ENVIRONMENTAL IMPACT ASSESSMENT
of
Blue Diamond Cement Factory,
at
Taung Pyi Nyaung, Tharzi Township,
Mandalay Region
by
Highland Cement International Co., Ltd
Second Amended Report (Third Submission)

(Myanmar Environment Sustainable Conservation)

April, 2022

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CONTENTS

ACRONYMS AND ABBREVIATION I
အကျဉ်းချုပ်အစီရင်ခံစာ VI
1. EXECUTIVE SUMMARY 1
2. INTRODUCTION 74
2.1 Name of the project proponent 74
2.2 Presentation of Environmental and social experts 77
2.3 Presentation of health experts for project with health impacts 81
3. ENVIRONMENTAL POLICY, LEGAL AND INSTITUTIONAL FRAME WORK 82
3.1 Corporate Environmental and social Policy 82
3.2 Environmental Policy and legal frame work 83
3.2.1 Environmental Policy 83
3.2.2 Applicable Laws and Rules 84
3.2.3 International and Regional Conventions and Protocols 94
3.2.4 International Standards and Guidelines 95
3.3 Commitments made by the project proponent 96
3.4 Legal and institutional frame work 98
3.4.1 Institutional Arrangement of the company 102
3.5 Project Environmental and Social Standards 103
3.5.1 National Environmental Quality (emission and effluent) Guidelines by ECD 103
3.5.1.1 Air quality 103
3.5.1.2 Water quality 104
3.5.1.3 Noise level 104
3.5.1.4 Odour 104
3.5.2 International Finance Corporation (IFC), Environmental and Social Standards (2012) 105
4. PROJECT DESCRIPTION AND ALTERNATIVE SELECTION 107
4.1 Project Background 107
4.2 Project location, overview map and layout plan 108
4.3 Project development and implementation time schedules 117
4.4 Description of the project 119
4.4.1 Project site and size 119

4.4.2 Installation and infrastructure 119
4.4.3 Production Processes (Brief description of the process of manufacturing) 132
4.4.4 Uses of materials and resources 137
4.4.5 Wastes generated (solid, liquid, gases) 149
4.4.6 Measure to control emissions and disturbance (in brief) 149
4.4.7 Decommissioning/Mine closure and rehabilitation in brief 153
4.5 Description of the selected alternative 159
4.6 Comparison and selection of the preferred alternative 160
5. DESCRIPTION OF THE SURROUNDING ENVIRONMENT 162
5.1 Setting the study limits 162
5.2 Methodology and objectives 164
5.3 Public Administration and planning 165
5.4 Legally protected area 167
5.5 Physical component of the surrounding environment 167
5.5.1 Topography 167
5.5.2 Water resources 168
5.5.3 Geology and soil, hydrology/hydrogeology (secondary data from company's geologists) 169
5.5.4 Environmental quality 172
5.5.5 Climate 180
5.5.6 Vegetation cover 183
5.5.7 Natural hazards 183
5.6 Biological component of the surrounding environment 184
5.6.1 Flora species 184
5.6.2 Fauna species 205
5.6.2.1 Avian fauna (birds) 205
5.6.2.2 Herpetofauna (Amphibians and reptiles) 212
5.6.2.3 Mammal fauna 216
5.6.2.4 Aquatic organisms 219
5.7 Infrastructure and services of the area 223
5.8 Socio-economic components of the surrounding environment 224
5.8.1 Livelihoods and incomes 226
5.8.2 Access to public services and natural resources 227

5.8.3 Land use ... 228
5.8.4 Population distribution ... 231
5.8.5 Other socio-economic status ... 231
5.9 Public health components of the surrounding environment (shown in tabulated form) ... 231
5.10 Cultural components of the surrounding environment (religious, cultural, historical, archeological, attributes - etc) (shown in tabulated form) ... 232
5.11 Visual components of the surrounding environment ... 234
6. IMPACTS ASSESSMENT AND MITIGATION MEASURES ... 235
6.1 Impact and risk assessment methodology ... 235
6.2 Impact and risk identification, Assessment and Mitigation ... 236
6.2.1 Identification and assessment of environmental impact ... 236
6.2.1.1 During The Preconstruction Phase ... 236
6.2.1.1.1 Potential polarization of locals into pro-project and anti-project groups due to instigation by activists and/or radical environmentalists and mitigation measures to be taken ... 236
6.2.1.1.2 The potential hiking of price of land and property and mitigation measures to be taken ... 237
6.2.1.2 During The Construction Phase ... 237
6.2.1.2.1 Impact of mobilization and preparation actions and mitigation measures to be taken ... 237
6.2.1.2.2 Impact on traffic and mitigation measures to be taken ... 238
6.2.1.2.3 Impact on air environment and mitigation measures to be taken ... 239
6.2.1.2.4 Impact: noise and vibration and mitigation measures to be taken ... 240
6.2.1.2.5 Impact on soil and mitigation measures to be taken ... 241
6.2.1.2.6 Impact on water environment and mitigation measures to be taken ... 243
6.2.1.2.7 Impact on waste disposal and mitigation measures to be taken ... 244
6.2.1.2.8 Impact on biodiversity and mitigation measures to be taken ... 245
6.2.1.2.9 Potential socio-economic impacts and mitigation measures to be taken ... 247
6.2.1.2.10 Impact due to lack of occupational health and safety measures ... 248
6.2.1.2.11 Potential security issue and mitigation measures to be taken ... 250
6.2.1.2.12 Visual impact and light at night and mitigation measures to be taken ... 251

6.2.1.2.13 Positive (beneficial) impacts during the Construction Phase 252
6.2.1.3 During The Operation Phase 253
6.2.1.3.1 Impact: blasting and quarry activities and mitigation measures to be taken 253
6.2.1.3.2 Impact on air environment (dust, smoke) and mitigation measures to be taken 255
6.2.1.3.3 Impact: stockpiling of mined/quarried out materials and overburden and mitigation measures to be taken 260
6.2.1.3.4 Impact: loss of non-living resources (limestone, clay, laterite etc) and mitigation measures to be taken 261
6.2.1.3.5 Impact: noise and vibration and mitigation measures to be taken 263
6.2.1.3.6 Impact on water environment and mitigation measures to be taken 265
6.2.1.3.7 Impact on biological component (biodiversity) and mitigation measures to be taken 270
6.2.1.3.8 Impact of waste disposal (solid, liquid) and mitigation measures to be taken 272
6.2.1.3.9 Impact on traffic and mitigation measures to be taken 277
6.2.1.3.10 Impact of power supply on national demand and vice versa and mitigation measures to be taken 279
6.2.1.3.11 Impact: exposure to intense heat and occupational and health hazards and mitigation measures to be taken 279
6.2.1.3.12 Potential social impacts and mitigation measures to be taken 284
6.2.1.3.13 Impact: Potential security issue and mitigation measures to be taken 286
6.2.1.3.14 Impact: public perception and mitigation measures to be taken 286
6.2.1.3.15 Impact: a change in relief (topography) and eventual alteration of landscape and mitigation measures to be taken 287
6.2.1.3.16 Positive (beneficial) impact during the Operation Phase 288
6.2.1.4 During the Decommissioning/Mine closure Phase 289
6.2.1.4.1 Potential accidents at work place and mitigation measures to be taken 290
6.2.1.4.2 Potential residual impacts and mitigation measures to be taken 290
6.2.2 Identification and assessment of the likelihood and severity of natural and industrial hazards relevant to the project 291
6.2.3 Characterization and assessment of any residual impacts and ricks 294
6.2.4 Risk assessment 295
6.2.5 Comprehensive monitoring plan 301

7. CUMULATIVE IMPACT ASSESSMENT 306
7.1 Definition 306
7.2 Processes or steps 306
7.3 Simplified CIA 307
8. ENVIRONMENTAL MANAGEMENT PLAN 312
8.1 Project description by project phase 312
8.2 Health policies and commitments, legal requirements and institutional arrangements 313
8.2.1 Health policy 313
8.2.1.1 National Environmental Health Agenda 314
8.2.1.2 Environmental, Health and Safety (EHS) 315
8.2.1.3 Occupational Health and Safety (OHS) by ILO 316
8.2.2 Legal requirements 317
8.2.3 Institutional Arrangement 317
8.3 Summary of impact and mitigation measures and overall MP 318
8.4 Overall budget for implementation of the EMP 320
8.4.1 Fund for EMP 320
8.4.2 Organization to implement EMP 321
8.5 Management and monitoring sub plans by project phase 322
8.5.1 Programmes for effective execution of EMP 344
8.5.2 Overall generalized EMP 356
8.6 Contents for each sub-plan (Management and Monitoring sub-plan, MMSP) 356
8.6.1 Objective 356
8.6.2 Legal requirement 357
8.6.3 Overview maps, layout map, images etc 357
8.6.4 Implementation plan 357
8.6.5 Management Actions 358
8.6.6 Monitoring plans 359
8.6.7 Projected budgets and responsibilities 362
9. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE 364
9.1 Purposes of the consultation during the preparation of the EIA/IEE/EMP report 364
9.2 Methodology and approach 365
9.3 Summary of consultation activities (At South Pyi Nyaung Village, 2015, 2017) 365
9.4 Summary of the last consultation meeting, Feb. 2017 374

9.4.1 Summary of main comments received from the stakeholders/locals 374
9.5 How comments are taken into account 374
9.6 Summary of consultation and activities undertaken 376
9.7 Results of public consultations.. 382
9.8 Further ongoing consultation 384
9.9 Information disclosure 384
10. CONCLUSION AND RECOMMENDATION 385
REFERENCES 386
ANNEX 388

List of Tables

Table 1 List of filter bags and one ESP including their capacities and installation areas 151

Table 2 Surface water quality at site 172

Table 3 Effluent water at site.. 173

Table 4 Ambient air at the site.. 174

Table 5 Noise levels at factory 175

Table 6 Noise levels at Taung Pyinyaung village 178

Table 7 Monthly minimum and maximum temperature (ºC) of Tharzi Township during 2010-2018 180

Table 8 Shows the monthly rainfall and total rainfall of Tharzi Township during the last seven years (2010-2017).. 181

Table 9 Monthly humidity (%) of Tharzi Township during (2015-2017).................................... 182

Table 10 Monthly wind speed (mph) of Tharzi Township during (2015-2017) 182

Table 11 List of plant species (natural vegetation) found and recorded... 194

Table 12 List of plant species (artificial vegetation) found and recorded 200

Table 13 Location and forest type of study areas 206

Table 14 List of birds found and recorded 207

Table 15 List of herpetofauna found and recorded.. 213

Table 16 List of mammals found and recorded... 217

Table 17 List of plankton species/taxa from Myit Thar stream...................................... 219

Table 18 Species list of fish recorded from the Myit Thar stream, in the study area 222

Table 19 Data on infrastructure and services of 5 villages.. 224

Table 20 Data on basic socio-economic aspects of 5 villages.. 224

Table 21 Data on main livelihoods and incomes of 5 villages 226

Table 22 Land uses (in acres) of the five villages 229

Table 23 Basic data on other socio-economic status 231

Table 24 Basic data on health component of five villages 231

Table 25 Cultural components of five villages.. 233

Table 26 Overall risks and impacts assessment during the Construction Phase (Qualitative assessment based from Expert judgment and IFC table).. 299

Table 27 Overall risks and impacts assessment during the Operation Phase (Qualitative assessment based from Expert judgement and IFC table).. 299

Table 28 Overall monitoring plan during the Construction Phase 301

Table 29 Overall monitoring plan during the Operation Phase...................................... 303

Table 30 Overall monitoring plan during the Decommissioning 305

List of figures

Figure 1 Certificate of project proponent ... 76

Figure 2 Certificate of consultant firm ... 80

Figure 3 Location Map (Google) ... 109

Figure 4 Satellite image of project site and its environs ... 110

Figure 5 Map of Part of Tharzi Township showing project site ... 111

Figure 6 Layout plan of project site (right), residential area (left) and two mining sites (above), (scale: 1" = 0.5 mile) ... 112

Figure 7 Overview of project site (factory and premise) ... 113

Figure 8 Document from the then Ministry of Mines ... 114

Figure 9 Map of mining sites ... 115

Figure 10 Mining sites (diagramatic) ... 116

Figure 11 New MIC permit ... 118

Figure 12 Aerial view of the factory and its environs ... 122

Figure 13 Weighing Bridge (with a cement mixer in it, outside the factory compound) ... 124

Figure 14 50 Tons Magazine (outside the factory compound) ... 124

Figure 15 Main office (Briefing Hall) ... 125

Figure 16 Messing (Canteen) ... 125

Figure 17 Workshop ... 125

Figure 18 Jaw crusher ... 126

Figure 19 Hammer crusher ... 126

Figure 20 Limestone conveyor line ... 126

Figure 21 Scraper reclaimer ... 127

Figure 22 Gypsum and Additive Crusher and Storage Shed ... 127

Figure 23 Coal shed ... 127

Figure 24 Laterite crusher ... 128

Figure 25 Clay crusher roller type ... 128

Figure 26 Conveyor and four raw material bins (alumina and silica clay, Laterite and limestone) raw meal silo is background ... 128

Figure 27 Conveyor from pre grinder to raw mill ... 129

Figure 28 Roatary kiln (Length 54 m, diameter 3.5 m) ... 129

Figure 29 Raw meal silo ... 129

Figure 30 Clinker silo ... 130

Figure 31 Cement silo 130
Figure 32 at Packing Plant 130
Figure 33 Finished product 131
Figure 34 Conveyor for transporting cement bags 131
Figure 35 Conveying cement bags onto the truck for marketing 131
Figure 36 Housing for staffs 132
Figure 37 Flow chart diagram of production process 136
Figure 38 Heavy machinery 138
Figure 39 Satellite image project site and clay site 140
Figure 40 Fuel depots 142
Figure 41 Building with CCR room, the laboratory and clinic 144
Figure 42 Inside the laboratory 144
Figure 43 Water sourced from Myit Thar stream bed 145
Figure 44 Part of ground tank and pump house 146
Figure 45 Substation 147
Figure 46 Satellite image showing project site and spots where generators are installed 148
Figure 47 Bag filter unit 150
Figure 48 ESP unit 150
Figure 49 Plan for compensatory planting of trees for 2017 (already implemented) 154
Figure 50 Satellite image showing location of planting 2017 (North side and behind briefing hall) 155
Figure 51 Satellite image showing location of planting 2017 (Behind chummeries and near the batching place 156
Figure 52 Plan for compensatory planting of trees for 2018 157
Figure 53 Satellite image showing location of planting 2018 (Left side of YCDC Street (behind the chummery) 158
Figure 54 Google satellite image showing project site and two miles radius area 163
Figure 55 Map of Tharzi Township 166
Figure 56 Panoramic view of the area 168
Figure 57 Myit Thar Stream (rivulet) 168
Figure 58 General Geology of the study area 170
Figure 59 Air sampler 175
Figure 60 Nosie level detector 176
Figure 61 Satellite map showing points where noise levels are measured at Taung Pyinyaung 177
Figure 62 Google satellite image showing spots where air, water and noise levels were measured179

Figure 63 *Commelina communis L.* 201
Figure 64 *Argostemma khasianum C.B.Clarke..* 201
Figure 65 *Passiflora foetida L.* 201
Figure 66 *Cassia occidentalis L..* 201
Figure 67 *Curcuma rocoeana Wall* 201
Figure 68 *Rauvolfia serpentina (L) Benth..* 201
Figure 69 *Begonia roxburghii A.DC..* 202
Figure 70 *Kaempferia rotunda L..* 202
Figure 71 *Euphorbia heterophylla L..* 202
Figure 72 *Stachytarpheta indica Vahl..* 202
Figure 73 *Leea hirta Banks..* 202
Figure 74 *Celtis tetrandra Roxb..* 202
Figure 75 *Terminalia arjuna Wight & Arn..* 203
Figure 76 *Lagerstroemia speciosa L..* 203
Figure 77 *Terminalia chebula Retz..* 203
Figure 78 *Crotalaria sericea Retz..* 203
Figure 79 *Cycas rumphii Miq.* 203
Figure 80 *Amorphophallus campanulatus Blume..* 203
Figure 81 *Lantana camara* L... 204
Figure 82 *Gardenia erythroclada Kurz..* 204
Figure 83 *Glaucidium cuculoides..* 210
Figure 84 *Chloropsis cochinchinesis ..* 210
Figure 85 *Pomatorhinus schisticeps.* 210
Figure 86 *Nyctyornis athertoni..* 210
Figure 87 *Spilornis cheela.* 210
Figure 88 *Pitta moluccensis..* 210
Figure 89 *Polypedates leucomystax..* 213
Figure 90 *Microhyla pulchra..* 213
Figure 91 *Calotes mystaceus..* 214
Figure 92 *Eutropis macularia..* 214
Figure 93 *Boiga orchracea..* 214
Figure 94 *Chrysopelea ornata.* 214
Figure 95 *Orthriophis taeniurus..* 214
Figure 96 *Ramphotyphlop braminus..* 214

Figure 97 *Niviventer fulvescens*.. 217
Figure 98 Satellite image showing position of five villages in relation to project site. 230
Figure 99 Spraying water for suppression of dust at the site (one of the options), especially along the dusty haulage road. 257
Figure 100 Bag filter house. 259
Figure 101 ESP unit. 259
Figure 102 Stockpiling of limestone. 262
Figure 103 Wearing PPE. 264
Figure 104 Water treatment system. 269
Figure 105 Water treatment plant. 270
Figure 106 Sewage treatment. 270
Figure 107 Compensatory plantation of trees. 272
Figure 108 Domestic waste bins at the site. 274
Figure 109 Landfill. 274
Figure 110 Satellite image showing project site and landfill. 275
Figure 111 Waste disposal plan practiced worldwide (the company has followed this plan) 276
Figure 112 Firefighting plan at the site. 282
Figure 113 OHS training session. 283
Figure 114 Firefighting training and drill 283
Figure 115 Firefighting stands (traditional). 284
Figure 116 Public consultation. 373
Figure 117 KII interview. 373
Figure 118 FGD meeting. 374
Figure 119 Public consultation meeting at South Pyi Nyaung Village. 376
Figure 120 Public consultation meeting at North Pyi Nyaung village and Lei Sa Pin village 378
Figure 121 Public consultation meeting at Oak-kyin Village and Mong-pin Village. 381

ACRONYMS AND ABBREVIATION

ADB	Asian Development Bank
ASEAN	Association of South-East Asian Nations
AOSA	Association of Official Seed Analysis
BAT	Best Available Technology
BOD	Biochemical Oxygen Demand
CBM	Complaint Grievance Mechanism
CGM	Complaint Grievance Mechanism
CHS	Community Health and Safety
CH_4	Methane
CIP	Clean In Place
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
CSR	Corporate Social Responsibility
dBA	Decibel A- weighting
ECD	Environmental Conservation Department
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPS	Environmental Performance Standards
ESP	Electrostatic Precipitator
FAO	Food and Agriculture Organization
FGD	Focal Group Discussion
FSSC	Food Safety System Certification
GDP	Gross Domestic Products
GE	Genetic Engineering

GHGs	Green House Gases (Glass House Gases)
GIIP	Good International Industry Practice
GRM	Grievance Redress Mechanism
HSE	Health and Safety Executive, WB Group
ID	Identity Card
IEE	Initial Environmental Examination
IFC	International Finance Corporation
ISO	International Standard Organization
KII	Key Informent Interview
MESC	Myanmar Environment Sustainable Conservation
MIC	Myanmar Investment Commission
MMSP	Management and Monitoring Sub-Plan
MOECAF	Ministry of Environmental Conservation and Forestry
MONREC	Ministry of Natural Resources and Environmental Conservation
MP	Monitoring Plan
NECCCCC	National Environmental Conservation and Climate Change Central Committee
NEQEG	National Environmental Quality Emission/Effluent Guideline
NHC	National Health Committee
NIHL	Noise Induced Hearing Loss
NO_x	Nitrogen Oxides
OECD	Organization for Economic Cooperation and Development
OEHD	Occupational and Environmental Health Department
OHS	Occupational Health and Safety
PES	Payment for Ecosystem Services
PET	Polyethylene terephthalate (plastic)
PL	Postlarvae
PPE	Personnel Protection Equipment
PM	Particulate Matter

PPM	Parts Per Million
RECP	Resource Efficient and Cleaner Products
RECPC	Resources Efficient and Cleaner Products Concept
RO	Reversed Osmosis
5Rs	Reduce, reuse, recover, recycle and redesign
R&D	Research and Development
SIA	Social Impact Assessment
STD	Sexually Transmitted Diseases
SWI	Specific Water Intake
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
UHT	Ultra High Temperature
ULD	Upper Limbs Disorders
VOC	Volatile Organic Compound
WHO	World Health Organization
YCDC	Yangon City Development Committee

Commitments made by the project proponent

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

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

(c) The project proponent will at all times comply fully with the commitments, mitigation measure and plans in this EIA report.

(Re: EIA procedure, Notification No. 616/2015, Sectors 62-a-c)

U Kyaw Soe Win
Director

Commitment by the consultant firm, MESC

The consultant firm has made a sincere commitment and confirmed that:

(a) the information and data in this EIA report are true and accurate and that the report is complete, and

(b) that the EIA has been prepared in strict compliance with applicable laws including EIA procedure and wth the ToR for the EIA (EIA procedure 616/2015, section-62 (a, b)).

The report has been prepared by MESC with utmost effort with all reasonable skills, care and diligence within the term of contract with the client Highland Cement International Co., Ltd. Recommendations are based on our experience, using professional judgment and based on the information that is available to us.

Myint Kyaw Thura
Managing Director
Myanmar Environment Sustainable
Conservation

အခန်း(၁)

အကျဉ်းချုပ်အစီရင်ခံစာ

ဤဒုတိယအကြိမ် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) အစီရင်ခံစာသည် Highland Cement International ကုမ္ပဏီလီမိတက်မှ တင်သွင်းသော သာစည်မြို့နယ်၊ တောင်ပြည်ညောင်ဒေသ၊ ဘလူးဒိုင်းမွန်း ဘိလပ်မြေစက်ရုံအတွက်ဖြစ်သည်။ ပထမအကြိမ် အစီရင်ခံစာကို ၂၀၁၈ခုနှစ်၊ ဒီဇင်ဘာလတွင် တင်ပြပြီးဖြစ်ပါသည်။

စီမံကိန်းအဆိုပြုတင်ပြသူ

ကုမ္ပဏီသည် မြန်မာကုမ္ပဏီဖြစ်သော Blue Diamond Cement ကုမ္ပဏီလီမိတက်နှင့် ကိုရီးယား ကုမ္ပဏီတစ်ခုဖြစ်သော LG International Corporation နှင့် ဖက်စပ်ကုမ္ပဏီ ဖြစ်သည်။ Blue Diamond နှင့် LG အကြား ဖက်စပ်အချိုးသည် (၄၉း၅၁)ဖြစ်သည်။

စီမံကိန်း အဆိုပြုသူ၏ အမည်

Highland Cement International Co., Ltd သည် ၂၀၁၅ ခုနှစ် ဒီဇင်ဘာတွင် မှတ်ပုံတင်ထားသော ကုမ္ပဏီ တစ်ခု ဖြစ်ပါသည်။ စီးပွားရေး နှင့် ကူးသန်းရောင်းဝယ်ရေး ဝန်ကြီးဌာနမှ ပို့ကုန် သွင်းကုန် မှတ်ပုံတင် (မှတ်ပုံတင်အမှတ်- ၄၀၀၄၂ (၁၇-၅-၂၀၁၆) နှင့် အမျိုးသား စီမံကိန်း နှင့် စီးပွားရေး ဖွံ့ဖြိုးတိုးတက်မှု ဝန်ကြီးဌာနမှ ခွင့်ပြုမိန့်ပုံစံ (အမှတ်.၇၂ စဂ/ ၂၀၁၅-၂၀၁၆ (နေပြည်တော်) ၂၂-၁၂-၂၀၁၅) ကို လည်း နောက်ဆက်တွဲတွင် ကြည့်ရှုနိုင်ပါသည်။

စီမံကိန်း အဆိုပြုသူ၏ အမည်	:	Highland Cement International Co., Ltd
လိပ်စာ (ရန်ကုန်ရုံးချုပ်)	:	Highland Cement International Co., Ltd အမှတ်-၉ (က) မြကန်သာ ၂ လမ်း၊ ၂ ရပ်ကွက်၊ ကမာရွတ်မြို့နယ်၊ ရန်ကုန်မြို့
ဖုန်းနံပတ်	:	၀၁၅၀၇၁၁၅
ဝက်ဘ်ဆိုဒ်	:	www.bluediamond.com.mm
အီးမေးလိပ်စာ	:	highlandcement@gmail.com

လိပ်စာ (စီမံကိန်း လုပ်ကွက်)	:	Highland Cement International Co., Ltd၊ ကြေးတိုင်ပြင်ကွင်း၊ ပြည်ညောင်ကျေးရွာ၊ သာစည်မြို့နယ်၊ မန္တလေးမြို့
ဆက်သွယ်ရမည့် တာဝန်ရှိသူ	:	ဦးအောင်ဇော်မြင့်
ဆက်သွယ်ရမည့် ဖုန်းနံပါတ်	:	၀၉-၉၇၄၉၁၆၇၇၈
အီးမေးလိပ်စာ	:	aungzaw.ygn@gmail.com
လိပ်စာ (မန္တလေးရုံးခွဲ)	:	၄၁/၁၊ ၃၅ လမ်း၊ ၆၉ နှင့် ၇၀ ကြား မဟာအောင်မြေ မြို့နယ်၊ မန္တလေးမြို့
ရည်ရွယ်ချက်	:	ထုံးကျောက်နှင့် အခြား ကုန်ကြမ်းများ ဆက်စပ်တူးဖော်ခြင်း/ ဖြတ်တောက်ခြင်း နှင့် အတူ ဘိလပ်မြေ စက်ရုံဆောက်လုပ်ခြင်း နှင့် လည်ပတ်ခြင်း

သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာကျွမ်းကျင်သူများ

မြန်မာ့ပတ်ဝန်းကျင် ရေရှည်တည်တံ့ရန်ထိန်းသိမ်းရေး ကုမ္ပဏီလီမိတက် (MESC)သည် အမျိုးသား စီမံကိန်းနှင့် စီးပွားရေးဖွံ့ဖြိုးတိုးတက်မှုဝန်ကြီးဌာနတွင် (စာအမှတ်။ ရက-၈(ဝ)၀၀၁/၂၀၁၄ (၀၀၄၇၂၀)၊ ရက်စွဲ။ ၆-၆-၂၀၁၄၊ မှတ်ပုံတင်လက်မှတ်အမှတ် ၈၃၀/၂၀၁၄-၂၀၁၅ (၂၀-၅-၂၀၁၄)ဖြင့် ၂၀၁၄ ခုနှစ်၌ တရားဝင်မှတ်ပုံတင်ထားသော အတိုင်ပင်ခံအဖွဲ့အစည်းတစ်ခု ဖြစ်သည်။ ကုမ္ပဏီမှတ်ပုံတင်အမှတ်အသစ်မှာ ၁၁၀၆၄၉၁၉၃ ဖြစ်သည်။

အတိုင်ပင်ခံအဖွဲ့အစည်း မြန်မာ့ပတ်ဝန်းကျင် ရေရှည်တည်တံ့ရန် ထိန်းသိမ်းရေးကုမ္ပဏီလီမိတက် (MESC)၏ ကြားကာလ ယာယီလိုင်စင်အမှတ်သည် ၀၀၀၃ ဖြစ်သည်။ (ရက်စွဲ။ ၁-၇-၂၀၁၇၊ ECD)

ဆက်သွယ်ရန်လိပ်စာ	: အခန်း(၅-ခ)၊ တိုက်အမှတ်(၇၂)၊ မာလာမြိုင်(၆)လမ်း၊ (၁၆)ရပ်ကွက်၊ လှိုင်မြို့နယ်၊ ရန်ကုန်တိုင်းဒေသကြီး
ဆက်သွယ်ရန် ပုဂ္ဂိုလ်	: ဦးမြင့်ကျော်သူရ
ဆက်သွယ်ရန်ဖုန်းနံပတ်	: +၉၅ ၉ ၄၂၀၁၀၅၀၇၁
	: +၉၅ ၉ ၇၃၀၄၄၉၀၃
အီးမေးလ်လိပ်စာ	: myanmar.esc@gmail.com
ဝက်ဘ်ဆိုဒ်	: www.myanmar environment sustainable conservation.com

ဤပတ်ဝန်းကျင်ထိခိုက်မှု စီမံကိန်းတွင်ပါဝင်သော MESC ၏ အဖွဲ့ဝင်များမှာ အောက်ပါအတိုင်း ဖြစ်သည် -

အမည်	နိုင်ငံသားနှင့် နိုင်ငံသား မှတ်ပုံတင် အမှတ်	ECD မှတ်ပုံတင် အမှတ်	ကျွမ်းကျင်ဘာသာရပ်
ဦးမြင့်ကျော်သူရ	မြန်မာ ၁၂/ဒဂတ(နိုင်) ၀၂၈၃၄၉	၀၀၀၆	အုပ်ချုပ်မှုဒါရိုက်တာ၊ ဇီဝမျိုးစုံမျိုးကွဲပညာရှင်၊
ဦးစောဟန်ရှိန်	မြန်မာ ၁၀/မလမ(နိုင်) ၀၀၈၁၇၃	၀၀၀၇	အငြိမ်းစားပါမောက္ခ၊ EIA ပညာရှင်
ဒေါက်တာ သီရိဒေဝီအောင်	မြန်မာ ၁၂/ဒလန(နိုင်) ၀၂၉၄၃၃	၀၀၀၈	ဇီဝမျိုးစုံမျိုးကွဲပညာရှင်(၄က်)
ဦးတင်ထွန်းအောင်	မြန်မာ ၁၂/ဥတမ(နိုင်) ၁၇၂၁၁၁	၀၀၀၉	အင်ဂျင်နီယာ၊ EIA ပညာရှင်
ဒေါ်ခင်နွေနိုင်	မြန်မာ ၉/ပခက(နိုင်) ၀၀၁၂၅၂	၀၀၀၁၀	ဇီဝမျိုးစုံမျိုးကွဲပညာရှင်(အပင်)၊ ပတ်ဝန်းကျင်သုတေသန လေ့လာရေး ပညာရှင်
ဦးသန်းစိုးဦး	မြန်မာ ၉/မနမ (နိုင်) ၀၅၀၈၀၈	၀၀၀၁၁	EIA ပညာရှင်
ဦးဥက္ကာကျော်သူ	မြန်မာ ၇/ရတရ (နိုင်) ၀၉၀၃၇၁	၀၀၀၁၂	ဘူမိဗေဒပညာရှင်
ဒေါ်သင်းသင်းရီ	မြန်မာ ၁၂/သဃက(နိုင်) ၀၃၉၂၉၂	၀၀၀၁၃	ဓာတုပတ်ဝန်းကျင်ဆိုင်ရာ သုတေသနပညာရှင်၊ ကွန်ပျူတာ

MESC တွင် အချိန်ပိုင်း ဝန်ထမ်းများလည်း ရှိသည်။

ဤအတိုင်ပင်ခံအဖွဲ့အစည်းနှင့်အတူ ရက္ခဗေဒပညာရှင်များ၊ သတ္တဗေဒပညာရှင်များ၊ ငှက်ပညာရှင်များ၊ ဂေဟဗေဒဆိုင်ရာ ပညာရှင်များ၊ ရေနေဂေဟဗေဒဆိုင်ရာ ပညာရှင်များ၊ လူမှုရေးဆိုင်ရာ ပညာရှင်များ၊ အင်ဂျင်နီယာများနှင့် ဘူမိဗေဒပညာရှင်များ ပါဝင်လုပ်ကိုင် ကြသည်။

ပတ်ဂန်းကျင်၏ ရုပ်ပိုင်းဆိုင်ရာနှင့် ဓါတုပိုင်းဆိုင်ရာ လေ့လာမှုများကို ဥပမာ- ကျန်းမာရေးဌာနနှင့် ရန်ကုန်တွင် မှတ်ပုံတင်ထားသော ဓာတ်ခွဲခန်းမှ ပညာရှင်များကို ငှားရမ်းအသုံးပြု ပါသည်။ သယ်ယူရ လွယ်ကူသော စမ်းသပ်ကိရိယာသည် လေထုအရည်အသွေးတိုင်းတာခြင်းအတွက် တိကျမှန်ကန်မှု နည်းပါးသောကြောင့် ကျန်းမာရေးဌာနမှ ပညာရှင်များ ငှားရမ်းရသည်။ ရေစစ်ခြင်းအတွက် ရေနမူနာ ယူဆောင်လာပြီး မှတ်ပုံတင်ထားသော ဓာတ်ခွဲခန်းသို့ ပို့ဆောင်စစ်ဆေး ပါသည်။

ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ မူဝါဒ၊ ဥပဒေရေးရာ နှင့် ဖွဲ့စည်းပုံမူဘောင် အကျဉ်းချုပ်

Highland Cement International Co., Ltd သည် သူတို့၏ ကိုယ်ပိုင် သဘာဝ ပတ်ဝန်းကျင်ဆိုင်ရာ မူဝါဒ ရှိပြီး ပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှု အနည်းဆုံးဖြင့် ၎င်း၏ ပန်းတိုင်များကို အောင်မြင်ရန် ရည်ရွယ်ပါသည်။

Highland Cement International Co., Ltd သည် သဘာဝ ပတ်ဝန်းကျင် နှင့် လိုက်လျော ညီထွေ ရှိသော စီးပွားရေး လုပ်ရန် ပတ်ဝန်းကျင်ဆိုင်ရာ မူဝါဒရှိသည်။ ကုမ္ပဏီသည် စီမံကိန်း ၊ လုပ်ငန်းစဉ် နှင့် မူဝါဒ ဆုံးဖြတ်ခြင်းများ လုပ်ဆောင်ရာတွင် သဘာဝပတ်ဝန်းကျင်ကိုထည့်သွင်းစဉ်းစား၍ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဝန်ကြီးဌာန (MONREC) ကဲ့သို့သော ဒေသခံ အဖွဲ့အစည်းများ နှင့် အစိုးရ အဖွဲ့အစည်းများနှင့် ပူးပေါင်း၍ လုပ်ဆောင်နေပါသည်။

ပထမဦးဆုံးနှင့် အဓိက အကျဆုံး မူဝါဒမှာ ရုပ်ပိုင်းဆိုင်ရာနှင့် လူမှုပတ်ဝန်းကျင်နှင့် ဆိုင်သော ဥပဒေများ၊ စည်းမျဉ်းစည်းကမ်းများကို လိုက်နာရန် ဖြစ်သည်။ အများအားဖြင့် ၎င်းသည် သဘာဝပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအတွက် အဓိက တာဝန်ရှိသော ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန (ECD) မှ ချမှတ်ထားသော စည်းမျဉ်းစည်းကမ်းများကို လိုက်နာပါမည်။ ကုမ္ပဏီသည် သတ္တုတွင်း ဦးစီးဌာန (DOM) နှင့် သစ်တော ဦးစီးဌာန (FD) တို့၏ စည်းမျဉ်းများကို လိုက်နာပါမည်။ ကုမ္ပဏီသည် သဘာဝပတ်ဝန်းကျင်နှင့် လိုက်လျောညီထွေဖြစ်မှုကို အတတ်နိုင်ဆုံး လက်တွေ့ကျကျ လုပ်ဆောင်သွားမည်ဟု ကတိပြုပါသည်။

Highland Cement ကုမ္ပဏီလီမိတက်သည် ဘိလပ်မြေထုတ်လုပ်ခြင်းနှင့် သက်ဆိုင်သော ဥပဒေများ၊ နည်းဥပဒေများနှင့် စည်းမျဉ်းများ (၃၁) ခု ကိုလိုက်နာပါမည်။ ဤ ဥပဒေများ၊ နည်းဥပဒေများ၊ စည်းမျဉ်းများမှာ ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဥပဒေ(၂၀၁၂)၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး နည်းဥပဒေ(၂၀၁၄)၊ တောရိုင်းတိရစ္ဆာန်နှင့် သဘာဝအပင်များ ကာကွယ်ရေးနှင့် သဘာဝနယ်မြေများ ထိန်းသိမ်းရေးဥပဒေ (၁၉၉၄)၊ သစ်တောဥပဒေ (၂၀၁၈)၊ မြန်မာ့သတ္တုတွင်း ဥပဒေ (၂၀၁၅)၊

မြန်မာ့သတ္တုတွင်းနည်းဥပဒေ (၂၀၁၈)၊ ရေအရင်းအမြစ်နှင့် ရေကြောင်းထိန်းသိမ်းရေးဥပဒေ(၂၀၀၆)၊ မြန်မာ့ရင်းနှီးမြှုပ်နှံမှုဥပဒေ(၂၀၁၆)၊ မြန်မာ့ရင်းနှီးမြှုပ်နှံမှု နည်းဥပဒေ(၂၀၁၇)၊ နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှု ဥပဒေ (၂၀၁၂)၊ စက်ရုံအက်ဥပဒေ (၁၉၇၄)၊ ပုဂ္ဂလိကစက်မှုလုပ်ငန်းဥပဒေ (၁၉၉၀)၊ လူမှုဖူလုံရေးဥပဒေ(၂၀၁၂) အလုပ်သမားဥပဒေ (၂၀၁၂)၊ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း (၂၀၁၅)၊ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေးထုတ်လွှတ်မှု လမ်းညွှန်ချက်(၂၀၁၅)တို့ဖြစ်ပါသည်။

၎င်းဥပဒေများ၏ သက်ဆိုင်ရာအပိုဒ်များ၊ အပိုဒ်ခွဲများကို အစီရင်ခံစာ၏ သက်ဆိုင်ရာအခန်းတွင် ဖော်ပြထားပါသည်။

ပတ်ဝန်းကျင်အရည်အသွေးလမ်းညွှန်ချက်များဖြစ်သည့် ပတ်ဝန်းကျင်လေထုအရည်အသွေး၊ ထုတ်လွှတ်မှု၊ ဆူညံသံ၊ စွန့်ထုတ်မှုကဲ့သို့သော ပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဦးစီးဌာန (ECD) မှ ချမှတ်ထားသော လမ်းညွှန်ချက်များ နှင့်လိုက်နာရမည့် အချက်များကို စီမံကိန်း၏ အခန်းတွင် ဖော်ပြထားပါသည်။

စီမံကိန်း အကြောင်းအရာ အကျဉ်းချုပ်

စီမံကိန်းသည် Highland Cement International Co., Ltd မှ လုပ်ဆောင်သော Blue Diamond ဘိလပ်မြေစက်ရုံတွင် Portland ဘိလပ်မြေ ထုတ်လုပ်ခြင်းအတွက် ဖြစ်ပါသည်။

စီမံကိန်း လုပ်ကွက်သည် တောင်ပြည်ညောင်ကျေးရွာ အနီး အနောက်တောင် ၀.၅ မိုင် အကွာတွင် တည်ရှိပါသည်။ ၎င်းသည် သာစည်မြို့နယ်၏ အရှေ့ဘက်ပိုင်းတွင် ရှိပါသည်။ ၎င်းသည် သာစည်မြို့နယ် ၏ အရှေ့ဘက် ၄၃ မိုင် နှင့် ရန်ကုန်မြို့၏ မြောက်ဘက် ၃၂၀ မိုင်တွင် ရှိပါသည်။

စီမံကိန်း၏ စုစုပေါင်း ဧရိယာမှာ ၁၃၀၈.၉၁ ဧက ရှိပြီး စက်ရုံအဆောက်အဦးများအတွက် ၁၇၃ ဧက၊ လူနေ အိမ်ယာများ (အလုပ်သမား များ၏ အိမ်ယာ) အတွက် ၁၈၁ ဧက၊ ညောင်ပင်တောင် ထုံးကျောက်တူးဖော်ခြင်းအတွက် ၆၄၉ ဧက နှင့် သရက်ရေတောင် ထုံးကျောက်တူးဖော်ခြင်းအတွက် ၃၀၁ ဧက တို့ပါဝင်ပါသည်။

ဆောက်လုပ်ရေး အဆင့်သည် ၂ နှစ်ဖြစ်ပြီး စီမံကိန်းလည်ပတ်ခြင်းကာလသည် ၁၀ နှင့် ထပ်တိုးနှစ် တို့ဖြစ်ပါသည်။

ခန့်မှန်းဘတ်ဂျက်မှာ အမေရိကန် ဒေါ်လာ ၁၉ မီလီယံ အပါအဝင် ကျပ် ၇၉,၃၃၀ မီလီယံ ဖြစ်ပါသည်။ ထုတ်လုပ်နိုင်မှု ပမာဏမှာ တစ်ရက်လျှင် Portland ဘိလပ်မြေ ၁၅၀၀ တန် ဖြစ်ပါသည်။

စီမံကိန်း လုပ်ကွက်၏ အပြင်အဆင်ကို အောက်တွင်ဖော်ပြထားပါသည်။

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Blue Diamond Cement Factory Layout Plan
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1. Limestone Crusher
2.Preblending Storage
3.Clays & Laterite Storage
4. Raw Mill
5.Raw Meal Silo
6. Preheater
7. Kiln
8. CCR & QC
9. Coal Mill
10. Coal Storage
11. Coal Dryer
12. Clinker Silo
13. Gypsum Storage
14. Cement Mill
15. Cement Silo
16. Packing
17. Cement Bag Storage
18. Main Store
19. M & E Workshop
20. Main Substation
21. Water Treatment
22. Canteen
23. Briefing Hall
24. Quarry Office
25. Oil Tank

အသုံးပြုသော စက်ပစ္စည်းများမှာ -

- မြေကော်စက်၊ လွှန်ဖောက်စက်၊ မြေတူးစက်၊ ကရိန်းစက်၊ မြေသယ်ယာဉ်၊ ကြိတ်ခွဲစက်၊ ချိုးဖျက်စက်၊ မြေညှိစက်၊ ကြိတ်စက် (အများစုကို ထုံးကျောက်တူးဖော်ခြင်းတွင် အသုံးပြုသည်။)

လျှပ်စစ်ကို မြောက်ဘက် ၄ မိုင်အကွာ ရေပေါင်းဆုံ ကျေးရွာ၏ အဝေးပြေးလမ်းမကြီးပေါ်ရှိ အမျိုးသား ဓာတ်အားပေး လိုင်းမှ ရရှိပါသည်။ ခန့်မှန်း နှစ်စဉ် လျှပ်စစ်ဓာတ်အား လိုအပ်ချက်မှာ ၂၅,၀၀၀,၀၀၀ KWh ဖြစ်ပါသည်။

နှစ်စဉ် ရေ လိုအပ်ချက်မှာ ၆၀,၀၀၀,၀၀၀ ဂါလန် ဖြစ်ပါသည်။ နေ့စဉ်သုံးစွဲမှုသည် တစ်နေ့လျှင် ၁၈၀,၀၀၀ ဂါလန် ဖြစ်ပြီး အိမ်တွင်း အသုံးပြုမှု (အများဆုံး) မှာ ၁၅၀,၀၀၀ ဂါလန် နှင့် စက်မှုသုံးအတွက် ၃၀,၀၀၀ ဂါလန် ဖြစ်ပါသည်။ (အခြောက်လုပ်ငန်းစဉ်များအတွက် ရေအနည်းငယ်သာ လိုအပ်သော်လည်း အအေးခံမျှော်စင်တွင် အအေးခံပြီး ၁၀၀ ရာခိုင်နှုန်း ပြန်လည်အသုံးပြုပါသည်။

<u>ကုန်ကြမ်းပစ္စည်းများနှင့် နှစ်စဉ် လိုအပ်ချက်</u>

ထုံးကျောက်	: ၇၈၀,၀၀၀ တန်
ရွှံ့စေး (alumina and silica)	: ၇၃၀,၀၀၀ တန်
ဂဝံကျောက်	: ၂၈,၀၀၀ တန်
ဂေါ်ဒန်ကျောက်	: ၂၀,၀၀၀ တန်
ကျောက်မီးသွေး	: ၉၆,၀၀၀- ၁၄၄,၀၀၀ တန်

ထုံးကျောက်နှင့် ရွှံ့စေးကို အနီးဝန်းကျင်ရှိ လုပ်ကွက်မှ ထုတ်ဖော်ရရှိပါသည်။ ထုံးကျောက်သည် ကုန်ကြမ်း၏ အဓိက ပါဝင်ပစ္စည်းဖြစ်ပါသည်။

ဂဝံကျောက်ကို ၃၂ ကီလိုမီတာ အဝေးရှိ ပြင်ဦးလွင် (အင်းလျား)နှင့် အောင်ပန်းမှ ဝယ်ယူပါသည်။

ဂေါ်ဒန်ကျောက် ကို ၉၆ ကီလိုမီတာ အဝေး ရှိ မောက်မယ်မှ ဝယ်ယူပါသည်။

ကျောက်မီးသွေးကို ၄၅၆ ကီလိုမီတာ အဝေးရှိ ကလေးဝမှ ဝယ်ယူပါသည်။ ကျောက်မီးသွေးမှုန့်ကို ကျောက်မီးသွေးလောင်စာ အဖြစ် အသုံးပြုပါသည်။

<u>ဓာတုပစ္စည်းများ</u> - နိူင်းယှဉ်သော ဓာတုပစ္စည်း အမျိုးအစားများမှာ- ethylene glycol၊ methyl cellulose၊ sodium hydroxide၊ magnesium oxide၊ ethanol၊ calcium carbonate၊ acetic acid၊ ammonia chloride၊ glycerol၊ silica gel၊ နှင့် methyl red၊ solid olefin ဖြစ်ပါသည်။ ဓာတုပစ္စည်း အားလုံးကို အနည်းငယ်သော ရေသန့်စင်ခြင်း (ရေသန့်စင်ခြင်းနှင့် ရေဆိုးသန့်စင်ခြင်း) အတွက် လိုအပ်ပါသည်။

Portland ဘိလပ်မြေ ထုတ်လုပ်ခြင်းအတွက် အဓိက အဆင့်များ

- ကုန်ကြမ်းပစ္စည်း စုဆောင်းခြင်းနှင့် ပြင်ဆင်ခြင်း
- Clinker ထုတ်လုပ်ခြင်း (pyro လုပ်ငန်း စဉ် နှင့် အခြောက် လုပ်ငန်းစဉ်)
- ဘိလပ်မြေ ကြိတ်ခွဲခြင်း နှင့် ဖြန့်ဖြူးခြင်း

၎င်း တို့ကို ခွဲ၍ ဖြန့်ဖြူးခြင်း-

- ကုန်ကြမ်းပစ္စည်း ဝယ်ယူခြင်း (ထုံးကျောက်၊ ရွှံ့စေး၊ ဂဝံကျောက်၊ ဂေါ်ဒန်ကျောက် နှင့် ကျောက်မီးသွေး)
- ကုန်ကြမ်းပစ္စည်းများ၊ ထုံးကျောက်၊ ရွှံ့စေး၊ ဂဝံကျောက်များကို ကြိတ်ခွဲခြင်း နှင့် တသားဖြစ်အောင် ပြုလုပ်ခြင်း
- ကြိတ်ခွဲခြင်း (pulverization) ၊ တစ်သားတည်းဖြစ်အောင် ပြုလုပ်ခြင်း နှင့် ကုန်ကြမ်းပစ္စည်း ယာယီသိုလှောင်ခြင်း
- အပူကြိုတင်ပေးခြင်းနှင့် clinkerization (ကျောက်မီးသွေး သည် လောင်စာဖြစ်သည်)
- Clinker အအေးခံခြင်း နှင့် ယာယီသိုလှောင်ခြင်း
- Clinkerနှင့် ဂေါ်ဒန်ကျောက်ကို ကြိတ်ခွဲခြင်း
- ဘိလပ်မြေ သိုလှောင်ခြင်း ထုတ်ပိုးခြင်း နှင့် ဖြန့်ဖြူးခြင်း

ထုတ်လုပ်နိုင်စွမ်း	: Portland ဘိလပ်မြေ ၁၅၀၀ တန် (တစ်ရက်လျှင်)
အလုပ်သမား အင်အား	: နိုင်ငံခြားသား ပညာရှင် ၁၀ ဦး အပါအဝင် ၃၉၁ ဦး (လည်ပတ်ခြင်း ကာလ)
အလုပ်လုပ်သော ရက်	: ၃၂၀ ရက်
အလုပ်လုပ်သော နာရီ	: တစ်ရက်လျှင် ၂၄ နာရီ (၃ ဆိုင်း)

ထွက်ရှိလာသော စွန့်ပစ်ပစ္စည်းများ

အဓိက ထွက်ရှိသော စက်မှု ဆိုင်ရာ စွန့်ပစ်ပစ္စည်းများ မှာ ဘိလပ်မြေ/ clinker အမှုန်များ၊ ပြာ နှင့် မီးခိုးခေါင်းတိုင်နှင့် မီးဖိုများမှ ထွက်ရှိသော အရင်းအမြစ်ပုံစံများ ဖြစ်ပါသည်။

ယေဘူယျအားဖြင့် ဘိလပ်မြေ ၁၅၀၀ တန် ထုတ်လုပ်ရာတွင် ပြာ နှင့် အမှုန်များ ၁၅၀၀ ကီလိုဂရမ် ထွက်ရှိပါသည်။

(၁၀၀ ရာခိုင်နှုန်း ကုန်ကြမ်းပစ္စည်း (ထုံးကျောက်၊ ရွံ့စေး၊ ဂဝံကျောက်) များသည် ပြင်းထန်စွာ လောင်ကျွမ်းပြီး အကြွင်းအကျန်နည်းသော (ပြီးပြည့်စုံသော လောင်ကျွမ်းမှု) pyroprocess တွင် clinker အဖြစ် ရုပ်ပိုင်းဆိုင်ရာ နှင့် ဓာတ်သတ္တုပိုင်းများ ပြောင်းလဲသွားပြီး အစိုင်အခဲ စွန့်ပစ် ပြာများ၊ slag နှင့် အမှုန်များမှာ နည်းပါးပါသည်။ အဓိက ထုတ်လွှတ်သော ဓာတ်ငွေ့မှာ CO_2 ဖြစ်ပါသည်။

(တွက်ချက်ခြင်း- တစ်နေ့လျှင် ၁၀၅၀ တန် CO_2 ၇၅၀ ကီလိုဂရမ် SO_2 နှင့် ၁၅၀၀ ကီလိုဂရမ် NO_x)

အမှုန်ဖမ်းစက် (ESP)တစ်ခုနှင့် စစ်ထုတ်အိတ် ၄၄ ခုကို အမှုန်အမွှား (PM) လျော့ချရန်အတွက် တပ်ဆင်ထားပါသည်။ ရုံးခန်း၊ အလုပ်သမား များ၏ အိမ်ယာများ နှင့် မီးဖိုချောင်များမှ ထွက်ရှိသော အိမ်သုံးသုံးအမှိုက်များ (လုပ်သား ၃၉၁) ကို အမှိုက်ပုံးများတွင် စုဆောင်းထားပြီး အမှိုက်ပုံတွင်စွန့်ပစ်ခြင်း (သို့မဟုတ်) မီးရှို့ခြင်းများ လုပ်ဆောင်ပါသည်။

<u>စက်မှု နှင့် အိမ်သုံးစွန့်ပစ်ရည်များ</u>

အခြောက်လုပ်ငန်းစဉ်သည် ရေမလိုအပ်သောကြောင့် စက်မှု စွန့်ပစ်ရည်များ ထွက်ရှိမှုကို လစ်လျူရှုနိုင်သည်။ အအေးခံခြင်းအတွက် ရေ ၃၀,၀၀၀ ဂါလန် အသုံးပြုပြီး ၁၀၀ ရာခိုင်နှုန်း ပြန်လည် အသုံးပြုပါသည်။

အိမ်သုံး ရေအသုံးပြုမှုမှာ- ၁၀၀,၀၀၀ ဂါလန် ဖြစ်ပြီး သုံးစွဲမှုမှ တဆင့် ကုန်ဆုံးမှုမှာ ၃၃,၀၀၀ ဂါလန် ဖြစ်ပြီး ၆၇,၀၀၀ ဂါလန် မှာ ရေဆိုးအဖြစ် စွန့်ထုတ်ပါသည်။ စွန့်ထုတ်ရေကို မစွန့်ပစ်ခင်တွင် (ရုပ်ပိုင်းဆိုင်ရာ၊ ဓာတုပိုင်းဆိုင်ရာနှင့် ဇီဝပိုင်းဆိုင်ရာ) သန့်စင်မှု ပြုလုပ်ပါသည်။ (အစိုင်အခဲများရှိလျှင် အလူမီနီယမ် ကလိုရိုက်ဖြင့် ရုပ်ပိုင်းဆိုင်ရာအနေဖြင့် ဖယ်ရှားခြင်း နှင့် အော်ဂဲနစ် အမှိုက်များကို ဖယ်ရှားရန် အတွက်၊ စိမ်းပြာရေညှိ ပေါက်ပွားခြင်းအတွက် ရေကို လေပေးခြင်းဖြင့် ဇီဝပိုင်းဆိုင်ရာ သန့်စင်မှု ပြုလုပ်ခြင်း)

<u>တစ်ခြားရွေးချယ်နိုင်သော စီမံကိန်း</u>

စီမံကိန်း အဆိုပြုသည် ယခုနစ် လည်ပတ်နေပြီ ဖြစ်သော စီမံကိန်း အတွက် ငွေသန်းပေါင်းများစွာ ရင်းနှီးမြှုပ်နှံထားပြီး ဖြစ်သောကြောင့် စီမံကိန်းကို ပြောင်းလဲရန် ထည့်သွင်းစဉ်းစားမည် မဟုတ်ပါ။

စီမံကိန်း လုပ်ကွက်သည် ထုံးကျောက်တောင် အနီးတွင် တည်ရှိသောကြောင့် တည်နေရာ ပြောင်းလဲခြင်းအတွက်မေးခွန်းထုတ်စရာ မရှိပေ။ "ခြောက်သွေ့ခြင်း လုပ်ငန်းစဉ်" သည် "အစိုလုပ်ငန်းစဉ်" ထက် ပိုမိုကောင်းမွန်သော နည်းပညာဖြစ်သောကြောင့် နည်းပညာ ပြောင်းလဲခြင်းအတွက် မေးခွန်းထုတ်စရာ မရှိပါ။

သဘာဝပတ်ဝန်းကျင်

ရုပ်ပိုင်းဆိုင်ရာ အစိတ်အပိုင်းများ

ဇရိယာသည် ပုံမှန် မုတ်သုန်ရာသီ ဥတုဖြစ်ပြီး မိုးလေဝသ အချက်အလက်များဖြစ်သော လစဉ် အမြင့်ဆုံး နှင့် အနိမ့်ဆုံး အပူချိန်၊ မိုးရေချိန်၊ စိုထိုင်းဆ နှင့် လေတိုက်နှုန်းကို ဖော်ပြထားပါသည်။

ဘူမိဗေဒအရ ရှမ်းကုန်းပြင်မြင့်ရှိ ကျောက်များသည် အခြေခံအားဖြင့် အနည်ကျကျောက်များ၊ Paleozoic၊ Mesozoic carbonate clastics နှင့် မီးသင့်ကျောက်များဖြင့် ဖွဲ့စည်းထားပါသည်။ စီမံကိန်း လုပ်ကွက်သည် Loi-an နှင့် Namyau အဖွဲ့၏ မြောက်ဘက်ပိုင်းတွင် တည်ရှိပါသည်။ တောင်သည် ထုံးကျောက်တောင်ဖြစ်ပြီး ကျောက်များကို ကယ်ဆိုက် (calcite) ထုံးကျောက် နှင့် ဒိုလိုမိုက် (dolomite) ထုံးကျောက် ဟူ၍ အမျိုးအစား ခွဲခြားနိုင်သည်။

မြေမျက်နှာသွင်ပြင်သည် တောင့်တင်းသော မြေနှင့် တောင်စောင်းဖြစ်ပါသည်။ မြေငလျင်အနေအထားအရ နိုင်ငံသည် ငလျင်ဖြစ်ပေါ်နိုင်ခြေ ရှိသော်လည်း ဤဒေသတွင် ငလျင် ကြီးကြီးမားမား လှုပ်ခဲ့ခြင်း မရှိကြောင်း သိရှိရပါသည်။ ထိုဒေသသည် ဆိုင်ကလုန်း မုန်တိုင်းများနှင့် ရခိုင်ပြည်နယ်၌ ကျရောက်ခဲ့ဖူးသော ပြင်းထန်သော အပူပိုင်းမုန်တိုင်းမှ လွတ်ကင်းခဲ့သည်။

ရုပ်ပိုင်းဆိုင်ရာ အစိတ်အပိုင်းများ ဖြစ်သော ရေအရည်အသွေး၊ လေအရည်အသွေး၊ ဆူညံသံနှင့် မြေအရည်အသွေးများကို EIA လေ့လာနေစဉ် တိုင်းတာခဲ့ပြီး အစီရင်ခံစာတွင် ဖော်ပြထားပါသည်။

(က) စီမံကိန်း လုပ်ကွက်ရှိ မြေပေါ်ရေ အရည်အသွေး

ရေပူချောင်းမှ ရေနမူနာ (ကိုဩဒိနိတ်- မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၂၉.၀၈ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၇ ဒီဂရီ ၂၃ မိနစ် ၅၂.၃၉ စက္ကန့်) နှင့် အအေးခံစင်မှ ရေနမူနာ (ကိုဩဒိနိတ်- မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၂၆.၉၇ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၀၆.၂၅ စက္ကန့်) တို့တွင် ကောက်ယူခဲ့ပြီး ရန်ကုန်ရှိ ISO, TECH Laboratory ဓာတ်ခွဲခန်းသို့ပို့ဆောင်၍ စစ်ဆေးခဲ့ပြီး ရလဒ်ကို အောက်ပါဇယားတွင် ဖော်ပြထားပါသည်။

စဉ်	တိုင်းတာသည့် အချက်များ (parameter)	ချောင်းရေ အရည် အသွေး	အအေးခံ သည့် ရေကန်	အအေးခံ ပြီး ပြန်လာသော ရေ အရည် အသွေး	NEQEG/WHO လမ်းညွှန်ချက်များ
၁	ချဉ်ငန်ဓာတ် (pH)	၇.၅	၈.၄	၈.၅	၆-၉ S.U
၂	အရောင်	Nil	Nil	Nil	၁၅ TCU
၃	Turbidity	၂	၂	၂	၅ NTU
၄	အပူချိန် (temperature)	၂၅	၂၅	၂၅	-
၅	Chloride (as Cl)	၆	၇	၆	၂၅၀ mg/l

၆	Total Hardness ($CaCO_3$)	၂၁၆	၂၆၆	၂၆၈	mg/l
၇	Sulphate (SO_4)	၂၈၀	၂၆၅	၂၇၂	၅၀၀ mg/l
၈	Total Solids	၂၈၀	၂၆၅	၂၇၂	၅၀ mg/l
၉	Phosphate	Nil			၂ mg/l
၁၀	သံဓာတ်(Iron)	၀.၂၅	၀.၂၁	၀.၂၂	၃.၅ mg/l
၁၁	Nitrate	Nil	Nil	Nil	၅၀ mg/l

ရေအရည်အသွေး ရလဒ်အားလုံးသည် ECD မှ ချမှတ်ထားသော မြန်မာနိုင်ငံ၏ အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅ ခုနှစ် ဒီဇင်ဘာလ) အောက်တွင်ရှိပါသည်။ (ဤအရာများကို EIA လေ့လာနေစဉ် ဇူလိုင် ၂၀၁၅ တွင် တိုင်းတာခဲ့ပြီးဖြစ်ပါသည်။)

နောက်ပိုင်းတွင် Highland Cement International Co., Ltd သည် မှတ်ပုံတင်ထားသော ဓာတ်ခွဲခန်း ISO, Tech, ရန်ကုန် မှ ပညာရှင်များကို ငှားရမ်း၍ စက်ရုံဝန်းထဲရှိ မတူညီသော နေရာများ နှင့် အိမ်ယာဧရိယာ များ၌ မတူညီသော အချိန် (၂၀၁၇ နှင့် ၂၀၁၈) တွင် ရေအရည်အသွေးတိုင်းတာမှုများ ပြုလုပ်ခဲ့ပါသည်။

ရလဒ်များကို နောက်ဆက်တွဲ တွင် ဖော်ပြထားပါသည်။

(ခ) စွန့်ထုတ်ရေ

စက်ရုံမှ စွန့်ထုတ်ရေကို (ကိုဩဒိနိတ်- မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၄၈.၀၈ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၀၁.၆၅ စက္ကန့်) တွင် ကောက်ယူခဲ့ပြီး အထက်တွင် ဖော်ပြထားသော ဓာတ်ခွဲခန်းတွင် စစ်ဆေးခဲ့ပြီး ရလဒ်ကို အောက်တွင်ဖော်ပြထားသည်။

တိုင်းတာသည့် အချက်များ (parameter)	လက်ရှိတန်ဖိုးများ		မြန်မာနိုင်ငံ၏ အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှင့်မှု) လမ်းညွှန်ချက်များ
	စွန့်ပစ်ရေ (အဝင်)	စွန့်ပစ်ရေ (အထွက်)	
5 day biochemical oxygen demand	၂၀		၉ mg/l
စိန် Arsenic	Nil		Nil
Chemical oxygen demand	၆၄		၃၂ mg/l
ကလိုရင်း Chlorine (total residual)	၆		၁၆ mg/l
ကြေးနီ Copper	Nil		Nil
ဆိုင်ယာနိုက် Cyanide (free)	Nil	Nil	၀.၁ mg/l

Fluoride	၀.၃	၀.၁ mg/l	၂၀ mg/l
သံဓာတ် Iron	၀.၃၆	၀.၁၈ mg/l	၃.၅ mg/l
ခဲ Lead	Nil	Nil	၀.၁ mg/l
ချဉ်ငန်ဓာတ် pH	၈.၆	၈.၂ S.U.[a]	၆-၉ S.U.[a]
ဆာဖိတ် Sulphide	၅၂	၄၆ mg/l	၁ mg/l
မြင့်တက်လာသော အပူချိန် Temperature increase	၂၅	၃၅ ^{o}C	<၃[b] ^{o}C
Total suspended solids	၂၂၂	၂၆၀	၅၀ mg/l
သွပ် Zinc	Nil	Nil	၂ mg/l

[a] = စံတိုင်းတာစနစ်

[b] = အနီးပတ်ဝန်းကျင်ရှိ ရေအရည်အသွေး၊ ရရှိသော ရေကို အသုံးပြုမှု၊ အလားလာရှိသော လက်ခံနေရာများ၊ တသားတည်းဖြစ်သော စွမ်းဆောင်ရည် အစသည်တို့ကို ထည့်သွင်းစဉ်းစား၍ သိပ္ပံနည်းကျ တည်ဆောက်ထားသည့် ရောနှောဇုန်၏ အစွန်း၌ရှိသော အပူချိန်ဖြစ်သည်၊ ဇုန်ကို အဓိက အဓိပ္ပါယ်သတ်မှတ်ခြင်း မရှိသေးပါက စွန့်ပစ်သည့် အမှတ်မှ ၁၀၀ မီတာ အကွာအဝေးကို အသုံးပြုပါ။ (အထက်ပါရေအရည်အသွေး စစ်ဆေးမှုများကို EIA လေ့လာနေစဉ် ဇူလိုင် ၂၀၁၅ တွင် တိုင်းတာခဲ့ပြီးဖြစ်ပါသည်။)

