/ workers in an emergency;
- Emergency response procedures;
- Evacuation, shelter, and accountability procedures;
- Location and use of common emergency equipment; and

The employee will be trained in first-aid procedures, including protection against blood borne pathogens; respiratory protection, including use of an escape-only respirator; and methods for preventing unauthorized access to the site. A good idea is to hold practice drills as often as necessary to keep employees prepared. After each drill, gather management and employees to evaluate the effectiveness of the drill. Identify the strengths and weaknesses of the plan and work to improve it.

9.16 Preliminary EMP Costs

Estimated costs for the initial implementation of the EMP will be defined on an initial set up basis. The factory will revise these costs and develop annual operating costs for the EMP. These include the following costs:

a. Supervision on environment (includes sampling for environmental quality)
b. Engineering supervision cost
c. Institutional Strengthening, Training and Capacity Building
d. Costs of salaries, administration and function of the environmental unit of factory
e. Technical assistance to factory environmental unit
f. Development of Manual of functions and procedures including HSE procedure
g. Equipment and logistics

Chapter 10

Public Consultation and Disclosure

10. Public Consultation and Disclosure

The public's understanding along with acceptance of the OJI GS factory project is the fundamental matter in the EMP approval. Therefore, in order to obtain public participation, the stakeholders consultation meeting is a must to build a trusting relationship and to obtain suitable recommendation for the environmental issues likely affected by the project as well.

Throughout the EMP development, the two public consultation meetings were organised and the first meeting was conducted by the zoom meeting attending Environmental Conservation Department (ECD, Yangon) and Myanmar Investment Commission in October, 2020.

And then, another stakeholders meeting attending in charge of the Myanmar Industrial Park , the representatives of nearest factories and the respective members of OJI GS factory and Environmental consulting company as the 3rd party which is responsible for developing EMP was held in June 2021.

10.1 Objective

1) To explain activities of the OJI GS Packaging (Yangon) which produce corrugated carton box and sheet along with the Environmental Management Plan to be developed
2) To identify the EMP objectives, potential impacts and monitoring programs
3) To reveal public perception including potential impacts and issues which can be identified by the community
4) To attain the public's understanding and acceptance of the project
5) To describe the useful recommendation in the EMP

10.2 Methodology and approach

Being not only located at the Industrial Zone (Myanmar Industrial Park) which is already set up taking into consideration the environmental factors but also there is no nearest local community within 2 km around the project site, the public consultation meeting was held organizing the project stakeholders including in charge of the Myanmar Industrial Park, the representatives of nearest factories and the respective members of OJI GS factory and the Environmental Quality Management Co., Ltd which is the 3rd party for the EMP development at the OJI GS factory meeting room in June, 2021 following the COVID 19 measures stated by Ministry of Health and Sports (MOHS).

The OJI GS project proponent and environmental consultant of Environmental Quality Management CO., Ltd presented the company activities and EMP plan respectively using the power point materials. After the presentation, questions and answers session was continued along with recording of the stakeholders' environmental perception for project

10.3 Summary of consultation activities

The OJI GS project proponent and environmental consultant of Environmental Quality Management CO., Ltd presented the company activities and EMP plan respectively.

Meeting of Minutes: Environmental Management Plan (EMP) Stakeholder Consultation of OJI GS Packaging Yangon Company Limited

Detail			
Project	OJI GS Packaging Yangon	**Region / State**	Yangon
Venue	OJI GS's office	**Township**	Mingalardon Industrial Zone
District	Yangon		
Objective	To present and explain about company information To inform about an Environmental Management Plan (EMP). To inform the future plans. To answer the questions and obtain suggestions from the attendees.		
Date	10th June 2021		
Time	14:00 PM		

- Daw Thazin Aung (OJI GS Co.,Ltd) presented the company information and upcoming future plans.
- Dr. Ohnmar May Tin Hlaing presented about an Environmental Management Plan (EMP), environmental impacts and mitigation measures.

Comments from U Min Oo (Security officer of MIP company/ Joint Secretary of Mingalardon Industrial Zone)

There was the ash problem which is emitted from the OJI GS factory boiler with nearest factories. What is the management plan to solve that problem? The ash emitted from the boiler disperse to the nearest factories. The nearest factory producing Kimino white wedding suits complained of ash effects on their wedding suits due to the dispersal of the ash emitted from the OJI GS factory' s boiler

Response from Dr. Ohmmar May Tin Hlaing (EQM)

There are various measures to mitigate the impact of ash from the boiler.

- Utilize pollutant control system in boiler.
- Use boiler cleaner technologies and less polluting technologies.
- Selection and use of environmentally friendly and low emission system.
- Exhaust gases and pollutants from boiler, generators/engines and any other machines should be channeled from at least three meters above the ground surface to allow dispersal through a pipe
- Ensure that boiler is maintained in accordance with manufacturer's recommendations to get complete combustion of fuelwood.

Furthermore, the proposed factory has to check the stack height of the boiler. The boiler engineer will calculate the stack height to not disperse the ash to the nearest factories and to disperse with the adequate distance from the impacted area.

Comments from U Aung Kyi Myint (OJIGS)
He also added that there is a technology which can cool ash at the required temperature and then emit to the surrounding air.

Comments from U Min Oo (Security officer of MIP company/ Joint Secretary of Mingalardon Industrial Zone)
He wanted to know about the wastewater especially sewage system. The sewage system of some factories and houses are not adequate. What is the sewage system of the OJI GS factory?
Response from Dr. Ohnmar May Tin Hlaing (EQM)
The sewage tanks for the wastewater must build with good foundation in order to prevent the leakage. Some industrial zone builds the central treatment plant. Does the industrial park have the central treatment plant for the sewage in this industrial zone?

Response from U Min Oo (Security officer of MIP company/ Joint Secretary of Mingalardon Industrial Zone)
There is sewage drainage line for the sewage. The sewage is discharged to the pond from the sewage drainage line. The problem is that the sewage does not enter to the sewage drainage line.

Response from Dr. Ohmmar May Tin Hlaing (EQM)
There is need to repair the drainage system.

Response from U Min Oo (Security officer of MIP company/ Joint Secretary of Mingalardon Industrial Zone)
In the past, the ash and charcoal residues are scattered on the road but not now.

Response from Dr. Ohnmar May Tin Hlaing (EQM)
At the moment, if there is no treatment technology for ash and charcoal residues, the factory should keep these wastes properly at the storage room before disposal to YCDC collection.

Comments from U Myo Min Thant, Admin, (IIDA Co.,Ltd)
This factory is clean. There is no clean environment near the kitchen and canteen around the Sunflower.

Response from Dr. Ohnmar May Tin Hlaing (EQM)
When taking water sample, the samples were collected from the tap water and potable domestic water from the kitchen and then send to the labs for the health and safety of the workers. The factories around the Sunflower need to do like the OJI GS factory.

Comments from U Min Oo (Security officer of MIP company/ Joint Secretary of Mingalardon Industrial Zone)
How to solve the problem which cause from the electrical shock and fire etc.?

Response from Dr. Ohnmar May Tin Hlaing (EQM)
There is Emergency Response Plan (Chapter 9) in the report. In this chapter, there is how to do in case of fire accident, how to communicate with the Fire department and other departments, how to do in case of fire accident from the electric shock and how to protect the emergency case which can be happened from the boiler. The electrical accident protection was mentioned in the Chapter 9.

Comments from U Myo Min Thant, Admin, (IIDA Co.,Ltd)
The OJI GS factory disposes the waste to the YCDC. In this regard, are domestic and chemical waste seperated?

Response from Daw Thazin Aung (OJI GS)
The domestic and chemical wastes are disposed separately. YCDC collects the waste from the factory.

Response from Dr. Ohnmar May Tin Hlaing (EQM)
In the Chapter 9 in brief, emergency team must organize. There is an organization chart for the emergency team. There is contact phone number of the proposed factory and Yangon Electricity Supply Corporation (YESC) to secure electrical service to the affected area. For the proposed factory, overheated boiler issue is critical.

Furthermore, the product of the proposed factory is cardboard and therefore fire protection is important case. Fire alarms are installed. In the event fire, extinguishers are used to fight a fire only when it is safe for the employee to do so and the employee has been trained on how to properly use a fire extinguisher, the factory manager should contact the service supplier to have the extinguisher(s) serviced and recharged.

Fire drills will be held at least twice per year to determine effectiveness of this emergency procedure. A written record of the drill will be kept on file at the facility by human. The contacts phone number of Fire station, Police station and nearest hospital are described.

The OJIGS Packaging Factory shall provide First Aid, Emergency Treatment, and Administration of medication for the factory workers during the working activities.

There is Actions plans for Person(s) falling from the height. There is also safety for pedestrian / forklift / warehouse**.** The workers must wear the personal protective equipment (PPE) during the working.

As the proposed factory is the joint venture factory, I noticed that they have to follow the rules and regulations along with the Japan audit team every year. ECD wants the project proponents to fulfill the IFC guidelines. Therefore, we need to choose and write the EMP complying the appropriate guidelines which can be adopted by the factory. The factory needs to sign to the commitment letter mentioning that the factory will the follow the guidelines. Moreover, the contractors of the proposed factory will follow the EMP rules cooperating with the factory.

Comments from U Myo Min Thant, Admin, (IIDA Co.,Ltd)
Is the Environmental Management Plan (EMP) report submitted to the ECD?

Response from Dr. Ohnmar May Tin Hlaing (EQM)
Not yet. It will be submitted when the whole report is completed together with the stakeholder's perception. The factory has also established grievances mechanism (CGM) related to environmental and social issues arising during operation as well.

Attendance Lists

No	Name	Position	Department/ Organization/ Address
1.	Daw Moe Moe Naing	HR Assistant	EMC Manufacturing Limited
2.	Ma May Zune Moe	Staff	EMC Manufacturing Limited
3.	U Min Oo	Security officer of MIP company	Joint Secretary of Mingalardon Industrial Zone)
4.	U Myo Min Thant	Admin	IIDA Co., Ltd
5.	U Nyi Nay Phyo	Admin	M.A.C. DO
6.	U Aung Kyi Myint	Acting Factory Manager	OJI GS
7.	Daw Mo Mo Thet Chaw	Personal Assistant	OJI GS
8.	Daw Ei Mon Kyaw	Executive	OJI GS
9.	Daw Thazin Aung	Executive	OJI GS
10			
11	Daw Ohnmar May Tin Hlaing	Environmental Consultant	EQM
12	U Ye Naung Tun	Associate Environmental Consultant	EQM
13	U Kyaw Ko Ko	Environmental Technician	EQM

Based on the comments of public consultation meetings, it was found out that there is no major negative response from the surrounding factories except some boiler ash issues and to maintain the proper drainage system in the factory.

Taking into account these issues and recommendations, the environmental management plan will be written accordingly. The EMP final report will be notified at the factory website as well as the Myanmar Industrial Park committee office.

Chapter 11

Conclusions and recommendations

11. Conclusions and recommendations

The EMP for the OJI GS Packaging (Yangon) Company Limited were carried out based on the extensive literature surveys, baseline existing environmental monitoring, socioeco surveys and consultation with the community and the respective OJI GS factory personnel.

As defined in chapter (5), in-depth environmental baseline existing situations were assessed. This project has defined all environmental and social impacts associated with the factory's existing operations.

The characteristics of the packaging particularly its medium significance of the potential environmental impacts (air, noise, waste and waste water discharge) on the working community and the nearest environment can be reduced and prevented by complying with the mitigation measures.

Based on the impact and risk assessment made in chapter (6), the significant appropriate mitigation measures and plans on environmental monitoring and environmental management together with emergency response plans were developed accordingly.

In conclusion, EQM has considered that:

- The prevention and mitigation measures defined are capable of providing the appropriate environmental management system to ensure that environmental and social impacts are prevented or minimized.

- As explained in chapter (8) and (9), the EMP on the various environmental issues are capable of detecting and solving the potential emergencies that likely occur at the packaging factory.

In terms of recommendations,

EQM has suggested the Environmental Management Plan that is designed to:

- Provide the framework for the compliance auditing and monitoring programmes that will lead the OJI GS packaging factory to carry out its operation activities in accordance with the Myanmar environmental rules and regulations; International practices and Health and safety regulations e.g., Overheated Boiler" condition

- This report gives the guidance the packaging factory employers to maintain the sustainable green development and provide their workers with a workplace free from recognized hazards as well.

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COMPARATIVE ENVIRONMENTAL IMPACT ASSESSMENT OF CORRUGATED BOARD PRODUCTIO

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TRUCK NOISE ASSESSMENT DC CONDITION NO 3.9 FIRST QUARTER MONITORING VISY PULP AND PAPER PTY LIMITED

Prepared for Ben Casauria, Project Environmental Engineer, Visy Pulp and Paper Pty Limited

Prepared by Samuel T Grieve, Acoustical Engineer R T Benbow, Principal Consultant BENBOW ENVIRONMENTAL
https://visy.squarespace.com/s/truck_noise_compliance_assessment_1st_quarter_21-03-11.pdf

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US EPA, https://www.epa.gov/sites/production/files/2014-08/documents/indoor.pdf

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Annex (A)

Methodology for Environmental Sampling

OJI GS PACKAGING (YANGON) CO., Ltd

Beyond the Boundaries

တွန့်ခေါက်စက္ကူချပ် နှင့် တွန့်ခေါက်စက္ကူပုံးများ ထုတ်လုပ်ခြင်းအတွက် အသုံးပြုသည့် ကုန်ကြမ်းပစ္စည်းများ

Paper Roll

- တွန့်ခေါက်စက္ကူချပ် နှင့် တွန့်ခေါက်စက္ကူပုံးများ ထုတ်လုပ်ခြင်းအတွက် လိုအပ်သော ကုန်ကြမ်းပစ္စည်းဖြစ်သည့် စက္ကူလိပ်အား ပြည်တွင်း / ပြည်ပ ကုမ္ပဏီများမှ ဝယ်ယူခြင်းဖြစ်သည်။
- ပျမ်းမျှ အားဖြင့် တစ်လလျှင် တန်ပေါင်း ၁၁၀၀ ခန့် အသုံးပြု၍ ဖောက်သည်များ၏ မှာယူမှု ပေါ်တွင် မူတည်၍ အသုံးပြုသည့် ပမာဏမှာ အပြောင်းအလဲ ရှိနိုင်သည်။
- ပြည်ပမှ ဝယ်ယူသည့် စက္ကူလိပ်များ အား ISO 9001:2015 (Quality Management) နှင့် ISO 14001:2015 (Environmental Management System) လက်မှတ်ရရှိထားသော ကုမ္ပဏီများမှ သာ ဝယ်ယူခြင်းဖြစ်သည်။

ကုန်ကြမ်းအဖြစ် ဝယ်ယူသော စက္ကူလိပ်များအား ပြည်ပမှ မိမိတို့စက်ရုံသို့ မရောက်မီ အောက်ဖော်ပါအတိုင်း သိုလှောင်ထားရှိပါသည်။

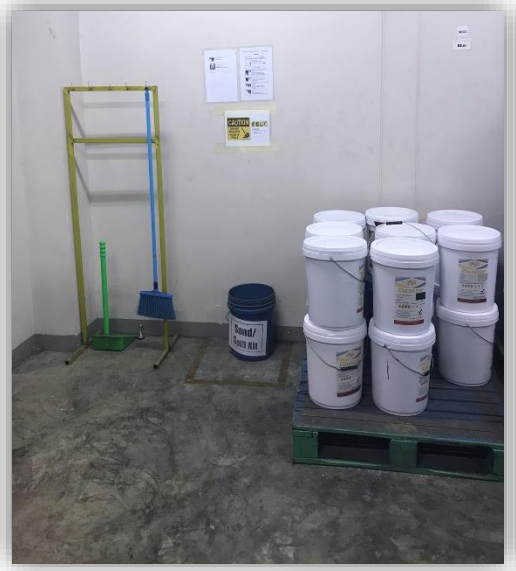
ဝယ်ယူထားသော ကုန်ကြမ်းစက္ကူလိပ်များ မိမိတို့စက်ရုံသို့မရောက်မီ သိုလှောင်ထားရှိပုံ

`

Printing Ink

- တွန့်ခေါက်စက္ကူချပ်များပေါ်တွင် ဆေးရိုက်ခြင်းအတွက် လိုအပ်သော ကုန်ကြမ်းပစ္စည်းဖြစ်သည့် printing ink အား ပြည်တွင်း မှ ဝယ်ယူခြင်းဖြစ်သည်။
- ပျမ်းမျှ အားဖြင့် တစ်လလျှင် တန်ပေါင်း ၄.၅ တန်ခန့် အသုံးပြု၍ ဖောက်သည်များ၏ မှာယူမှု ပေါ်တွင် မူတည်၍ အသုံးပြုသည့် ပမာဏမှာ အပြောင်းအလဲ ရှိနိုင်သည်။
- Printing အတွက် အသုံးပြုသော Ink မှာ water base ဖြစ်ပြီး အောက်ပါအတိုင်း သိုလှောင်ထားရှိသည်။

Printing Ink အတွက် အသုံးပြုသော ဓါတုပစ္စည်းများ သိုလှောင်ထားပုံ



Starch

- တွန့်ခေါက်စက္ကူချပ် နှင့် တွန့်ခေါက်စက္ကူပုံးများ ထုတ်လုပ်ခြင်းအတွက် လိုအပ်သော ကုန်ကြမ်းပစ္စည်းဖြစ်သည့် Starch အား ပြည်တွင်း မှ ဝယ်ယူခြင်းဖြစ်သည်။
- ပျမ်းမျှ အားဖြင့် တစ်လလျှင် ၁၈၀၀၀ ကီလိုဂရမ်ခန့် အသုံးပြု၍ ဖောက်သည်များ၏ မှာယူမှု ပေါ်တွင် မူတည်၍ အသုံးပြုသည့် ပမာဏမှာ အပြောင်းအလဲ ရှိနိုင်သည်။
- ကုန်ကြမ်းအဖြစ် ဝယ်ယူသော Starch များအား အောက်ဖော်ပါအတိုင်း သိုလှောင် ထားရှိပါသည်။

Starch များ သိုလှောင်ထားပုံ

Oji Group Environmental Charter

Basic Policy

The Oji Group Environmental Charter requires the Oji Group to help create a truly enriched and sustainable society by developing business activities that harmonize with the environment from a global perspective. The Charter calls for the Oji Group to make autonomous efforts to achieve further environmental improvement, and aggressively drive its forest recycling, paper recycling, and global warming countermeasures forward.

Action Guidelines

(1) Promotion of Forest Recycling

(2) Promotion of Paper Recycling

(3) Promotion of Global Warming Countermeasures

(4) Reinforcement of Environmental Improvement Measures and Environmental Management Systems

(5) Development of Production Technologies and Products that Minimize Environmental Impact

(6) Reduction and Effective Utilization of Waste

(7) Transfer of Environmental Protection Technology to Other Countries

(8) Building Relationships of Trust with Stakeholders

OJI
Beyond the Boundaries

Signature: M, Kaku Date: 6/2/2020

Masatoshi Kaku
President and Chief Executive Office
Oji Holdings Corporation

TUN THURIYA Company Limited
No.3, Myitkyinar Street, South Dagon Industrial Zone(1), South Dagon Tsp.,
Yangon, Myanmar. Tel : (+95)9-856-8661, E-mail:thuriya.tun@gmail.com

SAFETY DATA SHEET

1. Identification of the Hazardous Substance

1.1 Chemical Indicator

Trade Name	**WATER BASED FLEXO INK SERIES**
Chemical Name	-
Chemical Formolar	-
CAS No	-

1.2 Manufacturer: Chalermchaichan Co.,Ltd

Address: 536, 536/1 Ekachai road, Bangbon, Bangbon, Bangkok 10150 Thailand

Call: +662 4160155-9 FAX: +662 4160587

Emergency Call: +662 4160155-9 Email: rocket@chalermchaichan.co.th

1.3 Recommendations and restrictions on use. -

1.4 Usage: Used for Flexography Printing, Gravure Printing or Similar

2. Hazards Identification

2.1 Classification

Physical Hazard	May cause irritation. Slightly dangerous
Health hazards	Slightly hazardous to health
Environmental hazards	No data
Other	No data

2.2 Label elements

Symbol: No Data

Hazardous Signs: -

Precautions or precautions to prevent hazards: Avoid touching when not wearing chemical protection equipment.

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3. Composition/Information on Ingredients

No.	Chemical Name	CAS No.	% by weight	Toxicological Data	
				TLV	LD_{50}
1.	Pigment	-	10 – 20	-	-
2.	Monoethanolamine	141 – 43 – 5	< 0.5	3 ppm TWA-ACGIH	>700 mg/kg
3.	Styrene Acrylic copolymer	-	30 – 50	-	> 5,000 mg/kg (Oral Rat)
4.	Water	7732 – 18 – 5	30 – 50	-	-

4. First Aid Measures

4.1 After inhalation Immediately remove to fresh air. Consult a physician afterwards

4.2 After contact with eyes Rinse immediately with gently running water for 15 minutes, maintaining eyelids open. Consult at once an ophthalmologist or a physician.

4.3 After ingestion If swallowed seek medical advice immediately (treat symptomatically)

4.4 After contact with skin In case of contact with skin, clean with soap and water

5. Fire Fighting Measures

5.1 Suitable extinguishing media Carbon Dioxide, Dry Chemical, Foam, Water Fog

5.2 Specific hazards arising from the chemical No Data

5.3 Special protective equipment and precautions for fire fighters Use self contained breathing apparatus

5.4 Other No data

6. Accidental Release Measure

6.1 Personal precautions, protective equipment and emergency procedures Wear personal protective equipment. Unprotected persons must be kept away

6.2 Methods and materials for containment and cleaning up Pick up rest with suitable absorbent materials

6.3 Environmental precautions Do not let the liquid drain into rivers, ponds or sewer systems.

6.4 Other No data

7. Handling and Storage

7.1 Precautions for safe handling Keep container tightly closed. Avoid contact with skin and eyes. Avoid spillage !

7.2 Conditions for safe storage, including any incompatibilities Protect from direct sunlight. Keep container in a well-ventilated place

7.3 Other Do not store together with oxidizing agents

8. Exposure Controls and Personal Protection

8.1 TLV No data

OSHA No data

NIOSH No data

ACGIH No data

อื่นๆ No data

8.2 Engineering Control No data

8.3 Personal Protective Equipment

Respiratory protection Vapor respirator

Eye/face protection Wear eye/face protection

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	Skin/Hand protection	Wearchemical-resistant apron and wear suitable gloves	 
8.4	Other	No data	

9. Physical and Chemical Properties

9.1	General characteristics	Colored liquid
9.2	Odor	Ammonia Like
9.3	pH	8.00 – 10.00
9.4	Melting point/Freezing point	No data
9.5	Boiling point	No data
9.6	Flash point	No data
9.7	Evaporation rate	No data
9.8	Flammability	No data
9.9	Limits for flammability or cxplosion	No data
9.10	Vapor pressure	No data
9.11	Vapor density	No data
9.12	Relative density	No data
9.13	specific gravity	No data
9.14	Solubility	Dispersible in water
9.15	Ignition temperature	No data
9.16	Molecular mass	No data
9.17	Other	No data

10. Stability and Reactivity

10.1	Chemical stability	Stable at ambient temperature
10.2	Incomprehensible	No data
10.3	Other objects to avoid.	No data
10.4	Conditions to avoid	No data

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10.5 Hazardous Decomposition Products No data

10.6 Other No data

11. Toxicological Information

11.1 LD_{50}/LC_{50}

Oral >5,000 mg/kg.(Oral Rat)

Skin No Data

Inhalation No Data

11.2 Toxicity

Inhalation Inhalation of vapors in large quantities. May cause respiratory irritation. Can numb headache.

contact with skin Touching for a long time. May cause irritation

11.3 Other No data

12. Ecological Information

12.1 Ecotoxicity No data

12.2 Other No data

13. Disposal Consideration

Product In accordance with regulations for hazardous waste, must be taken to a hazardous waste disposal site

Uncleaned packaging Contaminated packaging should be emptied as far as possible and after appropriate cleansing may be taken for reuse. Packaging that cannot be cleaned should be disposed of as product waste

14. Transport Information

14.1 UN Number No data

14.2 Transportation Name No data

14.3 Transport Hazard Class The product is not classified as Hazardous for Transport

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14.4	Packing Group	No data
14.5	Other	No data

15. Regulatory Information

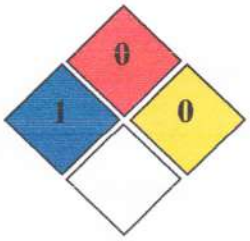
Safety, health and environmental regulations specific for the product in question

Thai regulations : The product is classified and labelled in accordance with GHS adopted by Thai authority.

Other regulations : None

16. Other Information

16.1 NFPA



16.2 Information sources and documents used to make detailed information on hazardous substance safety.

Material Safety Data Sheet from the material manufacturer.

16.3 Other The data are based on the current state of our knowledge, and are intended to describe the product with regard to the requirements of safety. The data should not be taken to imply any guarantee of a particular or general specification. It is the responsibility of the user of the product to ensure to his satisfaction that the product is suitable for the intended purpose and method of use. We do not accept responsibility for any harm caused by the use of this information. In all cases, our general conditions of sale apply.

N. Kabkaew

Approved by .....

Assistant Production Manager (Water Based Department)

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်
စက်မှုဝန်ကြီးဌာန
စက်မှုကြီးကြပ်ရေးနှင့်စစ်ဆေးရေးဦးစီးဌာန
ဘွိုင်လာအသုံးပြုခွင့်လက်မှတ်

ဘွိုင်လာဥပဒေ
ပုဒ်မ ၃၃၊
ပုဒ်မခွင့်ပုဒ်မခွဲ(ခ)

စာအမှတ်၊ ----

ဘွိုင်လာမှတ်ပုံတင်အမှတ်၊ မစ - [illegible]
ဘွိုင်လာအမျိုးအစား - [illegible]

မီးရှိန်ရမျက်နှာပြင်ဧရိယာ - [illegible]
ထုတ်လုပ်သည့်နိုင်ငံနှင့်ခုနှစ် - [illegible]

ပိုင်ရှင်နှင့်လုပ်ငန်းအမည် - [illegible]

ဘွိုင်လာတည်နေရာ - [illegible]

စစ်ဆေးတွေ့ရှိချက်များ (ဖိအားခံအစိတ်အပိုင်းများ)

သံပြားအထူအပါး - ရှဲ/ဒရမ် ---- ထိပ်ပိတ်ပြား ---- ဖလူး/မီးသေတ္တာ----

ဘွိုင်လာအခြေအနေ - [illegible] အနည်းဆုံးတွက်ချက်ရဖိအား - —

ဖိအားပြနာရှိခြင်းကိုက်စစ်ဆေးခြင်း - [illegible]

ပြုပြင်မှုများ - —

ရေဖိအား ---- ဖြင့် ---- နေ့တွင် စစ်ဆေးပြီးဖြစ်သည်။
---အနှစ်ရာယ်ကင်းဖိအားထိန်းအဆို့ရှင်ကို ---- ဖိအားထက်မပိုစေရ။
စစ်ဆေးခင်ငွေကျပ် ----ကို ----နေ့တွင် ပေးသွင်းသည်။
ခွင့်ပြုဖိအား ---- ဖြင့် ---- နေ့မှ ---- နေ့အထိ အသုံးပြုရန်ခွင့်ပြုသည်။
---- ခုနှစ်၊ ---- လ၊ ---- ရက်နေ့တွင် လက်မှတ်ရေးထိုးသည်။

မြို့နယ်/တိုင်းဒေသကြီး
ဘွိုင်လာစစ်ဆေးရေးမှူး
ဒုတိယညွှန်ကြားရေးမှူး
(ဘွိုင်လာစစ်ဆေးရေး)
ရန်ကုန်တိုင်းဒေသကြီး

(ဆောင်ရွက်)
ဘွိုင်လာစစ်ဆေးရေးမှူး
လက်ထောက်ညွှန်ကြားရေးမှူး
(ဘွိုင်လာစစ်ဆေးရေး)
ရန်ကုန်တိုင်းဒေသကြီး

ဘွိုင်လာစစ်ဆေးရေးမှူးချုပ်
ညွှန်ကြားရေးမှူး
ဘွိုင်လာစစ်ဆေးရေး

စည်းကမ်းချက်များ

၁။ ဘိုင်လာဥပဒေပုဒ်မ ၁၄ ပုဒ်မခွဲ(ခ)နှင့်အညီ ဘိုင်လာ၊ ရေးနွေးငွေ့ပိုက်၊ ရေသွင်းပိုက် တစ်ခုခုကိုဖြစ်စေ၊ ယင်းဘိုင်လာ၊ ရေနွေးငွေ့ပိုက်၊ ရေသွင်းပိုက်တစ်ခုခုတွင် တပ်ဆင်ထားသည့် ဖိအားခံအစိတ်အပိုင်း တစ်ခုခုကိုဖြစ်စေ၊ ပြုပြင်ခြင်း၊ ပြောင်းလဲခြင်း၊ ဖြည့်စွက်ခြင်း အသစ်လဲခြင်းတို့ကို မပြုလုပ်ရ။

၂။ ဘိုင်လာပေါက်ကွဲမှုများ၊ မတော်တဆထိခိုက်မှုများ မဖြစ်ပွားစေရန်အတွက်-

(က) အသုံးပြုခွင့်လက်မှတ်တွင် ဖော်ပြပါရှိသည့် အများဆုံးခွင့်ပြုဖိအားထက်ကျော်လွန်၍ အသုံးမပြုရ။

(ခ) ဘိုင်လာသုံးရေအား ထုတ်လုပ်သည့်ကုမ္ပဏီနှင့် နိုင်ငံတကာမှ သတ်မှတ်ထားသော စံချိန်စံညွှန်းများနှင့်ညီညွတ်အောင် ပြုပြင်သုံးစွဲရန်။

၃။ စက်ရုံ၊ အလုပ်ရုံအနီးပတ်ဝန်းကျင်တွင်နေထိုင်သော ပြည်သူများအားမထိခိုက်စေရန်အတွက် တာယာဟောင်း၊ ပလတ်စတစ်၊ ဖိုက်ဘာစနှင့် ပိတ်ဖြတ်စ စသောလောင်စာများအား မီးထိုးသုံးစွဲခြင်း မပြုရ။

၄။ မီးခိုးမဲများမထွက်ရှိစေရန် အစိုဓာတ်နည်းသော ဘေးထွက်လောင်စာများကိုသုံးစွဲရန်။

၅။ မီးဘေးအန္တရာယ်မဖြစ်ပေါ်စေရန် လောင်စာများအား စနစ်တကျသိုလှောင်ထားရန်။

၆။ ပတ်ဝန်းကျင်သို့ ပြာနှင့်အမှုန်အမွှားများ လွှင့်စင်ကျရောက်မှု မရှိစေရန် ဘိုင်လာနှင့် ခေါင်းတိုင်အကြားတွင် ပြာဖမ်းစနစ်ထားရှိရန်။

၇။ ဒီဇယ်ဆီ၊ မီးထိုးဆီနှင့် သဘာဝဓါတ်ငွေ့သုံးဘိုင်လာများတွင် လောင်စာဓါတ်ငွေ့ပေါက်ကွဲမှု မဖြစ်ပွားစေရန် ဂရုပြုဆောင်ရွက်ရန်။

၈။ ဘိုင်လာရေခမ်းမှု မဖြစ်ပေါ်စေရန်အတွက် ရေချိန်ပြဖန်ချောင်းရေဂိတ်များနှင့် ရေသွင်းစနစ်များအား စဉ်ဆက်မပြတ် စစ်ဆေးဆောင်ရွက်ရန်။

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ

အမျိုးသားစီမံကိန်းနှင့် စီးပွားရေးဖွံ့ဖြိုးတိုးတက်မှုဝန်ကြီးဌာန

ကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်

အမှတ် .၉၇၈ အက်ဖ်စီ / ၂၀၁၃-၂၀၁၄

မြန်မာနိုင်ငံ ကုမ္ပဏီများ အက်ဥပဒေအရ ...အိုဂျီ ဂျီအက်(စ်) ပက်ကေးဂျင်း (ရန်ကုန်)...
.....ကုမ္ပဏီ လီမိတက်..... အား ပေးရန်တာဝန် ကန့်သတ်ထားသော လီမိတက်
ကုမ္ပဏီအဖြစ် .၂၀၁၄ ခုနှစ်၊ ...မတ်..... လ၊ .၁၈. ရက်နေ့တွင် မှတ်ပုံတင်ခွင့်ပြုလိုက်သည်။

ညွှန်ကြားရေးမှူးချုပ်(ကိုယ်စား)
(မျိုးမင်း ၊ ညွှန်ကြားရေးမှူး)
ရင်းနှီးမြှုပ်နှံမှုနှင့်ကုမ္ပဏီများညွှန်ကြားမှုဦးစီးဌာန

THE GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR
MINISTRY OF NATIONAL PLANNING AND ECONOMIC DEVELOPMENT

CERTIFICATE OF INCORPORATION

NO. .....978 FC..... of 2013-2014

I hereby certify that ....OJI GS PACKAGING (YANGON).....
.....COMPANY LIMITED.....is this day incorporated under the Myanmar Companies Act and that the company is Limited.