ကလိုရိုက် (chloride)၊ ဆာလဖိတ် (sulphide) နှင့် ဆိုင်းကြွ အနည် စုစုပေါင်း (total suspended solid) တို့သည် လမ်းညွှန်ချက် တန်ဖိုးထက် မြင့်နေပါသည်။ အကြောင်းပြချက်မှာ မသိရသေးပါ။ ဖြစ်နိုင်ခြေ ရှိသော အကြောင်းရင်းများကို ထည့်သွင်းစဉ်းစားထားသော်လည်း မည်သည့် ဖြေရှင်းနည်းမှ ယခုအခါမသိနိုင်သေးပါ။

နောက်ပိုင်းတွင် Highland Cement International Co., Ltd သည် မှတ်ပုံတင်ထားသော ဓာတ်ခွဲခန်း ISO, Tech, ရန်ကုန် မှ ပညာရှင်များကို ငှားရမ်း၍ စီမံကိန်း လုပ်ကွက် အတွင်းမှ မတူညီသော နေရာများ၌ မတူညီသော အချိန် (၂၀၁၇ နှင့် ၂၀၁၈) တွင် ရေဆိုးနှင့် စက်မှုဆိုင်ရာ စွန့်ပစ်ရေ အရည်အသွေးတိုင်းတာမှုများ ပြုလုပ်ခဲ့ပါသည်။

ရလဒ်များကို နောက်ဆက်တွဲ တွင် ဖော်ပြထားပါသည်။

လေအရည်အသွေး

စီမံကိန်း လုပ်ကွက်ရှိ ပတ်ဝန်းကျင်လေထု အရည်အသွေး (ကိုဩဒိနိတ်- မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၃၁ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၁၇ စက္ကန့်) တွင် လုပ်ငန်းခွင် နှင့် ပတ်ဝန်းကျင် ကျန်းမာရေး ဌာနခွဲမှ ပညာရှင်များ ငှားရမ်း၍ တိုင်းထာခဲ့ပြီး ရလဒ်ကို အောက်ပါဇယားတွင် ဖော်ပြထားပါသည်။

စီမံကိန်း လုပ်ကွက်ရှိ ပတ်ဝန်းကျင်လေထု အရည်အသွေး

တိုင်းတာသည့် အရာဝတ္ထု	စံလမ်းညွှန် ချက်များ	အချိန်	စက်ရုံ လုပ်ကွက် (၃၀.၈.၁၈)	စက်ရုံ လုပ်ကွက် (၂.၁၀.၁၈)	MESC (၂၀.၁၂.၁၇)	OEHD (၁၆.၁.၁၈)	OEHD (၁၆.၃.၁၈)
အမှုန်အမွှား PM_{10}	၅၀ µg/m^3	၂၄ နာရီ	၂၃.၀	၃၃.၁	၃၆.၅	၉၅.၁	၂၅၂.၅
ဆာလဖာဒိုင် အောက်ဆိုဒ် (Sulphur dioxide)	၄၀၀ µg/m^3	၂၄ နာရီ	၁၂၀.၉	၁၁၆.၈	၃၃.၇	၃၂.၇	၁၁၀.၉
နိုက်ထရိုဂျင် ဒိုင်အောက်ဆိုဒ် (Nitrogen Dioxide)	၂၀၀ µg/m^3	၁ နာရီ	၅၂	၂၀.၃	၅၅.၂	၆၂.၂	၆၈.၈
ကာဗွန်မိုနောက်ဆိုဒ် (Carbon Monoxide)	၃၀၀၀၀ µg/m^3	၂၄ နာရီ	၀.၁	၀.၁	၆၆.၄	၄၄၅	၅၂၇
အိုဇုန်း (Ozone)	၁၀၀ µg/m^3	၈ နာရီ	၉၃.၃	၄၅.၅	၁၇.၂	၂၂.၆	၂၃.၇
ကာဗွန်ဒိုင် အောက်ဆိုဒ် (Carbon Dioxide)	-	၂၄ နာရီ	၆၁၀.၉	၅၉၃	-	-	-
နိုက်ထရိုဂျင် အောက်ဆိုဒ် (Nitrogen Oxide)	၆၀၀ µg/m^3	၂၄ နာရီ	၆.၁	၇.၅	-	-	-
အငွေ့ပြန်လွယ်သော အော်ဂဲနစ်ဓာတ်ပေါင်း VOC(µg/m^3)	-	-	-	-	၂၅.၂	၂၀၅	၂၄.၁
ဟိုက်ဒရို ကာဗွန် HC(ppm)	-	-	-	-	၄၄၇	၄၂၃	၃၇၈
မီသိန်း CH_4(ppm)	-	-	-	-	၅၄၈၉	၅၂၉၅	၄၃၆၇

MESC – မြန်မာ့ပတ်ဝန်းကျင်ရေရှည်တည်တံ့ရန် ထိန်းသိမ်းရေးကုမ္ပဏီလီမိတက်

OEHD –လုပ်ငန်းခွင် နှင့် ပတ်ဝန်းကျင် ကျန်းမာရေး ဌာနခွဲ

ဆူညံသံ အဆင့်

စက်ရုံရှိ ဆူညံသံ အဆင့်

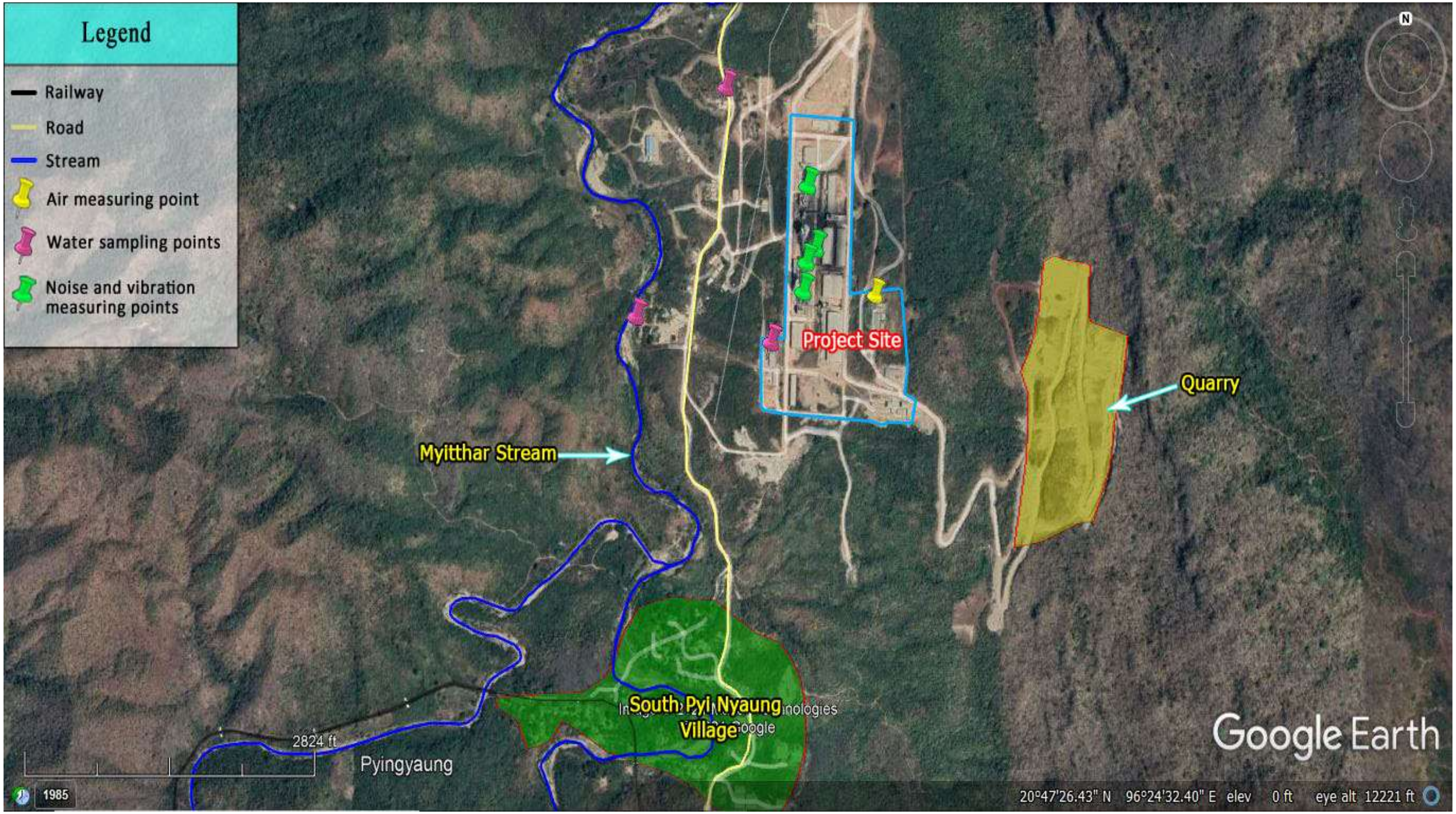
လက်ခံနေရာ	မြန်မာနိုင်ငံ၏ အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှင့်မှု) လမ်းညွှန်ချက်တန်ဖိုးများ One Hour L_{Aeq} (dBA)		ဘိလပ်မြေ စက်	ကျောက်မီးသွေး စက်	မီးဖို	ကုန်ကြမ်းစက်
	နေ့အချိန် ၀၇:၀၀-၂၂:၀၀ (၁၀:၀၀-၂၂:၀၀ အားလပ်ရက် အတွက်)	ညအချိန် ၂၂:၀၀-၀၇း၀၀ (၂၂:၀၀-၁၀း၀၀ အားလပ်ရက် အတွက်)	မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၃၉.၉၄ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၁၀.၀၆ စက္ကန့် **နေ့အချိန်**	မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၃၄.၇၅ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၁၀.၈၆ စက္ကန့် **နေ့အချိန်**	မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၃၃.၇၆၁ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၀၉.၉၁ စက္ကန့် **နေ့အချိန်**	မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၃၁.၁၈ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၀၉.၅၉ စက္ကန့် **နေ့အချိန်**
စက်မှု၊ စီးပွားရေး	၇၀	၇၀	၇၀	၇၀	၇၀	၇၀

င

တောင်ပြည်ညောင်ကျေးရွာ ရှိ ဆူညံသံ အဆင့်

လက်ခံနေရာ	One hour LAeq (dBA)[a]		အရှေ့ ဘက် (East)	အနောက်ဘက် (West)	ဘယ်ဘက် (North)	ညာဘက် (South)
	နေ့အချိန် ၀၇:၀၀-၂၂:၀၀ (၁၀:၀၀-၂၂:၀၀ အားလပ်ရက် အတွက်)	**ညအချိန်** ၂၂:၀၀-၀၇း၀၀ (၂၂:၀၀-၁၀း၀၀ အားလပ်ရက် အတွက်)	**နေ့အချိန်**	**နေ့အချိန်**	**နေ့အချိန်**	**နေ့အချိန်**
လူနေအိမ်၊ အဖွဲ့အစည်း ဆိုင်ရာနေရာ၊ ပညာရေး ဆိုင်ရာ နေရာ	၅၅	၄၅	၄၃.၈၉	၅၀.၁၅	၅၄.၁၁	၄၇.၅၃

မှတ်ချက်- ဆူညံသံ တိုင်းတာသည့် နေရာသည် စက်များ မီးဖိုများ နှင့် နီးကပ်နေသည့်အတွက် ပုံမှန် စက်မှု၊ စီးပွားရေး နေရာများထက် မြင့်နေပါသည်။



လေ၊ ရေနှင့် ဆူညံသံတိုင်းတာထားသော နေရာများပြ မြေပုံ

ဇီဝဗေဒဆိုင်ရာ အစိတ်အပိုင်းများ

အရှေ့ပိုင်းရှိ စီမံကိန်း ဧရိယာ ၏ တစ်ဝက်ကျော်သည် ပြည်ညောင် ကြိုးဝိုင်းဧရိယာ (စီမံကိန်း ဧရိယာ ၁၃၀၈.၉၁ ဧက၊ လူနေဧရိယာ ၇၅၀ ဧက) အတွင်း ရှိပါသည်။ သစ်တော်တစ်ခုလုံးသည် လွန်ခဲ့သော နှစ်ပေါင်းများစွာ ကတည်းကပင် တစ်စိတ်တစ်ပိုင်းယိုယွင်းပျက်စီးခဲ့သော်လည်း သစ်ပင်ပန်းမန် အမျိုးစား ကွဲပြားမှုမှာ အတော်ပင် မြင့်မားဆဲ ဖြစ်ပါသည်။

<u>သစ်ပင်ပန်းမန်</u>- စုစုပေါင်း အပင်မျိုးစိတ် ၁၃၉ မျိုး (အများအားဖြင့် Angiospermae၊ ကြီးကြီးမားမား အပင်ကြီးများ ရှားပါးပြီး GBH ၃၀၀ စင်တီမီတာရှိသော သစ်ပင်များသည် သစ်ပင်များ၏ ၁ ရာခိုင်နှုန်း အောက်တွင်သာ ရှိသည်။ မျိုးစိတ် တစ်ခုမှာ IUCN Red List ၏ မျိုးပြုန်းတီးမှု အန္တရာယ် နှင့် ကြုံတွေ့နေရသည့် အပင်မျိုးစိတ်(EN)၊ တစ်မျိုးမှာ ပြုန်းတီးမှု အန္တရာယ် နှင့် ကြုံရမည့် အဆင့်သို့ ရောက်သွားနိုင်သော အပင်မျိုးစိတ် (VU) ဖြစ်ပြီး ၁၂ မျိုးမှာ ပြုန်းတီးမှု အန္တရာယ် နည်းသေးသည့် အပင်မျိုးစိတ် အမျိုးစားများ (LC) ဖြစ်ကြသည်။ ပျောက်ကွယ်လုနီးပါး ဖြစ်နေသော သစ်ပင်များကို ကယ်တင်ရန် မဖြစ်နိုင်ပါ။ စီမံကိန်း ပြီးစီးပြီးနောက် တစ်ခုတည်းသော အဖြေမှာ အဓိက သစ်တောများကို ပြန်လည်စိုက်ပျိုးရေး ဖြစ်ပါသည်။ အစီရင်ခံစာတွင် တွေ့ရှိခဲ့သော အပင်မျိုးစိတ် ၁၃၉ မျိုးကို ဖော်ပြထားပါသည်။

<u>သတ္တဝါ</u>- ငှက်မျိုးစိတ် ၇၀၊ ကုန်းနေရေနေ၊ တွားသွားသတ္တဝါမျိုးစိတ် ၁၇ မျိုး (ကုန်းနေရေနေနှင့် တွားသွားသတ္တဝါများ) နို့တိုက်သတ္တဝါ ၁၄ မျိုး (တစ်ဆင့်ခံ သတင်းအချက်အလက်သာ)၊ ရေမျောမျိုးစိတ် ၆၆ မျိုး၊ ငါး မျိုးစိတ် ၆ မျိုးကို တွေ့ရှိ မှတ်တမ်းတင်ခဲ့ပါသည်။ စုစုပေါင်း တိရစ္ဆာန် ၁၀၇ မျိုးနှင့် ရေမျောမျိုးစိတ် အားလုံးကို အစီရင်ခံစာတွင် စာရင်းပြုစုထားပါသည်။

သစ်ပင်ပန်းမန်များနှင့် မတူဘဲ ရှားပါးမျိုးစိတ် မရှိသလောက်ဖြစ်ပါသည်။ မည်သည့် ငှက်မျိုးစိတ်မျှ IUCN Red List တွင် မပါဝင်ပါ။ ဖား အမျိုးအစား ၂ မျိုး၊ အိမ်မြှောင် နှင့် မြွေ အမျိုးစား ၁ မျိုးစီသည် IUCN Red List ၏ ပြုန်းတီးမှု အန္တရာယ် နည်းသေးသည့် သတ္တဝါမျိုးစိတ် အမျိုးအစားများ (LC) ဖြစ်ကြသည်။

နို့တိုက်သတ္တဝါ အမျိုးအစား၏ မျိုးစိတ် တစ်မျိုး (Slow Loris) သည် IUCN Red List ၏ ပြုန်းတီးမှု အန္တရာယ် နှင့် ကြုံရမည့် အဆင့်သို့ ရောက်သွားနိုင်သော သတ္တဝါမျိုးစိတ် (VU) ဖြစ်ပြီး မျောက်၊ ကျားသစ်၊ တောဝက်၊ ဂျီ၊ ရှဉ့်၊ နှင့် ကြွက် အမျိုးအစား ၁ မျိုးစီသည် IUCN Red List ၏ ပြုန်းတီးမှု အန္တရာယ် နည်းသေးသည့် သတ္တဝါမျိုးစိတ် အမျိုးအစားများ (LC) ဖြစ်ကြသည်။ မည်သည့် ရေမျောမျိုးစိတ်၊ ငါး မျိုးစိတ်မျှ IUCN Red List တွင် မပါဝင်ပါ။

လူမှု စီးပွားဆိုင်ရာ အစိတ်အပိုင်းများ

ရင်းတို့ကို အောက်ပါ ဇယားတွင် ဖော်ပြထားပါသည်။

ကျေးရွာ ၅ ရွာ၏ အခြေခံ အဆောက်အဦများ နှင့် ဝန်ဆောင်မှုများဆိုင်ရာ အချက်အလက်များ

စဉ်	အခြေခံ အဆောက်အဦများ နှင့် ဝန်ဆောင်မှုများဆိုင်ရာ အချက်အလက်များ	ကျေးရွာများ				
		တောင် ပြည်ညောင်	မြောက် ပြည်ညောင်	လယ်စ ပြင်	အုတ်ကျင်း	မုံပင်
၁။	<u>လမ်းပန်းဆက်သွယ်ရေး</u> ကားလမ်း မီးရထားလမ်း	 √ √	 √ -	 √ -	 √ -	 √ -
၂။	<u>လျှပ်စစ်ဓာတ်အား ရရှိနိုင်မှု</u>	သွယ်တန်းမှု လမ်းကြောင်း တစ်လျှောက် ရှိ အိမ်ခြေ၏ ၁၀ ရာခိုင်နှုန်း	အိမ်ခြေ၏ ၉၀ ရာခိုင်နှုန်း	×	အိမ်ခြေ၏ ၅၀ ရာခိုင်နှုန်း	၇၀ % (solar)
၃။	<u>ပညာရေး</u> ကျောင်း	မူလတန်းလွန် ကျောင်း	အထက်တန်း ကျောင်း	×	×	တွဲဖက် အလယ်တန်း ကျောင်း
	ကျောင်းသား ဦးရေ/ ဆရာမ ဦးရေ	၁၀၈/၈	၂၈	×	×	၂၈၈/၁၄
၄။	<u>ကျန်းမာရေး ဆိုင်ရာ အဆောက်အအုံ</u> ဆေးခန်း	×	√	×	×	×
၅။	<u>ကျေးရွာစာကြည့်တိုက်</u>	×	√	×	×	×
၆။	<u>အစိုးရ အဆောက်အဦ နှင့် အများပိုင် အဆောက်အဦ</u>	မီးရထားရုံ	×	×	×	×

ကျေးရွာ ၅ ရွာ၏ အခြေခံ လူထု စီးပွားရေးထောင့်ဆိုင်ရာ အချက်အလက်များ

စဉ်	လူထု စီးပွားရေးထောင့်/ သတ်မှတ်ချက်များ	ကျေးရွာများ				
		တောင် ပြည်ညောင်	မြောက် ပြည်ညောင်	လယ်စ ပြင်	အုတ်ကျင်း	မုံပင်
၁။	လူဦးရေ	၇၀၀	၂၉၉၀	၂၃၀	၆၁၅	၃၀၀
	ကျား	၃၄၄	၁၄၈၈	၁၁၂	၃၀၂	၁၅၃
	မ	၃၅၆	၁၅၀၂	၁၁၈	၃၁၃	၁၄၇
၂။	ကိုးကွယ်သည့်ဘာသာ (%)					
	ဗုဒ္ဓဘာသာ	၁၀၀ %	၁၀၀ %	၁၀၀ %	၁၀၀ %	၁၀၀ %
	ခရစ်ယာန်	-	-	-	-	-
	အခြား အစရှိသည်ဖြင့်	-	-	-	-	-
၃။	လူမျိုး					
	ဗမာ	၁၀၀	၁၀၀	၁၀၀	၁၀၀	၁၀၀
	ကရင်	-	-	-	-	-
	ရှမ်း	-	-	-	-	-
	အခြား အစရှိသည်ဖြင့်	-	-	-	-	-
၄။	ပညာရေး ဆိုင်ရာ အခြေအနေ					
	စာတတ်မြောက်နှုန်း (အရွယ်ရောက်ပြီးသား)	၈၂ %	၈၅ %	၇၈ %	၇၄ %	၇၂ %
၅။	နေထိုင်မှု အခြေအနေ					
	သစ်သားအိမ်	၉၉	၅၈၅	၄၅	၈၈	၄၈
	အုတ်အိမ်	၁	၃၀	၁	၃	-
	သစ်သား/ အုတ်အိမ်	၂၉	၂၅	၁	၅	၆
	၂ ထပ်အိမ် (အုတ်)	-	၁၅	-	၂	၆
	ဝါးအိမ်	၁	၃၅	၃	၂	-
၆။	ပစ္စည်း လက်ဝယ် ပိုင်ဆိုင်မှု					
	ကား (အစီးရေ)	၁ sedan ၅ trucks	၁၀ sedan ၅၀ trucks	- ၄ trucks	၅ sedan ၈ trucks	၁ sedan ၁၁ trucks
	မော်တော် ဆိုင်ကယ် (%)	၁၀၀ %	၁၀၀ %	၃၀ %	၉၀ %	၉၅ %
	တီဗွီ (%)	၃၀ %	၉၀ %	၂ %	၉၀ %	၇၀ %
	လက်ကိုင်ဖုန်း	၈၀ %	၁၀၀ %	၁၀၀ %	၈၀ %	၁၀၀ %

* အမြင်ဖြင့် စစ်ဆေးခြင်း နှင့် KII မှ ရရှိသော တစ်ဆင့်ခံ အချက်အလက်များ

ကျေးရွာ ၅ ရွာ၏ အဓိက အသက်မွေး ဝမ်းကြောင်း နှင့် ဝင်ငွေ ဆိုင်ရာ အချက်အလက်များ

စဉ်	အသက်မွေးဝမ်းကြောင်း နှင့် ဝင်ငွေ	ကျေးရွာများ				
		တောင်ပြည်ညောင်	မြောက်ပြည်ညောင်	လယ်စပြင်	အုတ်ကျင်း	မုံပင်
၁။	အသက်မွေးဝမ်းကြောင်း/ အလုပ်အကိုင် (အိမ်ခြေ ရာခိုင်နှုန်း					
	လယ်သမား (%)	၁၃ %	၁၅ %	၁၀ %	၂၂ %	၂၀ %
	အဓိက စိုက်ပျိုးသီးနှံ	-	-	-	-	-
	ဆန်စပါး	-	-	-	√	√
	နှမ်း	-	-	√	-	√
	ပြောင်း	-	-	-	-	√
	အခြား	√	√	√	-	-
	သစ်ခွ	-	√	-	√	-
	(သရက်၊ ငှက်ပျောသီး၊ မာလကာသီး စိုက်ပျိုးသူများ	-	√	-	(√)	-
	ထုံးထုတ်လုပ်မှု	၂၅ %	၁၅ %	-	-	-
၂။	ရာသီအလိုက် အလုပ်အကိုင်များ/ ပုံမှန် အလုပ်အကိုင်များ (%)	၂၂ %	၂၀%	၂၅ %	၃၀%	၃၀%
	သစ်ပင်/ ဝါးပင် ခုတ်ခြင်း	-	-	-	√	-
	Sterculia ခုတ်ခြင်း	-	-	-	√	-
၃။	ကုမ္ပဏီဝန်ထမ်း(အရေအတွက်)					
	Highland Cement	၂၀ ဦး	၄၅ ဦး	X	X	X
	Shwe Taung Cement	X	၅၀ ဦး	X	၅၀ ဦး	X
၄။	အစိုးရ ဝန်ထမ်း(အရေအတွက်)					
	ကျောင်းဆရာ/ ဆရာမ	၁	၂	X	X	X
	စစ်သား	X	၃	X	X	X
	ရဲသား	X	၃	X	X	X
	သူနာပြု	X	X	X	X	X
၅။	အိမ်ထောင်စု တစ်ခု၏ နှစ်စဉ် ဝင်ငွေ (ရာခိုင်နှုန်း)					
	၁၀ သိန်း ကျပ် အောက်	၁၀ %	၁၀ %	၄၀ %	၁၀ %	၂၀ %
	၁၁-၂၀ သိန်း ကျပ်	၄၀ %	၂၅ %	၄၀ %	၃၀ %	၅၀ %
	၂၁-၃၀ သိန်း ကျပ်	၂၀ %	၁၅ %	%	၃၀ %	၁၀ %
	၃၁-၄၀ သိန်း ကျပ်	၂၀ %	၅ %	%	၁၀ %	၁၀ %
	၄၁-၅၀ သိန်း ကျပ်	၁၀ %	၃၀ %	%	၁၀ %	%
	၅၁ သိန်း နှင့် အထက်	%	၅ %	%	%	%
	မသိပါ (နှစ်စဉ် ဝင်ငွေကို မခန့်မှန်းနိုင်ပါ။)	%	၁၀ %	၂၀ %	၁၀ %	၁၀ %

- အဓိက အသက်မွေးဝမ်းကြောင်း ရှိသော အိမ်ခြေ၏ ၁၀ ရာခိုင်နှုန်းကို HHI အခြေခံသည်
- ဤဒေသရှိ နေ့စဉ် လုပ်အားခမှာ လယ်စပြင် ကျေးရွာ တွင် ၅၀၀၀-၇၀၀၀ ကျပ် နှင့် တောင်ပြည်ညောင် ကျေးရွာတွင် ၆၀၀၀ ဖြစ်ပါသည်။ ကျန်သုံးရွာမှာ ၃၀၀၀ ကျပ်နှင့် ၇၀၀၀ ကျပ်ကြား ရှိပါသည်။

ကျေးရွာ ၅ ရွာ၏ မြေအသုံးချမှု (ဧက)

စဉ်	မြေအသုံးချမှု (ဧက)	ကျေးရွာများ				
		တောင် ပြည်ညောင်	မြောက် ပြည်ညောင်	လယ်စပြင်	အုတ်ကျင်း	မုံပင်
၁။	စပါးစိုက်ခင်း	၂	၁၂	NA	၁၃	၈
၂။	လယ်စိုက်ခင်း	၂၆၁	၂၃၈	NA	၂၅၂	၃၄၄
၃။	စိုက်ပျိုးရေး (သစ်ခွ)	၂၇	၃၁.၂၈၁	NA	၂၀	၉
၄။	သစ်တောကြိုးဝိုင်း	-	၁၃၁၄၀	NA	၁၃၁၉၂	-
၅။	မြေလွတ်/ မြေလပ်	-	-	NA	၂၁၀	၃၆
၆။	သတ္တုတွင်း ဧရိယာ	၃၀	-	NA	-	-
၇။	လမ်းဧရိယာ	၃	-	NA	၉	၉
၈။	စမ်းချောင်းငယ်/ စမ်းချောင်း ဧရိယာ	၉၂	၉၄	NA	၇၃	၈၂
၉။	စက်ရုံ ဧရိယာ	-	-	NA	၂၇၁၀	၁၁၆.၃၂
၁၀။	ကျေးရွာ ဧရိယာ	၆၅	၆၄	NA	၅၇	၄၈
၁၁။	ဘုန်းကြီးကျောင်းနှင့် သုသာန် ဧရိယာ	၆၆	၆၃	NA	၃၃	၂၅
၁၂။	အခြား	၁၅၉၅	၁၅၄	NA	၁၃၈၂	၁၁၆၁

* * KII အချက်အလက်များမှ

ကျေးရွာ ၅ ရွာ၏ ကျန်းမာရေးဆိုင်ရာ အခြေခံ အချက်အလက်များ

စဉ်	အသက်မွေးဝမ်းကြောင်း နှင့် ဝင်ငွေ	ကျေးရွာများ				
		တောင်ပြည်ညောင်	မြောက်ပြည်ညောင်	လယ်စပြင်	အုတ်ကျင်း	မုံပင်
၁။	ကျန်းမာရေး အခြေအနေ (ယေဘူယျ)	နိမ့်	နိမ့်	နိမ့်	နိမ့်	နိမ့်
၂။	ကျန်းမာရေးဆိုင်ရာ အဆောက်အအုံ					
	ကျေးရွာဆေးခန်း	-	၁	-	-	-
	ကိုယ်ပိုင်ဆေးခန်း	X	X	X	X	X
	ကျန်းမာရေးဝန်ဆောင်မှု- သူနာပြု/ သားဖွားဆရာမ အစရှိသည်ဖြင့်	-	၁	-	-	-
	သေဆုံးနှုန်း နှင့် ရောဂါဖြစ်နှုန်း အချက်အလက်များ	NA	NA	NA	NA	NA
	HIV/AIDS	NA	NA	NA	NA	NA
၃။	ကျန်းမာရေး ပြဿနာ					
	ငှက်ဖျား	ငှက်ဖျား	ငှက်ဖျား	ငှက်ဖျား	ငှက်ဖျား	ငှက်ဖျား
	သွေးလွန်တုတ်ကွေး	-	-	-	-	-
	ဝမ်းရောဂါ	-	-	-	-	-

- အနီးဆုံး မြို့နယ်ခွဲ ဆေးရုံသည် ယင်းမာပင် ကျေးရွာတွင် ဖြစ်ပါသည်။ အနီးဆုံး မြို့နယ်ဆေးရုံသည် သာစည် မြို့တွင် ဖြစ်ပါသည်။

ယဉ်ကျေးမှု ဆိုင်ရာ အစိတ်အပိုင်းများ

ကျေးရွာ ၅ ရွာ၏ ယဉ်ကျေးမှု ဆိုင်ရာ အစိတ်အပိုင်းများ

စဉ်	ဘာသာရေး၊ ယဉ်ကျေးမှု၊ သမိုင်း ရှေးဟောင်းသုတေသန၊ ဝတ္ထုရည်များ အစရှိသည်ဖြင့်	တောင် ပြည်ညောင်	မြောက် ပြည်ညောင်	လယ်စပြင်	အုတ်ကျင်း	မုံပင်
၁။	ကျေးရွာဘုရား	X	√	X	X	√
၂။	ကျေးရွာ ဘုန်းကြီးကျောင်း	၁	၁	X	X	၁
၃။	ရဟန်း သာမဏေ၊ သီလရှင် အရေအတွက်	၅ ပါး	၄ ပါး	X	ရဟန်း ၆ ပါး နှင့် သာမဏေ ၁၀ ပါး	ရဟန်း ၁ ပါး နှင့် သာမဏေ ၁ ပါး
၄။	ကျေးရွာ နတ်ကွန်း	-	-	-	-	-
၅။	"Bo" သစ်ပင် (သို့) မြင့်မြတ်သော သစ်ပင်	-	-	-	-	-
၆။	နတ်ကိုးကွယ်သူများ	ရှိ	ရှိ	ရှိ	ရှိ	ရှိ
၇။	ဘုရားကျောင်း / အခြား	X	X	X	X	X
၈။	သမိုင်း အထိမ်းအမှတ် အဆောက်အအုံများ အထိမ်းအမှတ် (နေရာ၊ ဖွဲ့စည်းပုံ)	X	X	X	X	X
၉။	ရှေးဟောင်း သုတေသန အထိမ်းအမှတ် (နေရာ၊ ဖွဲ့စည်းပုံ၊ အရာဝတ္ထု စသည်ဖြင့်)	X	X	X	X	X

- ☐ နှစ်စဉ် ဘုရားပွဲ (သို့မဟုတ်) ကြီးကျယ်သော ဘာသာရေး ပွဲများ မရှိပါ။ နှစ်စဉ် (သို့) ရာသီ အလိုက် နတ်ပွဲများ မရှိပါ။
- ☐ လပြည့်နေ့၊ လဆန်းနေ့နှင့် မြန်မာလ၏ ၈ ရက် မြောက်နေ့ ၂ ရက်တွင် ပုံမှန်ဘာသာရေးပွဲများသာ

မျက်စိပဒေသာဖြစ်သော အမြင်အာရုံဆိုင်ရာ အစိတ်အပိုင်းများ

ခရီးသွား ဧည့်သည်များကို ဆွဲဆောင်နိုင်သော လှပသော ရှုခင်းနေရာများ မရှိပါ။

ထူးခြားသော နေရာများမရှိပါ။ ထုံးကျောက်တောင်များ ချိုင့်ဝှမ်းများသာ ရှိသည်။

သို့သော် သစ်တောအပေါ် အမြင်သက်ရောက်မှုသည် ကြီးမားလိမ့်မည်။

သက်ရောက်မှုများနှင့် ဆန်းစစ်ခြင်းနှင့် လျော့ပါးသက်သာစေမည့် နည်းလမ်းများ

စီမံကိန်း ကာလ ၄ ကာလအတွင်းတွင် တွေ့နိုင်သော သက်ရောက်မှုများကို အစီရင်ခံစာ၏ အခန်း ၆ တွင် အသေးစိတ် ဖော်ပြထားပါသည်။

ဤအစီရင်ခံစာတွင် သက်ရောက်မှုများနှင့် ဆန်းစစ်ခြင်း အတွက် လက်တွေ့ကျသော ချဉ်းကပ်နည်းလမ်းဖြစ်သော နှင့် အန္တရာယ် အဆင့် သတ်မှတ်သည့် IFC ဇယား နှင့် အတူ ကျွမ်းကျင်သူများက အကဲဖြတ်သည့် နည်းလမ်း (ကျွမ်းကျင်သူ သဘောတူ လက်ခံသည့် နည်းလမ်း) ကို အသုံးပြုထားပါသည်။

(ကျွမ်းကျင်သူများက အကဲဖြတ်သည့် နည်းလမ်း သည် မတိကျနိုင်သော်လည်း မမှားနိုင်ပေ။).

<u>အန္တရာယ် အဆင့် အကဲဖြတ်သည့် IFC ဇယား</u>

ဖြစ်နိုင်ခြေ/ဖြစ်တန်စွမ်း x အကျိုးဆက်/ရလဒ် = နောက်ဆုံးရလဒ်

ဖြစ်နိုင်ခြေ (ဖြစ်တန်စွမ်း)	**အကျိုးဆက်**				
	အလွန်နိမ့် (လစ်လျူရှုနိုင်) ၁	**နိမ့် (အသေးအဖွဲ) ၂**	**အလယ်အလတ် (အလယ်အလတ်) ၃**	**မြင့် (အဓိက) ၄**	**အလွန်မြင့် (အလွန်အကျုး) ၅**
သေချာသလောက် နီးပါး (တိကျ) ၅	၅	၁၀	၁၅	၂၀	၂၅
ဖြစ်နိုင်ခြေ မြင့် (ဖြစ်နိုင်) ၄	၄	၈	၁၂	၁၆	၂၀
ဖြစ်နိုင် (အလယ်အလတ်) ၃	၃	၆	၉	၁၂	၁၅
မဖြစ်နိုင် (မဖြစ်နိုင်) ၂	၂	၄	၆	၄	၁၀
ဖြစ်နိုင်ရန် ရှားပါး (အလွန် မဖြစ်နိုင်) ၁	၁	၂	၃	၄	၅

ရလဒ်   : ၁-၂ အလွန်နိမ့်

၈ – ၁၂ အလယ်အလတ်

၁၅ – ၂၅ မြင့်- အလွန်မြင့်

တည်ဆောက်လုပ်ရေးကာလအတွင်းတွင် ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများနှင့် အန္တရာယ်ကို အကဲဖြတ်ခြင်း(IFC ဖယား နှင့် အတူ ကျွမ်းကျင်သူများက အကဲဖြတ်သည့် နည်းလမ်းကို အခြေခံ၍ အရည်အသွေး အကဲဖြတ်ခြင်း)

စဉ်	သက်ရောက်မှု သဘာဝ	အတိုင်းအတာ	ကာလအပိုင်းခြား	သက်ရောက်မှု အဆင့်	အကြိမ် အရေအတွက်	ပြင်းအား	သိသာထင်ရှားမှု	ဖြစ်နိုင်ခြေ	မှတ်ချက်
၁။	ရွှေ့ပြောင်းခြင်း နှင့် ပြင်ဆင်ခြင်း လုပ်ငန်းစဉ်များ	စီမံကိန်းနေရာ	ကာလတို	အဆင့် ၁-၂	OI	L	IS	P	-
၂။	အသွားအလာ အပေါ် သက်ရောက်မှု	လမ်း တစ်လျှောက်	ကာလတို	အဆင့် ၁-၂	S	L	IS	P	-
၃။	ပတ်ဝန်းကျင် လေထု အပေါ် သက်ရောက်မှု	စီမံကိန်းနေရာ	ကာလတို	အဆင့် ၁	OI	L	IS	D	-
၄။	သက်ရောက်မှု- ဆူညံသံ နှင့် တုန်ခါမှု	စီမံကိန်းနေရာ	ကာလတို	အဆင့် ၁	OI	L	IS	D	-
၅။	မြေထု အပေါ် သက်ရောက်မှု	စီမံကိန်းနေရာ	ကာလတို	အဆင့် ၁-၂	OI	L	IS	P	-
၆။	ပတ်ဝန်းကျင် ရေထု အပေါ် သက်ရောက်မှု	မြစ်သာမြစ် တစ်လျှောက်	ကာလတို	အဆင့် ၁	S	L	IS	P	-
၇။	စွန့်ပစ်ပစ္စည်း စွန့်ပစ် ခြင်းကြောင့် သက်ရောက်မှုများ	မြစ်သာမြစ် တစ်လျှောက်	ကာလတို	အဆင့် ၁-၂	S	L	IS	D	-
၈။	ဇီဝမျိုးစိတ် များ အပေါ် သက်ရောက်မှုများ	စီမံကိန်းနေရာ နှင့် ကျော်လွန်၍	ကာလတို	အဆင့် ၃-၄	OI	M-H	IS-Sg	D	-

၉။	ဖြစ်နိုင်ခြေ ရှိသော လူမှု စီးပွားဆိုင်ရာ သက်ရောက်မှုများ	စီမံကိန်းနေရာ နှင့် ကျော်လွန်၍	ကာလတို	အဆင့် ၁	R	L	IS	VIP	-
၁၀။	အရေးပေါ် အခြေအနေနှင့် ကျန်းမာရေး ဝန်ဆောင်မှု ပြင်ဆင်ထားမှု မရှိခြင်းကြောင့် သက်ရောက်မှုများ	စီမံကိန်းနေရာ	ကာလတို	အဆင့် ၁	R	L	IS	VIP	-
၁၁။	သက်ရောက်မှု- ဖြစ်နိုင်ခြေရှိသော လုံခြုံရေး ဆိုင်ရာ ပြဿနာများ	စီမံကိန်းနေရာ	ကာလတို	အဆင့် ၁	R	L	IS	VIP	-
၁၂။	မြင်ကွင်းဆိုင်ရာ သက်ရောက်မှုများ နှင့် အလင်းစူးခြင်း	စီမံကိန်းနေရာ နှင့် ကျော်လွန်၍	ကာလတို	အဆင့် ၁	OI	L	IS	D	-

စီမံကိန်းလည်ပတ်ခြင်း ကာလအတွင်းတွင် ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများနှင့် အန္တရာယ်ကို အကဲဖြတ်ခြင်း(IFC ဇယား နှင့် အတူ ကျွမ်းကျင်သူများက အကဲဖြတ်သည့် နည်းလမ်းကို အခြေခံ၍ အရည်အသွေး အကဲဖြတ်ခြင်း)

စဉ်	သက်ရောက်မှု သဘာဝ	အတိုင်းအတာ	ကာလအပိုင်း ခြား	သက်ရောက်မှု အဆင့်	အကြိမ် အရေအတွက်	ပြင်းအား	သိသာထင် ရှားမှု	ဖြစ်နိုင်ခြေ	မှတ်ချက်
၁။	ပတ်ဝန်းကျင် လေထု အပေါ် သက်ရောက်မှု	စီမံကိန်းနေရာ နှင့် အနီးတစ်ဝိုက်	ကာလရှည်	အဆင့် ၃-၄	OI	M	Sg	D	-
၂။	သက်ရောက်မှု- တူးဖော်ခြင်းမှ ထွက်ရှိသော ပစ္စည်းများ နှင့် မြေစာများ သိုလှောင်ခြင်း	စီမံကိန်းနေရာ	ကာလရှည်	အဆင့် ၃	OI	L-M	Sg	D	-
၃။	သက်ရောက်မှု- သက်မဲ့အရင်းအမြစ် များ ဆုံးရှုံးခြင်း ထုံးကျောက် အစရှိသည်ဖြင့်	စီမံကိန်းနေရာ	ကာလရှည်	အဆင့် ၂-၃	OI	M	Sg	D	-

၄။	သက်ရောက်မှု- ဆူညံသံ နှင့် တုန်ခါမှု	စီမံကိန်းနေရာ	ကာလရှည်	အဆင့် ၃-၄	OI	M	IS-Sg	D	-
၅။	ပတ်ဝန်းကျင် ရေထု အပေါ် သက်ရောက်မှု	စီမံကိန်းနေရာ နှင့် ကျော်လွန်၍	ကာလရှည်	အဆင့် ၃	OI	M	IS-Sg	D	-
၆။	ဇီဝမျိုးစိတ် များ အပေါ် သက်ရောက်မှု များ	စီမံကိန်းနေရာ	ကာလရှည်	အဆင့် ၃	OI	M	Sg	D	-
၇။	စွန့်ပစ်ပစ္စည်း စွန့်ပစ်ခြင်းကြောင့် သက်ရောက်မှုများ	စီမံကိန်းနေရာ	ကာလရှည်	အဆင့် ၂	OI	L-M	IS-Sg	P	-
၈။	အသွားအလာ အပေါ် သက်ရောက်မှု	လမ်း တစ်လျှောက်	ကာလရှည်	အဆင့် ၂	OI	L	IS	P	-
၉။	ဓာတ်အားထောက်ပံ့မှု ကြောင့် နိုင်ငံ လိုအပ်ချက် အပေါ် သက်ရောက်မှု နှင့် အပြန်အလှန်	စီမံကိန်းနေရာ နှင့် ကျော်လွန်၍	ကာလရှည်	အဆင့် ၂	OI	L-M	IS	D	-
၁၀။	သက်ရောက်မှု - အပူနှင့် ထိမိခြင်းနှင့် အခြားသော လုပ်ငန်းခွင် ကျန်းမာရေး အန္တရာယ်များ	စီမံကိန်းနေရာ	ကာလရှည်	အဆင့် ၂-၃	OI	M	IS-Sg	HP	-
၁၁။	ဖြစ်နိုင်ခြေရှိသော လူမှု စီးပွားဆိုင်ရာ သက်ရောက်မှုများ	စီမံကိန်းနေရာ နှင့် ကျော်လွန်၍	ကာလရှည်	အဆင့် ၂	OI	L	IS	R	-
၁၂။	သက်ရောက်မှု- ဖြစ်နိုင်ခြေရှိသော လုံခြုံရေး ဆိုင်ရာ ပြဿနာများ	စီမံကိန်းနေရာ	ကာလရှည်	အဆင့် ၂	OI	L	IS	R	-
၁၃။	သက်ရောက်မှု- လူထုအမြင်	ဒေသလူထု အတွင်း	ကာလရှည်	အဆင့် ၂	OI	L	IS	R	-
၁၄။	သက်ရောက်မှု- မြေအပြောင်းအလဲ များ နှင့် မြေမျက်နှာ သွင်ပြင် ပြောင်းလဲ ခြင်း	စီမံကိန်းနေရာ နှင့် အနီးတစ်ဝိုက်	ကာလရှည်	အဆင့် ၃-၄	OI	M	Sg	D	-

မှတ်ချက်- လျော့ပါးစေရေး နည်းလမ်းများ မလုပ်ဆောင်ခင် နောက်ဆုံးရလဒ်များ ဖြစ်ပါသည်။ အကုန်လုံးနီးပါးအား လျော့ချနိုင်ပါသည်။

ရှင်းလင်းချက်

သက်ရောက်မှု အဆင့်

အဆင့် ၁ = အလွန် နိမ့်/ လစ်လျူရှုနိုင်/ မသိသာ

အဆင့် ၂ = နိမ့်/ အသေးအဖွဲ (ဇီဝမျိုးစိတ်များနှင့် ပတ်ဝန်းကျင်အပေါ် အတိုင်းအတာ တစ်ခု အထိ သက်ရောက်မှု ရှိနိုင်)

အဆင့် ၃ = အလယ်အလတ်/ အလယ်အလတ်

အဆင့် ၄ = မြင့်/ အဓိက (ကာလတိုအတောတွင်း)

အဆင့် ၅ = အလွန်မြင့်/အလွန်အကျုး/ ကပ်ဆိုး (ကာလရှည် အတောတွင်း)

သက်ရောက်နိုင်မှု အကြိမ်ရေ

F = Frequently မကြာခဏ

O = Often ခဏခဏ

OI = Often (isolated case) ခဏခဏ (သီးခြား ကိစ္စ)

S = Seldom ရံဖန်ရံခါ

R = Rarely ရှားပါး

ပြင်းအား

VH = Very high အလွန်မြင့်

H = High မြင့်

M = Medium အလယ်လတ်

L = Low နိမ့်

ဖြစ်တန်စွမ်း

VIP = Very improbable/rare အလွန် မဖြစ်နိုင်/ ဖြစ်နိုင်ရန် ရှားပါး

IP = Improbable/unlikely မဖြစ်နိုင်/ ဖြစ်နိုင်ခြေမရှိ

P = Probable/moderate ဖြစ်နိုင်/ အလယ်လတ်

HP = Highly probable/likely ဖြစ်နိုင်ခြေ မြင့်/ ဖြစ်နိုင်

D = Definite/almost certain တိကျ/ သေချာသလောက်နီးပါး

သိသာထင်ရှားမှု

IS = In-significance မသိသာ

IS-Sg = In-significance to significance မသိသာ-သိသာ

Sg = Significance သိသာ

လျော့ပါးစေသော နည်းလမ်းများ

သက်ရောက်မှု အားလုံး နှင့် တစ်ခုချင်းစီ အတွက် ဆောင်ရွက်ရမည့် လျော့ပါးစေမည့် နည်းလမ်းများကို EIA အစီရင်ခံစာ၏ အခန်း ၆ တွင် နည်းပညာဆိုင်ရာ အသေးစိတ်ဖော်ပြထားပါသည်။ စီမံကိန်း သည် နှစ်ပေါင်းများစွာ လည်ပတ်နေသော လုပ်ငန်း ဖြစ်သောကြောင့် ၎င်း တို့ကို ဤ အကျဉ်းချုပ် အစီရင်ခံစာတွင် ဇယားပုံစံဖြင့် ဖော်ပြထားပါသည်။ အကြိုတည်ဆောက်ရေးကာလကို ရိုးရှင်းစွာ ချန်လှပ်ထားပါသည်။ (မြန်မာနိုင်ငံတွင် ယခုအချိန်အထိ ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုဆိုင်ရာ ကန်ထရိုက် ငှားရမ်းရန် မရှိပါ။ ထို့ကြောင့် လျော့ပါးသက်သာရေး နည်းလမ်းများ နှင့် စောင့်ကြပ်ကြည့်ရှုရေး အလုပ်များကဲ့သို့သော ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဉ်ကို လုပ်ဆောင်ရန်အတွက် လုပ်သားများကို EMP အဖွဲ့ဝင် အဖြစ် သင်ကြားပေးပါသည်။

တည်ဆောက်ခြင်း ကာလအတွင်း တွင်

စဉ်	သက်ရောက်မှုများ	လျော့ချနိုင်မည့် နည်းလမ်းများ	တာဝန်ရှိသူ	ခန့်မှန်းကုန်ကျ စရိတ်
၁။	တည်ဆောက်ခြင်း ကာလ စတင်ခြင်းအတွက် ရွှေ့ပြောင်းခြင်း နှင့် ပြင်ဆင်ခြင်း လုပ်ငန်းစဉ်များ ကြောင့် သက်ရောက်မှုများ	- အသုံးပြုမည့် လမ်း ရေရှည်တည်တံ့ ခိုင်မာသော ဆောက်လုပ်ရေး အတွက် အစီအစဉ် ဆွဲပြီး အကောင်အထည်ဖော်ခြင်း လိုအပ်သည်ထက်ပို၍ အပင်များရှင်းလင်းမှု မပြုလုပ်ခြင်း၊ - မြေသား ဖြတ်ခြင်း ပြန်ဖို့ရခြင်းများ လျော့ချရန်အတွက် ဖြစ်နိုင်လျှင် လမ်းဇရိယာကို ဆင်ခြေလျှောစောင်းများတွင် မဆောက်လုပ်ခြင်း - စက်ရုံနှင့် လုပ်ကွက် ပြင်ဆင်ခြင်းအတွက် လိုအပ်သည် ထက် ပို၍ အပင်များကို ရှင်းလင်းခြင်းများ မပြုလုပ်ခြင်း တတ်နိုင်သမျှ သစ်ပင်ကြီးများ ခုတ်လှဲခြင်းကို တတ်နိုင်သမျှ ရှောင်ရှားခြင်း၊ - ဆောက်လုပ်ရေး ပစ္စည်းများ ပြင်ပသို့ ဖိတ်စင်ခြင်းမှ ကာကွယ်ရန် စီစဉ်ခြင်း - လုပ်ကွက် ကို ခြံစည်းရိုးခတ်ခြင်း - ဆောက်လုပ်ရေး ပစ္စည်းများကို စနစ်တကျ သိုလှောင်သိမ်းဆည်းခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့
၂။	ယာဉ်ကြောပိတ်ဆို့မှုအပေါ် သက်ရောက်မှုများ	- ယာဉ်ကြော စီမံခန့်ခွဲမှု အစီအစဉ် ရေးဆွဲခြင်း - ယာဉ်သွားလာမှု အချိန်ကို အချိန်ဇယားရေးဆွဲခြင်း - ယာဉ်မောင်းများကို အကာအကွယ် ကားမောင်းနည်းကို ပညာပေးခြင်း - ယာဉ်သွားလာမှု အရှိန် သတ်မှတ်ခြင်း - ယာဉ်များ ဝန်ပို မသယ်ခြင်း - သယ်ယူပို့ဆောင်ရေးယာဉ်များကို တာပေါ်လင် အုပ်ခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

၃။	ပတ်ဝန်းကျင် လေထု အပေါ် သက်ရောက်မှု	- ECD မှ ချမှတ်ထားသော NEQEG လမ်းညွှန်ချက်များအတိုင်း လိုက်နာခြင်း၊ - အကြိုတည်ဆောက်ရေး ကာလတွင် မီးခိုးထုတ်လွှတ်မှု နည်းသော ယာဉ်များ စက်ပစ္စည်း ကိရိယာများ (ထုတ်လွှတ်မှု လိုက်နာခြင်းအတွက် အသိအမှတ်ပြုခံရစေရန်) ကို ဝယ်ယူရန် အစီအစဉ် ရေးဆွဲခြင်း - စက်ပစ္စည်းများကိုကောင်းစွာ လည်ပတ်စေရန်၊ ချောမွေ့စေရန် ယာဉ်များ စက်ပစ္စည်း ကိရိယာများ ကို ကောင်းစွာ ထိန်းသိမ်းခြင်း - အမှိုက်များကို ဟင်းလင်းပွင့် မီးပုံရှို့ခြင်းများကို ရှောင်ရှားခြင်း၊ - ဖုန်ထခြင်းအတွက်ရေဖြန်းခြင်း - ယာဉ်သွားလာမှုကို ကန့်သတ်ခြင်း လမ်းကို ရွှံ့များ ဖုန်များ ရှင်းလင်းအောင် ထိန်းသိမ်းခြင်း - သဲများ၊ မြေများ အစရှိသည်တို့ကို ဟင်းလင်းပွင့် ပုံထားခြင်းကို ကန့်သတ်ခြင်း - ဖုန်မှုန့်များ (သို့) မီးခိုးများကို အချိန်အတော်ကြာ ထိတွေ့ရသော လုပ်သားများကို PPE ထောက်ပံ့ခြင်း။ - ဒေသခံလူထုသည် ဖုန်မှုန့်များနှင့် မီးခိုးများ နှင့် ပတ်သက်၍ တိုင်ကြားနိုင်ရန် ဆောင်ရွက်ခြင်း	EMP အဖွဲ့ဝင် ၂၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး နှင့် ငှားရမ်းထားသော ပညာရှင်များ	ကျပ် ၃၀၀,၀၀၀,၀၀၀ (စီမံကိန်း လုပ်ကွက် ၂ ခု ၌ နှစ်ဝက် ပတ်ဝန်းကျင်လေထု အတွက် တစ်ကြိမ် ကုန်ကျစရိတ်)
၄။	ဆူညံသံ နှင့် တုန်ခါမှုကြောင့် သက်ရောက်မှု	- အကြိုတည်ဆောက်ရေး ကာလတွင် ဆူညံသံ ထုတ်လွှတ်မှု နည်းသော ယာဉ်များ စက်ပစ္စည်း ကိရိယာများကို ဝယ်ယူရန် အစီအစဉ် ရေးဆွဲခြင်း - ECD မှ ချမှတ်ထားသော ဆူညံသံအတွက် NEQEG လမ်းညွှန်ချက်များအတိုင်း လိုက်နာခြင်း၊ - silencers နှင့် mufflers တပ်ဆင်ခြင်း - ညအချိန်တွင် တည်ဆောက်ရေး လုပ်ငန်းများ လုပ်ဆောင်ခြင်းမှ ရှောင်ရှားခြင်း၊ - နေ့အချိန်အတွင်းသာ ဆူညံမှု မြင့်သော လုပ်ငန်းစဉ်များကို အချိန်ဇယားရေးဆွဲခြင်း - မြင့်မားသော ဆူညံသံနှင့် အချိန်အတော်ကြာ ထိတွေ့ရသော လုပ်သားများကို PPE ထောက်ပံ့ခြင်း။	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

		- ယာဉ်များ စက်ပစ္စည်း ကိရိယာများ၏ တုန်ခါမှုကို စီမံခန့်ခွဲခြင်း - ဖြစ်နိုင်လျှင် တုန်ခါမှု လျော့ချနိုင်သောအရာများကို တပ်ဆင်ခြင်း - ယာဉ်သွားလာမှု အရှိန် သတ်မှတ်ခြင်း		
၅။	မြေထု အပေါ် သက်ရောက်မှု	- မြေဆီလွှာ စီမံခန့်ခွဲခြင်းနှင့် ထိန်းသိမ်းစောင့်ရှောက်ခြင်းအတွက် အစီအစဉ် ရေးဆွဲခြင်း - မြေလုပ်ငန်းစဉ်များ လုပ်ဆောင်နေစဉ် မြေပေါ်မြေဆီလွှာများကို အခြားမြေသားများ ကျောက်များ နှင့် သီးခြား ခွဲ၍ ပုံခြင်း - လမ်းများကို ထိန်းသိမ်းရန် သို့မဟုတ် အဆောက်အဦများ အတွက် အပေါ်ယံ မြေဆီလွှာကို အသုံးမပြုသင့်ပါ။ - အပေါ်ယံ မြေဆီလွှာကို မြက်ခင်းများ (သို့) သဘာဝအပင်များ ရှင်သန်ကြီးထွားရန် နှင့် တိုက်စားခြင်းမှ ကာကွယ်ရန်အတွက် အသုံးပြုသင့်သည်။ - ပြန်လည်ထူထောင်ရေး ကာလတွင် အပေါ်ယံ မြေဆီလွှာ အပင်များ၏ သဘာဝအတိုင်း ရှင်သန်ကြီးထွားမှုကို မြှင့်တင်ရန် ထိရောက်စွာ အသုံးပြုသင့်သည်။ - ဆီ ဖိတ်စင်ခြင်း ကို ချက်ချင်းရှင်းလင်းခြင်း ရေဆေးခြင်း မပြုလုပ်ဘဲ စုပ်ယူနိုင်သည့် ဖော့ သို့မဟုတ် လွှစာ အသုံးပြုခြင်း - လောင်စာဆီ ဖိတ်စင်ခြင်း ကြောင့် မြေညစ်ညမ်းမှုကို ကာကွယ်ရန် အတွက် ယာဉ်များ စက်ပစ္စည်း ကိရိယာများကို ကောင်းစွာ ထိန်းသိမ်းခြင်း - တည်ဆောက်ရေး လုပ်ငန်းများ မှ ထွက်ရှိသော စွန့်ပစ်ပစ္စည်းများ (မြေများ၊ ကျောက်များ၊) ကို သတ်မှတ်နေရာများတွင် သေချာစွာ စွန့်ပစ်သင့်သည်။ - လုပ်ကွက်မှ ထွက်ရှိသော စွန့်ပစ်ပစ္စည်းများနှင့် စွန့်ပစ်ရည်များကို သတ်မှတ်နေရာများတွင် သေချာစွာ စွန့်ပစ်သင့်သည်။ - လုပ်သားများကို အလေ့အကျင့်ကောင်းများကို သင်ကြားလေ့ကျင့်ပေးခြင်း၊ အမှိုက်မပစ်ခြင်း၊ ဧရိယာကို မညစ်ညမ်းစေခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

၆။	ပတ်ဝန်းကျင် ရေထု အပေါ် သက်ရောက်မှု (က) မြေပေါ်ရေ	- လမ်းများ ဖောက်ခြင်း တည်ဆောက်ခြင်းအတွက် ရေထုနှင့် ဝေးနိုင်သမျှ ဝေးဝေးတွင် ဆောင်ရွက်ခြင်း - လုပ်ကွက်မှ သစ်ပင်များကို ဖယ်ရှားရှင်းလင်းသည့်အခါ လုပ်ကွက်ရှင်းလင်းခြင်းမှ မြေပေါ်ရေ စီးဆင်းမှုအပေါ် သက်ရောက်မှုကို ကန့်သတ်ရန်အတွက် အပေါ်ယံမြေဆီလွှာ ကို ဦးဆုံးဖယ်ရှားခြင်း - သိုလှောင်ထားသော လောင်စာ အသုံးပြုပြီးသော ဆီများကို မဖယ်ရှားမချင်း သတ်မှတ်ထားသော နေရာတွင် ခြံခတ်ထားခြင်း - မြေပေါ်ရေ ညစ်ညမ်းမှုကို ဖြစ်စေသော ဖိတ်စင်ခြင်းကို ကာကွယ်ရန်အတွက် ယာဥ်များ စက်ပစ္စည်း ကိရိယာများကို ကောင်းစွာ ထိန်းသိမ်းခြင်း - လောင်စာဆီ ကိုင်တွယ်ရာတွင် မြေပေါ်ရေထဲသို့ မတော်တဆ ဖိတ်စင်ခြင်းမဖြစ်စေရန် ဆောင်ရွက်ခြင်း၊ ဖိတ်စင်မှုများရှိပါက သင့်တော်သော နည်းလမ်းဖြင့် ချက်ချင်း ဆောင်ရွက်ခြင်း၊ - ရေထဲသို့ စွန့်ပစ်ပစ္စည်းများ (အစိုင်အခဲ နှင့် စွန့်ပစ်ရည်များ) ကို စွန့်ပစ်ခြင်းမှ ရှောင်ရှားခြင်း။ - ရေထုညစ်ညမ်းခြင်းများကို တတ်နိုင်သမျှ နည်းလမ်းအားလုံးဖြင့်ရှောင်ရှားခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့
	(ခ) မြေအောက်ရေ	- မြေဆီလွှာညစ်ညမ်းခြင်းမှ တဖြေးဖြေး မြေအောက်ရေ ညစ်ညမ်းခြင်းကို ကာကွယ်ရန် စီမံခန့်ခွဲခြင်းနှင့် အစီအစဉ် ရေးဆွဲခြင်း - မြေဆီလွှာ(ထို့နောက် မြေအောက်ရေ) ကို ဟိုက်ဒရို ကာဗွန်မှ ကာကွယ်ရန်အတွက် လောင်စာဆီ သိုလှောင်သည့် ဖူးခွံများကို သိုလှောင်ခြင်းနှင့် သတ်မှတ်ထားသော နေရာတွင် ခြံခတ်ထားခြင်း - လောင်စာဆီနှင့် ချောဆီအတွက်လည်း အတူတူ လုပ်ဆောင်သင့်သည်။ - ဖိတ်စင်ခြင်းကြောင့် မြေအောက်ရေ ညစ်ညမ်းမှုကို ကာကွယ်ရန်အတွက် ယာဥ်များ စက်ပစ္စည်း ကိရိယာများကို ကောင်းစွာ ထိန်းသိမ်းခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

		- လောင်စာဆီ ကိုင်တွယ်ရာတွင် ဖိတ်စင်ခြင်းမဖြစ်စေရန် ဆောင်ရွက်ခြင်း၊ - ဖိတ်စင်မှုများရှိပါက သင့်တော်သော နည်းလမ်းဖြင့် ချက်ချင်း ဆောင်ရွက်ခြင်း ရေဆေးခြင်း မပြုလုပ်ဘဲ စုပ်ယူနိုင်သည့် ဖော့ သို့မဟုတ် လွှစာ အသုံးပြုခြင်း - မြေအောက်ရေကို တဖြေးဖြေး ညစ်ညမ်းခြင်းမှ ကာကွယ်ရန်အတွက် ယာယီအိမ်သာများကို စီမံခန့်ခွဲခြင်းအတွက် အစီအစဉ် ရေးဆွဲခြင်း၊ အိမ်သာထဲသို့ သဲများ ပြာများကို အခါအားလျော်စွာ ဖြန့်ပေးခြင်း		
၇။	စွန့်ပစ်ပစ္စည်းများကြောင့် သက်ရောက်မှုများ	- စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲခြင်းအတွက် အစီအစဉ် ရေးဆွဲခြင်း - ပြဌာန်းထားသော လိုအပ်ချက်များကို ဖြည့် ဆည်းရန် စီမံခြင်း - အမှိုက်များကို ဟင်းလင်းပွင့် မီးပုံရှို့ခြင်းများကို ရှောင်ရှားခြင်း၊ - မြေကို ပုံမှန်ရှင်းလင်းခြင်း၊ သတ်မှတ် အမှိုက်ပုံများတွင် အမှိုက်သေချာ စွန့်ပစ်ခြင်း - လုပ်သားများကို အလေ့အကျင့်ကောင်းများကို သင်ကြားလေ့ကျင့်ပေးခြင်း၊ အမှိုက်မပစ်ခြင်း၊ - စွန့်ပစ်ပစ္စည်း လျှော့ချခြင်းအတွက် လုပ်သားများကို သင်ကြားပေးခြင်း၊ - ဆောက်လုပ်ရေး အဆင့် အဆုံးတွင် ဆောက်လုပ်ရေး ပစ္စည်းများကို ရှောင်းချရန် စီစဉ်ခြင်း - လောင်စာဆီ ကိုင်တွယ်ရာတွင် ဖိတ်စင်ခြင်းမဖြစ်စေရန် ဆောင်ရွက်ခြင်း၊ - ဖိတ်စင်မှုများရှိပါက စုပ်ယူနိုင်သည့် ဖော့ သို့မဟုတ် လွှစာ အသုံးပြု၍ ချက်ချင်း ဆောင်ရွက်ခြင်း (ရေဖြင့်ဆေးမချခြင်း) - လုပ်သမားအိမ်ယာများ အတွက် ယာယီ အိမ်သာများကို စီမံခန့်ခွဲခြင်းအတွက် အစီအစဉ် ရေးဆွဲခြင်း၊ အိမ်သာထဲသို့ သဲများ ပြာများကို အခါအားလျော်စွာ ဖြန့်ပေးခြင်း၊ တည်ဆောက်ရေး ကာလ ပြီးဆုံးသွားသည့်အခါ အိမ်သာများကို ပြန်လည် ဖို့ထားခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

၈။	ဇီဝမျိုးစုံ မျိုးကွဲအပေါ် သက်ရောက်မှု (ဇီဂမျိုးစုံမျိုးကွဲ) (က) အပင်	- တတ်နိုင်သမျှ သစ်ပင်များ ထိန်းသိမ်းခြင်းနှင့်စောင့်ရှောက်ခြင်းအတွက် စီမံခန့်ခွဲခြင်းနှင့် အစီအစဉ် ရေးဆွဲခြင်း - လမ်းများနှင့် မိုင်းလုပ်ကွက် ဆောက်လုပ်ခြင်းအတွက် လိုအပ်သည်ထက် သစ်ပင်များကို ခုတ်ထွင် ရှင်းလင်းမှုများကို ရှောင်ရှားခြင်း၊ - အပင်များ အပေါ် အထူးသဖြင့် အမြစ် ဖွဲ့စည်းပုံ အပေါ် ဆိုးကျိုးသက်ရောက်စေသော hydrocarbons ဖိတ်စင်ခြင်းကို ရှောင်ရှားခြင်း - မြက်ပင်များ မြေကပ်ပင်များ နှင့် အပင်ငယ်များ အပေါ် သက်ရောက်မှု မရှိစေရန် ယာဉ်သွားလာမှုကို ကန့်သတ်ခြင်း၊ - လောင်စာထင်း စုဆောင်းမှုကို ကန့်သတ်ခြင်း - အမှိုက်များကို ဟင်းလင်းပွင့် မီးပုံရှို့ခြင်းများကို ရှောင်ရှားခြင်း၊ - မီးဘေး အသိပညာနှင့် ကာကွယ်မှု အတွက် အလုပ်သမားများကို ပညာပေးခြင်း - အထိခိုက် မခံနိုင်သော မျိုးစိတ်များ နှင့် နေရင်းဒေသများကို ရှာဖွေပြီး ၎င်း နေရာများကို တတ်နိုင်သမျှ ရှောင်ကြဉ်ခြင်း - လုပ်သားများအား သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ အသိပညာပေးခြင်း - လုပ်ကွက်တွင် တည်ဆောက်ရေး လုပ်ငန်းများ ပြီးဆုံးသည့်အခါ သဘာဝအပင်များကို ပြန်လည် စိုက်ပျိုးခြင်းနှင့်ပြန်လည်ထူထောင်ရေးများကို အကောင်အထည်ဖော်ခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့
	(ခ) တိရစ္ဆာန်များ	- တတ်နိုင်သမျှ တောရိုင်းတိရစ္ဆာန်များ ထိန်းသိမ်းခြင်းနှင့်စောင့်ရှောက်ခြင်းအတွက် စီမံခန့်ခွဲခြင်းနှင့် အစီအစဉ် ရေးဆွဲခြင်း - တူးဖော်ခြင်းလုပ်ငန်းများသည် တောရိုင်း တိရစ္ဆာန်များ အပေါ် သက်ရောက်မှု အနည်းဆုံးဖြစ်စေရန် သေချာစေခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

		- ငှက်များ တိရစ္ဆာန်များ၏ နေရင်းဒေသများ အပေါ် သက်ရောက်မှု ဖြစ်စေသော ယာဉ်သွားလာမှုကို ကန့်သတ်ခြင်း၊ - တောရိုင်းတိရစ္ဆာန်များကို ဖမ်းခြင်း နှင့်/သို့မဟုတ် တောလိုက်ခြင်းကို တားမြစ်ခြင်း - ညအချိန်တွင် ယာဉ်များ သွားလာခြင်းကြောင့် ဖြစ်ပေါ်နိုင်သော တောရိုင်းတိရစ္ဆာန်များ ထိခိုက်ခြင်း (သို့) သေဆုံးခြင်းကို ကာကွယ်ခြင်း - အင်းဆက်များစွာ သေဆုံးခြင်းကို ကာကွယ်ရန် ညအချိန်တွင် တောက်ပသော အလင်းရောင်ကို အချိန်ကြာ အသုံးပြုခြင်းကို ရှောင်ကြဉ်ခြင်း (ညအချိန် တောထဲတွင် တောက်ပသော အလင်းရောင်သည် တောရိုင်းတိရစ္ဆာန်များ၏ သဘာဝကျက်စားရာနေရာများ (သို့) ပေါက်ဖွားရာနေရာများကို ကြောက်ရွံ့စေသည်) - ရှောင်ရှားရန် လိုအပ်သည့် အထိခိုက် မခံနိုင်သော မျိုးစိတ်များကို ရှာဖွေခြင်း၊ နှင့် အသိုက်နှင့် ပေါက်ဖွားရာနေရများ ဖြစ်သော တောရိုင်း တိရစ္ဆာန်များ၏ နေရင်းဒေသများ ကို တတ်နိုင်သမျှ ရှောင်ကြဉ်ခြင်း		
၉။	ဒေသခံများ အပေါ် လူမှုစီးပွားဆိုင်ရာ သက်ရောက်မှုများ	- ဒေသခံများ၏ လူမှု စီးပွားအပေါ်နှင့် ကုမ္ပဏီ လုပ်သားများ အပေါ်တွင်လည်း ဆိုးကျိုးသက်ရောက်မှုများကို ရှောင်ကြဉ်ရန် (သို့) လျှော့ချရန် အစီအစဉ် ရေးဆွဲခြင်း - ယာဉ်များ သွားလာခြင်း (သို့) တူးဖော်ခြင်း လုပ်ငန်းများမှ ဖုန်မှုန့်များထုတ်လွှတ်သည့်အခါ ဖုန်မှုန့်များကို တတ်နိုင်သမျှ လျော့ချခြင်း (ရေဖြန်းခြင်း) ရွာများအနီးတွင် ယာဉ်သွားလာမှု အရှိန် လျော့ချခြင်း - ဒေသခံများနှင့် အိမ်မွေး တိရစ္ဆာန်များ၏ လုံခြုံမှု အတွက် မတော်တဆ မှု မဖြစ်စေရန် ထိန်းသိမ်းထားရန် ယာဉ်မောင်းများကို အကာအကွယ် ကားမောင်းနည်းကို ပညာပေးခြင်း - ဒေသခံများ၏ ရေသောက်အရင်းအမြစ် ညစ်ညမ်းမှု ဖြစ်စေခြင်းမှ ရှောင်ကြဉ်ခြင်း - လူထုနှင့် ကောင်းမွန်သော ဆက်ဆံရေးကို တည်ဆောက်ခြင်း၊	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

		- စီမံကိန်းအပေါ် ဒေသခံများ၏ အကောင်းမြင်ခြင်းများ ရရှိစေရန် လူထုတွေ့ဆုံဆွေးနွေးပွဲများ ပြုလုပ်ခြင်း - ဒေသခံများနှင့် ဆက်ဆံရသည့်အခါ ၎င်းတို့၏ ယဉ်ကျေးမှု နှင့် အစဉ်အလာကို လေးစားရန် အစရှိသော သင့်တော်သည့် အမူအကျင့်များ ပြုကျင့်ရန် လုပ်သားများကို ပညာပေးခြင်း - လူမှုရေးအလေ့အကျင့်ဆိုးများ၊ ကိုယ်ကျင့်တရားဖောက်ပြန်ခြင်းများအတွက် စီမံခန့်ခွဲမှု အစီအစဉ် ရေးဆွဲခြင်း - အမှားလုပ်သူများအား ဆိုင်းငံ့ခြင်း ကဲ့သို့သော အပြစ်ပေးအရေးယူမှုကို ကျင့်သုံးခြင်း - အလုပ်ချိန်တွင် အရက်သောက်ခြင်းကို တင်းကြပ်စွာ တားမြစ်ခြင်း၊ လုပ်သားများကြား မူးယစ်ဆေးဝါးသုံးစွဲမှုကို လုံးဝ တားမြစ်ခြင်း - အမှန်တကယ် တူးဖော်ခြင်းလုပ်ငန်းများ လုပ်ဆောင်သည့်အခါ ရပ်ရွာလူထုအကူအညီ နှင့် ဖွံ့ဖြိုးမှု (CSR) ကို လုပ်ဆောင်ရန် ထည့်သွင်းစဉ်းစားခြင်း - ဒေသခံလူထုသည် လူမှု စီးပွားဘဝ အပေါ် မည်သည့် သက်ရောက်မှု နှင့် မဆို ပတ်သက်၍ တိုင်ကြားနိုင်ရန် ဆောင်ရွက်ခြင်း		
၁၀။	အရေးပေါ် အခြေအနေနှင့် ကျန်းမာရေး ဝန်ဆောင်မှု (ဆေးရုံ) ပြင်ဆင်ထားမှု မရှိခြင်းကြောင့် သက်ရောက်မှုများ	- အရေးပေါ် အခြေအနေ လုပ်ငန်းစဉ်များအတွက် ဂရုတစိုက် အစီအစဉ် ရေးဆွဲခြင်း (စီမံကိန်းလည်ပတ်ခြင်းကာလတွင် မဖြစ်မနေ ဆက်လက်လုပ်ဆောင်သင့်) - အရေးပေါ်နှင့် မီးငြိမ်းသတ်ရေး လေ့ကျင့်မှုများ နှင့် ရှေးဦးသူနာပြုသင်တန်းများကို ဖွဲ့စည်းပေးခြင်းနှင့် ထောက်ပံ့ပေးခြင်း၊ - ရှေးဦးသူနာပြုပစ္စည်းများနှင့် မီးသတ်ဆေးဘူးများကို လုံလောက်စွာ ထောက်ပံ့ပေးခြင်း၊ မီးငြိမ်းသတ်ရေး အတွက် ရေကန်တွင် ရေအပြည့်အမြဲတမ်း ဖြည့်ထားခြင်း - အရေးပေါ် တုံ့ပြန်မှုအတွက် လေ့ကျင်ပေးခြင်းများ ပြုလုပ်ပေးခြင်း - ကြက်ခြေနီ အသင်းများ၊ လူနာတင်ယာဉ်၊ မီးသတ်၊ ရဲစခန်း နှင့် သာစည် ဆေးရုံ အစရှိသည်တို့၏ ဖုန်းနံပါတ်များ နှင့် လိပ်စာများကို လူတိုင်းမြင်နိုင်သည့် နေရာတွင် ကပ်ထားခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

		- အလုပ်လုပ်သည့်နေရာ (မိုင်းတူးဖော်ခြင်း) လုပ်ကွက် နှင့် ဆပ်စပ်နေရာများ ဥပမာ ကြိတ်ခွဲသည့်နေရာ၊ ကြိတ်စက်များ ဇကာနေရာများ နှင့် သိုလှောင်ရုံများ) ကို ဘေးကင်းလုံခြုံသည့် အခြေအနေကို ဖန်တီးပေးခြင်း - လုပ်သားများကို ကောင်းမွန်သော အလုပ်လုပ်ခြင်း အလေ့ကျင့်ကောင်းများ၊ ကောင်းမွန်သော အင်ဂျင်နီယာ အလေ့ကျင့်ကောင်းများ နှင့် ကောင်းမွန်သော အိမ်တွင်း အလေ့ကျင့်ကောင်းများကို သင်ကြား လေ့ကျင့်ပေးခြင်း၊ ၎င်း အလေ့အကျင့်ကောင်းများကို လေ့ကျင့်ပေးခြင်းသည် အလုပ်သမားများ၏ စိတ်ထဲတွင် စွဲနေစေရန် ဖြစ်သည်။ - အလုပ်နေရာတွင် မတော်တဆ မှု လုံးဝမဖြစ်စေရန် ကာကွယ်ခြင်းနှင့် ရှောင်ရှားခြင်း - ကျန်းမာရေး အသိပညာနှင့် သန့်ရှင်းရေး အတွက် ပညာပေးခြင်း နှင့် လေ့ကျင့်ပေးခြင်း		
၁၁။	သက်ရောက်မှု- ဖြစ်နိုင်ခြေရှိသော လုံခြုံရေး ဆိုင်ရာ ပြဿနာများ	- လုံခြုံရေး စီမံခန့်ခွဲမှု အစီအစဉ် ရေးဆွဲခြင်း - ဝန်းတံခါးများကို ထိရောက်စွာ ကာရံထားခြင်း - ဝင်ပေါက်အားလုံးကို ထိန်းချုပ်ထားခြင် လုံခြုံရေး တံခါးများ၊ လုံလောက်သော လုံခြုံရေးကို ထားရှိခြင်း - ကြိုတင်ခွင့်ပြုချက် မရှိဘဲ လုပ်သားများ (ဆောက်လုပ်ရေး လုပ်သား အများစု) ကို အနီးဝန်းကျင်ရွာများကို ဝင်ခွင့်မပေးခြင်း၊ လုပ်သားများကို ဒေသခံများ နှင့် လွတ်လွတ်လပ်လပ် မရောနှောစေခြင်း - ဖြစ်နိုင်လျှင် တည်ဆောက်ရေး ပစ္စည်းများကို သော့ခတ်သိမ်းဆည်းခြင်း - ဆောက်လုပ်ရေး ကန်ထရိုက်တာများကို လုပ်သားများကို စည်းကမ်းပေးရန် တောင်းဆိုခြင်း - လိုအပ်လျှင် လုပ်သားများကို ဆိုင်းငံ့ခြင်း (သို့)ရပ်နားခြင်း ကဲ့သို့သော အပြစ်ပေးအရေးယူမှုကို ကျင့်သုံးခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

၁၂။	မြင်ကွင်းဆိုင်ရာ သက်ရောက်မှုများ နှင့် အလင်းစူးခြင်း	- အမြင်အာရုံ ဆွဲဆောင်မှုကို အဓိကထားသည့် စက်ရုံ နှင့် အဆောက်အအုံများ တည်ဆောက်ရေးကို အစီအစဉ် ရေးဆွဲပြီး အကောင်အထည်ဖော်ခြင်း - သင့်တော်သော ပစ္စည်းကိုရွေးချယ်ခြင်း - သင့်တော်သော ဖွဲ့စည်းပုံ၊ ဆေးသုတ်မည့် အရောင် နှင့် နောက်ခံ အခြေအနေကို ရွေးချယ်ခြင်း - ဆောက်လုပ်ရေး လုပ်ငန်းများ ပြီးဆုံးသည့်အခါ ကြီးထွားနှုန်း မြန်သော အပင်များ စိုက်ပျိုးခြင်းနှင့် စိမ်းလန်း ဇရိယာ ဖန်တီးခြင်း - စိမ်းလန်းသော မြက်ခင်းများ စိမ်းလန်းရှုခင်းများကို လည်း ဖန်တီးခြင်း၊ လှပသော ပန်းပင်များ၊ အလှအပင်များကို စိုက်ပျိုးခြင်း - လုံခြုံရေးအတွက်သာ အလင်းရောင်ကို သုံးစွဲခြင်း - ညအချိန်တွင် တောက်ပသော အလင်းရောင်များ စူးရှသော အလင်းရောင်များကို အသုံးပြုခြင်းကို ရှောင်ကြဉ်ခြင်း - အင်းဆက်များစွာ သေဆုံးနိုင်၊ ထိခိုက်နိုင်သော အဖြူရောင် အလင်းရောင်ကို အသုံးပြုခြင်းကို ရှောင်ကြဉ်ခြင်း (အဝါရောင် မီး အလင်းရောင်ကို အသုံးပြုခြင်း) - မီးတိုင်များတွင် မီးသီး မီးလုံးများကို တိုက်ရိုက်မတပ်ဆင်ခြင်း (အနီးနားဝန်းကျင်ရှိ တောရိုင်း တိရစ္ဆာန်များကို အနှောက်အယှက်ဖြစ်လျှင်) မီးအိမ်ကိုထားခြင်း (မီးတိုင်တွင် မီးလုံးအစောင်းထားခြင်း)	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

စီမံကိန်းလည်ပတ်ခြင်းကာလအတွင်းတွင်

စဉ်	သက်ရောက်မှုများ	လျော့ချနိုင်မည့် နည်းလမ်းများ	တာဝန်ရှိသူ	ခန့်မှန်းကုန်ကျ စရိတ်
၁။	ပတ်ဝန်းကျင် လေထု အပေါ် သက်ရောက်မှု	- ကာလရှည် စီမံကိန်း လည်ပတ်ခြင်းကာလအတွက် လေအရည်အသွေး စီမံခန့်ခွဲခြင်း အတွက် အစီအစဉ် ရေးဆွဲခြင်း - ECD မှ ချမှတ်ထားသော ဆူညံသံအတွက် NEQEG လမ်းညွှန်ချက်များအတိုင်း လိုက်နာခြင်း၊ - လိုအပ်သည်ထက်ပို၍ အပင်များရှင်းလင်းမှု မပြုလုပ်ခြင်း၊ မြေလွတ် အတိုင်း ထားရှိခြင်း - လေတိုက်ခြင်းကြောင့် ဖုန်ထခြင်းကို ကာကွယ်ရန် မြေနေရာအားလုံးကို ကျစ်လစ်စေရန် လုပ်ဆောင်ခြင်း - တူးဖော်သည့်နေရာများတွင် ဖုန်စုပ်စက်နှင့် စစ်ထုတ်သည့် အိတ်များကို တပ်ဆင်ခြင်း (သို့) အစို တူးဖော်ခြင်း။ - ဖုန်ထခြင်းအတွက်ရေလုံလုံလောက်လောက် ဖြန်းခြင်း - ဖုန်ထခြင်းကို လျော့ချရန် အတွက် ယာဉ်သွားလာမှု အရှိန် သတ်မှတ်ခြင်း - ယာဉ်သွားလာမှုကို ကန့်သတ်ခြင်း လမ်းကို ရွံ့များ ဖုန်များ ရှင်းလင်းအောင် ထိန်းသိမ်းခြင်း - သဲများ၊ မြေများ အစရှိသည်တို့ကို ဟင်းလင်းပွင့် ပုံထားခြင်းကို ကန့်သတ်ခြင်း - အမှိုက်များ (သို့) အစိုင်အခဲ စွန့်ပစ်ပစ္စည်းများကို ဟင်းလင်းပွင့် မီးပုံရှို့ခြင်းများကို ရှောင်ရှားခြင်း၊ - မီးခိုးထုတ်လွှတ်မှု လျှော့ချရန်အတွက် ယာဉ်များ စက်ပစ္စည်း ကိရိယာများ ကို ကောင်းစွာ ထိန်းသိမ်းခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး နှင့် ငှားရမ်းထားသော ပညာရှင်များ	ကျပ် ၇၅,၀၀၀,၀၀၀ (စီမံကိန်း လုပ်ကွက် ၅ ခု ၌ နှစ်ဝက် ပတ်ဝန်းကျင်လေထု အတွက် တစ်ကြိမ် ကုန်ကျစရိတ်)

		- အမှုန်အမွှားလျှော့ချရန်အတွက် စစ်ထုတ်သည့် အိတ်များနှင့် electrostatic precipitator (ESP) များကို တပ်ဆင်ခြင်း (ကုမ္ပဏီသည် လုပ်ဆောင်ပြီး) - ပြာများ ဘိလပ်မြေအမှုန်များကို သေချာစွာ စုထားပြီး သတ်မှတ်နေရာများတွင် စွန့်ပစ်ခြင်း - Clinker ရှိ conveyer line များတွင် အမှုန်အမွှား ထွက်ရှိခြင်း (ဘိလပ်မြေအမှုန်များ၊ Clinker အမှုန်များ) ကို လျှော့ချရန်အတွက် နှင့် ဘိလပ်မြေထုတ်ပိုးခြင်းဌာန နှင့် ဘိလပ်မြေ သိမ်းဆည်းခြင်းနှင့် သယ်ယူခြင်းများ (တာပေါ်လင် အုပ်ခြင်း) အတွက်လည်း တတ်နိုင်သမျှနည်းလမ်း အားလုံးဖြင့် လျှော့ချခြင်း - ဖုန်မှုန့်များ (သို့) မီးခိုးများကို အချိန်အတော်ကြာ ထိတွေ့ရသော လုပ်သားများကို PPE ထောက်ပံ့ခြင်း(ဥပမာ မျက်နှာဖုံး၊ နားခေါင်း နှင့် ပါးစပ်အကာ၊ ဓာတ်ငွေ့ မျက်နှာဖုံး) လည်ပတ်သူများအတွက် လေအေးပေးစက်ပါသော excavator တပ်ဆင်ခြင်း		
၂။	သက်ရောက်မှု- တူးဖော်ခြင်းမှ ထွက်ရှိသော ပစ္စည်းများ၊ မြေစာပုံများ နှင့် မြေဆီလွှာ သိုလှောင်ခြင်း	- ထွက်ရှိသော ထုံးကျောက်များ၊ မြေစာပုံများ နှင့် မြေဆီလွှာ စနစ်တကျ သိုလှောင်ခြင်း အတွက် ထိရောက်သော လေအရည်အသွေး စီမံခန့်ခွဲခြင်း အတွက် အစီအစဉ် ရေးဆွဲခြင်း - သိုလှောင်ခြင်းအတွက် လိုအပ်သည်ထက်ပို၍ အပင်များရှင်းလင်းမှု မပြုလုပ်ခြင်း၊ - မြေဆီလွှာနှင့် မြေစာပုံများကို သီးခြားထားရှိခြင်း - မြေဆီလွှာနှင့် မြေစာပုံ သိုလှောင်ခြင်းအတွက် ယိုဖိတ်ခြင်း မရှိ လျှောတိုက်ခြင်း မရှိ၊ တိုက်စားခြင်း မရှိ၊ သဘာဝ ရေနုတ်မြောင်းစနစ်အား ပိတ်ဆို့ထားခြင်း မရှိ၊ စမ်းချောင်းများ၊ စိုက်ပျိုးမြေများနှင့် ကျေးရွာများ အတွင်းသို့ ဝင်ရောက်ခြင်းမရှိ စေရန် စီမံခန့်ခွဲခြင်း - အမိုက်ပုံအဖြစ် ဆင်ခြေလျှောကို မည့်သည့်အခါမှ မရွေးပါနှင့် တည်ငြိမ်စေရန်အတွက် လျှောစောက်၏ အဆင့်ကို ဦးစွာသတ်မှတ်ပါ။ - မြေဆီလွှာနှင့် မြေစာပုံ သိုလှောင်ခြင်းသည် ထိရောက်သော တည်ငြိမ်စေခြင်းအတွက် အနည်းဆုံးလျှောစောက်၏ အဆင့်မှာ ၃၇ ဒီဂရီထက် မပိုရပါ။	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

		- ဇီဝဗေဒနည်းအရ တည်ငြိမ်စေခြင်းအတွက် မြက်များ (သို့) ပျိုးပင်များကို မြေစာပုံတွင် ပေါက်ရောက်စေခြင်း (မြေစာပုံပေါ်တွင် မြေဆီလွှာ အလွှာပါး ဖြန့်ထားခြင်း) - တိုက်စားခြင်း၊ မြေပြိုခြင်းကို ရပ်တန့်စေရန်အတွက် ထိန်းထားသည့် နံရံကို တည်ဆောက်ခြင်း၊ စိုစွတ်သောရာသီတွင် ရေများ စီးဆင်းသွားစေရန်အတွက် နံရံကို အပေါက်ဖော်ထားခြင်း - အသေးစား ရေလှောင်ကန်၊ အနည်စုကန်နှင့် မြောင်းများ တည်ဆောက်ခြင်းဖြင့် မြေစာပုံ နှင့် မြေဆီလွှာ တိုက်စားခံရခြင်းကို ထိန်းသိမ်းခြင်း		
၃။	သက်မဲ့အရင်းအမြစ် များ ဆုံးရှုံးခြင်း ဥပမာ ထုံးကျောက်၊ ရွှံ့စေး၊ laterite	- ကာလရှည် ထုံးကျောက်၊ ရွှံ့စေး၊ laterite တူးဖော်ခြင်းအတွက် အစီအစဉ် ရေးဆွဲခြင်း - သတ္တုတူးဖော်ရေး အင်ဂျင်နီယာများသည် တွင်းထွက်သည့်နေရာ (သို့မဟုတ်) ဧရိယာအား စနစ်တကျ နှင့်ထိရောက်သော တူးဖော်ခြင်း အတွက် အစီအစဉ် ရေးဆွဲခြင်း - တောင်တစ်ခုလုံးသည် ထုံးကျောက်ဖြစ်သည်ဟုယူဆလျှင် တစ်ပိုင်းပြီး တစ်ပိုင်း စနစ်တကျ တူးဖော်ခြင်းကို လုပ်ဆောင်ခြင်း - အလွန်အကျွံတူးဖော်ခြင်းကို ရှောင်ရှားခြင်း (လိုအပ်သည်ထက်) သဘာဝအရင်းအမြစ်များ ကို ထိန်းသိမ်းခြင်း - ထုတ်လုပ်သည့် ပမာဏကို လစဉ်နှင့် နှစ်စဉ် နှုန်းဖြင့် စစ်ဆေးခြင်း နှင့် တွက်ချက်ခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့
၄။	ဆူညံသံ နှင့် တုန်ခါမှု ကြောင့် သက်ရောက်မှု	- ECD မှ ချမှတ်ထားသော ဆူညံသံအတွက် NEQEG လမ်းညွှန်ချက်များအတိုင်း လိုက်နာခြင်း၊ - ယာဉ်ကြီးများ သွားလာမှု နှင့် စက်ပစ္စည်း ကိရိယာကြီးများ၏ ရွေ့လျားမှုများကို ကန့်သတ်ခြင်း - ဆူညံသံ ထုတ်လွှတ်မှု နည်းသော ယာဉ်များ စက်ပစ္စည်း ကိရိယာများကို သင့်တော်သော ရွေးချယ်မှု ပြုလုပ်ရန် အစီအစဉ် ရေးဆွဲခြင်း၊ အလုပ်လုပ်ပုံ နှင့် ထိရောက်သော စက်ပစ္စည်းကိုင်တွယ်ခြင်း နည်းလမ်းများ	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး နှင့် ငှားရမ်းထားသော	ကျပ် ၃၅၀,၀၀၀ (စီမံကိန်း လုပ်ကွက် ၄ ခု ၌ နှစ်ဝက် တစ်ကြိမ် ကုန်ကျစရိတ်)

		- ဆူညံသံ ကို လျှော့ချနိုင်သောအရာများ ဥပမာ လေအ၀င်နှင့် ပန်ကာများနှင့် compressor များ၏ အထွက်နေရာများတွင် silencers နှင့် mufflers ကို တပ်ဆင်ခြင်း၊ ဒီဇိုင်းကို သုံးသပ်၍ ဆူညံသော နေရာအရင်းအမြစ်များကို အဝေးတွင် ထားပါ။ - ဆူညံသံ အနိမ့်နှင့် မလိုအပ်သော ဆူညံသံကို ကာကွယ်ရန် အတွက် ယာဥ်များ စက်ပစ္စည်း ကိရိယာများကို ကောင်းစွာ လည်ပတ်စေခြင်း၊ ကောင်းစွာ ထိန်းသိမ်းခြင်း - ဆူညံသံကို လျှော့ချရန်အတွက် ယာဥ်၊ စက်ပစ္စည်း ကိရိယာအဟောင်းများကို အသေးစား ဒီဇိုင်းပြောင်းလဲခြင်းများကို ပြုလုပ်ခြင်း - စီမံကိန်း ဧရိယာဝန်းကျင်တွင် စိမ်းလန်း ဧရိယာ (အပင်များ စိုက်ပျိုးခြင်း) ဖြစ်ထွန်းစေခြင်း၊ သစ်ပင်များသည် အသံများကို စုပ်ယူနိုင်ပြီး အသံစုပ်သည့်အရာ (ညစ်ညမ်းမှု စုပ်သည့်အရာ) အဖြစ် လုပ်ဆောင်သည်။ - ယာဥ်ကြီးများ သွားလာမှု နှင့် စက်ပစ္စည်း ကိရိယာကြီးများ၏ ရွေ့လျားမှုများကြောင့် ထွက်ရှိသော တုန်ခါမှုကို လျှော့ချရန်အတွက် လမ်းကို ချောမွေ့စေရန် ဖန်တီးခြင်း - တုန်ခါမှုကို လျှော့ချရန် စက်ပစ္စည်း ကိရိယာကြီးများ (ဥပမာ ကြိတ်ခွဲသည့်နေရာ၊ ကြိတ်စက်များ ဇကာနေရာများအစရှိသည့်နေရာများ) အတွက် သင့်တော်သော အောက်ခံဒီဇိုင်းကို ဖန်တီးပေးခြင်း - ဖြစ်နိုင်လျှင် တုန်ခါမှု လျှော့ချနိုင်သောအရာများကို တပ်ဆင်ခြင်း - မြင့်မားသော ဆူညံသံနှင့် ကို အချိန်အတော်ကြာ ထိတွေ့ရသော လုပ်သားများကို PPE (ဥပမာ ear muffs၊ ear protectors)ထောက်ပံ့ခြင်း၊ လည်ပတ်သူများအတွက် လေအေးပေးစက်ပါသော excavator နှင့် bulldozer များကို တပ်ဆင်ခြင်း - ဆူညံသံ ထိတွေ့မှု စံနှုန်း (၈၅-၉၀ dBA ထက် မပိုသော) အတွင်း ရှိသည်မှာ သေချာစေရန် ပုံမှန် ဆူညံသံထိန်းချုပ်မှုကို ပြုလုပ်ခြင်	ပညာရှင်များ	

၅။	ပတ်ဝန်းကျင် ရေထု အပေါ် သက်ရောက်မှု (က) မြေပေါ်ရေ	- ပတ်ဝန်းကျင် ရေအရည်အသွေး ညစ်ညမ်းခြင်းကို ကာကွယ်ရန်အတွက် စီမံခန့်ခွဲခြင်းနှင့် အစီအစဉ် ရေးဆွဲခြင်း - တူးဖော်ခြင်း လုပ်ငန်း စဉ်များသည် မြစ်သာမြစ်၏ မြေပေါ် ရေအရည်အသွေးအပေါ် သက်ရောက်မှု မရှိစေရန် စီမံခန့်ခွဲခြင်း - တိုက်စားခံရခြင်း၊ မြေလျှောကျခြင်း၊ မြေပြိုခြင်း ကို ကာကွယ်ရန်၊ အပေါ်ယံရေစီးဆင်းမှုကို မထိခိုက်စေရန် (သို့) ရေကြောင်းပြောင်းလဲခြင်း မရှိစေရန် နှင့် ရေနေဇီဝ မျိုးစိတ်များအပေါ် သက်ရောက်မှု မရှိစေရန် အတွက် မြေဆီလွှာ နှင့် မြေစာပုံ၏ တည်ငြိမ်မှုရှိစေရန် စီမံခန့်ခွဲခြင်း၊ - လောင်စာဆီ သိုလှောင်သည့်နေရာသည် မြစ်ချောင်းနှင့် အဝေးတွင် ထားသင့်သည်။ လောင်စာဆီ ဖိတ်စင်ခြင်း ကြောင့် မြေပေါ်ရေ ညစ်ညမ်းခြင်းကို ကာကွယ်ရန် သိုလှောင်သည့်နေရာကို ခြံခတ် ထားသင့်သည်။ - ရေထဲသို့ စွန့်ပစ်ပစ္စည်းများ (အစိုင်အခဲ နှင့် စွန့်ပစ်ရည်များ) ကို စွန့်ပစ်ခြင်းမှ ရှောင်ရှားခြင်း - ရေထိန်းသိမ်းမှုကို စီမံခန့်ခွဲခြင်း- ရေအသုံးချမှုကို လျှော့ချခြင်း။ - ရိုးရှင်းသော ပါရာမီတာများ ဥပမာ အပူချိန်၊ ချဉ်ငန်ဓာတ် (pH) နှင့် total alkalinity များအပေါ် အခြေခံ၍ ရေအရည်အသွေးနှင့် ပမာဏကို စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ်ကို လုပ်ဆောင်ခြင်း။	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး နှင့် ငှားရမ်းထားသော ပညာရှင်များ	ကျပ် ၃၅၀,၀၀၀ (စီမံကိန်း လုပ်ကွက် ၄ ခု ၌ နှစ်ဝက် တစ်ကြိမ် ကုန်ကျစရိတ်)
	(ခ) မြေအောက်ရေ	- မြေဆီလွှာညစ်ညမ်းခြင်းမှ တစ်ဖြည်းဖြည်း မြေအောက်ရေ ညစ်ညမ်းခြင်းကို ကာကွယ်ရန် စီမံခန့်ခွဲခြင်းနှင့် အစီအစဉ် ရေးဆွဲခြင်း - မြေအောက်ရေ အပေါ် ပြင်းထန်သော ဆိုးကျိုးသက်ရောက်မှုများ မရှိစေရန်အတွက် လုပ်ဆောင်မှုအားလုံးကို စီမံခန့်ခွဲခြင်းရန် အစီအစဉ် ရေးဆွဲခြင်း - မြေဆီလွှာ(ထို့နောက် မြေအောက်ရေ) ကို ဟိုက်ဒရို ကာဗွန်မှ ကာကွယ်ရန်အတွက် လောင်စာဆီ သိုလှောင်သည့် ပုံးခွံများကို သိုလှောင်ခြင်းနှင့် သတ်မှတ်ထားသော နေရာတွင် ခြံခတ်ထားခြင်း	-	-

		- မြေအောက်ရေ ညစ်ညမ်းမှုကို ကာကွယ်ရန်အတွက် ဖိတ်စင်ခြင်း မရှိစေရန် ယာဉ်များ စက်ပစ္စည်း ကိရိယာများကို ကောင်းစွာ ထိန်းသိမ်းခြင်း - ဖိတ်စင်မှုများရှိပါက သင့်တော်သော နည်းလမ်းဖြင့် ချက်ချင်း ဆောင်ရွက်ခြင်း ရေဆေးခြင်း မပြုလုပ်ဘဲ စုပ်ယူနိုင်သည့် ဖော့ သို့မဟုတ် လွှစာကို ရှင်းလင်းခြင်းအတွက် အသုံးပြုခြင်း		
၆။	ဇီဝမျိုးစုံ မျိုးကွဲ များ အပေါ် သက်ရောက်မှုများ (ဇီဝအစိတ်အပိုင်း) (က)အပင်	- ပတ်ဝန်းကျင်ရှိ ဇီဝအစိတ်အပိုင်းများကို ထိန်းသိမ်းခြင်းနှင့်စောင့်ရှောက်ခြင်းအတွက် စီမံခန့်ခွဲခြင်းနှင့် အစီအစဉ် ရေးဆွဲခြင်း - တတ်နိုင်သမျှ သစ်ပင်များ ထိန်းသိမ်းခြင်းနှင့်စောင့်ရှောက်ခြင်းအတွက် အစီအစဉ် ရေးဆွဲခြင်း - အပင်များ အပေါ် အနည်းဆုံး အနှောက်အယှက်ဖြစ်စေရန် အစီအစဉ် ရေးဆွဲခြင်း - လိုအပ်သည်ထက် သစ်ပင်များကို ခုတ်ထွင် ရှင်းလင်းမှုများကို မပြုလုပ်ခြင်း - အပင်များ အပေါ် အထူးသဖြင့် အမြစ် ဖွဲ့စည်းပုံ အပေါ် ဆိုးကျိုးသက်ရောက်စေသော hydrocarbons ဖိတ်စင်ခြင်းကို ကာကွယ်ခြင်း - သစ်ပင်များကို hydrocarbons ကြောင့် ထိခိုက်ခြင်းကို ကာကွယ်ရန်အတွက် Drip trays နှင့် သတ်မှတ်ထားသော ခြံခတ်ထားခြင်းကို ပြုလုပ်သင့်သည်။ - အသုံးပြုသော လမ်းသို့ ယာဉ်များ သွားလာမှုကို ကန့်သတ်ခြင်း - လောင်စာထင်း စုဆောင်းမှုကို ကန့်သတ်ခြင်း - အမှိုက်များကို ဟင်းလင်းပွင့် မီးပုံရှို့ခြင်းများကို ရှောင်ရှားခြင်း - မီးဘေး အသိပညာနှင့် ကာကွယ်မှု အတွက် အလုပ်သမားများကို ပညာပေးခြင်း - အထိခိုက် မခံနိုင်သော မျိုးစိတ်များ နှင့် နေရင်းဒေသများကို ရှာဖွေပြီး ၎င်း နေရာများကို တတ်နိုင်သမျှ ရှောင်ကြဉ်ခြင်း - လုပ်သားများအား သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ အသိပညာပေးခြင်း - သဘာဝအပင်များကို ပြန်လည် စိုက်ပျိုးခြင်းနှင့်ပြန်လည်ထူထောင်ရေးများကို အကောင်အထည်ဖော်ခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

	(ခ) တိရစ္ဆာန်များ	- တတ်နိုင်သမျှ တောရိုင်းတိရစ္ဆာန်များ ထိန်းသိမ်းခြင်းနှင့်စောင့်ရှောက်ခြင်းအတွက် အစီအစဉ် ရေးဆွဲခြင်း နှင့် အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်း (သစ်တောကို ထိန်းသိမ်းခြင်းနှင့်စောင့်ရှောက်ခြင်းသည် တောရိုင်းတိရစ္ဆာန်များ ထိန်းသိမ်းခြင်းနှင့် စောင့်ရှောက်ခြင်း နှင့် တူသည်) - ငှက်များ တိရစ္ဆာန်များ၏ နေရင်းဒေသများ အပေါ် သက်ရောက်မှု ဖြစ်စေသော ယာဉ်သွားလာမှုကို ကန့်သတ်ခြင်း၊ - တောရိုင်းတိရစ္ဆာန်များကို ဖမ်းခြင်း/သို့မဟုတ် တောလိုက်ခြင်းကို တားမြစ်ခြင်း - လုပ်သားများအား သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ အသိပညာပေးခြင်း - ညအချိန်တွင် ယာဉ်များ သွားလာခြင်းကြောင့် ဖြစ်ပေါ်နိုင်သော တောရိုင်းတိရစ္ဆာန်များ ထိခိုက်ခြင်း (သို့) သေဆုံးခြင်းကို ကာကွယ်ခြင်း - အင်းဆက်များစွာ သေဆုံးခြင်းကို ကာကွယ်ရန် ညအချိန်တွင် တောက်ပသော အလင်းရောင်ကို အချိန်ကြာ အသုံးပြုခြင်းကို ရှောင်ကြဉ်ခြင်း - ရှောင်ရှားရန် လိုအပ်သည့် အထိခိုက် မခံနိုင်သော မျိုးစိတ်များကို ရှာဖွေခြင်း၊ နှင့် အသိုက် နှင့် ပေါက်ဖွားရာနေရများ ဖြစ်သော တောရိုင်း တိရစ္ဆာန်များ၏ နေရင်းဒေသများ ကို တတ်နိုင်သမျှ ရှောင်ကြဉ်ခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့
၇။	စွန့်ပစ်ပစ္စည်း များကြောင့် သက်ရောက်မှုများ (အစိုင်အခဲ စွန့်ပစ်ပစ္စည်းများ နှင့် စွန့်ပစ်ရည်)	- အစိုင်အခဲစွန့်ပစ်ပစ္စည်း နှင့် ရေဆိုး စီမံခန့်ခွဲခြင်းအတွက် အစီအစဉ် ရေးဆွဲခြင်း - ပြဌာန်းထားသော လိုအပ်ချက်များကို ဖြည့် ဆည်းရန် စီမံခြင်း - ထွက်ရှိလာသော စွန့်ပစ်ပစ္စည်းအားလုံး အထူးသဖြင့် ဘိလပ်မြေမှုန့်၊ ပြာ နှင့် အခြားသော အိမ်တွင်းအမှိုက်များကို စစ်ဆေးခြင်း - လုပ်သားများကို စွန့်ပစ်ပစ္စည်းများ ကိုင်တွယ်ခြင်းနှင့် စွန့်ပစ်ခြင်း ကို ညွှန်ကြားထားခြင်း ဥပမာ အမှိုက်ပုံ - 5 Rs နိယာမ အတိုင်းတတ်နိုင်သမျှ လိုက်နာခြင်း- လျှော့ချခြင်း၊ ပြန်သုံးခြင်း၊ ပြန်လည်ရယူခြင်း၊ ပြန်လည်အသုံးပြုခြင်း၊ နှင့် ပြန်လည်ဒီဇိုင်းဆွဲခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး နှင့် ငှားရမ်းထားသော ပညာရှင်များ	ကျပ် ၁၅၀,၀၀၀ (စီမံကိန်း လုပ်ကွက် ၄ ခု ၌ နှစ်ဝက် တစ်ကြိမ် ကုန်ကျစရိတ်)

		- အစိုင်အခဲစွန့်ပစ်ပစ္စည်းကို အမျိုးအစားခွဲခြားခြင်း၊ အမှိုက်ပုံခွဲသုံးခြင်း နှင့် သတ်မှတ်အမှိုက်ပုံတွင် စွန့်ပစ်ခြင်း - အမှိုက်များ မထွက်ရှိစေရန် ဆောင်ရွက်ခြင်းနှင့် ပြန်လည်အသုံးပြုခြင်း နည်းဗျူဟာကို အသုံးပြု၍ စွန့်ပစ်ခြင်း - ရေဆိုး စီမံခန့်ခွဲခြင်းအတွက် အစီအစဉ် ရေးဆွဲခြင်း - ရေအသုံးပြုမှုကို လျှော့ချခြင်းနှင့် နည်းစေရန် ဆောင်ရွက်ခြင်း - လုပ်သားများကို ရေအသုံးပြုမှုကို သင်ကြားလေ့ကျင့်ပေးခြင်း - သတ်မှတ်နေရာတွင်သာ ယာဉ်များ၊ စက်ပစ္စည်းများကိုဆေးကြောခြင်း - မိုးရေ နှင့် ရေဆိုး ကို ရေမြောင်းစနစ် ခွဲခြားခြင်း - အပြင်သို့ ရေဆိုး မစွန့်ထုတ်ခြင်း(မြေပေါ် (သို့) ရေထုထဲ) - မစွန့်ထုတ်ခင် ရေဆိုးကို သန့်စင်ခြင်း - လုပ်သားများကို အလေ့အကျင့်ကောင်းများကို သင်ကြားလေ့ကျင့်ပေးခြင်း၊		
၈။	ယာဉ်ကြော ပိတ်ဆို့မှု အပေါ် သက်ရောက်မှု	-လမ်းကြောင်း စီမံခန့်ခွဲမှု အစီအစဉ် ရေးဆွဲခြင်း (အနည်းငယ် ယာဉ်ကြောကြပ်သော်လည်း အများစုမှာ ဆိုင်ကယ်သမားများနှင့် လမ်းသွားလမ်းလာများသာ ဖြစ်ပါသည်။) -ထောက်ပံ့ပို့ဆောင်ရေး အထူးသဖြင့် ကုန်ကား များ ကို အချိန်ဇယားရေးဆွဲခြင်း -အသုံးပြုသည့် လမ်း နှင့် လမ်းမကြီး ဖြတ်သည့် နေရာတွင် ဆိုင်းဘုတ်တပ်ခြင်း -ယာဉ်များ ဝန်ပို မသယ်ခြင်း -သယ်ယူပို့ဆောင်ရေးယာဉ်များ (ဘိလပ်မြေအိတ်၊ ကျောက်မီးသွေး၊ gypsum) ကို တာပေါ်လင် အုပ်ခြင်း -အရှိန်လျှော့ခြင်း နှင့် အကာအကွယ် ကားမောင်းနည်းကို သေချာစွာ လိုက်နာစေခြင်း ယာဉ်မောင်းများ (အထူးသဖြင့် ကုန်တင်ကားကြီး ယာဉ်မောင်းများ) ကို ပညာပေးခြင်း -ဒေသခံလူထုသည် လမ်းကြောင်းနှင့် ပတ်သက်၍ တိုင်ကြားနိုင်ရန် ဆောင်ရွက်ခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး နှင့် ငှားရမ်းထားသော ပညာရှင်များ	ကျပ် ၃၅၀,၀၀၀ (စီမံကိန်း လုပ်ကွက် ၄ ခု ၌ နှစ်ဝက် တစ်ကြိမ် ကုန်ကျစရိတ်)

၉။	စွမ်းအင် လိုအပ်ချက် ကြောင့် (ဓာတ်အားလိုင်း)အပေါ် သက်ရောက်မှု	- စွမ်းအင်သုံးစွဲခြင်းအတွက် အစီအစဉ် ရေးဆွဲခြင်း - လျှပ်စစ်ဓာတ်အား သုံးစွဲမှုသည် လုပ်ငန်းစတင်ခြင်းအစောပိုင်းထဲက သတ်မှတ် အလုပ်ဘောင်အတွင်း ရှိစေရန် သေချာစေခြင်း - စွမ်းအင်ချွေတာနိုင်သော စက်ပစ္စည်း၊ ကိရိယာများကို အသုံးပြုခြင်း - သတ်မှတ်ထားသောအချိန်အတွက် မီးပျက်သွားသော အချိန်အတောတွင်း အရံထားသော မီးစက်ကို အသုံးပြုခြင်း - လျှပ်စစ်ဓာတ်အား သုံးစွဲမှုကို ပုံမှန် စောင့်ကြပ်ကြည့်ရှုခြင်း - လျှပ်စစ်တာဝန်ရှိသူများနှင့် ပုံမှန်ဆွေးနွေးမှုများ ပြုလုပ်ခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့
၁၀။	အပူ ကြောင့် သက်ရောက်မှုများ နှင့် အခြားသော လုပ်ငန်းခွင် ကျန်းမာရေး အန္တရာယ်များ	- ဘေးကင်းလုံခြုံသည့် အလုပ်နေရာ အတွက် စီမံခန့်ခွဲခြင်း နှင့် အစီအစဉ် ရေးဆွဲခြင်း - အလုပ်နေရာတွင် မတော်တဆ မှု လုံးဝမဖြစ်စေရန် ဆောင်ရွက်ခြင်း - လုပ်သားများကို ကောင်းမွန်သော အလုပ်လုပ်ခြင်း အလေ့ကျင့်ကောင်းများ၊ လုံခြုံရေး အလေ့ကျင့်ကောင်းများနှင့် ကျန်းမာရေး အသိပညာနှင့် သန့်ရှင်းရေး အတွက် ပညာပေးခြင်း နှင့် လေ့ကျင်ပေးခြင်း - မီးဖိုတွင် အပူနှင့် ထိတွေ့ခြင်း (ထိတွေ့မှုအနည်းဆုံး) ကို တတ်နိုင်သမျှ ကန့်သတ်ခြင်း - အပူ၊ ဖုန်မှုန့်၊ မီးခိုး၊ ကျယ်သောဆူညံသံ အစရှိသည်တို့နှင့် အချိန်အတော်ကြာ ထိတွေ့ရသော လုပ်သားများကို PPE ထောက်ပံ့ပေးခြင်း - လုပ်သားအားလုံးသည် အလုပ်မဆင်းမီ ဆေးစစ်ချက်အောင်ရမည် - အန္တရာယ်ရှိသော ပစ္စည်းများ ကိုသိုလှောင်ခြင်း၊ သယ်ယူပို့ဆောင်ခြင်းနှင့် ကိုင်တွယ်ခြင်းအတွက် လုံခြုံပြီး ထိရောက်သော လုပ်ငန်းစဉ်များကို အကောင်ထည်ဖော် လုပ်ဆောင်ခြင်း (ကုမ္ပဏီသည် ပေါက်ကွဲစေသော ပစ္စည်းများအတွက် ယမ်းသိုလှောင်ရုံ နှင့် လုံခြုံသော လောင်စာဆီ သိုလှောင်ရုံ ရှိပါသည်။)	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

		- မီးနှင့် အရေးပေါ်အခြေအနေ ကာကွယ်ခြင်းအတွက် အသေးစိတ် အစီစဉ်ရှိပါသည်။ (ကုမ္ပဏီသည် ၎င်း အတွက် အစီစဉ်ရှိပြီး ဖြစ်ပါသည် စာရွက်စာတမ်း-၁၅.၁.၂၀၁၆ အစရှိသဖြင့်) - မီးငြိမ်းသတ်ရေး လေ့ကျင့်မှုများ နှင့် အခြေခံ ရှေးဦးသူနာပြုသင်တန်းများကို ဖွဲ့စည်းပေးခြင်း (ကုမ္ပဏီသည် တစ်ခု ဖွဲ့စည်းပြီး ဖြစ်ပါသည်) - မီးငြိမ်းသတ်ရေး ပစ္စည်းများ ထောက်ပံ့ပေးခြင်း၊ (ကုမ္ပဏီသည် လုပ်ဆောင်ပြီး ဖြစ်ပါသည်) - ရှေးဦးသူနာပြုပစ္စည်းများနှင့် ဆေးဝါးများ ကို ထောက်ပံ့ပေးခြင်း၊ (ကုမ္ပဏီသည် လုပ်ဆောင်ပြီး ဖြစ်ပါသည်) - မီးငြိမ်းသတ်ခြင်းနှင့် ရှေးဦးသူနာပြုသင်တန်းများအတွက် အဖွဲ့ဖွဲ့ခြင်း (ကုမ္ပဏီသည် လုပ်ဆောင်ပြီး ဖြစ်ပါသည်) - မီးသတ်၊ လူနာတင်ယာဉ်၊ ကြက်ခြေနီ အသင်းများ၊ဆေးရုံ နှင့် ရဲစခန်း အစရှိသည်တို့၏ ဖုန်းနံပတ်များ နှင့် လိပ်စာများကို လူတိုင်းမြင်နိုင်စေရန် ကပ်ထားခြင်း - ဘီလပ်မြေစက်ရုံအတွက်အာမခံ ထားရှိခြင်း နှင့် မီးအာမခံ လည်း ထားခြင်း - လုံလောက်သောသင့်တော်သည့် သန့်ရှင်းရေးပြုလုပ်ရန် အဆောက်အအုံများ ထောက်ပံ့ပေးခြင်း၊ (ဥပမာ- ရေချိုးခန်း အိမ်သာ စသည်ဖြင့်		
၁၁။	လူမှုစီးပွား ဆိုင်ရာ နှင့် ဒေသခံများ၏ ဘဝများ အပေါ် သက်ရောက်မှု များ	- ဒေသခံများ၏ လူမှု စီးပွားအပေါ်နှင့် ကုမ္ပဏီ လုပ်သားများ အပေါ်တွင်လည်း ဆိုးကျိုးသက်ရောက်မှုများကို ရှောင်ကြဉ်ရန် (သို့) လျော့ချရန် အစီအစဉ် ရေးဆွဲခြင်း - ယာဉ်များ သွားလာခြင်း (သို့) တူးဖော်ခြင်း လုပ်ငန်းများမှ ဖုန်မှုန့်များထုတ်လွှတ်သည့်အခါ ဖုန်မှုန့်များကို တတ်နိုင်သမျှ လျော့ချခြင်း (ရေဖြန်းခြင်း) ရွာများအနီးတွင် ယာဉ်သွားလာမှု အရှိန် လျော့ချခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

		- ဒေသခံများနှင့် အိမ်မွေး တိရစ္ဆာန်များ၏ လုံခြုံမှု အတွက် မတော်တဆ မှု မဖြစ်စေရန် ထိန်းသိမ်းထားရန် ယာဉ်မောင်းများကို အကာအကွယ် ကားမောင်းနည်းကို ပညာပေးခြင်း - ဒေသခံများ၏ ရေသောက်အရင်းအမြစ် ညစ်ညမ်းမှု ဖြစ်စေခြင်းမှ ရှောင်ကြဉ်ခြင်း - လူထုနှင့် ကောင်းမွန်သော ဆက်ဆံရေးကို တည်ဆောက်ခြင်း၊ - စီမံကိန်းအပေါ် ဒေသခံများ၏ အကောင်းမြင်ခြင်းများ ရရှိစေရန် လူထုတွေ့ဆုံဆွေးနွေးပွဲများ ပြုလုပ်ခြင်း - ဒေသခံများနှင့် ဆက်ဆံရသည့်အခါ ၎င်းတို့၏ ယဉ်ကျေးမှု နှင့် အစဉ်အလာကို လေးစားရန် အစရှိသော သင့်တော်သည့် အမူအကျင့်များ ပြုကျင့်ရန် လုပ်သားများကို ပညာပေးခြင်း - မြေနှင့် အိမ်ယာမြေ ပိုင်ဆိုင်မှု ထင်ကြေးပေးသည့် လုပ်ငန်းစဉ်များတွင် ကုမ္ပဏီ၏ တာဝန်ရှိသူများနှင့် ဝန်ထမ်းများ မပါဝင်သင့်ပါ - ရပ်ရွာလူထုအကူအညီ နှင့် ဖွံ့ဖြိုးမှု (CSR) ကို လုပ်ဆောင်ခြင်း - လူမှုရေးအလေ့အကျင့်ဆိုးများ၊ ကိုယ်ကျင့်တရားဖောက်ပြန်ခြင်းများအတွက် စီမံခန့်ခွဲမှု အစီအစဉ် ရေးဆွဲခြင်း - လုပ်သားများကို စည်းကမ်းနှင့် ကျင့်ဝတ်များအကြောင်း လေ့ကျင်သင်ကြားပေးခြင်း - အမှားလုပ်သူများအား ဆိုင်းငံ့ခြင်း ကဲ့သို့သော အပြစ်ပေးအရေးယူမှုကို ကျင့်သုံးခြင်း - အလုပ်ချိန်တွင် အရက်သောက်ခြင်းကို တင်းကြပ်စွာ တားမြစ်ခြင်း၊ လုပ်သားများကြား မူးယစ်ဆေးဝါး နှင့် စိတ်ကြွဆေးသုံးစွဲမှုကို လုံးဝ တားမြစ်ခြင်း - မျှတသော လုပ်သားများနှင့် အလုပ်လုပ်ခြင်း - အလုပ်သမားများနှင့် အဆင်မပြေသော ဆက်ဆံရေးကို ရှောင်ရှားခြင်း၊ ၎င်းတို့ကို အလုပ်အလွန်အကျွံ လုပ်စေခြင်း နှင့် လစာမပေးခြင်းများ မပြုလုပ်ခြင်း		

၁၂။	ဖြစ်နိုင်ခြေရှိသော လုံခြုံရေး ဆိုင်ရာ ပြဿနာများ	-လုံခြုံရေး စီမံခန့်ခွဲမှု အစီအစဉ် ရေးဆွဲခြင်း -နေ့နှင့် ညအချိန် လုံခြုံရေး အပြည့်အဝ ချထားခြင်း၊ တင်းကြပ်သော လုံခြုံရေး ကို လုပ်ဆောင်ခြင်း -စက်ရုံဝန်းအတွင်း အဝင်အထွက်များကို စစ်ဆေးခြင်း -လွယ်ကူစွာ ခွဲခြားနိုင်စေရန် လုပ်သားအားလုံးကို တူညီသော ဝတ်စုံ နှင့် ID များ ထောက်ပံ့ပေးထားခြင်း -ဘီလပ်မြေ စက်ရုံ နှင့် စက်ရုံဝန်း နှင့် တူးဖော်သည့် လုပ်ကွက် နှင့် အဆောက်အအုံများတွင် လုံခြုံရေး ထားရှိခြင်း -ယမ်းသိုလှောင်ရုံအတွက် အထူး လုံခြုံရေး ထားရှိခြင်း -စီမံခန့်ခွဲခြင်း နှင့် လျော့ပါးစေရေး လုပ်ငန်းစဉ်များ အားလုံးကို စောင့်ကြပ်ကြည့်ရှုခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့
၁၃။	လူထုသဘောထားအမြင်	- လူထုနှင့် ကောင်းမွန်သော ဆက်ဆံရေးကို တည်ဆောက်ရန် စီမံခန့်ခွဲခြင်းနှင့် အစီအစဉ် ရေးဆွဲခြင်း - လူထုနှင့် ပြောဆို ဆက်ဆံရန်အတွက် လူထု ဆက်ဆံရေး ဝန်ထမ်း (ညှိနှိုင်းရေး တာဝန်ခံ) ခန့်အပ်ခြင်း၊ - ရွာသားများနှင့် အဆက်မပြတ် ကောင်းမွန်သော ဆက်ဆံရေးကိုထိန်းသိမ်းခြင်း - ရပ်ရွာလူထုအကူအညီ နှင့် ဖွံ့ဖြိုးမှု (CSR) နှင့် အခြား လူထုအကျိုးပြု အစီအစဉ်များကို လုပ်ဆောင်ခြင်း (ကုမ္ပဏီသည် လုပ်ဆောင်ပြီး ဖြစ်ပြီး ဆက်လက်လုပ်ဆောင်ပါမည်။) - ပြင်ပမှ ဝန်ထမ်းများထက် ဒေသခံများကို ဦးစားပေး ခန့်ထားခြင်း- အမျိုးသမီးများ အလုပ်အကိုင်ရရှိရေး - ဒေသ၏ ယဉ်ကျေးမှု နှင့် အစဉ်အလာကို ထိန်းသိမ်းခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

		- ဒေသခံများ၏ ယဉ်ကျေးမှု နှင့် ကျင့်ဝတ် နှင့် သက်ဆိုင်သော ပတ်ဝန်းကျင်၌ သင့်လျော်သောအပြုအမူများကို သင်ကြားပေးခြင်း - သင့်လျော်သော တိုင်ကြားမှု နှင့် မကျေနပ်မှု ဆိုင်ရာ ယန္တရား (CGM) ကို တုန့်ပြန်မှုယန္တရားဖြင့် အကောင်အထည်ဖော်ခြင်း။ မကျေနပ်မှုအားလုံးအတွက်မှတ်တမ်းစာအုပ်ထားရှိခြင်း - ရွာသားများ၏ အမြင်နှင့် ထင်မြင်ချက်များကို ဂရုပြုခြင်း - အလုပ်တွင် လစ်လပ်နေရာရှိပါက ဒေသခံများကို အခါအားလျော်စွာ ဆက်သွယ်ပြောဆိုခြင်း - ဒေသဈေးမှ အစားအစာနှင့် ကုန်စည်များကို တတ်နိုင်သမျှ ဝယ်ယူခြင်း		
၁၄။	စီမံကိန်း လုပ်ဆောင်ခြင်းကြောင့် မြေမျက်နှာ သွင်ပြင်ပြောင်းလဲ ခြင်း	- မြင်ကွင်းပဒေသများ အပေါ် အလေးထားသော စီမံကိန်း အစီအစဉ်ကို အကောင်အထည်ဖော်ခြင်း - ထုံးကျောက်များ ရှိသော သတ္တုတူးဖော်မည့် ဧရိယာ (သို့) နေရာကို ဂရုတစိုက်ရွေးချယ်ခြင်း (ကျပန်း ကျောက်တူးဖော်ခြင်းသည် ဆိုးဝါးသော အပေါက်များ၊တွင်းများ နှင့် ကျင်းများ ဟိုဟို ဒီဒီ ကျန်ရှိစေနိုင်ပါသည်။) - ကျောက်ဖြတ်ခြင်း/ တူးဖော်ခြင်းများ ပြီးဆုံးသည့်အခါ အပေါက်များ၊တွင်းများ ကို မြေပြန်လည်ဖြည့်ခြင်း - တူးဖော်နေရာများတွင် မြေဆီလွှာကို အသုံးပြု၍ အပင်များ ပြန်လည်စိုက်ပျိုးခြင်း- - စိမ်းလန်းသော ဧရိယာ ကို တတ်နိုင်သမျှ ထိန်းသိမ်းခြင်း - စိမ်းလန်းသော ဧရိယာ / စိမ်းလန်းရှုခင်းများကို ဆက်လက်ဖန်တီးခြင်း- အပင်များကို တတ်နိုင်သမျှ ပို၍ စိုက်ပျိုးခြင်း - မြေစာပုံကို စီမံခန့်ခွဲခြင်း၊ တူးဖော်ခြင်းများ ပြီးဆုံးသည့်အခါ မြေပြင်ကို အတတ်နိုင်ဆုံး ညှိခြင်း နှင့် အပင်များကို ပို၍ စိုက်ပျိုးခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့

စီမံကိန်းပိတ်သိမ်းခြင်း/ မိုင်း ပိတ်သိမ်းခြင်း / ပြန်လည်ထူထောင်ခြင်း ကာလအတွင်းတွင်