Given under my hand at Nay Pyi Taw this .....EIGHTEENTH.....day of .....MARCH ,...TWO THOUSAND AND FOURTEEN.....

For Director General
(Myo Min - Director)
Directorate of Investment and Company Administration

ဤကုမ္ပဏီမှတ်ပုံတင် လက်မှတ်သည် (၁၈- ၃- ၂၀၁၄)မှ (၁၇-၃-၂၀၁၉)ရက်နေ့ အထိ (၅)နှစ် သက်တမ်းအတွက်သာ ဖြစ်သည်။ သက်တမ်း မကုန်ဆုံးမီ (၃)လအလိုတွင် သက်တမ်းတိုးရန် ရင်းနှီးမြှုပ်နှံမှုနှင့် ကုမ္ပဏီများညွှန်ကြားမှု ဦးစီးဌာနသို့ လျှောက်ထားရမည်။

ညွှန်ကြားရေးမှူးချုပ်(ကိုယ်စား)
(သီတာအောင်၊ဒုတိယညွှန်ကြားရေးမှူး)

Issued Dated: 24 JUN 2014

FORM VI

029594

RETURN OF ALLOTMENTS
THE MYANMAR COMPANIES ACT.

(See Section 104)

(To be filed with the Registrar within one month after the allotment is made)

Return of allotment from the of 2016

on the of 20 of the *OJI GS Packaging (Yangon)Co.,Ltd.

Made pursuant to Section 104 (1)

Number of the shares allotted payable in cash 51,746 Shares

" " " " .....

Nominal amount of the shares so allotted USD 51,746

" " " " .....

Amount paid or due and payable on cash such share USD1/-

" " " " (Fully Paid Up)

Number of ordinary shares allotted for a consideration other than cash

Nominal amount to be ordinary shares so allotted .....

Amount to be treated as paid on each such share .....

The consideration for which such share have been allotted is as follow : -

---

NOTE In making a return of allotments under Section 104 (1) the Myanmar Companies Act., it is to be noted that -

1. When a return include several allotments made on different dates, the actual date of only the first and last of such allotment should be entered at the tip of the front page, and the registration of the return should be effected within one month of the first date.
2. When a return relates to one allotment only, made on one particular date, that date only should be inserted and the spaces for the second date struck out and the world made substituted for the world "From" after the world "allotments" above.

Here insert name of Company.

Distinguish between preference, ordinary, or other description of shares.

MR SIA BOON SOON
Director
OJI GS Packaging (Yangon) Co., Ltd

Presented for filing by : Mr. Sia Boon Soon (Director)

Name, Address and Description of Allotees

Name & N.R.C No	Address	Description	Number of the shares allotted	
			Preference	Ordinary
GS Paper & Packaging Sdn. Bhd	No. 24-4, Jalan Tun Sambanthan 3, Kuala Lumpur 50470 Malaysia			44, 74 6 Shares
Represented By : Mr. Sia Boon Soon P. P. No. A26152877	5, Jalan 3/4, Kampung Tasik Tambahan 68000 Ampang, Selangor, Malaysia.			
U Maung Sitt NRC No. 12/La Ma Ta (Naing)	No. 22, Ground Floor, Nwethagyi Street, Saw Yan Paing (West) Ward, Ahlone Township, Yangon.			7, 000 Shares
			Total	51, 74 6 Shares

Signature Director signature

Date

Director stamp

Company stamp

MR. SIA BOON SOON
Director
Oji GS Packaging (Yangon) Co., Ltd

OJI GS PACKAGING (YANGON) COMPANY LIMITED ★ Date.....

FORM VI

036844

FORM XXVI

PARTICULARS OF DIRECTORS, MANAGERS AND MANAGING AGENTS AND OF ANY CHANGES THEREIN

(Myanmar Companies Act, See Section 87)

Name of Company : OJI GS PACKAGING (YANGON) COMPANY LIMITED

Presented by : Mr. Hiroshi Matsumura (Chairman)

The Present Christian name or names of surnames	Nationality, National Registration Card No.	Usual Residential Address	Other Business Occupation	Changes
Mr. Sia Boon Soon	Malaysia A26152877	5 Jalan ¾, Kampung Tasik Tambahan 68000 Ampang, Selangor, Malaysia.	Director	Director
U Maung Sitt @ Chew Won Min	Myanmar 12/LaMaTa(Ng) 016221	No. 22, Ground Floor, Nwethagyi Ahlone Township, Yangon.	Director	Director
Mr. Seiro Tokunaga	Japanese TZ0803967	6-54-205, Tsutsujigaoka, Aobaku Yokohama, Kanagawa, Japan.	Director	Director
Mr. Yasuo Nakanishi	Japanese TR1630649	32-23 Akane-Dai 1, Aoba-ku Yokohama, Japan 227-0066.	Director	Chairman
Mr. Fong Weng Meng	Malaysia A39465692	8-2-30, Blok 30, Pangsapuri TSK, 2A, Jalan Anggerik Vanilla, Seksyen 31, Kota Kemuning, 40460 Shah Alam, Selangor DE	Director	Appointed as director w.e.f 8 MAY 2017
Mr. Ooi Choon Hong	Malaysia A34575796	18, Persiaran Mahsuri 2/5, Sunway Tunas, 11900 Bayan Lepas, Pulau Pinang	Director	Appointed as director w.e.f 8 MAY 2017
Mr. Hiroshi Matsumura	JapaneseTL0200876	1-4-20-2929, Ariake Koto-ku, Tokyo, Japan 135-0063	Director	Appointed as director w.e.f 8 MAY 2017
Mr. Tsuyoshi Teragaki	JapaneseTH2585383	1-12-201, Kyuden 5-chome, Setagaya-ku, Japan, Postal Code 1570064	Director	Resigned from director w.e.f 8 MAY 2017

NOTE : (1) A Complete list of the Directors or Managers or Managing Agents shown as existing in the last particulars.

(2) A note of the changes since the last list should be made in the column for "Changes" by placing against the new Director's name the word "in place of ..... andby writing against any former Director's name the the word "dead" "resigned" or as the case may be giving the date of change against the entry.

OJI GS PACKAGING (YANGON) COMPANY LIMITED Date.....

Signature .....
Chairman

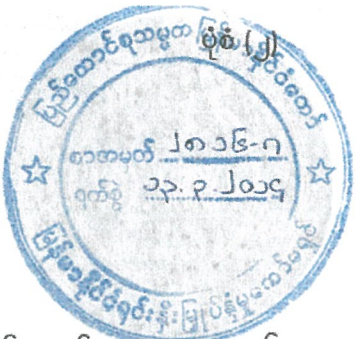
Designation ..... Mr. Yasuo Nakanishi
Chairman
Oji GS Packaging (Yangon) Co., Ltd

Dated this 8 MAY 2017

Form (26)

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်
မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှု ကော်မရှင်

ခွင့်ပြုမိန့်



ခွင့်ပြုမိန့်အမှတ် ၆၈၇/၂၀၁၄ ၂၀၁၄ ခုနှစ်၊ မတ်လ ၁၂ ရက်

ပြည်ထောင်စုသမ္မတ မြန်မာနိုင်ငံတော်နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှု ဥပဒေ ပုဒ်မ ၁၃ပုဒ်မခွဲ(ခ) အရ ဤခွင့်ပြုမိန့်ကို မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှု ကော်မရှင်က ထုတ်ပေးလိုက်သည် -

(က) ရင်းနှီးမြှုပ်နှံသူ/ကမကထပြုသူအမည် MR. SEIRO TOKUNAGA

(ခ) နိုင်ငံသား JAPAN

(ဂ) နေရပ်လိပ်စာ 6-54-205, TSUTSUJIGAOKA, AOBA-KU, YOKOHAMA, KANAGAWA, JAPAN

(ဃ) ပင်မအဖွဲ့အစည်းအမည်နှင့်လိပ်စာ GS PAPER & PACKAGING SDN.BHD., LOT 7090, MUKIM TANJUNG 12 DAERAH, KUALA LANGAT, 42700 BANTING SELANGOR DARUL EHSAN, MALAYSIA

(င) ဖွဲ့စည်းရာအရပ် MALAYSIA

(စ) ရင်းနှီးမြှုပ်နှံသည့်လုပ်ငန်းအမျိုးအစား တွန့်ခေါက်စက္ကူပုံးနှင့် တွန့်ခေါက်စက္ကူချပ်များ ထုတ်လုပ်ရောင်းချခြင်းလုပ်ငန်း

(ဆ) ရင်းနှီးမြှုပ်နှံသည့်အရပ်ဒေသ(များ) မြေကွက်အမှတ်(ဘီ-၁-၂)၊ မင်္ဂလာဒုံစက်မှုဇုန်၊ မင်္ဂလာဒုံမြို့နယ်၊ ရန်ကုန်တိုင်းဒေသကြီးဒေသကြီး

(ဇ) နိုင်ငံခြားမတည်ငွေရင်း ပမာဏ အမေရိကန်ဒေါ်လာ ၁၇,၃၂၂သန်း

(စျ) နိုင်ငံခြားမတည်ငွေရင်းယူဆောင်လာရမည့်ကာလ ကော်မရှင်ခွင့်ပြုမိန့်ရရှိပြီး (၃)နှစ်အတွင်း

(ည) စုစုပေါင်း မတည်ငွေရင်းပမာဏ(ကျပ်) အမေရိကန်ဒေါ်လာ ၂၁.၅၃၂သန်းနှင့် ညီမျှသော မြန်မာကျပ်ငွေ (အမေရိကန်ဒေါ်လာ ၁၇.၃၂၂သန်း အပါအဝင်)

(ဋ) တည်ဆောက်မှုကာလ ၁ နှစ်

(ဌ) ရင်းနှီးမြှုပ်နှံခွင့်ပြုသည့် သက်တမ်း ၃၅ နှစ်

(ဍ) ရင်းနှီးမြှုပ်နှံမှုပုံစံ ဖက်စပ်နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှု

(ဎ) မြန်မာနိုင်ငံတွင် ဖွဲ့စည်းမည့် ကုမ္ပဏီအမည် OJI GS PACKAGING (YANGON) COMPANY LIMITED

ဥက္ကဋ္ဌ
မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုကော်မရှင်

Form (2)

Sr No. 2816-C

Dated 13.3.2014

THE REPUBLIC OF THE UNION OF MYANMAR

The Myanmar Investment Commission

PERMIT

Permit No. 687 /2014 Date 13 March 2014

The Myanmar Investment Commission issues this Permit under section 13(b) of the Republic of the Union of Myanmar Foreign Investment Law-

(a) Name of Investor/Promoter MR. SEIRO TOKUNAGA

(b) Citizenship JAPAN

(c) Address 6-54-205, TSUTSUJIGAOKA, AOBA-KU, YOKOHAMA, KANAGAWA, JAPAN

(d) Name and Address of principal organization GS PAPER & PACKAGING SDN.BHD., LOT 7090, MUKIM TANJUNG 12 DAERAH, KUALA LANGAT, 42700 BANTING SELANGOR DARUL EHSAN, MALAYSIA

(e) Place of incorporation MALAYSIA

(f) Type of business in which investment is to be made MANUFACTURING AND MARKETING OF CORRUGATED CARTON BOX AND SHEET

(g) Place(s) at which investment is permitted PLOT NO. B-1-2, CORNER OF NO.3 HIGHWAY ROAD AND KHAYEBIN ROAD, MINGALADON INDUSTRIAL PARK, MINGALADON TOWNSHIP, YANGON REGION

(h) Amount of foreign capital US $ 17.325 MILLION

(i) Period for bringing in foreign capital WITHIN 3(THREE) YEARS AFTER ISSUANCE OF MIC PERMIT

(j) Total amount of capital (Kyat) EQUIVALENT IN KYAT OF US $ 21.532 MILLION (INCLUDING US $ 17.325 MILLION)

(k) Construction period 1 YEAR

(l) Permitted duration of investment 35 YEARS

(m) Form of investment JOINT VENTURE INVESTMENT

(n) Name of Company incorporated in Myanmar

OJI GS PACKAGING (YANGON) COMPANY LIMITED

Htin Shein

Chairman

The Myanmar Investment Commission

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်

မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုကော်မရှင်

အမှတ်(၁)၊သစ္စာလမ်း၊ ရန်ကင်းမြို့နယ်၊ ရန်ကုန်မြို့

စာအမှတ်၊ ရက-၉/ ၁ / ၂၀၁၅ (၀၁၀၅၂)

ရက်စွဲ ၊ ၂၀၁၅ ခုနှစ် ဇွန်လ ၁၈ ရက်

အကြောင်းအရာ။ **OJI GS Packaging (Yangon) Co., Ltd. ၏ စီးပွားဖြစ် စတင်သောနေ့သတ်မှတ်ပေးရန်ကိစ္စ**

ရည်ညွှန်းချက် ။ OJI GS Packaging (Yangon) Co., Ltd. ၏ ၂၀၁၅ ခုနှစ် ဇွန်လ ၅ ရက်စွဲပါစာအမှတ် OGPY/MIC/6-2015

၁။ မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုကော်မရှင်၏ ၂၀၁၄ ခုနှစ် မတ်လ ၁၃ ရက်စွဲပါ ခွင့်ပြုမိန့်အမှတ် (၆၈၇/၂၀၁၄) ဖြင့် မြေကွက်အမှတ်(ဘီ-၁-၂)၊ မဂ်လာဒုံစက်မှုဇုန်၊ မဂ်လာဒုံမြို့နယ်၊ ရန်ကုန်တိုင်းဒေသကြီးတွင် တွန့်ခေါက်စက္ကူပုံးနှင့် တွန့်ခေါက်စက္ကူချပ်များ ထုတ်လုပ်ရောင်းချခြင်းလုပ်ငန်းအား ဖက်စပ်နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှုဖြင့် ဆောင်ရွက်နေသည့် OJI GS Packaging (Yangon) Co., Ltd. ၏ စီးပွားဖြစ် စတင်သောနေ့ကို ၂၀၁၅ ခုနှစ် ဇွန်လ ၃ ရက်နေ့ အဖြစ် အတည်ပြုသတ်မှတ်ပါသည်။

၂။ သို့ဖြစ်ပါ၍ နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှုဥပဒေအခန်း ၁၂၊ ပုဒ်မ ၂၇-က အရ စီးပွားဖြစ်လုပ်ငန်း စတင်သည့်နေ့မှစ၍ ဝင်ငွေခွန်ကင်းလွတ်ခွင့်ကာလ ၅ နှစ် ခံစားခွင့်ပြုသဖြင့် သက်ဆိုင်ရာဌာနများနှင့် ဆက်သွယ်ဆောင်ရွက်နိုင်ရန် အကြောင်းကြားပါသည်။

ဥက္ကဋ္ဌ (ကိုယ်စား)
(အောင်နိုင်ဦး၊ အတွင်းရေးမှူး)

မန်နေဂျင်းဒါရိုက်တာ
OJI GS Packaging (Yangon) Co., Ltd.
မိတ္တူကို

ပြည်ထောင်စုဝန်ကြီးရုံး၊ ဘဏ္ဍာရေးဝန်ကြီးဌာန
ပြည်ထောင်စုဝန်ကြီးရုံး၊ စီးပွားရေးနှင့်ကူးသန်းရောင်းဝယ်ရေးဝန်ကြီးဌာန
ညွှန်ကြားရေးမှူးချုပ်၊ ပြည်တွင်းအခွန်များဦးစီးဌာန
ညွှန်ကြားရေးမှူးချုပ်၊ အကောက်ခွန်ဦးစီးဌာန
ညွှန်ကြားရေးမှူးချုပ်၊ ကုန်သွယ်ရေးဦးစီးဌာန
ရုံးလက်ခံ၊ မျှောစာတွဲ

THE REPUBLIC OF THE UNION OF MYANMAR
MYANMAR INVESTMENT COMMISSION
No(1), Thitsar Road, Yankin Township, Yangon

Our ref: DICA-9/1/2015(01172) Tel - 01-657824

Date : 17 June 2015 Fax - 01-657824

Subject : **Commencement date of commercial operation of OJI GS Packaging (Yangon) Co., Ltd.**

Reference: OJI GS Packaging (Yangon) Co., Ltd. letter dated 5th June 2015, OGPY/MIC/6-2015.

1. In accordance with Myanmar Investment Commission's Permit No.687/2014 dated 13th March 2014, it is confirmed that 3rd June 2015 as the date of the commencement of business operation to the OJI GS Packaging (Yangon) Co., Ltd. on Plot No.B-1-2, Corner of No.3, Highway Road and Khayebin Road, Mingaladon Industrial Park, Mingaladon Township, Yangon Region for manufacturing and marketing of corrugated carton box and sheet.

2. It is notified that OJI GS Packaging (Yangon) Co., Ltd. can contact and perform with the relevant departments as income tax shall be exempted for a period of 5 years including the year of commencement date of the business operation according to the Foreign Investment Law, Chapter 12, section 27(a).

for Chairman
(Aung Naing Oo, Secretary)

Managing Director
OJI GS Packaging (Yangon) Co., Ltd.

cc:

Office of the Union Minister, Ministry of Finance
Office of the Union Minister, Ministry of Commerce
Director General, Internal Revenue Department
Director General, Customs Department
Director General, Department of Trade
Office Copy

1. Ambient air monitoring instrument

The air monitoring survey will use the HAZ-SCANNER EPAS Wireless Environmental Perimeter Air Monitoring Station. (EPAS).

(i) Principles

The EPAS, manufactured by EDC/SKC (USA), is a light scattering photometer equipped with a filter sampling system. This dual capability allows for simultaneous real-time and filter measurement. Single-jet impactors are used for particulate size selection and the TSPM, PM10 and PM2.5 impactors would be used for air quality survey.

The highly sensitive EPAS provides real-time determinations and data recordings of airborne particle concentration in $\mu g/m^3$. It provides the minimum, maximum and time-weighted average (TWA) monitoring of gases as well.

This instrument is factory calibrated with the appropriate USEPA certified target gas and correlated with USEPA methods. (Ref: Code of Federal Regulation 40CFR part 53). The EPAS is annually calibrated and does not require laboratory analysis to determine concentrations. It operates maximum automation of data collection, uses the optional data logger including Dust Comm Pro Software for PC that provides statistical analysis, graphs, and detailed reports that can be printed for record keeping.

(ii) System check

Prior to the survey, calibration span and system checks (system flow rate, sensor baseline levels for all parameters, etc.) will be performed on the EPAS to ensure it is operational and ready for monitoring.

The air monitoring instrument will be operated in accordance with the manufacture's guidelines.

2 Ambient air monitoring

(i) The sensor intakes

The survey would deploy the sensor intakes based on the sitting criteria as specified. The survey will comply with the following guidelines as follows;

• Particulates and gas sensor intakes will be located between 2-3 meters above the ground level
• Keep unrestricted airflow located away from obstacles so that the distance from the sensor intake is at least twice the height that the obstacle protrudes above the probe
• Keep unrestricted airflow in an arc of at least 270 degrees around the inlet probe, or 180 degrees if the probe is on the side of a building
• Would be clear of optical obstructions, including potential obstructions that may move due to wind, human activity, growth of vegetation, etc.
- Spacing from trees (10-20 m)
- Spacing from roadways (10-250 m) depending on the traffic
• Observe temporary optical obstructions, such as rain, particles, fog, or snow

(ii) Location of the monitoring sites

The monitoring sites were selected based on their being broadly distributed within the project area and in proximity to the most sensitive receptors i.e. communities. Operating activities of the project would impact local air quality. Air pollution both on site and in the surrounding locality may result from release of dust and gases to the atmosphere from handling or processing of its by-products.

(iii) Sampling time and frequency of measurements

The survey will monitor 24hr continuously.

(iv) Ambient air parameters to be measured

1) Particulates: PM10, PM2.5 } USEPA Criteria air pollutants
2) Gases: NO2, SO2, CO, VOC, NH3, CH4, O3, CO2, H2S
3) Meteorology: Temperature, Relative Humidity, Wind Speed, Wind Direction which can have the influence on both local and regional air quality

(I) Particulates

Sr	Parameters	Sensors	Detection limit
1	**TSPM, PM10, PM2.5**	**90 degree Infra Red Light Scattering**	0 to 5000 µg/m3

Calibration: Gravimetric reference NIST Traceable - SAE fine dust- ISO12103-1
Accuracy (± 10% to filter gravimetric SAE fine test dust which falls under the ACGIH/ ISO/CEN criteria.

(II) Gases
Calibration: ppm equivalent change/year in lab air (24month warranted)

Sr	Parameters	Sensors	Detection limit
1	NO2	Electrochemical	(0-5000) ppb
2	SO2	Electrochemical	(0-5000) ppb
3	CO	Electrochemical	(0 -10,000) ppb
4	NH3	Electrochemical	(0 -100) ppm
5	H2S	Electrochemical	(0 -25) ppm
6	VOC	Photoionization	0 to 50,000 ppb
7	CO2	NDIR	0 to 5000 ppm
8	Methane	NDIR	0 to 1% Vol,0 to 10,000 ppm,0 to 20% LEL
9	O3	Metal oxide semiconductor (MOS),	(0 -150) ppb

(III) Meteorology (EPAS Meters)

Sr	Parameters	Sensors	Detection limit
1	Temperature,	NTC	(-20 to 60 C)/ (-4º to 140ºF

	Detection limit -)/ (-20ºC - 60ºC)		
2	Relative Humidity	CAP	(0-100)%
3	Wind Speed (sensor:), Detection limit -	3-cup anemometer a	(0 – 125 mph)
4	Wind Direction	Continuous rotation potentiometric wind direction vane	(5 – 355)degrees

References:

Air Emissions from Municipal Solid Waste Landfills - Background Information for Proposed Standards and Guidelines, Office of Air Quality Planning and Standards, EPA-450/3-90-011a, Chapters 3 and 4, U. S. Environmental Protection Agency, Research Triangle Park, NC, March 1991.

ENVIRONMENTAL PROTECTION AGENCY (US EPA), 40 CFR Appendix E to Part 58, Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring https://www3.epa.gov/ttnamti1/files/ambient/longpath/fropenph.pdf

Noel De Nervers, (2000), Air Pollution Control Engineering, 2nd edition, McGraw-Hill International Editions, Civil Engineering Series

General principles of Health risk assessment of air pollution, WHO , 2016

Sendai Framework for Disaster Risk Reduction 2015 – 2030, UN.

Solid Waste Management and Climate Change https://www.researchgate.net/publication/46212886_Capacity_building_of_disaster_waste_management_for_disaster_risk_reduction [accessed Sep 29, 2017].

Technical Guidance Note (Monitoring), M17, Monitoring Particulate Matter in Ambient Air around Waste Facilities, Environment Agency Version 2 July 2013

The Impact on Health of Emissions to Air from Municipal Waste Incinerators, Health Protection Agency, September 2009

2. Check lists

Sr.	Description	Remarks
1	Measuring equipment can be used (specification, calibration certificate)	Mentioned above
2	Maximum number of equipment can be	One set up

	mobilized for each Site	
3	Number and qualification of the personnel	(3) in number
4	Maximum number of qualified personnel can be mobilized for Site	(3) in number
5	Number of measuring points required per each Site (minimum and average)	(4 and 2)
6	Measurements Protocol for each pollutant (see 2.2.1)	Mentioned above
7	Monitoring frequency (Day/Night, 24h)	24 hr continuously
8	Maintenance of the equipment during the mission	Keep the instrument one day off along with battery charging for the next run after (2) days continuously monitoring.

2 Ambient Noise monitoring

At each site, Baseline Sound Pressure Levels (SPLs) for (daytime (LAeq 90 D), night time (LAeq 90 N)), and 24-hour (LAeq 90) will be monitored using the Sound level Meter (Model: SL-4023SD) along with SD card real time data recorder (USB/RS232) in order to determine background ambient noise levels within the study area. This SLM meets IEC61672 class 2 with the tolerance is +/- 1.4dB.

(i) Principles

Noise monitoring on LAeq which is the A-weighted equivalent continuous sound level in decibels db(A) measured over the certain period of time (24hr continuously) will be conducted at the selected location that is considered to best represent the most affected location and also can reflect the exposure of the nearest local community and sensitive locations in accordance with the procedures described below.

Sampling location

Sampling locations will be selected according to the site visit at the operation sites and nearby sensitive receptors in order to be the representative location of the noise exposure.

Site setting

Sound level meter (SLM including microphone) will be mounted on the tripod which is the standard methodology for most noise measurements taking into account not to make noises while observing the meter and ensuring the least amount of reflective surface from the observer's body is exposed to the meter.

The device will be set up more than 3.5m away from a reflective surface (building) at minimum and a noise reading will be taken at the average height of the receptor.

Monitoring

The baseline noise surveys will be conducted for the Project site including:
Sound statistical descriptors (L10, L50, L90); and Time varying noise: LAeq,T is used to quantify the noise where the Lp varies over time. In most situations, the LAeq,T is the most appropriate descriptor used to investigate environmental noise complaints.

Along with the deployment of a meteorological station to measure wind speed data for the purpose of excluding noise measurements affected by periods of high winds (>5m/s) and/or rain.

Calibration

Calibration of the SLM is to be carried out before and after each set of noise measurements using the Lutron SC-942 which generates 94dB and 114dB at 1000Hz – and this [especially 94dB] is a very common reference point for sound level meters. The Lp shown on the meter should match the stated Lp for the calibrator being used. Standard calibration is generally 94 dB(A) but can vary slightly due to the microphone sensitivity e.g. 93.8 dB(A).

The calibration level should be confirmed with the SLM manufacturer's specifications. The variation before and after the calibrations should be no more or less than 1 dB(A). If the deviation

of the calibration is greater than 1 dB(A) then the results obtained during the assessment are invalid.
The monitoring procedures, data analysis and interpretation were carried out in accordance with USEPA operating procedure as well as the operational manufacture.

Figure 3: Baseline noise level monitoring

2.1Features and Specification of the Equipment;

(i) SOUND LEVEL METER

Model No : **SL-4023SD**

Description :

SD Card real time data recorder

SOUND LEVEL METER,
Model : SL-4023SD

* Real time data recorder, save the data into the SD memory card and can be download to the Excel, extra software is no need.

* Meet IEC61672 class 2
*Frequency 31.5 to 8,000 Hz
* Auto range : 30 to 130 dB.
* Manual range : 3 ranges 30 to 80 dB, 50 to 100 dB, 80 to 130 dB .
* A/C frequency weighting.
* Fast/slow time weighting,
* Peak hold, Data hold.
* Record (Max., Min.).
* RS232/USB computer interface.
* Optional wind shield ball, SB-01.
* Patented. * Patent: Taiwan, China, Japan, Germany, USA pending.

2.2 Certificate of Calibration Regarding calibration, the external calibration adjustment is used before each and every monitoring starts.

Sound Calibrator (Lutron SC 942)

2.2 Comparison of Results with Applicable Guideline

Being the environmental sound level measurement, the A-weighted sound level expressed in the A scale decibel (dBA) unit which gives greater weight to the frequencies of sound to which the human ear is most sensitive.

The baseline equivalent sound pressure levels monitored will be compared accordingly with the following Noise level guideline value under National Environmental Quality (Emission) Guidelines stated by Environmental Conservation Department, Dec 29, 2015.

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

2.3 Proposed Team

EQM technician team comprising of (2) members who have been experienced with noise monitoring, data entry, analysis and reporting for years will conduct the project.

2.4 Reporting

The background ambient noise level will be described in terms of an average level which is LAeq (dBA) as the summation of all the time-varying events. Generally, the report is used to presented in average, min and max with L90 considering the background or ambient level of a noise environment.

If necessary, the report will be prepared with percentile dB (A) level (L90, L50, L10).
While determining the daily measure of environmental noise, surrounding activities will be observed and incorporated into the report to reveal the potential sources of noise emission.
The final report used to be submitted in accordance with the EQM format. If the format is available from the proponent side, it will be prepared accordingly.