စဉ်	သက်ရောက်မှုများ	လျော့ချနိုင်မည့် နည်းလမ်းများ	တာဝန်ရှိသူ	ခန့်မှန်းကုန်ကျ စရိတ်
၁။	အလုပ်ခွင်တွင် ဖြစ်နိုင်ခြေရှိသော မတော်တဆမှု	- ထိရောက်သော လုပ်ကွက် ပိတ်သိမ်းခြင်း အတွက် စီမံခန့်ခွဲခြင်း နှင့် အစီအစဉ် ရေးဆွဲခြင်း - အလုပ် လုပ်ဆောင်ရန် လုပ်ကွက် ပိတ်သိမ်းခြင်း ကန်ထရိုက်တာကို ငှားရမ်းခြင်း - အသုံးမပြုနိုင်သော ပစ္စည်းများကို စွန့်ပစ်ခြင်း နှင့် ပြန်လည်အသုံးပြုနိုင်သော ပစ္စည်းများကို ပြန်လည်အသုံးချခြင်းနှင့် ရောင်းချခြင်း - မြေပြင်နှင့် မြေဆီလွှာကို ပြန်လည် ထိန်းသိမ်းခြင်း - မြေပြင်ပေါ်တွင် အပင်များ ပြန်လည် စိုက်ပျိုးခြင်းနှင့် ပြန်လည်ထူထောင်ခြင်း- အပင်များကို စိုက်ပျိုးခြင်း - အမှိုက်များအားလုံးကို ဖယ်ရှား ရှင်းလင်းခြင်းနှင့် နေရာကို ရှင်းလင်းခြင်း - အပေါက်များ၊တွင်းများ ချိုင့်များ ကို မြေစာများ နှင့် မြေဆီလွှာများဖြင့် မြေပြန်လည်ဖြည့်ခြင်း - မြေပြင်ကို ညှိခြင်း နှင့် မြေဆီလွှာ ပြန်လည်ထိန်းသိမ်းခြင်း - စီမံခန့်ခွဲခြင်းနှင့် လျော့ပါးသက်သာစေသော လုပ်ဆောင်မှု အားလုံးကို စောင့်ကြပ်ကြည့်ရှုခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့
2.	ဖြစ်နိုင်ခြေရှိသော ကြွင်းကျန် သက်ရောက်မှု	- ထိရောက်သော လုပ်ကွက် ပိတ်သိမ်းခြင်း နှင့် ပြန်လည်ထူထောင်ရေး အတွက် စီမံခန့်ခွဲခြင်း နှင့် အစီအစဉ် ရေးဆွဲခြင်း - ကြွင်းကျန်များ ရှိပါက ဖယ်ရှား ရှင်းလင်းခြင်း - မြေထုညစ်ညမ်းစေသော လောင်စာဆီ (သို့) ဓာတုပစ္စည်းများ ရှိပါက ဖယ်ရှား ခြင်း - မြေထုညစ်ညမ်းစေသော အရာများ မရှိကြောင်း သေချာစေရန် မြေအရည်အသွေးကို စစ်ဆေးခြင်း - ဖြစ်နိုင်ခြေရှိသော ညစ်ညမ်းစေသော အရာများအတွက် ရေအရည်အသွေးကို လည်း စစ်ဆေးခြင်း - နောက်ဆုံးအကြိမ် ရေအရည်အသွေးကို စစ်ဆေးခြင်း - မြေဆီလွှာ၏ သဘာဝ အခြေအနေပြန်လည်ထိန်းသိမ်းခြင်း - လုပ်ကွက်တွင် အပင်များ ပြန်လည် စိုက်ပျိုးခြင်းနှင့် ပြန်လည်ထူထောင်ခြင်း	EMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး နှင့် ငှားရမ်းထားသော ပညာရှင်များ	နောက်ဆုံးအကြိမ် ရေ၊ မြေ၊ လေ စစ်ဆေးခြင်း ကျပ် ၁,၅၀၀,၀၀၀ (လေ) ကျပ် ၈၀,၀၀၀ (ရေ) ကျပ် ၄၀,၀၀၀ (မြေ)

ဆက်စပ်သက်ရောက်မှုများကို ဆန်းစစ်ခြင်း

စီမံကိန်း ၏ အဆက်ဆက်၊ တိုးပွားလာခြင်း နှင့် /သို့မဟုတ် ပေါင်းစပ်သက်ရောက်မှုများ အခြား တည်ရှိနေပြီးသော စီမံကိန်း နှင့် ပေါင်းသွားသောအခါ စုပေါင်းသက်ရောက်မှုများဖြစ်လာသည်။

Highland ဘိလပ်မြေ စက်ရုံ၏ အဆက်ဆက်နှင့် တိုးပွားလာသော စုပေါင်းသက်ရောက်မှုများကို အောက်ပါအတိုင်း တွက်ချက်နိုင်သည်- တစ်ရက်လျှင် ထုတ်ကုန် Portland ဘိလပ်မြေ ၁၅၀၀ တန် ထုတ်လုပ်ခြင်းမှ တစ်ရက်လျှင် ၁၀၅၀ တန် CO_2, ၁၅၀ ကီလိုဂရမ် SO_2 နှင့် ၁၅၀၀ ကီလိုဂရမ် NO_x ထွက်ပါသည်။ နှစ် ၃၀ ကြာသောအခါ တိုးပွားလာသော စုပေါင်းသက်ရောက်မှုများသည် ၁၁,၄၉၇,၅၀၀ တန် CO_2, ၈၁၀၀ တန် SO_2 နှင့် ၁၆၂၀၀ တန် NO_x ထွက်နိုင်ပါသည်။

(SO_2 နှင့် NO_x ကို လျှော့ချနိုင်သော်လည်း CO_2 ကို လျှော့ချရန်မှာ လက်တွေ့မကျပါ။ CO_2 ကို လျှော့ချရန် တစ်ခုထဲသော ဖြစ်နိုင်သော နည်းလမ်းမှာ အနီးတွင် စိမ်းလန်း ဇရိယာ ဖန်တီးခြင်းဖြစ်ပါသည်။)

- သစ်ပင်များ/နေရင်းဒေသ အပေါ် တိုးပွားလာသော စုပေါင်းသက်ရောက်မှု- နှစ် ၃၀ ကြာသောအခါ ၁၃၀၈.၉၁ ဧက (၎င်းကို လျှော့ချနိုင်ပြီး သက်ရောက်မှုကို ပြောင်းပြန်လှန်နိုင်ပါသည်- ဥပမာ သစ်တောများ ပြန်လည်စိုက်ပျိုးခြင်း)
- သဘာဝ အရင်းအမြစ်များအပေါ် တိုးပွားလာသော စုပေါင်းသက်ရောက်မှုများ (အရင်းအမြစ်များ ဆုံးရှုံးခြင်း)

နှစ် ၃၀ ကြာသောအခါ ထုံးကျောက် ၁၉,၅၀၀,၀၀၀ တန်၊ ရွံ့စေး ၃,၀၀၀,၀၀၀ တန်၊ ဂဝံကျောက် ၁,၅၀၀,၀၀၀ တန်၊ ဂေါ်ဒန် ၆၆၀,၀၀၀ တန် (၎င်းသည် မပြုပြင်နိုင် အရင်းအမြစ်များသည် အမြဲတမ်း ဆုံးရှုံးနေသည်)

တပြိုင်နက်တည်း (သို့မဟုတ်) ပေါင်းစပ် စုဆောင်းထားသော သက်ရောက်မှု

ဇရိယာတွင် Max Myanmar ဘိလပ်မြေ စက်ရုံ နှင့် Shwe Taung (Apache) ဘိလပ်မြေ စက်ရုံ အမည်ရသော အခြား ဘိလပ်မြေ စက်ရုံ ကြီး ၂ ခုရှိသည်။ စက်ရုံ ၃ ခု၏ ဆက်စပ်သက်ရောက်မှုများကို ထည့်ပေါင်းလိုက်သောအခါ ရလဒ်သည် တုန်လှုပ်ဖွယ်ဖြစ်သည်။ Max Myanmar နှင့် Shwe Taung ၏ အချက်အလက် မရှိပါ။ ထို့ကြောင့် စက်ရုံ ၃ ခု၏ ပေါင်းစပ်/တပြိုင်နက်တည်း ပေါင်းစပ် ထားသော သက်ရောက်မှု သည် ECD ၏ အာဏာ အောက်တွင်သာ လုပ်ဆောင်နိုင်သည်။

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ် (EMP)

EMPသည် စီမံကိန်း လုပ်ဆောင်ခြင်းကြောင့် ဧရိယာ၏ ပတ်ဝန်းကျင် အရည်အသွေး ပျက်ဆီးယိုယွင်းမှု မရှိစေကြောင်းသေချာစေရန် အရေးပါပါသည်။ ၎င်း တွင် ပတ်ဝန်းကျင်ဆိုင်ရာ ပြဿနာများအားလုံး၏ စီမံခန့်ခွဲမှုများ ပါဝင်ပါသည်။ EMP ၏ ထိရောက်သော လုပ်ဆောင်ခြင်းအတွက် စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ် (MP) သည် အရေးပါဆုံးဖြစ်ပါသည်။

EMP ၏ အဓိက လုပ်ငန်းစဉ်များတွင် စောင့်ကြပ်ကြည့်ရှုခြင်း၊ အစီရင်ခံခြင်း၊ အရေးပေါ်အခြေအနေ စီမံခန့်ခွဲခြင်းနှင့် စွမ်းရည်မြှင့်တင်ခြင်းနှင့် လေ့ကျင့်ပေးခြင်းများ ပါဝင်ပါသည်။ ဖွံ့ဖြိုးပြီး နိုင်ငံများတွင် စီမံခန့်ခွဲခြင်းခြင်း၊ စောင့်ကြပ်ကြည့်ရှုခြင်း နှင့် လျော့ပါးသက်သာစေရေး များကို လုပ်ဆောင်ရန် EMP ကန်ထရိုက်တာ၊ MP ကန်ထရိုက်တာ၊ နှင့် လျော့ချခြင်း ကန်ထရိုက်တာများကို ငှားရမ်းပါသည်။ မြန်မာနိုင်ငံတွင် ကန်ထရိုက်တာများ ငှားရမ်းခြင်းများ ယခုထိ မရှိခြင်းကြောင့် လုပ်သားများကို ၎င်း တို့ကို လုပ်ဆောင်ရန် လေ့ကျင့်ပေးပြီး EMP အဖွဲ့ (nucleus organization) ကို အောက်ပါအတိုင်း ဖွဲ့စည်းထားပါသည်။ ၎င်း EMP အဖွဲ့ စီမံခန့်ခွဲခြင်းခြင်း၊ စောင့်ကြပ်ကြည့်ရှုခြင်း နှင့် လျော့ပါးသက်သာစေရေး များကို လုပ်ဆောင်ရန် တာဝန်ရှိပါသည်။

Highland Cement International Co., Ltd (ဘီလပ်မြေစက်ရုံ) သည် EMP အဖွဲ့ ကို အောက်ပါအတိုင်း ဖွဲ့စည်းထားပါသည်။

စဉ်	အမည်	ရာထူး	တာဝန်
၁	ဦးအောင်ဇော်မြင့်	မန်နေဂျာ	EMP cell leader
၂	ဦးတင်ခိုင်	အင်ဂျင်နီယာ	EMP cell member
၃	ဦးမြင့်ဦး	အင်ဂျင်နီယာ	EMP cell member
၄	ဦးကြည်မြင့်	ပညာရှင်	EMP cell member
၅	ဦးမင်းဇော်ထက်	ဘူမိဗေဒ ပညာရှင်	EMP cell member
၆	ဦးဝင်းတင့်	ရွာသား	EMP cell member
၇	ဦးဝင်းနိုင်	ရွာသား	EMP cell member

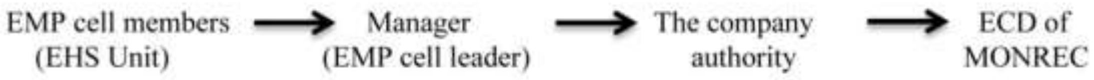
လုပ်သား ၂၅ ဦးကို လည်း စီမံခန့်ခွဲခြင်းခြင်း၊ စောင့်ကြပ်ကြည့်ရှုခြင်း နှင့် လျော့ပါးသက်သာစေရေး များကို လုပ်ဆောင်ရန် လေ့ကျင့်ပေးထားသည်။

EMP အဖွဲ့ဝင် ၅ ဦး နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦးသည် စီမံခန့်ခွဲခြင်းခြင်း၊ စောင့်ကြပ်ကြည့်ရှုခြင်း ကို လုပ်ဆောင်ရန် နှင့် သက်ရောက်မှု တစ်ခုချင်းစီတိုင်းအတွက် လျော့ပါးသက်သာစေရေး များကို လုပ်ဆောင်ရန် တာဝန်ရှိသည်။

EMP ၏ လမ်းညွှန် နိယာမ ၃ ခုမှာ-

- ဆိုးကျိုးသက်ရောက်မှုများကို ရှောင်ရှားခြင်း၊ လျှော့ချခြင်း (လျော့ပါးစေခြင်း)၊ ပြန်လည်ရယူခြင်း (သို့) ဖြေရှင်းခြင်း နှင့် ကောင်းကျိုး သက်ရောက်မှုများကို ပိုမိုတိုးပွားစေခြင်း
- ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ် (EMP) ကို ပြင်ဆင်ခြင်း နှင့်
- ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ် (EMP) ကို လက်တွေ့လုပ်ဆောင်ခြင်းနှင့် ၎င်း ၏ အကျိုးသက်ရောက်မှုများကို စောင့်ကြပ်ကြည့်ရှုခြင်း

၎င်း စီမံကိန်း အခြေအနေတွင် EMP ကို အကောင်အထည်ဖော်ရန် အတွက် လက်တွေ့ကျသော အဖွဲ့အစည်းဆိုင်ရာ အစီအစဉ်များမှာ အောက်ပါအတိုင်းဖွဲ့စည်းထားပါသည်။



<u>အစီရင်ခံခြင်းအတွက် လိုအပ်ချက်</u>

EMP အစီရင်ခံခြင်းတွင် အောက်ပါတို့ပါဝင်ပါသည်-

- အတွင်း စောင့်ကြပ်ကြည့်ရှုခြင်း နှင့် စစ်ဆေးခြင်းဆိုင်ရာ အစီရင်ခံခြင်း
- မတော်တဆ ထိခိုက်မှုများနှင့် အရေး ပေါ် အစီရင်ခံခြင်း
- လုပ်ဆောင်ချက်ညွှန်းချက် အစီရင်ခံခြင်း
- လေ့ကျင့်ခြင်း အစီအစဉ်ကို အစီရင်ခံခြင်း

<u>စောင့်ကြပ်ကြည့်ရှုခြင်း လိုအပ်ချက်</u>

အခြေခံ ပတ်ဝန်းကျင်ဆိုင်ရာ စောင့်ကြပ်ကြည့်ရှုခြင်းသည် အောက်ပါတို့ကို ခြုံငုံမိပါသည်-

- EIA တွင် ပတ်ဝန်းကျင်ဆိုင်ရာ စောင့်ကြပ်ကြည့်ရှုခြင်း
- စံနှုန်းများလမ်းညွှန်ချက်များအားလိုက်နာမှုကို စောင့်ကြပ်ကြည့်ရှုခြင်း

အရေးပေါ်အခြေအနေ တုံ့ပြန်မှု အစီအစဉ်

သေဆုံးနှုန်း နှင့် ဒဏ်ရာ ရရှိမှု ကို ကာကွယ်ခြင်း ပိုင်ဆိုင်မှုနှင့် ပတ်ဝန်းကျင်ကို ပျက်ဆီးစေမှု ကိုလျှော့ချခြင်း နှင့် လူထုကို ကာကွယ်ရန် ရည်ရွယ်၍ ပြင်ဆင်ခြင်းဖြစ်ပါသည်။

လုပ်ငန်းစဉ်များသည် အရေးပေါ် တုံ့ပြန်မှု အစီအစဉ် ၏ တိုးတက်မှု- လေ့ကျင့်ခြင်း- အရေးပေါ် လေ့ကျင့်ခန်း- ပြန်လည်သုံးသပ်ခြင်း နှင့် ပြင်ဆင်ခြင်းများကို ခြုံငုံမိပါသည်။

စွမ်းရည်မြှင့်တင်ခြင်းနှင့် လေ့ကျင့်ပေးခြင်းများ

မြန်မာနိုင်ငံတွင် EMP ကန်ထရိုက်တာများ ငှားရမ်းခြင်းများ ယခုထိ မရှိခြင်းကြောင့် ကုမ္ပဏီသည် ရရှိနိုင်သော အရင်းမြစ်များ နှင့် နည်းလမ်းများ(ကိုယ်တိုင်သင်ပြခြင်းနှင့် ကိုယ်တိုင်လေ့ကျင့်ပေးခြင်း) နှင့် လုပ်ဆောင်ပြီး EMP အဖွဲ့ကို ဖွဲ့စည်းထားပါသည်။

လက်တွေ့ရည်ရွယ်ချက်များ အတွက်

- မီးသတ်ဌာနမှ အရာရှိ အကူအညီဖြင့် မီးသတ်သင်တန်းပေးခြင်း
- ကြက်ခြေနီအသင်းမှ အရာရှိ အကူအညီဖြင့် ရှေးဦးသူနာပြု သင်တန်းပေးခြင်း
- အလုပ်သမား ဝန်ကြီး ဌာန အကူအညီဖြင့် လုပ်သားများ သင်တန်း စီစဉ်ပေးခြင်း
- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ သင်တန်းများအတွက် ECD မှ အရာရှိအား တောင်းဆိုခြင်း

စီမံခန့်ခွဲခြင်း၊ စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ်ခွဲများ

ECD မှ ဖော်ပြထားသော ဖြစ်နိုင်ခြေရှိသော ပတ်ဝန်းကျင်နှင့် လူမှု ဆိုင်ရာ ပြဿနာ ၁၅ ခု ဖြစ်သည့် ဆူညံသံနှင့် တုန်ခါမှု၊ စွန့်ပစ်ပစ္စည်း၊ ဘေးအန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်း၊ ရေဆိုးနှင့် မိုးရေ၊ လေအရည်အသွေး၊ အနံ့၊ ဓာတုပစ္စည်း၊ ရေအရည်အသွေး၊ တိုက်စားခံရခြင်းနှင့် အနည်ကျခြင်း၊ ဇီဝမျိုးစုံမျိုးကွဲများ၊ လုပ်ငန်းခွင် ဘေးအန္တရာယ် ကင်းရှင်းရေး နှင့် ကျန်းမာရေး၊ လူထု ဘေးအန္တရာယ် ကင်းရှင်းရေး နှင့် ကျန်းမာရေး၊ ယဉ်ကျေးမှု အမွေအနှစ်၊ အလုပ်ခန့်အပ်ထားရှိမှု နှင့် လေ့ကျင့်ပေးခြင်း နှင့် အရေးပေါ် တုံ့ပြန်မှု အစီအစဉ် များကို တည်ဆောက်ခြင်း၊ လည်ပတ်ခြင်း နှင့် ပိတ်သိမ်းခြင်း/ ပြန်လည်ဖွံ့ဖြိုးခြင်းကာလများအတွက် စီမံခန့်ခွဲခြင်း၊ စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ်ခွဲများ ကိုဇယားပုံစံဖြင့် အကျဉ်းချုပ်ဖော်ပြထားပါသည်။ (စီမံကိန်းလည်ပတ်နေသည်မှာ နှစ်ပေါင်းများစွာ ကြာနေပြီ ဖြစ်သောကြောင့် အကြိုတည်ဆောက်ရေး ကာလကို ရိုးရှင်းစွာ ချန်လုပ်ထားပါသည်။)

ပတ်ဝန်းကျင်နှင့် လူမှု စီမံခန့်ခွဲခြင်း၊ အစီအစဉ်ခွဲများ

အစီအစဉ်ခွဲများသည် စီမံကိန်းကာလအားလုံး (အကြိုတည်ဆောက်ခြင်းကာလ၊ တည်ဆောက်ခြင်း/ မိုင်းဖွံ့ဖြိုးရေး ကာလ၊ စီမံကိန်းလည်ပတ်ခြင်းကာလ၊ စီမံကိန်းဖျက်သိမ်းခြင်း/ မိုင်းပိတ်သိမ်း ကာ နှင့် စီမံကိန်းပိတ်သိမ်းပြီးနောက်ကာလ/ပြန်လည်ထူထောင်ခြင်း ကာလ) ကို ခြုံငုံမိပါသည်။ လက်တွေ့ရည်ရွယ်ချက်များ အတွက် အကြိုတည်ဆောက်ခြင်းကာလ ကိုချန်လှပ်ထားပါသည်။

အစီအစဉ်ခွဲများသည် ပတ်ဝန်းကျင်နှင့် လူမှု ဆိုင်ရာ ပြဿနာများဖြစ်သော ဆူညံသံနှင့် တုန်ခါမှု၊ စွန့်ပစ်ပစ္စည်း၊ ဘေးအန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်း၊ ရေဆိုးနှင့် မိုးရေ၊ လေအရည်အသွေး၊ အနံ့၊ ဓာတုပစ္စည်း၊ ရေအရည်အသွေး၊ တိုက်စားခံရခြင်းနှင့် အနည်ကျခြင်း၊ ဇီဝမျိုးစုံမျိုးကွဲများ၊ လုပ်ငန်းခွင် ဘေးအန္တရာယ် ကင်းရှင်းရေး နှင့် ကျန်းမာရေး၊ လူထု ဘေးအန္တရာယ် ကင်းရှင်းရေး နှင့် ကျန်းမာရေး၊ ယဉ်ကျေးမှု အမွေအနှစ်၊ အလုပ်ခန့်အပ်ထားရှိမှု နှင့် လေ့ကျင့်ပေးခြင်း နှင့် အရေးပေါ် တုံ့ပြန်မှု အစီအစဉ် များကို ဖြေရှင်းနိုင်ပါသည်။ (ref. EIA guideline for mining sector; Technical guidance, October , 2018).

လက်တွေ့ကျသော ရည်ရွယ်ချက်အတွက် ဇယားပုံစံဖြင့် ဖော်ပြထားပါသည်-

၁။ မိုင်းဖွံ့ဖြိုးရေး ကာလ/ တည်ဆောက်ရေး ကာလ အတွင်းတွင်

စဉ်	သက်ရောက်မှုများ	အစီအစဉ်ခွဲများ (လျှော့ချရေး လုပ်ဆောင်ရန် အဓိက လုပ်ဆောင်ခြင်း)	တာဝန်ရှိသူ	ခန့်မှန်းကုန်ကျစရိတ် (တစ်နှစ်)	အချိန် ကာလ အပိုင်းခြား/ အကြိမ်
၁။	ဆူညံသံနှင့် တုန်ခါမှု	- အကြိုတည်ဆောက်ရေး ကာလတွင် ဆူညံသံ ထုတ်လွှတ်မှု နည်းသော ယာဉ်များ စက်ပစ္စည်း ကိရိယာများကို ဝယ်ယူရန် အစီအစဉ် ရေးဆွဲခြင်း - ECD မှ ချမှတ်ထားသော ဆူညံသံအတွက် NEQEG လမ်းညွှန်ချက်များအတိုင်း လိုက်နာခြင်း၊ - silencers နှင့် mufflers တပ်ဆင်ခြင်း - ညအချိန်တွင် တည်ဆောက်ရေး လုပ်ငန်းများ လုပ်ဆောင်ခြင်းမှ ရှောင်ရှားခြင်း၊ - မြင့်မားသော ဆူညံသံနှင့် ကို အချိန်အတော်ကြာ ထိတွေ့ရသော လုပ်သားများကို PPE ထောက်ပံ့ခြင်း၊ - ယာဉ်များ စက်ပစ္စည်း ကိရိယာများ၏ တုန်ခါမှုကို စီမံခန့်ခွဲခြင်း - ယာဉ်သွားလာမှု အရှိန် သတ်မှတ်ခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	ကျပ် ၁,၀၀၀,၀၀၀ ဆူညံသံ တိုင်းတာခြင်းအတွက် ပညာရှင် ငှားရမ်းခြင်း	၆ လ တစ်ကြိမ်
၂.	စွန့်ပစ်ပစ္စည်း၊	- လုပ်ကွက် တည်ငြိမ်ခြင်း ရှိစေရန် စိုက်ပျိုးခြင်းအတွက် အမှိုက်ပုံတွင် သစ်ကိုင်းသစ်ပင် စွန့်ပစ်အမှိုက်များ၊ မြေစာပုံနှင့် မြေဆီလွှာများကို သီးခြား သတ်မှတ်ခြင်း၊ သစ်ကိုင်းသစ်ပင် စွန့်ပစ်အမှိုက်များ(သစ်ပင်များ) ကို ဒေသခံများအား ထင်းမီးအဖြစ်ပေးခြင်း - လုပ်ကွက်တွင် အမှိုက်များကို ပုံမှန် စုခြင်း နှင့် သတ်မှတ် အမှိုက်ပုံတွင် စွန့်ပစ်ခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	တည်ဆောက်ရေး ကာလ တစ်လျှောက် ရံဖန် ရံခါ၊ အပတ်စဉ်၊ လစဉ် လိုအပ်ပါသည်။

၃။	ဘေးအန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်း	- မထွက်ရှိ	-	-	-
၄။	ရေဆိုးနှင့် မိုးရေ	- လုပ်ကွက်စခန်းနေရာ တွင် ရေဆိုးကို စီမံခန့်ခွဲရန်၊ မြစ်ချောင်းထဲသို့ ဝင်ရောက်သွားခြင်း မရှိစေရန် နှင့် မိုးရေကို စီမံခန့်ခွဲရန် အတွက် စနစ်တကျမြောင်းစနစ် ဖန်တီးထားခြင်း - သတ္တုတွင်း တူးဖော်သည့်နေရာတွင် နှင့် မိုးရေကို စီမံခန့်ခွဲရန် အတွက် စနစ်တကျမြောင်းစနစ် ဖန်တီးထားခြင်း - .သဘာဝမြောင်းများ၏ လျှောစောက်ကို ထိန်းသိမ်းခြင်း- အတတ်နိုင်ဆုံး အတားအဆီး မပြုလုပ်ခြင်း၊ မပြောင်းလဲခြင်း (အသုံးပြုသည့် လမ်း၊ မိုင်းတွင်းသို့ ဝင်ရောက်သည့် လမ်း၊ ချဉ်းကပ်လမ်းများ တည်ဆောက်ခြင်ကြောင့် သဘာဝမြောင်းကို ထိခိုက်မှု မရှိစေရန် ဆောင်ရွက်ခြင်း - မြေစာပုံ နှင့် မြေဆီလွှာ အပုံများသည် မိုးရေသက်ရောက်ခြင်း မရှိစေရန် သေချာစေခြင်း။	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၅ ဦး	အခမဲ့	တည်ဆောက်ရေး ကာလ တစ်လျှောက် ရံဖန် ရံခါ၊ အပတ်စဉ်၊ လစဉ် လိုအပ်ပါသည်။
၅။	လေ အရည်အသွေး	- ECD မှ ချမှတ်ထားသော NEQEG လမ်းညွှန်ချက်များအတိုင်း လိုက်နာခြင်း၊ - အကြိုတည်ဆောက်ရေး ကာလတွင် မီးခိုးထုတ်လွှတ်မှု နည်းသော ယာဉ်များ စက်ပစ္စည်း ကိရိယာများ (ထုတ်လွှတ်မှု လိုက်နာခြင်းအတွက် အသိအမှတ်ပြုခံရစေရန်) ကို ဝယ်ယူရန် အစီအစဉ် ရေးဆွဲခြင်း - စက်ပစ္စည်းများကိုကောင်းစွာ လည်ပတ်စေရန်၊ ချောမွေ့စေရန် ယာဉ်များ စက်ပစ္စည်း ကိရိယာများ ကို ကောင်းစွာ ထိန်းသိမ်းခြင်း - ထုတ်လွှတ်မှု နှုန်း နိမ့်သော စက်ပစ္စည်းများ၊ ယာဉ်များကို အသုံးပြုခြင်း၊ ဆာလဖာ ပါဝင်မှု နည်းသော လောင်စာဆီကို အသုံးပြုခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	ကျပ် ၃,၀၀၀,၀၀၀ လေအရည်အသွေး တိုင်းတာခြင်း အတွက် ပညာရှင် ငှားရမ်းခြင်း	နှစ်ဝက် တစ်ကြိမ်

		- အမှိုက်များကို ဟင်းလင်းပွင့် မီးပုံရှို့ခြင်းများကို ရှောင်ရှားခြင်း၊ - ဖုန်ထခြင်းအတွက်ရေဖြန်းခြင်း - ယာဉ်သွားလာမှုကို ကန့်သတ်ခြင်း လမ်းကို ရွှံ့များ ဖုန်များ ရှင်းလင်းအောင် ထိန်းသိမ်းခြင်း - သဲများ၊ မြေများ အစရှိသည်တို့ကို ဟင်းလင်းပွင့် ပုံထားခြင်းကို ကန့်သတ်ခြင်း - ဖုန်မှုန့်များ (သို့) မီးခိုးများကို အချိန်အတော်ကြာ ထိတွေ့ရသော လုပ်သားများကို PPE ထောက်ပံ့ခြင်း။			
၆။	အနံ့	- မထွက်ရှိပါ	-	-	-
၇။	ဓာတုပစ္စည်း၊	- တည်ဆောက်ခြင်းကာလတွင် အသုံးမပြုပါ	-	-	-
၈။	ရေ အရည်အသွေး	- လမ်းများ ဖောက်ခြင်း တည်ဆောက်ခြင်းအတွက် ရေထုနှင့် ဝေးနိုင်သမျှ ဝေးဝေးတွင် ဆောင်ရွက်ခြင်း - သိုလှောင်ထားသော လောင်စာ အသုံးပြုပြီးသော ဆီများကို မဖယ်ရှားမချင်း သတ်မှတ်ထားသော နေရာတွင် ခြံခတ်ထားခြင်း - မြေပေါ်ရေ ညစ်ညမ်းမှုကို ဖြစ်စေသော ဖိတ်စင်ခြင်းကို ကာကွယ်ရန်အတွက် ယာဉ်များ စက်ပစ္စည်း ကိရိယာများကို ကောင်းစွာ ထိန်းသိမ်းခြင်း - လောင်စာဆီ ကိုင်တွယ်ရာတွင် မြေပေါ်ရေထဲသို့ မတော်တဆ ဖိတ်စင်ခြင်းမဖြစ်စေရန် ဆောင်ရွက်ခြင်း၊ ဖိတ်စင်မှုများရှိပါက သင့်တော်သော နည်းလမ်းဖြင့် ချက်ချင်း ဆောင်ရွက်ခြင်း၊ - ရေထဲသို့ စွန့်ပစ်ပစ္စည်းများ (အစိုင်အခဲ နှင့် စွန့်ပစ်ရည်များ) ကို စွန့်ပစ်ခြင်းမှ ရှောင်ရှားခြင်း။	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	ကျပ် ၁,၀၀၀,၀၀၀ ရေ အရည်အသွေး တိုင်းတာခြင်း အတွက် ပညာရှင် ငှားရမ်းခြင်း	နှစ်ဝက် တစ်ကြိမ်

		- တိုက်စားခြင်းနှင့် မြေပြိုခြင်းကို ကာကွယ်ခြင်းဖြင့် ရေထုညစ်ညမ်းခြင်းကို ရှောင်ကျဉ်ရန် အပေါ်ယံ မြေဆီလွှာကို သဘာဝအပင်များ ရှင်သန်ကြီးထွားရန် ပြုလုပ်ခြင်း			
၉။	တိုက်စားခံရခြင်း နှင့် အနည်ကျခြင်း	- သဘာဝ လျှောစောက်သည် ၂၀ ဒီဂရီ ထက် ကျော်သော အခါ တိုက်စားခြင်း ထိန်းချုပ်မှု/ စီမံခန့်ခွဲမှုကို ဆောင်ရွက်ခြင်း - လျှောစောက်၏ အရှည်နှင့် မတ်စောက်မှုကို အနည်းဆုံး ဖြစ်အောင် ဆောင်ရွက်ခြင်း (မြေဖြတ်ခြင်း၊ မြေပြန်လည်ဖြည့်ခြင်း၊ မြေတည်ဆောက်ခြင်း ကို လုပ်ဆောင်ခြင်း) - ထိတွေ့သော မြေဆီလွှာ ဧရိယာကို တတ်နိုင်သလောက် အနည်းဆုံးဖြစ်အောင်လုပ်ဆောင်ခြင်း (မြေဆီလွှာ ဧရိယာ အကြီး ကို ချန်ထားနိုင်ရန် အတွက် အပင်များကို လိုအပ်သည်ထက် ပို၍ မရှင်းလင်းခြင်း) - လုပ်ကွက်နှင့် နီးသော ဧရိယာ မှ တိုက်စားခြင်းများသည် ထိခိုက် ဧရိယာ ပတ်လည်တွင် လမ်းကြောင်းပြောင်းခြင်း (လွှဲမြောင်းများ/ ရေနုတ်မြောင်းငယ်များ တည်ဆောက်ခြင်း) - အနည်များကို ထိန်းချုပ်ခြင်း (လိုအပ်သည့် နေရာတွင် အနည်ဖမ်းကန်၊ (သို့) ရေလှောင်တမံ တည်ဆောက်ခြင်း) - မြေဆီလွှာနှင့် မြေစာပုံ သိုလှောင်ခြင်း မှ တိုက်စားခြင်း၊ မြေပြိုခြင်းကို တတ်နိုင်သလောက် ကာကွယ်ခြင်း- မြက်များ နှင့် အပင်များကို မြေစာပုံ တည်ငြိမ်စေရန် အတွက် သဘာဝအတိုင်းပေါက်ရောက်စေခြင်း - သိုလှောင်ခြင်းသည် လျှောစောက် အဆင့် ၃၇ ဒီဂရီထက် မပိုစေခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	တည်ဆောက်ရေး ကာလ တစ်လျှောက် ရံဖန် ရံခါ၊ လိုအပ်ပါသည်။

		- လုပ်ကွက်မှ ထွက်ရှိလာသည်များကို တိုက်စားမှု မရှိသော အလျင်ဖြင့် စွန့်ပစ်ခြင်း- သဘာဝ ရေလမ်းကြောင်း (စမ်းချောင်း)အထိခိုက်စေသော နေရာသို့ စွန့်ပစ်ခြင်း			
၁၀။	ဇီဝမျိုးစုံမျိုးကွဲများ	- လမ်းများနှင့် မိုင်းလုပ်ကွက် ဆောက်လုပ်ခြင်းအတွက် လိုအပ်သည်ထက် သစ်ပင်များကို ခုတ်ထွင် ရှင်းလင်းမှုများကို ရှောင်ရှားခြင်း၊ - အပင်များ အပေါ် အထူးသဖြင့် အမြစ် ဖွဲ့စည်းပုံ အပေါ် ဆိုးကျိုးသက်ရောက်စေသော hydrocarbons ဖိတ်စင်ခြင်းကို ရှောင်ရှားခြင်း - လောင်စာထင်း စုဆောင်းမှုကို ကန့်သတ်ခြင်း - အမှိုက်များကို ဟင်းလင်းပွင့် မီးပုံရှို့ခြင်းများကို ရှောင်ရှားခြင်း၊ - မီးဘေး အသိပညာနှင့် ကာကွယ်မှု အတွက် အလုပ်သမားများကို ပညာပေးခြင်း - အထိခိုက် မခံနိုင်သော မျိုးစိတ်များ နှင့် နေရင်ဒေသများကို ရှာဖွေပြီး ၎င်း နေရာများကို တတ်နိုင်သမျှ ရှောင်ကြဉ်ခြင်း - လုပ်သားများအား သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ အသိပညာပေးခြင်း - တရားမဝင် သစ်ခုတ်ခြင်းကို တားမြစ်ခြင်း၊ ရှိခဲ့လျှင် သက်ရောက်ရာကို အကြောင်းကြားခြင်း - လုပ်ကွက်တွင် တူးဖော်ခြင်းများ ပြီးစီးပြီးနောက် သဘာဝအပင်များ ပေါက်ရောက်ခြင်းကို မြှင့်တင်ပြီး ပြန်လည်ထူထောင်ရေးကို လုပ်ဆောင်ခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	တည်ဆောက်ရေး ကာလ တစ်လျှောက် ရံဖန် ရံခါ၊ လိုအပ်ပါသည်။

		- တူးဖော်ခြင်းလုပ်ငန်းများသည် တောရိုင်း တိရစ္ဆာန်များ အပေါ် သက်ရောက်မှု အနည်းဆုံးဖြစ်စေရန် သေချာစေခြင်း - ငှက်များ တိရစ္ဆာန်များ၏ နေရင်းဒေသများ အပေါ် သက်ရောက်မှု ဖြစ်စေသော ယာဉ်သွားလာမှုကို ကန့်သတ်ခြင်း၊ - တောရိုင်းတိရစ္ဆာန်များကို ဖမ်းခြင်း နှင့်/သို့မဟုတ် တောလိုက်ခြင်းကို တားမြစ်ခြင်း - ညအချိန်တွင် ယာဉ်များ သွားလာခြင်းကြောင့် ဖြစ်ပေါ်နိုင်သော တောရိုင်းတိရစ္ဆာန်များ ထိခိုက်ခြင်း (သို့) သေဆုံးခြင်းကို ကာကွယ်ခြင်း - အင်းဆက်များစွာ သေဆုံးခြင်းကို ကာကွယ်ရန် ညအချိန်တွင် တောက်ပသော အလင်းရောင်ကို အချိန်ကြာ အသုံးပြုခြင်းကို ရှောင်ကြဉ်ခြင်း (ညအချိန် တောထဲတွင် တောက်ပသော အလင်းရောင်သည် တောရိုင်းတိရစ္ဆာန်များ၏ သဘာဝကျက်စားရာ နေရာများ (သို့) ပေါက်ဖွားရာနေရာများကို ကြောက်ရွံ့စေသည်)			
၁၁။	လုပ်ငန်းခွင် ကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး	- ဘေးကင်းလုံခြုံသည့် အလုပ်နေရာ နှင့် အလုပ်အခြေအနေကို ဖန်တီးပေးခြင်း - အဆောက်အအုံများအတွက် လုံလောက်သော နေရာများ ထားရှိခြင်း ဥပမာ- တူးဖော်ခြင်း၊ သယ်ယူပို့ဆောင်ခြင်း၊ ကြိတ်ခွဲခြင်း သိုလှောင်ခြင်း အစရှိသဖြင့် - သန့်ရှင်းဆိုင်ရာ အဆောက်အအုံများ ရေချိုးသန့်စင်သည့် နေရာများ လုံလောက်စွာ ထောက်ပံ့ခြင်း၊ လုံလောက်သော သောက်သုံးရေ ထောက်ပံ့ခြင်း၊ ကျန်းမာစွာ နေထိုင်နိုင်မည့် နေရာ နှင့် သန့်ရှင်းစွာ စားသောက်နိုင်သည့် နေရာများ ထောက်ပံ့ခြင်း၊ လုပ်သားများ အတွက် အရေးပေါ်ဆေးအိတ် ထောက်ပံပေးခြင်း (ကုမ္ပဏီတွင် ကိုယ်ပိုင် ဆေးခန်း ရှိပါသည်)	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	တည်ဆောက်ရေး ကာလ တစ်လျှောက် ရုံဖန် ရံခါ၊ လိုအပ်ပါသည်။

		- မြို့နယ် ကြက်ခြေနီ အသင်း၏ အကူအညီဖြင့် လုပ်သား အချို့ကို လက်တွေ့ရည်ရွယ်ချက်အတွက် ရှေးဦးသူနာပြုသင်တန်းပေးခြင်း ရှေးဦးသူနာပြုသေတ္တာ၊ဆေးဝါးနှင့် ဆေးများ အပါအဝင် လုံလောက်သောရှေးဦးသူနာပြု လိုအပ်ချက်များကို ထောက်ပံ့ပေးခြင်း - ကောင်းမွန် လုံခြုံသော အလေ့အကျင့်ကောင်းများ၊ တစ်ကိုယ်ရေ လုံခြုံရေး (မတော်တဆများ၊ ဒဏ်ရာများ ရရှိမှုကို ကာကွယ်ခြင်း) အခြေခံ ဘေးအန္တရာယ် အသိပညာ နှင့် လုပ်ကွက် ဆိုင်ရာ ဘေးအန္တရာယ် များ (မိုင်းတူးရေး လုပ်ကွက်) အတွက် သင်တန်းများ ထောက်ပံ့ပေးခြင်း - စက်ပစ္စည်းကိရိယာများ ဘေးကင်းကင်း လည်ပတ်ခြင်း နှင့် ကိုင်တွယ်ခြင်း၊ လောင်စာဆီများ ဘေးကင်းကင်း သိုလှောင်ခြင်း နှင့် ကိုင်တွယ်ခြင်း အတွက် သင်တန်းပေးခြင်း - လုပ်သားများ၏ အခြေခံ ကျန်းမာရေး ကာကွယ်မှု နှင့် လုံခြုံမှုရရှိကြောင်း သေချာစေရန် လုပ်သားများကို လိုအပ်သည့်နေရာ လိုအပ်သည့် အချိန်တွင် လုံလောက်သော PPEs များ ထောက်ပံ့ခြင်း - တည်ဆောက်ခြင်း၊ လည်ပတ်ခြင်း နှင့် ပိတ်သိမ်း ခြင်း နှင့် ဖြိုဖျက်ခြင်း အလုပ်များအားလုံးကို ခြုံငုံမိသော လျှပ်စစ်လုပ်ငန်း အားလုံးအတွက် လုံခြုံသော လုပ်ငန်းစဉ်များ ထားရှိခြင်း - သွားရေး လာရေး မလုံမခြုံ မဖြစ်စေရန် နှင့် လုံခြုံစွာ မောင်းနှင်ကြောင်း သေချာစေရန် ယာဉ်မောင်းများ အထူးသဖြင့် ကုန်ကားမောင်းသမားများကို အကာအကွယ် ကားမောင်းနည်းကို လေ့ကျင့်သင်ကြားပေးခြင်း			

		- လမ်းပိတ်ခြင်း အပါအဝင် တူးဖော်ခြင်း၊ သယ်ယူခြင်း နှင့် ပို့ဆောင်ခြင်း လုပ်ငန်းအားလုံးတွင် မတော်တဆ မှု လုံးဝမဖြစ်စေရန် ဆောင်ရွက်ခြင်း - အလုပ်သမားများသည် အလွန်အကျွံ ထပ်ခါ တလဲလဲ လုပ်ဆောင်ချက်များ၊ အားထုတ်မှုများ နှင့် လက်ဖြင့် အလွန်အကျွံ ကိုင်တွယ်ခြင်း တို့ မပြုလုပ်စေရန် သေချာစေခြင်း ဖြစ်နိုင်လျှင် လုပ်သမားများ ပင်ပန်းနွမ်းနယ်ခြင်း နှင့် ဒဏ်ရာ ရရှိခြင်းများကို လျော့ချရန် လုပ်သမားများ ထက် စက်များကို ပိုမိုသုံးစွဲခြင်း			
၁၂။	လူထု ကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး	- မီးခိုးနှင့် ဖုန်မှုန့် ထွက်ရှိမှုကို တတ်နိုင်သမျှ ထိန်းချုပ်ခြင်း၊ ကျေးရွာများသို့ မီးခိုးမရောက်ရှိစေရန် အမှိုက်များကို ဟင်းလင်းပွင့် မီးပုံရှို့ခြင်းများကို ရှောင်ရှားခြင်း၊ ရွာများအနီးတွင် ယာဉ်သွားလာသည့်အခါ ယာဉ်မောင်းများကို အရှိန်လျော့ချရန် ပညာပေးခြင်း (အရှိန် ၄၀ ကီလိုမီတာမှ ၅၀ ကီလိုမီတာ ထိ လျော့ချခြင်းဖြင့် ဖုန်မှုန့် ထွက်ရှိမှုကို ၅၀% အထိ လျော့ချနိုင်ကြောင်း တွေ့ရှိရပါသည်) - ရေသိုလှောင်ကန်သည် ခြင်များ ပေါက်ဖွားမှု မရှိစေရန် သေချာစေခြင်း၊ ရေကိုပုံမှန်လဲလှယ်ခြင်း၊ ပျော့သော ကလိုရင်း အသုံးပြုခြင်း၊ ခြင်သားလောင်းအားလုံးကို နည်းလမ်းအားလုံးဖြင့် ရှင်းလင်းခြင်း၊ လုပ်သားများကို ညအချိန်အတွင် ခြင်ထောင်အသုံးပြုရန် သင်ကြားပေးခြင်း နှင့် ခြင်ထောင် ထောက်ပံ့ပေးခြင်း - vector ကြောင့် ဖြစ်ပွားသော ရောဂါများ နှင့် ရေကြောင့် ဖြစ်ပွားသော ရောဂါများ (သို့မဟုတ်) ရေနှင့် ဆက်စပ်သည့် ရောဂါများ ကို ကာကွယ်ရန် အိမ်တွင်း စွန့်ပစ်အမှိုက်များ၊ စွန့်ပစ်ရည်များနှင့် မြောင်းများသည် ခြင်များ ၊ ယင်များ၊ အင်းဆက်များ ပေါက်ဖွားမှု မရှိစေရန် သေချာစေခြင်း၊	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	တည်ဆောက်ရေး ကာလ တစ်လျှောက် ရံဖန် ရံခါ လိုအပ်ပါသည်။

		- ကူးစက်ရောဂါများဖြစ်ပွားခြင်းနှင့် ပြန့်ပွားခြင်းကို နည်းလမ်း အားလုံးဖြင့် ကာကွယ်ပေးခြင်း၊ ဒေသခံလူထုအား အတတ်နိုင်ဆုံး ကျန်းမာရေး အသိပညာပေးခြင်းနှင့် သင်ကြားပေးခြင်း အစီအစဉ်များ (ကျန်းမာရေး အသိပညာပေးခြင်း လှုပ်ရှားမှု) ကို လုပ်ဆောင်ခြင်း (ကုမ္ပဏီသည် ကိုယ်ပိုင်ဆေးခန်းရှိပြီး ရွာသားများကို အခမဲ့ ဆေးဝါးကုသပေးပါသည်။) - စီမံကိန်းလုပ်ငန်းစဉ်များမှ vector ကြောင့် ဖြစ်ပွားသော ရောဂါများ နှင့် ရေကြောင့် ဖြစ်ပွားသော ရောဂါများ (သို့မဟုတ်) ရေနှင့် ဆက်စပ်သည့် ရောဂါများ နှင့် ကူးစက်ရောဂါများ ကို နည်းလမ်း အားလုံးဖြင့် မဖြစ်အောင် လျော့နည်းအောင် ဆောင်ရွက်ခြင်း၊ မြို့နယ်ကျန်းမာရေး တာဝန်ရှိသူများ နှင့်ပုံမှန် ဆွေးနွေးတိုင်ပင်ခြင်း။ - လုပ်သားများမှ ရောဂါများ ပြန့်ပွားခြင်းကို နည်းလမ်း အားလုံးဖြင့် ကာကွယ်ပေးခြင်း၊ STD, HIV/AIDS ပြန့်ပွားခြင်းကို ကာကွယ်ရန် အကာအကွယ် ကွန်ဒုံး အသုံးပြုခြင်း အတွက် လိင်ပညာပေး ခြင်းနှင့် ပတ်သက်၍ ခရီးဝေး ထရပ်ကားမောင်းသူများအား ပညာပေးခြင်း၊ - လုပ်သားများကို ကျင့်ဝတ်များ၊ လူမှု ကျင့်ဝတ်များ နှင့် ဒေသ ယဉ်ကျေးမှု အစဉ်အလာများ နှင့် ပတ်သက်၍ အလုပ်သမားကို ပညာပေးခြင်း - ယာဉ်မောင်းများကို အန္တရာယ် ကင်းစွာ မောင်းနှင်ရန် အကာအကွယ် ကားမောင်းနည်းကို ပညာပေးခြင်းနှင့် ယာဉ်စည်းကမ်း လမ်းစည်းကမ်းများကို လိုက်နာစေခြင်း၊ ဒေသခံပြည်သူများအတွက် လမ်း အန္တရာယ် ကင်းရှင်းရေး ပညာပေး လှုပ်ရှားမှုများကို ပြုလုပ်ခြင်း၊ ဒေသခံလူထုသည် ယာဉ် အသွားအလာ နှင့် ပတ်သက်၍ တိုင်ကြားနိုင်ရန် ဆောင်ရွက်ပေးခြင်း။			

		- လောင်စာကဲ့သို့သော အန္တရာယ် ရှိပစ္စည်းများ သယ်ယူခြင်း အတွက် သက်ဆိုင်သော ဥပဒေ နှင့် စည်းမျဉ်းများ အတိုင်း လိုက်နာခြင်း၊ လောင်စာကဲ့သို့သော အန္တရာယ် ရှိပစ္စည်းများ မတော်တဆ ဖိတ်ခြင်း/ ယိုခြင်း၏ အကျိုးဆက်များကို ကာကွယ်ခြင်း နှင့်/ သို့မဟုတ် လျော့ပါးစေသော နည်းလမ်းများ စီစဉ်ထားခြင်း၊ အန္တရာယ် ရှိပစ္စည်းများ နှင့် ရပ်ရွာလူထု ထိတွေ့မှုကို ရှောင်ရှားခြင်း/ လျော့နည်းအောင် ဆောင်ရွက်ခြင်း - လိုအပ်သောအခါ ထိရောက်သော လုပ်ဆောင်ခြင်းအတွက် အရေးပေါ် ပြင်ဆင်မှု နှင့် အရေးပေါ် တုန့်ပြန်မှု အစီအစဉ်များကို ထားရှိခြင်း၊ ပြင်ပ အရေးပေါ်အစီအစဉ် နှင့် အတွင်း အရေးပေါ်အစီအစဉ်များအတွက် လုပ်ငန်း လမ်းညွှန်ချက်များကို လုပ်သားအားလုံး လိုအပ်ပါက ဒေသခံများနှင့် အစိုးရ စစ်ဆေးရေးမှူးများထံသို့လည်း ထောက်ပံ့ပေးခြင်း ဤ အရေးပေါ်အစီအစဉ်များကို ပြင်ဆင်လေ့ကျင့်ခြင်းများ လုပ်ဆောင်ခြင်း၊ အရေးပေါ်အစီအစဉ် ပြင်ဆင်ခြင်းအတွက် ဒေသရပ်ရွာလူထုနှင့် အာဏာပိုင်များ နှင့် ပူးပေါင်းခြင်း။			
၁၃။	ယဉ်ကျေးမှု အမွေအနှစ်	- တူးဖော်ရေး လုပ်ငန်းများကြောင့် ဗုဒ္ဓဘာသာ ဘုန်းကြီးကျောင်းများအပေါ် သက်ရောက်မှု မရှိကြောင်း သေချာစေခြင်း - အခြေအနေကို စောင့်ကြပ်ကြည့်ရှုခြင်း - ဘုန်းကြီးများ (သံဃာတော်များအား) ရံဖန် ရံခါ ဂါဝရ ပြုခြင်း၊ ငွေသား နှင့် အခြား လိုအပ်သည်များကို လှူဒါန်း ပြီး ကောင်းမွန်သော ဆက်ဆံရေး တည်ဆောက်ခြင်း - ဘာသာရေး ပွဲတော်များ ပါဝင်ခြင်း နှင့် လှူဒါန်းခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	အခါအားလျော်စွာ

၁၄။	အလုပ်ခန့်အပ်ထားရှိမှု နှင့် လေ့ကျင့်ပေးခြင်း	- အရည်အသွေးမြှင့်တင်ခြင်းအတွက် အစီအစဉ်ဆွဲခြင်း - ဒေသခံများကို တတ်နိုင်သမျှ ဦးစားပေး အလုပ်ခန့်အပ်ခြင်း - အလုပ်သင်တန်းများအတွက် အလုပ်သမား သစ်များစုစည်းခြင်း - အလုပ်သမား သစ်များကို ၎င်းတို့၏ အလုပ်များ ထိထိရောက်ရောက် လုပ်ဆောင်နိုင်ရန် စနစ်ကျသော သင်တန်းများ ပေးခြင်း - သင်တန်းများသည် ယေဘူယျ လေ့ကျင့်မှုများ- ကျန်းမာရေး နှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး နှင့် သက်ဆိုင်သော ထိရောက်ပြီး ကျွမ်းကျင်ခြင်းအတွက် မဖြစ်မနေ လေ့ကျင့်ပေးရန်အတွက် ကျွမ်းကျင်မှု သင်တန်းပေးခြင်း (ဥပမာ- ဘေးအန္တရာယ် ပစ္စည်းများ ကိုင်တွယ်ခြင်း နှင့် စက်ပစ္စည်းများ ဘေးအန္တရာယ် ကင်းရှင်းစွာ လည်ပတ်စေခြင်း) - လုပ်သားများကို ကောင်းမွန်သော အလုပ်လုပ်ခြင်း အလေ့ကျင့်ကောင်းများ၊ ကောင်းမွန်သော လုံခြုံရေးဆိုင်ရာ အလေ့ကျင့်ကောင်းများ နှင့် ကောင်းမွန်သော ကျန်းမာရေး နှင့် တစ်ကိုယ်ရေ သန့်ရှင်းရေးဆိုင်ရာ အလေ့အကျင့်များနှင့် ကောင်းမွန်သော ပတ်ဝန်းကျင်ဆိုင်ရာ အလေ့ကျင့်ကောင်းများကို လုပ်သားများ၏ စိတ်ထဲစွဲနေပြီး အလေ့အကျင့်ကောင်းများ ဖြစ်နေသည်အထိ သင်ကြား လေ့ကျင့်ပေးခြင်း၊ - ဆိုးကျိုးသက်ရောက်မှုများနှင့် ရင်းနှီးကျွမ်းဝင်စေရန် သင်ကြား လေ့ကျင့်ပေးခြင်း နှင့် နောက်ဆက်တွဲ လျော့ပါးသက်သာစေရေး နည်းလမ်းများ လုပ်ဆောင်ခြင်း	ကုမ္ပဏီ တာဝန်ရှိသူများနှင့် ESMP အဖွဲ့ဝင်၊ လေ့ကျင့်ပေးခြင်း နှင့် သင်တန်းပေးခြင်း အတွက် အစိုးရ ဌာနများမှ ဝန်ထမ်းများ	ကျပ် ၁၀,၀၀၀,၀၀၀ (၇ဏ်ထူးဆောင် ကြေး နှင့် ဂါဝရ လက်ဆောင်)	လိုအပ်သလို အခါအားလျော်စွာ

		- လုပ်သားများကို သဘာဝပတ်ဝန်းကျင်နှင့် လိုက်လျောညီထွေရှိသော အခြေခံ အလေ့ကျင့်များ ကို (ဥပမာ- ကောင်းမွန်သော အိမ်တွင်း အလေ့ကျင့်ကောင်းများ- အမှိုက်မပစ်ခြင်း၊ ကိုယ့်နေရာကို မညစ်ပတ်စေခြင်း၊ ရေ နှင့် လောင်စာဆီ အသုံးပြုမှုကို လျှော့ချခြင်း) သင်ကြား လေ့ကျင့်ပေးခြင်း၊			
၁၅။	အရေးပေါ် တုံ့ပြန်မှု အစီအစဉ်	- သေဆုံးမှုနှင့် ဒဏ်ရာ အနာတရ ရရှိမှုကိုကာကွယ်ရန်၊ ပတ်ဝန်းကျင်နှင့် လူထုကိုကာကွယ်ရန် နှင့် ထိခိုက်မှုကို လျော့ချရန် အရေးပေါ် တုံ့ပြန်ရေး အစီအစဉ် နှင့် အဖွဲ့ ပြင်ဆင်ခြင်း - အရေးပေါ် ပြင်ဆင်မှု အစီအစဉ်ကို ပြင်ဆင်ခြင်း - (အရေးပေါ် တုံ့ပြန်ရေး အစီအစဉ်သည် အရေးပေါ် အရင်းအမြစ်၊ အရေးပေါ် ပြင်ဆင်ခြင်းနှင့် လေ့ကျင့်ခြင်း၊ အရေးပေါ် တုံ့ပြန်ရေး လုပ်ငန်းစဉ်၊ အစီအစဉ် ဆက်သွယ်ရေး နှင့် လုပ်ငန်းစဉ်များ ကို စီမံခန့်ခွဲခြင်းနှင့် ပြန်လည်ရှင်းလင်းတင်ပြခြင်းနှင့် စိတ်ဒဏ်ရာရပြီးနောက် စိတ်ဖိစီးမှု ဆိုင်ရာ လုပ်ငန်းစဉ်များကို ခြုံငုံမိပါသည်။ - အရေးပေါ်နှင့် မီးငြိမ်းသတ်ရေး လေ့ကျင့်မှုများ နှင့် ရှေးဦးသူနာပြုသင်တန်းများကို ထောက်ပံ့ပေးခြင်း - အထောက်အကူပစ္စည်းများ (ဥပမာ- မီးငြိမ်းသတ်ရေး ဝတ်စုံ၊ ရှေးဦးသူနာပြု ပစ္စည်းများနှင့် အရေးပေါ်ယာဉ်များ) ထောက်ပံ့ပေးခြင်း - မီးသတ်၊ လူနာတင်ယာဉ်၊ ၊ ကြက်ခြေနီ အသင်းများ၊ ဆေးရုံ နှင့် ရဲစခန်း အစရှိသည်တို့၏ ဖုန်းနံပတ်များ ကို ကပ်ထားခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	ကျပ် ၁၄,၄၂၈,၀၀၀ (အစိုးရ ဌာနများမှ သင်တန်းပေးခြင်း ပညာပေးခြင်း အတွက် အရေးပေါ်အတွက် ဖယ်ထားခြင်း)	တည်ဆောက်ခြင်း ကာလ အတွင်း တစ်ကြိမ်

၂။ စီမံကိန်းလည်ပတ်ခြင်း ကာလ အတွင်းတွင်

စဉ်	သက်ရောက်မှုများ	အစီအစဉ်ခွဲများ (လျော့ပါးသက်သာစေရေး နည်းလမ်းများကို အဓိက လုပ်ဆောင်ခြင်း))	တာဝန်ရှိသူ	ခန့်မှန်းကုန်ကျ စရိတ် (တစ်နှစ်)	အချိန် ကာလ အပိုင်းခြား/ အကြိမ်
၁။	ဆူညံသံနှင့် တုန်ခါမှု၊	- ECD မှ ချမှတ်ထားသော ဆူညံသံအတွက် NEQEG လမ်းညွှန်ချက်များအတိုင်း လိုက်နာခြင်း၊ - ယာဉ်များ စက်ပစ္စည်း ကိရိယာများ၏ ရွေ့လျားမှု တားမြစ်ခြင်း (သို့မဟုတ်) ကန့်သတ်ခြင်း - ဆူညံသံ ထုတ်လွှတ်မှု နည်းသော ယာဉ်များ စက်ပစ္စည်း ကိရိယာများ၏ သင့်တော်သော ရွေးချယ်မှုများ အတွက် အစီအစဉ် ရေးဆွဲခြင်း- အလုပ်လုပ်ပုံနှင့် ပစ္စည်းကိရိယာများကို အကျိုးရှိစွာ ကိုင်တွယ်နိုင်သည့်နည်းလမ်းများ - ဆူညံကိုလျော့ချနိုင်သော silencers နှင့် mufflers တပ်ဆင်ခြင်း - ဆူညံသံ အနိမ့်နှင့် မလိုအပ်သော ဆူညံသံကို ကာကွယ်ရန် အတွက် ယာဉ်များ စက်ပစ္စည်း ကိရိယာများကို ကောင်းစွာ လည်ပတ်စေခြင်း နှင့် ထိန်းသိမ်းခြင်း - စီမံကိန်း ဧရိယာဝန်းကျင်တွင် စိမ်းလန်း ဧရိယာ (အပင်များ စိုက်ပျိုးခြင်း) ဖြစ်ထွန်းစေခြင်း၊ သစ်ပင်များသည် အသံများကို စုပ်ယူနိုင်ပြီး အသံစုပ်သည့်အရာ (ညစ်ညမ်းမှု စုပ်သည့်အရာ) အဖြစ် လုပ်ဆောင်သည်။ . - ဖြစ်နိုင်လျှင် တုန်ခါမှု လျော့ချနိုင်သောအရာများကို တပ်ဆင်ခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	ကျပ် ၁,၀၀၀,၀၀၀ ဆူညံသံ တိုင်းတာခြင်း အတွက် ပညာရှင် ငှားရမ်းခြင်း	နှစ်ဝက် တစ်ကြိမ်

		- မြင့်မားသော ဆူညံသံနှင့် ကို အချိန်အတော်ကြာ ထိတွေ့ရသော လုပ်သားများကို PPE (ဥပမာ ear muffs၊ ear protectors)ထောက်ပံ့ခြင်း၊ လည်ပတ်သူများအတွက် လေအေးပေးစက်ပါသော excavator နှင့် bulldozer များကို တပ်ဆင်ပေးခြင်း - ဆူညံသံ ထိတွေ့မှု စံနှုန်း (၈၅-၉၀ dBA ထက် မပိုသော) အတွင်း ရှိသည်မှာ သေချာစေရန် ပုံမှန် ဆူညံသံထိန်းချုပ်မှုကို လုပ်ဆောင်ခြင်း			
၂.	စွန့်ပစ်ပစ္စည်း၊	- မြေစာပုံနှင့် မြေဆီလွှာများကို သီးခြား ထားခြင်း - ဖိတ်စင်ခြင်း၊ မြေပြိုခြင်း၊ မြေ တိုက်စားခံရခြင်း၊ သဘာဝ ရေနုတ်မြောင်း ပိတ်ခြင်းမရှိစေရန်၊ မြစ်ချောင်းများ၊ စိုက်ပျိုးဧရိယာ နှင့် ကျေးရွာ ဧရိယာအတွင်း မဝင်ရောက်စေရန် မြေစာနှင့် မြေဆီလွှာပုံများကို သေချာစွာ စီမံခန့်ခွဲခြင်း။ - ထိရောက်သော တည်ငြိမ်မှု ဖြစ်စေရန် သိုလှောင်ခြင်း (မြေဆီလွှာ (သို့) မြေစာသည်) သည် အမြင့်ဆုံး လျှောစောက် အဆင့် ၃၇ ဒီဂရီထက် မပိုစေခြင်း - တွင်းများ ချိုင့်များကို မြေစာများဖြင့် မြေဖို့ခြင်း။ - တူးဖော်ခြင်းနှင့် မြေစာပုံနှင့် မြေဆီလွှာများပုံထားခြင်းကြောင့် ဖြစ်နိုင်ခြေရှိသော ပျက်စီးဆုံးရှုံးမှုများကို အတတ်နိုင်ဆုံး ရှောင်ရှားခြင်း - အမှိုက်များကို သင့်တော်စွာ ကိုင်တွယ်ခြင်းနှင့် စွန့်ပစ်ခြင်း အတွက် လုပ်သားများကို ညွှန်ကြားထားခြင်း (ဥပမာ- သတ်မှတ် အမှိုက်ပုံ) - အမှိုက်များကို အမျိုးအစား ခွဲခြားခြင်းနှင့် သီးသန့် အမှိုက်ပုံးကို အသုံးပြုခြင်း၊ သတ်မှတ် အမှိုက်ပုံ တွင် စွန့်ပစ်ခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	တည်ဆောက်ရေး ကာလ တစ်လျှောက် ရံဖန် ရံခါ၊ အပတ်စဉ်၊ လစဉ်

		- အမှိုက်များကို မထွက်ရှိအောင် ပြုလုပ်ခြင်းနှင့် ပြန်လည်အသုံးပြုနိုင်သော နည်းဗျူဟာများ လုပ်ဆောင်ပြီးမှ သာ စွန့်ပစ်ခြင်း - ရေဆိုးများကို ပြင်ပသို့ မစွန့်ပစ်ခြင်း (မြေပေါ် သို့ ရေထဲသို့) - ကောင်းမွန်သော အိမ်တွင်း အလေ့ကျင့်ကောင်းများကို လုပ်သားများအား သင်ကြား လေ့ကျင့်ပေးခြင်း၊			
၃။	ဘေးအန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်း၊	- မည်သည့် ဘေးအန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်း မှ မထွက်ရှိပါ။ - အသုံးပြုပြီးသော လောင်စာဆီ၊ အင်ဂျင်ဆီများကို ဒရမ်တွင် စုဆောင်းပြီး ပြန်လည်အသုံးပြုသူများကို ပေးခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	တည်ဆောက်ရေး ကာလ တစ်လျှောက် ရံဖန် ရံခါ၊ အပတ်စဉ်၊ လစဉ်
၄။	ရေဆိုးနှင့် မိုးရေ၊	- လုပ်ကွက်စခန်းနေရာ တွင် ရေဆိုးကို စီမံခန့်ခွဲရန်၊ မြစ်ချောင်းထဲသို့ ဝင်ရောက်သွားခြင်း မရှိစေရန် နှင့် မိုးရေကို စီမံခန့်ခွဲရန် အတွက် စနစ်တကျမြောင်းစနစ် ဖန်တီးထားခြင်း - သတ္တုတွင်း တူးဖော်သည့်နေရာတွင် မိုးရေကို စီမံခန့်ခွဲရန် အတွက် စနစ်တကျမြောင်းစနစ် ဖန်တီးထားခြင်း - သဘာဝမြောင်းများ၏ လျှောစောက်ကို ထိန်းသိမ်းခြင်း- အတတ်နိုင်ဆုံး အတားအဆီး မပြုလုပ်ခြင်း၊ မပြောင်းလဲခြင်း (အသုံးပြုသည့် လမ်း၊ မိုင်းတွင်းသို့ ဝင်ရောက်သည့် လမ်း၊ ချဉ်းကပ်လမ်းများ တည်ဆောက်ခြင်းကြောင့် သဘာဝမြောင်းကို ထိခိုက်မှု မရှိစေရန် ဆောင်ရွက်ခြင်း)	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	ကျပ် ၁,၀၀၀,၀၀၀ ရေ အရည်အသွေးကို တိုင်းတာရန် ပညာရှင်များ ငှားရမ်းခြင်း	ESMP အဖွဲ့ဝင်များဖြင့် ရံဖန် ရံခါ၊ ငှားရန်းထားသော ပညာရှင်များ ဖြင့် နှစ်ဝက် တစ်ကြိမ်

		- မြေစာပုံ နှင့် မြေဆီလွှာ အပုံများသည် မိုးရေသက်ရောက်ခြင်း မရှိစေရန် သေချာစေခြင်း။ - မိုးရေများ သတ္တုကျင်များ အတွင်းစီးဝင်ခြင်းကို ရှောင်ရှားခြင်းနှင့် သေးငယ်သော ရေလွှဲမြောင်းများ ပိုမို ဖန်တီးပေးခြင်း			
၅။	လေ အရည်အသွေး၊	- ECD မှ ချမှတ်ထားသော NEQEG လမ်းညွှန်ချက်များအတိုင်း လိုက်နာခြင်း၊ - လိုအပ်သည်ထက်ပို၍ အပင်များရှင်းလင်းမှု မပြုလုပ်ခြင်း၊ မြေလွတ် အတိုင်း ထားရှိခြင်း - လေကြောင့် ဖုန်ထခြင်းကို ကာကွယ်ရန် မြေနေရာအားလုံးကို ကျစ်လစ်သိပ်သည်းစေရန် ပြုလုပ်ခြင်း - လေပြင်းတိုက်ခတ်သည့်အချိန်တွင်း တူးဖော်ခြင်းလုပ်ငန်းများအား ရပ်တန့်ထားခြင်း။ - ဖုန်ထခြင်းအတွက်ရေဖြန်းခြင်း - ဖုန်ထခြင်းကို လျှော့ချရန် အတွက်ယာဉ်သွားလာမှု အရှိန် လျှော့ချခြင်း - ယာဉ်သွားလာမှုကို ကန့်သတ်ခြင်း လမ်းကို ရွှံ့များ ဖုန်များ ရှင်းလင်းအောင် ထိန်းသိမ်းခြင်း - အမှိုက်များ (သို့) စွန့်ပစ် အစိုင်အခဲများကို ဟင်းလင်းပွင့် မီးပုံရှို့ခြင်းများကို ရှောင်ရှားခြင်း၊ - မီးခိုးထွက်ရှိမှုကို လျှော့ချရန် အတွက် စက်ပစ္စည်း ကိရိယာများ ကို ကောင်းစွာ ထိန်းသိမ်းခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	ကျပ် ၃,၀၀၀,၀၀၀ အရည်အသွေးကို တိုင်းတာရန် ပညာရှင်များ ငှားရမ်းခြင်း	နှစ်ဝက်တစ်ကြိမ်

		- ဖုန်မှုန့်များ (သို့) မီးခိုးများကို အချိန်အတော်ကြာ ထိတွေ့ရသော လုပ်သားများကို PPE ထောက်ပံ့ခြင်း(ဥပမာ မျက်နှာဖုံး၊ နှာခေါင်း နှင့် ပါးစပ်အကာ၊ ဓာတ်ငွေ့ မျက်နှာဖုံး) လည်ပတ်သူများအတွက် လေအေးပေးစက်ပါသော excavator တပ်ဆင်ပေးခြင်း			
၆။	အနံ့၊	- မထွက်ရှိ	-	-	-
၇။	ဓာတုပစ္စည်း၊	- ထုံးကျောက်တူးဖော်ရေး တွင် ဓာတုပစ္စည်းကို အသုံးမပြုပါ	-	-	-
၈။	ရေ အရည်အသွေး	- ပတ်ဝန်းကျင် ရေအရည်အသွေး ညစ်ညမ်းခြင်းကို ကာကွယ်ရန်အတွက် စီမံခန့်ခွဲခြင်းနှင့် အစီအစဉ် ရေးဆွဲခြင်း - တူးဖော်ခြင်း လုပ်ငန်း စဉ်များသည် ရေပူချောင်း ၏ မြေပေါ် ရေအရည်အသွေးအပေါ် သက်ရောက်မှု မရှိစေရန် စီမံခန့်ခွဲခြင်း - တိုက်စားခံရခြင်း၊ မြေလျှောကျခြင်း၊ မြေပြိုခြင်း ကို ကာကွယ်ရန်၊ အပေါ်ယံရေစီးဆင်းမှုကို မထိခိုက်စေရန် (သို့) ရေကြောင်းပြောင်းလဲခြင်း မရှိစေရန် နှင့် ရေနေဇီဝ မျိုးစိတ်များအပေါ် သက်ရောက်မှု မရှိစေရန် အတွက် မြေဆီလွှာ နှင့် မြေစာပုံ၏ တည်ငြိမ်မှုရှိစေရန် စီမံခန့်ခွဲခြင်း - လောင်စာဆီ သိုလှောင်သည့်နေရာသည် မြစ်ချောင်းနှင့် အဝေးတွင် ထားခြင်း၊ လောင်စာဆီ ဖိတ်စင်ခြင်း ကြောင့် မြေပေါ်ရေ ညစ်ညမ်းခြင်းကို ကာကွယ်ရန် သိုလှောင်သည့်နေရာကို ခြံခတ်ထားခြင်း၊ - ရေထဲသို့ စွန့်ပစ်ပစ္စည်းများ (အစိုင်အခဲ နှင့် စွန့်ပစ်ရည်များ) ကို စွန့်ပစ်ခြင်းမှ ရှောင်ရှားခြင်း - ရေထိန်းသိမ်းမှုကို စီမံခန့်ခွဲခြင်း- ရေအသုံးချမှုကို လျှော့ချခြင်း။	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	ကျပ် ၁,၀၀၀,၀၀၀ ရေ အရည်အသွေးကို တိုင်းတာရန် ပညာရှင်များ ငှားရမ်းခြင်း	နှစ်ဝက်တစ်ကြိမ်

		- ရိုးရှင်းသော ပါရာမီတာများ ဥပမာ အပူချိန်၊ ချဉ်ငန်ဓာတ် (pH) နှင့် total alkalinity များအပေါ် အခြေခံ၍ ရေအရည်အသွေးနှင့် ပမာဏကို စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ်ကို လုပ်ဆောင်ခြင်း - ဖိတ်စင်ခြင်း ကြောင့် မြေအောက်ရေ ညစ်ညမ်းမှုကို ကာကွယ်ရန်အတွက် ယာဉ်များ စက်ပစ္စည်း ကိရိယာများကို ကောင်းစွာ ထိန်းသိမ်းခြင်း - .လောင်စာဆီများ ကိုင်တွယ်ရာတွင် ဖိတ်စင်ခြင်းကို ရှောင်ရှားခြင်း - မတော်တဆ ဖိတ်စင်မှုများရှိပါက သင့်တော်သော နည်းလမ်းဖြင့် ချက်ချင်း ဆောင်ရွက်ခြင်း ရေဆေးခြင်း မပြုလုပ်ဘဲ စုပ်ယူနိုင်သည့် ဖော့ သို့မဟုတ် လွှစာကို ရှင်းလင်းခြင်းအတွက် အသုံးပြုခြင်း			
၉။	တိုက်စားခံရခြင်းနှင့် အနည်ကျခြင်း	- သဘာဝ လျှောစောက်သည် ၂၀ ဒီဂရီ ထက် ကျော်သော အခါ တိုက်စားခြင်း ထိန်းချုပ်မှု/ စီမံခန့်ခွဲမှုကို ဆောင်ရွက်ခြင်း - လျှောစောက်၏ အရှည်နှင့် မတ်စောက်မှုကို အနည်းဆုံး ဖြစ်အောင် ဆောင်ရွက်ခြင်း (မြေဖြတ်ခြင်း၊ မြေပြန်လည်ဖြည့်ခြင်း၊ မြေတည်ဆောက်ခြင်း ကို လုပ်ဆောင်ခြင်း) - ထိတွေ့သော မြေဆီလွှာ ဧရိယာကို တတ်နိုင်သလောက် အနည်းဆုံးဖြစ်အောင်လုပ်ဆောင်ခြင်း (မြေဆီလွှာ ဧရိယာ အကြီး ကို ချန်ထားနိုင်ရန် အတွက် အပင်များကို လိုအပ်သည်ထက် ပို၍ မရှင်းလင်းခြင်း) - လုပ်ကွက်နှင့် နီးသော ဧရိယာ မှ တိုက်စားခြင်းများသည် ထိခိုက် ဧရိယာ ပတ်လည်တွင် လမ်းကြောင်းပြောင်းခြင်း (လွှဲမြောင်းများ / ရေနုတ်မြောင်းငယ်များ တည်ဆောက်ခြင်း)	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	ရံဖန် ရံခါ၊ အပတ်စဉ်၊ လစဉ်

		- အနည်များကို ထိန်းချုပ်ခြင်း (လိုအပ်သည့် နေရာတွင် အနည်ဖမ်းကန်၊ (သို့) ရေလှောင်တမံ တည်ဆောက်ခြင်း) - မြေဆီလွှာနှင့် မြေစာပုံ သိုလှောင်ခြင်း မှ တိုက်စားခြင်း၊ မြေပြိုခြင်းကို တတ်နိုင်သလောက် ကာကွယ်ခြင်း- မြက်များ နှင့် အပင်များကို မြေစာပုံ တည်ငြိမ်စေရန် အတွက် သဘာဝအတိုင်းပေါက်ရောက်စေခြင်း - သိုလှောင်ခြင်းသည် လျှောစောက် အဆင့် ၃၇ ဒီဂရီထက် မပိုစေခြင်း - လုပ်ကွက်မှ ထွက်ရှိလာသည်များကို တိုက်စားမှု မရှိသော အလျင်ဖြင့် စွန့်ပစ်ခြင်း- သဘာဝ ရေလမ်းကြောင်း (စမ်းချောင်း)အထိခိုက်စေသော နေရာသို့ စွန့်ပစ်ခြင်း - လမ်းများနှင့် မိုင်းအဝင်လမ်းများ ချဉ်းကပ်လမ်းကြောင်းများ တည်ငြိမ်ပြီး အလွယ်တကူ တိုက်စားမခံရစေရန် သေချာစေခြင်း။ - မိုးရာသီ အထူးသဖြင့် မိုးကြီးသော နေ့များ အတွင်း သတ္တု တူးဖော်ခြင်းများကို ရပ်ထားခြင်း - လိုအပ်ပါက အနည်ဖမ်းကန် နှင့် ကမ်းများကို တည်ဆောက်ခြင်း			
၁၀။	ဇီဝမျိုးစုံမျိုးကွဲများ	- တူးဖော်ခြင်း လုပ်ငန်းစဉ်များကြောင့် အပင်များအပေါ် အနည်းဆုံး နောက်ယှက်မှု ဖြစ်စေရန် အစီအစဉ် ရေးဆွဲခြင်း - လိုအပ်သည်ထက် သစ်ပင်များကို ခုတ်ထွင် ရှင်းလင်းမှုများကို မပြုလုပ်ခြင်း - လမ်းကြောင်းများ အပေါ် ယာဉ်သွားလာမှုကို ကန့်သတ်ခြင်း၊ - လောင်စာထင်း စုဆောင်းမှုကို ကန့်သတ်ခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	ရံဖန် ရံခါ၊ အပတ်စဉ်၊ လစဉ်

		- အမှိုက်များကို ဟင်းလင်းပွင့် မီးပုံရှို့ခြင်းများကို ရှောင်ရှားခြင်း၊ - မီးဘေး အသိပညာနှင့် ကာကွယ်မှု အတွက် အလုပ်သမားများကို ပညာပေးခြင်း၊ မီးလောင်စေနိုင်သော အမှိုက်များအားလုံးကို ရှင်းစေခြင်း - အထိခိုက် မခံနိုင်သော မျိုးစိတ်များ နှင့် နေရင်ဒေသများကို ရှာဖွေပြီး ၎င်း နေရာများကို တတ်နိုင်သမျှ ရှောင်ကြဉ်ခြင်း - လုပ်ကွက်တွင် တူးဖော်ခြင်းများ ပြီးစီးပြီးနောက် သဘာဝအပင်များ ပေါက်ရောက်ခြင်းကို မြှင့်တင်ပြီး ပြန်လည်ထူထောင်ရေးကို လုပ်ဆောင်ခြင်း - ငှက်များ တိရစ္ဆာန်များ၏ နေရင်းဒေသများ အပေါ် သက်ရောက်မှု ဖြစ်စေသော ယာဉ်သွားလာမှုကို ကန့်သတ်ခြင်း၊ - တောရိုင်းတိရစ္ဆာန်များကို ဖမ်းခြင်း နှင့်/သို့မဟုတ် တောလိုက်ခြင်းကို တားမြစ်ခြင်း - ညအချိန်တွင် ယာဉ်များ သွားလာခြင်းကြောင့် ဖြစ်ပေါ်နိုင်သော တောရိုင်းတိရစ္ဆာန်များ ထိခိုက်ခြင်း (သို့) သေဆုံးခြင်းကို ကာကွယ်ခြင်း - အင်းဆက်များစွာ သေဆုံးခြင်းကို ကာကွယ်ရန် ညအချိန်တွင် တောက်ပသော အလင်းရောင်ကို အချိန်ကြာ အသုံးပြုခြင်းကို ရှောင်ကြဉ်ခြင်း - ရှောင်ရှားရန် လိုအပ်သည့် အထိခိုက် မခံနိုင်သော မျိုးစိတ်များကို ရှာဖွေခြင်း၊ နှင့် အသိုက် နှင့် ပေါက်ဖွားရာနေရများ ဖြစ်သော တောရိုင်း တိရစ္ဆာန်များ၏ နေရင်းဒေသများ ကို ရှောင်ကြဉ်ခြင်း			

၁၁။	လုပ်ငန်းခွင် ကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး	- ဘေးကင်းလုံခြုံသည့် အလုပ်နေရာ အတွက် စီမံခန့်ခွဲခြင်း နှင့် အစီအစဉ် ရေးဆွဲခြင်း - အလုပ်နေရာတွင် မတော်တဆ မှု လုံးဝမဖြစ်စေရန် ကာကွယ်ခြင်း - လုပ်သားများကို ကောင်းမွန်သော အလုပ်လုပ်ခြင်း အလေ့ကျင့်ကောင်းများ၊ ကောင်းမွန် လုံခြုံသော အလေ့အကျင့်ကောင်းများ နှင့် ကောင်းမွန်သော တစ်ကိုယ်ရေသန့်ရှင်းရေး နှင့် ကျန်းမာရေး ဆိုင်ရာ အလေ့အကျင့်ကောင်းများအား သင်ကြား လေ့ကျင့်ပေးခြင်း၊ - အပူ၊ ဖုန်မှုန့်၊ မီးခိုး၊ ကျယ်သောဆူညံသံ အစရှိသည်တို့နှင့် အချိန်အတော်ကြာ ထိတွေ့ရသော လုပ်သားများကို PPE ထောက်ပံ့ပေးခြင်း - လုပ်သားအားလုံးသည် အလုပ်မဆင်းမီ ဆေးစစ်ချက်အောင်ရမည် - အန္တရာယ်ရှိသော ပစ္စည်းများ ကိုသိုလှောင်ခြင်း၊ သယ်ယူပို့ဆောင်ခြင်းနှင့် ကိုင်တွယ်ခြင်းအတွက် လုံခြုံပြီး ထိရောက်သော လုပ်ငန်းစဉ်များကို အကောင်ထည်ဖော် လုပ်ဆောင်ခြင်း (ကုမ္ပဏီသည် ပေါက်ကွဲစေသော ပစ္စည်းများအတွက် ယမ်းသိုလှောင်ရုံ နှင့် လုံခြုံသော လောင်စာဆီ သိုလှောင်ရုံ ရှိပါသည်။) - မီးနှင့် အရေးပေါ်အခြေအနေ ကာကွယ်ခြင်းအတွက် အသေးစိတ် အစီစဉ်ရှိပါသည် - မီးငြိမ်းသတ်ရေး လေ့ကျင့်မှုများ နှင့် အခြေခံ ရှေးဦးသူနာပြုသင်တန်းများကို ဖွဲ့စည်းပေးခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	ကျပ် ၂,၀၀၀,၀၀၀ (အခကြေး နှင့် နှင့် စေတနာ လက်ဆောင်)	လိုအပ်သလို အခါအားလျော်စွာ

		- မီးငြိမ်းသတ်ရေး ပစ္စည်းများ ထောက်ပံ့ပေးခြင်း၊ - ရှေးဦးသူနာပြုပစ္စည်းများနှင့် ဆေးဝါးများ ကို ထောက်ပံ့ပေးခြင်း၊ - မီးငြိမ်းသတ်ခြင်းနှင့် ရှေးဦးသူနာပြုသင်တန်းများအတွက် အဖွဲ့ဖွဲ့ခြင်း - မီးသတ်၊ လူနာတင်ယာဉ်၊ ကြက်ခြေနီ အသင်းများ၊ဆေးရုံ နှင့် ရဲစခန်း အစရှိသည်တို့၏ ဖုန်းနံပတ်များ နှင့် လိပ်စာများကို လူတိုင်းမြင်နိုင်စေရန် ကပ်ထားခြင်း - လုပ်ကွက်အတွက် အာမခံ ရယူခြင်း နှင့် မီးအာမခံ လည်း ရယူခြင်း - လုံလောက်သောသင့်တော်သည့် သန့်ရှင်းရေးပြုလုပ်ရန် အဆောက်အအုံများ ထောက်ပံ့ပေးခြင်း၊ (ဥပမာ- ရေချိုးခန်း အိမ်သာ အစရှိသည်ဖြင့်) - တည်ဆောက်ခြင်း၊ လည်ပတ်ခြင်း နှင့် ပိတ်သိမ်း ခြင်း နှင့် ဖြိုဖျက်ခြင်း အလုပ်များအားလုံးကို ခြုံငုံမိသော လျှပ်စစ်လုပ်ငန်း အားလုံးအတွက် လုံခြုံသော လုပ်ငန်းစဉ်များ ထားရှိခြင်း - သွားရေး လာရေး မလုံမခြုံ မဖြစ်စေရန် နှင့် လုံခြုံစွာ မောင်းနှင်ကြောင်း သေချာစေရန် ယာဉ်မောင်းများ အထူးသဖြင့် ကုန်ကားမောင်းသမားများကို အကာအကွယ် ကားမောင်းနည်းကို လေ့ကျင့်သင်ကြားပေးခြင်း - စက်ပစ္စည်းများ လည်ပတ်နေစဉ်အတွင်း မည်သူမှ မည်သည့် အစိတ်အပိုင်း (လက်၊ လက်ချောင်း အစရှိသော ပြင်ပ အစိတ်အပိုင်းများ) ကို မထိခိုက်ကြောင်း သေချာစေခြင်း။			

		- အလုပ်သမားများသည် အလွန်အကျွံ ထပ်ခါ တလဲလဲ လုပ်ဆောင်ချက်များ၊ အားထုတ်မှုများ နှင့် လက်ဖြင့် အလွန်အကျွံ ကိုင်တွယ်ခြင်း တို့ မပြုလုပ်စေရန် သေချာစေခြင်း ဖြစ်နိုင်လျှင် လုပ်သမားများ ပင်ပန်းနွမ်းနယ်ခြင်း နှင့် ဒဏ်ရာ ရရှိခြင်းများကို လျော့ချရန် လုပ်သမားများ ထက် စက်များကို ပိုမိုသုံးစွဲခြင်း			
၁၂။	လူထု ကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး	- မီးခိုးနှင့် ဖုန်မှုန့် ထွက်ရှိမှုကို တတ်နိုင်သမျှ ထိန်းချုပ်ခြင်း၊ ကျေးရွာများသို့ မီးခိုးမရောက်ရှိစေရန် အမှိုက်များကို ဟင်းလင်းပွင့် မီးပုံရှို့ခြင်းများကို ရှောင်ရှားခြင်း၊ ရွာများအနီးတွင် ယာဉ်သွားလာသည့်အခါ ယာဉ်မောင်းများကို အရှိန်လျော့ချရန် ပညာပေးခြင်း (အရှိန် ၄၀ ကီလိုမီတာမှ ၅၀ ကီလိုမီတာ ထိ လျော့ချခြင်းဖြင့် ဖုန်မှုန့် ထွက်ရှိမှုကို ၅၀% အထိ လျော့ချနိုင်ကြောင်း တွေ့ရှိရပါသည်) - ဒေသခံလူထုသည် ဖုန်မှုန့်များနှင့် ဆူညံသံ တုန်ခါမှု နှင့် ပတ်သက်၍ တိုင်ကြားနိုင်ရန် ဆောင်ရွက်ခြင်း - ရေသိုလှောင်ကန်သည် ခြင်များ ပေါက်ဖွားမှု မရှိစေရန် သေချာစေခြင်း၊ ရေကိုပုံမှန်လဲလှယ်ခြင်း၊ ပျော့သော ကလိုရင်း အသုံးပြုခြင်း၊ ခြင်သားလောင်းအားလုံးကို နည်းလမ်းအားလုံးဖြင့် ရှင်းလင်းခြင်း၊ လုပ်သားများကို ညအချိန်အတွင်း ခြင်ထောင်အသုံးပြုရန် သင်ကြားပေးခြင်း နှင့် ခြင်ထောင် ထောက်ပံ့ပေးခြင်း - vector ကြောင့် ဖြစ်ပွားသော ရောဂါများ နှင့် ရေကြောင့် ဖြစ်ပွားသော ရောဂါများ (သို့မဟုတ်) ရေနှင့် ဆက်စပ်သည့် ရောဂါများ ကို ကာကွယ်ရန် အိမ်တွင်း စွန့်ပစ်အမှိုက်များ၊ စွန့်ပစ်ရည်များနှင့်	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	လိုအပ်သလို အခါအားလျော်စွာ

		မြောင်းများသည့် ခြင်များ ၊ ယင်များ၊ အင်းဆက်များ ပေါက်ဖွားမှု မရှိစေရန် သေချာစေခြင်း၊ - ကူးစက်ရောဂါများဖြစ်ပွားခြင်းနှင့် ပြန့်ပွားခြင်းကို နည်းလမ်း အားလုံးဖြင့် ကာကွယ်ပေးခြင်း၊ ဒေသခံလူထုအား အတတ်နိုင်ဆုံး ကျန်းမာရေး အသိပညာပေးခြင်းနှင့် သင်ကြားပေးခြင်း အစီအစဉ်များ (ကျန်းမာရေး အသိပညာပေးခြင်း လှုပ်ရှားမှု) ကို လုပ်ဆောင်ခြင်း၊ ကြာရှည်သော လည်ပတ်ခြင်းကာလအတွင်း လုပ်ကွက်တွင် ဆေးခန်း ထားရှိရန် ထည့်သွင်းစဉ်းစားခြင်း နှင့် ဒေသခံများအတွက် ကျန်းမာရေး စောင့်ရှောက်မှုများကို တတ်နိုင်သမျှ ထောက်ပံ့ပေးခြင်း။ - စီမံကိန်းလုပ်ငန်းစဉ်များမှ vector ကြောင့် ဖြစ်ပွားသော ရောဂါများ နှင့် ရေကြောင့် ဖြစ်ပွားသော ရောဂါများ (သို့မဟုတ်) ရေနှင့် ဆက်စပ်သည့် ရောဂါများ နှင့် ကူးစက်ရောဂါများ ကို နည်းလမ်း အားလုံးဖြင့် မဖြစ်အောင် လျော့နည်းအောင် ဆောင်ရွက်ခြင်း/ ရှောင်ရှားခြင်း၊ မြို့နယ်ကျန်းမာရေး တာဝန်ရှိသူများ နှင့်ပုံမှန် ဆွေးနွေးတိုင်ပင်ခြင်း။ - လုပ်သားများမှ ရောဂါများ ပြန့်ပွားခြင်းကို နည်းလမ်း အားလုံးဖြင့် ကာကွယ်ပေးခြင်း၊ STD, HIV/AIDS ပြန့်ပွားခြင်းကို ကာကွယ်ရန် အကာအကွယ် ကွန်ဒုံး အသုံးပြုခြင်း အတွက် လိင်ပညာပေး ခြင်းနှင့် ပတ်သက်၍ ခရီးဝေး ထရပ်ကားမောင်းသူများအား ပညာပေးခြင်း၊ - လုပ်သားများကို ကျင့်ဝတ်များ၊ လူမှု ကျင့်ဝတ်များ နှင့် ဒေသ ယဉ်ကျေးမှု အစဉ်အလာများ နှင့် ပတ်သက်၍ အလုပ်သမားကို ပညာပေးခြင်း			

		- ယာဉ်မောင်းများကို အန္တရာယ် ကင်းစွာ မောင်းနှင်ရန် အကာအကွယ်ကားမောင်းနည်းကို ပညာပေးခြင်းနှင့် ယာဉ်စည်းကမ်းလမ်းစည်းကမ်းများကို လိုက်နာစေခြင်း၊ ဒေသခံပြည်သူများအတွက် လမ်း အန္တရာယ် ကင်းရှင်းရေး ပညာပေး လှုပ်ရှားမှုများကို ပြုလုပ်ခြင်း၊ ဖြစ်နိုင်လျှင် ဒေသခံလူထုသည် ယာဉ် အသွားအလာ နှင့် ပတ်သက်၍ တိုင်ကြားနိုင်ရန် ဆောင်ရွက်ပေးခြင်း။ - လောင်စာကဲ့သို့သော အန္တရာယ် ရှိပစ္စည်းများ သယ်ယူခြင်း အတွက် သက်ဆိုင်သော ဥပဒေ နှင့် စည်းမျဉ်းများ အတိုင်း လိုက်နာခြင်း၊ အန္တရာယ် ရှိပစ္စည်းများ (လောင်စာ နှင့် ပေါက်ကွဲစေနိုင်သော ပစ္စည်းများ) မတော်တဆ ဖိတ်ခြင်း/ ယိုခြင်း၏ အကျိုးဆက်များကို ကာကွယ်ခြင်း နှင့်/ သို့မဟုတ် လျော့ပါးစေသော နည်းလမ်းများ စီစဉ်ထားခြင်း၊ အန္တရာယ်ရှိပစ္စည်းများ နှင့် ရပ်ရွာလူထု ထိတွေ့မှုကို ရှောင်ရှားခြင်း/ လျော့နည်းအောင် ဆောင်ရွက်ခြင်း - လိုအပ်သောအခါ ထိရောက်သော လုပ်ဆောင်ခြင်းအတွက် အရေးပေါ် ပြင်ဆင်မှု နှင့် အရေးပေါ် တုန့်ပြန်မှု အစီအစဉ် နှင့် အရေးပေါ် လုပ်ဆောင်မှု အစီအစဉ်များထားရှိခြင်း၊ ပြင်ပ အရေးပေါ် အစီအစဉ် နှင့် အတွင်း အရေးပေါ် အစီအစဉ်များအတွက် လုပ်ငန်း လမ်းညွှန်ချက်များကို လုပ်သားအားလုံး လိုအပ်ပါက ဒေသခံများနှင့် အစိုးရ စစ်ဆေးရေးမှူးများထံသို့လည်း ထောက်ပံ့ပေးခြင်း ၎င်း အရေးပေါ် အစီအစဉ်များကို ပြင်ဆင်လေ့ကျင့်ခြင်းများ လုပ်ဆောင်ခြင်း၊ အရေးပေါ် အစီအစဉ် ပြင်ဆင်ခြင်းအတွက် ဒေသရပ်ရွာလူထုနှင့် အာဏာပိုင်များ နှင့် ပူးပေါင်းခြင်း။			

၁၃။	ယဉ်ကျေးမှု အမွေအနှစ်	- တူးဖော်ရေး လုပ်ငန်းများကြောင့် ဗုဒ္ဓဘာသာ ဘုန်းကြီးကျောင်းများအပေါ် သက်ရောက်မှု မရှိကြောင်း သေချာစေခြင်း - အခြေအနေကို စောင့်ကြပ်ကြည့်ရှုခြင်း - ဘုန်းကြီးများ (သံဃာတော်များအား) ရံဖန် ရံခါ ဂါရဝ ပြုခြင်း၊ ငွေသား နှင့် အခြား လိုအပ်သည်များကို လှူဒါန်းပြီး ကောင်းမွန်သော ဆက်ဆံရေး တည်ဆောက်ခြင်း - ဘာသာရေး ပွဲတော်များ ပါဝင်ခြင်း နှင့် လှူဒါန်းခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	လိုအပ်သလို အခါအားလျော်စွာ
၁၄။	အလုပ် ခန့်အပ်ထားရှိမှု နှင့် လေ့ကျင့်ပေးခြင်း	- အရည်အသွေးမြှင့်တင်ခြင်းအတွက် အစီအစဉ်ဆွဲခြင်း - ဒေသခံများကို တတ်နိုင်သမျှ ဦးစားပေး အလုပ်ခန့်အပ်ခြင်း - အလုပ်သင်တန်းများအတွက် အလုပ်သမား သစ်များစုစည်းခြင်း - အလုပ်သမား သစ်များကို ၎င်းတို့၏ အလုပ်များ ထိထိရောက်ရောက် လုပ်ဆောင်နိုင်ရန် စနစ်ကျသော သင်တန်းများ ပေးခြင်း - သင်တန်းများသည် ယေဘူယျ လေ့ကျင့်မှုများ- ကျန်းမာရေး နှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး နှင့် သက်ဆိုင်သော ထိရောက်ပြီး ကျွမ်းကျင်ခြင်းအတွက် မဖြစ်မနေ လေ့ကျင့်ပေးရန်အတွက် ကျွမ်းကျင်မှု သင်တန်းပေးခြင်း (ဥပမာ- ဘေးအန္တရာယ် ပစ္စည်းများ ကိုင်တွယ်ခြင်း နှင့် စက်ပစ္စည်းများ ဘေးအန္တရာယ် ကင်းရှင်းစွာ လည်ပတ်စေခြင်း) - လုပ်သားများကို ကောင်းမွန်သော အလုပ်လုပ်ခြင်း	ကုမ္ပဏီ တာဝန်ရှိသူများနှင့် ESMP အဖွဲ့ဝင် နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	လိုအပ်သလို အခါအားလျော်စွာ

		အလေ့ကျင့်ကောင်းများ၊ ကောင်းမွန်သော လုံခြုံရေးဆိုင်ရာ အလေ့ကျင့်ကောင်းများ နှင့် ကောင်းမွန်သော ကျန်းမာရေး နှင့် တစ်ကိုယ်ရေ သန့်ရှင်းရေးဆိုင်ရာ အလေ့အကျင့်များနှင့် ကောင်းမွန်သော ပတ်ဝန်းကျင်ဆိုင်ရာ အလေ့ကျင့်ကောင်းများကို လုပ်သားများ၏ စိတ်ထဲစွဲနေပြီး အလေ့အကျင့် ဖြစ်နေသည်အထိ သင်ကြား လေ့ကျင့်ပေးခြင်း၊ - ဆိုးကျိုးသက်ရောက်မှုများနှင့် ရင်းနှီးကျွမ်းဝင်စေရန် သင်ကြား လေ့ကျင့်ပေးခြင်း နှင့် နောက်ဆက်တွဲ လျော့ပါးသက်သာစေရေး နည်းလမ်းများ လုပ်ဆောင်ခြင်း - လုပ်သားများကို သဘာဝပတ်ဝန်းကျင်နှင့် လိုက်လျောညီထွေရှိသော အခြေခံ အလေ့ကျင့်များ ကို (ဥပမာ- ကောင်းမွန်သော အိမ်တွင်း အလေ့ကျင့်ကောင်းများ- အမှိုက်မပစ်ခြင်း၊ ကိုယ့်နေရာကို မညစ်ပတ်စေခြင်း၊ ရေ နှင့် လောင်စာဆီ အသုံးပြုမှုကို လျှော့ချခြင်း) သင်ကြား လေ့ကျင့်ပေးခြင်း၊ - သတ္တုတွင်းဖော်ခြင်းအတွက် စက်ပစ္စည်းကြီးများနှင့် ကုန်ကားကြီးများ လည်ပတ်ခြင်းအတွက်လည်း ပိုမို တိကျသောသင်တန်းများ ပေးခြင်း - တိုးတက်မှုအတွက် သင်တန်းပေးခြင်း၏ ထိရောက်မှု အပေါ် ပြန်လည်သုံးသပ်ခြင်း - သတ္တုတူးဖော်ခြင်း လုပ်ကွက်/ ထုတ်ယူသည့် နေရာ များကို ပုံမှန် စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးခြင်း			

၁၅။	အရေးပေါ် တုံ့ပြန်မှု အစီအစဉ်	- သေဆုံးမှုနှင့် ဒဏ်ရာ အနာတရ ရရှိမှုကိုကာကွယ်ရန်၊ ပတ်ဝန်းကျင်နှင့် လူထုကိုကာကွယ်ရန် နှင့် ထိခိုက်မှုကို လျှော့ချရန် အရေးပေါ် တုံ့ပြန်ရေး အစီအစဉ် နှင့် အဖွဲ့ ပြင်ဆင်ခြင်း - အရေးပေါ် ပြင်ဆင်မှု အစီအစဉ်ကို ပြင်ဆင်ခြင်း - (အရေးပေါ် တုံ့ပြန်ရေး အစီအစဉ်သည် အရေးပေါ် အရင်းအမြစ်၊ အရေးပေါ် ပြင်ဆင်ခြင်းနှင့် လေ့ကျင့်ခြင်း၊ အရေးပေါ် တုံ့ပြန်ရေး လုပ်ငန်းစဉ်၊ အစီအစဉ် ဆက်သွယ်ရေး နှင့် လုပ်ငန်းစဉ်များ ကို စီမံခန့်ခွဲခြင်းနှင့် ပြန်လည်ရှင်းလင်းတင်ပြခြင်းနှင့် စိတ်ဒဏ်ရာရပြီးနောက် စိတ်ဖိစီးမှု ဆိုင်ရာ လုပ်ငန်းစဉ်များကို ခြုံငုံမိပါသည်။) - အရေးပေါ်နှင့် မီးငြိမ်းသတ်ရေး လေ့ကျင့်မှုများ နှင့် ရှေးဦးသူနာပြုသင်တန်းများကို ထောက်ပံ့ပေးခြင်း - အထောက်အကူပစ္စည်းများ (ဥပမာ- မီးငြိမ်းသတ်ရေး ဝတ်စုံ၊ ရှေးဦးသူနာပြု ပစ္စည်းများနှင့် အရေးပေါ်ယာဉ်များ) ထောက်ပံ့ပေးခြင်း - မီးသတ်၊ လူနာတင်ယာဉ်၊ ၊ ကြက်ခြေနီ အသင်းများ၊ ဆေးရုံ နှင့် ရဲစခန်း အစရှိသည်တို့၏ ဖုန်းနံပတ်များ ကို ကပ်ထားခြင်း - တိုးတက်မှုအတွက် သင်တန်းပေးခြင်း၏ ထိရောက်မှု အပေါ် ပြန်လည်သုံးသပ်ခြင်း - သတ္တုတူးဖော်ခြင်း လုပ်ကွက်/ထုတ်ယူသည့် နေရာ များကို ပုံမှန် စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးခြင်း - ERP အတွက် လေ့ကျင့်မှုများကို ပုံမှန် ပြုလုပ်ခြင်း နှင့် တစ်နှစ် နှစ်ကြိမ် ပြုလုပ်ခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	ကျပ် ၁၄,၄၂၀,၀၀၀ (အရေးပေါ် ကိစ္စများအတွက် ဘေးဖယ် ထားရှိခြင်း)	လိုအပ်သလို အခါအားလျော်စွာ

၃။ စီမံကိန်းဖျက်သိမ်းခြင်း/ မိုင်းပိတ်သိမ်းခြင်း ကာလ အတွင်းတွင်

စဉ်	သက်ရောက်မှုများ	အစီအစဉ်ခွဲများ (လျော့ပါးသက်သာစေရေး နည်းလမ်းများကို အဓိက လုပ်ဆောင်ခြင်း))	တာဝန်ရှိသူ	ခန့်မှန်းကုန်ကျ စရိတ် (တစ်နှစ်)	အချိန် ကာလ အပိုင်းခြား/ အကြိမ်
၁။	လေအရည်အသွေး နှင့် ရေ အရည်အသွေး	- သတ်မှတ် လမ်းညွှန် တန်ဖိုးများ အတွင်း ရှိနေကြောင်း နှင့် ရေသည် ညစ်ညမ်းပြီး ကျန်ရှိမနေကြောင်း သေချာစေရန် နောက်ဆုံးအကြိမ်အတွက် လေအရည်အသွေး နှင့် ရေ အရည်အသွေး ကို စစ်ဆေးခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	ကျပ် ၃,၀၀၀,၀၀၀ လေ ကျပ် ၁,၀၀၀,၀၀၀ ရေ အတွက် ပညာရှင် ငှားရမ်းခြင်း	နှစ်ဝက် တစ်ကြိမ်
၂။	မြေ အရည်အသွေး	- မြေ အရည်အသွေး ညစ်ညမ်းမှု (သို့) လောင်စာဆီများ ဖြင့် ညစ်ညမ်းမှု ဖြစ်မနေကြောင်း သေချာစေရန် နောက်ဆုံးအကြိမ်အတွက် မြေအရည်အသွေး ကို စစ်ဆေးခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	ကျပ် ၄၀၀,၀၀၀ ပညာရှင် ငှားရမ်းခြင်း	နှစ်ဝက် တစ်ကြိမ်
၃။	တိုက်စားခံရခြင်း နှင့် အနယ်ကျခြင်း	- ဖျက်သိမ်းခြင်း/ မိုင်းပိတ်သိမ်းခြင်း ကာလ အတောအတွင်း တိုက်စားခံရခြင်း နှင့် အနယ်ကျခြင်း မရှိစေရန် သေချာစေခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	ရံဖန် ရံခါ၊ အပတ်စဉ်၊ လစဉ်
၄။	လူထု ကျန်းမာရေး၊ နှင့်ဘေးအန္တရာယ် ကင်းရှင်းရေး	- ဖျက်သိမ်းခြင်း/ မိုင်းပိတ်သိမ်းခြင်း ကာလ အတောအတွင်း လူထု ဘေးအန္တရာယ် ကင်းရှင်းရေး နှင့် ကျန်းမာရေး လစ်လပ်မှု မရှိကြောင်းသေချာစေရန် စီမံဆောင်ရွက်ခြင်း	ESMP အဖွဲ့ဝင် ၅ ဦး၊ နှင့် လေ့ကျင့်ထားသော လုပ်သား ၂၅ ဦး	အခမဲ့	အခါအားလျော်စွာ

စောင့်ကြပ်ကြည့်ရှုရေး အစီအစဉ်

အထူးပတ်ဝန်းကျင်အရည်အသွေး စောင့်ကြပ်ကြည့်ရှုရေး အတွက် (စီမံကိန်း လည်ပတ်နေစဉ် ကာလအတွင်း)

စောင့်ကြပ်ကြည့်ရှုရေးကို နှစ်ဝက်လျှင် တစ်ကြိမ် ပြုလုပ်ပြီး ECD ကို အချိန် နှင့် တပြေးညီ အစီရင်ခံ တင်ပြခြင်းကို လုပ်ဆောင်ပါသည်။ ပတ်ဝန်းကျင်ဆိုင်ရာ စောင့်ကြပ်ကြည့်ရှုရေး အခြားသော ဌာနမှ ကျွမ်းကျင်သူများ နှင့် ပညာရှင်များကို ငှားရမ်းပါမည်။

နှစ်ဝက် တစ်ကြိမ် ပတ်ဝန်းကျင် အရည်အသွေး စောင့်ကြပ်ကြည့်ရှုခြင်း/ စစ်ဆေးခြင်း (လည်ပတ်ခြင်းကာလ)

စဉ်	အစိတ်အပိုင်း	စောင့်ကြပ်ကြည့်ရှုမည့် ပါရာမီတာများ	စောင့်ကြပ်ကြည့်ရှုမည့် နေရာ/ လုပ်ကွက်	တာဝန်ရှိသူ	အကြိမ်ရေ	ခန့်မှန်းကုန်ကျစရိတ် (တစ်ကြိမ်အတွက်)
၁။	လေ အရည်အသွေး	PM_{10}, $MP_{2.5}$, SO_2, NO_2, CO, O_3, VOC, CO_2, NO, HC, CH_4	- စက်ရုံ ဝန်းအတွင်း မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၄၈.၀၈ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၀၁.၆၅ စက္ကန့် - ကျေးရွာတွင် (မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၁.၀၄ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၀.၀၉ စက္ကန့်)	EMP အဖွဲ့ဝင် နှင့် ငှားရမ်းထားသော ပညာရှင်များ	၆ လတစ်ကြိမ်	ကျပ် ၃,၀၀၀,၀၀၀ (၂ နေရာ)

၂။	ထုတ်လွှတ်မှုများ	Cadmium + Thallium, dioxins/furan; Dust; hydrogen chloride; hydrogen fluoride; mercury; nitrogen dioxide; PM10; sulphur oxide total metals (arsenic, lead, cobalt, chromium, copper, manganese, nickel, vanadium, antimony); total organic carbon	- မီးခိုးခေါင်းတိုင် (မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၃၉.၈၁ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၁၂.၈၆ စက္ကန့်) - clinker အအေးခံသည့်နေရာ (မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၄၈.၀၈ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၀၁.၆၅ စက္ကန့်) - ဘိလပ်မြေ ကြိတ်ခွဲသည့် နေရာ (မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၃၉.၀၁ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၁၀.၁၅ စက္ကန့်)	EMP အဖွဲ့ဝင် နှင့် ငှားရမ်းထားသော ပညာရှင်များ	နှစ်ဝက် တစ်ကြိမ်	ကျပ် ၄,၅၀၀,၀၀၀ (နေရာ ၃ ခု)
၃	ဆူညံသံ	dBA	- ဘိလပ်မြေကြိတ်စက်၊ ကျောက်မီးသွေးကြိတ် စက်၊ မီးဖို၊ နှင့် ကုန်ကြမ်းကြိတ် စက်နေရာ (မြောက်လတ္တီကျူ ၂၀ ဒီဂရီ ၄၇ မိနစ် ၃၉.၉၄ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၁၀.၀၆ စက္ကန့်)	EMP အဖွဲ့ဝင် နှင့် ငှားရမ်းထားသော ပညာရှင်များ	နှစ်ဝက် တစ်ကြိမ်	ကျပ် ၃၅၀,၀၀၀ (နေရာ ၃ ခု)

			- (မြောက်လတ္တီကျူ ၂ဝ ဒီဂရီ ၄၇ မိနစ် ၃၄.၇၅ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၁ဝ.၈၆ စက္ကန့်) - (မြောက်လတ္တီကျူ ၂ဝ ဒီဂရီ ၄၇ မိနစ် ၃၃.၆၁ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ၉.၉၁ စက္ကန့်) - (မြောက်လတ္တီကျူ ၂ဝ ဒီဂရီ ၄၇ မိနစ် ၃၁.၁၈ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ဝ၉.၉၅ စက္ကန့်) - ကျေးရွာတွင် (မြောက်လတ္တီကျူ ၂ဝ ဒီဂရီ ၄၇ မိနစ် ၁.ဝ၄ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၄ မိနစ် ဝ.ဝ၉ စက္ကန့်			
၄	ရေအရည်အသွေး	pH; temperature; turbidity; suspended total solids; total hardness; nitrate; sulphate; phosphate; chloride; iron;	- အပေါ်ယံရေနှင့် စွန့်ပစ်ရေ (မြောက်လတ္တီကျူ ၂ဝ ဒီဂရီ ၄၇ မိနစ် ၂၉.ဝ၈ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၂၃ မိနစ် ၅၂.၃၉ စက္ကန့်)	EMP အဖွဲ့ဝင် နှင့် ငှားရမ်းထားသော ပညာရှင်များ	နှစ်ဝက် တစ်ကြိမ်	ကျပ် ၈ဝ,ဝဝဝ (နေရာ ၁ ခု)

			- (မြောက်လတ္တီကျု ၂၀ ဒီဂရီ ၄၇ မိနစ် ၄၈.၀၈ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျု ၉၆ ဒီဂရီ ၂၄ မိနစ် ၀၁.၆၅ စက္ကန့်)			
၅	ရေဆိုး/ စွန့်ပစ်ရည်	5 days, BOD, COD; arsenic; chlorine (total residual); copper; cyanide; fluoride; iron; lead; pH, sulphide; temperature increase, total suspended solids, zinc.	- ကျေးရွာ စိုက်ပျိုးမြေတွင် (မြောက်လတ္တီကျု ၂၀ ဒီဂရီ ၄၇ မိနစ် ၇.၇၂ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျု ၉၆ ဒီဂရီ ၂၃ မိနစ် ၅၉.၁၃ စက္ကန့်	EMP အဖွဲ့ဝင် နှင့် ငှားရမ်းထားသော ပညာရှင်များ	နှစ်ဝက် တစ်ကြိမ်	ကျပ် ၈၀,၀၀၀ (နေရာ ၁ ခု)
၆	မြေ	Moisture; pH; texture (sand%, silt%, clay%), total nitrogen; available nutrient (P, N); heavy metal	- ကျေးရွာ စိုက်ပျိုးမြေတွင် (မြောက်လတ္တီကျု ၂၀ ဒီဂရီ ၄၇ မိနစ် ၇.၇၂ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျု ၉၆ ဒီဂရီ ၂၃ မိနစ် ၅၉.၁၃ စက္ကန့်)	EMP အဖွဲ့ဝင် နှင့် ငှားရမ်းထားသော ပညာရှင်များ	နှစ်ဝက် တစ်ကြိမ်	ကျပ် ၄၀,၀၀၀ (နေရာ ၁ ခု)

စီမံကိန်း ရန်ပုံငွေ နှင့် တာဝန်ဝတ္တရားများ

စုစုပေါင်း ရန်ပုံငွေ၏ ၁ % နှင့် ညီမျှသော ၇၉၃,၃၀၀,၀၀၀ ကို ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ် (EMP)၊ စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ် (MP) နှင့် လျော့ပါးစေရေး နည်းလမ်းများ လုပ်ဆောင်ရန် အတွက် EMP ရန်ပုံငွေ အဖြစ်ထားရှိပါမည်။

- EMP ရန်ပုံငွေ ၏ ၂၅ % (ကျပ် ၁၉၈,၃၂၅,၅၀၀) ကို လျော့ပါးစေရေး နည်းလမ်းများ လုပ်ဆောင်ရန် အတွက် ထားရှိမည်။ ကန်ထရိုက် ငှားရမ်းရန် မလိုအပ်သောကြောင့် ၎င်း ရန်ပုံငွေသည် အနည်းဆုံး ၁၀ နှစ် စာ အတွက် လုံလောက်မည်ဟု မျှော်လင့်ရပါသည်။

- ရန်ပုံငွေ ၏ ၂0 % (ကျပ် ၁၅၈,၆၆၀,၀၀၀) ကို ၊ စောင့်ကြပ်ကြည့်ရှုခြင်း အစီအစဉ် (MP) လုပ်ဆောင်ရန် အတွက် ထားရှိမည်။ ကျွမ်းကျင်သူများ နှင့် ပညာရှင်များကို အလွန်မြင့်မားသော ကုန်ကျစရိတ်ဖြင့် ငှားရမ်း ရန် လိုအပ်သောကြောင့် လုံလောက်မည်မဟုတ်ပါ ထို့ကြောင့် ရန်ပုံငွေ ထပ်မံ၍ ထည့်ဝင်ရန် ပိုမို လိုအပ်ပါသည်။

- ရန်ပုံငွေ ၏ ၂၅ % (ကျပ် ၁၉၈,၃၂၅,၅၀၀) ကို ပစ္စည်းကိရိယာများကို ဥပမာ- ခရီးဆောင် လေထု စမ်းသပ်သည့် ကိရိယာ၊ ရေစမ်းသပ်သည့် ကိရိယာ နှင့် မြေ စမ်းသပ်သည့် ကိရိယာဝယ်ယူရန်အတွက် ထားရှိပါမည်။ သို့သော် ၎င်း စမ်းသပ်သည့် ကိရိယာများသည် ယေဘူယျ ရည်ရွယ်ချက်အတွက်သာ ယုံကြည်စိတ်ချရသောကြောင့် ခေတ်မီစက်ကိရိယာများ အသုံးပြုသော ကျွမ်းကျင်သူများ နှင့် ပညာရှင်များကို ငှားရမ်းရပါမည်။ နောင်အခါတွင် ရန်ပုံငွေပိုထည့်ရပါမည်။

- EMP ရန်ပုံငွေ ၏ ၁၀ % (ကျပ် ၇၉,၃၃၀,၀၀၀) ကို အရေးပေါ်စောင့်ရှောက်မှုများအတွက် အသုံးပြုရန် ဖယ်ထားပါမည်။ ကံမကောင်းစွာ အကြီးစား မတော်တဆ မှုများ ဖြစ်ပွားပါက ရန်ပုံငွေ ထပ်မံ၍ ထည့်ဝင်ရန် ပိုမို လိုအပ်ပါသည်။

- EMP ရန်ပုံငွေ ၏ ၇ % (ကျပ် ၅၅,၅၃၁,၀၀၀) ကို စွမ်းရည်မြှင့်တင်ခြင်းနှင့် သင်တန်းပေးခြင်း များ အတွက် ထားရှိပါမည်။ လေ့ကျင့်သင်ကြားပေးသူ (ဥပမာ- မီးငြိမ်းသတ်ရေး၊ ရှေးဦးသူနာပြု) ကို ငှားရမ်းရပါမည်။ ဟောပြောပွဲများ၊ ရက်တိုသင်တန်းများပေးရန် နှင့် မိန့်ခွန်းပေးရန် ဖိတ်ကြားထားသော သက်ဆိုင်ရာ အစိုးရ အဖွဲ့အစည်းများမှ အစိုးရ အရာရှိများကို ဉာဏ်ပူဇော်ခ (သို့) ဂါဝရကြေးများ ပေးအပ်ရပါလိမ့်မည်။

- ရန်ပုံငွေ ၏ ၅ % (ကျပ် ၃၉,၆၅၅,၄၀၀) ကို လိုအပ်လျှင် တခြားသော စက်ကိရိယာများ လည်ပတ်ခြင်းအတွက် ရန်ပုံငွေ ထားရှိပါမည်။

- ရန်ပုံငွေ ၏ ၅ % (ကျပ် ၃၉,၆၅၅,၄၀၀) ကို အထွေထွေ ကုန်ကျစရိတ်အတွက် ထားရှိပါမည်။ (ဥပမာ- ရုံးသုံးပစ္စည်းနှင့် စာရေးကိရိယာ အစရှိသဖြင့်)

- ရန်ပုံငွေ ၏ ၃ % (ကျပ် ၂၃,၇၉၉,၀၀၀) ကို အဖွဲ့အစည်းများ ဖွဲ့စည်းခြင်းအတွက် ထားရှိပါမည်။ ဥပမာ- လုပ်ဆောင်နေစဉ်အတွင်း ကုန်ကျစရိတ်များ အစည်းအဝေး၊ ဆွေးနွေးမှုများ နှင့် အခြား ပုံမှန် ကုန်ကျစရိတ်များ

အချိန်ကြာလာသည်နှင့် အမျှ EMP ရန်ပုံငွေ ထဲသို့ လိုအပ်သလို ပိုက်ဆံ ပိုမိုထည့်ဝင်ရပါလိမ့်မည်။ (CSR လုပ်ငန်းစဉ်ကို အကောင်အထည်ဖော်ရန် အတွက် သီးသန့် ရန်ပုံငွေ ထားရှိထားပါသည်။)

စီမံကိန်း ၏ အဓိက ရန်ပုံငွေမှ ဖျက်သိမ်းခြင်း နှင့်ပြန်လည်ထူထောင်ခြင်း အတွက် ရန်ပုံငွေကို ထားရှိပါမည်။

<u>လူထုတွေ့ဆုံဆွေးနွေးပွဲ</u>

စီမံကိန်း အဆိုပြုသူသည် ဒေသခံ လူထုနှင့် လူထုတွေ့ဆုံဆွေးနွေးပွဲ ၅ ပွဲကို ကျင်းပခဲ့ပါသည်။

၁။ ပထမ အကြိမ် လူထုတွေ့ဆုံဆွေးနွေးပွဲ

နေရာ : တောင်ပြည်ညောင်ကျေးရွာ

ရက်စွဲ : ၁၁.၇.၂၀၁၅

တက်ရောက်သူ : ၂၇ ဦး

အစည်းအဝေးတွင် ဒေသခံများသည် တိုင်ကြားချက် ၁ ခု၊ စိုးရိမ်မှု ၂ ခု နှင့် လိုအပ်ချက် ၆ ခု ကို ထုတ်ဖော်ပြောကြားခဲ့ပါသည်။

တိုင်ကြားချက် : မြစ်သာမြစ် ညစ်ညမ်းခြင်း

<u>မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ </u>: ၎င်းသည် Highland Cement (then Blue Diamond) စက်ရုံ နှင့် Max Myanmarဘိလပ်မြေစက်ရုံ အမည်ရသော ဘိလပ်မြေစက်ရုံ ၂ ရုံကြောင့် ညစ်ညမ်းခြင်းကို ဒေသခံ တချို့ အထင်မြင် လွဲမှားခြင်း ဖြစ်ပါသည်။ အမှန်တကယ်မှာ စမ်းချောင်းအထက်ပိုင်းတွင် တရားမဝင် ရွှေတူးဖော်ခြင်း/ ရွှေကျင်ခြင်းများကြောင့် ဖြစ်သည်။ ရွာလူကြီးများသည် ၎င်းကို ကောင်းစွာ သိပါသည်။

စိုးရိမ်မှု : နောင်အနာဂတ်တွင် လောင်စာထင်းရရှိမှု

<u>မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ </u>: ဒေသခံများကို လောင်စာထင်းများ၊စားသုံးနိုင်သော ဟင်းသီးဟင်းရွက်များနှင့် သစ်သီးဝလံများ စုဆောင်းခွင့်ပြုခဲ့သော်လည်း စီမံကိန်း ဧရိယာ အတွင်းတရားမဝင် သစ်ခိုးထုတ်ခြင်းကို ခွင့်မပြုတော့ပါ။

စိုးရိမ်မှု : ကျေးရွာအတွင်း ဝင်ရောက်လာသော မီးခိုးများ နှင့် ဖုန်မှုန့်များ

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ : ESP တစ်ခု နှင့် စစ်ထုတ်အိတ် ၄၄ ခု မတပ်မီ မီးခိုးများ ထွက်ရှိခဲ့ပါသည်။ အခြေအနေသည် အများကြီး တိုးတက်လာပါသည်။ ဖုန်မှုန့်များသည် YCDC မှ ဆောက်လုပ်ထားသော လမ်းဟောင်း (ပိုင်ရှင်ဟောင်း Max Myanmar ဘိလပ်မြေစက်ရုံ) တွင် ယာဉ်များ သွားလာခြင်းကြောင့်ဖြစ်ပါသည်။ ထိုလမ်းကို အဓိကအားဖြင့် (မိတ္ထီလာ မှ) တရားမဝင်သစ်ထုတ်လုပ်သည့် ထရပ်ကားကြီးများနှင့် တရားမဝင် ရွှေတူးဖော်သည့် ယာဉ်များက အများဆုံး အသုံးပြုပါသည်။ Highland ဘိလပ်မြေစက်ရုံ တွင် ကိုယ်ပိုင်လမ်းသစ် ရှိပါသည်။

လိုအပ်ချက် : လျှပ်စစ်မီးအတွက်

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ : ကုမ္ပဏီသည် ကျေးရွာ လျှပ်စစ်မီးအတွက် ကျပ် ၇၀,၀၀၀,၀၀၀ ကို လှူဒါန်းပြီး ဖြစ်ပါသည်။ အိမ်များသည် ပြန့်ကျဲပြီး ကြမ်းတမ်းသော ရွာမြေ အနေအထားတွင် ဝေးကွာစွာ တည်ရှိနေသောကြောင့် အိမ်ထောင်စုတိုင်းကို မီးပေးရန် မဖြစ်နိုင်ပါ။ လျှပ်စစ်ဓာတ်အားလိုင်း တစ်လျှောက်ရှိ အိမ် ၁၀ အိမ်သာ လျှပ်စစ်မီး ပေးနိုင်ပါသည်။

လိုအပ်ချက် : ကျေးရွာဆေးခန်း

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ : ကျန်းမာရေး နှင့် အားကစား ဝန်ကြီးဌာန မှ တာဝန်ယူပြီး ဆုံးဖြတ်ရပါမည်။ ကုမ္ပဏီသည် Max Myanmar Co., Ltd နှင့် ပူးပေါင်း၍ ကျေးရွာဆေးခန်း ဖြစ်လာစေရန် ကူညီပံ့ပိုးပေးပါမည်။ စီမံကိန်းအဆိုပြုသူသည် ၎င်းတို့၏ လုပ်သားအားလုံးအတွက် ကိုယ်ပိုင်ဆေးခန်း ထားရှိထားပြီး အချို့သော ဒေသခံများကိုလည်း အခမဲ့ ဆေးဝါးကုသမှု ပေးခဲ့ပါသည်။

လိုအပ်ချက် : ကျေးရွာစာကြည့်တိုက်

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ : ကုမ္ပဏီသည် ကျေးရွာစာကြည့်တိုက် အတွက် ကျပ် ၃၀၀,၀၀၀ ကို လှူဒါန်းပြီး ဖြစ်ပါသည်။ ကျေးရွာစာကြည့်တိုက် သည် အကောင်အထည် မပေါ်သေးပါ။

လိုအပ်ချက် : နောက်ထပ်လူမှု အကူအညီများအတွက်

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ : ၂၀၁၅ ခုနှစ် အဆုံးပိုင်းထိ ကုမ္ပဏီသည် CSR အစီအစဉ် အတွက် ၇၆,၃၇၈,၂၀၀ ကျပ် နှင့် တောင်ပြည်ညောင်ကျေးရွာအတွက် သီးသန့် လှူဒါန်းမှု အတွက် ၇၁,၄၉၀,၇၀၀ ကျပ် အသုံးပြုပြီး ဖြစ်ပါသည်။

လိုအပ်ချက် : စက်ရုံတွင် အခြားသော ကျေးရွာများမှ အလုပ်ပိုမိုခန့်ထားရေး

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ : စက်ရုံတွင် ဒေသခံ ၇၉ ဦးကို အလုပ်ခန့်အပ်ထားပြီး ဖြစ်ပါသည်။ အလုပ်၏ သဘောသဘာဝသည် အလုပ်သမားများ (အလုပ်သမားများစွာ လိုအပ်သော နေရာ)ထက်

စက်ပစ္စည်းများနှင့် အလိုအလျောက် လည်ပတ်ခြင်းဖြစ်ပါသည်။ ကျွမ်းကျင်ပြီး အရည်အချင်းပြည့်ဝသော လုပ်သားများသာ လိုအပ်ပါသည်။

လိုအပ်ချက် : မူလတန်းကျောင်းများကို မူလတန်းလွန် ကျောင်းများ နှင့် အလယ်တန်းကျောင်းများ အဖြစ် အဆင့်မြှင့်ရန်

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ ၎င်းသည် ကုမ္ပဏီမှ လုပ်ဆောင်နိုင်သည် ထက် ပိုပါသည် ပညာရေးဝန်ကြီးဌာနကသာ လျှင် ဆုံးဖြတ်နိုင်ပါသည်။

၂။ ဒုတိယ အကြိမ် လူထုတွေ့ဆုံဆွေးနွေးပွဲ

နေရာ : တောင်ပြည်ညောင်ကျေးရွာ

ရက်စွဲ : ၂၀.၂.၂၀၁၇

တက်ရောက်သူ : ၆၁ ဦး

ဒေသခံများသည် တိုင်ကြားချက် ၃ ခု၊ နှင့် လိုအပ်ချက် ၃ ခု ကို ထုတ်ဖော်ပြောကြားခဲ့ပါသည်။

တိုင်ကြားချက် : တူးဖော်ခြင်းလုပ်ငန်းစဉ်များကြောင့် ကျောင်းအဆောက်အဦတွင် အက်ကြောင်းလေးများ ဖြစ်ပေါ်နေပါသည်။

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ : အက်ကြောင်းလေးများ အင်္ဂတေဖြင့်ပြုပြင်ပေးပြီးဖြစ်ပါသည်။

တိုင်ကြားချက် : ဖုန်မှုန့်ပြဿနာ (ကျေးရွာအတွင်း ကျလာသော ဖုန်မှုန့်များ)