References:

Noise measurement methodologies, https://www.ehp.qld.gov.au/licences-permits/.../noise-measurement-manual-em1107.p.
U.S. EPA BASE STUDY STANDARD OPERATING PROCEDURE, Environmental Health & Engineering, Inc. 60 Wells Avenue Newton, MA 02159-3210
US EPA, https://www.epa.gov/sites/production/files/2014-08/documents/indoor.pdf

3 Ambient vibration monitoring

Determination of Natural vibration which can be expressed in metric units (m/s^2) will be monitored using the vibration meter DIGICON TV 120SD having size: 68x177x45 mm with SD card data logger within the study area.

(i) Principles

Measurements of vibration accelerations is carried out using the vibration meter DIGICON TV 120SD with SD card data logger measurement system under ambient conditions.

Accelerometer area: 0.5 ~ 199.9 m / s2 (Peak)
Speed measurement range: 0.5 ~ 199.9m / s
Vibration range: 199.9 mm

Sampling location

Sampling locations will be selected according to the site visit at the operation sites and nearby sensitive receptors in order to be the representative location of the vibration exposure.

Site setting

The vibration meter is mounted on the tripod and vibration sensor with cable and magnetic base is attached to the ground on the recorded level of vibration acceleration. Accelerometers is mounted to the ground using various mounting bases anchored in the ground with one, three and four rods accordingly. The device will be set up more than 3-5m away from a reflective surface (building) at minimum.

Monitoring

The monitoring is over the certain period of time (24hr continuously) at the selected location that is considered to best represent the most affected location and also can reflect the exposure of the nearest local community and sensitive locations in accordance with the procedures described above.

Calibration

The device is factory calibrated along with the manufacturer's specifications.

Figure 4: Natura vibration level monitoring

3.1 Features and Specification of the Equipment;

DIGICON TV-120SD can measure both acceleration (Acceleration), velocity (Velocity) and vibration distance (Displacement)
Measure the vibrations of machinery and motors in order to inspect maintenance conditions
Wide frequency range: 10Hz ~ 1kHz, corresponding sensitivity according to ISO 2954
Vibration sensor and magnetic base included
Data is maintained the highest-lowest values are recorded. And can be called up to view
The data from the SD card is an Excel file with time data (year / month / day / hour / minute / second). No need to use the program when storing data via SD CARD.
Can connect to the computer via RS232 / USB port (order more cable)

3.2 Comparison of Results with Applicable Guideline

A complete assessment of exposure to vibration requires the measurement of vibration acceleration in meters per second squared (m/s^2). Vibration exposure direction is also important and is measured in defined directions.

Currently, there is no national vibration guideline or standard values yet in Myanmar.

Therefore, the following standard values are adopted to analyse the natural vibration,
For whole-body vibration (WBV), the daily exposure limit value (ELV) is 1.15 m/s2 A (8).

The daily exposure to vibration is measured by a formula known as an A(8) value. This is the average (A) exposure over an eight-hour (8) day.

Receptor	**Daily exposure limit value (ELV) (ms^2) A (8).**
whole-body vibration (WBV),	1.15 m/s^2

Safety, Health and Welfare at Work (General Application. Regulations 2007 (S.I. No. 299 of 2007) www.hsa.ie

3.3 Proposed Team

EQM technician team comprising of (2) members who have been experienced with vibration monitoring, data entry, analysis and reporting will conduct the project.

3.4 Reporting

The background ambient vibration level will be described in terms of an average level which is the daily ELV (ms^2). While determining the daily measure of environmental vibration, surrounding activities will be observed and incorporated into the report to reveal the potential sources of vibration.
The final report used to be submitted in accordance with the EQM format. If the format is available from the proponent side, it will be prepared accordingly.

References:

Ground-Borne Noise and Vibration in Buildings Caused by Rail Transit (2010) https://www.nap.edu/read/22951/chapter/9

Guide to the Safety, Health and Welfare at Work,(General Application) Regulations 2007 https://www.hsa.ie/eng/Publications_and_Forms/Publications/General_Application_Regulations/Control_of_Vibration_at_Work.pdf

Huan vibration, Briiel & Kjcer,1989

Measuring Vibration with Accelerometers, Updated Mar 14, 2019, https://www.ni.com/en-us/innovations/white-papers/06/measuring-vibration-with- accelerometers.html

Rail Vibration Assessment Stirling Alloa Kincardine Railway Line, Clackmannanshire Council October 2009, https://www.clacks.gov.uk/document/2464.pdf

Simplified Method of Determination of Natural-Vibration Frequencies of Prestressed Suspension Bridge, Vadims Goremikinsa,*, Karlis Rocensb, Dmitrijs Serdjuksc, Janis Sliserisd, Institute of Structural Engineering and Reconstruction, Riga Technical University, Azenes Str. 16, LV-1048, Riga, Latvia. Available online at www.sciencedirect.com

VIBRATION ANALYSIS OF A RESIDENTIAL BUILDING, Regina Augusta Sampaio and Remo Magalhâes de Souza, 2015, https://www.matec-conferences.org

4 Groundwater Sampling Methodology

4.1 Preparation before leaving for the field site.

Sample bottles and sampling dipper were washed and cleaned with purified water as well as deionized water for three times, filled preservatives if needed and capped securely. These procedures were unnecessary for the sample bottles sent by the international lab as all bottles were already prepared and sealed.

Prepare the one page check list for the list of water parameters to be tested, label sample parameters, site identification code and a field date and time on the bottles.

Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.

Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.

Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.

4.2 Sampling procedure and sampling device

Groundwater samples will typically be collected from the discharge line of a pump or from a bailer, either from the pour stream of an up-turned bailer or from the stream from a bottom-emptying device. Efforts should be made to reduce the flow from either the pump discharge line or the bailer during sample collection to minimize sample agitation. During sample collection, make sure that the pump discharge line or the bailer does not contact the sample container.

Sampling is the process of obtaining, containerizing, and preserving (if required) a ground water sample after the purging process is complete. Non-dedicated pumps for sample collection generally should not be used. Many pumps are made of materials such as brass, plastic, rubber, or other elastomer products which may cause chemical interferences with the sample. Their principle of operation may also render them unacceptable as a sample collection device. It is recognized that there are situations, such as industrial or municipal supply wells or private residential wells, where a well may be equipped with a dedicated pump from which a sample would not normally be collected. Discretion should always be used in obtaining a sample.

One member of the field sampling team should take all the notes and photographs, fill out tags, etc., while the other members collect the samples.

Gloves and sampling dipper

In general, water samples were collected using clean sampling dipper in order to avoid sample contamination from other sources according to the standard operation procedures.

Before sample collection, appropriate measures including wearing a clean pair of new, non-powdered, disposable gloves will be worn each time a different location is sampled and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised and rinsing of sampling dipper with native water were carried out so as to condition, or equilibrate to the sample environment and make sure that all cleaning-solution residues have been removed.

Ground-water-sampling is mainly based on site-specific conditions.

(a) Dug well
Firstly, dug well water was collected by a bucket being currently used in the well (metal, plastic, wood). Then water in the bucket was collected by sampling dipper and transferred into sample bottles.

(b) Tube well (Shallow well Deep well)
The sample was taken at the closest access to water from the well before the water enters any treatment and the distribution system. Water was collected at the outflow of a pressure and flushed (hand pump and compressor pump for shallow well and deep well respectively) for few minutes prior to sampling in order to remove any stagnant water in the well casing and to ensure that at least 95 percent of the water sample originates from the aquifer formation being sampled.
Then water was transferred to sampling plastic bucket and then filled into the bottles by using sampling dipper.

A hand-held, narrow mouth bottles
The sample bottles were partially filled and rinsed with the water to be sampled (rinse water).
For bacteriological analysis, the preconditioned sterile glass bottles directly from the analytical laboratory were used.

Onsite water quality monitoring
Total dissolved solid (TDS), Conductivity, Chlorine, Salt, PH value, Temperature were measured on-site at the sampling locations according to the standard operation procedures.

Transportation (shipping) and storage of samples through cold chain till laboratory
After sample collection, sample bottles were kept in a cooling box with ice/ice packs/ice chests until the laboratory.

4.3 Water sample to be measured

Table-1.2 Laboratory services for water analysis provided to project

Laboratory	Parameters
Public Health Laboratory	pH, Color. Turbidity, Total solids, Total Hardness, Total Alkalinity, Calcium, Magnesium, Chloride, Sulphate, Iron, Total Coliforms

References

Bartram, J., & Balance, R. (1996). Water Quality Monitoring - A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programmes: CH 5 - Field Work and Sampling. United Nations Environment Programme & the World Health Organization ISBN 0 419 22320 7 (Hbk) 0 419 21730 4 (Pbk). Retrieved from http://www.who.int/water_sanitation_health/resourcesquality/waterqualmonitor.pdf

U.S. Geological Survey Techniques of Water-Resources Investigations: Book 9Handbooks for Water-Resources Investigations: CH A4.Collection of Water Samples (2006).US Geological Survey. Retrieved from http://pubs.water.usgs.gov/twri9A/

Water sampling and analysis - World Health Organization, www.who.int/water_sanitation_health/dwq/2edvol3d.pdf

Yeskis, D. * & Zavala, B. **, May 2002, Ground-Water Sampling Guidelines for Superfund & RCRA Project Managers: GROUND WATER FORUM ISSUE PAPER, EPA 542-S-02-001United States Environmental Protection Agency (USEPA). Retrieved from https://www.epa.gov/sites/production/files/2015-06/documents/gw_sampling_guide.pdf

Groundwater Sampling https://www.epa.gov/foia/groundwater-sampling

5 Surface Water Sampling Methodology

5.1 Preparation before leaving for the field site.

Sample bottles and sampling dipper were washed and cleaned with purified water as well as deionized water for three times, filled preservatives if needed and capped securely. These procedures were unnecessary for the sample bottles sent by the international lab as all bottles were already prepared and sealed.

Prepare the one page check list for the list of water parameters to be tested, label sample parameters, site identification code and a field date and time on the bottles.

Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.

Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.

Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.

5.2 Sampling procedure and sampling device

The physical location of the investigator when collecting a sample may dictate the equipment to be used. If surface water samples are required, direct dipping of the sample container into the stream is desirable. Collecting samples in this manner is possible when sampling from accessible locations such as stream banks or by wading or from low platforms, such as small boats or piers. Wading or streamside sampling from banks, however, may cause the re-suspension of bottom deposits and bias the sample. Wading is acceptable if the stream has a noticeable current (is not impounded), and the samples are collected while facing upstream. If the stream is too deep to wade, or if the sample must be collected from more than one water depth, or if the sample must be collected from an elevated platform (bridge, pier, etc.), supplemental sampling equipment must be used.
To collect a surface water sample from a water body or other surface water conveyance, a variety of methods can be used:

- Dipping Using Sample Container
- Scoops
- Peristaltic Pumps
- Submersible Pumps
- Discrete Depth Samplers
- Bailers
- Buckets

Regardless of the method used, precautions should be taken to insure that the sample collected is representative of the water body or conveyance. These methods are discussed in the following sections.

One member of the field sampling team should take all the notes and photographs, fill out tags, etc., while the other members collect the samples.

Gloves and sampling dipper

In general, water samples were collected using clean sampling dipper in order to avoid sample contamination from other sources according to the standard operation procedures.

Before sample collection, appropriate measures including wearing a clean pair of new, non-powdered, disposable gloves will be worn each time a different location is sampled and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised and rinsing of sampling dipper with native water were carried out so as to condition, or equilibrate to the sample environment and make sure that all cleaning-solution residues have been removed.

Onsite water quality monitoring
Total dissolved solid (TDS), Conductivity, Chlorine, Salt, PH value, Temperature were measured on-site at the sampling locations according to the standard operation procedures.

A hand-held, narrow mouth bottles
The sample bottles were partially filled and rinsed with the water to be sampled (rinse water). In order to avoid suspended sand particles, water for rinsing was collected at the edge of the stream in an area of low-flow turbidity and then drained the rinse water.

Transportation (shipping) and storage of samples through cold chain till laboratory
After sample collection, sample bottles were kept in a cooling box with ice/ice packs untill the laboratory.

5.3 Water sample to be measured

Table-1.2 Laboratory services for water analysis provided to project

Laboratory	Parameters
Public Health Laboratory	pH, Color. Turbidity, Total solids, Total Hardness, Total Alkalinity, Calcium, Magnesium, Chloride, Sulphate, Iron, Total Coliforms

References:

Bartram, J., &Balance, R. (1996). Water Quality Monitoring - A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programmes:CH 5 - Field Work and Sampling. United Nations Environment Programme & the World Health Organization ISBN 0 419 22320 7 (Hbk) 0 419 21730 4 (Pbk). Retrieved from http://www.who.int/water_sanitation_health/resourcesquality/waterqualmonitor.pdf

Franceska D. W. (2004). U.S. Geological Survey Techniques of Water-Resources Investigations: Book 9Handbooks for Water-Resources Investigations: CH A3.Cleaning of equipment for water Sampling (Ed).US Geological Survey. Retrieved from http://pubs.water.usgs.gov/twri9A/

U.S. Geological Survey Techniques of Water-Resources Investigations: Book 9Handbooks for Water-Resources Investigations: CH A4.Collection of Water Samples (2006).US Geological Survey. Retrieved from http://pubs.water.usgs.gov/twri9A/

Surface Water Sampling
https://www.epa.gov/foia/surface-water-sampling

(1) Air Monitoring Raw Data

Main | Preferences | Header | Data | Report

Environmental Report

Record Cnt 96

Start Date 5/31/2020 10:45:01 PM 96

End Date 6/1/2020 10:30:00 PM

	NH3 ppm	ARad CPM	CO2 ppm	CO ppm	H2S ppb	CH4 ppm	NO2 ppb	O3 ppb	PM10 uG/m3	PM25 uG/m3	RH %	SO2 ppb	TmpC Deg. C	VOCS ppb	WDir Deg.	WSpM kph	Pwr V
Ave	**38.4802**	**0**	**431.916**	**.331458**	**71.9375**	**63.9583**	**67.0416**	**1.41666**	**17.2604**	**8.03125**	**97.1666**	**15.6666**	**26.8020**	**3.5**	**189.322**	**.26875**	**12.2031**
Max	85.8	0	687	1.38	183	190	83	10	58	24	100	20	31	110	358	4.3	12.5
Min	10.5	0	351	0	0	1	11	1	2	1	76	1	25	0	0	0	12
6/1/20 22:30:00	40.7	0	451	0.23	0	34	57	1	2	1	92	14	29	0	268	0	12

Comments

Environmental Report

Start: 5/31/2020 10:45:01 PM End: 6/1/2020 10:30 PM

Collected by:

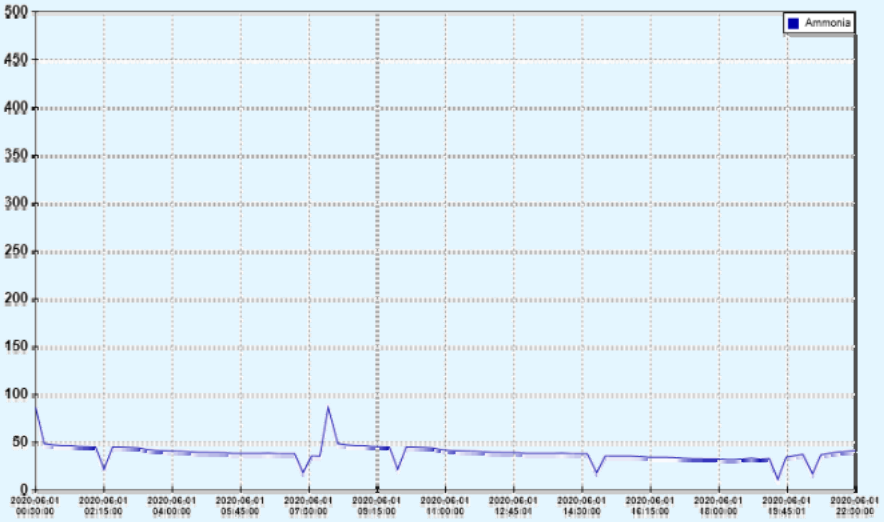
Logger ID 912005 Record Count 96

Ammonia

Sensor ID

Range: 0 to 100 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
10.5	38.4802	85.8	ppm				

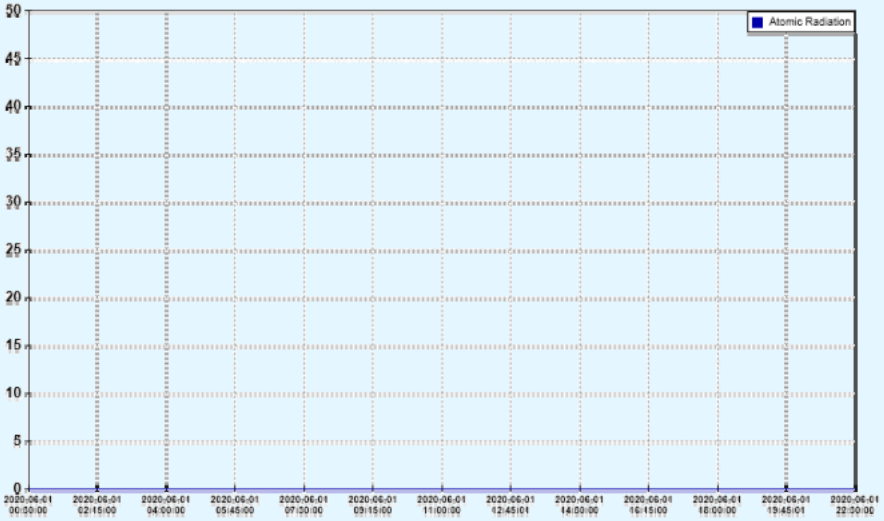


Atomic Radiation

Sensor ID

Range: 0 to 20000 CPM

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	0	0	CPM				



Environmental Report

Start: 5/31/2020 10:45:01 PM End: 6/1/2020 10:30 PM

Collected by:

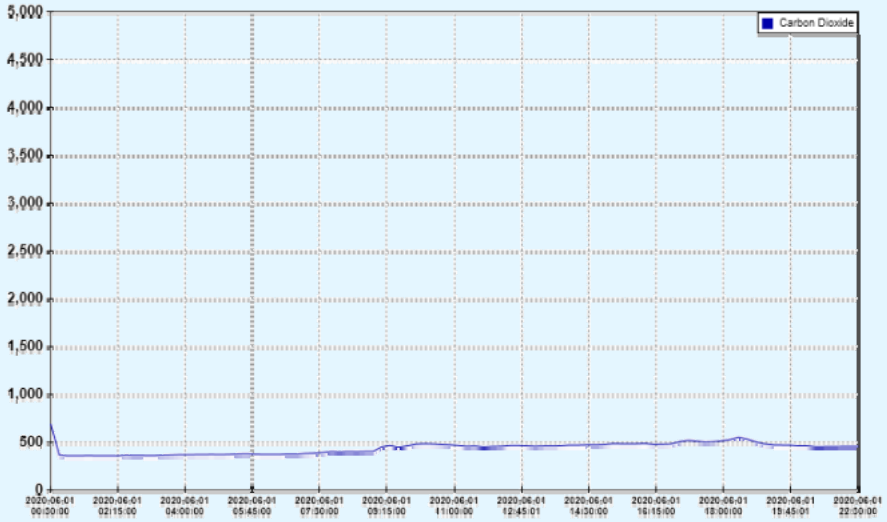
Logger ID 912005 Record Count 96

Carbon Dioxide

Sensor ID

Range: 0 to 5000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
351	431.916	687	ppm				

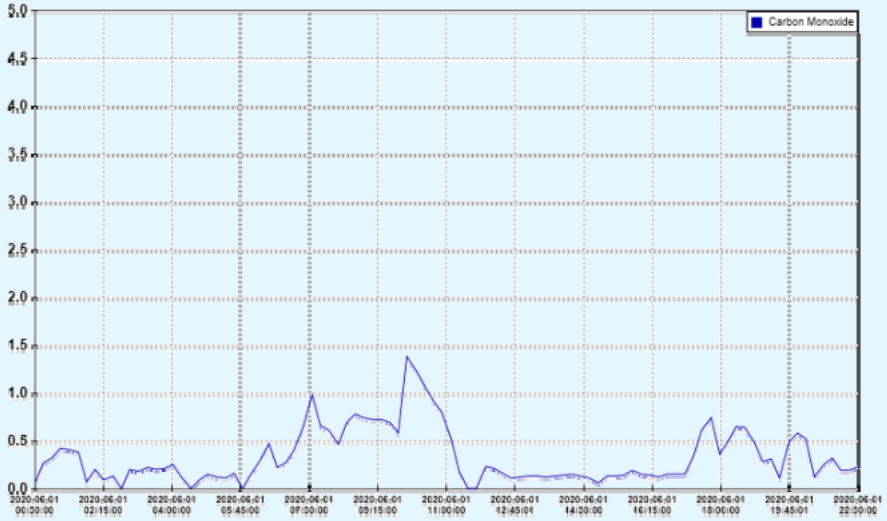


Carbon Monoxide

Sensor ID

Range: 0 to 15 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	.331458	1.38	ppm				



Environmental Report

Start: 5/31/2020 10:45:01 PM End: 6/1/2020 10:30 PM

Collected by:

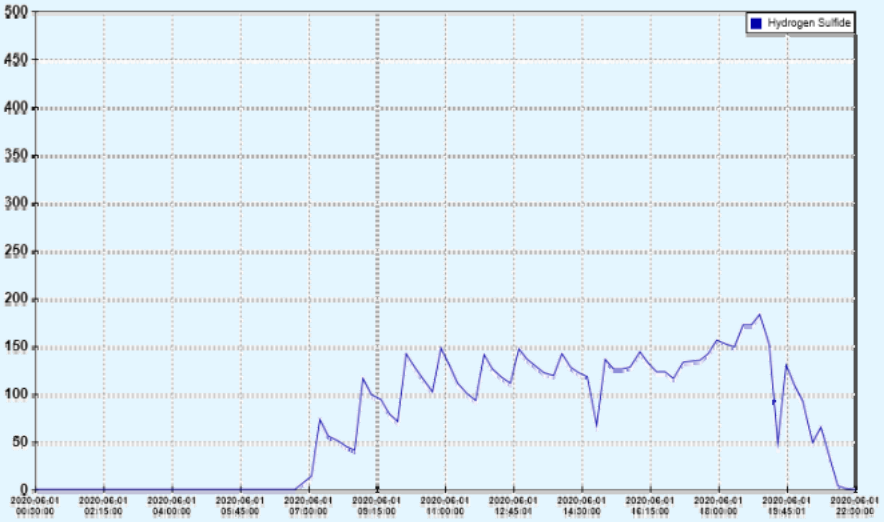
Logger ID 912005 Record Count 96

Hydrogen Sulfide

Sensor ID

Range: 0 to 5000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	71.9375	183	ppb				

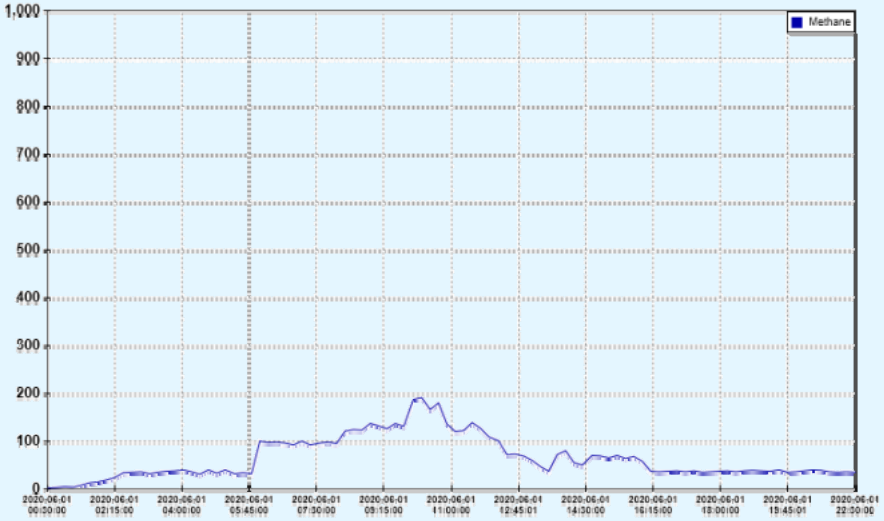


Methane

Sensor ID

Range: 0 to 10000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	63.9583	190	ppm				



Environmental Report

Start: 5/31/2020 10:45:01 PM End: 6/1/2020 10:30 PM

Collected by:

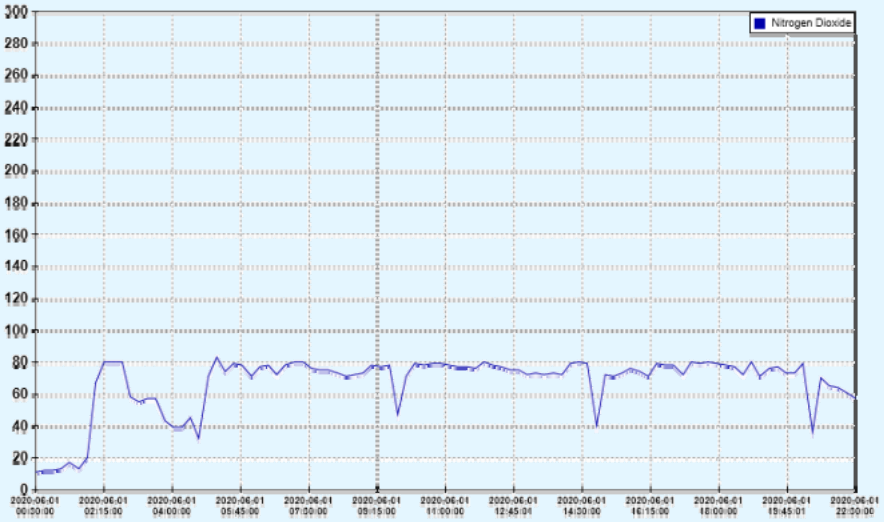
Logger ID 912005 Record Count 96

Nitrogen Dioxide

Sensor ID

Range: 0 to 10000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
11	67.0416	83	ppb				

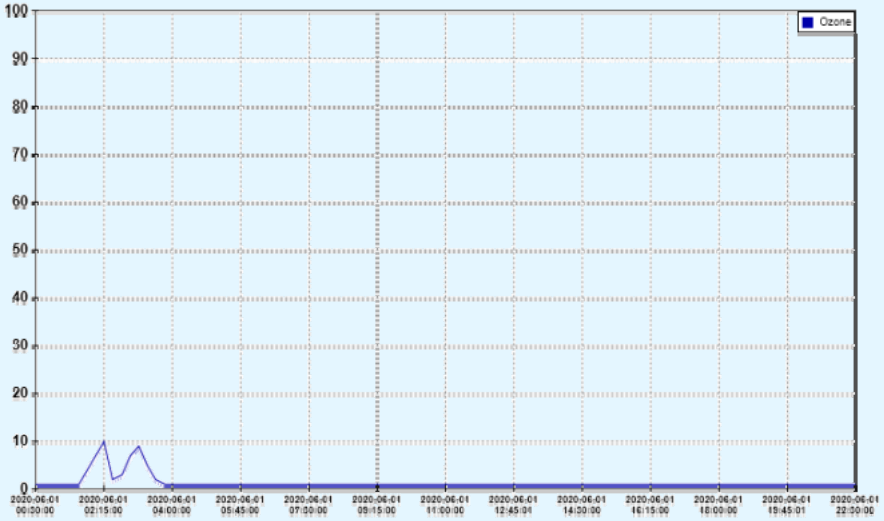


Ozone

Sensor ID

Range: 0 to 150 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	1.41666	10	ppb				



Environmental Report

Start: 5/31/2020 10:45:01 PM End: 6/1/2020 10:30 PM

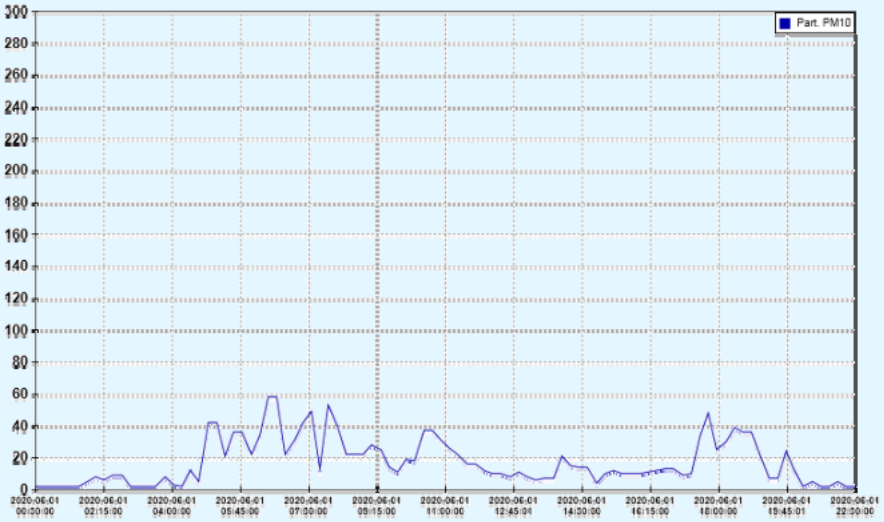
Collected by:

Logger ID 912005 Record Count 96

Prt10 **Part. PM10** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

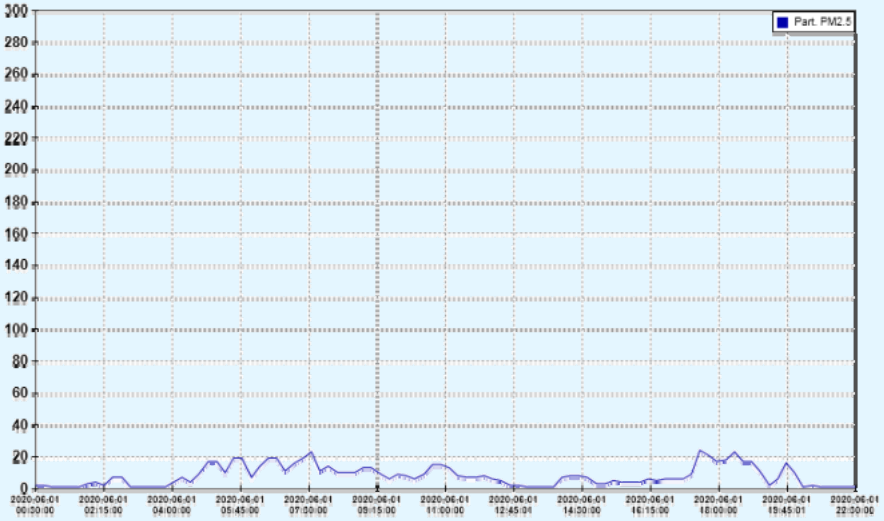
Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
2	17.2604	58	uG/m3				



Prt10 **Part. PM2.5** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	8.03125	24	uG/m3				



Environmental Report

Start: 5/31/2020 10:45:01 PM End: 6/1/2020 10:30 PM

Collected by:

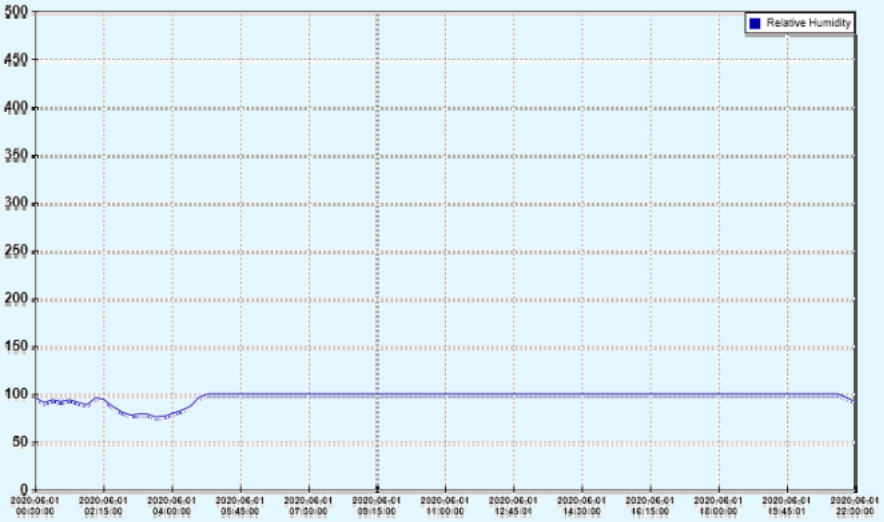
Logger ID 912005 Record Count 96

Relative Humidity

Sensor ID

Range: 0 to 100 %

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
76	97.1666	100	%				

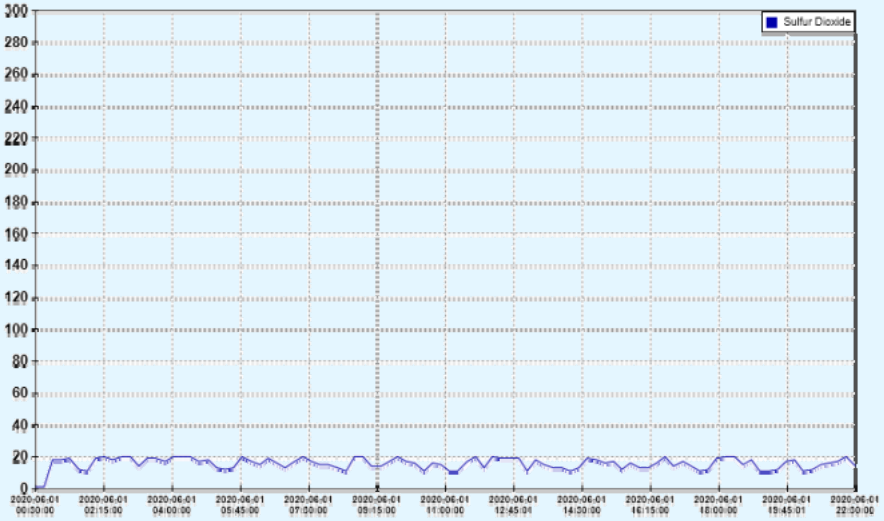


Sulfur Dioxide

Sensor ID

Range: 0 to 10000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	15.6666	20	ppb				



Environmental Report

Start: 5/31/2020 10:45:01 PM End: 6/1/2020 10:30 PM

Collected by:

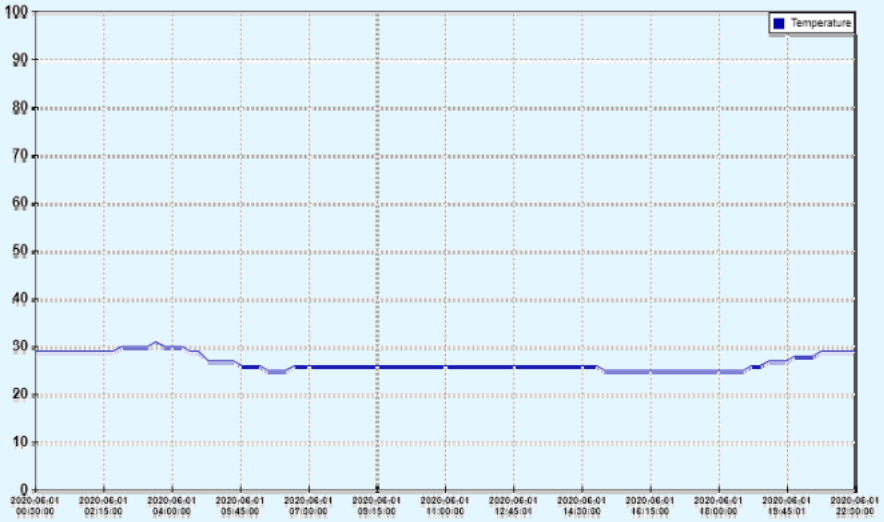
Logger ID 912005 Record Count 96

Temperature

Sensor ID

Range: -20 to 60 Deg. C

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
25	26.8020	31	Deg. C				

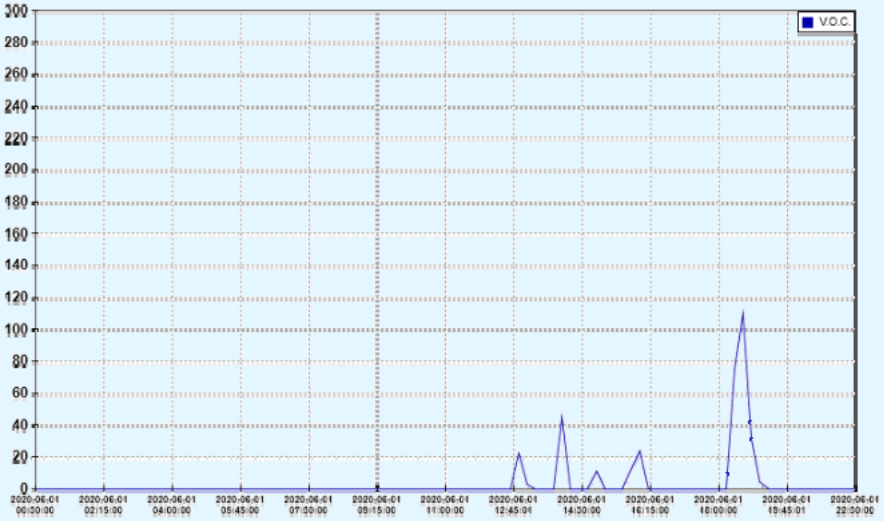


V.O.C.

Sensor ID

Range: 0 to 50000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	3.5	110	ppb				



Environmental Report

Start: 5/31/2020 10:45:01 PM End: 6/1/2020 10:30 PM

Collected by:

Logger ID 912005 Record Count 96

W. DIR.

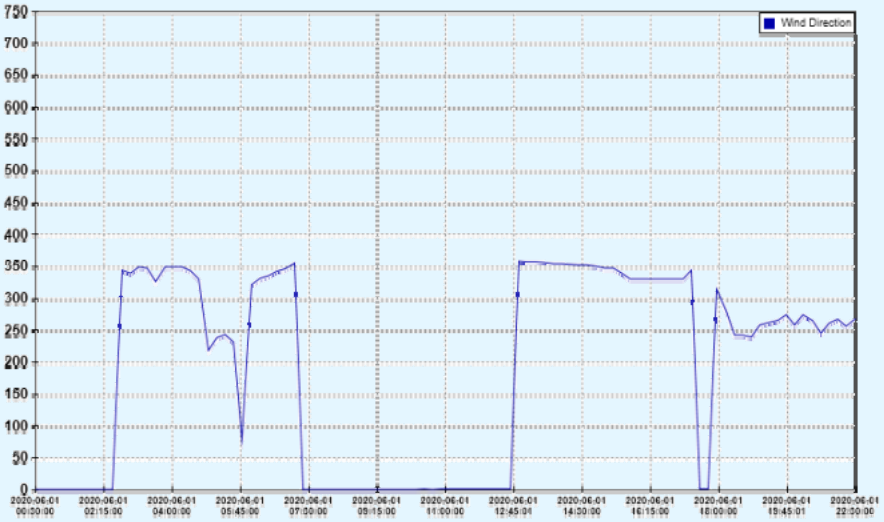
Wind Direction

W. DIR.

Sensor ID

Range: 0 to 359 Deg.

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	189.322	358	Deg.				



W. SPD.

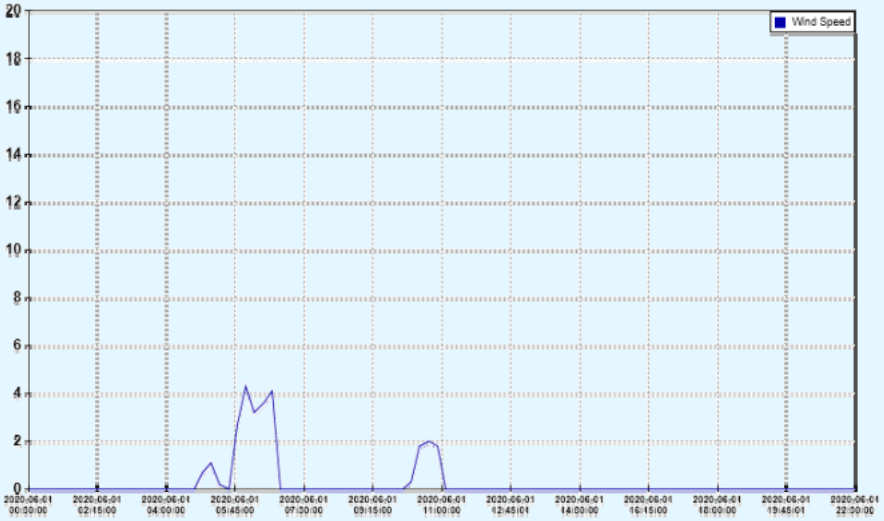
Wind Speed

W. SPD.

Sensor ID

Range: 0 to 160 kph

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	.26875	4.3	kph				



Environmental Report

Start: 5/31/2020 10:45:01 PM End: 6/1/2020 10:30 PM

Collected by:

Logger ID 912005

Record Count 96

Batt.

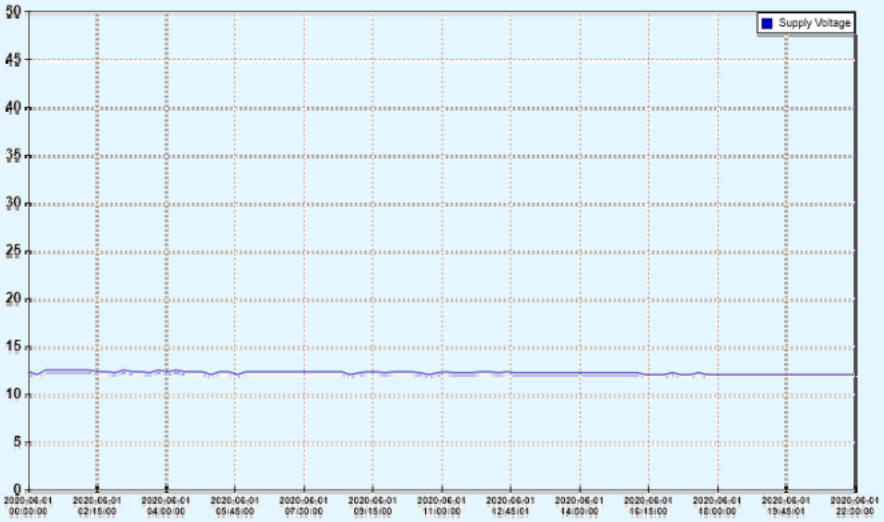
Supply Voltage

Batt.

Sensor ID

Range: 10 to 16 V

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
12	12.2031	12.5	V				



Main | Preferences | Header | Data | Report

Environmental Report

Record Cnt 79

Start Date 6/2/2020 11:15:00 AM

End Date 6/3/2020 6:45:00 AM

	NH3 ppm	ARad CPM	CO2 ppm	CO ppm	H2S ppb	CH4 ppm	NO2 ppb	O3 ppb	PM10 uG/m3	PM25 uG/m3	RH %	SO2 ppb	TmpC Deg. C	VOCS ppb	WDir Deg.	WSpM kph	Pwr V
Ave	**24.3126**	**0**	**393.670**	**.237721**	**101.531**	**69.9746**	**80.3797**	**1.50632**	**24.7088**	**16.2151**	**69.1139**	**6.89873**	**28.8607**	**9.27848**	**248.177**	**.017721**	**12.1936**
Max	46	0	499	.51	208	190	98	10	49	60	82	10	31	67	357	1.1	12.5
Min	3.3	0	319	0	0	1	8	1	2	1	60	1	27	0	7	0	12

Comments

Environmental Report

Start: 6/2/2020 11:15 AM End: 6/3/2020 6:45 AM

Collected by:

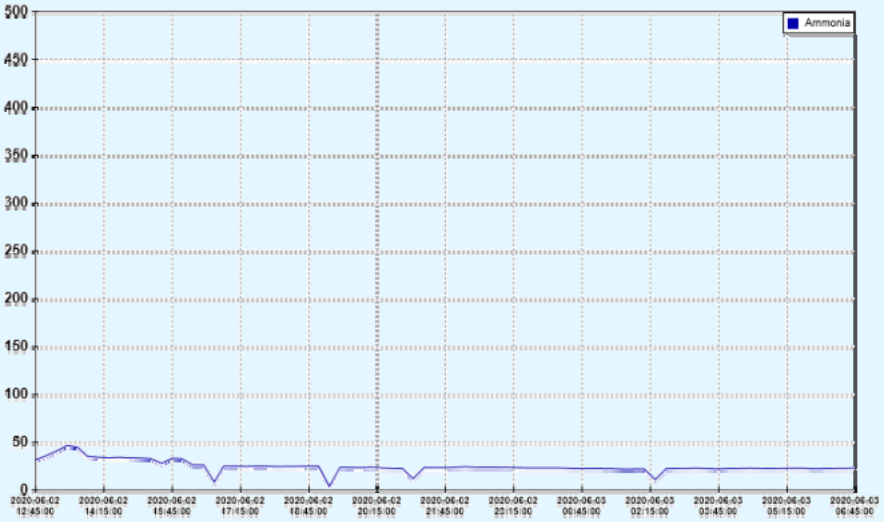
Logger ID 912005 Record Count 79

Ammonia

Sensor ID

Range: 0 to 100 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
3.3	24.3126	46	ppm				

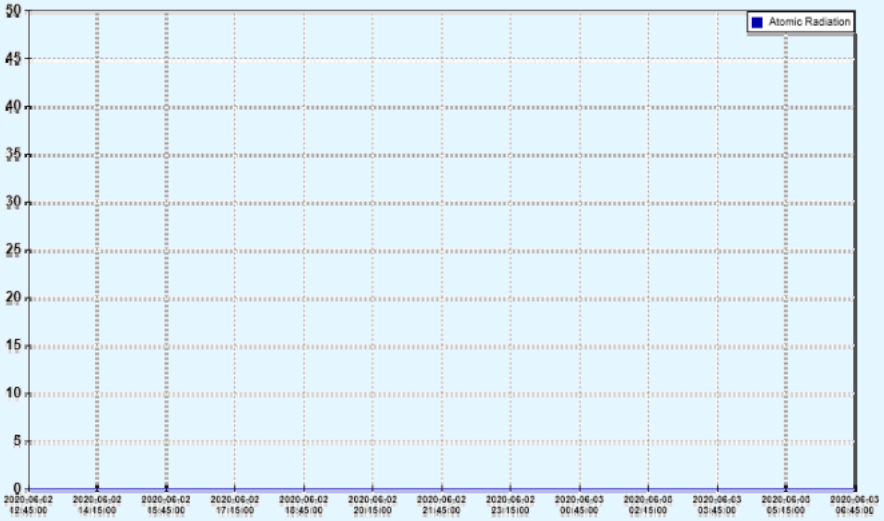


Atomic Radiation

Sensor ID

Range: 0 to 20000 CPM

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	0	0	CPM				



Environmental Report

Start: 6/2/2020 11:15 AM End: 6/3/2020 6:45 AM

Collected by:

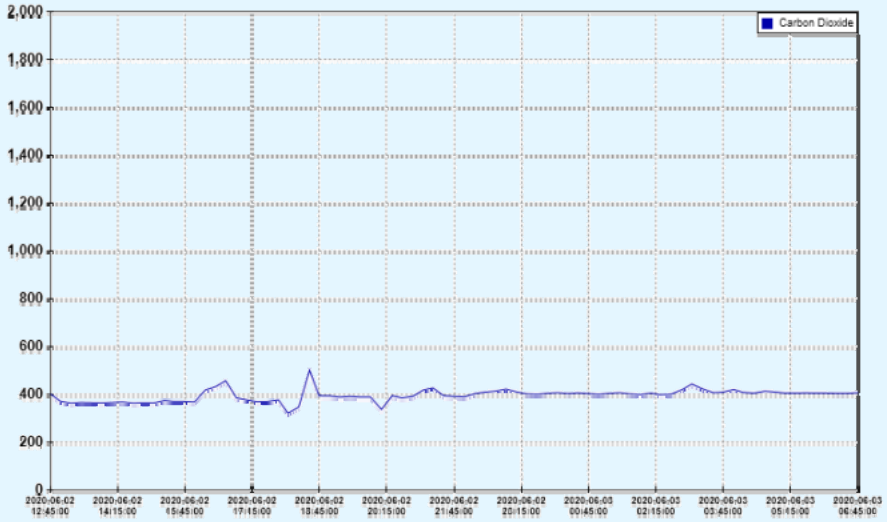
Logger ID 912005 Record Count 79

Carbon Dioxide

Sensor ID

Range: 0 to 5000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
319	393.670	499	ppm				

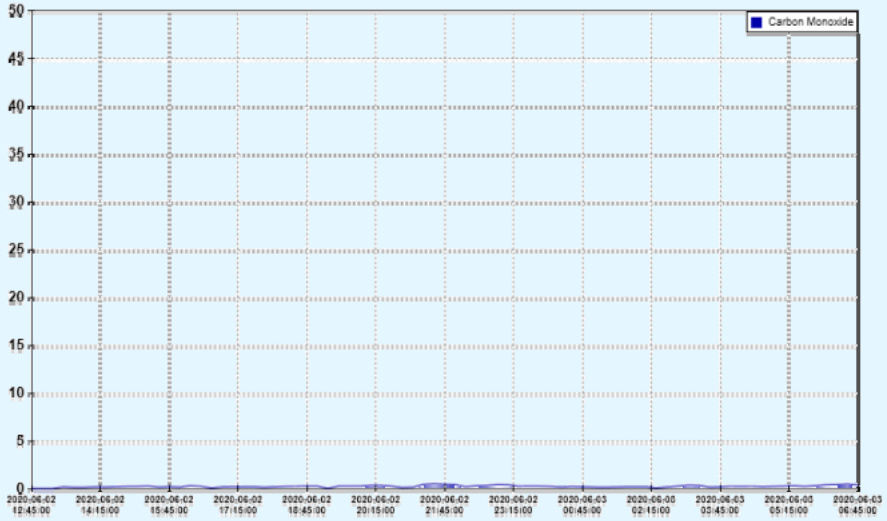


Carbon Monoxide

Sensor ID

Range: 0 to 15 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	.237721	.51	ppm				



Environmental Report

Start: 6/2/2020 11:15 AM End: 6/3/2020 6:45 AM

Collected by:

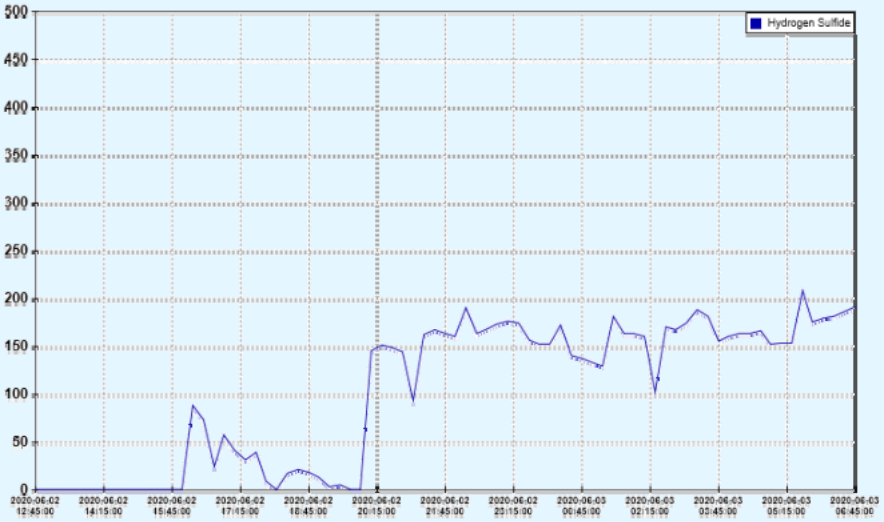
Logger ID 912005 Record Count 79

Hydrogen Sulfide

Sensor ID

Range: 0 to 5000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	101.531	208	ppb				

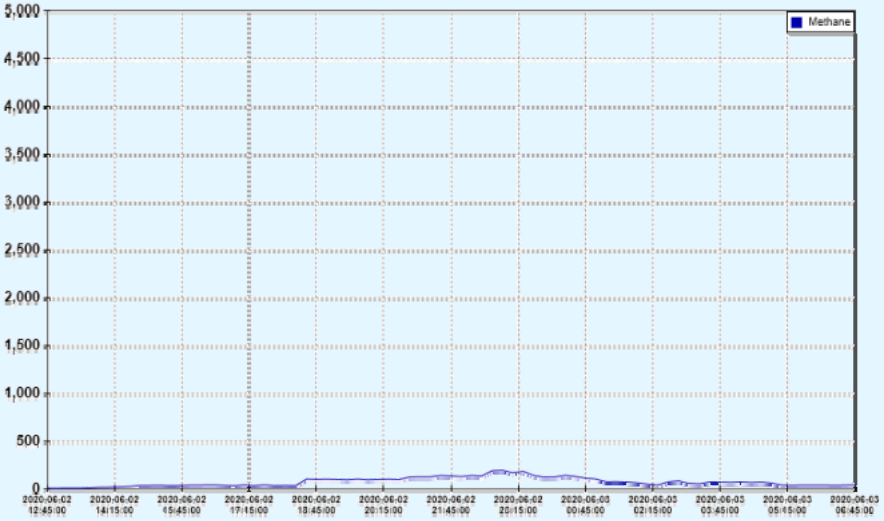


Methane

Sensor ID

Range: 0 to 10000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	69.9746	190	ppm				



Environmental Report

Start: 6/2/2020 11:15 AM End: 6/3/2020 6:45 AM

Collected by:

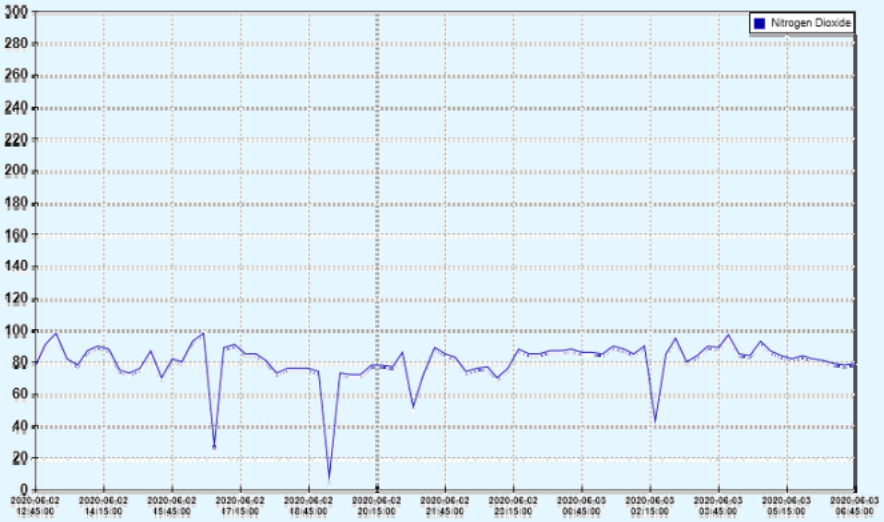
Logger ID 912005 Record Count 79

Nitrogen Dioxide

Sensor ID

Range: 0 to 10000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
8	80.3797	98	ppb				

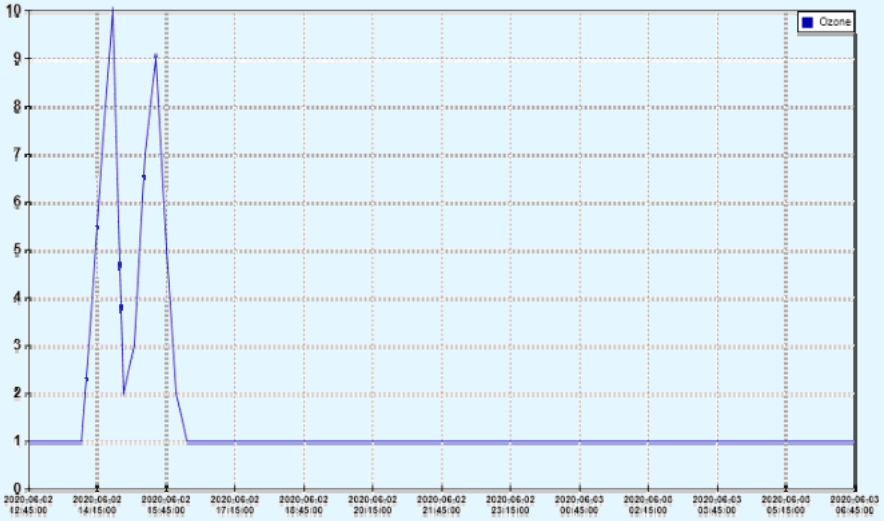


Ozone

Sensor ID

Range: 0 to 150 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	1.50632	10	ppb				



Environmental Report

Start: 6/2/2020 11:15 AM End: 6/3/2020 6:45 AM

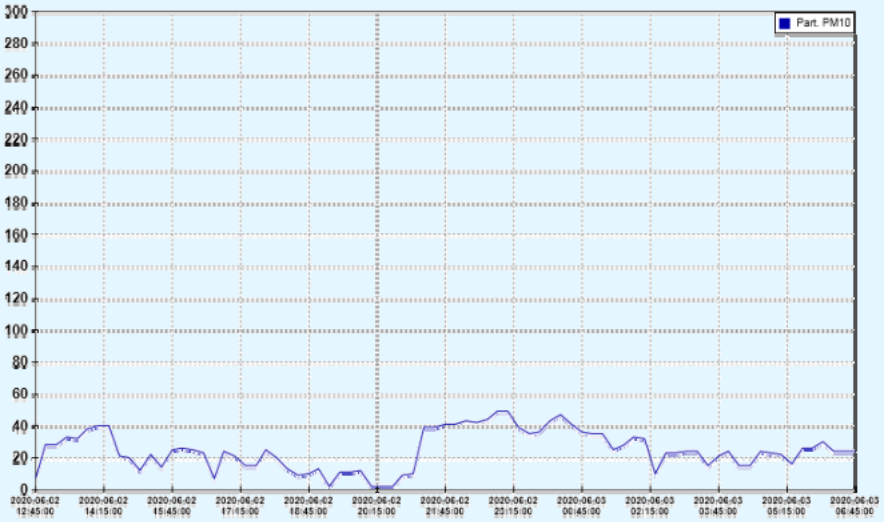
Collected by:

Logger ID 912005 Record Count 79

Prt10 **Part. PM10** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

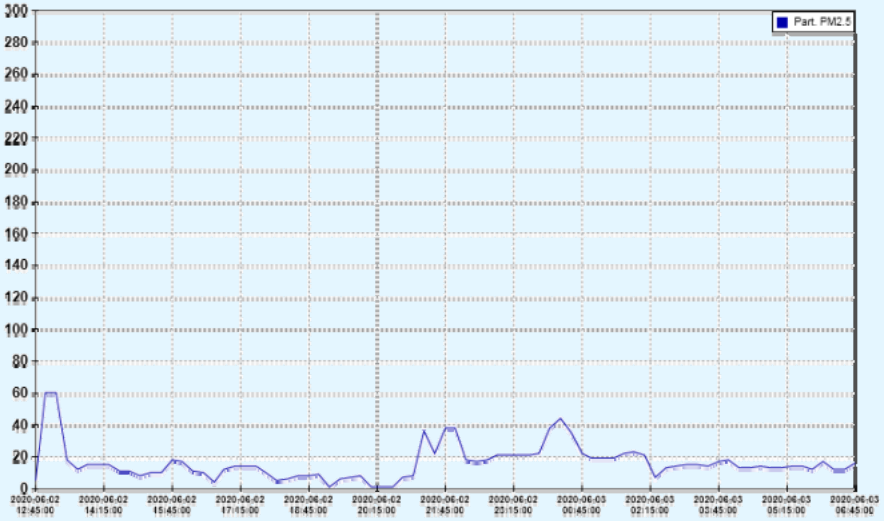
Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
2	24.7088	49	uG/m3				



Prt10 **Part. PM2.5** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	16.2151	60	uG/m3				



Environmental Report

Start: 6/2/2020 11:15 AM End: 6/3/2020 6:45 AM

Collected by:

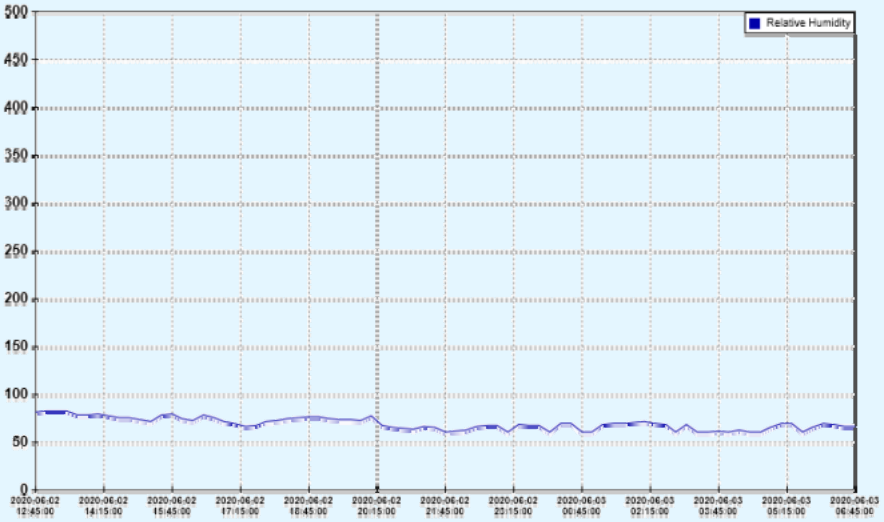
Logger ID 912005 Record Count 79

Relative Humidity

Sensor ID

Range: 0 to 100 %

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
60	69.1139	82	%				

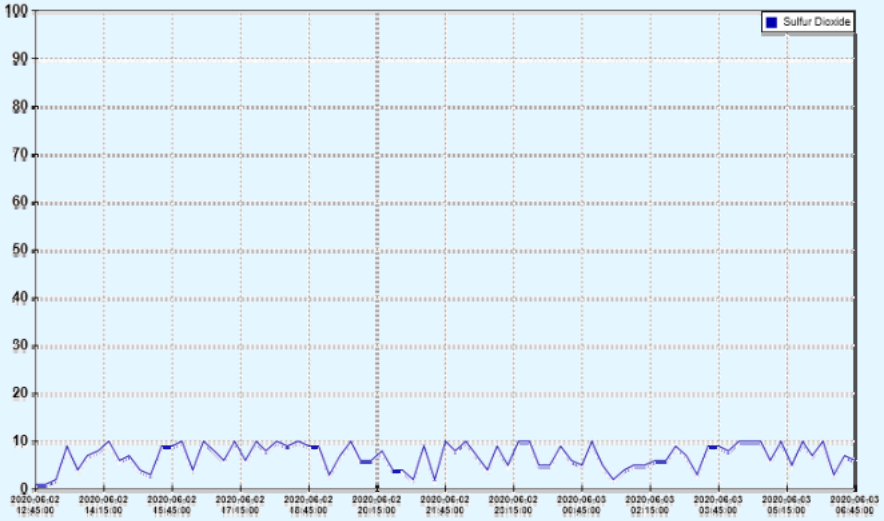


Sulfur Dioxide

Sensor ID

Range: 0 to 10000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	6.89873	10	ppb				



Environmental Report

Start: 6/2/2020 11:15 AM End: 6/3/2020 6:45 AM

Collected by:

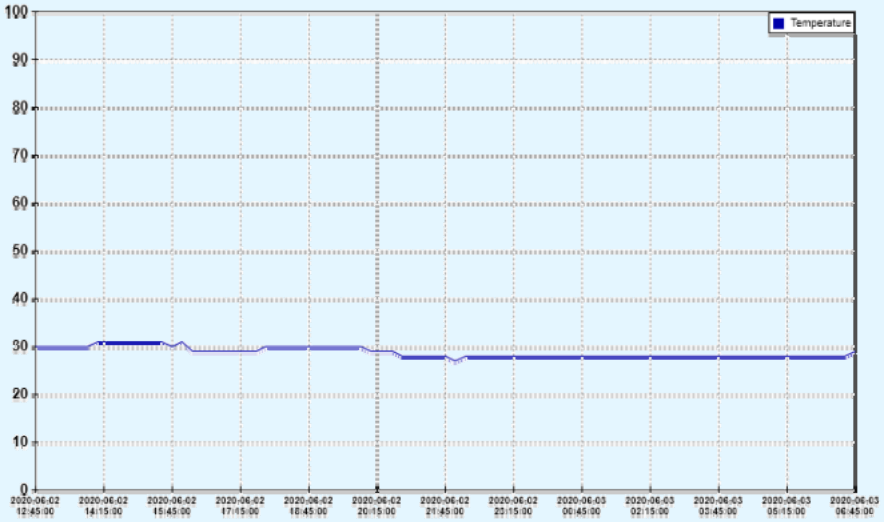
Logger ID 912005 Record Count 79

Temperature

Sensor ID

Range: -20 to 60 Deg. C

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
27	28.8607	31	Deg. C				

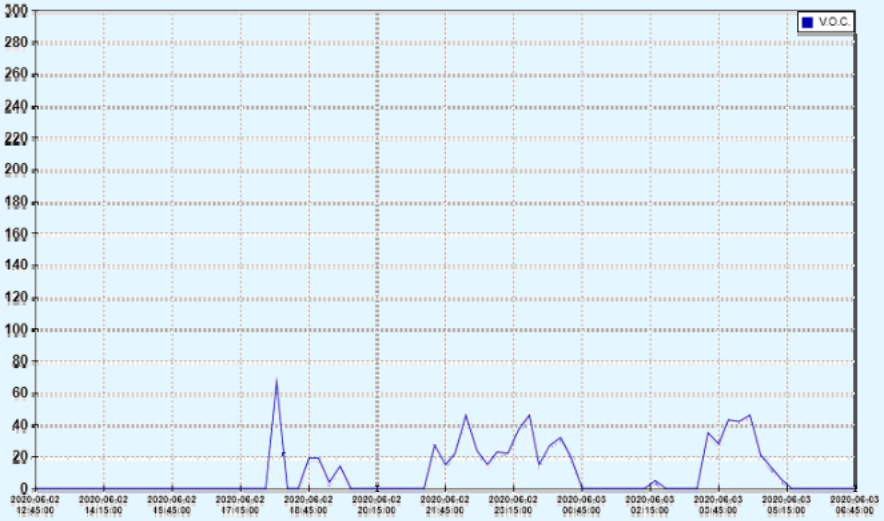


V.O.C.

Sensor ID

Range: 0 to 50000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	9.27848	67	ppb				



Environmental Report

Start: 6/2/2020 11:15 AM End: 6/3/2020 6:45 AM

Collected by:

Logger ID 912005 Record Count 79

W. DIR.

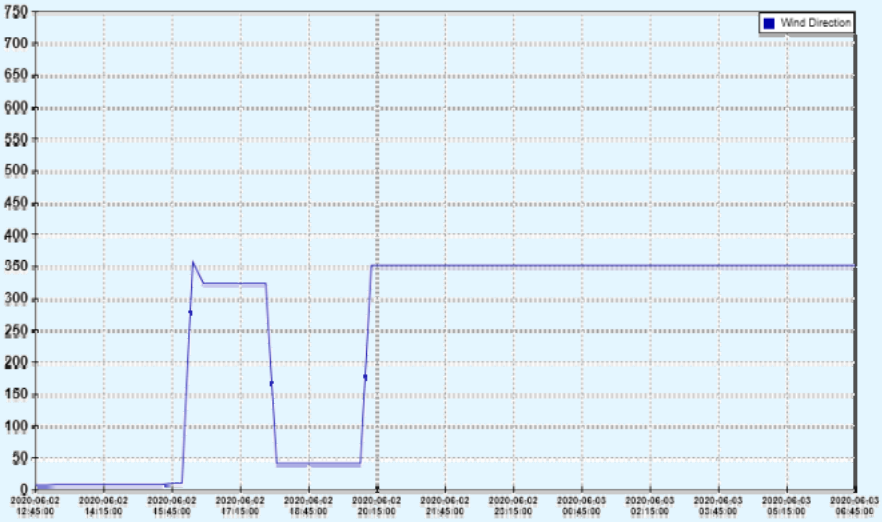
Wind Direction

W. DIR.

Sensor ID

Range: 0 to 359 Deg.

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
7	248.177	357	Deg.				



W. SPD.

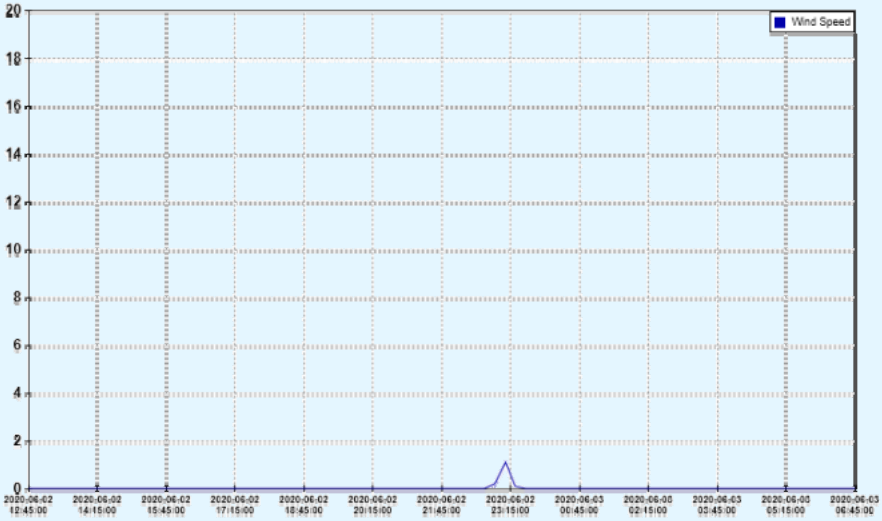
Wind Speed

W. SPD.

Sensor ID

Range: 0 to 160 kph

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	.017721	1.1	kph				



Environmental Report

Start: 6/2/2020 11:15 AM End: 6/3/2020 6:45 AM

Collected by:

Logger ID 912005

Record Count 79

Batt.

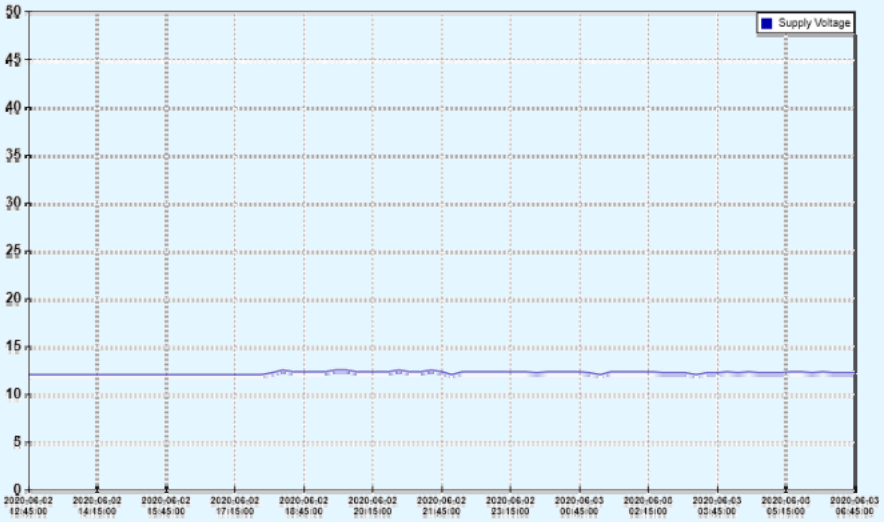
Supply Voltage

Batt.

Sensor ID

Range: 10 to 16 V

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
12	12.1936	12.5	V				



Main | Preferences | Header | Data | Report

Environmental Report

Record Cnt 31

Start Date 6/3/2020 1:30:00 AM

End Date 6/3/2020 9:00:00 AM

	NH3 ppm	ARad CPM	CO2 ppm	CO ppm	H2S ppb	CH4 ppm	NO2 ppb	O3 ppb	PM10 uG/m3	PM25 uG/m3	RH %	SO2 ppb	TmpC Deg. C	VOCS ppb	WDir Deg.	WSpM kph	Pwr V
Ave	**19.5064**	**0**	**639.129**	**.201290**	**24.4516**	**75.0645**	**76.8387**	**1**	**7.77419**	**5.25806**	**81.1935**	**6.77419**	**29.7741**	**8.09677**	**91.0645**	**0**	**12.3548**
Max	25.2	0	1545	.38	151	190	86	1	20	9	97	10	30	81	351	0	12.5
Min	0	0	383	.03	0	1	70	1	2	1	74	1	28	0	39	0	12.2

Comments

Environmental Report

Start: 6/3/2020 1:30 AM End: 6/3/2020 9:00 AM

Collected by:

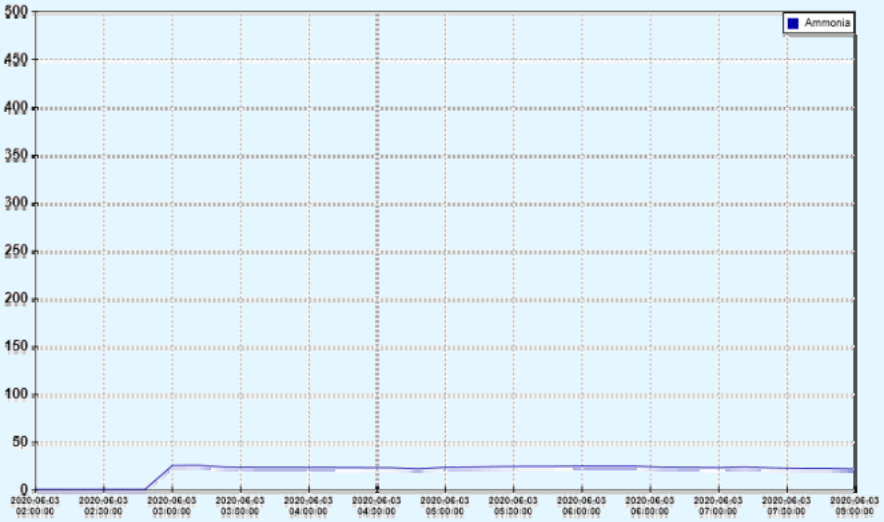
Logger ID 912005 Record Count 31

Ammonia

Sensor ID

Range: 0 to 100 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	19.5064	25.2	ppm				

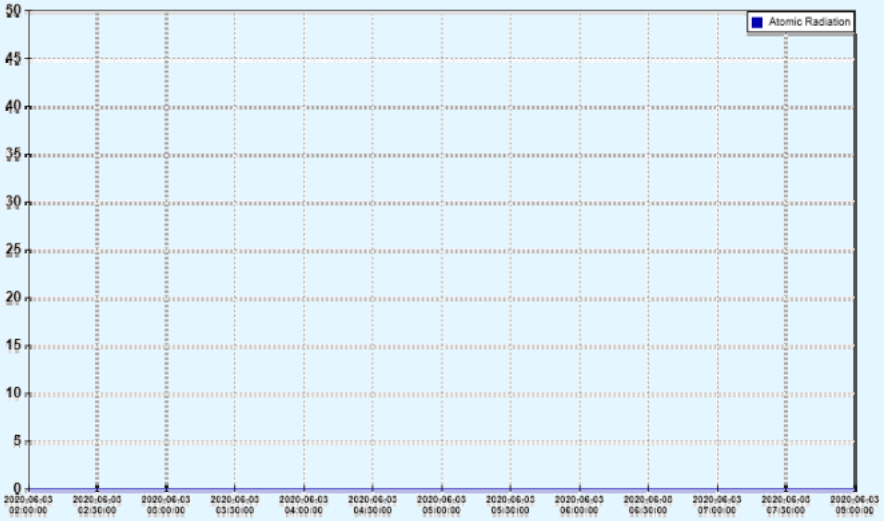


Atomic Radiation

Sensor ID

Range: 0 to 20000 CPM

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	0	0	CPM				



Environmental Report

Start: 6/3/2020 1:30 AM End: 6/3/2020 9:00 AM

Collected by:

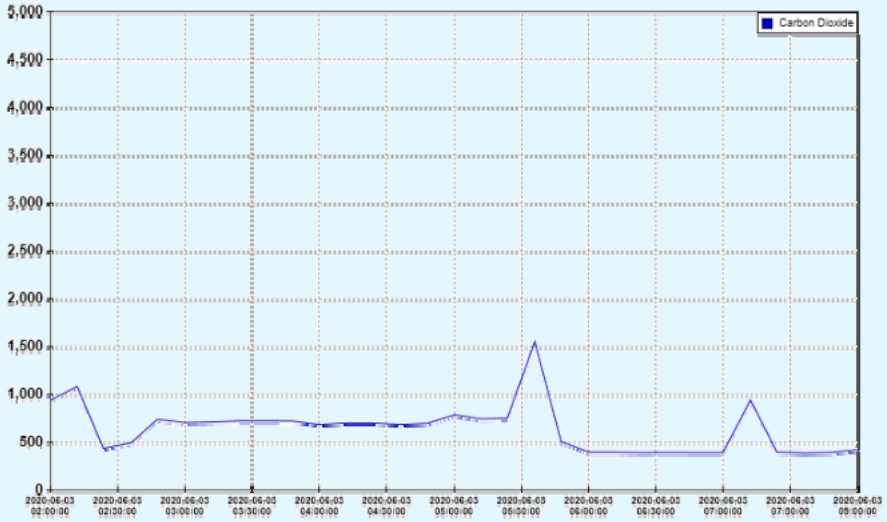
Logger ID 912005 Record Count 31

Carbon Dioxide

Sensor ID

Range: 0 to 5000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
383	639.129	1545	ppm				

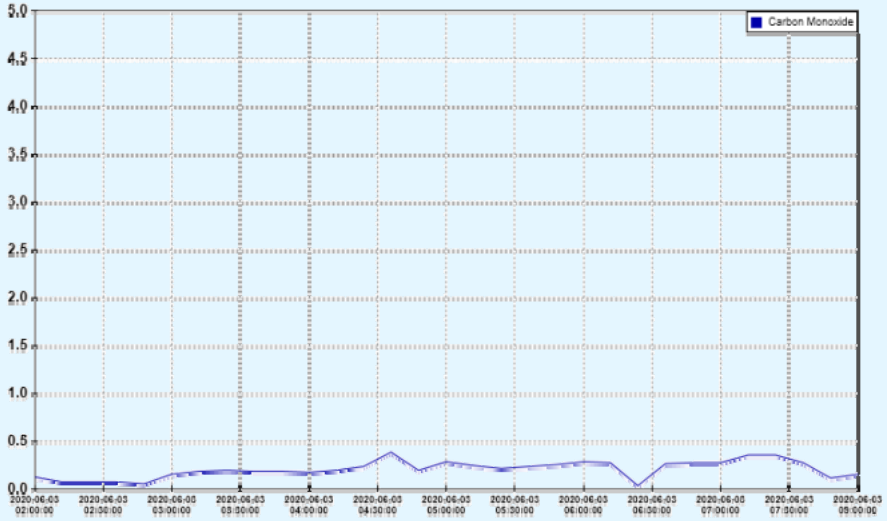


Carbon Monoxide

Sensor ID

Range: 0 to 15 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
.03	.201290	.38	ppm				



Environmental Report

Start: 6/3/2020 1:30 AM End: 6/3/2020 9:00 AM

Collected by:

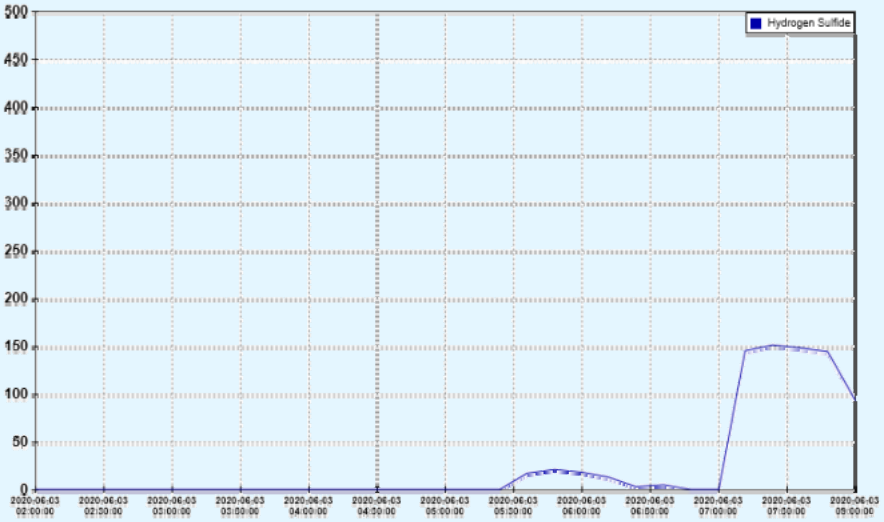
Logger ID 912005 Record Count 31

Hydrogen Sulfide

Sensor ID

Range: 0 to 5000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	24.4516	151	ppb				

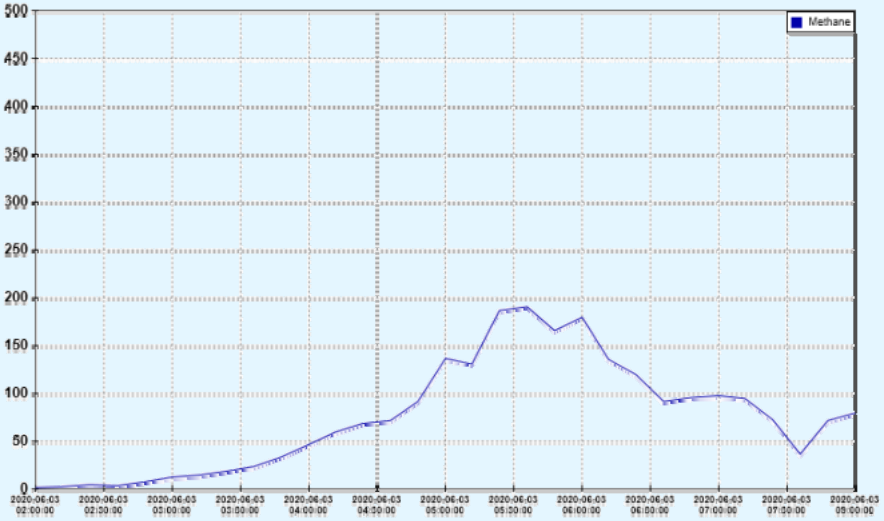


Methane

Sensor ID

Range: 0 to 10000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	75.0645	190	ppm				



Environmental Report

Start: 6/3/2020 1:30 AM End: 6/3/2020 9:00 AM

Collected by:

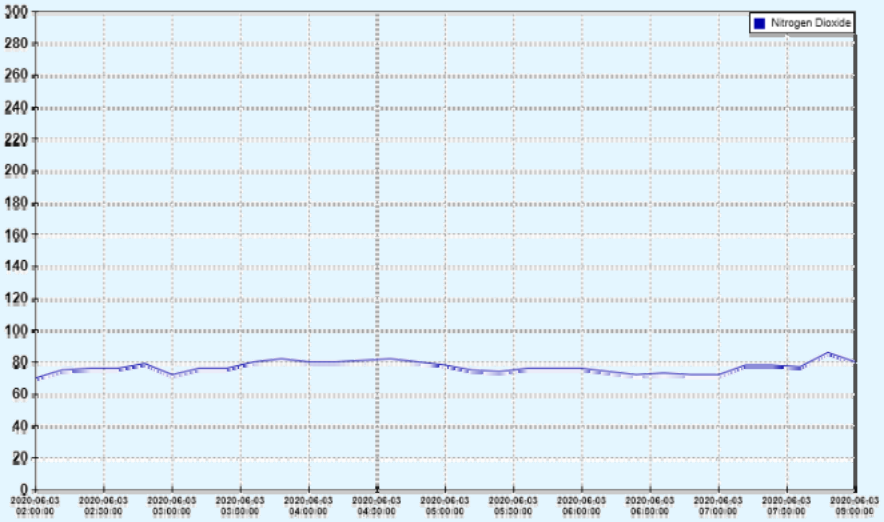
Logger ID 912005 Record Count 31

Nitrogen Dioxide

Sensor ID

Range: 0 to 10000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
70	76.8387	86	ppb				

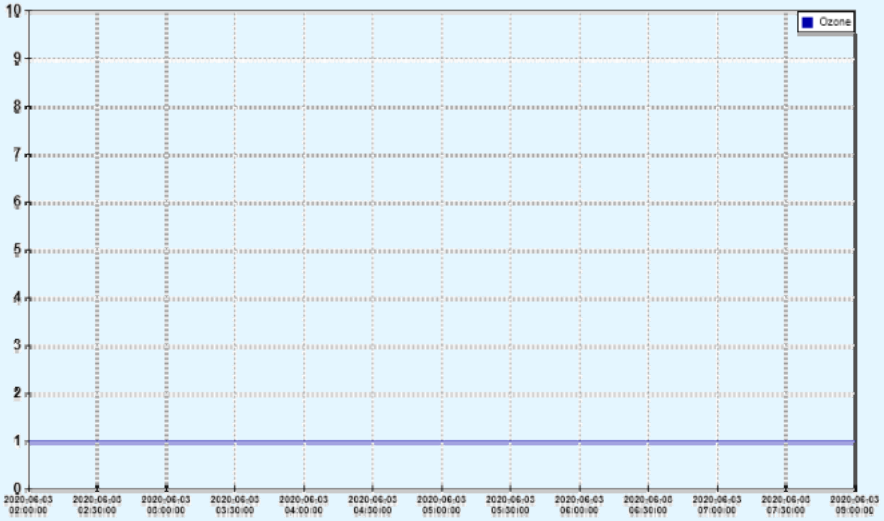


Ozone

Sensor ID

Range: 0 to 150 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	1	1	ppb				



Environmental Report

Start: 6/3/2020 1:30 AM End: 6/3/2020 9:00 AM

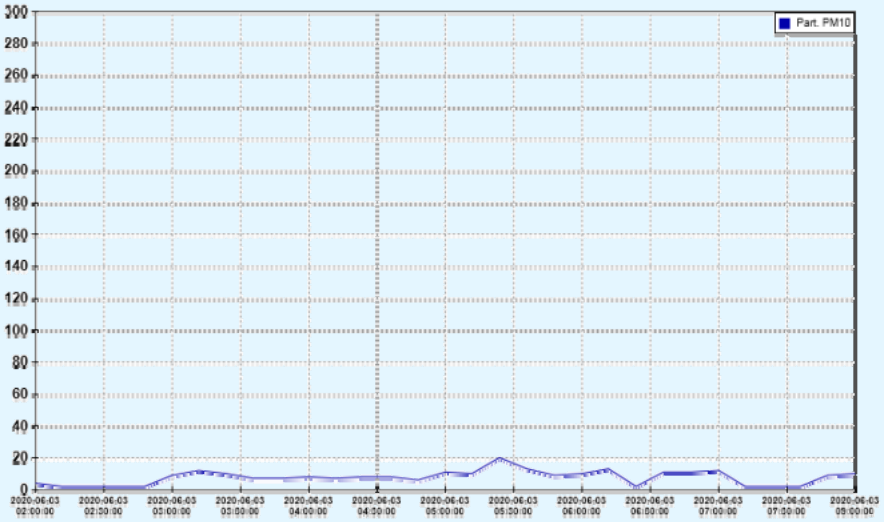
Collected by:

Logger ID 912005 Record Count 31

Prt10 **Part. PM10** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

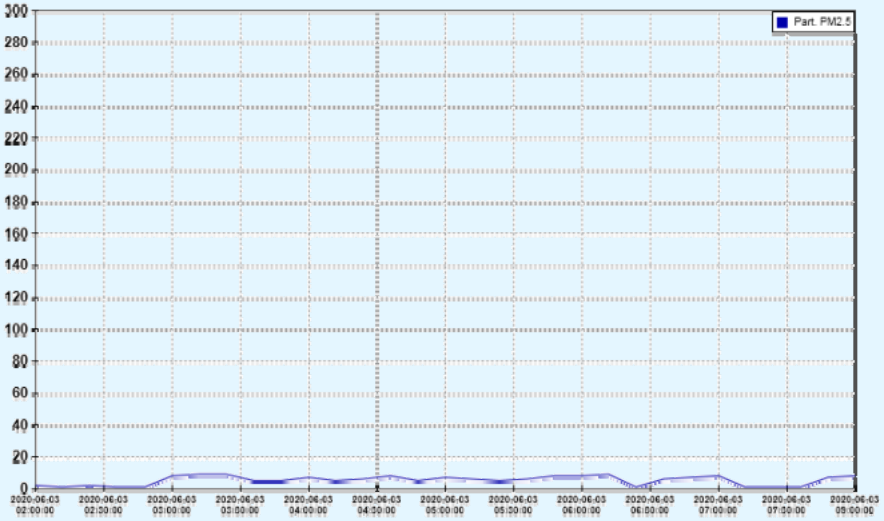
Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
2	7.77419	20	uG/m3				



Prt10 **Part. PM2.5** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	5.25806	9	uG/m3				



Environmental Report

Start: 6/3/2020 1:30 AM End: 6/3/2020 9:00 AM

Collected by:

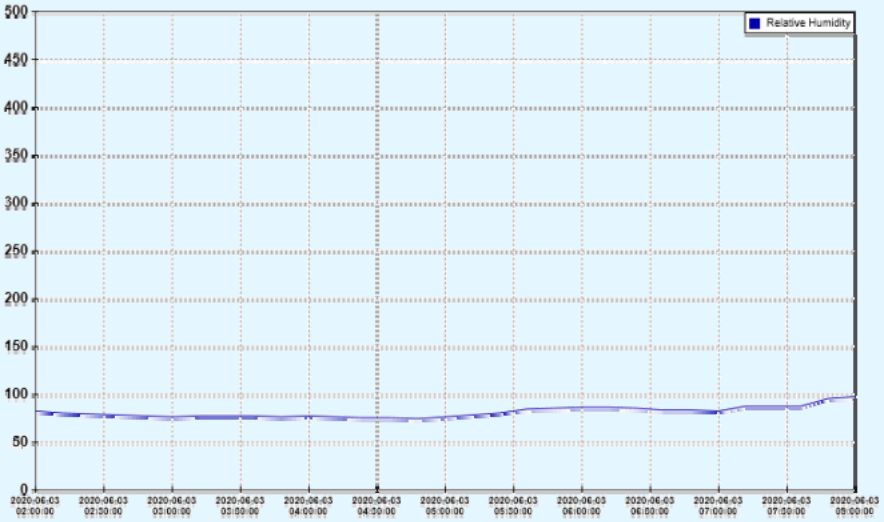
Logger ID 912005 Record Count 31

Relative Humidity

Sensor ID

Range: 0 to 100 %

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
74	81.1935	97	%				

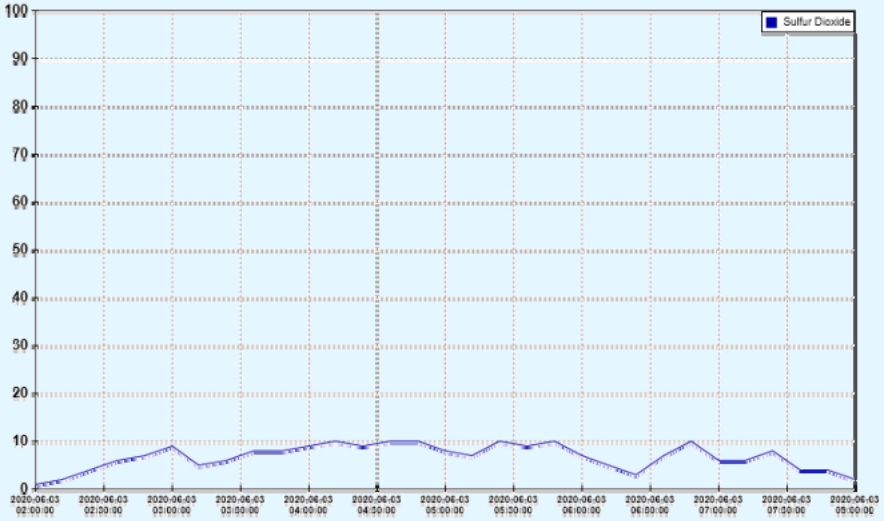


Sulfur Dioxide

Sensor ID

Range: 0 to 10000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	6.77419	10	ppb				



Environmental Report

Start: 6/3/2020 1:30 AM End: 6/3/2020 9:00 AM

Collected by:

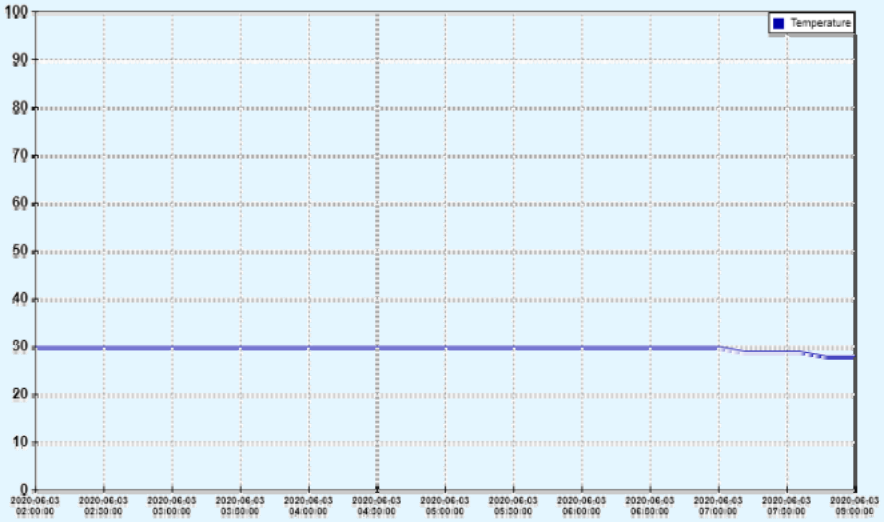
Logger ID 912005 Record Count 31

Temperature

Sensor ID

Range: -20 to 60 Deg. C

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
28	29.7741	30	Deg. C				

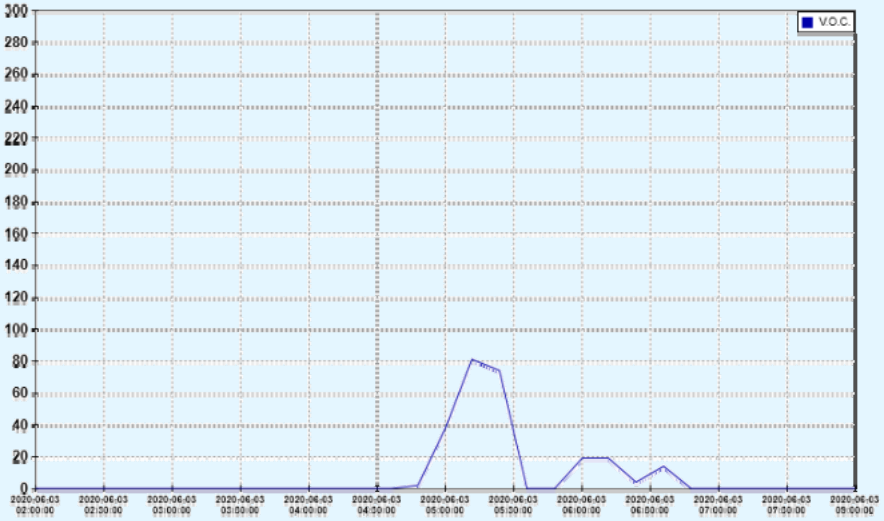


V.O.C.