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ : ဖုန်မှုန့်များထွက်ရှိခြင်းသည် YCDC မှ ဆောက်လုပ်ထားသော လမ်းဟောင်းတွင် ယာဉ်များ သွားလာခြင်းကြောင့်ဖြစ်ပါသည်။ (Meithtila မှ) တရားမဝင် သစ်ထုတ်လုပ်သည့် ထရပ်ကားကြီးများနှင့် တရားမဝင် ရွှေတူးဖော်သည့် ယာဉ်များလည်း ထိုလမ်းမှ သွားလာပါသည်။ ကုမ္ပဏီသည် ၎င်း၏ သယ်ယူပို့ဆောင်ရေး လမ်းတစ်လျှောက်တွင် ရေကိုပုံမှန် ဖြန်းခဲ့ပါသည်။ သို့ရာတွင် လမ်းဟောင်းတစ်လျှောက်ရှိ ၎င်း ပြဿနာကို ကိုင်တွယ်ဖြေရှင်းနိုင်စွမ်း မရှိပါ။

တိုင်ကြားချက်: မြစ်သာမြစ် ညစ်ညမ်းခြင်း

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ : ၎င်းသည် Highland ဘိလပ်မြေစက်ရုံ နှင့် Max Myanmarဘိလပ်မြေစက်ရုံ ကြောင့် ညစ်ညမ်းခြင်းဖြစ်သည်ဟု ဒေသခံ တချို့ အထင်မြင် လွဲမှားခြင်း ဖြစ်ပုံပေါ်သည်။ အမှန်တကယ်မှာ စမ်းချောင်းအထက်ပိုင်းတွင် လူအမျိုးမျိုး၏ တရားမဝင် ရွှေတူးဖော်ခြင်း/ ရွှေကျင်ခြင်းများကြောင့် ဖြစ်သည်။

လိုအပ်ချက် :   အလုပ်အကိုင် ပိုမို ရရှိရေး

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ : စက်ရုံတွင် ဒေသခံ ၇၉ ဦးကို အလုပ်ခန့်အပ်ထားပြီး ဖြစ်ပါသည်။ အလုပ်နေရာ လိုအပ်သော အခါ (သို့) လစ်လပ်နေရာရှိသောအခါ (သို့) လုပ်ငန်းသည် နောက်ပိုင်းတွင် ပိုမိုကောင်းမွန်လာသောအခါ အလုပ်ပိုမို ခန့်အပ်ထားရှိပါမည်။

လိုအပ်ချက် :   ပျက်ဆီးသွားသော လမ်းကို ပြန်လည်ပြင်ဆင်ခြင်း

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ : ကုမ္ပဏီသည် ၎င်းတို့၏ ကိုယ်ပိုင် လမ်း (မော်တော်ဆိုင်ကယ်များသာ အသုံးပြုသည့် ဒေသခံများ အသုံးပြုသော) ကို တစ်ကြိမ်ပြုပြင်ပြီးဖြစ်သည်။ YCDC တည်ဆောက်ထားသော လမ်းဟောင်းကို ပြုပြင်ပေးရန် ထည့်သွင်းစဉ်းစားပေးပါမည်။

လိုအပ်ချက် : သောက်သုံးရေ ရရှိရေး အတွက်

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ : ကုမ္ပဏီတောင်မှ မြစ်သာမြစ်မှ ရေကို (ချောင်းဘေးတွင်ရှိသော ရေတိမ်သောရေတွင်းများ) နှင့် တောင်ဘက်ရှိ ချောင်းငယ်မှ ရေကို အသုံးပြုပါသည်။ (မြေအောက်ရေကို အသုံးပြုခြင်းသည် ၎င်းဒေရိယာတွင် မဖြစ်နိုင်ပါ) ၎င်း ပြဿနာကို ယခုအချိန်ထိ မဖြေရှင်းနိုင်ပါ။

၃။ လူထုတွေ့ဆုံဆွေးနွေးပွဲ ၃ ခုကို တောင်ပြည်ညောင်ကျေးရွာနှင့် အုတ်ကျင်းကျေးရွာတွင် ပြုလုပ်ခဲ့ပါသည်။

(က) တောင်ပြည်ညောင်ကျေးရွာတွင် ၇.၈.၂၀၁၈ တွင်ပြုလုပ်ခဲ့ပြီး ဒေသခံ ၃၀ တက်ရောက်ခဲ့ပါသည်။

(ခ) မြောက်ပြည်ညောင်ကျေးရွာတွင် ၇.၈.၂၀၁၈ (နေ့လည်) တွင်ပြုလုပ်ခဲ့ပြီး မြောက်ပြည်ညောင်ကျေးရွာ နှင့် လယ်စပြင်ကျေးရွာမှ ဒေသခံ ၁၈ ဦးသာ တက်ရောက်ခဲ့ပါသည်။

(ဂ) အုတ်ကျင်းကျေးရွာတွင် ၈.၈.၂၀၁၈ တွင်ပြုလုပ်ခဲ့ပြီး အုတ်ကျင်းကျေးရွာနှင့်မုံပင် ကျေးရွာမှ ဒေသခံ ၆၂ ဦး တက်ရောက်ခဲ့ပါသည်။

ဒေသခံများသည် တိုင်ကြားချက် ၁ ခု၊ နှင့် လိုအပ်ချက် ၆ ခု ကို ထုတ်ဖော်ပြောကြားခဲ့ပါသည်။

တိုင်ကြားချက်: ဖုန်မှုန့်ပြဿနာ (တောင်ပြည်ညောင်ကျေးရွာမှ ကျေးရွာသားမှ ပြောကြားသော)

မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ : YCDC မှ ဆောက်လုပ်ထားသော လမ်းဟောင်း များတစ်လျှောက် ဖုန်မှုန့်များထွက်ရှိခြင်းကို ယခုအချိန်ထိ မဖြေရှင်းနိုင်သေးပါ။ ၎င်းလမ်းကို တရားမဝင်သစ်ထုတ်လုပ်သည့် ထရပ်ကားကြီးများနှင့် တရားမဝင် ရွှေတူးဖော်သည့် ယာဉ်များက အသုံးပြုပါသည်။

လိုအပ်ချက် : လျှပ်စစ်မီး ရရှိရေး အတွက် (တောင်ပြည်ညောင်၊ လယ်စပြင်၊ အုတ်ကျင်းနှင့် မုံပင်ကျေးရွာသားများ ပြောကြားသော ပြဿနာများ)

<u>မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ</u> : ကျေးရွာ ၄ ရွာ လျှပ်စစ်မီး ရရှိရေး အတွက် မဖြေရှင်းနိုင်ပါ။ ၎င်းသည် ကန့်သတ်ချက်ရှိသော ကုမ္ပဏီ၏ လုပ်ဆောင်နိုင်စွမ်းထက် ကျော်လွန်နေပါသည်။

လိုအပ်ချက် : လမ်းခင်းခြင်းအတွက် (တောင်ပြည်ညောင်၊နှင့် မြောက်ပြည်ညောင် ကျေးရွာသားများ ပြောကြားသော ပြဿနာများ)

<u>မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ</u> – ကျောက်စရစ်လမ်းခင်းခြင်းအတွက် ကုန်ကျစရိတ်သည်ကြီးပါသည်။ ၎င်းပြဿနာကို ယခုအချိန်ထိ မဖြေရှင်းနိုင်သေးပါ။ သို့သော် ကုမ္ပဏီသည် ၎င်းကို ထည့်သွင်းစဉ်းစားပေးပါမည်။

လိုအပ်ချက် : ကျောင်းပြန်လည်ပြုပြင်ခြင်းနှင့် ဘောလုံးကွင်း/ ကစားကွင်းမြေညှိခြင်း (မြောက်ပြည်ညောင် ကျေးရွာသားများ ပြောကြားသော)

<u>မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ</u>: ၎င်းပြဿနာကို ယခုအချိန်ထိ မဖြေရှင်းနိုင်သေးပါ။

လိုအပ်ချက် : မီးသဂြိုလ်စက် အသစ်ဆောက်လုပ်ခြင်းအတွက် (မြောက်ပြည်ညောင် ကျေးရွာသားများ ပြောကြားသော)

<u>မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ</u>: ၎င်းပြဿနာကို ယခုအချိန်ထိ မဖြေရှင်းနိုင်သေးပါ။

လိုအပ်ချက် :ကျေးရွာစာကြည့်တိုက်နှင့် ကျေးရွာရေတွင်း (အုတ်ကျင်း ကျေးရွာသားများ ပြောကြားသော)

<u>မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ</u>: ၎င်းပြဿနာကို ယခုအချိန်ထိ မဖြေရှင်းနိုင်သေးပါ။

လိုအပ်ချက် : စမ်းချောင်းမှ ရေကိုရယူရန် PVC ပိုက်လိုင်းများ အတွက်

<u>မှတ်ချက်ကို ဘယ်လိုဖြေရှင်းခဲ့လဲ</u>: ၎င်းပြဿနာကို ယခုအချိန်ထိ မဖြေရှင်းနိုင်သေးပါ။

CSR အစီအစဉ်သည် ထိရောက်ပြီး အဓိပ္ပါယ် ပြည့်ဝရမည်ဖြစ်ကြောင်း ကုမ္ပဏီသည် ကောင်းစွာ နားလည်သော်လည်း အခြားတဖက်တွင် CSR အစီအစဉ်သည် ကုမ္ပဏီမှ တတ်နိုင်သည့် ပမာဏသာ ဖြစ်သင့်သည်။ ဒေသခံများသည် ငွဲညာပြီး အများကြီး မတောင်းဆိုသင့်ပါ။ ကုမ္ပဏီသည်လည်း ကန့်သတ်ချက်ရှိပါသည်။

လူထုတွေ့ဆုံဆွေးနွေးပွဲ သည် ဆက်လက်လုပ်ဆောင်ရမည့် လုပ်ငန်း ဖြစ်ပြီး နောင် အစည်းအဝေးများကိုလည်း အခါအားလျော်စွာ ပြုလုပ်သွားမည် ဖြစ်ပါသည်။

အကောင်အထည်ဖော်ပြီးသော CSR အစီအစဉ်များ

ကုမ္ပဏီသည် CSR အစီအစဉ်များနှင့် လှူဒါန်းခြင်းများ အတွက် ၁၆၄,၇၃၀,၀၀၀ ကျပ် အသုံးပြုပြီးဖြစ်ပါသည်။ ၂၀၁၅ နှစ်ကုန်အထိ ကုမ္ပဏီသည် ကျပ် ၇၆,၃၅၈,၀၀၀ အသုံးပြုပြီးဖြစ်ပါသည်။ ၂၀၁၆ မှ ၂၀၁၈ အထိ CSR အစီအစဉ်များနှင့် လှူဒါန်းခြင်းများ အတွက် ၈၈,၃၇၁,၈၀၀ ကျပ်ကို ထပ်မံ အသုံးပြုပြီးဖြစ်ပါသည်။ ထိုထဲမှ အချို့သည် အမြတ်မရခင်အချိန်ထဲမှ လုပ်ဆောင်ခဲ့ခြင်းဖြစ်ပါသည်။

မည်သို့ပင်ဆိုစေ ကုမ္ပဏီသည် CSR အစီအစဉ်ကို လူထုစာနာထောက်ထားမှု ဆိုင်ရာ အကြောင်းပြချက်ဖြင့် ဆက်လက်လုပ်ဆောင်ပေးမည်ဖြစ်သည်။ ကုမ္ပဏီသည် CSR အစီအစဉ်ကို လုပ်ဆောင်ရန် အတွက် အမြတ်၏ ၅%ကို ထားရှိထားပါမည်။

နိဂုံးချုပ်နှင့် အကြံပြုချက်

အခြောက်လုပ်ငန်းစဉ် "dry process method" ကဲ့သို့သော ခေတ်သစ် နည်းပညာ ကို အသုံးမပြုခြင်နှင့် ESP နှင့် စစ်ထုတ်အိတ်များ မတပ်ဆင်ခင် တွင် ဘိလပ်မြေ စက်ရုံသည် လေထုပတ်ဝန်းကျင်အတွက် ညစ်ညမ်းစေမှု မြင့်မားကြောင်း ယေဘူယျ သဘောတူပါသည်။ ခေတ်သစ် နည်းပညာ ကို အသုံးပြုသည့် တိုင်အောင် ဘိလပ်မြေ စက်ရုံသည် လေထုကို အတိုင်းအတာ တစ်ခု အထိ ညစ်ညမ်းစေပါသည်။ အမှန်တကယ်တွင် ညစ်ညမ်းမှုကို ရှောင်ရှားနိုင်သော ဘိလပ်မြေ စက်ရုံ ဟူ၍ မရှိပါ။

အခြားတဖက်တွင် ဘိလပ်မြေသည် နိုင်ငံ၏ အခြေခံအဆောက်အအုံ များ ဖွံ့ဖြိုးတိုးတက်ခြင်းတွက် အရေးပါပါသည်။

အခြေခံအဆောက်အအုံ များ ဖွံ့ဖြိုးတိုးတက်ခြင်း နှင့် ပတ်သက်လျှင် မြန်မာနိုင်ငံသည် အခြားသော နိုင်ငံများထက် နောက်ကျကျန်နေပြီး မြန်မာနိုင်ငံသည် နိုင်ငံ လိုအပ်ချက်အတွက် ပြည်ပမှ ဘိလပ်မြေ၏ ၅၀ % ခန့်ကို သက်ရောက်နေဆဲ ဖြစ်ပါသည်။ မြန်မာနိုင်ငံမှ ဘိလပ်မြေ သုံးစွဲမှု သည် ၁၀၀ ကီလိုဂရမ်ဖြစ်သည်ဟု တွက်ချက်ထားပြီး အခြားအာဆီယံ နိုင်ငံများထက် ၅၀ ရာခိုင်နှုန်း နည်းပါသည်။ (အင်တာနက်မှ, ၂၀၁၈)

စီမံကိန်း အဆိုပြုသူသည် ၎င်း ဘိလပ်မြေစက်ရုံကြောင့် ဖြစ်လာသော ဆိုးကျိုးသက်ရောက်မှုများကို အတတ်နိုင်ဆုံးလျှော့ချသွားပါမည်။ စီမံကိန်းကို သိသာထင်ရှားပြီး ပြင်းထန်သော ပတ်ဝန်းကျင်နှင့် လူမှု သက်ရောက်မှုများ မဖြစ်စေဘဲ လုပ်ဆောင်နိုင်မည်ဟု ယုံကြည်ပါသည်။

ကတိကဝတ်များ စာရင်း

(၁) ဥပဒေ၊ နည်း ဥပဒေ၊ စည်းမျဉ်းစည်းကမ်းများနှင့် လမ်းညွှန်ချက်များကို လိုက်နာမည် ဖြစ်ကြောင်း ကတိကဝတ် (စာမျက်နှာ ၂၃)

(၂) EIA လုပ်ထုံးလုပ်နည်း, အမှတ် ၆၁၆/ ၂၀၁၅ အပိုင်း ၆၂-က-ဂ)" တွင်ဖော်ပြထားသည့်အတိုင်း စီမံကိန်း အဆိုပြုသူမှ ပြုလုပ်ရမည့် ကတိကဝတ် (စာမျက်နှာ ၃၂)

(၃) EIA လုပ်ထုံးလုပ်နည်း, အမှတ် ၆၁၆/ ၂၀၁၅ အပိုင်း ၆၂-က-ဂ)" တွင်ဖော်ပြထားသည့်အတိုင်း တတိယ အဖွဲ့အစည်း MESC မှ ပြုလုပ်ရမည့် ကတိကဝတ် (စာမျက်နှာ ၃၃)

(၄) မြေအောက်ရေ အသုံးမပြုဘဲ ချောင်းများ၊ စမ်းချောင်းများမှ ရေကိုသာ ရယူသုံးစွဲမည် ဖြစ်ကြောင်း ကတိကဝတ် (စာမျက်နှာ-၈၁)

(၅) စီမံကိန်း လုပ်ဆောင်ခြင်းကြောင့် ဘေးပတ်ဝန်းကျင်ရှိ ယဉ်ကျေးမှု အစိတ်အပိုင်းများအပေါ် သက်ရောက်မှု မရှိစေကြောင်း ကတိကဝတ် (စာမျက်နှာ-၁၅၂)

(၆) CSR အစီအစဉ် လုပ်ဆောင်ခြင်းအတွက် အသားတင် အမြတ်ငွေ၏ ၅ % ကို သုံးစွဲမည် ရယူသုံးစွဲမည် ဖြစ်ကြောင်း ကတိကဝတ် (မြန်မာဘာသာဖြင့်) နောက်ဆက်တွဲ (စာမျက်နှာ-၂၈၈)

(၇) လုပ်သားများ သက်သာချောင်ချိရေး လုပ်ဆောင်ခြင်းအတွက် ကတိကဝတ် (မြန်မာဘာသာဖြင့်) နောက်ဆက်တွဲ (စာမျက်နှာ-၂၈၉)

(၈) မီးဘေးကာကွယ်ရေး နှင့် မီးငြိမ်းသတ်ရေး လုပ်ငန်းများ လုပ်ဆောင်ခြင်းအတွက် ကတိကဝတ် (မြန်မာဘာသာဖြင့်) နောက်ဆက်တွဲ (စာမျက်နှာ-၂၉၀)

(၉) ဓာတ်အားလိုင်းများမှ လျှပ်စစ်မီး ရယူခြင်းနှင့် အရံ မီးစက် ထားရှိခြင်း နှင့် ပတ်သက်၍ ကတိကဝတ် (မြန်မာဘာသာဖြင့်) နောက်ဆက်တွဲ (စာမျက်နှာ-၂၉၁)

(၁၀) လေထုညစ်ညမ်းခြင်း၊ ရေထုညစ်ညမ်းခြင်း နှင့် မြေထုညစ်ညမ်းခြင်း ကို လျော့ချရန်/ လျော့ပါးစေရန် ကတိကဝတ် (မြန်မာဘာသာဖြင့်) နောက်ဆက်တွဲ (စာမျက်နှာ-၂၉၂)

1. EXECUTIVE SUMMARY

This is the second amended Environmental Impact Assessment (EIA) report for the operation of Blue Diamond Cement Factory by Highland Cement International Co., Ltd. The first amended report was submission in December 2018.

The project proponent

Highland Cement International Co., Ltd is a joint ventures company between Blue Diamond Cement Co., Ltd (Myanmar) and LG International Corporation (Korea); The joint venture ration being 49:51.

Name of the project proponent

Highland Cement International Co., Ltd was registered as a limited company in December, 2015. See also **ANNEX** for Certificate of Exporter/Importer Registration (No. 40042 (17-05-16) from the Ministry of Commerce; and also Form of Permit (No.72 FC/2015-2016(NPT) 22-12-2015 from the Ministry of National Planning and Economic Development.

Name of the project proponent	:	Highland Cement International Co., Ltd
Address (Yangon head office)	:	Highland Cement International Co., Ltd, No.9-A, Mya Kanthar 2 Street, 2nd Ward, Kamaryut Township,Yangon Region
Telephone	:	01507115
Website	:	www.bluediamond.com.mm
E-mail	:	highlandcement@gmail.com
Address (Location site)	:	Highland Cement International Co., Ltd, Kyaytine-pyin Kwin, Pyi Nyaung village, Tharzi Township, Mandalay Region
Contact person	:	U Aung Zaw Myint
Phone	:	09 974916778
E-mail	:	aungzaw.ygn@gmail.com
Address (Mandalay branch office)	:	43/1, 35th Street, between 69 & 70th Street, Mahar Aungmyay Township, Mandalay Region
Objective	:	Construction and Operation of a cement plant together with associated mining/quarrying of limestone and other raw materials

Environmental and social experts

Myanmar Environment Sustainable Conservation Co., Ltd (MESC) is a consultant firm officially registered in 2014 as a limited company (a consultant/service company) at the Ministry of National Planning and Economic Development. Document: YaKa-8(Ga) 001/2014(004720), dated: 6th June, 2014. Registration No. 830/2014-2015, (20-5-2014). The new registration number is 110649193.

The Transitional Registration/License No. of the consultant firm, MESC is No. 0003, ECD, Dated 1st July 2017.

Contact Address	**:**	Room no. (B -5), Building no.72, Marlar-Myaing 6th Street, 16 Ward, Hlaing Township, Yangon Region
Contact person	**:**	Myint Kyaw Thura 95 9 420105071
Contact number	**:**	95 9 73044903
E-mail	:	myanmar.esc@gmail.com
Website	**:**	www.myanmar environment sustainable conservation.com

Members of MESC who are IEE/EIA appraisers, or IEE/EIA practitioners or who are involved in this IEE/EIA project are as follows:-

Name	Nationality & National Registration Card No.	Registration/ license No. by ECD	Designation
U Myint Kyaw Thura M.Sc (Zoology)	Myanmar 12/Da Ga Ta (N)028349	0006	Managing Director, Biodiversity Specialist (Fauna), EIA practitioner and EIA Appraiser
U Saw Han Shein B.Sc (Botany) M.Sc (Marine Biology)	Myanmar 10/Ma La Ma (N)008173	0007	Retired Professor, EIA Practitioner and Appraiser
Dr. Thiri Dawe Aung Ph.D (Zoology)	Myanmar 12/Da La Na (N) 029433	0008	Biodiversity Specialist (Ornithologist)
U Tin Tun Aung B.Sc (Engineering)	Myanmar 12/U Ka Ma (N)172111	0009	Engineer and EIA practitioner
Daw Khin Nhwe Naing M.Sc (Botany)	Myanmar 9/Pa Kha Ka (N)001252	00010	Biodiversity Specialist (Flora), Environment Researcher

U Than Soe Oo M.Sc (Forestry)	Myanmar 9/Ma Na Ma (N) 050808	00011	EIA practitioner
U Oakka Kyaw Thu B.Sc (Geology)	Myanmar 7/Ya Ta Ya (N) 090371	00012	Geologist
Daw Thin Thin Yee B.Sc (Chemistry)	Myanmar 12/Tha Ga Ka (N)039292	00013	Chemical Environment Researcher, Computer Programmer

MESC has also part time members working as free lances.

The firm is not in a position to employ all its part time members on a permanent basis.

These are botanists, zoologists, ornithologists, ecologists, aquatic ecologists, social scientists, engineers and geologists working with this firm.

For the physical and chemical environmental studies MESC has to hire experts, say for example, from the Health Department and from registered laboratory in Yangon. Since portable test kits are sometime not reliable, experts from the Health Department have to be hired for the analysis of air quality. Experts from a registered laboratory were hired for the analysis of water (or samples have to be sent to the laboratory).

Environmental Policy, legal and institutional frame work in brief.

Highland Cement International Co., Ltd has environmental policy of its own and aim to achieve its goals with minimal impact on the environment.

Highland Cement International Co., Ltd has environmental policy of doing environmentally sound business. The company is working with the local communities and government agencies, such as the Ministry of Natural Resources and Environmental Conservation (MONREC) integrating the environment into its planning, operations and policy decision.

The first and foremost policy is to comply with laws, rules and regulations relating to the physical and social environment. Most of all, it will follow the rules and regulations set up by the Environmental Conservation Department (ECD), the main agency responsible for environmental management. The company will also comply with regulations of Department of Mines (DOM), and the Forest Department (FD). The company pledges to do the business that will be environmentally sound as practical as possible.

Highland Cement International Co., Ltd will comply with all the 31 applicable laws, rules and regulation relating to the manufacturing of cement. These laws, rules comprise: Environmental Conservation Law 2012; Environmental Conservation Rules 2014; the Protection of Wildlife and Protected Area Law 1994, the Forest Law 2018; Myanmar Mine Law 2015; Myanmar Mine Rules 2018; the Conservation of Water Resources and River Law 2006; Myanmar Investment Law 2016; Foreign Investment Law 2012; the Factory Act 1974;

Myanmar Private Industries Enterprise Law 1990; the Social Security Law 2012; Labour Organization Law 2012; Environmental Impact Assessment (EIA) Procedure 2015; National Environmental Quality (Emission) Guideline, NEQEG, 2015, among others.

Relevant sections and subsection of these laws are reproduced in related chapter of this report.

The environmental qualities guideline such as ambient air, emission, noise level, effluent guidelines prescribed by ECD and to be complied with are mentioned in that chapter of the report.

The Project in Brief

The project is for manufacturing of Portland cement of at Blue Diamond Cement factory operated by Highland Cement International Co., Ltd.

The project site is located near South Pyi Nyaung Village which is ½ miles in the southwest. It is in the eastern part of Tharzi Township. It is 43 miles east of Tharzi Town and 320 miles north of Yangon City.

The total area of the site is 1308.91 acres comprising 173 acres for factory premise; 181 acres for residential area (housing for workers), 649 acres for Nyaung Pin Taung limestone quarry and 301 acres for Thayat-yay Taung limestone quarry.

The Construction Phase is 2 years while the Operation Phase is 10 years and renewable.

The estimated budget is Kyat 79,330 million including USD 19 million. The production capacity is 1,500 tons Portland cement/day.

The layout of the project site is shown below:

Aerial view of the factory and its environs

Blue Diamond Cement Factory Layout Plan
1. Limestone Crusher
2.Preblending Storage
3.Clays & Laterite Storage
4. Raw Mill
5.Raw Meal Silo
6. Preheater
7. Kiln
8. CCR & QC
9. Coal Mill
10. Coal Storage
11. Coal Dryer
12. Clinker Silo
13. Gypsum Storage
14. Cement Mill
15. Cement Silo
16. Packing
17. Cement Bag Storage
18. Main Store
19. M & E Workshop
20. Main Substation
21. Water Treatment
22. Canteen
23. Briefing Hall
24. Quarry Office
25. Oil Tank

The machinery used includes:

- Wheel loader, crawler drills, dozers, cranes, dump trucks, crusher, breaker, grader, roller (most are for use in limestone quarry).

Electricity is sourced from National Gridline on the high way of at Yay Paung Sone Village 4 miles away in the north. Annual electric power requirement in estimated at 75,000,000 KWh.

The annual water requirement is 60,000,000 gallons. The daily consumption is estimated at 180,000 gallons/day of which 150,000 gallons (at most) is for domestic uses and 30,000 gallons is for industrial uses ("dry process method needs little water but only for cooling at cooling tower for 100% recirculation).

Raw materials and annual requirement

Limestone	: 780,000 tons
Clay (alumina and silica)	: 73,000 tons
Laterite	: 28,000 tons
Gypsum	: 20,000 tons
Coal	: 96,000 – 144,000 tons.

Limestone and clay are extracted from the nearby quarry sites. limestone is the major component of raw materials.

Laterite is procured Pyin Oo Lwin (Inya) and Aung Bann, 32 km away.

Gypsum is procured from Mauk Mai, 96 km away.

Coal is procured from Kalaywa, 456 km away; coal powder is used as coal burner.

Chemicals : 54 types of chemical comparing: ethylene glycol, methyl cellulose, sodium hydroxide, magnesium oxide, ethanol, calcium carbonate, acetic acid, ammonia chloride, glycerol, silica gel, and methyl red, solid olefin, among others. All are needed in relatively small quantity for treatment of water (water purification and waste water treatment).

Main steps in manufacturing of Portland cement

- raw materials collection and preparation
- clinker production (pyrro process and dry process)
- cement grinding and distribution

These can be subdivided and distribution:

- procurement of raw materials (limestone, clay, laterite, gypsum and coal)
- crushing and pro-homogenization of raw materials, limestone, clay, literate
- grinding (pulverization), homogenization and temporary storage of raw material
- pre-heating and clinkerization (coal is burner)
- clinker cooling and temporary storage
- grinding clinker and gypsum
- cement storage, packing and distribution

Production capacity	: 1,500 tons of Portland cement (days)
Work force	: 391 workers (Operation Phase) including 10 foreigner technicians
Operational days	: 320 days
Working hours	: 24 hrs/day (in three shifts)

Waste generated

Main Industrial solid waste in the form of cement/clinker dust, ash, and point source emission from stalk and from kiln.

Generally the production of 1500 tons of cement generates 1500 kg of ash and dust.

(The solid waste ash, slag, dust are relatively small in quantity as almost 100% of raw materials (limestone, clay, laterite) are physically and chemically transformed into clinker in the pyroprocess that involves intense heat leaving little residue (complete combustion). The main flue gas emitted is CO_2.

(Estimation: 1050 tons of CO_2, 750 kg of SO_2 and 1500 kg of NO_x per day).

One Esp and 44 bags filters are installed to mitigate PM. Domestic waste from office, workers' housing and kitchen in substantial quantity (391 workers). Waste are collected in bins and disposed at land fill or incinerated.

Industrial and domestic liquid waste

Industrial waste water is negligible as dry process does not need water; 30,000 gallons of water is used daily for cooling and 100% recirculated.

Domestic consumption is actually 100,000 gallons of which 33,000 gallons is lost through consumption and 67,000 gallons and up as waste water. Waste water is treated (physically chemically and biologically) before discharged. (Physical removal of solid if any; actually with aluminum chloride; and biologically by vigorous aeration of water for blooming of blue green algae for removal of organic waste).

Project alternative

Because the project proponent has already invested millions of kyats for this project which is already in operation for year, the project alternative is not taken into consideration.

The site is close to a limestone mountain and therefore location alternative is out of the question. The "dry process" is a better technology than "wet process" and so technology alternative is also out of the question.

The surrounding environment

The physical components

The climate of the area is typical monsoon climate and meteorological data, namely, the monthly maximum and minimum temperature, rainfall and humidity and prevailing wind are shown.

Geologically speaking the rocks of Shan Plateaus are basically composed of meta-sedimentary rocks, Paleozoic and Mesozoic carbonate clastics and igneous rocks. The project site is in the northern portion of Loi-an Group and Namyau Group. The mountain is a limestone mountain and the rocks can be categorized into calcite limestone and dolomite limestone.

The topography is mountain slope with rugged terrain. Seismologically speaking the country is prone to earthquake but there was/is no precedent of major earthquake in this area, it is learnt. The area was/is spared from Cyclones and violent tropical storms that used to made landfall in the Rakhine State.

The physical parameter such as water quality, air quality and noise are tested during the EIA study and shown in the report.

(a) Surface water quality at the site

The samples of water from the stream (coordinates: N. Lat. 20° 47' 29.08", E. Long. 96° 23'52.39") and from the cooling tank (coordinates: N. Lat. 20° 47' 26.97", E. Long. 96° 24'

06.25") are collected and analysed at ISO, TECH Laboratory in Yangon and result is shown in the following Table.

Sr. No	Parameters	Existing values at stream	Cooling water tank	Cooling water return	NEQEG/WHO guideline values
1	pH	7.5	8.4	8.5	6-9 S.U
2	Colour	Nil	Nil	Nil	15 TCU
3	Turbidity	2	2	2	5 NTU
4	Temperature	25	25	25	-
5	Chloride (as Cl)	6	7	6	250 mg/l
6	Total Hardness ($CaCO_3$)	216	266	268	mg/l
7	Sulphate (SO_4)	280	265	272	500 mg/l
8	Total Solids	280	265	272	50mg/l
9	Phosphate	Nil			2 mg/l
10	Iron	0.25	0.21	0.22	3.5 mg/l
11	Nitrate	Nil	Nil	Nil	50 mg/l

All values are generally lower than the National Environmental Quality (NEQ) guideline values prescribed by ECD. (These are done during the EIA study, July 2015).

Later Highland Cement International Co., Ltd has also hired technicians from the registered laboratory, ISO, Tech, Yangon who has under taken a series of water analysis at different spots inside the factory component and in housing area (chummery) at different times (2017 and 2018).

The results are shown in the ANNEX.

(b) Effluent

The effluent water from the factory (coordinate: N. Lat. 20° 47' 48.08"; E. Long. 96° 24' 01.65") is collected and analysed at the said laboratory and the result are shown below.

Parameter	Existing values		NEQEG value
	Waste water (input)	Waste water (output)	
5 day biochemical oxygen demand	20	-	9 mg/l
Arsenic	Nil	-	Nil
Chemical oxygen demand	64	-	32mg/l
Chlorine (total residual)	6	-	16mg/l
Copper	Nil	-	Nil
Cyanide (free)	Nil	Nil	0.1 mg/l
Fluoride	0.3	0.1 mg/l	20 mg/l

Iron	0.36	0.18mg/l	3.5 mg/l
Lead	Nil	Nil	0.1 mg/l
pH	8.6	8.2S.U.[a]	6-9 S.U.[a]
Sulphide	52	46mg/l	1 mg/l
Temperature increase	25	25ºC	<3[b] ºC
Total suspended solids	222	260	50 mg/l
Zinc	Nil	Nil	2 mg/l

[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 accumulative capacity; when the zone is not defined, use 100 meters from the point of discharge.

The values of chloride, sulphide and total suspended solid are higher than the guideline values. The reasons are unknown. All possible causes are considered but no remedy is known now.

Later Highland Cement International Co., Ltd has also hired the technicians from the certified laboratory, ISO, TECH, Yangon which has analyzed a series of waste water and industrial water from different sport within the project site at different time (2017, 2018)

The results are show in the ANNEX.

Air quality

The ambient air quality at the site (coordinate: N. Lat. 20 47' 31"; E. Long. 96 24' 17") was measured by technicians from the Occupational and Environmental Health Division and the result is shown in the following Table.

Ambient air at the site

Parameter	Standard Guideline	Time	Plant Site (30.8.18)	Plant Site (2.10.18)	MESC (20.12.17)	OEHD (16.1.18)	OEHD (16.3.18)
pM_{10}	50µg/m^3	24 hr	23.0	33.1	36.5	95.1	252.5
So_2(Sulphure Dioxide)	400µg/m^3	24 hr	120.9	116.8	33.7	32.7	110.9
No_2 (Nitrogen Dioxide)	200µg/m^3	1 hr	52	20.3	55.2	62.2	68.8
Co(Carbon Monoxide)	30000µg/m^3	24 hr	0.1	0.1	66.4	445	527
O_3 (Ozone)	100µg/m^3	8 hr	93.3	49.5	17.2	22.6	23.7

CO_2 (Carbon Dioxide)	-	24 hr	610.9	593	-	-	-
NO(Nitrogen Oxide)	600µg/m^3	24 hr	6.1	7.5	-	-	-
VOC(µg/$m^{3)}$	-	-	-	-	25.2	205	24.1
HC(ppm)	-	-	-	-	447	423	378
CH_4(ppm)	-	-	-	-	5489	5295	4367

MESC – Myanmar Environment Sustainable Conservation consultant
OEHD – Occupational and Environmental Health Division

Noise level

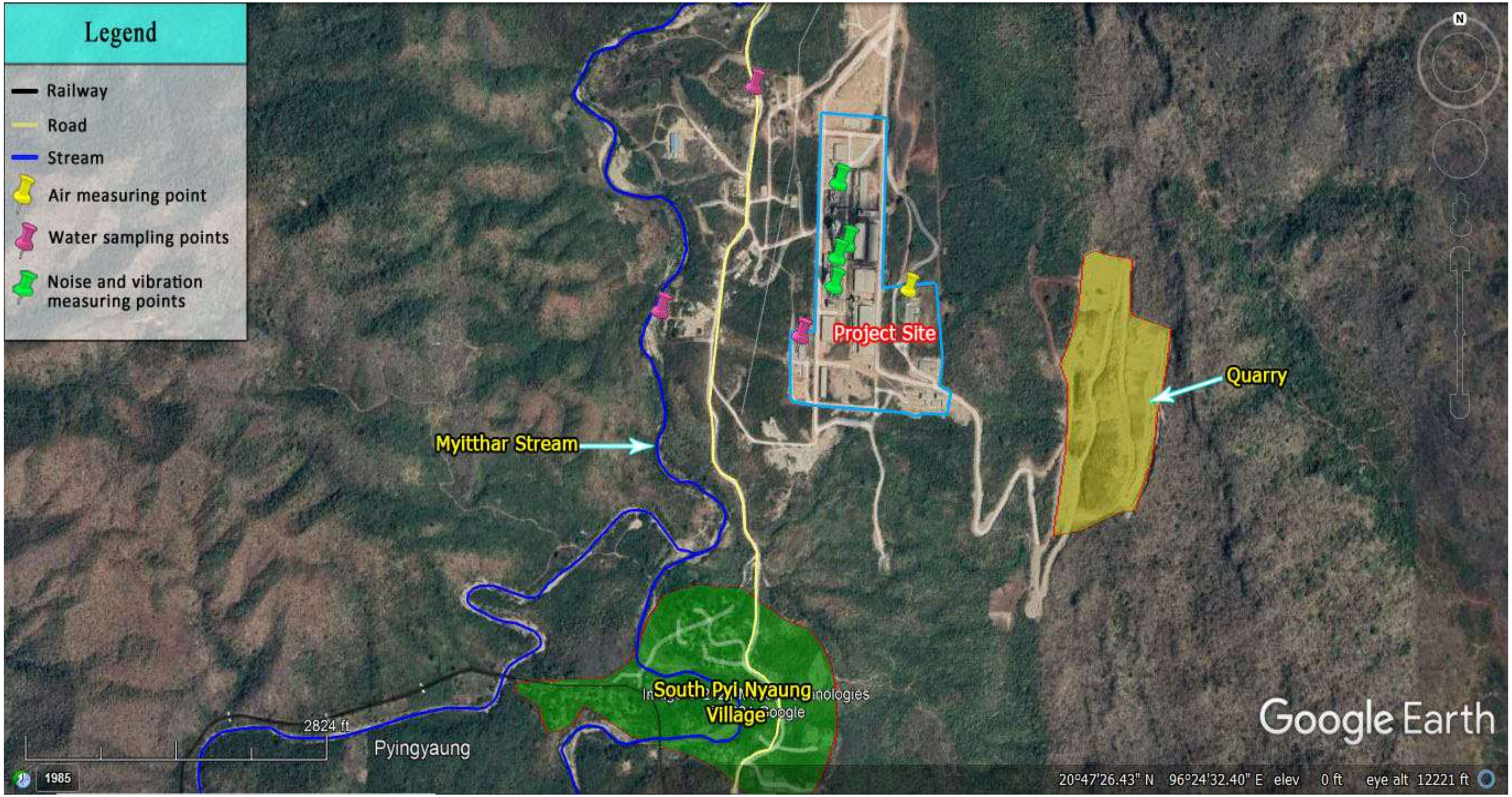
Noise levels at factory

Receptor	One hour LAeq (dBA)[a] (NEQEG Guideline value)		Cement mill	Coal mill	Kiln	Raw mill
	Day time 07:00 - 22:00 (10:00 - 22:00 for public holidays)	**Night time 22:00 - 07:00 (22:00 - 10:00 for public holidays)**	20°47'39.94"N, 96°24'10.06"E **Day time**	20°47'34.75"N, 96°24'10.86"E **Day time**	20°47'33.61"N, 96°24'9.91"E **Day time**	20°47'31.18"N, 96°24'9.59"E **Day time**
Industrial, commercial	70	70	98.45	98.69	95.27	101.34

Noise levels at Taung Pyinyaung village

Receptor	One hour LAeq (dBA)[a]		Infront (East)	Behind (West)	Leftside (North)	Rightside (South)
	Day time 07:00 - 22:00 (10:00 - 22:00 for public holidays)	**Night time 22:00 - 07:00 (22:00 - 10:00 for public holidays)**	**Day time**	**Day time**	**Day time**	**Day time**
Residential, institutional, educational	55	45	43.89	50.15	54.11	47.53

Note – Since noise are measured close to the mills and kiln the levels are higher than a general commercial or industrial zone area.



Google satellite image showing spots where air, water and noise levels were measured

Biological components

A little more than half of the area project site in the east is within the Pyi Nyaung Reserved Forest area (project site 1308.91 acres: residential area 750 acres). The forest as a whole is partially degraded since many years ago, but the flora diversity is still relatively high.

Flora: a total of 139 species of plants (mostly Angiospermae, on the whole big trees are very rare; trees with GBH of 300 cm represented less than 1% of the trees. One species is in the IUCN Red List of Endangered (EN); one is in vulnerable (VU) and 12 are in Least Concerned (LC) category. It is not plausible to save these endangered trees; the only solution is major reforestation after completion of the project. 139 species of plant found are listed in the report.

Fauna: 70 species of avian fauna (bird); 17 species of Herpetofauna (Amphibians and Reptiles); 14 species of mammal (only from secondary information), 66 species of plankton and 6 species of fish were found and recorded. A total of 107 species of fauna and 66 species of plankton found are listed in the report.

Unlike the flora the fauna on the whole very rare to almost non-existence. No species of bird are in the IUCN Red List. Two species of frogs, one species each of lizard and snake are in the IUCN Red List of LC.

One species of mammal (Slow Loris) is in the IUCN Red List as (VU) while one species each of macaque, leopard cat, wild pig, muntjac, squirrel and rat are in the IUCN Red List as (LC). None of the species of plankton and fish are in the IUCN Red List.

Socio-economic components

These are shown in the following table:

Data on infrastructure and services of 5 villages

Sr No.	Infrastructure and service data	Villages				
		South Pyi Nyaung	**North Pyi Nyaung**	**Lei Sa Pin**	**Oak-kyin**	**Mong-Pin**
1.	Accessibility Motor road Railway	 √ √	 √ -	 √ -	 √ -	 √ -
2.	Access to gridline electricity	10% of house hold along the transmission line	90% of households	×	50% of households	70% (solar)

3.	Education School	Post primary	High School	×	×	Affiliatted Middle School
	Number of students/teachers	108/8	28	×	×	288/14
4.	Health facilities Clinic	×	√	×	×	×
5.	Village library	×	√	×	×	×
6.	Government building and public building	Railway station	×	×	×	×

Data on basic socio-economic aspects of 5 villages

Sr No.	**Socio-economic aspects/parameters**	**Villages**				
		South Pyi Nyaung	**North Pyi Nyaung**	**Lei Sa Pin**	**Oak-kyin**	**Mong-Pin**
1.	Population	700	2990	230	615	300
	Male	344	1488	112	302	153
	Female	356	1502	118	313	147
2.	Religions (%)					
	Buddhist	100%	100%	100%	100%	100%
	Christian	-	-	-	-	-
	Other etc	-	-	-	-	-
3.	Ethnicity					
	Bamar	100	100	100	100	100
	Kayin	-	-	-	-	-
	Shan	-	-	-	-	-
	Others etc	-	-	-	-	-
4.	Education status					
	Lateracy rate (adults)	82%	85%	78%	74%	72%
5.	Living condition					
	Wooden house	99	585	45	88	48

	Brick house	1	30	1	3	-
	Wood/brick house	29	25	1	5	6
	Two storey house (brick)	-	15	-	2	6
	Bamboo house	1	35	3	2	-
6.	Materials possession					
	Car (Nos.)	1 sedan 5 trucks	10 sedan 50 trucks	- 4 trucks	5 sedan 8 trucks	1 sedan 11 trucks
	Motorcycle (%)	100%	100%	30%	90%	95%
	Television set (%)	30%	90%	2%	90%	70%
	Hand phone	80%	100%	100%	80%	100%

* From visual inspection and KII secondary data.

Data on main livelihoods and incomes of 5 villages

Sr. No.	Livelihoods and income	Villages				
		South Pyi Nyaung	North Pyi Nyaung	Lei Sa Pin	Oak-kyin	Mong-Pin
1.	Livelihood/occupation (percentage of households)					
	Farmer by (%)	13%	15%	10%	22%	20%
	Main crops	-	-	-	-	-
	Rice	-	-	-	√	√
	Sesame	-	-	√	-	√
	Maize	-	-	-	-	√
	Others	√	√	√	-	-
	Orchards	-	√	-	√	-
	(Mango, banana, guava, flowers)	-	√	-	(√)	-
	Lime extraction powder production	25%	15%	-	-	-
	Seasonal job/ Odd jobs by (%)	22%	20%	25%	30%	30%
	Wood/bamb cutter	-	-	-	√	-
	Sterculia cutter	-	-	-	√	-

3.	Employed by the companies (in numbers) At Highland Cement	20 persons	45 persons	×	×	×
	At Shwe Taung Cement	×	50 persons	×	50 persons	×
4.	Government services (in number) Teacher	1	2	×	×	×
	Soldier	×	3	×	×	×
	Policeman	×	3	×	×	×
	Nurse	×	×	×	×	×
5.	Annual income per household (in percentage)					
	Less than 10 lakh (kyats)	10%	10%	40%	10%	20%
	11-20 lakh kyat	40%	25%	40%	30%	50%
	21-30 lakh kyat	20%	15%	%	30%	10%
	31-40 lakh kyat	20%	5%	%	10%	10%
	41-50 lakh kyat	10%	30%	%	10%	%
	51 and above	%	5%	%	%	%
	Unknown (cannot estimate annual income)	%	10%	20%	10%	10%

- Based on HHI on 10% of households encompassing main livelihoods.
- The daily wages in this area range from Ks 5000- Ks 7000 in Lei Sa Pin and Ks 3000-Ks 6000 in North Pyi Nyaung. The remaining three villages are between Ks 3000- Ks 7000.

Land uses (in acres) of the five villages

Sr No.	Land uses in acres	Villages				
		South Pyi Nyaung	**North Pyi Nyaung**	**Lei Sa Pin**	**Oak-kyin**	**Mong-pin**
1.	Paddy field	2	12	NA	13	8
2.	Farm land	261	238	NA	252	344
3.	Plantation (orchard)	27	31.281	NA	20	9

4.	Reserved forest	-	13140	NA	13192	-
5.	Vacant/Fallow Land	-	-	NA	210	36
6.	Mining area	30	-	NA	-	-
7.	Road area	3	-	NA	9	9
8.	Rivulet/stream area	92	94	NA	73	82
9.	Industrial area	-	-	NA	2710	116.32
10.	Village area	65	64	NA	57	48
11.	Monastery and cemetry areas	66	63	NA	33	25
12.	Others	1595	154	NA	1382	1161

* * From KII data

Basic data on health component of five villages

Sr. No.	Health status (parameters)	Villages				
		South Pyi Nyaung	**North Pyi Nyaung**	**Lei Sa Pin**	**Oak-kyin**	**Mong-Pin**
1.	Health status (general)	Low	Low	Low	Low	Low
2.	Health facilities					
	Village clinic	-	1	-	-	-
	Private clinic	×	×	×	×	×
	Health services-nurse/mid wife etc	-	1	-	-	-
	Data on mortality and morbidity	NA	NA	NA	NA	NA
	HIV/AIDS	NA	NA	NA	NA	NA
3.	Health issue					
	Malaria	Malaria	Malaria	Malaria	Malaria	Malaria
	Dengue	-	-	-	-	-
	Chlolera etc	-	-	-	-	-

- The nearest sub-township hospital is at Yin-mar-bin village. The nearest township hospital is in Tharzi Town.

Cultural Components

Cultural components of five villages

Sr No.	Religious, cultural, historica, archeological, attributes - etc	South Pyi Nyaung	North Pyi Nyaung	Lei Sa Pin	Oak-kyin	Mong-pin
1.	Village pagoda	×	√	×	×	√
2.	Village monastery	1	1	×	×	1
3.	Number of monks, novices, num etc	5 Monks	4 Monks	×	6 Monks and 10 novices	1 Monk and 1 novice
4.	Village "Nat" shrine	-	-	-	-	-
5.	“Bo” tree or large sacred tree	-	-	-	-	-
6.	Nat worshippers	Present	Present	Present	Present	Present
7.	Churches/others	×	×	×	×	×
8.	Historical monument (site/structure)	×	×	×	×	×
9.	Archeological monument (site, structure, objects, etc)	×	×	×	×	×

- No annual pagoda festival or grand religious festival. No annual or seasonal Nat festival.
- Only normal religious events on full moon days, new moon day and the two 8th days of the Burmese months.

Visual component

There are no scenic spots or areas of aesthetic beauty for tourist's attraction.

There are no outstanding landmark but only limestone mountain and valley.

However, the impact on the forest will greatly affect the vissual/aesthetic component.

IMPACT AND RISK ASSESSMENT AND MITIGATION MEASURES

The impact during the four phases of the project is described in technical details in Chapter 6 of this report.

In this EIA report context the pragmatic approach method such as Experts Judgement method (Expert Consensus Method and Ad hoc Method) together with IFC table of risk ranking are applied for qualitative assessment of risks and impacts.

(Experts judgement method may not be accurate but will never go wrong).

IFC Table of risk assessment

Likelihood/probability x consequence/outcome = Final outcome

Likelihood (probability)	**Consequence**				
	very low (negligible) 1	**low (minor) 2**	**medium (moderate) 3**	**high (major) 4**	**very high (extreme) 5**
Almost certain (Definite) 5	5	10	15	20	25
Highly probable (likely) 4	4	8	12	16	20
Probable (moderate) 3	3	6	9	12	15
Unlikely (improbable) 2	2	4	6	4	10
Rare (very importable)	1	2	3	4	5

Scoring : 1 – 2 very low to low

8 – 12 medium

15 – 25 high to very high

Overall risks and impacts assessment during the Construction Phase (Qualitative assessment based from Expert judgement and IFC table)

Sr. No	Nature of impacts	Extent	Duration	Level of impact	Frequency	Intensity	Significance	Probability	Remarks
1.	Impact of mobilization and preparation actions	Foot print	Short term	Level 1-2	OI	L	IS	P	-
2.	Impact on traffic	Along the road	Short term	Level 1-2	S	L	IS	P	-
3.	Impact on air environment	Foot print	Short term	Level-1	OI	L	IS	D	-
4.	Impact: noise and vibration	Foot print	Short term	Level-1	OI	L	IS	D	-
5.	Impact on soil	Foot print	Short term	Level 1-2	OI	L	IS	P	-
6.	Impact on water environment	Myit Thar stream	Short term	Level-1	S	L	IS	P	-
7.	Impact of waste disposal	Myit Thar stream	Short term	Level 1-2	S	L	IS	D	-
8.	Impact on biodiversity	Foot print & beyond	Short term	Level 3-4	OI	M-H	IS-Sg	D	-
9.	Potential socio-economic impact	Foot print & beyond	Short term	Level-1	R	L	IS	VIP	-
10.	Impact lack of emergency and health service	Foot print	Short term	Level-1	R	L	IS	VIP	-
11.	Impact: Potential security issue	Foot print	Short term	Level-1	R	L	IS	VIP	-
12.	Visual impact and lighting	Foot print & beyond	Short term	Level-1	OI	L	IS	D	-

Overall risks and impacts assessment during the Operation Phase (Qualitative assessment based from Expert judgement and IFC table)

Sr. No	Nature of impacts	Extent	Duration	Level of impact	Frequency	Intensity	Significance	Probability	Remarks
1.	Impact on air environment	Foot print & vicinity	Long term	Level 3-4	OI	M	Sg	D	-
2.	Impact: stockpiling of mined out materials and overburden	Foot print	Long term	Level-3	OI	L-M	Sg	D	-
3.	Impact: loss of non-living resources limestone etc	Foot print	Long term	Level 2-3	OI	M	Sg	D	-
4.	Impact: noise and vibration	Foot print	Long term	Level 3-4	OI	M	IS-Sg	D	-
5.	Impact on water environment	Foot print & beyond	Long term	Level-3	OI	M	IS-Sg	D	-
6.	Impact on biodiversity	Foot print	Long term	Level-3	OI	M	Sg	D	-
7.	Impact of waste disposal	Foot print	Long term	Level-2	OI	L-M	IS-Sg	P	-
8.	Impact on traffic	Along the road	Long term	Level-2	OI	L	IS	P	-
9.	Impact of power supply on national demand and vice versa	Foot print & beyond	Long term	Level-2	OI	L-M	IS	D	-
10.	Impact: exposure to heat and other occupational and health hazards	Foot print	Long term	Level 2-3	OI	M	IS-Sg	HP	-
11.	Potential socio-economic impact	Foot print & beyond	Long term	Level-2	OI	L	IS	R	-
12.	Impact: potential security	Foot print	Long term	Level-2	OI	L	IS	R	-
13.	Impact: public perception	In the local communit y	Long term	Level-2	OI	L	IS	R	-
14.	Impact: a change in relief and alteration of landscape	Foot print & vicinity	Long term	Level 3-4	OI	M	Sg	D	-

Note – The final outcome without mitigation measures taken. Almost all can be mitigated.

Explanation

Level of impacts

Level 1 = Very low/negligible/insignificant

Level 2 = Low/minor (can have impact on biodiversity and environment to certain extent)

Level 3 = Medium/moderate

Level 4 = High/major (short duration)

Level 5 = Very high/Extreme/catastrophic (long duration)

Frequency of impacts

F = Frequently

O = Often

OI = Often (isolated case)

S = Seldom

R = Rarely

Intensity

VH = Very high

H = High

M = Medium

L = Low

Probability

VIP = Very improbable/rare

IP = Improbable/unlikely

P = Probable/moderate

HP = Highly probable/likely

D = Definite/almost certain

Significance

IS = In-significance

IS-Sg = In-significance to significance

Sg = Significance

Mitigation measures

Option of mitigation measures to be taken for each and every impact is described in technical detail in Chapter 6 of this EIA report. In this executive summary they are summarized in tabulated form as the project is already in operation for many years. The Preconstruction Phase is simply omitted. (There are no EMP contractors in Myanmar yet for hire. Therefore employees are trained as EMP cell members to implement EMP such as taking mitigation measures and monitoring works).

During the Construction Phase

Sr. No	Impact	Mitigation	Responsible persons	Cost estimate
1.	Impact of mobilization and preparation actions for the start of Construction Phase	- Plan and implement for sustainable construction of access road; do no clear vegetation more than necessary - If possible avoid construction of access road on steep slope to minimize the need for cut and fill - Do not also clear vegetation more than necessary for the preparation of factory and premise site; avoid cutting of big trees as far as possible - Plan to prevent the spilling of building materials outside - Fence the site - Systematic storage of all building materials	5 EMP cell members and 25 trained workers	free of charges
2.	Impact on traffic	- Draw up a traffic management plan - Schedule the timing for vehicular movements - Educate the drivers to practice defensive driving - Set up speed limit for vehicles - Do no overload the trucks - Cover the haulage with tarpaulin	5 EMP cell members and 25 trained workers	free of charges
3.	Impact on air environment	- Comply with ECD's NEQ emission guidelines - Plan in the Pre-Construction Phase for the procurement of equipment, vehicles that emit less smoke (to be certified for emission compliance) - Keep equipment and vehicles well-maintained, well-operated and well-lubricated to reduce smoke emission - Avoid open burning of debris	5 EMP cell members and 25 trained workers and hired technicians	Ks 300,000,000 (once off cost for ambient air semi-annually at 2 sites)

		- Spray water for suppression of dust - Restrict vehicular movement; maintain road clear of mud and dirt - Limit open stockpile of earth, sand etc. - Provide PPE to workers who are exposed to smoke or dust for long period - Local community should be able to file complaint regarding dust and smoke		
4.	Impact of noise and vibration	- Plan in the Preconstruction Phase for procurement of equipment, and vehicles that emit lower noise level - Comply with ECD's NEQEG guidelines for noise level - Install silencers and mufflers - Avoid construction work at night - Schedule high noise activity only during day time hours - Provide PPE to workers exposed to prolonged high noise level - Manage vibration of machine, equipment and vehicle - If possible install vibration absorbers - Limit the speed of vehicles	5 EMP cell members and 25 trained workers	free of charges
5.	Impact on soil	- Plan for the management and conservation of soil - During earth work the top soil should be separately stockpiled from other sub-surface soil or rocks - Top soil should not be used for maintaining access road or for building - Stockpiles of top soil should be grassed or allowed to naturally vegetate for stabilization and prevent erosion - During rehabilitation top soil should be effectively used to promote the natural growth of vegetation - Oil spilled should be cleaned up immediately; do not wash down with water but used absorbents or saw dust - Vehicles and machinery should be adequately maintained to prevent fuel leaks resulting to soil contamination	5 EMP cell members and 25 trained workers	free of charges

		- All waste materials (earth, rocks) resulting from construction work should be disposed of at a designated spot - Solid waste and liquid waste from field camp should be also disposed of at designated spot - Educate and train the workers for good housekeeping practice; do not litter; do not pollute the area		
6.	Impact on water environment (a) Surface water	- Avoid water bodies as far as possible when constructing or building roads - When clearing for site remove vegetation prior to top soil removal in order to limit the effect of site clearance on surface water flow dynamics - Storage of fuel oil as well as used fuel oil should be done in a designated banded side until removal - Maintain vehicles and machinery adequately to prevent spillages resulting in surface water contamination - When handling fuel oil avoid accidental spillages into the surface water; should spillages occur implement appropriate clean up immediately - Avoid disposing of waste (both liquid and solid) into water bodies; - Avoid pollution of water by all means	5 EMP cell members and 25 trained workers	free of charges
	(b) Ground water	- Plan and manage to prevent the contamination of soil and eventually groundwater - For storage of fuel drip trays and designated banded site should be used to protect soil (and hence ground water) from hydrocarbon - The same should be done for used oil and grease - Adequately maintain vehicle and machinery to prevent spillages resulting in groundwater contamination - Avoid spillage during the handling of fuel oil	5 EMP cell members and 25 trained workers	free of charges

		- Should accidental spillages occur implement appropriate clean up immediately; do not wash down spill with water; use absorbents or saw dust for clean up - Plan for management of temporary latrines to prevent eventual contamination of groundwater; spread soil or ash into the latrines from time to time;		
7.	Impact of waste disposal	- Draw up a plan for management of solid waste - Manage to meet a statutory requirement, - Avoid open burning of debris - Clear the ground regularly; ensure dumping at approved landfill - Educate workers for good housekeeping; do not litter - Educate workers also for waste minimization - At the end of Construction Phase put up construction spoils, left over materials for sale - Avoid spillage of fuel oil-; should spill occur immediately clean by means of absorbent or saw dust (do not wash down with water) - Plan for management of temporary latrines for worker camps; regularly spread soil or ash into the pit; back fill all latrines after completion of Construction Phase	5 EMP cell members and 25 trained workers	free of charges
8.	impact on biological component (biodiversity) (a) Flora	- Plan and manage for the protection and conservation the flora as far as possible. - Do not clear vegetation more than necessary for the construction of access road and quarry site - Prevent the spillages of hydrocarbons which has negative impact on plants especially on the root system	5 EMP cell members and 25 trained workers	free of charges

		- Restrict the movement of vehicles to the access rood; not to impact grass, herbs and small plants - Restrict the collection of fire wood; - Avoid open burning of debris - Educate workers for fire awareness and protection; - Identify sensitive species and habitats and try to avoid such spots as far as possible - Promote environment awareness to workers - Implement rehabilitation to promote natural vegetation establishment after completion at a site		
	(b) Fauna	- Plan and implement the protection and conservation of wildlife as far as possible - Ensure that quarry works have minimal disturbance or wildlife - Restrict vehicular movement to the access road to prevent habitat disturbance of birds and animals - Prohibit the hunting and/or trapping of wild animals - Prevent the potential injury or death of wildlife due to vehicular movements especially during night time - Avoid the use of excessive bright light for long hours at night to prevent the aggregation and eventual death of large number of insects (offensive bright light in the forest at night will also scare away wild animals from their natural foraging or breeding ground) - Identify sensitive species which need to be avoided; avoid the disturbance of animal habitat such as nest and breeding ground as far as possible	5 EMP cell members and 25 trained workers	free of charges

9.	Impact on socio-economic life of the locals	- Plan to avoid or minimize the potential negative impacts on the socio-economic life of the locals as well as the company workers - If dust is generated either from vehicular movement or quarry works, try to suppress dust as far as possible (water spray); reduce the speed of vehicles when passing near the village - Educate the drivers for defensive driving, to maintain zero accident for the safety of the locals and domestic animals - Avoid the contamination of the drinking water source of the locals - Try to build good relation with the locals - Conduct public consultation so that the locals will have a positive perception on the project - Educate the workers for appropriate behavior when dealing with locals; to respect their culture and tradition - Draw up a plan for management of misbehavior and social illness - Apply punitive measures such as suspension of the wrong doer - Strictly prohibit the drinking of alcohol during working hours; totally ban the use of narcotics among workers - Consider for Corporate Social Responsibility (CSR) action to be taken when actual mining operation commence - The local community should be able to file complaint regarding any impact on their socio-economic lives.	5 EMP cell members and 25 trained workers	free of charges
10.	Impact of lack of emergency and health (hospital) service	- Careful planning of emergency procedures (this must be continued to Operation Phase) - Organize and provide first aid training and fire prevention and fighting training - Provide adequate First Aid Kit, and Fire extinguishers; keep water tanks always full for firefighting - For emergency response organize mock drills and rehearsals	5 EMP cell members and 25 trained workers	free of charges

		- Phone numbers and address of Red Cross Society, Ambulance service, Fire Brigade, Police station, Tharzi Hospital etc. must be displayed so that everyone could easily see - Create safety condition for work places (mining/quarry) site, and associated area e.g. crushers; grinders, screeners and stockpile sites) - Educate and train workers for good working practice, good engineering practice, good safety practice and good housekeeping practice so that these good practices will be ingrained in each and every worker's mind - Prevent and avoid accidents and try to achieve zero accident at work places - Educate and train them for health education and hygiene		
11.	impact: potential security issue	- Draw up a security management plan - Effective walling of the compound - All accesses must be controlled; set up security gates, adequate guards - Do not let the workers (mostly construction workers) enter the neighboring village without preauthorization; do not let workers mingle freely with locals - Store building materials under lock and key as far as possible - Ask the building contractor to discipline his workers - Apply punitive measures, such as suspension or termination of employment if necessary	5 EMP cell members and 25 trained workers	free of charges
12.	visual impact and lighting	- Plan and execute construction of the factory and facilities which is focused on visual appeal - Select suitable materials - Select suitable shape of structure, colour of paint, back ground condition	5 EMP cell members and 25 trained workers	free of charges

		- After construction of plant fast growing trees for shade and create of green zone - Also create green lawns and green landscaping; plant beautiful flowering trees, ornamental trees - Use lighting only for security purpose - Avoid using very bright and offensive light at night. - Also avoid white light which will attract and kills hundreds of inset (use yellow light) - Do not direct the lamp/bulb at the lamp post outwards (offensive to wildlife in the neighborhood, if any); keep the lamp (bulb slanting at the lamp pose		

During the Operation Phase

Sr. No	Impact	Mitigation	Responsible persons	Cost estimate
1.	impact on air environment	- Draw up a plan for air quality management for the long term Operation Phase - Comply with ECD's NEQ emission guideline - Do not clear the vegetation (grass) and leave the land bare more than necessary - Consolidate and compact all areas to prevent generation of dust due to wind - Apply dust extractor and filter at drilling or apply wet drilling - Spray water adequately to suppress dust - Reduce the speed of vehicle to reduce dust generation - Restrict vehicular movement; maintain road, clear of mud and dirt	5 EMP cell members, 25 trained workers and hired technician	Ks 7,5000,000 (once off cost semi-annually for ambient air emission at 5 sites)