Sensor ID

Range: 0 to 50000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	8.09677	81	ppb				



Environmental Report

Start: 6/3/2020 1:30 AM End: 6/3/2020 9:00 AM

Collected by:

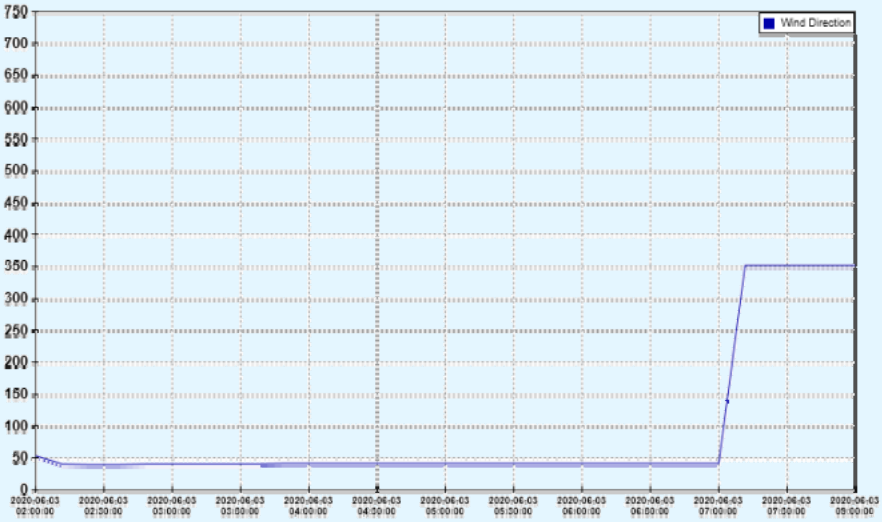
Logger ID 912005 Record Count 31

Wind Direction

Sensor ID W. DIR.

Range: 0 to 359 Deg.

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
39	91.0645	351	Deg.				

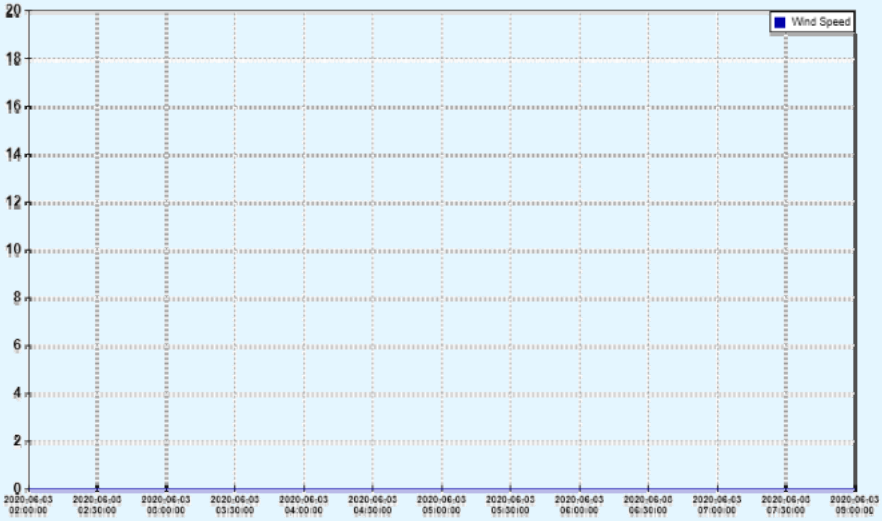


Wind Speed

Sensor ID W. SPD.

Range: 0 to 160 kph

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	0	0	kph				



Environmental Report

Start: 6/3/2020 1:30 AM End: 6/3/2020 9:00 AM

Collected by:

Logger ID 912005

Record Count 31

Batt.

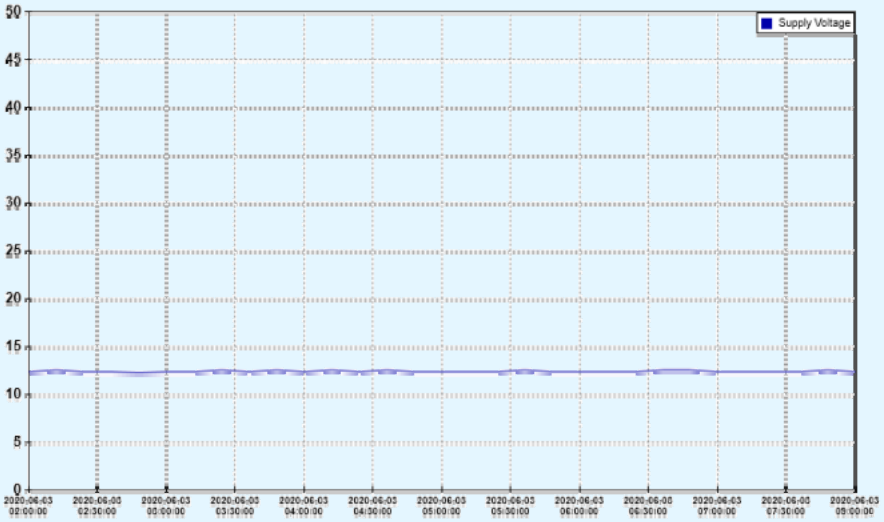
Supply Voltage

Batt.

Sensor ID

Range: 10 to 16 V

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
12.2	12.3548	12.5	V				



Main | Preferences | Header | Data | Report

Environmental Report

Record Cnt 28

Start Date 6/3/2020 8:15:00 PM 28

End Date 6/4/2020 3:30:00 AM

	NH3 ppm	ARad CPM	CO2 ppm	CO ppm	H2S ppb	CH4 ppm	NO2 ppb	O3 ppb	PM10 uG/m3	PM25 uG/m3	RH %	SO2 ppb	TmpC Deg. C	VOCS ppb	WDir Deg.	WSpM kph	Pwr V
Ave	**22.3928**	**0**	**404.928**	**.161071**	**1.71428**	**77.0714**	**54.8928**	**1**	**16.8571**	**13.3928**	**77.2857**	**22.7857**	**30.9285**	**55.25**	**203.75**	**.921428**	**12.1821**
Max	25.5	0	733	.28	25	190	83	1	65	63	100	40	33	161	268	4.3	12.2
Min	16.8	0	362	.02	0	1	33	1	2	1	59	1	28	0	83	0	11.9
6/4/20 3:30:00	23.8	0	367	0.25	0	46	74	1	65	43	93	40	29	0	247	1.8	12.2

Comments

Environmental Report

Start: 6/3/2020 8:15 PM End: 6/4/2020 3:30 AM

Collected by:

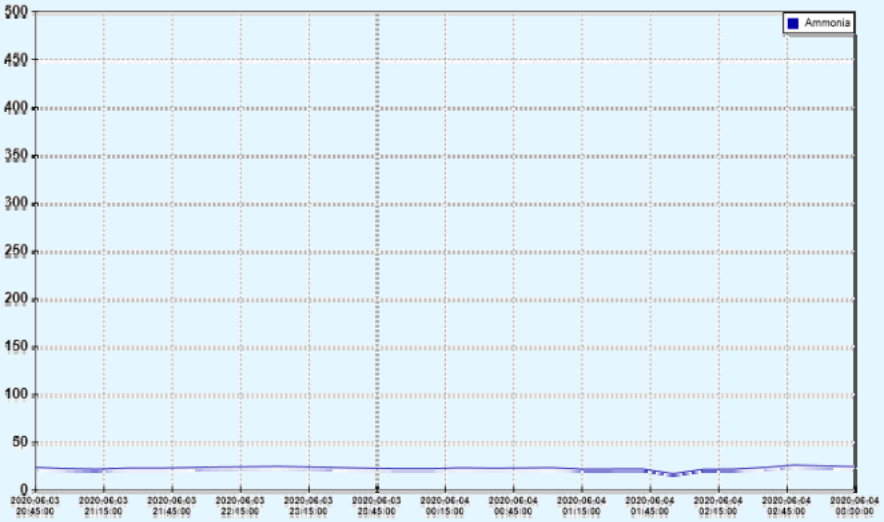
Logger ID 912005 Record Count 28

Ammonia

Sensor ID

Range: 0 to 100 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
16.8	22.3928	25.5	ppm				

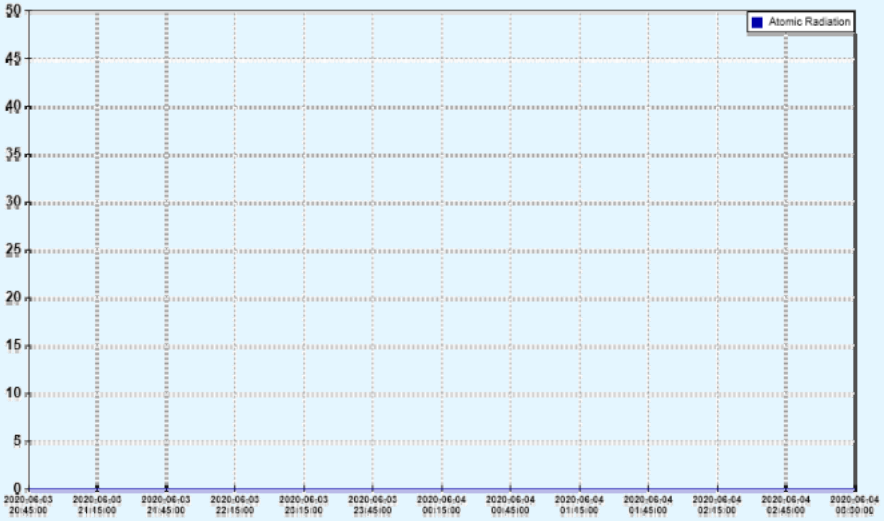


Atomic Radiation

Sensor ID

Range: 0 to 20000 CPM

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	0	0	CPM				



Environmental Report

Start: 6/3/2020 8:15 PM End: 6/4/2020 3:30 AM

Collected by:

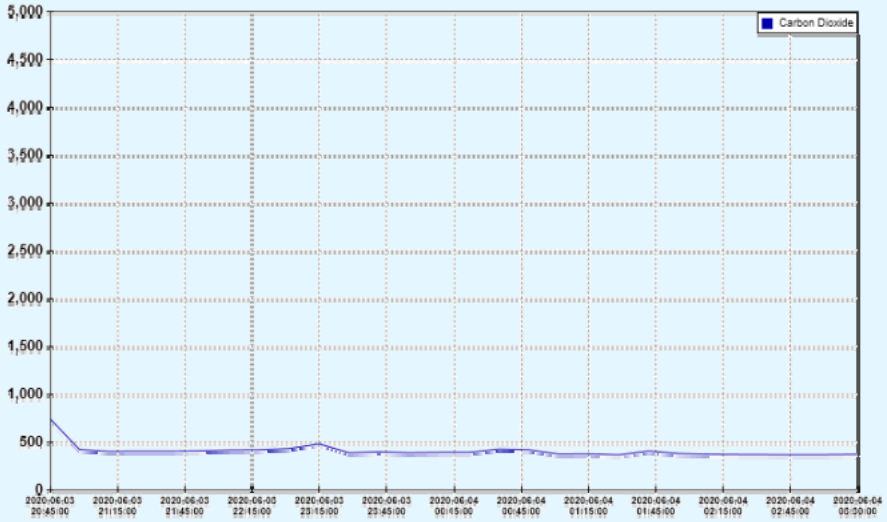
Logger ID 912005 Record Count 28

Carbon Dioxide

Sensor ID

Range: 0 to 5000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
362	404.928	733	ppm				

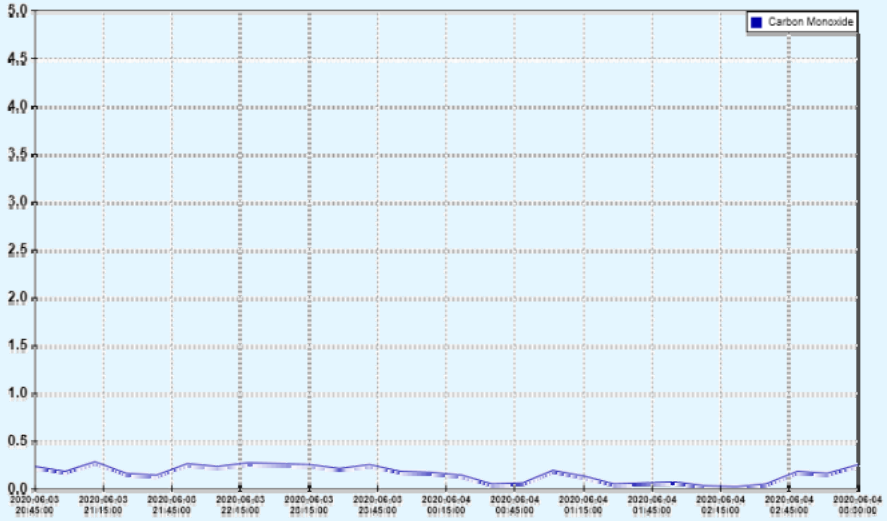


Carbon Monoxide

Sensor ID

Range: 0 to 15 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
.02	.161071	.28	ppm				



Environmental Report

Start: 6/3/2020 8:15 PM End: 6/4/2020 3:30 AM

Collected by:

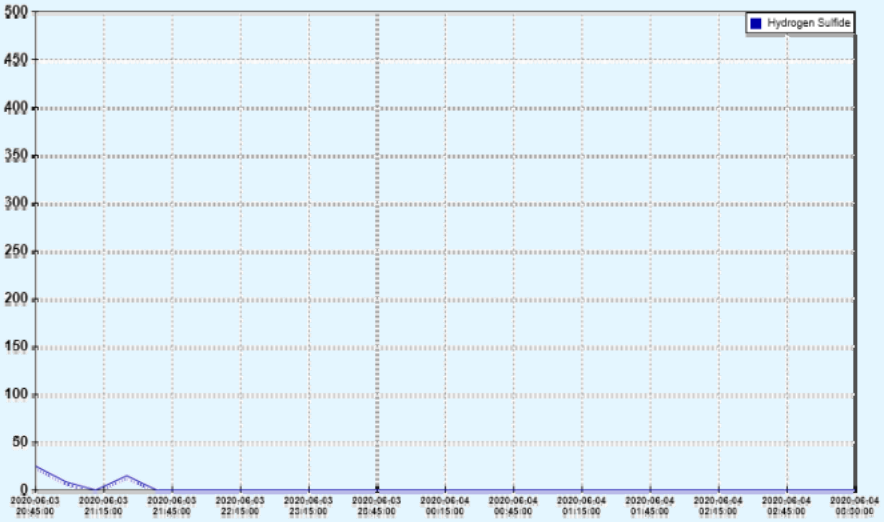
Logger ID 912005 Record Count 28

Sensor ID

Hydrogen Sulfide

Range: 0 to 5000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	1.71428	25	ppb				

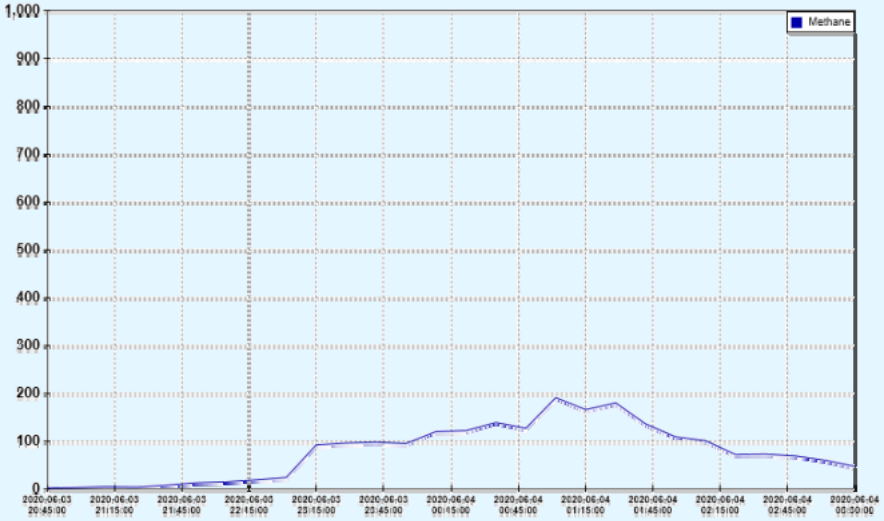


Sensor ID

Methane

Range: 0 to 10000 ppm

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	77.0714	190	ppm				



Environmental Report

Start: 6/3/2020 8:15 PM End: 6/4/2020 3:30 AM

Collected by:

Logger ID 912005

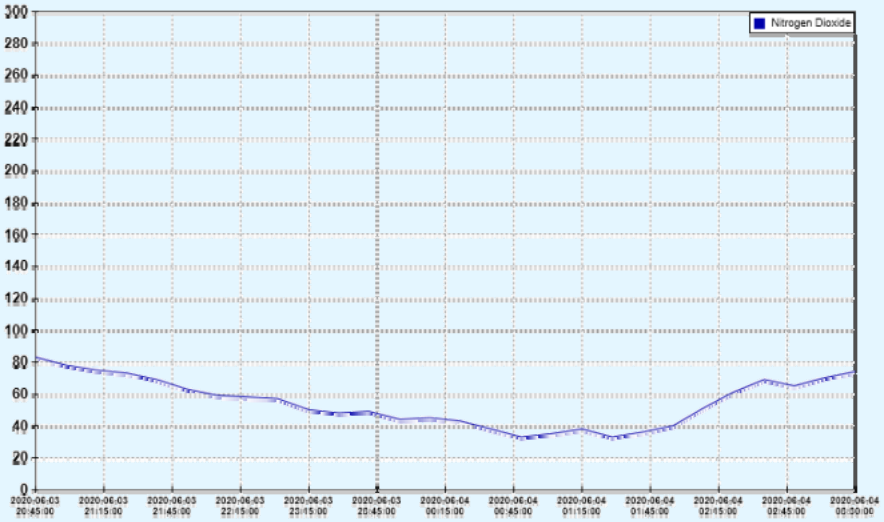
Record Count 28

Nitrogen Dioxide

Sensor ID

Range: 0 to 10000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
33	54.8928	83	ppb				

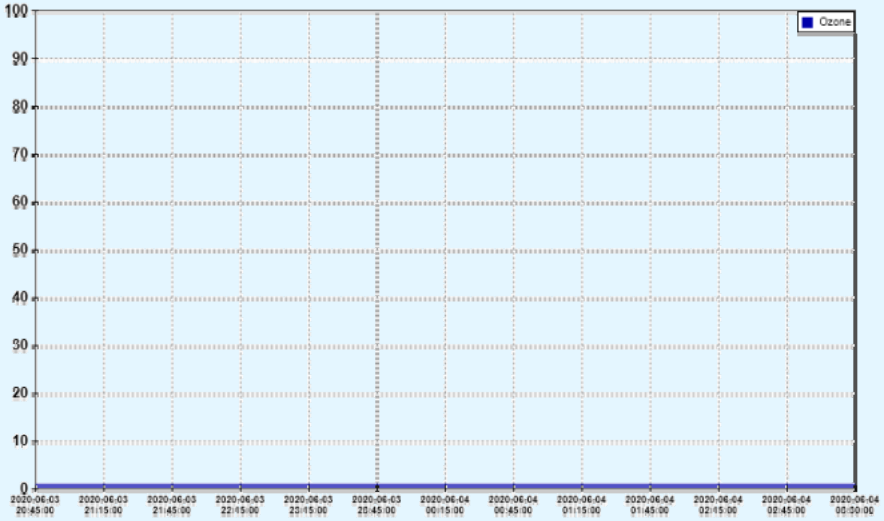


Ozone

Sensor ID

Range: 0 to 150 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	1	1	ppb				



Environmental Report

Start: 6/3/2020 8:15 PM End: 6/4/2020 3:30 AM

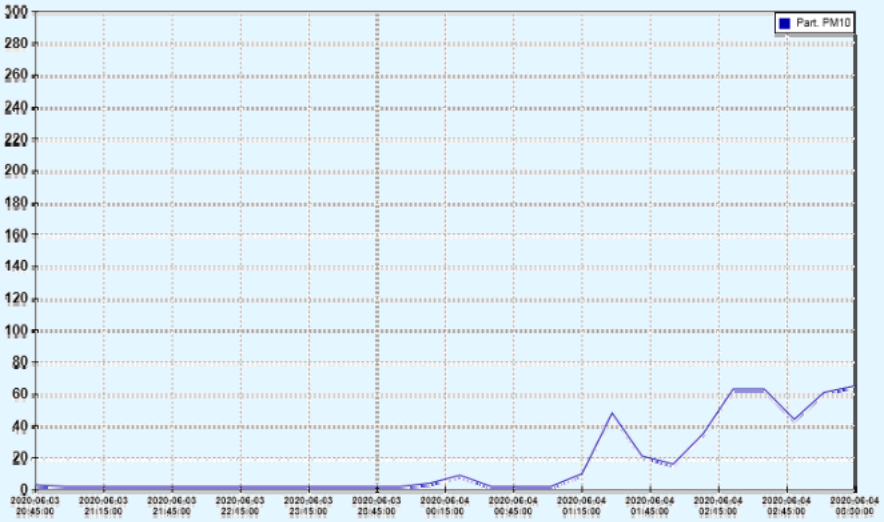
Collected by:

Logger ID 912005 Record Count 28

Prt10 **Part. PM10** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

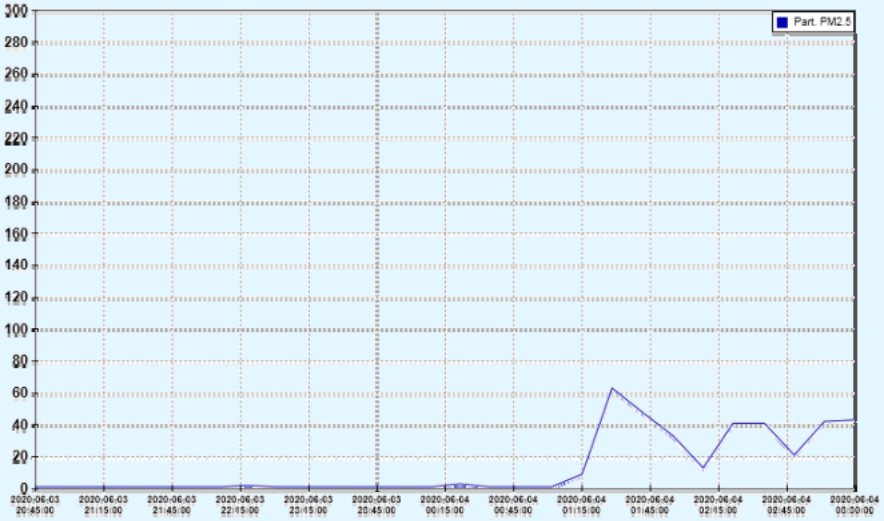
Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
2	16.8571	65	uG/m3				



Prt10 **Part. PM2.5** Prt10 Sensor ID

Range: 0 to 20000 uG/m3

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	13.3928	63	uG/m3				



Environmental Report

Start: 6/3/2020 8:15 PM End: 6/4/2020 3:30 AM

Collected by:

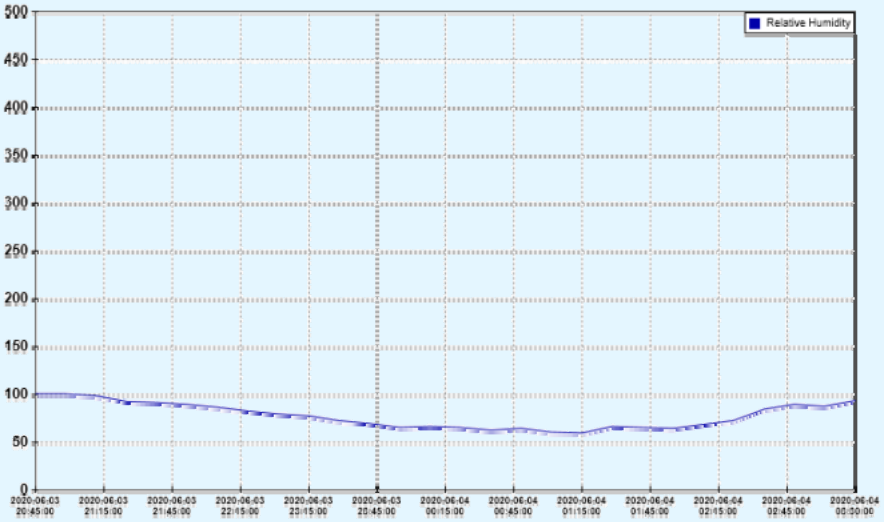
Logger ID 912005 Record Count 28

Relative Humidity

Sensor ID

Range: 0 to 100 %

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
59	77.2857	100	%				

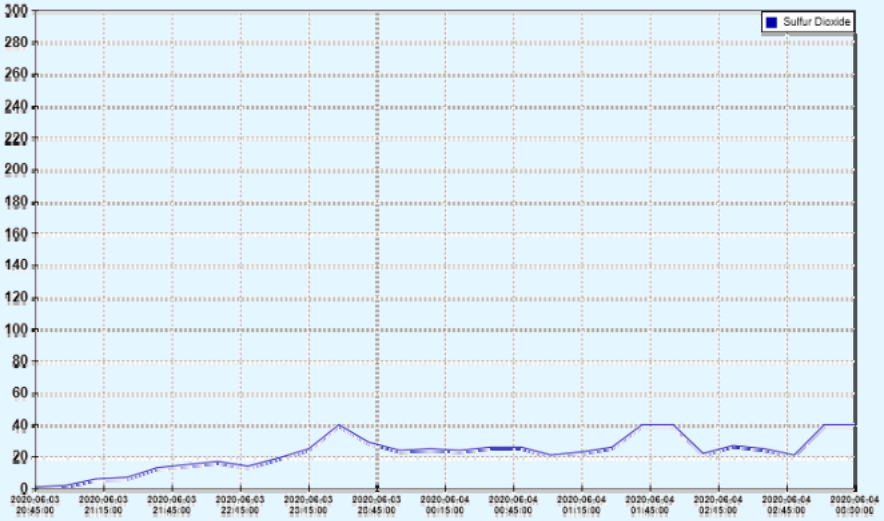


Sulfur Dioxide

Sensor ID

Range: 0 to 10000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
1	22.7857	40	ppb				



Environmental Report

Start: 6/3/2020 8:15 PM End: 6/4/2020 3:30 AM

Collected by:

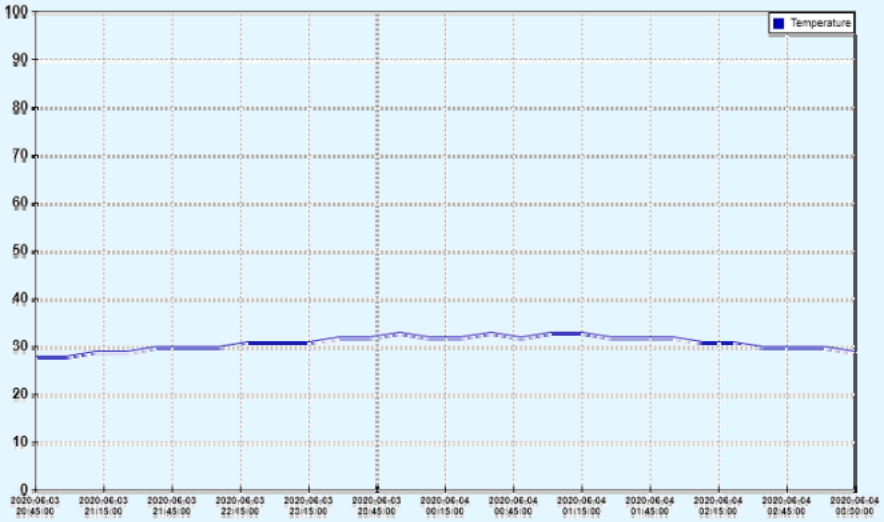
Logger ID 912005 Record Count 28

Temperature

Sensor ID

Range: -20 to 60 Deg. C

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
28	30.9285	33	Deg. C				

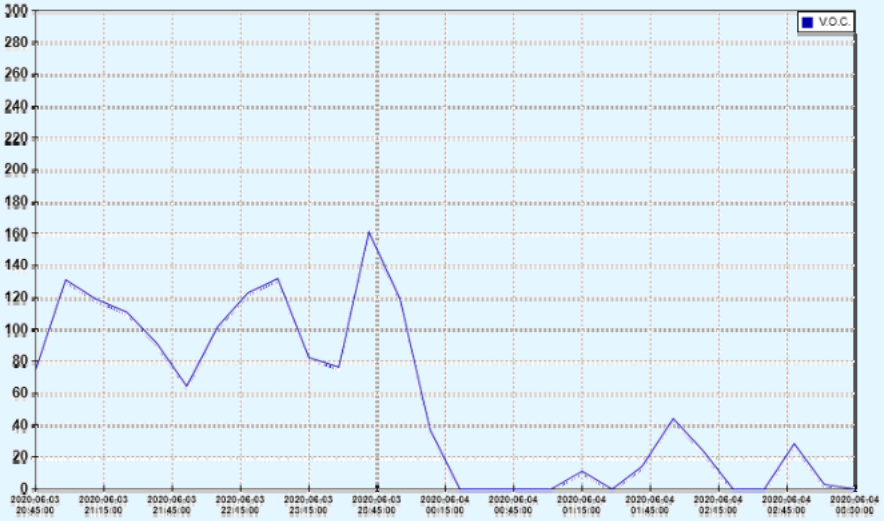


V.O.C.

Sensor ID

Range: 0 to 50000 ppb

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	55.25	161	ppb				



Environmental Report

Start: 6/3/2020 8:15 PM End: 6/4/2020 3:30 AM

Collected by:

Logger ID 912005 Record Count 28

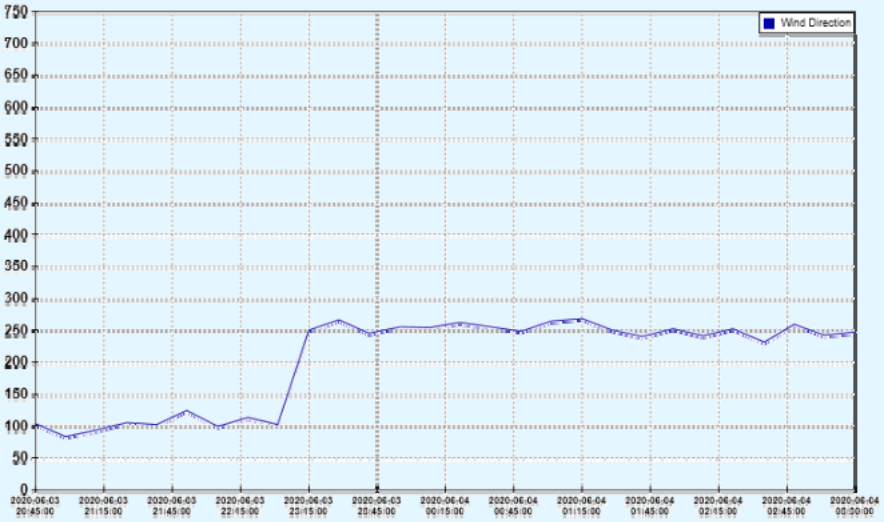
W. DIR.

Wind Direction

W. DIR. Sensor ID

Range: 0 to 359 Deg.

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
83	203.75	268	Deg.				



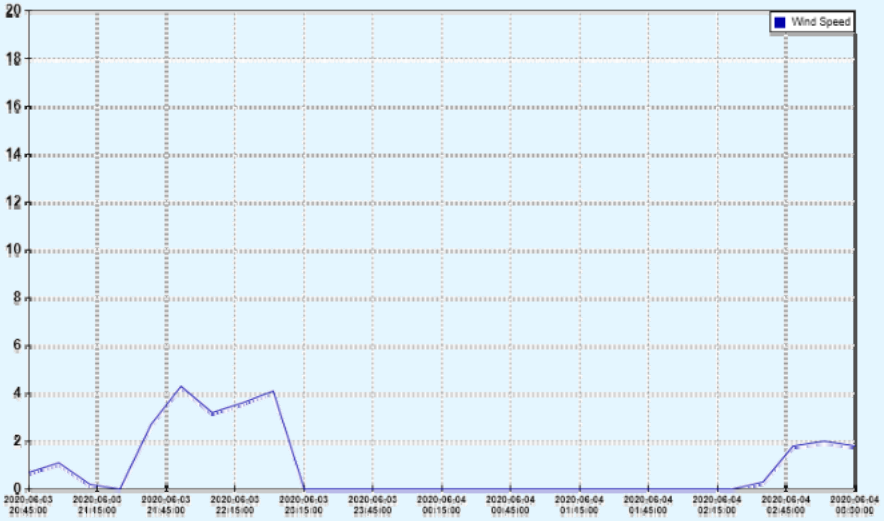
W. SPD.

Wind Speed

W. SPD. Sensor ID

Range: 0 to 160 kph

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
0	.921428	4.3	kph				



Environmental Report

Start: 6/3/2020 8:15 PM End: 6/4/2020 3:30 AM

Collected by:

Logger ID 912005

Record Count 28

Batt.

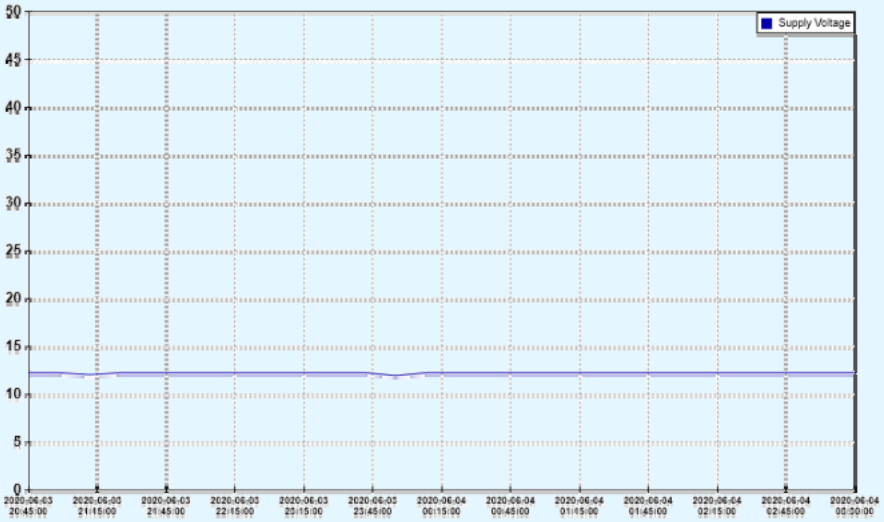
Supply Voltage

Batt.

Sensor ID

Range: 10 to 16 V

Min	Ave	Max		Hi Limit	% Above Hi	Lo Limit	% Below Lo
11.9	12.1821	12.2	V				



(2) Laboratory Result Data

Tap water

ALARM Ecological Laboratory
Water Testing Result Report

Report Number : EL-WR-20-00361 **Date** : 17-02-20

Client Information

Client Name : **Environmental Quality Management Co,.Ltd**
Organization : **Environmental Quality Management Co,.Ltd**
Client ID : **LC-10-005**
Registration Date & Time : **31-01-20** **4:45 PM**
Contact :
Testing Purpose : **Monitoring**

Sample Information

Sample ID : WS-20-00356
Sample Name : **Sample No.1**
Sample Type / Source : **Treated**
Sampling Date & Time : **31-01-20** 1:30PM
Sample Location : **Mingalardon Industry**
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	Emission Standard	Remarks
1	TSS	1	mg/L	≤50 (d)	Normal
2	BOD5	3.5	mg/L	≤50 (d)	Normal
3	COD	<30	mg/L	≤250 (d)	Normal
4	Nitrate-Nitrogen	1.4	mg/L	-	-

"ND"= Not Detected | "LOD"= Lower limit of detection | "-" = No Reference Standard

Tested by	Checked by	Approved by
Daw Myat Myat Khine Lab. Technician II Ecological Laboratory ALARM	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory	Dr Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

Building A-2, Kan Street, Hlaing Township, Yangon, Myanmar.Tel: 01-503301, 01-503302, 09 407496078
Email: aelab@alarmmyanmar.org, website: www.alarmmyanmar.org

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 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 19897/ 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	Available Myanmar Drinking Water Standard	Proposed National Drinking Water Standards, Ministry of Health, September 2014
d	Myanmar Emission Guideline (2015)	National Environmental Quality (Emission) Guidelines, Order No. (615/2015) MOECAF, 2015, December 29.
e	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 effluents 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 aninrease 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 ~ ~ ~

Building A-2, Kan Street, Hlaing Tsp., Yangon. Tel: 01-503301, 01-503302, 09-407496078
Email: aelab@alarmmyanmar.org , websites: www.alarmmyanmar.org

ပတ်ဝန်းကျင်ရေးရာဓာတ်ခွဲခန်း
Ecological Laboratory

စိမ်းလန်းအမိမြေပြန်လည်ဖြိုးထွန်းရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

Reference Number/ စာအမှတ်: EL (M)-R / 300

Date / နေ့စွဲ: 7th February, 2020

Laboratory Analysis Report/ဓာတ်ခွဲစစ်ဆေးမှုအစီအရင်ခံစာ

Sample Profile နမူနာရာဇဝင်

နမူနာအမည် /Sample Name	Sample 1 (Tap Water)	နမူနာအမှတ် / Sample ID	300	
နေရာ (မြို့နယ်) Location (Township)	Mingalardon	လတ္တီတွဒ် Latitude		
နေရာ (တိုင်း/ပြည်နယ်) Location (Division/State)	Yangon	လောင်ဂျီတွဒ် Longitude		
ပေးပို့သူအမည် Sender Name	Environmental Quality Management	နမူနာကောက်ယူချိန် (နေ့၊ နာရီ) Sampling Time (Date, Time)	31.1.2020	
အဖွဲ့အစည်း Organisation	Environmental Quality Management			
ဆက်သွယ်ရန် Contact	09798292927	နမူနာရောက်ရှိချိန် (နေ့၊ နာရီ) Arriving Time (Date, Time)	31.1.2020	

(This laboratory analysis report is based solely on the sample submitted by the customer)

(ဤဓာတ်ခွဲစစ်ဆေးမှုအစီရင်ခံစာသည် ပေးပို့သူမှပို့ဆောင်ခဲ့သည့်နမူနာကိုသာအခြေခံထားပါသည်။)

Analysis Results စမ်းသပ်ချက်အဖြေ

စဉ် Sr.	အရည်အသွေးညွှန်းကိန်း Quality Parameter	ရလဒ် အဖြေ Results	နည်းစဉ် Method	စံသတ်မှတ်ချက် Drinking Standard	မှတ်ချက် Remarks
၁	Total plate count (CFU/ml)		Total plate count method	0	
၂	Total coliform count (MPN/100 ml) (Presemption test)	460	Most Probable Number method	0	
၃	Total faecal coliform count (MPN/100ml) (Presemption test)		Most Probable Number method	0	
၄	Total coliform count (CFU/ml) (Confirm test)		Eosin Methyl blue agar plate test	0	
၅	Complete test for coliform bacteria		Gram staining test	-	
၆	Total coliform count (CFU/ml)		3M Pate count method	0	
၇	Total *E.coli* count (CFU/ml)		3M Pate count method	0	

Note: Sample was submitted using customer arranged bottle. The target sample needs to test some additional tests to confirm total coliform and total faecal coliform.

စမ်းသပ်ပြီး Tested by	စစ်ဆေးပြီး Check by	တာဝန်ခံ Approved by
Myat Nyein Khine Research Assistant ALARM	Htun Inzali Research Assistant ALARM	Dr. Nitar Nwe Research Scientist Ecological Laboratory ALARM

Storm Water

ALARM Ecological Laboratory
Water Testing Result Report

Report Number : EL-WR-20-00362 **Date** :

Client Information

Client Name : **Environmental Quality Management Co,.Ltd**
Organization : **Environmental Quality Management Co,.Ltd**
Client ID : **LC-10-005**
Registration Date & Time : **31-01-20** **4:45 PM**
Contact :
Testing Purpose : **Monitoring**

Sample Information

Sample ID : WS-20-00357
Sample Name : **Sample No.2**
Sample Type / Source : **Raw**
Sampling Date & Time : **31-01-20** 1:47 PM
Sample Location : **Mingaladon Industry**
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	Emission Standard	Remarks
1	TSS	1	mg/L	≤50 (d)	Normal
2	BOD5	58	mg/L	≤50 (d)	Above the limit
3	COD	167	mg/L	≤250 (d)	Normal
4	Nitrate-Nitrogen	0.7	mg/L	-	-

"ND"= Not Detected	"LOD"= Lower limit of detection	"-" = No Reference Standard
Tested by	Checked by	Approved by
Daw Myat Myat Khine Lab. Technician II Ecological Laboratory	Daw Lin Myat Myat Aung Lab. Technician I Ecological Laboratory	Dr. Aye Aye Win Laboratory In-Charge Ecological Laboratory (ALARM)

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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 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 19977/ 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	Available Myanmar Drinking Water Standard	Proposed National Drinking Water Standards, Ministry of Health, September 2014
d	Myanmar Emission Guideline (2015)	National Environmental Quality (Emission) Guidelines, Order No. (618/2015) MOECAF, 2015, December 29.
e	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 effluents 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 brine, 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 thenicrobial 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 ~ ~ ~

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Email: aelab@alarmmyanmar.org , websites: www.alarmmyanmar.org

ပတ်ဝန်းကျင်ရေးရာဓာတ်ခွဲခန်း
Ecological Laboratory

စိမ်းလန်းအမိမြေဖွံ့ဖြိုးတိုးတက်ရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

Reference Number/ စာအမှတ်: EL (M)-R / 301

Date / နေ့စွဲ: 7th February, 2020

Laboratory Analysis Report/ဓာတ်ခွဲစစ်ဆေးမှုအစီအရင်ခံစာ

Sample Profile နမူနာရာဇဝင်

နမူနာအမည် /Sample Name	Sample 2 (Storm Water)	နမူနာအမှတ် / Sample ID	301	
နေရာ (မြို့နယ်) Location (Township)	Mingalardon	လတ္တီတွဒ် Latitude		
နေရာ (တိုင်း/ပြည်နယ်) Location (Division/State)	Yangon	လောင်ဂျီတွဒ် Longitude		
ပေးပို့သူအမည် Sender Name	Environmental Quality Management	နမူနာကောက်ယူချိန် (နေ့ နာရီ) Sampling Time (Date, Time)	31.1.2020	
အဖွဲ့အစည်းOrganisation	Environmental Quality Management			
ဆက်သွယ်ရန် Contact	09798292927	နမူနာရောက်ရှိချိန် (နေ့ နာရီ) Arriving Time (Date, Time)	31.1.2020	

(This laboratory analysis report is based solely on the sample submitted by the customer)

(ဤဓာတ်ခွဲစစ်ဆေးမှုအစီရင်ခံစာသည် ပေးပို့သူမှပို့ဆောင်ခဲ့သည့်နမူနာကိုသာအခြေခံထားပါသည်။)

Analysis Results စမ်းသပ်ချက်အဖြေ

စဉ် Sr.	အရည်အသွေးညွှန်းကိန်း Quality Parameter	ရလဒ် အဖြေ Results	နည်းစဉ် Method	စံသတ်မှတ်ချက် Drinking Standard	မှတ်ချက် Remarks
၁	Total plate count (CFU/ml)		Total plate count method	0	
၂	Total coliform count (MPN/100 ml) (Presemption test)	1100	Most Probable Number method	0	
၃	Total faecal coliform count (MPN/100ml) (Presemption test)		Most Probable Number method	0	
၄	Total coliform count (CFU/ml) (Confirm test)		Eosin Methyl blue agar plate test	0	
၅	Complete test for coliform bacteria		Gram staining test	-	
၆	Total coliform count (CFU/ml)		3M Pate count method	0	
၇	Total *E.coli* count (CFU/ml)		3M Pate count method	0	

Note: Sample was submitted using customer arranged bottle. The target sample needs to test some additional tests to confirm total coliform and total faecal coliform.

စမ်းသပ်ပြီး
Tested by

Myat Nyein Khine
Research Assistant
ALARM

စစ်ဆေးပြီး
Check by

Htun Inzali
Research Assistant
ALARM

တာဝန်ခံ
Approved by

Dr. Nitar Nwe
Research Scientist
Ecological Laboratory
ALARM

Wastewater

Goshu-A1

Goshu-A1 Eco Business Company Limited

Plot No.19,2nd Street, Yangon Industrial Zone, Mingalardon Township, Yangon,
Ph: +959-253685274

Wastewater Analysis Report

Customer name: Oji GS Packaging (Yangon) Co.,Ltd
Project:
Sample Name: WW
Receiving Date: 01/06/2020
Reporting Date: 05/06/2020

Sample No: 060102
Sampling Date: 01/06/2020
Analytical Date: 01-05/06/2020
Report No: ARWW 200602
Job No: MMA 200602

No.	Item	Result	Method	Detection Limit
1	Silver (mg/L as Ag)	0.074	*SM 2012:3120B ICP-OES	0.01
2	Selenium (mg/L as Se)	<0.01	*SM 2012:3120B ICP-OES	0.01
3	Chromium (mg/L as Cr)	<0.01	*SM 2012:3120B ICP-OES	0.01
4	Cadmium (mg/L as Cd)	<0.005	*SM 2012:3120B ICP-OES	0.005
5	Mercury (mg/L as Hg)	≤0.002	*SM 2012:3120B ICP-OES	0.002
6	Hexavalent chromium (mg/L as Cr^{6+})	<0.05	*SM 3500-Cr B Colorimetric method	0.05
7	Total Nitrogen (mg/L)	2.6	Hach Method 10072, TNT Persulfate Digestion	0.5
8	Total Phosphorus (mg/L as P)	1.0	*SM 4500-PB+E Persulfate+Ascorbic	0.25

*Based on Standard Methods for the Examination of Water and Wastewater (SM), APHA,AWWA, WEF

Analyzed by:.....

Yu Nandar Aung
Laboratory Supervisor
Goshu-A1 Laboratory

Approved by:.....

Goshu-A 1

KOJI NAKAHASHI
MANAGING DIRECTOR
GOSHU-A1 ECO BUSINESS CO.,LTD.

ALARM Ecological Laboratory
Water Testing Result Report

Report Number : EL-WR-20-00709 **Date : 11-06-20**

Client Information

Client Name : **OJIGS**
Organization :
Client ID : **LC-17-016**
Registration Date & Time : **01-06-20** **4:10 PM**
Contact :
Testing Purpose : **Monitoring**

Sample Information

Sample ID : WS-20-00686
Sample Name : **Waste Water**
Sample Type / Source : **Treated**
Sampling Date & Time : **01-06-20**
Sample Location : **Mingalardon, Industrial Zone**
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	Emission Standard	Remarks
1	Apparent Colour	**138**	**HU**	-	-
2	TSS	**17**	**mg/L**	≤50 (d)	Normal
3	BOD5	**49**	**mg/L**	≤50 (d)	Normal
4	COD	**103**	**mg/L**	≤250 (d)	Normal
5	Free Cyanide	**<0.01**	**mg/L**	≤0.1 (d)	Normal
6	Aluminium	**0.1**	**mg/L**	-	-
7	Arsenic	**0.025**	**mg/L**	≤0.1 (d)	Normal
8	Copper	**0.02**	**mg/L**	≤ 0.5 (d)	Normal
9	Iron	**0.11**	**mg/L**	≤3.5 (d)	Normal
10	Lead	**ND**	**mg/L**	≤ 0.1 (d)	LOD=0.1
11	Zinc	**0.02**	**mg/L**	≤2 (d)	Normal
12	Sulfide	**<0.04**	**mg/L**	≤1 (d)	Normal
13	Phenol	**<0.1**	**mg/L**	≤0.5 (d)	Normal
14	Fluoride	**<0.05**	**mg/L**	≤20 (d)	Normal
15	Oil & Grease	**4**	**mg/L**	≤10 (d)	Normal

"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)

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Email: aelab@alarmmyanmar.org| website: www.alarmmyanmar.org

ပတ်ဝန်းကျင်ရေးရာဓာတ်ခွဲခန်း
Ecological Laboratory

စိမ်းလန်းအသိပြေဖွံ့ဖြိုးတိုးတက်ရေးအသင်း (Advancing Life and Regenerating Motherland, ALARM)

Reference Number/ စာအမှတ်: EL (M)-R / 342

Date / နေ့စွဲ: 9th June, 2020

Laboratory Analysis Report/ဓာတ်ခွဲစစ်ဆေးမှုအစီအရင်ခံစာ

Sample Profile နမူနာရာဇဝင်

နမူနာအမည် /Sample Name	Waste Water	နမူနာအမှတ် / Sample ID	342	
နေရာ (မြို့နယ်) Location (Township)	Mingalardon	လတ္တီတွဒ် Latitude		
နေရာ (တိုင်း/ပြည်နယ်) Location (Division/State)	Yangon	လောင်ဂျီတွဒ် Longitude		
ပေးပို့သူအမည် Sender Name	OJIGS	နမူနာကောက်ယူချိန် (နေ့၊ နာရီ) Sampling Time (Date, Time)	2.6.2020	
အဖွဲ့အစည်းOrganisation	OJIGS			
ဆက်သွယ်ရန် Contact	09798292927	နမူနာရောက်ရှိချိန် (နေ့၊ နာရီ) Arriving Time (Date, Time)	2.6.2020	

(This laboratory analysis report is based solely on the sample submitted by the customer)

(ဤဓာတ်ခွဲစစ်ဆေးမှုအစီရင်ခံစာသည် ပေးပို့သူမှပို့ဆောင်ခဲ့သည့်နမူနာကိုသာအခြေခံထားပါသည်။)

Analysis Results စမ်းသပ်ချက်အဖြေ

စဉ် Sr.	အရည်အသွေးညွှန်းကိန်း Quality Parameter	ရလဒ် အဖြေ Results	နည်းစဉ် Method	စံသတ်မှတ်ချက် Drinking Standard	မှတ်ချက် Remarks
၁	Total plate count (CFU/ml)		Total plate count method	0	
၂	Total coliform count (MPN/100 ml) (Presemption test)	>1100	Most Probable Number method	0	
၃	Total faecal coliform count (MPN/100ml) (Presemption test)		Most Probable Number method	0	
၄	Total coliform count (CFU/ml) (Confirm test)		Eosin Methyl blue agar plate test	0	
၅	Complete test for coliform bacteria		Gram staining test	-	
၆	Total coliform count (CFU/ml)		3M Pate count method	0	
၇	Total *E.coli* count (CFU/ml)		3M Pate count method	0	

Note: Sample was submitted using customer arranged bottle. The target sample needs to test some additional tests to confirm total coliform and total faecal coliform.

စမ်းသပ်ပြီး	စစ်ဆေးပြီး	တာဝန်ခံ
Tested by	Check by	Approved by
Htun Inzali	Sai Pyae Sone Aung	Dr. Nitar Nwe
Research Assistant	Research Assistant	Research Scientist
ALARM	ALARM	Ecological Laboratory ALARM

ANNEX (B)

Impact Assessment Methodology

1 Environmental Aspect Identification

The ISO's standard for Environmental Management Systems (EMS), ISO 14001 defines an environmental aspect as:

'*An element of an organization's activities, products or services that can interact with the environment or social make-up of nearby communities.*'

This definition has been used in the identification of the proposed project's environmental, health, socio-economic, and legal aspects. To identify project aspects, all proposed activities, have been considered in terms of their direct or indirect potential to:

- Breach relevant policy, legal and administrative frameworks including Government Agreement and national legislation, relevant international legislation, standards and guidelines, and corporate environmental policy and management systems
- Interact with the existing natural environment including its physical and biological elements
- Interact with the existing socio-economic environment

1.1 Environmental Impact Assessment

An impact may result from any of the project activities identified during the screening process. The potential impacts will be assessed for their significance level (high, medium, low) based on standard criteria as outlined below.

1.1.1. Criteria for Environmental Impact Assessment

Identify criteria to specify the impact significance level (high, medium, and low) by considering magnitude, extent, duration, reversibility/irreversibility, and likelihood of impact.

1.1.2 Method for Environmental Impact Assessment

The assessment of environmental impacts for key issues consists of 3 main stages as shown below:

1. Identification of impact source and receptor
2. Impact prediction
3. Assessment of the impact significance level

Stage 1: Identification of Impact Source and Receptor

1. Identify project activities that are impact sources and explain details of these activities.
2. Identify the impact receptors and explain environmental settings of impact receptors.

Stage 2: Impact Prediction

Impact prediction is the assessment of the characteristics and magnitude of expected impacts. There are many methods used for impact assessment, and the selection of a method for impact assessment for the proposed project depends on the type of environment and resources, time, existing technology, and experience of the assessor.

Stage 3: Assessment of Impact Significance Level

Once project impacts have been predicted it is important to assess the potential significance of the impact. Impact significance is rated as insignificant, low, medium, or high. The rating of impact

significance is based on both objective and subjective criteria. The following criteria in **Table 1.1**will be considered when rating impact significance:

Table 1.1: Impact Significance Criteria

Criteria	Significance
Extent	This is the extent to which the potential impact may eventually extend (e.g., local, regional, national, global), as well as to geographical location. Regional impacts, those impacts that extend beyond the project area, are generally considered more significant than local impacts that are limited to the project area. Extent should also consider the people affected, such as how pervasive will the impact be across the population? This criterion should be used to assess both the percentage of the population affected and the extent to which it will affect different social or demographic groups, particularly the vulnerable groups (e.g. children, elderly, pregnant women, indigenous population, etc.).
Local sensitivity	To what extent is the local population aware of the impact? Is it perceived to be significant? Has it been a source of previous concern in the community? Are there any organized interest groups likely to be mobilized by the impact?
Expense	Costs and expenses required to reduce or clean up impacts, the responsible person or entity who has to bear the expenses, and whether the expense has to be paid immediately or not.
Potential of related organizations	Current potential of related organizations to manage impacts, whether supporting laws and regulations exist, and whether local governmental organizations can handle the impacts.
Risk	The probability/predictability of an impact occurring. For many environmental impacts, qualitative assessments would be appropriate (high, medium, low).
Duration and Frequency	The length of time (day, year, decade) for which an impact may be discernible, and the nature of that impact over time (is it intermittent and/or repetitive?). Long-term impacts, those impacts that may last for an extended period of time are considered more significant than short-term impacts that are limited to a few days or months.
Reversibility	How long will it take to mitigate the impact by natural or man-induced means? Reversible impacts, those impacts that will be fully reversed after the activity that causes the impact ceases, are considered less significant than irreversible impacts.

Criteria	Significance
Magnitude	The probable severity of each potential adverse impact, in the sense of degree, extensiveness or scale. Magnitude takes into account numerous factors related to the environmental resource and socio-cultural values. This is largely subjective based upon values of society. Another important factor in determining the magnitude of an impact is the degree of variation from baseline conditions.
Uncertainty	In addition, the level of confidence of impact predictions reflects the quality and quantity of available site-specific data, experience from implementation of similar projects, and the expertise of the EIA project team. Where all else is similar, assessments that are more speculative in nature for any particular project activity are generally given a higher impact rating than ones based on a higher level of confidence.
Cumulative Impacts	Whether occurring impacts will be added on existing impacts or not, which will be used to consider whether the cumulative impacts exceed the maximum acceptable level or not.
Overall Impacts	Based on the above, each impact is rated as low, medium or high. Medium or high impacts are ones that require specific mitigation and/or monitoring measures.
Residual Impact	Impacts that remain after mitigation measures have been applied.
Mitigation Measure	An action that prevents, eliminates, reduces or compensates for a negative impact.

The significance of an impact is evaluated using Scaling and Matrix methods. Each impact is assessed based on its "characteristics" and "importance".

Significance = Characteristics x Importance

Characteristic is determined using magnitude, extent, and duration of impacts. Importance of impact is determined using the values of resources and environment that are lost or decreased as a result of the project activities.

There are three stages for evaluation of impact significance level.

Stage 1: Analysis of Impact Characteristics

Analysis of impact characteristics is determined using the sum of magnitude, extent, and duration of the impact. The criteria for impact assessment are shown in

Table 1.2.