		- Limit open stockpile of earth and sand - Avoid open burning of debris or solid waste - Keep equipment and vehicles well- maintained to reduce smoke - Install electrostatic precipitator (ESP), bag filters to mitigate PM (the company has exactly done this) - Regularly collect down ash and cement dust and dispose them at an approved landfill - Minimize by all means the generation of dust (PM) at the conveyer line, at clinker (cement dust, clinker dust) and also at the cement packaging department; also at storage and haulage of cement bags (cover with tarpaulin) - Provide PPE (eg. face masks, mouth and nose covers, gas masks) to workers exposed to long hours of dust and smoke; fit excavator with air conditioned cabin for operators		
2.	Impact of stockpiling of mined out materials, overburden and top soil	- Plan for effective management for systemic stockpiling of mined out limestone, overburdens and top soil; minimize impacts on the environment - Do not clear vegetation more than necessary for stockpiles - Keep top soil and overburden separately - Manage for the stockpiling of overburden and top soil; no spill over, no sliding, no erosion, no blocking of natural drainage system; no entering into stream, cultivated areas and village area - Never choose a slope as a dumpsite but level the slope first for stabilization - The stockpiles (of top soil or overburden) must have a minimum slope of not more than 37° for effective stabilization	5 EMP cell members, 25 trained workers	Free of charges

		- Let the grass or herb grow on the overburden for stabilization biologically (spread a thin layer of top soil on overburden) - Construct retaining wall to stop erosion or sliding; furnish the wall with weep holes to drain out water during the wet season - Regulate runoff from overburden and top soil dump by construction small check dams; sediment traps or drains		
3.	Loss of non-living resources e.g. limestone, clay, laterite	- Plan for long term sustainable exploitation of limestone, clay, laterite - Mining engineers must investigate the mining area in detail and draw up a plan for systematic and effective mining at mineralized spots or area - If the whole mountain is sheer limestone as supposed to be then systematic mining of portion after portion to be carried out - Avoid over extraction (more than necessary); conserve natural resources - Check and calculate the extraction rate on a monthly and yearly basis	5 EMP cell members, 25 trained workers	Free of charges
4.	Impact of noise and vibration	- Comply with ECD's NEQ noise level guidelines - Restrict or limit vehicular and heavy machinery movements - Plan for appropriate choice of machinery and vehicles (that emit low noise level); method of working, efficient material handling - Installation of noise abating devices e.g. silencers, mufflers at air inlet and outlet of far and compressor; place noisier sources far away in overall design - Well-operated and well-maintained vehicles and machinery generate lower noise level and prevent undesirable noise level - Modified old machinery, vehicles and equipment by incorporating minor design change for reducing noise level - Develop green belt (plant trees) around the mining/quarry site; trees abate noise and serve as noise sink (pollution sink)	5 EMP cell members, 25 trained workers and hired technicians	Ks 350,000 (once off cost semi-annually at 4 sites)

		- Create smooth road surface as far as possible to mitigate vibration due to vehicular and heavy machinery movement - Create suitable foundation design for machinery and equipment (e.g. crusher, grinder, screen etc.) to mitigate vibration - If necessary install vibration absorbers or vibration absorbers or vibration abators - Provide adequate PPE e.g. ear muffs, ear protectors to workers exposed to long hours of high noise level; fit excavator, bulldozer with air conditioned cabin for operators - Conduct regular noise monitoring to ensure that the levels are within noise exposure standard (not higher than 85-90 dBA)		
5.	Impact on water environment (a) surface water	- Plan and manage for preventing pollution on the water environment - Manage so that mining/quarry activities will not impact the surface water of Myit Thar - Manage for the stability of top soil and overburden to prevent erosion and sliding and siltation; not to impact surface water flow dynamic or alter water courses and not to impact on aquatic biodiversity - Fuel oil depot should be away from a stream; the depot should be banded to protect surface water from oil spill - Avoid disposing of waste (liquid and solid) into water bodies - Manage water conservation; reduce water consumption; - Apply a monitoring plan for water quantity and quality based on simple parameter e.g. temperature, pH and total alkalinity	5 EMP cell members, 25 trained workers and hired technicians	Ks 350,000 (once off cost semi-annually at 4 sites)

	(b) ground water	- Plan and manage to prevent the contamination of soil and eventually groundwater - Plan to manage all activities so that there will have no severe negative impact on ground water - For storage of fuel drip trays and designated banded site should be used to protect soil (and hence ground water) from hydrocarbon - Adequately maintain vehicle and machinery to prevent spillages resulting in groundwater contamination - Should accidental spillages occur implement appropriate clean up immediately; do not wash down spill with water; use absorbents or saw dust for clean up	-	-
6.	Impact on biodiversity (biological component) (a) Flora	- Plan and manage for the protection and conservation of the biological component of the environment - Plan for the protection and conservation the flora as far as possible - Plan for minimum disturbance to the flora - Do not clear vegetation more than necessary - Prevent the spillages of hydrocarbons which has negative impact on plants especially on the root system - Drip trays and designated banded side should be used to protect vegetation from hydrocarbons - Restrict the movement of vehicles to the access road; - Restrict the collection of fire wood;	5 EMP cell members, 25 trained workers	Free of charges

		- Avoid open burning of debris - Educate workers for fire awareness and protection; - Identify sensitive species and habitats and try to avoid such spots as far as possible - Promote environment awareness to workers - Implement rehabilitation to promote natural vegetation establishment		
	(b) Fauna	- Plan and implement the protection and conservation of wildlife as far as possible. (The protection and conservation of forest is tantamount to protection and conservation of wildlife) - Restrict vehicular movement to the access road to prevent habitat disturbance of birds and animals - Prohibit the hunting and/or trapping of wild animals - Promote environmental awareness for workers - Prevent the potential injury or death of wildlife due to vehicular movements especially during night time - Avoid the use of excessive bright light for long hours at night to prevent the aggregation and eventual death of large number of insects - Identify sensitive species which need to be avoided; avoid the disturbance of animal habitat such as nest and breeding ground	5 EMP cell members, 25 trained workers	Free of charges
7.	impact of waste disposal (solid and liquid)	- Plan for the management of solid and liquid waste - Manage to meet statutory requirements - Track all wastes generated, especially cement dust, ash and all other domestic wastes - Instruct workers for proper handling and disposal of wastes e.g. at the landfill	5 EMP cell members, 25 trained workers and hired technicians	Ks 350,000 (once off cost semi-annually at 4 sites)

		- Follow the 5 Rs principle: reduce, reuse, recover, recycle and redesign, wherever possible - Separate solid waste into categories, use separate bins, disposed at approved landfill - Dispose waste only after all waste preventive and recycling strategies have been undertaken - Draw up a plan for the management of waste water - Reduce and minimize the use of water; - Educate and train workers for conservation of water - Wash vehicles and equipment in designated area - Drainage system to separate waste water from storm water - No disposal of waste water outside (on land or into water body) - Treat all waste water before discharge - Educate and train workers for good house keeping practices		
8.	Impacts on traffic	- Draw up a traffic management plans (even though the traffic was light; road users were mostly motorcyclists and pedestrians) - Schedule the logistics especially for trucks - Set up signage at the intersection of the access road and highway - Avoid overloading heavy truck - Cover haulage (cement bags, coal, gypsum etc.) with tarpaulin - Educate the driver (especially heavy trucks drivers) for driving at reduced speed and adhere to the principle of defensive driving - Local community should be able to file complaint regarding traffic	5 EMP cell members, 25 trained workers and hired technicians	Ks 350,000 (once off cost semi-annually at 4 sites)

9.	Impact of power supply on national demand (gridline) and vice versa	- Draw up a plan for the conservation of energy - Ensure that the consumption of electricity be in the work frame as stated earlier - Use equipment and machinery that are energy efficient - Use backup generator during power outage for limited period - Regularly monitor electricity consumption - Have regular consultation with electricity authority	5 EMP cell members, 25 trained workers	Free of charge
10.	Impact of exposure to heat and other occupational and health hazards	- Plan and manage for safe working environment - Try to achieve zero accidents at work place - Educate and train workers for good working practice, good safety practice and good health and hygiene practices - Limit the exposure to heat at kiln (minimum exposure) as practical as possible - Provide adequate PPEs for workers who are exposed to heat, dust, smoke, loud noise etc. - All workers must pass a medical examination in the first place before being employed. - Implement safe and effective procedures for storage, transportation and handling of hazardous materials (the company has a magazine for explosives, and a safe fuel depot) - Have detail plan for prevention of fire and emergency (the company has already a plan for this. Document: 15-1-2016 etc.). - Organize basic First Aid Training and Fire Fighting Training (the company has already conducted one).	5 EMP cell members, 25 trained workers	Free of charge

		- Provision of firefighting equipment (the company has already done this) - Provision of First Aid Kits, medicines and drugs (the company has already done this) - Organize mock drills for firefighting and first aid training (the company has already done this) - Display addresses and phone numbers of Fire Bridge, Ambulance Service, Red Cross Society, Hospital and Police Station so that every can see easily - Take out insurance for the cement plant and also fire insurance - Provide adequate proper sanitation facility – e.g. bath rooms, toilets etc.		
11.	Impact on socio-economic components and life of the locals	- Plan to avoid or minimize the potential negative impacts on the socio-economic life of the locals as well as the company workers - If dust is generated either from vehicular movement or quarry works, try to suppress dust as far as possible (water spray); reduce the speed of vehicles when passing near the village - Educate the drivers for defensive driving, to maintain zero accident for the safety of the locals and domestic animals - Avoid the contamination of the drinking water source of the locals - Try to build good relation with the locals - Conduct public consultation so that the locals will have a positive perception on the project - Educate the workers for appropriate behavior when dealing with locals; to respect their culture and tradition - The authority and employees of the company should not personally get involve in land and property speculation activities, if any - Corporate Social Responsibility (CSR) action to be taken	5 EMP cell members, 25 trained workers	Free of charge

		- Draw up a plan for management of misbehavior and social illness - Educate and train workers for discipline and code of conducts - Apply punitive measures such as suspension of the wrong doer - Strictly prohibit the drinking of alcohol during working hours; ban the use of narcotics and stimulants - Deal with workers on a fair and square basis - Avoid unhealthy relationship with workers; they should not be over worked and underpaid		
12.	Potential security	- Draw up a plan for the management of security - Deploy adequate security personnel day and night; implement strict security - Check all entering and leaving of the factory premise - Provide uniforms and ID for all workers for easy identification - Security should be both for the cement factory and premise and the quarry site and facility - Special security for magazine - Monitor all the management and mitigation activitie	5 EMP cell members, 25 trained workers	Free of charge
13.	Public preception	- Plan and manage for building good relation with the local community - Appoint a public relation officer (liaison officer) to deal with the locals - Maintain the ongoing good relation with the villagers - Implement CSR activities and other social assistant programme (the company has already done this and will continue to do so)	5 EMP cell members, 25 trained workers	Free of charge

		- Prioritize the hiring of locals over hiring personnel from beyond; promote employment of women - Uphold the culture and tradition of the area - Educate on appropriate behaviors in the neighborhood pertaining to local culture and etiquettes - Implement an appropriate complaint and grievance mechanism (CGM) with feedback mechanism; keep a log book for all complaints or grievances - Heed to the views and opinions of the villagers - Communicate the availability of job opportunities to the locals from time to time if there is any vacancy in job - Prioritize purchasing of food and commodities from the local market as far as possible		
14.	Change in relief and alternation of landscape due to implementation of project	- Execute project plan which is focused on visual appeal - Carefully select mineralized area or spot where there are limestone (random quarrying/mining will leave ugly dents, pits and holes here and there) - After completion of quarry/mining at a site backfill all the dents and pits - Revegation the spot; use top soil - Reserve green areas as far as possible - Continue the creation of green belt/zone; plant more trees as far as possible - Manage the mounds of overburden; level the ground as far as possible after completion of quarry; plant more trees	5 EMP cell members, 25 trained workers	Free of charge

During the Decommissioning/Mine closure/Rehabilitation Phase

Sr No.	Impact	Mitigation	Responsible persons	Cost estimate
1.	Potential accident at work place	- Plan and manage for effective decommissioning of site - Hire decommissioning contractor to do the work - Dispose materials that are no longer useable; redeploy or put up for sale those that are useable - Restore the ground and soil profile - Revegetative and rehabilitate the ground; plant trees - Remove and clear all debris and tidy up the place - Backfill all dents, pits and depressions with overburdens and top soils - Level the ground and restore the soil - Monitor all the management and mitigation activities	5 EMP cell members, 25 trained workers	Free of charge
2.	Potential residual impacts	- Plan and manage for effective decommissioning and rehabilitation - Clear and remove all residuals, if any. - Remove all soil contaminated by fuel oils or chemicals; if any. - Test the soil; ensure that no contaminants remain - Also test the river water for possible pollutant. - Test the air quality for the last time - Restore the soil to its natural condition - Revegetate and rehabilitate the site	5 EMP cell members, 25 trained workers and hire technicians	test air, water and soil for the last time Ks 1,500,000 (air) Ks 80,000 (water) Ks 40,000 (soil)

Cumulative impact assessment

Cumulative impacts are there that are resulted from successive, incremental and/or combined effects of a project when added to other existing projects.

Successive and incremental cumulative impact by Highland cement factory can be calculated as follow: the products of 1500 tons of Portland cement a day generate 1050 tons of CO_2, 150 kg of SO_2 and 1500 kg of per day. Over a period of 30 years, the incremental cumulative impacts will be 11,497,500 tons of CO_2; 8100 tons of SO_2 and 16200 tons of NO_x.

(SO_2 and NO_x can be mitigated but it is not practical to mitigate SO_2; the only plausible way is creation of green zone in the vicinity to sequestrate CO_2).

- Incremental cumulative impact on flora/habitat: 1308.91 acres after 30 years. (This can be mitigated; and it is reversible; for example: reforestation).
- Incremental cumulative impact on natural resources (loss of resources).

19,500,000 tons of limestone; 3,000,000 tons of clay; 1,500,000 tons of laterite; 660,000 tons of gypsum over a period of 30 years. (This is irreversible; the resources are lost forever).

Simultaneous or combined cumulative impact

There are two other large cement factories in this area namely. Max Myanmar cement factory and Shwe Taung (Apache) cement factory. When the cumulative impact of three factories is added together the result will be staggering. No data on Max Myanmar and Shwe Taung are available. Therefore the combined/simultaneous cumulative impacts of the three factories can be assessed only under the authority of ECD.

Environmental Management Plan (EMP)

EMP is the key to ensure that the environmental quality of the area does not deteriorate due to the implementation of this project. It involves the management of overall environmental issues. Monitoring Plan (MP) is of utmost importance for the effective executive of EMP.

The main task of EMP includes monitoring, reporting, emergency response management and capacity building and training. In most developed countries there are EMP contractors, MP contractors and mitigation contractors which can be hired to do EMP, MP and mitigation works. As there are no such contractors in Myanmar yet employed are trained for this purpose and an EMP cell (nucleus organization) is set up as followed. This EMP cell is responsible for the implementation of EMP, MP as well as mitigation measures.

Highland Cement International Co., Ltd (cement plant) has formed the EMP cell as follows:

Sr No.	Name	Designation	Responsibility
1.	U Aung Zaw Myint	Manager	EMP cell leader
2.	U Tin Khaing	Engineer	EMP cell member
3.	U Myint Oo	Engineer	EMP cell member
4.	U Kyi Myint	Technician	EMP cell member
5.	U Min Zaw Htet	Geologist	EMP cell member
6.	U Win Tint	Villager	EMP cell member
7.	U Win Naing	Villager	EMP cell member

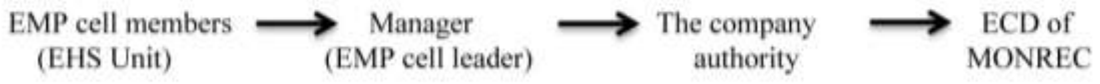
25 workers are also trained for conducting EMP, MP and taking mitigation measures.

The 5 EMP cell members and 25 trained workers are responsible for the implementation of EMP, MP and taking a variety of mitigation measures for each and every impact.

The 3 guiding principle of EMP are:

- Avoid, minimize (mitigate), restore or offset negative impacts and enhance possible impact.
- Prepare an EMP plan and
- Implement EMP and monitor its effectiveness.

In this project context the pragmatic institutional arrangement for implementation of EMP comprises:



<u>Reporting requirement</u>

Reporting EMP includes:

- Internal monitoring and inspection reporting
- Incident accident and emergency reporting
- Performance indicator reporting
- Reporting on training programme

<u>Monitoring requirement</u>

Basic environmental monitoring covers:

- Environmental monitoring in EIA
- Monitoring for compliance with standards and giudeline

Emergency response plan

The objective is to be prepared to prevent fatalities and injuries, reduce damage to asset and environment and protection of the community.

The process covers: - development of Emergency Response Plan – training – emergency exercise – review and correction

Capacity development and training

There are no EMP contractor s in Myanmar yet; the company has to make do with the available resources and means (self-taught and self-trained) and set up an EMP cell.

For practical purpose:

- Firefighting training is provided with the help of officers from the Fire Brigade
- First Aid training is provided with the help of officers from the Red Cross society
- Has organized training with the help of officers from Ministry of labour
- Will request officer from ECD for giving lectures on Environmental affair

Management and Monitoring sub-plan

The sub-plan for management and monitoring of 15 environmental and social potential issues, namely, noise and vibration, waste, hazardous waste, waste water and storm water, air quality, odour, chemical, water quality, erosion and sedimentation, biodiversity, Occupational Health and Safety, Community Health and Safety, cultural heritage, employment and training and emergency response as prescribed by ECD are summarized in tabulated forms for construction, Operation and Decommissioning/Rehabilitation Phase (As this project is already in operation for many years the Preconstruction Phase is simply omitted).

Environmental and social management sub-plans

The sub-plans cover all Project Phases (Preconstruction Phase, Construction/Mine Development Phase, Operation Phase, Decommissioning/Mine Closure Phase and Post Closure/Rehabilitation Phase). For practical purpose the Preconstruction Phase is omitted.

This sub-plans address such environmental and social issues as: noise and vibration, waste, hazardous waste, waste water and storm water, air quality, odour, chemicals, water quality, erosion and sedimentation, biodiversity, occupational health and safety, community health and safety, cultural heritage, employment and training and emergency response plan (ref. EIA guideline for mining sector; Technical guidance, October , 2018).

For pragmatic purpose these are outlined in tabulated forms.

I. **During the Construction Phase**

Sr. No.	Potential issue	Sub-plans (mainly for taking mitigation measures)	Responsible persons	Cost estimate (One year)	Time frame/ frequency
1.	Noise and vibration	- Plan in the Preconstruction Phase for procurement of equipment, and vehicles that emit lower noise level. - Comply with ECD's NEQEG guidelines for noise level. - Install silencers and mufflers. - Avoid construction work at night. - Provide PPE to workers exposed to prolonged high noise level. - Manage vibration of machine, equipment and vehicle. - Limit the speed of vehicles.	5 ESMP cell members, 25 trained workers	Ks. 1,000,000 Hired technicians for noise level testing	Semi-annually
2.	Waste	- Designate separate dumping site for vegetation waste, overburden and topsoil; ensure that the site are stable; give away vegetable waste (trees) to locals for fire wood. - Regularly collect waste at camp in waste bins and dispose at approved landfill (or dumping) site.	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Construction Phase; occasionally, weekly, monthly as required
3.	Hazardous waste	- Not generated.	-	-	-
4.	Waste water and storm water	- Create systematic drainage at the camp site to manage waste water; ensure that it does not enter the stream; also to manage storm water. - Create suitable drainage at mining site to manage storm water. - Keep natural drainage of the slope intact; do not block or alter as far as possible. (Ensure that the construction of series of access road, in-mine roads, ramps does not damage the natural drainage as far as possible.) - Ensure that overburden and top soils stockpiles, from not effected by storm water.	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Construction Phase; occasionally, weekly, monthly as required

5.	Air quality	- Comply with ECD's NEQEG emission guidelines. - Plan in the Pre-Construction Phase for the procurement of equipment, vehicles that emit less smoke (to be certified for emission compliance). - Keep equipment and vehicles well-maintained, well-operated and well-lubricated to reduce smoke emission. - Use machinery and vehicle with low emission rate; use fuel with low sulphur content. - Avoid open burning of debris. - Spray water for suppression of dust. - Restrict vehicular movement; maintain road clear of mud and dirt. - Limit open stockpile of earth, sand etc. - Provide PPE to workers who are exposed to smoke or dust for long period.	5 ESMP cell members, 25 trained workers	Ks. 3,000,000 Hired technicians for air quality testing	Semi-annually
6.	Odour	- Not generated.	-	-	-
7.	Chemicals	- Not used during Construction Phase.	-	-	-
8.	Water quality	- Avoid water bodies as far as possible when constructing or building roads - Storage of fuel oil as well as used fuel oil should be done in a designated bunded side until removal - Maintain vehicles and machinery adequately to prevent spillages resulting in surface water contamination - When handling fuel oil avoid accidental spillages into the surface water; should spillages occur implement appropriate clean up immediately. - Avoid disposing of waste (both liquid and solid) into water bodies.	5 ESMP cell members, 25 trained workers	Ks. 1,000,000 Hired technicians for water quality testing	Semi-annually

		- Top soil should be allowed to naturally vegetate in order to stabilize soil particles and thus preventing erosion and limiting siltation to avoid pollution of water by all means.			
9.	Erosion and sedimentation	- Implement erosion control/management when the natural slope is more than 20°. - Minimize length and steepness of slope (conduct land cutting, land filling and land construction). - Minimize the area of bare soil exposed as practical as possible (do not clear the vegetation more than necessary leaving large area of bare land). - Run-off from areas adjacent to the site will be diverted around disturbed areas (construction of small diversion canal/drainage). - Control sediment (build sediment trap or dam where necessary). - Prevent sliding and erosion of overburden stockpiles and top soil stockpile as far as possible: let grass and vegetation naturally grow on stockpile for stabilization. - Ensure that the slope of a stockpile is not more than 37°. - Ensure that run-off from the site is discharged at non-erosive velocities; discharge will be to location that do not adversely impact the natural waterways (the stream).	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Construction Phase; occasionally, as required
10.	Biodiversity	- Do not clear vegetation more than necessary for the construction of access road and quarry site. - Prevent the spillages of hydrocarbons which has negative impact on plants especially on the root system - Restrict the collection of fire wood. - Avoid open burning of debris. - Educate workers for fire awareness and protection. - Identify sensitive species and habitats and try to avoid such spots as far as possible.	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Construction Phase; occasionally, as required

		- Promote environment awareness to workers. - Try to stop illegal logging; inform the authority if there is any. - Implement rehabilitation to promote natural vegetation establishment after completion of quarry at a site. - Ensure that mine works have minimal disturbance or wildlife. - Restrict vehicular movement to the access road to prevent habitat disturbance of birds and animals. - Prohibit the hunting and/or trapping of wild animals. - Prevent the potential injury or death of wildlife due to vehicular movements especially during night time. - Avoid the use of excessive bright light for long hours at night to prevent the aggregation and eventual death of large number of insects (offensive bright light in the forest at night will also scare away wild animals from their natural foraging or breeding ground).			
11.	Occupational Health and Safety	- Creation of a safe working place and working condition. - Facilities will have adequate space for all kinds of activities, e.g. excavation, transportation, crushing, site for stockpiles, etc. - Provision of adequate lavatory facility, bath and washing area; provision of adequate potable drinking; provision of health living spaces and clear eating areas, provision of first aid at all times for workers (the company has its own clinic). - For practical purpose provide First Aid Training for some workers with the assistance of Township Red Cross society; will provide adequate first aid facility including first aid kits, medicines and drugs. - Provide training for Occupational Health and Safety; training for good safety practice, for personal safety (preventing accidents, injuries), basic hazards awareness, and site specific hazards, (especially at mining sites).	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Construction Phase; occasionally, as required

		- Provide training on safety handling and operation of machinery equipment, safety storage and handling of fuel oils. - Will provide adequate PPEs to workers where and when necessary to ensure the basic health protection and safety of workers. - Safe work procedure for all electrical works covering construction, operation and decommissioning and demolition works. - Educate and train drivers, particularly heavy truck drivers for safety driving and defensive driving; ensure that the access road is not bumpy and safe for driving. - Try to achieve zero accidents in excavation, hauling and transportation activities including traffic. - Ensure that workers are not subject to excessive repetitive motions, over exertion and excessive manual handling; if possible will use mechanical labour rather than manual labour as practical as possible to reduce fatigue, strain and injury on workers.			
12.	Community Health and Safety	- Will control smoke and dust as practical as possible; will avoid open burning of debris and trash so that smoke will not reach the village; educate the driver to lower speed when passing through the village (the reduction of speed from 40 km to 35 km can reduce dust to 50%, it is learnt). - Ensure that the water ponds do not become breeding ground for mosquitoes; regularly changing of water; application of mild chlorination; annihilation of mosquito larvae by all means; educate workers to use mosquito's nets at night and provision of mosquito nets.	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Construction Phase; occasionally, as required

		- Also ensure that domestic solid wastes, liquid waste water and drainage do not become breeding ground for flies, mosquitoes and insect for prevention of vector borne diseases and water borne or water related disease. - Will prevent the occurrence and spread of infectious and communicable diseases by all means; will undertake health awareness and educations initiative (health education campaign) in local community as far as possible. (the company has its own clinic where villagers are given free medicare) - Avoid/minimize by all means, vector borne, water borne (water based, water related disease and communicable diseases that would result from project activities. Liaise with Township Health Authority regularly. - Avoid/minimize by all mean spread of diseases from workers. Educate long distance truck driver regarding sex education ;example for use of prophylactic condom; prevent spread of STD, HIV/AIDS. - Educate workers regarding code of conducts, social conducts, etiquette and local culture and tradition. - Educate drivers for safe driving and defensive driving and to comply with rules and regulation regarding traffic; also conduct road safety education campaign for the local community, if possible; locals should be able to file complaint regarding traffic. - Comply with law and regulation relevant to transportation of hazardous materials such as fuel oils; also plan for measures for preventing and/or mitigation the consequence of accidental release/spill of hazardous materials (fuel oil); avoid/minimize community exposure to hazardous materials.			

		- Develop emergency preparedness and emergency response plan and contingency plan (action plan) for effective implementation when necessary; provide operation manuals for external emergency plan and internal emergency plan for all workers and if necessary also to local community and government inspectors. Conduct rehearsals or drills for such plan. Cooperation with local community and authority in preparation of emergency plan.			
13.	Cultural heritage	- Ensure that mining activities have no impact on the Buddhist monastery. - Monitor the situation. - Pay courtesy visit (obeisance visit) occasionally to the abbot monk and offer cash and kinds and build good cordial relation. - Get involve in religious festivals; provide donations.	5 ESMP cell members, 25 trained workers	Free of charge	From time to time
14.	Employment and training	- Plan for human resource development. - Prioritize employing locals as far as possible. - Organize new task employees for job training. - Also provide systematic induction training for new workers to enable them to do their jobs efficiently. - Induction training will cover: general training; skill training for efficiency and mandatory training relating to health and safety (e.g. safety operation of machinery and handling of hazardous materials).	Company authority and ESMP cell members, officers from government department for training and educating	Ks. 10,000,000 (honourarian fees, courtesy gift)	From time to time as required

		- Educate and train them for good working practice, good safety practice, good health and hygine practice and good environmental awareness practice until all these practices are ingrained in their mind sets and become good habits. - Educate and train them for familiarization with negative impacts and subsequent taking of mitigation measures. - Educate and train them for basic eco-friendly behaviours e.g. good house-keeping practice, do not litter, do not dirty your place, minimize the use of water, fuel.			
15.	Emergency response	- Prepare Emergency Response Plan (ERP) and team to prevent fatilities and injuries, to reduce damage and to protect environment and community. - Prepare emergency preparedness plan execute the plan. - (Emergency Response Plan will cover emergency resources, emergency preparedness and training, emergency response procedures, administration of the plan, communication and procedures, and debriefing and post-traumatic stress procedures.) - For practical purpose provide training for firefighting, training for First Aid and Rescue. - Provide facilities (e.g. firefighting equipment, suit, first aid kits, emergency vehicle. - Display phone numbers of Firefighting Department, Ambulance Services, Red Cross Society, Hospital and Police Station.	5 ESMP cell members, 25 trained workers	Ks. 14,420,000 (Set aside for emergency case, for educating and training by government officials)	Once during Construction Phase

II. During the Operation Phase

Sr. No.	Potential issue	Sub-plans (mainly for taking mitigation measures)	Responsible persons	Cost estimate (One year)	Time frame/ frequency
1.	Noise and vibration	- Comply with ECD's NEQEG noise level guidelines. - Restrict or limit vehicular and heavy machinery movements. - Plan for appropriate choice of machinery and vehicles (that emit low noise level); method of working, efficient material handling. - Installation of noise abating devices e.g. silencers, mufflers. - Well-operated and well-maintained vehicles and machinery generate lower noise level and prevent undesirable noise level. - Develop green belt (plant trees) around the mining site; trees abate noise and serve as noise sink (pollution sink). - If necessary install vibration absorbers or vibration absorbers or vibration abators. - Provide adequate PPE e.g. ear muffs, ear protectors to workers exposed to long hours of high noise level; fix excavator, bulldozer with air conditioned cabin for operators. - Conduct regular noise monitoring to ensure that the levels are within noise exposure standard (not higher than 85-90 dBA).	5 ESMP cell members, 25 trained workers	Ks. 1,000,000 Hired technicians for noise level testing	Semi-annually
2.	Waste	- Keep top soil and overburden separately. - Manage for the stockpiling of overburden and top soil; no spill over, no sliding, no erosion, no blocking of natural drainage system; no entering into stream, cultivated areas and village area. - The stockpiles (of top soil or overburden) must have a maximum slope of not more than 37° for effective stabilization.	5 ESMP cell members,25 trained workers	Free of charge	Throughout Operation Phase; occasionally, weekly, monthly

		- Backfill mined out pits, holes, with overburden. - Avoid all collateral damages due to mining and stockpiling of overburden and top soil as far as possible. - Instruct workers for proper handling and disposal of wastes e.g. at the landfill. - Separate solid waste into categories, use separate bins, disposed at approved landfill. - Dispose waste only after all waste preventive and recycling strategies have been undertaken. - No disposal of waste water outside (on land or into water body). - Educate and train workers for good house-keeping practices.			
3.	Hazardous waste	- No hazardous waste envisaged. - Used fuel oil, engine oil will be collected in drums and give away to recyclers.	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Operation Phase; occasionally, weekly, monthly
4.	Waste water and storm water	- Create systematic drainage at the camp site to manage waste water; ensure that it does not enter the stream; also to manage storm water. - Create suitable drainage at mining site to manage storm water. - Keep natural drainage of the slope intact; do not block or alter as far as possible. (Ensure that the construction of series of access road, in-mine roads, ramps do not damage the natural drainage as far as possible.) - Ensure that overburden and top soils stockpiles, from not effected by storm water. - Avoid the flowing of storm water into mine pits, create more small diversion canal.	5 ESMP cell members, 25 trained workers	Ks. 1,000,000 Hired technicians for water quality testing	Occasionally by ESMP cell member, semiannually for hired technicians

5.	Air quality	- Comply with ECD's NEQEG emission guideline. - Do not clear the vegation (grass) and leave the land have more than necessary. - Consolidate and compact all areas to prevent generation of dust due to wind. - Stop excavation/extraction for a while when strong wind is blowing. - Spray water adequately to suppress dust. - Reduce the speed of vehicle to reduce dust generation. - Restrict vehicular movement; maintain road, clear of mud and dirt. - Avoid open burning of debris or solid waste. - Keep equipment and vehicles well- maintained to reduce smoke. - Provide PPE (e.g. face masks, mouth and nose covers, gas masks) to workers exposed to long hours of dust and smoke; fit excavator with air conditioned cabin for operators.	5 ESMP cell members, 25 trained workers	Ks. 3,000,000 Hired technicians for air quality testing	Semi-annually
6.	Odour	- Not generated.	-	-	-
7.	Chemicals	- Chemical are not used in limestone mining.	-	-	-
8.	Water quality	- Plan and manage for preventing pollution on the water environment. - Manage so that mining activities will not impact the surface water of Yay Pu Chaung. - Manage for the stability of top soil and oveburden to prevent erosion and sliding and siltation; not to impact surface water flow dynamic or alter water courses and not to impact on aquatic biodiversity.	5 ESMP cell members, 25 trained workers	Ks. 1,000,000 Hired technicians for water quality testing	Semi-annually

		- Fuel oil depot is away from a stream; the depot is bunded to protect surface water from oil spill. - Avoid disposing of waste (liquid and solid) into water bodies. - Manage water conservation; reduce water consumption. - Apply a monitoring plan for water quantity and quality based on simple parameter e.g. temperature, pH and total alkalinity. - Adequately maintain vehicle and machinery to prevent spillages resulting in groundwater contamination. - Avoid spillage during the handling of fuel oil. - Should accidental spillages occur implement appropriate clean up immediately; do not wash down spill with water; use absorbents or saw dust for clean-up.			
9.	Erosion and sedimentation	- Implement erosion control/management when the natural slope is more than 20°. - Minimize length and steepness of slope (conduct land cutting, land filling and land construction). - Minimize the area of bare soil exposed as practical as possible (do not clear the vegetation more than necessary leaving large area of bare land). - Run-off from areas adjacent to the site will be diverted around disturbed areas (construction of small diversion canal/drainage). - Control sediment (build sediment trap or dam where necessary). - Prevent sliding and erosion of overburden stockpiles and top soil stockpile as far as possible: let grass and vegetation grow on stockpile for stabilization. - Ensure that the slope of a stockpile is not more than 37°. - Ensure that run-off from the site is discharged at non-erosive velocities; discharge will be to location that do not adversely impact the natural waterways (the stream).	5 ESMP cell members,2 5 trained workers	Free of charge	Occasionally, weekly, monthly

		- Ensure that the main access road, in-mine roads, ramps, berms are stable and not easily eroded. - Stop mining activities during rainy season, especially during days with heavy rain. - Construct sediment traps bars and bank, to contain erosion where necessary.			
10.	Biodiversity	- Plan for minimum disturbance to the flora when conducting mining activities. - Do not clear vegetation more than necessary. - Restrict the movement of vehicles to the access road. - Restrict the collection of fire wood. - Avoid open burning of debris. - Educate workers for fire awareness and protection; get rid of all debris that can cause fire. - Identify sensitive species and habitats and try to avoid such spots as far as possible. - Implement rehabilitation to promote natural vegetation establishment after completion of mining at a site. - Restrict vehicular movement to the access road to prevent habital disturbance of birds and animals. - Prohibit the hunting and/or trapping of wild animals. - Prevent the potential injury or death of wildlife due to vehicular movements especially during night time. - Avoid the use of excessive bright light for long hours at night to prevent the aggregation and eventual death of large number of insects. - Identify sensitive species which need to be avoided; avoid the disturbance of animal habitat such as nest and breeding ground.	5 ESMP cell members, 25 trained workers	Free of charge	Occasionally, weekly, monthly

11.	Occupational Health and Safety	- Plan and manage for safe working environment. - Try to achieve zero accidents at work place. - Educate and train workers for good working practice, good safety practice and good health and hygiene practices. - Provide adequate PPEs for workers who are exposed to heat, dust, smoke, loud noise etc. - All workers must pass a medical examination in the first place before being employed. - Implement safe and effective procedures for storage, transportation and handling of hazardous materials (the company has a magazine for explosives, and a safe fuel depot). - Have detail plan for prevention of fire and emergency. - Organize basic First Aid Training and Fire Fighting Training. - Provision of firefighting equipment. - Provision of First Aid Kits, medicines and drugs. - Organize mock drills for firefighting and first aid training. - Display addresses and phone numbers of Fire Bridge, Ambulance Service, Red Cross Society, Hospital and Police Station so that every can see easily. - Take out insurance for the project and also fire insurance. - Provide adequate proper sanitation facility e.g. bath rooms, toilets etc. - Safe work procedure for all electrical works covering construction, operation and decommissioning and demolition works. - Educate and train drivers, particularly heavy truck drivers for safety driving and defensive driving; ensure that the access road is not bumpy and safe for driving.	5 ESMP cell members,25 trained workers	Ks. 2,000,000 (fees and courtesy gifts)	From time to time as required

		- Ensure that nobody parts (extremities such as hands, fingers) are kept out of harm way during operation equipment. - Ensure that workers are not subject to excessive repetitive motions, over exertion and excessive manual handling; if possible will use mechanical labour rather than manual labour as practical as possible to reduce fatigue, strain and injury on workers.			
12.	Community Health and Safety	- Will control smoke and dust as practical as possible; will avoid open burning of debris and trash so that smoke will not reach the village; educate the driver to lower speed when passing through the village (the reduction of speed from 40 km to 35 km can reduce dust to 50%, it is learnt). - Locals should be able to file complaints regarding dust, noise and vibration. - Ensure that the water ponds do not become breeding ground for mosquitoes; regularly changing of water; application of mild chlorination; annihilation of mosquito larvae by all means; educate workers to use mosquito's nets at night and provision of mosquito nets. - Also ensure that domestic solid wastes, liquid waste water and drainage do not become breeding ground for flies, mosquitoes and insect for prevention of vector borne diseases and water borne or water related disease. - Will prevent the occurrence and spread of infectious and communicable diseases by all means; will undertake health awareness and educations initiative (health education campaign) in local community as far as possible. During the long Operation Phase will consider for setting up a clinic at the site and provide health care for locals as practical as possible.	5 ESMP cell members, 25 trained workers	Free of charge	From time to time as required

		- Avoid/minimize by all means, vector borne, water borne (water based, water related disease and communicable diseases that would result from project activities. Liaise with Township Health Authority regularly. - Avoid/minimize by all mean spread of diseases from workers. Educate long distance truck driver regarding sex education example for use of prophylactic condom; prevent spread of STD, HIV/AIDS. - Educate workers regarding code of conducts, social conducts, etiquette and local culture and tradition. - Educate drivers for safe driving and defensive driving and to comply with rules and regulation regarding traffic; also conduct road safety education campaign for the local community, if possible; locals should be able to file complaint regarding traffic. - Comply with law and regulation relevant to transportation of hazardous materials such as fuel oils; also plan for measures for preventing and/or mitigation the consequence of accidental release/spill of hazardous materials (fuel oil and explosive); avoid/minimize community exposure to hazardous materials. - Develop emergency preparedness and emergency response plan and contingency plan (action plan) for effective implementation when necessary; provide operation manuals for external emergency plan and internal emergency plan for all workers and if necessary also to local community and government inspectors. Conduct rehearsals or drills for such plan. Cooperation with local community and authority in preparation of emergency plan.			

13.	Cultural heritage	- Ensure that mining activities have no impact on the Buddhist monastery. - Monitor the situation. - Pay courtesy visit (obeisance visit) occasionally to the abbot monk and offer cash and kinds and build good cordial relation. - Get involve in religious festivals; provide donations.	5 ESMP cell members, 25 trained workers	Free of charge	From time to time as required
14.	Employment and training	- Plan for human resource development. - Prioritize employing locals as far as possible. - Organize new task employees for job training. - Also provide systematic induction training for new workers to enable them to do their jobs efficiently. - Induction training will cover: general training; skill training for efficiency and mandatory training relating to health and safety (e.g. safety operation of machinery and handling of hazardous materials). - Educate and train them for good working practice, good safety practice, good health and hygine practice and good environmental awareness practice until all these practices are ingrained in their mind sets and become good habits. - Educate and train them for familiarization with negative impacts and subsequent taking of mitigation measures. - Educate and train them for basic eco-friendly behiviours e.g. good house-keeping practice, do not litter, do not dirty your place, minimize the use of water, fuel. - More specific training for mining as well as operation of heavy machinery and heavy trucks will be organized. - Review on the effectiveness of training will be done for improvement. - Regular monitoring of mining site/extraction site will be conducted.	Company authority and ESMP cell members, 25 trained workers	Free of charge	From time to time as required

15.	Emergency response	- Prepare Emergency Response Plan (ERP) and team to prevent fatalities and injuries, to reduce damage and to protect environment and community. - Prepare emergency preparedness plan execute the plan. - (Emergency Response Plan will cover emergency resources, emergency preparedness and training, emergency response procedures, administration of the plan, communication and procedures, and debriefing and post-traumatic stress procedures.) - For practical purpose provide training for firefighting, training for First Aid and Rescue. - Provide facilities (e.g. firefighting equipment, suit, first aid kits, emergency vehicle. - Display phone members of Firefighting Department, Ambulance Services, Red Cross Society, Hospital and Police Station. - Review on the effectiveness of training will be done for improvement. - Regular monitoring of mining site/extraction site will be conducted. - Mock drill for ERP will be conducted, on a regular basic; bi-annually.	5 ESMP cell members,2 5 trained workers	Ks. 14,420,000 (Set aside for emergency case)	From time to time as required

III. During the Decommissioning/Mine Closure Phase

Sr. No.	Potential issue	Sub-plans (mainly for taking mitigation measures)	Responsible persons	Cost estimate	Time frame/ frequency
1.	Air quality and water quality	- Test air quality and water quality each for the last time to ensure that it is within guideline values and that water do not remain polluted.	5 ESMP cell members, 25 trained workers	Ks. 3,000,000 for air Ks. 1,000,000 for water Hired technicians	Semi-annually
2.	Soil quality	- Test soil quality for the last time to ensure that there the soil quality is polluted or contaminated with fuel oil.	5 ESMP cell members, 25 trained workers	Ks. 400,000 Hired technicians	Semi-annually
3.	Erosion and sedimentation	- Ensure that no erosion and sedimentation take place during the decommissioning/Mine Closure Phase.	5 ESMP cell members, 25 trained workers	Free of charge	Occasionally, weekly, monthly
4.	Community health and safety	- Manage to ensure that community health and safety are not compromise during Decommissioning/Mine Closure Phase.	5 ESMP cell members, 25 trained workers	Free of charge	From time to time

Monitoring Plan

For special Environmental quality monitoring (During Operation Phase)

This will be conducted semi-annually and reported to ECD in a timely manner. Experts/technicians from various departments will have to be hired to conduct the environmental monitoring.

Semi-annual environmental qualities monitoring/testing (Operation Phase)

Sr.	Component	Parameter to be monitoring	Monitoring spots/ sites	Responsible person	Frequency	Cost estimate (once off cost)
1.	Air quality	PM_{10}, $MP_{2.5}$, SO_2, NO_2, CO, O_3, VOC, CO_2, NO, HC, CH_4	- Inside factory compound. (Coordinate 20°47'48.08" N; 96° 24' 01.65" E) - At the village (Coordinate 20°47'1.04"N, 96°24'0.09"E)	EMP cells members and hired technicians	semi-annually	Ks 3,000,000 (2 sites)
2.	Emission	Cadmium + Thallium, dioxins/furan; Dust; hydrogen chloride; hydrogen fluoride; mercury; nitrogen dioxide; PM10; sulphur oxide total metals (arsenic, lead, cobalt, chromium, copper, manganese, nickel, vanadium, antimony); total organic carbon	- At kiln stack: (Coordinate 20°47'34.02"N, 96°24'9.83"E) - At clinker cooling: (Coordinate 20°47'39.81"N, 96°24'12.86"E) - Cement grinding: (Coordinate 20°47'39.01"N, 96°24'10.15"E)	EMP cells members and hired technicians	semi-annually	Ks 4,500,000 (3 sites)
3.	Noise level	dBA	- At the cement mill, coal mill; kiln, raw mill (Coordinate 20°47'39.94"N, 96°24'10.06"E, 20°47'34.75"N, 96°24'10.86"E, 20°47'33.61"N, 96°24'9.91"E, 20°47'31.18"N, 96°24'9.59"E)	EMP cells members and hired technicians	semi-annually	Ks 350,000 (3 sites)

			- At the village (Coordinate 20°47'1.04"N, 96°24'0.09"E)			
4.	Water quality	pH; temperature; turbidity; suspended total solids; total hardness; nitrate; sulphate; phosphate; chloride; iron;	- At the surface water and waste water (Coordinate 20°47'29.08" N, 96° 23'52.39"E, 20°47'48.08" N; 96° 24' 01.65" E.)	EMP cells members and hired technicians	semi-annually	Ks 80,000 (one sites)
5.	Waste water/ effludent	5 days, BOD, COD; arsenic; chlorine (total residual); copper; cyanide; fluoride; iron; lead; pH, sulphide; temperature increase, total suspended solids, zinc.	- At the village cultivated land (Coordinate 20°47'7.72"N, 96°23'59.13"E)	EMP cells members and hired technicians	semi-annually	Ks 80,000 (one site)
6.	Soil	Moisture; pH; texture (sand%, silt%, clay%), total nitrogen; available nutrient (P, N); heavy metal	- At the village cultivated land (Coordinate 20°47'7.72"N, 96°23'59.13"E -)	EMP cells members and hired technicians	semi-annually	Ks 40,000 (one site)

Project budget and responsibilities

One percent of the total budget equivalent to Ks 793,300,000 is set aside for EMP fund, for especially implementing EMP, MP and taking mitigation measures.

- 25 % of EMP fund (Ks 198,325,500) is allotted for execution of mitigation measures. Since no contractors have to be hired it is expected that this fund will be adequate for at least a period of 10 years.
- 20 % of the fund (Ks 158,660,000) is for implementing monitoring plan. Since experts and technicians have to be hired at very high cost this money will not be adequate and therefore more funds will have to add a required.
- 25% of the fund (Ks 198,325,500) is for procurement of equipment e.g. Portable air test kit, water test kit and soil test kids. But these test kit are just for general purpose and jot reliable and so experts and technicians with sophisticated equipment will have to be hired. More money will have to be added later.
- 10% of the EMP fund (Ks 79,330,000) will be set aside simply for use in emergency cares only. Unfortunately if major accidents happen more money will have to be added to this fund.
- 7% of the EMP fund (Ks 55,531,000) is for capacity building and training. Trainers (e.g. for firefighting, for First Aid training) will have to hired. Honorarium fees or courtesy gifts will be given to respective government officers who will be invited to give speeches, lectures and short course training.
- 5% of the fund (Ks 39,655,400) will be set aside for operation cost of other equipment, if requirement.
- 5% of the fund (Ks 39,655,400) is for miscellaneous expense – e.g. office equipment, stationary etc.
- 3% of the fund (Ks 23,799,000) is set aside in the first place for organizational works; e.g. overhead charges, meetings discussions and other casual expenses.

As time goes on more money will be added to this EMP fund as required. (There will be a separate fund for implementation of CSR programme)

Fund for decommissioning and Rehabilitation will be borne by the project main budgets.

Public Consultation Meetings

So far, the project proponent has conducted 5 public consultation meetings with the local communities.

1. First consultation meeting

Location : at South Pyi Nyaung Village

Date : 11-7-2015

Attendees : 27 persons

At that meeting the local people have expressed one complaint, 2 concerns and 6 needs.

Complaint : pollution of Myit Thar Stream.

How comment was taken into account: It was a misunderstanding by some locals who through that the stream was polluted by the two cements factories, namely Highland Cement (then Blue Diamond) factory and Max Myanmar cement factory. Actually pollution was due to illegal gold mining/panning taking places up stream. The village elders know this very well.

Concern: for the availability of fuel wood in the future.

How comment was taken into account: The locals were allowed to collect fuel wood, edible vegetable and fruits in the area but illegal logging is no longer allowed in the project site area.

Concern: smoke and dust entering the village.

How comment was taken into account: Smoke was generated before installation of one ESP and 44 bag filter. The situation has improved greatly. Dust was due to vehicular movement along the old access road built by YCDC (former owner of Max Myanmar cement plant). That road was mainly used by various illegal logging trucks (from Meithtila) and also by vehicle used by illegal gold miners. Highland cement factory has its own new access road.

Needs: for electricity

How comment was taken into account: The Company has already donated Ks 70,000,000 for village electrification. If is not possible to provide electricity to every household as houses are very wildly scattered and far between on rugged village terrain. Only 10 houses along the power line are electrified.

Need: for village clinic

How comment was taken into account: The Ministry of Health and Sports is responsible and will make the decision. The company in collaboration with Max Myanmar Co., Ltd will then contribute to the materialization of village clinic. The project proponent its own clinics for its employees, but some locals are also given free medical treatment.

Need: village library

How comment was taken into account: The company has donated Ks 300,000 for the school library; village library not materialized yet.

Need: for more community assistance

How comment was taken into account: Up to the end of 2015 the company has so far spent Ks 76,378,200 for CSR programme and donations of which Ks 71,490,700 is specially for South Pyi Nyaung village alone.

Need: for more villages to be employed at the factory

How comment was taken into account: So far 79 locals are employed at the factory. The nature of work is not labour intensive (where many workers are required) but mechanized and automation work. Only skilled and qualified workers are necessary.

Need: for upgrading village primary school to Post Primary and hence Middle School.

How comment was taken into account: It is beyond the capacity of the company; only the Ministry of Education can decide this.

2. Second Public Consultation Meeting

Location : South Pyi Nyaung

Date : 20-2-2017

Attendees : 61 persons

There complaints and three needs were expressed by the locals people.

Complaint : Small cracks are happening on the school building due to blasting activities

How comment was taken into account: the small cracks have be plastered and fixed.

Complaint : Dust issue (dust fallen onto the village area)

How comment was taken into account: fugitive emission of due is to vehicular movements along the old road constructed by YCDC. Various illegal logging trucks (mostly from Meikhtila) as well as some vehicles by illegal gold miners are plying along that road. The company, on its part, has regularly sprayed water along its haulage road; but it is not in a capacity to tackle this issue along the old road.

Complaint: pollution of Myit Thar Stream

How comment was taken into account: it seemed that some locals still think that stream pollution were caused by High Land Cement factory and Max Myanmar cement factory. Actually that was due to illegal gold mining/panning by various people taking places up stream.

Need: for more employment

How comment was taken into account: the Company has already employed 79 locals. More will be employed when required or when there are vacant posts or when the business progress well later.

Need: to repair damage road

How comment was taken into account: the company has already repaired it own access road once (which can be used by the locals, who have only motorcycles). Repaired the old road built by YCDC will be considered.

Need: for provision of potable water

How comment was taken into account: Even the company has to use water from Myit Thar River (by means of shallow collector wells beside the stream) and also water from a small spring in the south. (Sourcing ground water is not feasible in the area). The issue cannot be tackled yet.

(3) Three more public consultation meeting were held later at South Pyi Nyaung village and Oak-kyin village.

(a) At South Pyi Nyaung village on 7-8-2018 and attended by 30 locals

(b) At North Pyi Nyaung village on 7-8-2018 (afternoon) and attended locals from North Pyi Nyaung and Lei-sa Pin village attended: only 18 people

(c) At Oak-kyin village on 8-8-2018 and attended by 62 persons form Oak-kyin and Mong-pin village

One complaint and six needs were expressed by the local people.

Complaint: dust issue (raised by South Pyi Nyaung villagers)

How comment was taken into account: the issue of fugitive dust emission along the old access road build by YCDC cannot be tackled yet. That road was used by venom illegal logging trucks and also by illegal gold miners.

Need: for village electrification (issue raised by villagers of South Pyi Nyaung, Lei-sa Pin, Oak Kyin and Mong Pin villages).

How comment was taken into account

This issue of electrification of 4 villages can not be tackled; it is beyond the capacity of the company which has its limit.

Need: for paving road – (issue raised by villagers of South and North Pyi Nyaung)

How comment was taken into account – the cost for paving gravel road is huge. This issue cannot be tackled yet, but this is being considered by the company.

Needs: for renovation of school and leveling of football/playing ground (raised by villagers of North Pyi Nyaung).

How comment was taken into account: This issue cannot be tackled yet.

Need: for construction of a new crematory (issue raised by North Pyi Nyaung villagers).

How comment was taken into account: issue cannot be tackled yet.

Need: for a village library and village tube well (raised by villagers of Oak-kyin village).

How comment was taken into account: issue can not be tackled yet.

Need: for PVC pipes for souring water from a spring.

How comment was taken into account: issue cannot be tackled yet.

The company realized very well that CSR programme must be effective and meaningful but on the other hand the CSR programme should be affordable by the company. The locals should be considerate and should not ask for too much; the company has its limits.

Public consultation is a continuous process and future meetings will be held from time to time.

The CSR programme implemented so far

The company has so far spent Ks 164,730,000 for CSR programme and donations. Up to the end of 2015, the company has spent Ks 76,358,000. From 2016 to 2018 it has spent a further Ks 88,371,800 for CSR and donation. Some of this has been done even when no profit was realized yet.

Anyway, the company will continue the CSR programme for humanitarian reason. The company will set aside 5% of its profit for implementation of CSR programme.

Conclusion and recommendation

It is generally agreed that cement factories are the great polluters of the air environment, and that was true before the application of modern technology such as the "dry process method" and application of ESP and Series of bag filters. Even with modern technology cement factories still pollute the air to some extent. Of course there is no cement plant devoid of environmental impact.

On the other hand cement is essential for national infrastructure development.

When it comes to infrastructure development Myanmar still lags behind its neighbors and Myanmar still has to impact about 50% of cement from abroad for national need. It is estimated that the per capital consumption of cement is Myanmar is about 100 kg and this is about 50% lower than that of other ASEAN nation. (From internet, 2018).

The project proponent on its part will do its utmost for the mitigation of the negative impacts cause by its cement plant. And it really believe that the project can be implemented without significant adverse environmental and social impacts.

List of commitments

(1) Commitment to strictly comply with the law, rules, regulation and guideline (pg-86)

(2) Commitment made by the project proponent as prescribed in "EIA procedure, No.616/2015, section 62-a-c)" (pg-96)

(3) Commitment made by the consultant firm, MESC as prescribed in "EIA procedure, No.616/2015, section 62-a-c)" (pg-97)

(4) Commitment that ground water is not sourced and that only water from the stream and spring is sourced. (pg-146)

(5) Commitment not to impact on the cultural component of the surrounding area due to operation of the project. (pg-233)

(6) Commitment to set aside 5% of the net profit for implementation of CSR programme (in Myanmar version) in ANNEX (pg-392).

(7) Commitment for implementation of plan for workers well-fare (in Myanmar version) in ANNEX (pg-393)

(8) Commitment for implementation of Fire Prevention and Fire Fighting programme (in Myanmar version) in ANNEX (pg-394)

(9) Commitment concerning sourcing of electricity from gridline and installation of backup generators (in Myanmar version) in ANNEX (pg-395)

(10) Pledge to mitigate/minimize air pollution, water pollution and soil pollution (in Myanmar version) in ANNEX (pg-396)

2. INTRODUCTION

Cement is the essential commodity for the construction work and limestone is the main raw materials for the manufacturing of cement. The availability of raw material, limestone is of great importance for the production of cement and the availability of this finished product, cement is of profound importance for the infrastructure development of a nation.

It is estimated that Myanmar national annual demand for cement is 12 million tons while the annual production is less than 6 million tons.

When it comes to infrastructure development Myanmar still lags behind its neighbours and Myanmar still has to import about 50% of cement from abroad for the national need. The per capital consumption of cement in Myanmar is about 100kg, and this is about 50% lower than that of other ASEAN countries. Myanmar still has to import cement from abroad, for instance, China, India, Bangladesh, Thailand and Vietnam, for the national need. As cement is the basic building materials it should be readily available at a reasonable price throughout the country.

In this context Highland Cement International Co., Ltd has proposed for the mining of limestone for the production of cement. The objectives also include the construction and operation of a large cement plant together with this associated quarry operation at Ya-htarr Pyi Nyaung village, Tharzi Township, Mandalay Region.

2.1 Name of the project proponent

Highland Cement International Co., Ltd was registered as a limited company in December, 2015. See also **ANNEX** for Certificate of Exporter/Importer Registration (No. 40042 (17-05-16) from the Ministry of Commerce; and also Form of Permit (No.72 FC/2015-2016(NPT) 22-12-2015 from the Ministry of National Planning and Economic Development.

Name of the project proponent	:	Highland Cement International Co., Ltd
Address (Yangon head office)	:	Highland Cement International Co., Ltd, No.9-A, Mya Kanthar 2 Street, 2nd Ward, Kamaryut Township,Yangon Region
Telephone	:	01507115
Website	:	www.bluediamond.com.mm
E-mail	:	highlandcement@gmail.com
Address (Location site)	:	Highland Cement International Co., Ltd, Kyaytine-pyin Kwin, Pyi Nyaung village, Tharzi Township, Mandalay Region
Contact person	:	U Aung Zaw Myint

Phone	:	09 974916778
E-mail	:	aungzaw.ygn@gmail.com
Address (Mandalay branch office)	:	43/1, 35th Street, between 69 & 70th Street, Mahar Aungmyay Township, Mandalay Region
Objective	:	Construction and Operation of a cement plant together with associated mining/quarrying of limestone and other raw materials

Particulars of executive and administrative body

Name	Nationality & National Registration Card No.	Address of resident	Designation	Other business occupation
LG International Corporation (Represented by) Mr. Hoon Jee Lee	Korean PP No. M 74326842	1013-dong 1005-ho Taegang Apt, Gongneung 2-dong, Nowon-gu, Seoul, Korea	Managing Director	Business man
Mr. Jin Ho Park	Korean PP No. M 16817324	104-1102 (Chunggu Joonggye-dong Apt, Joongye-dong), Joongye-ro 184, Nowon-gu, Seoul, Korea	Director	Business man
Mr. Kwang Ryun Song	Korean PP No. M 78146575	101-dong 301-ho, Hakdong-ro 409, Gangnam-gu, Seoul, Korea	Director	Business man
Mr. Jaehyun Son	Korean PP No. M 73085146	714-713, 84-8, Jingwan, 4-ro, Eunpyeong, Seoul, Korea	Appointed As Chief Finance Officer (CFO) w.e.f 3-3-2016	Business man
Blue Diamond Cement Co., Ltd (Represented by) U Kyaw Soe Win	Myanmar 12/Ma Ya Ka (N) 125421	No.33/D, Yadanar Street, 7th Quarter, Mayangone Township, Yangon Region	Director	Business man
Daw Khaing Mu Mu	Myanmar 8/Ma Ka Na (N) 010989	Building No.0, No (4), Quarter, No.8 Shwe Myint Zu Street, Kamayut Township, Yangon	Director	Business man

The object for which the company is formed is manufacturing and marketing of cement as per MIC permit No. 1083/2016 dated, 17-2-2016.

The brand name of the cement product is "Blue Diamond Cement".

ကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်

Certificate of Incorporation

ဟိုင်းလန်း စီးမန့် အင်တာနေရှင်နယ် ကုမ္ပဏီ လီမိတက်

HIGHLAND CEMENT INTERNATIONAL COMPANY LIMITED

Company Registration No. 100633922

မြန်မာနိုင်ငံကုမ္ပဏီများအက်ဥပဒေ ၁၉၁၄ ခုနှစ် အရ

ဟိုင်းလန်း စီးမန့် အင်တာနေရှင်နယ် ကုမ္ပဏီ လီမိတက်

အား ၂၀၁၅ ခုနှစ် ဒီဇင်ဘာလ ၂၂ ရက်နေ့တွင်

အစုရှယ်ယာအားဖြင့် တာဝန်ကန့်သတ်ထား သည့် အများနှင့်မသက်ဆိုင်သောကုမ္ပဏီ

အဖြစ် ဖွဲ့စည်းမှတ်ပုံတင်ခွင့် ပြုလိုက်သည်။

This is to certify that

HIGHLAND CEMENT INTERNATIONAL COMPANY LIMITED

was incorporated under the Myanmar Companies Act 1914 on 22 December 2015 as a Private Company Limited by Shares.

ကုမ္ပဏီမှတ်ပုံတင်အရာရှိ

Registrar of Companies

ရင်းနှီးမြှုပ်နှံမှုနှင့်ကုမ္ပဏီများညွှန်ကြားမှုဦးစီးဌာန

Directorate of Investment and Company Administration

DICA

Former Registration No. 72FC/2015-2016(NPW)

Figure-1: Certificate of project proponent

2.2 Presentation of Environmental and social experts

About the consultant firm, Myanmar Environment Sustainable Conservation Co., Ltd (MESC)

MESC is a consultant firm officially registered in 2014 as a limited company (a consultant/service company) at the Ministry of National Planning and Economic Development. Document: YaKa-8(Ga) 001/2014(004720), dated: 6th June, 2014. Registration No. 830/2014-2015, (20-5-2014). The new registration number is 110649193.

The Transitional Registration/License No. of the consultant firm, MESC is No. 0003, ECD, Dated 1st July 2017.

Contact Address	**:**	Room no. (B -5), Building no.67/69, Parami Road, 16 Ward, Hlaing Township, Yangon Region
Contact person	**:**	Myint Kyaw Thura 95 9 420105071
Contact number	**:**	95 9 73044903
E-mail	:	myanmar.esc@gmail.com
Website	**:**	www.myanmar environment sustainable conservation.com

Members of MESC who are IEE/EIA appraisers, or IEE/EIA practitioners or who are involved in this IEE/EIA project are as follows:-

Name	Nationality & National Registration Card No.	Registration/ license No. by ECD	Designation
U Myint Kyaw Thura M.Sc (Zoology)	Myanmar 12/Da Ga Ta (N)028349	0006	Managing Director, Biodiversity Specialist (Fauna), EIA practitioner and EIA Appraiser
U Saw Han Shein B.Sc (Botany) M.Sc (Marin Biology)	Myanmar 10/Ma La Ma (N)008173	0007	Retired Professor, EIA Practitioner and Appraiser
Dr. Thiri Dawe Aung Ph.D (Zoology)	Myanmar 12/Da La Na (N) 029433	0008	Biodiversity Specialist (Ornithologist)
U Tin Tun Aung B.Sc (Engineering)	Myanmar 12/U Ka Ma (N)172111	0009	Engineer and EIA practitioner
Daw Khin Nhwe Naing M.Sc (Botany)	Myanmar 9/Pa Kha Ka (N)001252	00010	Biodiversity Specialist (Flora), Environment Researcher

U Than Soe Oo M.Sc (Forestry)	Myanmar 9/Ma Na Ma (N) 050808	00011	EIA practitioner
U Oakka Kyaw Thu B.Sc (Geology)	Myanmar 7/Ya Ta Ya (N) 090371	00012	Geologist
Daw Thin Thin Yee B.Sc (Chemistry)	Myanmar 12/Tha Ga Ka (N)039292	00013	Chemical Environment Researcher, Computer Programmer

MESC has also part time members working as free lances.

The firm is not in a position to employ all its part time members on a permanent basis.

These are botanists, zoologists, ornithologists, ecologists, aquatic ecologists, social scientists, engineers and geologists working with this firm.

For the physical and chemical environmental studies MESC has to hire experts, say for example, from the Health Department and from registered laboratory in Yangon. Since portable test kits are sometime not reliable, experts from the Health Department have to be hired for the analysis of air quality. Experts from a registered laboratory were hired for the analysis of water (or samples have to be sent to the laboratory).

Members of MESC have quite a lot of experiences with IEE, EIA and SIA works.

So far, starting from 2014 MESC has been involved in IEE, EIA, SIA and EMP projects: such as limestone minings/quarries; gold and copper minings; tin and tungsten minings; coal minings; cement factories; Iron and steel factory; hotel and housing projects; fuel storage tank farms; fuel storage and distribution terminal; cigarette factory, paper factory, electronic and ear phone parts factory, motorcycle and spare parts factory, saw mill (veneer factory), sugar factories, hydropower project, water boom park, fish meal factories, zip line project, seed processing plant, specific taxonomic and ecological study of herpetofauna, specific biodiversity and ecological survey of forest and parts etc. projects.