Impact Characteristics = Magnitude + Extent + Duration

Table 1.2: General Criteria and Scoring for Environmental Impact Characteristics (1)

Level	Definition	Score
Magnitude		
High	• Exceed the standard values	3

	• Major change in the original structure of environmental system, ecosystem or baseline.	
Medium	• Less than the standard values • Change some factors in environmental system, ecosystem or baseline, but does not change the structure.	2
Low	• Less than the standard values • Small change in some factors of the environmental system, ecosystem, or baseline but does not change the structure.	1
Insignificant	• Less than the standard values • No change in the environmental system, ecosystem, from baseline.	0

Extent		
High	• Area of impact is beyond the 2-km radius of associated facilities/stations. • Impact extends to regional and national level.	3
Medium	• Area of impact is beyond the project area but is in a limited area, for example the area of impact is outside a safety zone but within the 2-km radius of associated facilities.	2
Low	• Area of impact is in the immediate area of the project activity or within a safety zone	1
Insignificant	• Area of impact is not discernible	0
Duration		
High (long-term duration)	• Permanent impact • Impact will remain after well abandonment. • Impact occurs in long-term duration	3
Medium	• Impact can be reversible overtime. • Period of impact occurrence is within the project period. • Impact occurs over mid-term duration	2
Low (short-term duration)	• Impact can be quickly reversible. • Period of impact occurrence is less than the project period. • Impact occurs in short-term duration	1
Total Score for Impact Characteristics = Magnitude + Extent + Duration		

Source: Adapted from Nigel Rossouw (2003); Sippe (1999); and United Nations University (2007)

Total score for impact characteristics (Magnitude + Extent + Duration) will be compared with the criteria and scoring as shown in **Table 1.3**.

Table 1.3: Example of Criteria and Scoring for Environmental Impact Characteristics (2)

Total Score for Impact Characteristics[1]	Impact Level	Definition	Score
7-9	High	Have impact or cause large changes.	3
4-6	Medium	Have impact or cause medium changes.	2
1-3	Low	Have impact or cause small changes.	1
0	Insignificant	No impact	0

Stage 2: Analysis of Importance of Impact

Importance of impact is determined from the values of resources and environment that are lost or decreased from the project activities by comparison with criteria and scoring for importance of impact as shown in **Error! Reference source not found..**

Table 1.4: Example of Criteria and Scoring for Importance of Impact

Impact Level	Definition	Score
High	• Impact disturbs pristine area which has conservation value. • Impact damages rare/endangered species. • Impact is significant on a national or international level.	3
Medium	• Impact disturbs the area which has a value for conservation. • Impact causes a significant change in species and diversity. • Impact is important at a local or regional level.	2
Low	• Impact disturbs degraded area or causes a small disturbance in the area which has a value for conservation. • Impact causes a small change in species and diversity.	1

Stage 3: Impact Significance Evaluation

The significance of environmental impact will be evaluated by using Matrix Method as shown in **Table 1.5**. The calculation of impact significance is shown below:

Significance = Characteristics x Importance

Table 1.5: Evaluation of Significance Level of Environmental Impact

Significance Level of Environmental Impact			Characteristic		
			Low	Medium	High
			1	2	3
Importance	Low	1	Low (1)	Low (2)	Low (3)
	Medium	2	Low (2)	Medium (4)	Medium (6)
	High	3	Low (2)	Medium (6)	High (9)

The results from the evaluation of impact significance will be further used to specify mitigation measures. Examples of definition of impact significance level are shown in **Table 1.6**.

Table 1.6: Example for Definition of Impact Significance Level

Significance Level	Score	Definition
High	7-9	Impact is classified as severe and can cause other effects. Impact can not be protected and resolved by any mitigation measures or scarcely protected or resolved.
Medium	4-6	Impact causes a change that affects values of resources and environment. It needs to have mitigation measures for protecting or decreasing the impacts and include monitoring measures.
Low	1-3	Impact causes a change in resources and environment but this change does not decrease values of these resources and environment. Impact can be protected and resolved by implementation of general measures.

Source: Adapted from Nigel Rossouw (2003) and Sippe (1999)

2. Socio-eco and Health aspect

2.1Socio-economic Baseline

EQM social scientists will define socio-economic baseline conditions. The survey begins with an introductory statement providing background on the proposed project. Interviews with the stakeholders will be then carried out using a pro-forma questionnaire. The questionnaires covered the following main topics:

- Population and Demographics
- Culture, local administration, decision making and planning
- Livelihoods
- Labor and working conditions
- Employment
- Energy
- Health and nutrition
- Water, sanitation and hygiene
- Household structure and migration
- Household assets
- Land ownership
- Infrastructure, resources and services
- Transportation
- Communication
- Environmental and cultural heritage
- Experiences with previous projects
- Awareness, attitudes, and perceptions on four categories: physical resources, ecological resources, human use values, quality-of-life values and cultural heritage.

2.2 Sample Size

The social survey team used to choose a two-stage stratified random sampling for the sampling population. The first-stage unit is ‘village’ and the second- stage unit is ‘household’. At the first stage, the sampled villages will be allocated proportionately to stratum size in each of the selected townships and the primary sampling units (PSU) will be chosen from each township. At the second stage, the households will be selected by using systematic random sampling**.**

The TARO YAMANE formula will be used to determine the correct number of households to be surveyed in the project area with rural household (Population) as shown below. The sample size will reach a standard deviation of less than 3% and confidence interval will be higher than 95% at aggregate level.

$$N = \frac{N}{(1+Ne^2)}$$

n=sample size, N=population, e=error

Socio-economic Environment Survey Method

- Secondary data
- Site Visit
- Focus group meeting (closed and open ended questionnaire)
- Key informant interview (closed and open ended questionnaire)
- Household surveys

2.3 Social Impact Assessment

The evaluation of socio-economic impacts is based on quantitative and qualitative data, and the use of professional judgment. Factors used to analyze for scale of social impacts are similar to the criteria used for environmental impact analysis such as likelihood of impact, direct/indirect impact, duration, reversibility, and magnitude of impact which also takes into consideration threats perceived as significant by the affected communities.

Additional criteria factors include consideration for changes to the assets that households depend upon for their livelihoods, manageability of the change and potential for it to lead to further changes beyond the control of the project, and whether the effects are acute or chronic.

2.1 Social Impact Significance

Significance of social impact is ranked Beneficial, Low, Medium or High using criteria below (**Table 2-1**).

Table 2-1: Social Impact Category

Impact Category	Social Impact
Beneficial	Improvement in the ability of household or settlement to maintain or improve its livelihood/store of assets Enhancement in quality or availability of resource leading to improvement in quality of life. For example: • Enhancement in physical capital including availability of infrastructure • Enhancement in social capital, including skills for future employment • Enhancement of relationship between the PTTEP MOGE-3 project developer and communities • Enhancement in health and safety of local population
Low	Possible short term decrease in availability of resource or access to infrastructure not affecting livelihood Possible short term decrease in quality of life of household or settlement not affecting long term outcomes No effect on human health No discernable long term effect of the local economy Impacts which are long lasting but to which the community is able to adapt, such as increased access to information/possible slow cultural change/changes in economic structure

Impact Category	Social Impact
Medium	Potential effect or perceived effect on ability of household to maintain livelihood/store of assets in short term Potential reduction in quality of life in short term Potential disruption to lifestyle in short term Perception of missed opportunity to improve Possible decrease or perceived decrease in access to infrastructure to which community is unable to adapt in the short term Negative effect on human health which can be contained and is therefore short term with no increased mortality Impacts which may result in high levels of complaint in the short term
High	Negative effect on safety of humans or animals Negative effect on human health which cannot be contained or results in increased mortality Effect or perceived effect on ability of household to maintain livelihood/store of assets to an extent not acceptable to affected people Permanent or perceived permanent reduction in quality of life Permanent cultural change to which the communities are unable to adapt Widespread perception of missed opportunity to improve quality of life, resulting in frustration and disappointment Result in tensions with communities which lead to sabotage by local communities, or outbreaks of violence between workers and communities

3 Health Impact Assessment

Potential impact on health is assessed for both project workers and nearby community. Factors used to analyze for scale of health impacts are similar to the criteria used for environmental and social impact analysis, such as extent, duration, reversibility, and magnitude of impact.

Additional factors unique to health aspects are considered as provided in **Table 3.1**

Table 3.1: Factors for Determining Scope and Type of Health Impact

Factor	Detail
Hazardous Chemicals or Health Threats	• Chemicals: heavy metals, toxic organic compounds. • Physical: noise and vibration • Biological: viruses, bacteria • Ergonomic: lifting of heavy material and/or inappropriate posture • Psychological: stress, annoyance, and nuisance • Social: lack of community relationship
Environment	• Change of environmental quality: water quality, air quality • Change of utilization or acquiring resources: water use • Physical: noise, dust, radiation, vibration
Factors of Exposure	• Exposure pathway: eating or skin exposure • Risk group: worker(s) or people around the project area
Health Impact	• Death rate • Injury rate from infectious diseases or non-infectious diseases, acute or chronic effects • Rate of emotional impact, stress • Injuries and accidents • Impacts on the next generation • Impacts to high-risk groups • Stimulate or enhance the severity of the disease • Cumulative impacts
Impacts on Medical Services	• Overall increase in the demand for health care • Demand for special health care • Changes to existing medical services
Impacts on Society and Human well being	• Impacts on income, employment, and socio-economics • Impacts on local income, industrial sector, and local agriculture • Impacts on migration and settlement • Impacts on environmental health • Impacts on society, culture, and lifestyle • Impacts on education • Impact on social support network • Benefits to health from project operations

Source: World Health Organization

3.1 Health Impact Significance

Method of assessing the significance of health impact is similar to a risk assessment method. The procedure involves setting criteria for analysis of probability/likelihood of health impact occurring and the severity of impact on health.

3.2 Probability of Occurrence

Likelihood is presented in the form of the probability that the impact might affect health. Considerations are based on past data, the probability of exposure or threat from the environment, and the previous data both at a domestic or international level (**Table 3.2**).

Table 3.2: Criteria for Likelihood of Causing Health Impact

Incident Potential Rating	Score	Definition
Very low	1	No evidence that the situation occurs
Low	2	Can occur by theory, but no report of occurrence in the region or abroad
Medium	3	1 time occurrence in Myanmar or abroad from the development of a similar project
High	4	Occurred more than 1 time in Myanmar or abroad from the development of a similar project
Very high	5	Have evidence of situation occurring during project operation in the same project, and occurred in Myanmar or abroad

Note: The definition might be adjusted depending on discretion of expertise and project characteristic.
Source: Adaptation from Department of Health, Philippines, available from http://doh.gov.ph/ehia.htm (2009)

3.3 Severity of Consequence

Severity of consequences is set by analysis of the severity of heath impacts, considering the worst case scenario (**Table 3-4**).

Table 3-4: Criteria for Severity of Consequences on Health

Severity of Consequences	Score	Definition
No significance	1	**No injuries or illness:** no effect on work or lifestyle and does not cause illness in the community
Low	2	**Minor injuries or illnesses**: effect on work or lifestyle: requires 2-3 days for recovery - Cause(s) of disease has a slight or short-term effect (skin irritation, food poison from bacteria)
Medium	3	**Medium injuries or illness:** effect on work or lifestyle: long-term/continued effect on the community - Causes of disease have moderate effects on health (loud noises or disturbances, hazards from environmental performance).
High/serious	4	**Permanent illness: (large of population exposure group)**

Severity of Consequences	Score	Definition
		- Causes severe disease, which can cause loss or death of workers or at-risk groups (such as cancer from some chemical).
Very high/deadly	5	**The multiplied effect** (large of population exposure group/ over local governmental organizations can handle impacts) - Cause(s) of disease(s) enhance the severity of impact (toxic chemical are cause of cancer, especially if the contaminate is in air and water, i.e. heavy metals).

Note: The definition might be adjusted depending on discretion of expertise and project characteristic.
Source: Adaptation from Department of Health, Philippines, available from http://doh.gov.ph/ehia.htm (2009)

3.4 Health Assessment Matrix

The significance level of health impact is rated by comparing the likelihood and severity of impact using a Matrix Method (from very low to very high) as shown in **Table 3.5**. The meanings of the significance levels are described in **Table 3.6**.

Table 3.5: Significance Rating of Health Impact

Health Impact Significance Matrix			Likelihood				
			Very low	Low	Medium	High	Very high
			1	2	3	4	5
Severity of Consequences	Insignificant	1	Low (1)	Low (2)	Low (3)	Medium (4)	Medium (5)
	Low	2	Low (2)	Medium (4)	Medium (6)	Medium (8)	High (10)
	Medium	3	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)
	High/ Crisis	4	Medium (4)	Medium (8)	High (12)	High (16)	Very high (20)
	Very high/death	5	Medium (5)	Hig h (10)	High (15)	Very high (20)	Very high (25)
			Significance Rating				

Note: 1. Significance Rating = Likelihood x Severity of Consequences
1.The definition might be adjusted depending on the discretion of expertise and project characteristics.
Source: Adaptation from the Department of Health, Philippines, available from http://doh.gov.ph/ehia.htm (2009)

Table 3.6: Health Impact Significance Levels

Risk Level	Rating	Definition
Low	1-3	Acceptable level without controlling impacts/ does not require additional management.
Medium	4-9	Acceptable level/but must be controlled to prevent increased risk to unacceptable levels.
High	10-16	Unacceptable level/ the impact must be managed/must be reduced to an acceptable level.
Very High	17-25	Unacceptable level/ the impact must be managed/ reduced to an acceptable level immediately.

Note: The definition of risk significance might be adjusted depending on the discretion of expertise and project characteristics following the HIA guideline criteria in the HIA guidelines (ONEP, 2008).
Source: Adaptation from the Department of Health, Philippines, available from http://doh.gov.ph/ehia.htm (2009)

3.5 Impacted and Vulnerable Groups

As the length of the proposed gas pipeline is substantial crossing over four divisions/states in Myanmar covering different ethnographic regions with varying economic and social conditions, any resulting impacts are expected to be non-homogenous. Therefore, it will be important to assess potential impacts and provide specific community level mitigation measures based on local conditions as well as individual household conditions.

4 Environmental and Social Risk Assessments

Environmental, social, and health risk assessment includes a qualitative and, where appropriate, a quantitative evaluation of risks to help further define the probability and potential consequences of potentially major hazardous events, and to evaluate the significance of areas that might be impacted by events. The main objective is to find the most acceptable method of undertaking the project while minimizing the risk to people and the environment.

4.1 Determination of Risk

Risk associated with the PTTEP MOGE-3 project will be determined by assessing the probability of an event occurring and the significance of its occurrence. An “event” is identified as unplanned or accidental activity. The methodology used in risk assessment is described below.

4.2 Probability of Occurrence

The probability of a specific event occurring can be determined either in terms of historical precedence or by calculation. Probability has been categorized as shown in **Table 4.1**.

Table 4.1: Recommended Categories for Probability/Frequency Screening

Probability of Occurrence						
Likelihood	<1 in 100,000	1 in 5,000 – 100,000	1 in 100 – 5000	1 in 10 – 100	1 in 1 – 10	1 in 1
Frequency	<Once in 100 Projects	Once in 50-100 Projects	Once in 10-50 Projects	Once in 1-10 Projects	Once per Project	> Once per project
	Remote	Unlikely	Quite Likely	Likely	Very Likely	Definite
	0	1	2	3	4	5

4.3 Consequence of Occurrence

The consequence of an event occurring is determined according to a number of themes:

- Environment (physical and ecological)
- Society (including socio-economic)
- Health and Safety
- Company Reputation

Each of these has a set of pre-defined criteria associated with them which classify the level of consequence (**Table 4.2**).

Table 4.2: Categories for Consequence of Occurrence

	Issues				**Level of Consequence**
	Environment	**Society**	**Health and Safety**	**Reputation**	
Consequence	Regional scale, long-term impact	Civil unrest; closure of plant	Multiple off-site and on-site fatalities or permanent disabilities	International concerns; major ventures terminated	A+
	Large scale, long-term (decades) impact	Public protest; disruption of production; loss of livelihood to sector	Multiple on site fatalities or permanent disabilities	Persistent national concerns; long-term impact	A
	Medium scale, medium term (years) impact	Official complaints; loss of livelihood > 10 persons	Major illness/ disability	Medium term national concerns; operations curtailed	B
	Medium scale, short-term (months) impact	Long-term nuisance; loss of income > 10 persons	Illness or injury leading to lost time > 4 days	Short-term regional concerns; close scrutiny	C

	Short-term (weeks) impact	Temporary nuisance; > 5 third party complaints	Illness or injury leading to lost time < 4 days	Short-term local concern; some impact on asset	D
	Localised (immediate area), temporary impact	Temporary nuisance; < 5 third party complaints	Illness or injury requiring first aid or medication	Local mention only; freedom to operate unaffected	E
	No measurable impact	No complaints	No injury or illness	No mention	F

4.4 Risk Matrix

The level of risk can then be identified by use of a matrix comparing probability with consequence (**Table 4.3**). The matrix consists of:

Scale of Consequence (column) from A+ to F to indicate increasing severity of the consequence if such risk occurred.

Scale of Probability (row) from zero to 5 on the basis of historical evidence, or calculation.

The intersection of the chosen column and rows determine the significance, or acceptability, of the risk as being "Low", "Medium", "High" or "Severe". If the risk is determined to be "Medium" or "High", it needs to be managed to reduce the frequency of occurrence or to mitigate any consequences to achieve a risk which is "As Low As Reasonably Possible" (ALARP). If the risk is determined to be "Severe" (i.e. unacceptable), specific actions must be developed to reduce the risk to an acceptable level, which may involve a full Quantified Risk Assessment (QRA).

Based on the results, specific systems for management of risks were recommended, as appropriate. It is also important to note that existing mitigation measures used by the Client in similar projects were considered throughout the risk assessment process.

Table 4.3: Environmental Hazard Assessment Matrix

						Frequency/Likelihood					
					Likelihood	<1 in 100,000	1 in 5,000 – 100,000	1 in 100 – 5000	1 in 10 – 100	1 in 1 - 10	1 in 1
					Frequency	<Once in 100 Projects	Once in 50-100 Projects	Once in 10-50 Projects	Once in 1-10 Projects	Once per Project	> Once per project
Consequence	**Environment**	**Society**	**Health and Safety**	**Reputation**		0 ***Remote***	1 ***Unlikely***	2 ***Quite***	3 ***Likely***	4 ***Very***	5 ***Definite***
	Regional scale, long-term impact	Civil unrest; closure of plant	Multiple off-site and on-site fatalities or permanent disabilities	International concerns; major ventures terminated	**A+**						**Severe**
	Large scale, long-term (decades) impact	Public protest; disruption of production; loss of livelihood to sector	Multiple on-site fatalities or permanent disabilities	Persistent national concerns; long-term impact	**A**						
	Medium scale, medium term (years) impact	Official complaints; loss of livelihood > 10 persons	Major illness/ disability	Medium term national concerns; operations curtailed	**B**				**High**		
	Medium scale,	Long-term nuisance; loss	Illness or injury	Short-term	**C**			**Medium**			

	short-term (months) impact	of income > 10 persons	leading to lost time > 4 days	regional concerns; close scrutiny							
	Short-term (weeks) impact	Temporary nuisance; > 5 third party complaints	Illness or injury leading to lost time < 4 days	Short-term local concern; some impact on asset	**D**						
	Localised (immediate area), temporary impact	Temporary nuisance; < 5 third party complaints	Illness or injury requiring first aid or medication	Local mention only; freedom to operate unaffected	**E**	**Low**					
	No measurable impact	No complaints	No injury or illness	No mention	**F**						

5 Mitigation of Potential Impacts

Mitigation is an integral component of the ESHIA process. Environmental Impact and Mitigation, and Social Impact and Mitigation, potentially significant impacts will be identified. For each of these impacts, mitigation measures will be defined to prevent and/or reduce the likelihood or magnitude of a negative impact and to enhance a positive impact.

The proposed mitigation measures take into account applicable guidelines, industry practices, expert judgement, design techniques and operational control. The project team, community and relevant stakeholders will be consulted to ensure that the mitigation measures are both practical and appropriate.

Examples of mitigation measures include:

- Avoiding areas of high sensitivity
- Measures in the original project design
- Engineering design solutions
- Alternative solutions to processes and methods to achieving objectives (i.e. methods of transporting materials, or recruitment of unskilled workers)
- Timing restrictions (i.e. near villages and schools)
- Operational control procedures
- Conservation management
- Management systems (i.e. reporting mechanisms for Community Liaison officers)
- Compliance and monitoring of contractors
- Development of policies and procedures (i.e. compensation plans for land/livelihoods)

Following assignment of mitigation measures, any impact that remains is termed a **residual impact**, as described below.

5.1 Residual Impacts

Any impacts remaining after mitigation measures are considered residual impacts. The significance level of the residual impact is reassessed using the same impact criteria applied to the environmental, social and health impact assessment above and re-rated (insignificant, low, medium, or high) as described in detail below.

5.2 Likelihood

To assign likelihood of residual impact, five criteria will be defined and ranked. This five-tiered likelihood ranking criteria are in line with international practices (e.g. Australian/New Zealand Risk Management Standard AS/NZS: 4360). The criteria for likelihood are shown in **Table** .

Table 5.1: Likelihood Categories and Rankings for Environmental, Social and Health Impacts

Ranking	Definition
5	The impact will occur under normal operating conditions.
4	The impact is very likely to occur under normal operational conditions.
3	The impact is likely to occur at some time under normal operating conditions.
2	The impact is unlikely to but may occur at some time under normal operating conditions.
1	The impact is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.

5.3 Residual Environmental Impact

The residual environmental impacts are assigned a level of significance based on the likelihood of the impact and the consequence of that impact. For each residual impact a consequence/severity ranking between 0 and 3 (insignificant, low, medium or high) has been assigned using the impact criteria used in environmental impact assessment above. The likelihood is assigned using **Table** . The significance level of residual environmental impact is then determined using the matrix below where L denotes a Low-level of impact, M a Medium-level and H a High-level (**Table 5.2**).

Table 5.2: Level of Residual Environmental Impact

Likelihood	0	1	2	3
5	L	M	H	H
4	L	L	M	H
3	L	L	M	M
2	L	L	L	M
1	L	L	L	L

Consequence/Severity

5.4 Residual Social and Health Impacts

As per environmental impacts, residual social and health impacts are any potential impacts remaining once mitigation measures have been implemented. However, in the case of socio-economic impacts, these may not be directly related to the aspects of the project, but may arise from unmet expectations or difficulties in communication (i.e. access to energy, or in relation to employment opportunities).

Once identified, these residual impacts will be assigned a level of significance for individuals or communities. Residual social and health impacts will be ranked, High, Medium, Low, according to the criteria used to evaluate social impact significance above in **Table 5.2.**

5.5 Addressing Residual Impacts

The following approach is applied to addressing environmental, social and health residual impacts.

High (H)

- Check that the residual impact has been subject to feasible and cost effective mitigation where possible
- Where no further reduction in impact levels can be made, it remains a High-level impact and which may therefore be subject to compensation or offsets

Medium (M)

- Check that the residual impact has been subject to feasible and cost effective mitigation and that no further measures are practicable

Low (L)

- Not mitigated further

6.7 Cumulative Impacts

The December 1998 IFC “Procedure for Environmental and Social Review of Projects” states that that an environmental assessment should also address cumulative impacts.

Cumulative Effects Assessment (CEA) is the process of assessing the incremental effects resulting from the combined influences of various actions. These actions can refer to either the

combined effects of discrete aspects of a project (e.g., effects on community health from cumulative exposure to air emissions, noise, traffic) and/or to the combined effects of other industries and developments, either existing or planned for in the future (e.g., cumulative impacts of air emissions from other activities or projects in the area). These incremental effects may be significant even though the effects of each action, when independently assessed, are considered insignificant.

The potential for cumulative impacts is of greatest concern for those aspects of the project where residual impacts are rated as medium or high.

6. Methodology for Socio-economic impact assessment

The following methodology has been applied to assess the socio-economic impacts of the project during construction, operation and decommissioning phases mainly on livelihoods, education, infrastructure, water quality, physical resources, biological resources, human use, quality of life and cultural heritage. Each source of impacts has been assessed by two parameters namely magnitude and Probability along with five scores assessment as well. Detail methodology can be seen in annex (A).

Table 6.1: Impact Assessment Parameters and its scores

Assessment	**Score**				
	1 (very low)	**2 (Low)**	**3 (Medium)**	**4 (High)**	**5 (Very High)**
Magnitude	Insignificant	Small and will have on the socio-economic environment	Moderate and will result in minor changes on community	High and will result in significant changes on community	Very high and will result permanent changes on community
Probability	Insignificant	Little socio-economic challenges	Indirect Socio-economic challenges	Direct socio-economic challenges	Direct and significance socioeconomic challenges

Then, significant rating is calculated by the following formula.
Significant point = Magnitude x Probability
Impact Significance Level: Based on the calculated significant point, impact significance can be categorized as follows;

Table 6.2: Impact Significance Levels

Risk level	Rating	Definition
Very low	1-3	No impacts occur.

Low	4-9	Acceptable level without controlling impacts/ does not require additional management.
Medium	10-16	Acceptable level/but must be controlled to prevent increased risk to unacceptable levels.
High	17-25	Unacceptable level/ the impact must be managed/must be reduced to an acceptable level.
Very High	Above 25	Unacceptable level/ the impact must be managed/ reduced to an acceptable level immediately.

Table 6.3: Analysis of Socio-economic Impact
(a) Construction phase

No.	Socio-economic impacts	Significance of potential socioeconomic impacts			Impact significance
		Magnitude	Probability	Impact significance	
The effect on Physical Resources					
1	Soil quality	3	4	12	Medium
2	Surface water quality	2	3	6	Low
3	Ground water quality	2	3	6	Low
4	Air quality	3	3	12	Medium
5	Noise	3	4	12	Medium
Effect on Biological Resources					
6	Forestry and conservation Areas	2	3	6	Low
7	Agriculture/Farming areas	3	4	9	Medium
8	Local animals	1	2	2	Very low
9	Pasture	1	2	2	Very low
10	Aquatic animals	1	2	2	Very low
Effect on human use					
11	Local fisheries	1	2	2	Very low
12	Local livestock	1	2	2	Very low
13	Local vegetation	3	3	9	Low
14	Local industry	1	2	2	Very low
15	Local transportation	3	3	9	Low
16	Local price	1	2	2	Very low
17	Recreation	1	2	2	Very low
18	Local economy	1	2	2	Very low
Effect on Quality of life					
19	Housing	1	2	2	Very low
20	Health	1	2	2	Very low
21	Education	1	2	2	Very low
22	Spiritual	1	2	2	Very low
23	Safety	3	3	9	Low
24	Crime	3	3	9	Low
25	Family Structure	1	2	2	Very low
26	Job opportunities	3	4	12	Medium
27	Income	3	3	9	Low
28	Scenery	1	2	2	Very low

29	Local culture	1	2	2	Very low
Effect on Cultural Heritage					
30	Religious building	1	2	2	Very low
31	Cemetery	1	2	2	Very low
32	Historic buildings	1	2	2	Very low

(b) Operation phase

No.	Socio-economic impacts	Significance of potential socioeconomic impacts			Impact significance
		Magnitude	Probability	Impact significance	
The effect on Physical Resources					
1	**Soil quality**	**3**	**3**	**9**	**Low**
2	**Surface water quality**	**2**	**2**	**4**	**Low**
3	**Ground water quality**	**2**	**2**	**4**	**Low**
4	**Air quality**	**3**	**4**	**12**	**Medium**
5	**Noise**	**3**	**3**	**9**	**Low**
Effect on Biological Resources					
6	**Forestry and conservation Areas**	**1**	**2**	**2**	**Very Low**
7	**Agriculture/Farming areas**	**1**	**2**	**2**	**Very Low**
8	**Local animals**	**1**	**2**	**2**	**Very low**
9	**Pasture**	**1**	**2**	**2**	**Very low**
10	**Aquatic animals**	**1**	**2**	**2**	**Very low**
Effect on human use					
11	**Local fisheries**	**1**	**2**	**2**	**Very low**
12	**Local livestock**	**1**	**2**	**2**	**Very low**
13	**Local vegetation**	**1**	**2**	**2**	**Very Low**
14	**Local industry**	**1**	**2**	**2**	**Very low**
15	**Local transportation**	**3**	**3**	**9**	**Low**
16	**Local price**	**1**	**2**	**2**	**Very low**
17	**Recreation**	**1**	**2**	**2**	**Very low**
18	**Local economy**	**1**	**2**	**2**	**Very low**
Effect on Quality of life					
19	**Housing**	**1**	**2**	**2**	**Very low**
20	**Health**	**2**	**2**	**4**	**Low**
21	**Education**	**1**	**2**	**2**	**Very low**
22	**Spiritual**	**1**	**2**	**2**	**Very low**
23	**Safety**	**3**	**3**	**9**	**Low**
24	**Crime**	**3**	**3**	**9**	**Low**
25	**Family Structure**	**1**	**2**	**2**	**Very low**
26	**Job opportunities**	**3**	**4**	**12**	**Medium**
27	**Income**	**3**	**3**	**9**	**Low**
28	**Scenery**	**1**	**2**	**2**	**Very low**
29	**Local culture**	**1**	**2**	**2**	**Very low**
Effect on Cultural Heritage					
30	**Religious building**	**1**	**2**	**2**	**Very low**
31	**Cemetery**	**1**	**2**	**2**	**Very low**
32	**Historic buildings**	**1**	**2**	**2**	**Very low**

(c) Decommission phase

No.	Socio-economic impacts	Significance of potential socioeconomic impacts			Impact significance
		Magnitude	Probability	Impact significance	
The effect on Physical Resources					
1	Soil quality	3	3	9	Low
2	Surface water quality	2	2	4	Low
3	Ground water quality	2	3	6	Low
4	Air quality	3	4	12	Medium
5	Noise	3	4	12	Medium
Effect on Biological Resources					
6	Forestry and conservation Areas	2	3	6	Low
7	Agriculture/Farming areas	3	3	9	Low
8	Local animals	1	2	2	Very low
9	Pasture	1	2	2	Very low
10	Aquatic animals	1	2	2	Very low
Effect on human use					
11	Local fisheries	1	2	2	Very low
12	Local livestock	1	2	2	Very low
13	Local vegetation	3	3	9	Low
14	Local industry	1	2	2	Very low
15	Local transportation	3	3	9	Low
16	Local price	1	2	2	Very low
17	Recreation	1	2	2	Very low
18	Local economy	1	2	2	Very low
Effect on Quality of life					
19	Housing	1	2	2	Very low
20	Health	1	2	2	Very low
21	Education	1	2	2	Very low
22	Spiritual	1	2	2	Very low
23	Safety	3	3	9	Low
24	Crime	3	3	9	Low
25	Family Structure	1	2	2	Very low
26	Job opportunities	3	4	12	Medium
27	Income	3	3	9	Low
28	Scenery	1	2	2	Very low
29	Local culture	1	2	2	Very low
Effect on Cultural Heritage					
30	Religious building	1	2	2	Very low
31	Cemetery	1	2	2	Very low
32	Historic buildings	1	2	2	Very low