MESC is now involved in the on-going project such as private hospital project, waste incineration energy plant, transmission line, biomass power plant, shopping center project, assembly and marketing of cars project, assembly and installation of elevator, lifts and escalators. Some members have also participated in Road construction (air quality) project. Herpetological survey in association with foreign experts.

REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. ......3...... Date ....

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.

(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၆၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို အဖွဲ့အစည်းအား ထုတ်ပေးလိုက်သည်။)

(a)	Name of Organization (အဖွဲ့အစည်းအမည်)	Myanmar Environment Sustainable Conservation-MESC
(b)	Name of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ အမည်)	U Myint Kyaw Thura
(c)	Citizenship of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ နိုင်ငံသား)	Myanmar
(d)	Identity Card /Passport Numberof the representative person in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	12/ Da Ga Ta (N) 028349
(e)	Address of organization (ဆက်သွယ်ရန်လိပ်စာ)	Room No. B-5, Building No.72, Marlar Myaing 6th street, 16 Ward, Hlaing Township, Yangon. myanmar.esc@gmail.com , 09 73044903
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Organization
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 March 2018

EXTENSION

The VALIDITY of this certificate is extended for one year from (1.4.2018) to (31.3.2019)

For Director General

(Soe Naing, Director)

Environmental Conservation Department

Director General

Environmental Conservation Department

Ministry of Natural Resources and Environmental Conservation

Areas of Expertise Permitted

(ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Air Pollution Control

2. Ecology and Biodiversity

3. Facilitation of Meeting

4. Geology and Soil

5. Land use

6. Modeling for Water Quality

7. Socio-Economy

8. Water Pollution Control

EXTENSION

The VALIDITY of this certificate is extended for one year from (1.1.2020) to (31.12.2020)

5.2.2020

For Director General

(Soe Naing, Director)

Environmental Conservation Department

EXTENSION

The VALIDITY of this certificate is extended for nine months from (1.4.2019) to (31.12.2019)

17.6.19

For Director General

(Soe Naing, Director)

Environmental Conservation Department

EXTENSION

The VALIDITY of this certificate is extended for six month from (1.1.2021) to (30.6.2021)

For Director General

(Soe Naing, Director)

Environmental Conservation Department

EXTENSION

The VALIDITY of this certificate is extended for six months from (1.7.2021) to (31.12.2021)

For Director General

(Soe Naing, Director)

Environmental Conservation Department

Figure-2: Certificate of consultant firm

2.3 Presentation of health experts for project with health impacts

The consultant firm, MESC, is not yet in a position to hire health experts for the preparation of EIA report.

However the firm has undertaken the environmental health survey in the form of testing and analysis of air quality with the help of experts from Occupational and Environmental Health Division of the Department of Public Health, the Ministry Health and Sports. As regards testing and analysis of water this is conducted by experts and technicians from a certified laboratory, ISO Teach Laboratory in Yangon.

3. ENVIRONMENTAL POLICY, LEGAL AND INSTITUTIONAL FRAME WORK

3.1 Corporate Environmental and social policy

Highland Cement International Co., Ltd, one of the leading cement production companies in Myanmar has environmental policy of its own. The first and foremost policy is to obey, abide and comply with all laws and rules relating to physical and social environment. Most of all, it will follow all the rules and regulations set up by the Environmental Conservation Department, the main agency responsible for environmental management in Myanmar. The company pledges to do a cement business that will be environmentally sound as far as possible.

The company shall endeavor to:

- Operate the cement factory and limestone quarry with an environmentally and socially responsible manner and to comply with laws and regulation
- Prevent pollution of surrounding area; monitoring and adopting suitable measures for environment protection
- Implement EMP effectively to mitigate pollution of water, land, air, noise and dust and proper disposal of waste
- Develop green belt in available space
- Conserve natural resources and energy as far as possible
- If possible recycling of waste through the principles of 5Rs (reduce, reuse, recover, recycle, redesign), and
- Create environmental awareness among employees and local community through education and training

Corporate Social Responsibility (CSR) and community developmen

The company very well realizes that the ethic code of 21th century big business is not to make profit at the expense of the environment and the local community. And that the big business should not focus only on economically viable venture but also on environmentally and functionally sound, ecologically viable as well as socially sustainable venture.

CSR has become mandatory in many countries and it is also now an official policy of most big companies. Highland Cement International Co., Ltd had already implemented CSR programmes as far as possible and will continue to do so and carry out community assistance and community development. Generous compensation would be provided if there is any loss or damage due to the implementation of this project. Moreover charity works and donation works had been carried out and this trend will be continued.

As regards 5% of net profit for CSR, the company has so far spent more than Ks 164,730,100 for the execution of CSR (for South Pyi Nyaung, North Pyi Nyaung, Yay Paung Sone, Yin Mar Pin villages and Tharzi Town welfare association) infrastructure development area plus assistance and donation in materials and kinds for CSR activities such as community development, charity works and donations. These are already done before any profiles are realized yet.

Another form of CSR is the reforestation of mine area after mine closure. Highland Cement International Co., Ltd is already reforested 500 acres of land with teak.

The company will follow the principle of CSR, which are:

- Not to destroy the environment
- Not to infringe on human right
- Not to get involve in child labour and forced labour, and
- Not to get involve in bribery and corruption in league with corrupt officials/authorities when doing business.

The company is also very aware of the other environmental and social principles such as Extractive Industry Transparency Initiatives (EITI) and Payment for Ecosystem Services (PES) when these two principles become mandatory in Myanmar. The company shall comply with all the regulations concerning EITI and PES.

3.2 Environmental policy and legal frame work

3.2.1 Environmental policy

The environmental policy is to protect and conserve the environment while striving for national development. In other word to aim for sustainable development.

The National Environmental Policy (1994) is:

- to achieve harmony and balance between socio-economic, natural resources and environment through the integration of environmental considerations into the development process enhancing the quality of life of all its citizens

In short, the policy covers three strategic areas:

(a) Clean environment and health, functioning ecosystem

(b) Sustainable development, and

(c) Mainstreaming environmental protection and management.

Myanmar is cooperating with the international community to draft a national environment policy and adopt its main tasks in order to contribute to sustainable development, policies, strategies and work programmes relating to climate change, a framework for a green economy and strategies and work programmes for waste management.

The nation is in the process of formulating a new and comprehensive national environmental policy. Since 2015 United Nations Development Programme (UNDP) has been supporting the government to formulate a new national environmental policy that places environmental consideration at the centre of efforts to promote economic and social development, reduce poverty and mitigate and adapt to climate change and natural disasters.

This national environmental policy will ensure environmental protection and sustainable development across the country.

The pragmatic aim is to integrate environmental governance into the national economic development programme. This is indeed a new multifaceted national environmental policy and strategic frame work that address new challenges.

3.2.2 Applicable Laws and Rules

Highland Cement International Co., Ltd shall comply with the following laws, rules and regulation, and guidelines.

1. Myanmar Mine Laws, 1994 (Amended 2015)
2. Myanmar Mine Rules, 1996 (Amended 2018)
3. Environmental Conservation Law, 2012
4. Environmental Conservation Rule, 2014
5. The Conservation of Water Resources and River Law, 2006
6. The Forest Law, 2018
7. The Protection of Wildlife and Protected Area Law, 1994
8. The Protection and Preservation of Cultural Heritage Law, 2009
9. Vacant, Fallow and Virgin Lands Management Rules, 2012

10. Myanmar Investment Law, 2016

11. Foreign Investment Law, 2012

12. Myanmar Investment Rules, 2017

13. Land Acquisition Act, 1894, (Still in revision at Hluttaw, 2018)

14. The Factories Act, 1974

15. The Explosive Substance Act, 1908 (Amended 2001)

16. The Fire Service Law, 2012

17. Electricity Law, 2014

18. Myanmar Private Industry Enterprise Law, 1990

19. Myanmar Insurance Law, 1993

20. The Social Security Law, 2012

21. Labour Organization Law, 2013

22. Workmen Compensation Act, 1951

23. The Leave and Holiday Act, 1951

24. Settlement of Labour Disputes Law, 2012

25. Minimum Wages Law, 2013

26. The Public Health Law, 1972

27. Import-Export Law, 2012

28. Myanmar Highway Law, 2000

29. The related Law enacted by Mandalay Region Hluttaw and Rules issued by Mandalay Region Government

30. Environmental Impacts Assessment (EIA) Procedures, 2015

31. National Environmental Quality (NEQ) Emission Guidelines, 2015

The above mentioned 29 Laws and Rules and procedures and guidelines are directly or indirectly related to cement factory business. Since these laws cover a very wide spectrum and various aspects the company is not in a position to study all these law. The company has, therefore, hired a legal expert to deal expert to deal with the details of these laws.

Commitment

The project proponent has made a commitment to comply with these above mentioned laws, rules, regulation and guideline. The project proponent will, in particular, strictly comply with all the specific sections and sub-sections described above.

U Kyaw Soe Win
Director

When implementing the project the company authority will apply the common sense and simple logics not to pollute the air, water, land and the community. When it comes to detail the legal expert will assist the company to comply with these laws, accordingly.

However certain points or articles of the relevant for laws are excerpted and reproduced as follow.

(1) Myanmar Mine Laws, 2015

The law sets out the mining licensing framework, the respective roles of and responsibilities of MONREC at union and State/Region levels and royalty rates and penalties for non-compliance. The law covers small scale to large scale mining.

The objectives are to protect the environment that may be impacted due to mining operation and make provision for safety and prevention of accidents in mine/quarry.

(2) Myanmar Mine Rules, 2018

Among the regulations are: the permit holder must:

- Minimize environmental negative impacts on local communities and make an annual contributor to a fund for environmental conservation (Article. 13)
- Contribute to Mine closure fund for rehabilitation (Art. 13)
- Not to pollute and to maintain water quality above and below ground (M Rule. 154)
- Make provision for safety and prevention of accidents at the mine/quarry site (Art.13)
- Provide all necessary measures for safety in the mine/quarry (M Rule. 176)
- Monitor and regularly inspect and maintain the working environment, tools and equipment and others for safe working (M Rule. 176)
- Prepare an emergency plan (M Rule. 176), among others

(3) The Environmental Conservation Law, 2012

Objectives:

(a) To enable to implement the Myanmar National Environment Policy.

(i) To enable to emerge a health and clean environment and to enable to conserve natural and cultural heritage for the benefit of the present and future generations.

The project proponent is required to install or use on-site equipment in order to monitor, control, reduce and eliminate pollution and to discharge polluting substances according to NEQ guideline 2015.

(4) <u>The Environmental Conservation Rules, 2014</u>

Rule 56: The person who carries out any project, business or activity shall arrange and carry out for conducting the EIA for any project, business or activity by qualified third person or organization accepted by the ministry (MONREC)

Rule 69: (i) Any person shall not emit, cause to emit, dispose, and cause to dispose, pile and cause to pile, by any means, the pollutants and hazardous waste or hazardous materials stipulated by the notification under the law and any of these rules at any lace which may affect the public directly or indirectly.

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

The rules also set out further details on the requirement to conduct EIA and prepare EMP on the basic of EIA.

(6) <u>The Protection of Wildlife and Protected Area Law, 1994</u>

Objectives:

(a) To implement the government policy for wildlife protection

(b) To implement the policy for natural areas conservation

(c) To carry out in accordance with the International Conservations acceded by the State in respect of the protection and conservation of wildlife, ecosystems and migratory birds

(d) To protect endangered species of wildlife and their natural habitats

(7) <u>The Forest Law, 2018</u>

Chapter (2) Basic principles:

(b) To implement the environmental conservation policy of the Government

(c) To promote the sector of public coorperation in implementing the forest policy and the environmental conservation policy of the Government

Chapter-4 management of forest land:

Whoever is desirous of carrying out any development work or economic scheme on the forest land shall obtain the prior approval of the Forest Department.

Any one that has obtained the right to carry out economic activating on the forest land has the responsibility for reforestation of the area.

(7) The Conservation of Water Resources and River Law, 2006

Objective

- To conserve and protect water resources and rivers for use by the public and to protect

- To protect environmental impacts on water environment.

Mining/quarry in or near water course

- Anyone wanting to do the activity for commercial purpose near the water course must seek permission from the Directorate of Water Resource and Improvement of River System, Ministry of Transport (Art. 13)

- Prohibits discording engine oil, chemical or poisonous materials which may affect the environment (Art. 11)

(8) Protection and Preservation of Cultural Heritage Law, 2008

Objectives: To protect and preserve cultural heritage

- Prohibits exploration of petroleum, natural gas, precious stone or minerals in cultural heritage regions. (Art. 20) except for the benefit of the state (Art. 29)

(9) Explosive Substances Act, 2001

Objectives: to regulate the use of explosives and blasting.

- Use of dynamite is allowed on mine/quarry site only with the permission of the Ministry of Defense or one of the State-owned Enterprise.

(10) Land Acquisition Act, 1894

A company may carry out land acquisition when it is "likely to prove useful to the public".

- The company acquiring the land has to provide the compensation. Compensation is based on the market value of the land and also possible damage incurred by the private land owner, such as loss of crops and firewood or the cost of changing residence and place of business. (Art. 6)

(11) Myanmar Investment Law, 2016

The Myanmar Investment Law and Rules cover all investment in Myanmar and clearly states that the country is to attract "responsible investment business which do not cause harm to the natural environment and the society for the benefit of the Union and its citizens.

(12) Foreign Investment Law, 2012

This law was enacted in 2012 by the previous government of President U Thein Sein. This law vastly simplified the process of investment application and offers a number of tax breaks, incentives and guarantees rights and protection for foreign business ventures. The law commits to provide a secure, accusable and conducive environment for foreign investors.

Investment may be in the form of 100% investment, joint venture (JV), contract and other forms.
The government guarantees:

- No nationalization.
- No suspension of investment without sufficient causes.
- The right to transfer money in the foreign currency of the original investment.

The following is excerpt from Chapter-8 of the Foreign Investment Law.

(a) Invest or rights

According to Section-17 and 18 of Chapter-8, investors have the right to:

- The legal sale, exchange or transfer of assets with Myanmar Investment Commission (MIC) approval.
- Sell some or all of the company's shares
- Expand the business or increase foreign capital with MIC approval
- Request the re-evaluation and amendment of the benefit provided to the investors in accordance with existing law.
- Address and seek reparation for grievances in accordance with existing law.
- Request additional benefit when investing and expanding operation to adopt new technology, enhance the quality of products, increase production volume and reduce negative impacts.
- Apply for special tax exemption and relief for investment that benefit the development of the nation.

(b) Duty and obligation of investors,

Investors have a duty to:

- Abide by the existing law
- Incorporate a company under the existing law and abide by these in all dealings and operations.

- Abide by the provision of (Foreign Investment Law) FIL and all terms and conditions contained in the rules, procedures, orders etc issued under FIL.

- Use any land lease in accordance with the terms and conditions stipulated by MIC and contained in any business agreement.

- Sub-lease and mortgage land and/or structures only to business with investment permits from MIC; transfer shares to other business or individuals only with approval of MIC.

- Not alter land in a significant way-such as topography and elevation without approval of MIC.

- Inform MIC immediately if they find valuable natural resources or archeological artifacts either above or below the land that are not related to permitted operation. If MIC determines that operation must temporarily half because of such a recovery the investors may select and submit an alternative site to MIC for approval.

- Avoid pollution and other environmental impacts in accordance with existing law.

- Forfeit the investment permit before completely or partially transferring the hotel shares of the company to another foreigner or citizen, and to seek prior approval from MIC.

Carry out the systematic transfer of high technology related to the business from the investors to relevant enterprises, departments or organization according to the contract.

(13) Myanmar Investment Rules, 2017

- Projects that cause a large impact on the environment and the local community require a permit from the Myanmar Investment Commission (MIC). (Art. 36)

- Businesses that may cause significant damage to the natural environment and ecosystem are prohibited. (Art. 41)

- MIC screens the proposal and makes the final decision.

(14) The Factories Acts, 1974

Purpose: to ensure the health, safety, welfare, fair working time the clean environment for the employees working inside a factory. This law focuses on all stipulation for the employer (project owner).

The project owner should abide by nearly all sections in this Act. The project owner has to abide by all provisions for healthy, safety, welfare, working-hours and other needs. The project owner shall ask its legal expert to study this Act in details for his advice.

This Act also contains the provision for chemicals management and storage. The chemicals use in the manufacturing of motorcycle, paints, thinners, varnishes etc, may not require permits. Since iron smelting will not be involved permit for "hot work" may not be also necessary.

This factory Acts requires all factories to have proper pollution control measures such as air pollution, sewage and waste water treatment system and solid waste management system.

(15) Myanmar Insurance Law, 1993

Purpose: The project can cause the damages to the environment and injuries to public. Therefore, the project owner shall take out insurance for the factory and for fire insurance. This law focuses on the following matters:

- Under Section-6: the project owner has to insure the insurance to compensate for general damage as the project can probably cause the damages to the environment and injury to the public.
- Under Section-15: of the project owner uses the owned vehicles he or she has to insure the insurance for injured person.

(16) Fire Service Law, 2012

Purposes:
- To take precautionary and preventive measures for the loss of life and property due to fire and other natural disaster.
- To organize fire brigade systematically and to train the brigade.
- To conduct release work when fire disaster, natural disaster, epidemic disease or any kind of dangers occur.
- To educate, organize and motivate to chive public cooperation.

The relevant Government Development or organization shall, for the purpose of precaution and prevention, obtain the approval of the Fire Force Department before granting permission for the following cases:

(c) Construction factory, workshop, storage facilities and warehouse.

Sub-section (a) of Section-25: The project owner promise not fails to institute the specific fire service under Section-13 of said law.

Sub-section (b) of section-25: The project owner promises not fail to provide materials and apparatuses for fire precaution and prevention.

In addition to the above-mentioned laws the company will comply with all laws, rules and regulations related to motorcycle manufacturing. The company shall comply with, in particular, the National Environmental Quality standard guideline prescribed by the Environmental Conservation Department. The company shall also comply with all the statutory requirement set up by the concerning ministries e.g. Ministry of Industry, Ministry of Energy, Agencies, Departments etc. and the authority of Mandalay Region.

(17) Labour Organization Law, 2011

Objectives: The law permits the exercise of the freedom of association and the formation of independent trade unions.

- Everybody has the right to join or resign from a labour organization. (Act. 3, a)
- Basic labour organizations shall be formed with a minimum of 30 workers in the relevant trade or activity. If less than 30 workers, it may form jointly with any other trade of the same nature. (Art. 4, a)

(18) Social Security Law, 2012

Objectives: To provide for:

- A health and social care insurance system; a family assistance insurance system; invalidity benefit; superannuation benefit and survivor's benefit insurance system and unemployment benefit system.
- Both employers and workers must pay into a social security fund. (Act. 2, (c) and (e))
- Companies with five or more employees in the extractive industries (among others) are required to pay social security. (Art. 11)

(19) Settlement of Labour Disputes Law, 2012

Objectives: To safeguard the rights of workers, maintain a good relationship between employers and workers and a peaceful workplace; and to protect rights through settling disputes between employers and workers.

- Employers of more than 30 workers must form a Workplace Coordinating Committee including worker and employer representatives. This is to promote a good relationship between the employer and the workers through negotiation and coordination on terms and conditions of employment OHS, welfare and productivity. (Chap. 11(3))

(20) Minimum Wages Law, 2013

The law sets a minimum wage to meet the essential needs of workers and their families and for the purpose of increasing the capacity of the workers.

Employers must:

- Pay a national minimum wage, currently set at Ks 4800/day, to employees (Art. 2, a), including for part time and hourly work (Art. 14, e).
- Provide salaried workers one day's paid leave per week. (Art. 14, f)
- Provide both men and women minimum wage without discrimination. (Art. 14, b)

In addition to the very briefly above-mentioned laws and rules the company will comply with all laws, rules and regulation related to cement business. The company will comply with, in particular, the NEQ guideline prescribed by ECD. The company shall also comply with the entire statutory requirement set up by the concerning ministries.

The legal experts hired by the company will study all the above-mentioned law and rules and advice the company whenever and wherever deems necessary.

3.2.3 International and Regional Conventions and Protocols

Myanmar has either signed or ratified no less than thirty treaties, conventions and protocols concerning environment, it is learnt.

Some of the regional conventions or protocols signed or ratified by Myanmar are:

(i) ASEAN Agreement on Conservation of Nature and Natural Resources. Kuala Lumpur, 1985

(ii) ASEAN Agreement on Tran-boundary Haze Pollution, 2002

(iii) Establishment of ASEAN Regional Centre for Biodiversity, 2005

Some of the international conventions and protocol which are of importance are:

(i) Convention for the protection of World Culture and National Heritages. Paris, 1972.

(ii) Convention on International trade in Endangered Species of wild Fauna and Flora. Washington, 1973, and amended, Bonn, 1979.

(iii) Convention on conservation of migratory species of wild animals. Bern, 1983.

(iv) Vienna convention for the protection of Ozone Layer. Vienna, 1985.

(v) Convention on Biological Diversity. Rio-de-Janero, 1992

(vi) U N Frame work Convention on Climate Change, 1992.

(vii) Kyoto Protocol on the frame work convention on climate change. Kyoto, 1998

(viii) Protocol on Bio safety. Cartagena, 2000

Recently the country has participated in:

(ix) UN Climate Change Conference, COP (conference of the parties) 21, Paris, 2015

(x) UN Climate change conference, COP 22, Marrakesh, 2016

The country will also participate in:

(xi) International conference on climate change, 2017

(xii) Second international conference on climate change, Colombo, 2018 and all UN Climate change yearly conference hold in the frame work of UN Framework Convention on Climate Change (UNFCCC).

3.2.4 International Standards and Guidelines

Highland Cement International Co., Ltd shall refer to the following international standards and guidelines as practical as possible while strictly follow the NEQ guideline.

1) Cement Production. www.ebrd.com>policies>const.
2) Cement quality. www.polskicement.pl>pges>upload
3) IFC. 2007. Environmental Health and Safety Guidelines for Cement and Lime Manufacturing. IFC, World Bank
4) IFC. 2007. Environmental Health and Safety Guidelines for Mining.
5) IFC. 2012. Sustainability Framework: Policy and Performance Standards on Environmental and Social Sustainability
6) IFC. 2007. Environmental, Health and Safety General Guidelines.
7) IFC. EHS guidelines for coal processing. https://www.gov.at>content>files>E
8) IFC. Cement manufacturing. https://www.wbcsdcement.org>pdf
9) ISO/TC.74. Cement and Lime. https://www.iso.org>cat
10) ISO.679.2009. Cement test method. https://www.iso.org>standard
11) ISO.91.160.10. Cement, Gypsum, Lime motar. https://www.iso.org>htm
12) Management of tailings and waste materials in mining/quarry. Europa IPPC Bureau. eppchjne:ec.europa.eu>ref
13) ECD, MOECAF 2015. National Environmental Quality (emission, effluent) Guidelines. Pec.2015
14) New Dry Process Cement Plant. www.greatwallco/cementplant/
15) Production of Cement. www.webcrawler.com/
16) Safety and sustainable mining with 150 standards. www.150.org>iso>news.archive.news.
17) Safety in cement industry. https://www.wbcsdcement.org>pdf
18) Safety guidelines in Chinese mines and quarries. www.xinhaimineral.com>benefication.

3.3 Commitments made by the project proponent

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

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

(c) The project proponent will at all times comply fully with the commitments, mitigation measure and plans in this EIA report.

(Re: EIA procedure, Notification No. 616/2015, Sectors 62-a-c)

U Kyaw Soe Win
Director

Commitment by the consultant firm, MESC

The consultant firm has made a sincere commitment and confirmed that:

(a) the information and data in this EIA report are true and accurate and that the report is complete, and

(b) that the EIA has been prepared in strict compliance with applicable laws including EIA procedure and wth the ToR for the EIA (EIA procedure 616/2015, section-62 (a, b)).

The report has been prepared by MESC with utmost effort with all reasonable skills, care and diligence within the term of contract with the client Highland Cement International Co., Ltd. Recommendations are based on our experience, using professional judgment and based on the information that is available to us.

Myint Kyaw Thura
Managing Director
Myanmar Environment Sustainable Conservation

3.4 Legal and institutional frame work

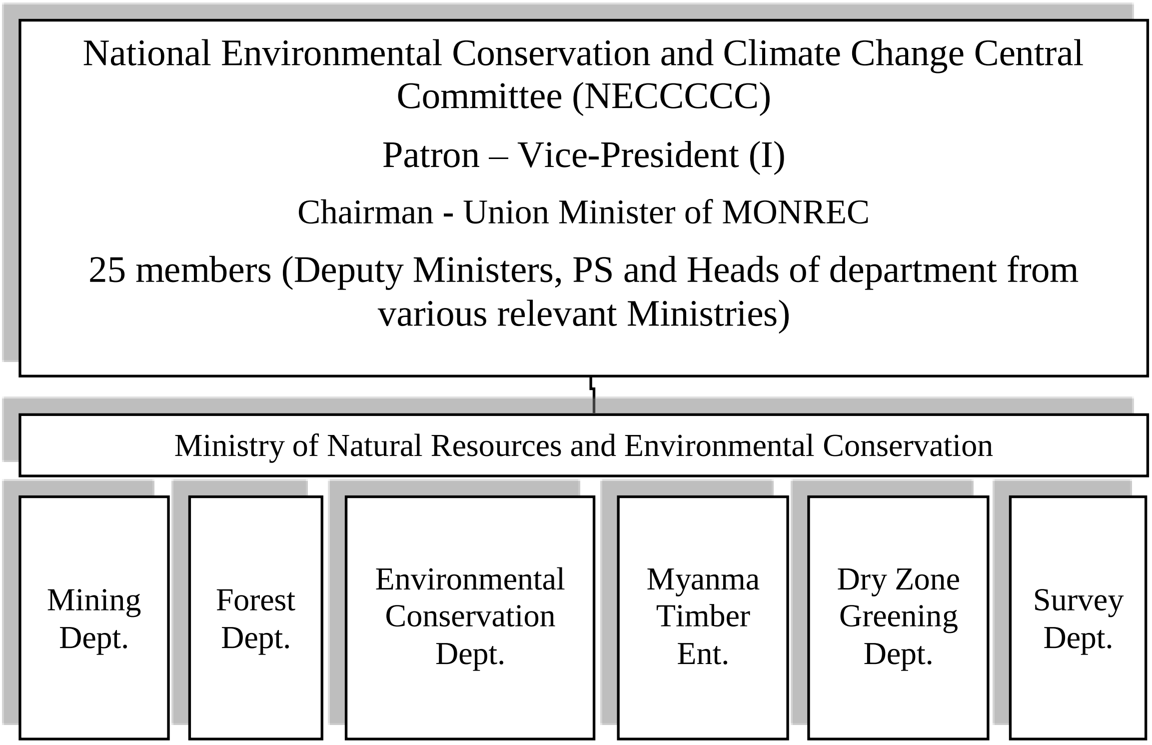
Article 42 of Myanmar Constitution (2008) clearly states that "The Union shall protect and conserve national environment".

Environmental conservation is an obligation of every citizen of Myanmar as per the Myanmar constitution (2008). Section-8, Article 390 of the constitution states that "Every citizen has the duty to assist the Union in carrying out the following matter: (b) environmental conservation.

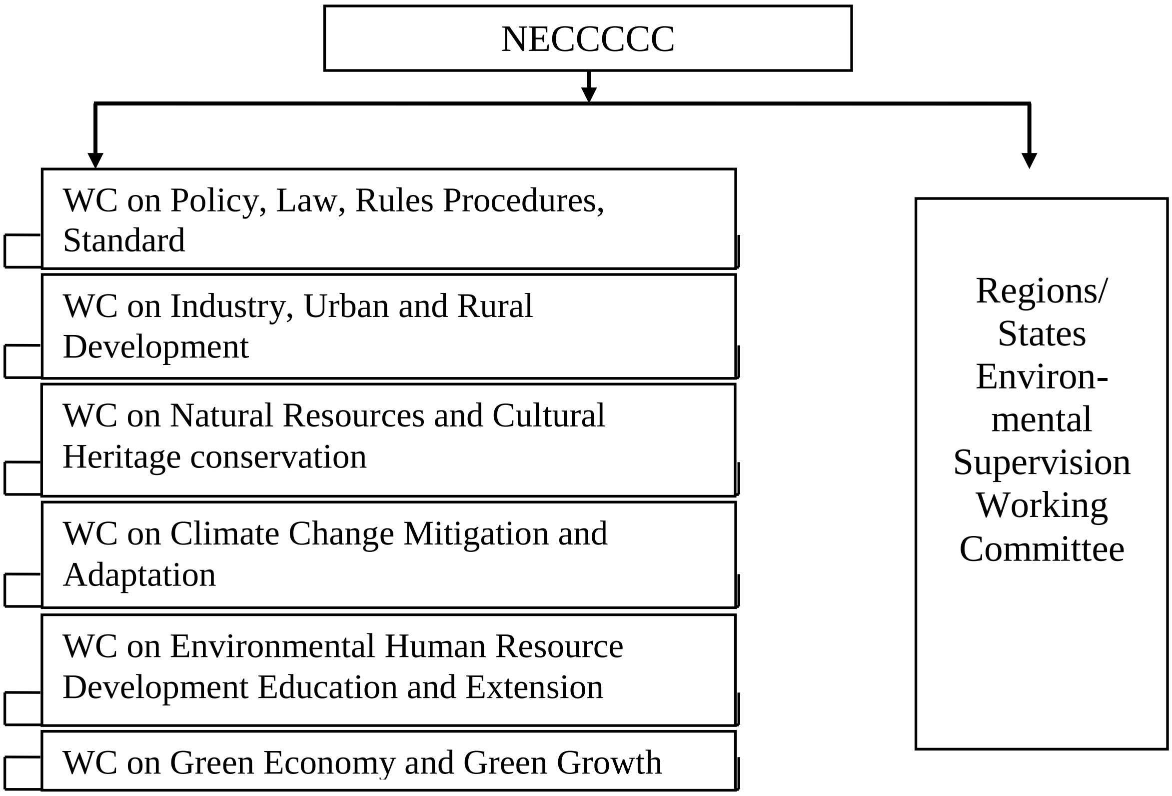
The conservation of the environment was/is one of the priorities of successive governments.

The National Environmental Conservation Committee (NECC) was formed in 2011 with the aim to achieve sound environmental management in the country. It is enlarged and reorganized as National Environmental Conservation and Climate Change Central Committee (NECCCCC).

The institutional organization of NECCCCC is as follow:

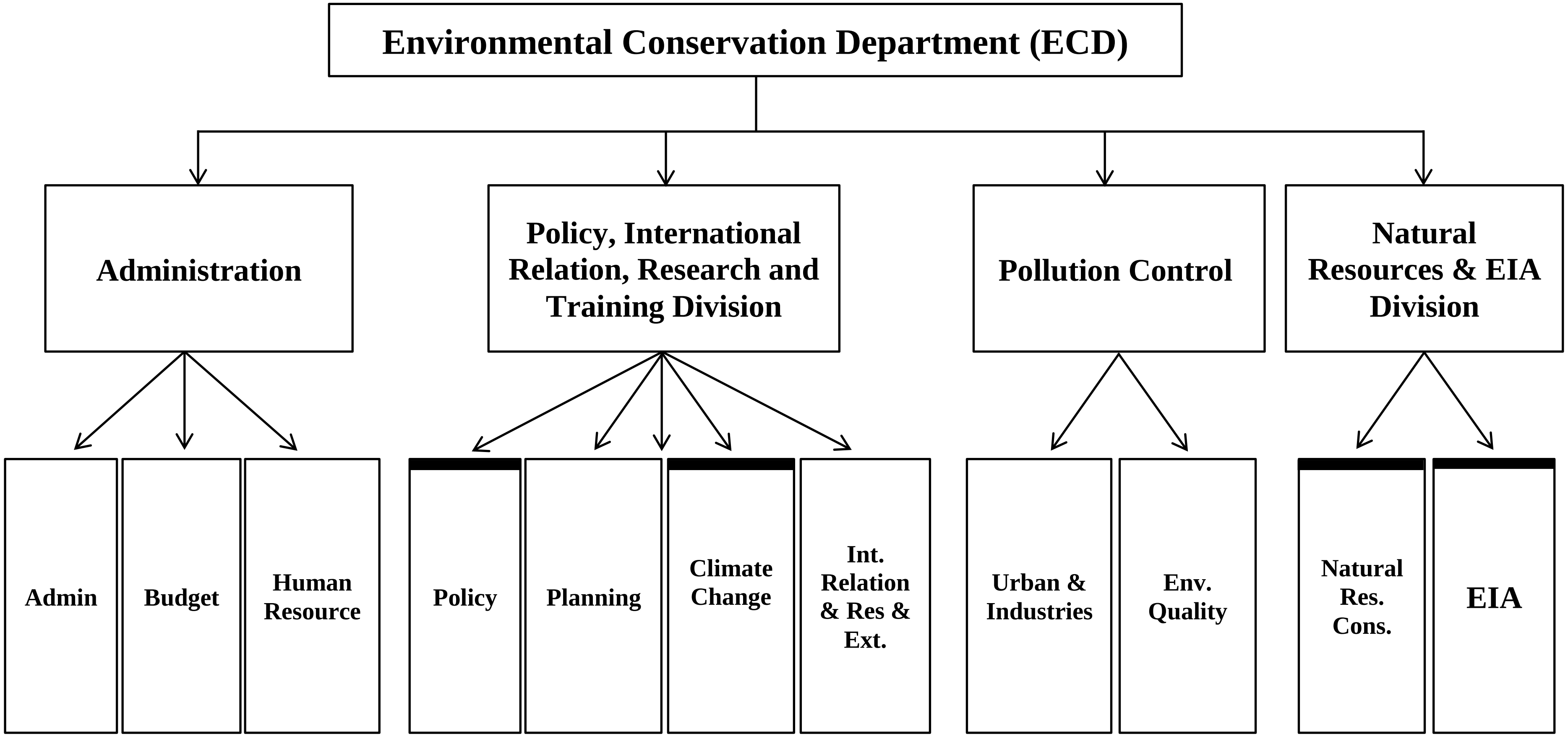


There are six Working committees under NECCCCC and supervision WC at 14 states and Regions.



Institutional organization of ECD

ECD is a major department under MONREC and is headed by a director general. Under the Director General are one Deputy Director General and 4 Directors at the directorate. ECD is the focal and coordinating agency for the overall environmental management of the country. It is also directly responsible for all the management of IEE, EIA, EMP etc. activities taking places all over the country.



These four departments are each headed by a director.

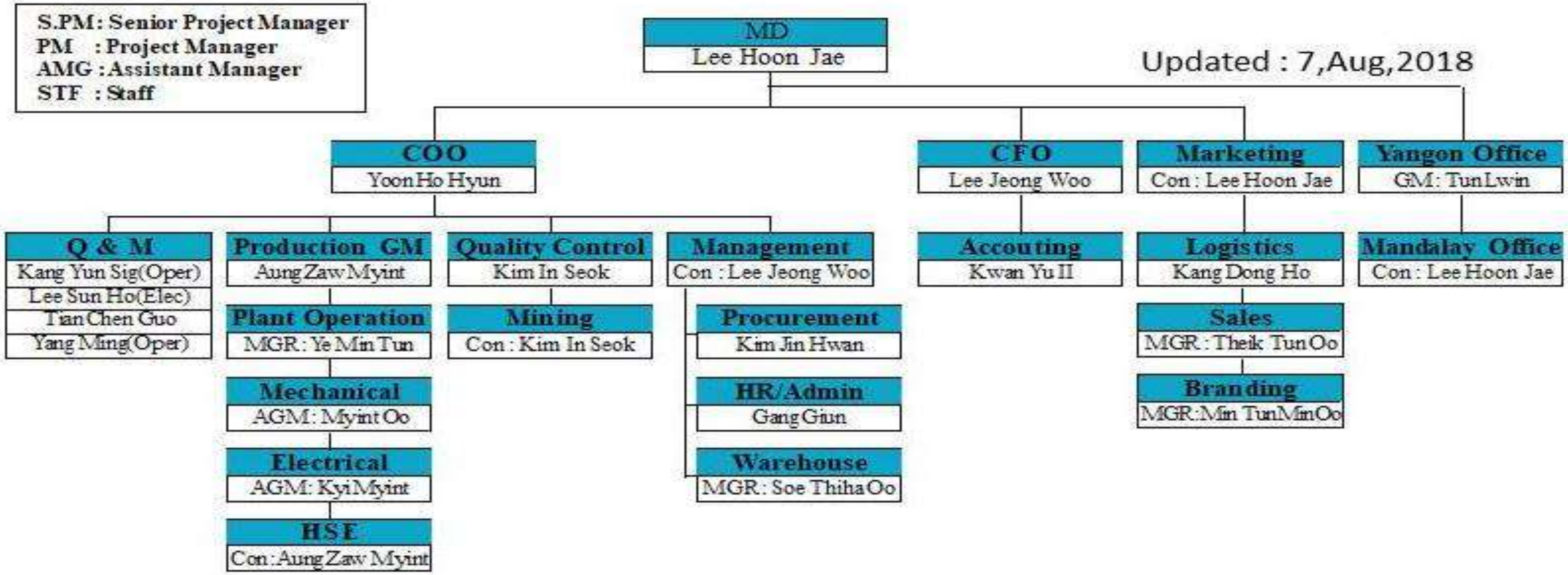
The main tasks of ECD include:

- implementing environmental conservation policy
- designing and implementing monitoring programmes
- prescribing environmental quality standards and,
- conducting activities relating to waste management and conducting environmental impacts assessments

Recently various Environmental Conservation Departments at States and Regional levels under the Directorate were established in all the 14 States and Regions of the nation. This will surely greatly enhance the conservation of the environment and especially the management of the environment of the country.

3.4.1 Institutional Arrangement of the company

The institutional arrangement of the company is as follows:



(Table of Organization)

Division	Korean				Global Staff												Grand Total
					Head Office (Pyi Nyaung)					Yangon/Mandalay Office					Sub Total	Contractor	
	LGI	Q& M	HCI (G,S)	Total	S.PM	PM	AMG	STF	Sub Total	S.PM	PM	AMG	STF	Sub Total			
Plan	4	4	5	13	4	10	22	367	403	1	7	14	39	61	464	115	592
Current	4	4	4	12	3	6	16	356	381	1	4	11	39	55	436	129	577
Vacancy	-	-	1	1	1	4	6	11	22	-	3	3	-	6	28	14	15

3.5 Project Environmental and Social Standards

3.5.1 National Environmental Quality (emission and effluent) Guidelines by ECD

3.5.1.1 Air quality

The followings are from cement and lime manufacturing guidelines for air emission (from Notification No.615/2015, December 2015, by ECD, MOECAF)

Air emission levels

Parameter	Unit	Guideline Value
Cadmium + Thallium	mg/Nm^{3a}	0.05
Dioxins/Furans	$mgTEQ^{b}/Nm^{3}$	0.1
Dust (other point sources including clinker cooling, cement grinding)	mg/Nm^{3a}	50
Hydrogen chloride	mg/Nm^{3a}	10
Hydrogen fluoride	mg/Nm^{3a}	1
Mercury	mg/Nm^{3a}	0.05
Nitrogen dioxide	mg/Nm^{3a}	600
Particulate matter PM_{10} (existing kilns)	mg/Nm^{3a}	100
Particulate matter PM_{10} (new kiln system)	mg/Nm^{3a}	30
Sulphur dioxide	mg/Nm^{3a}	400
Total metals	mg/Nm^{3a}	0.5
Total organic carbon	mg/Nm^{3a}	10

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

[b] Toxicity equivalence factor

[c] Particulate matter 10 micrometers or less in diameter

[d] Total metals are Arsenic, Lead, Cobalt, Chromium, Copper, Manganese, Nickel, Vanadium, and Antimony

Note: The hired technicians, at the moment, are not familiar with the units, mg/Nm3, and TEQ/Nm3, and also not familiar with these parameters, and units.

Therefore, these parameters cannot be measured yet. The company is trying its best to measures these parameter in the near future and report the result in the future semi-annual monitoring reports.

3.5.1.2 Water quality

The general guideline for waste water and others (from Notification No.615/2015, December 2015, by ECD, MOECAF)

Effluent levels

Parameter	Unit	Guideline value
pH	S.U.[a]	6-9
Temperature increase	^{o}C	<3[b]
Total suspended solids	mg/l	50 mg/l
COD	mg/l	250 mg/l
BOD	mg/l	50 mg/l
Phosphate	mg/l	100 mg/l
Nitrate	mg/l	50 mg/l
Oil and Grease	mg/l	10 mg/l

3.5.1.3 Noise level

The general guideline for noise (from Notification No.615/2015, December 2015, by MOECAF)

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

Note: Noise level must not be 3 dBA higher than standards level. If higher mitigate or reduce.

3.5.1.4 Odour

Guideline standard for odorant unit is between 5 and 10.

3.5.2 International Finance Corporation (IFC), Environmental and Social Standards (2012)

There are eight performance standards for a big company to do business in a new area.

I) Assessment and Management of Environmental and Social Risks and Impacts

- identify and evaluate environmental and social risks and impacts of the project
- adopt mitigation measures to avoid, or if avoidance is not possible, minimize or mitigate the impact; compensate for the impacts on people and on the environment
- promote improved environmental and social performance through the effective use of management system
- ensure that grievances from the effected people are responded and managed appropriately
- promote and provide means for adequate engagement with the community throughout the project period

II) Labour and Working Conditions

- promote the fair treatment, non-discrimination and equal opportunity of workers
- establish, maintain and improve the worker-management relationship
- promote compliance with national employment and labour laws
- promote safe and healthy working conditions and the health of workers
- avoid the use of forced labour and child labour

III) Resource Efficiency and Pollution Prevention

- avoid or minimize adverse impacts or human health and the environment by avoiding or minimizing pollution from project activities
- promote more sustainable use of resources, including energy and water
- reduce project-related GHG emissions

IV) Community Health, Safety and Security

- avoid adverse impact on the health and safety of the community during the project life
- ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the community

V) Land Acquisition and Involuntary Resettlement

- avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs
- avoid forced eviction
- avoid, or where avoidance is not possible, minimize social and economic impacts from land acquisition or restriction on land use by
  - (i) providing compensation for loss of assets at replacement cost (value of asset plus transaction costs), and
  - (ii) ensure that resettlement activities are implemented with appropriate disclosure of information, consultation and the informed participation of those effected
- improve or restore, the livelihoods and standards of living of displaced persons

VI) Biodiversity Conservation and Sustainable Management of living Natural Resources

- protect and conserve biodiversity
- maintain the benefits from ecosystem services
- promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development prioritie

Indigenous Peoples

- ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of indigenous peoples
- avoid adverse impacts of project on indigenous people, or when avoidance is not possible, minimize and/or compensate for such impacts
- promote sustainable development benefits and opportunities for indigenous people in a culturally appropriate manner
- establish and maintain an ongoing relationship with these people throughout the project period
- respect and preserve the culture, knowledge and practices of indigenous peoples

VIII) Cultural Heritage

- protect cultural heritage from the adverse impacts of project activities and support its preservation
- promote the equitable sharing of benefits from the use of cultural heritage

4. PROJECT DESCRIPTION AND ALTERNATIVE SELECTION

4.1 Project background

The Limestone Mountains in Pyi Nyaung area, Tharzi Township possess ideal limestone raw material for the production of quality cements. The abundance of limestone and another raw material, clay, makes this Pyi Nyaung area an ideal landscape for the production of cement.

The cement factory project was started by Htoo International Industries Group Co., Ltd. The scoping for cement project was carried out since 2007. Approval from Myanmar Investment Commission (MIC) was obtained on 17-2-2011. (Document: Ma Na Tha 790/2011; dated: 17-2-2011)

However an application for change and amendment in the name of the company, name of owner, expansion of investment and capital and upgrade of production capacity was submitted by Blue Diamond Cement Co., Ltd to MIC. The changes and amendment were:

a) A change in the name of company from Htoo International Industries Group Co., Ltd to Blue Diamond Cement Co., Ltd. (Document: Ya-Ka-3/Ma-1106/2015(971); Myanmar Investment Commission; dated 24-7-2015.

b) Name of owner from U Tay Za to Daw Shwe Shwe Lin

c) Later A joint venture between Blue Diamond Cement Co., Ltd and LG International Corporation was formed and the name of the company was again changed to Highland Cement International Co., Ltd (Document: 72FC/2015-2016 (Na Pa Ta); Directorate of Investment and company Administration; dated 22-12-2015.

d) Expansion of investment and capitals from million kyats 25,210.18 (including 26.53 million US $) to million kyats 79,330.00 (including 29.00 million US $).

e) Upgrade of production capacity from 1,000 tons/day to 1500 tons/day.

<u>Brief chronology and documentation</u>

The first approval for Htoo International Industries Group Co., Ltd was obtained on 17-2-2011.

A new approval from MIC was obtained on 24-7-2015 following an MIC meeting amending the former approved of 17-2-2011. (Document: Ya Ka-3/Ma-1106/2015(971); dated: 24-7-2015. The name of the company was changed to Blue Diamond Cement Co., Ltd.

Later a joint venture between Myanmar company and Korean company was formed and the name of the company was changed to Highland Cement International Co., Ltd and that was approved and the new company was officially registered on 22-12-2015 (Document: No. 72

FC of 2015-2016(NPT), directorate of Investment and company Administration, Ministry of National Planning and Economic Development.

The brand name of cement product is Blue Diamond Cement.

The amended new approval was granted on condition that the project proponent, Highland Cement International Co., Ltd strictly follows all the rules and regulations set up by MIC in the original approval Document: Ma-Na-Tha 790/2011, dated: 17-2-2011.

Project objectives

The main objectives are:

- to produce quality cement to meet the demand of the nation
- to play a leading role in cement production industry in Myanmar
- to contribute to the development of the infrastructure of the nation and also enhance the construction sector of country
- to substitute for the import of cement abroad and thus conserve the foreign exchange, and
- to aim for export of cement to neighbouring countries

4.2 Project location, overview map and layout plan

The project site is half mile north east of Taung (South) Pyi Nyaung (Ya-htarr Pyinyaung) village and about 2 miles south of Myauk (North) Pyi Nyaung village.

The later has the status of a village tract and it is in Tharzi Township, Mandalay Region. South Pyi Nyaung village has a small railway station (Taung Pyi Nyaung Budar) on the Tharzi-Shwe Nyaung Railway. North Pyi Nyaung is situated on the Meikhtilar Taunggyi Highway.

The project site is 44 miles east of Tharzi Town and 320 miles north of Yangon.

The coordinates of the site are: N Lat 20˚.47´ and E.Long 96˚24´. The elevation is 341m asl.

The site is at the western side of the foot Hill of Limestone Mountain.

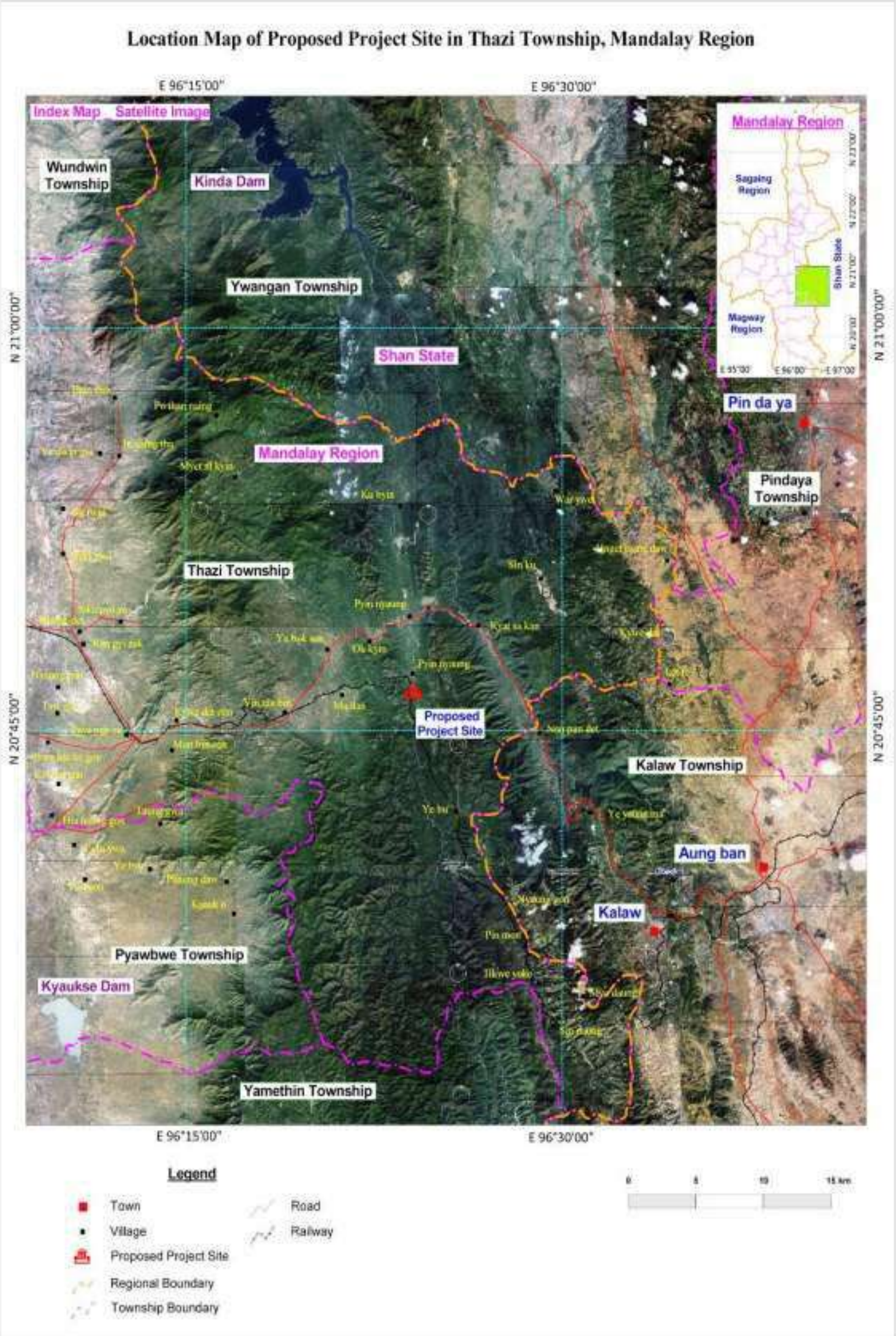


Figure – 3: Location Map (Google)

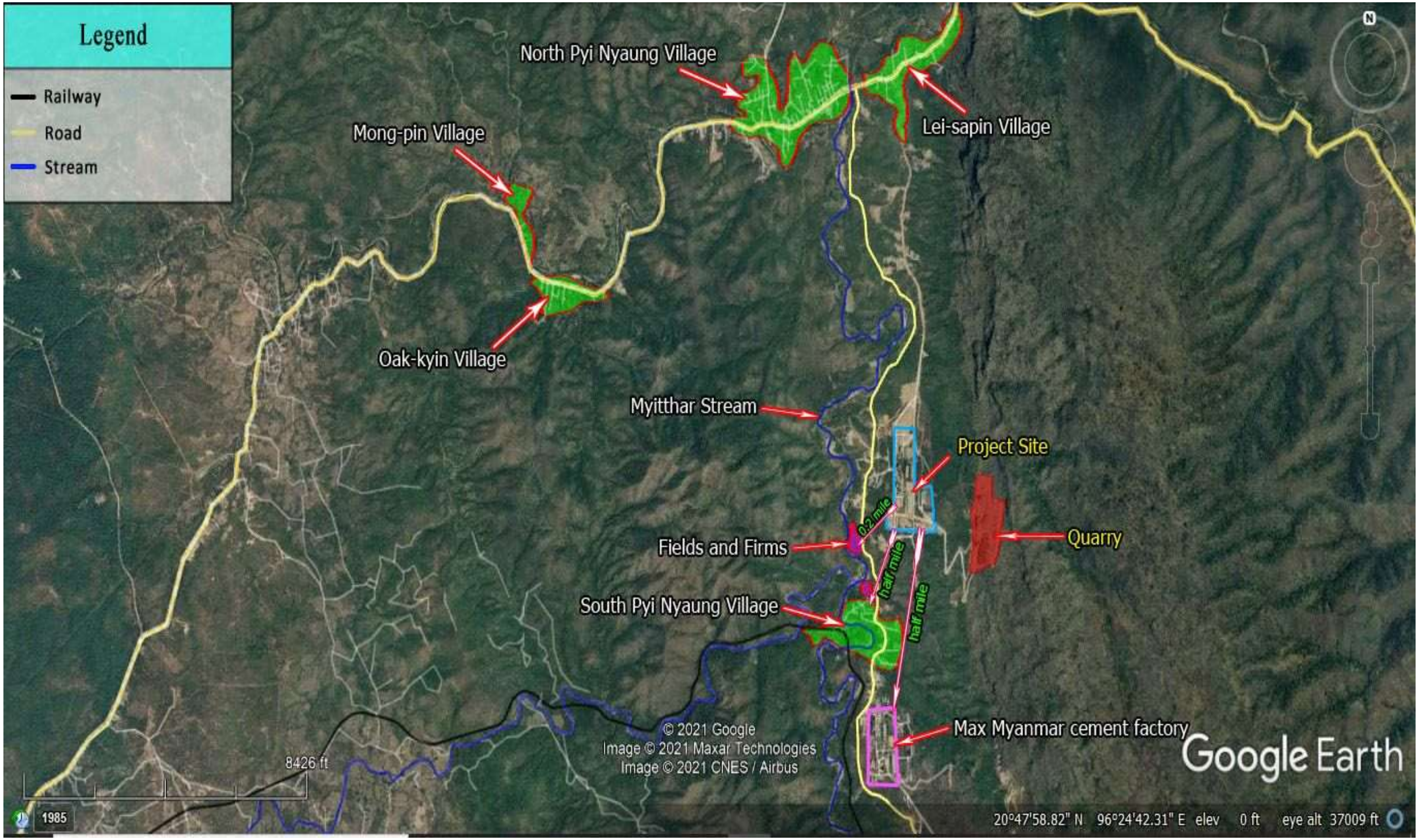


Figure – 4: Satellite image of project site and its environs

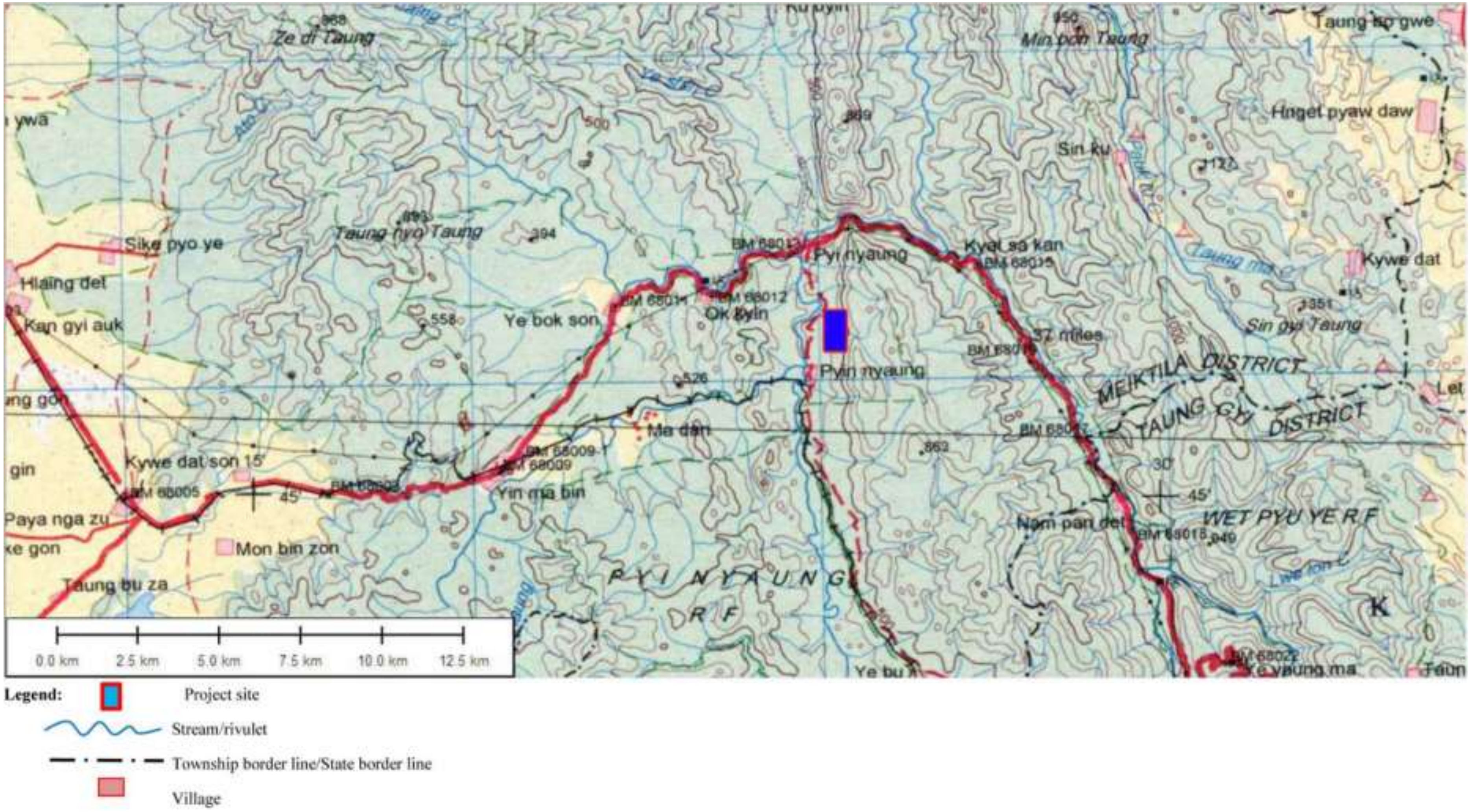


Figure – 5: Map of Part of Tharzi Township showing project site

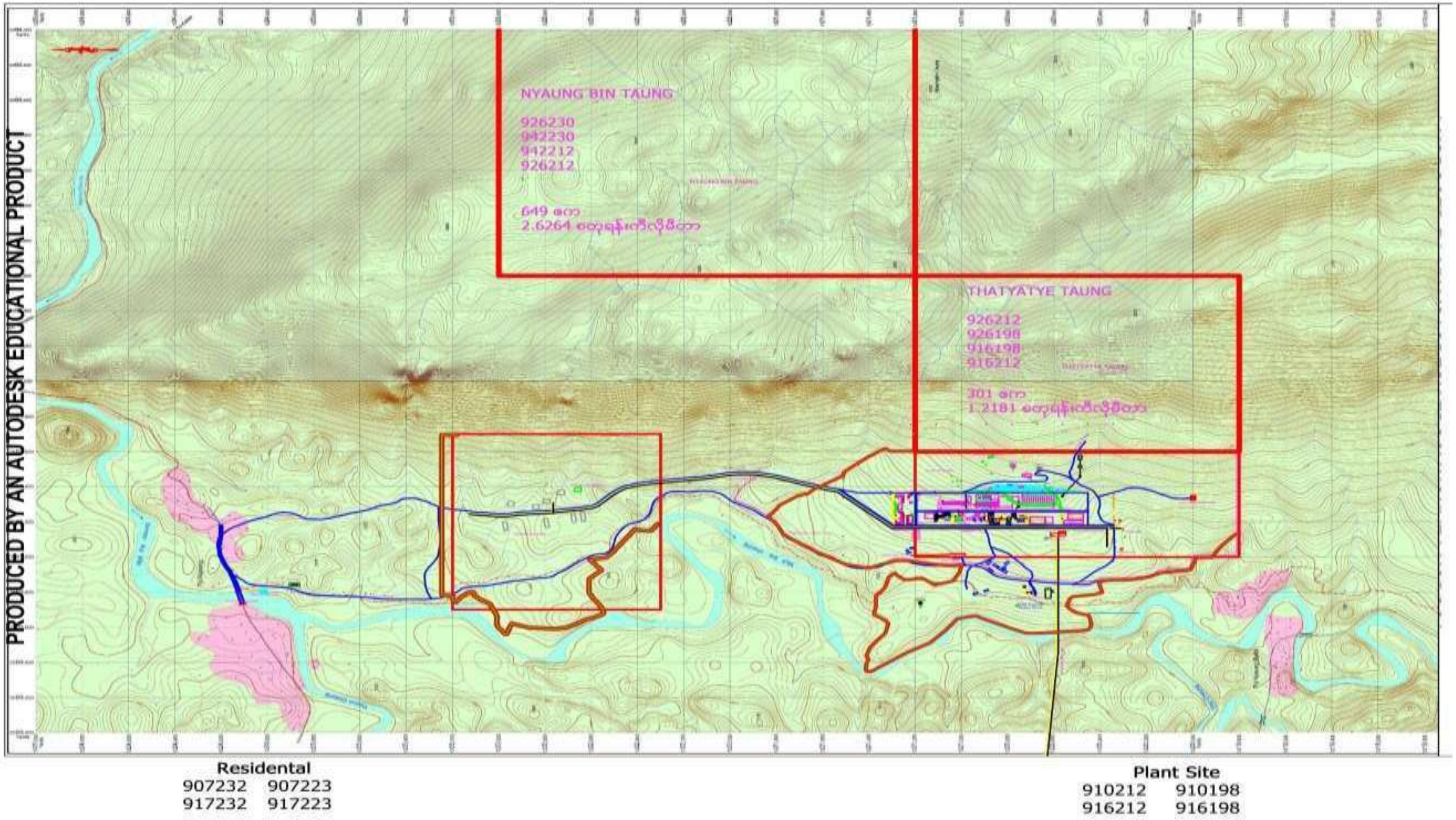


Figure – 6: Layout plan of project site (right), residential area (left) and two mining sites (above), (scale: 1" = 0.5 mile)

Figure – 7: Overview of project site (factory and premise)

ပုံစံ(၄)

၁/၃

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
သတ္တုတွင်းဝန်ကြီးဌာန
ဝန်ကြီးရုံး
ဓာတ်သတ္တုအကြီးစားထုတ်လုပ်ရန်ခွင့်ပြုမိန့်

ခွင့်ပြုမိန့်အမှတ်၊ ၀၀၀၄ /၂၀၀၉(လွှဲပြောင်းခြင်း)　　　　ရက်စွဲ၊ ၂၀၁၅ ခုနှစ်၊ စက်တင်ဘာလ ၂၄ ရက်

အောက်ဖော်ပြပါ အဖွဲ့အစည်းအား မြန်မာ့သတ္တုတွင်းဥပဒေအရ အောက်ပါအချက်အလက်များနှင့်အညီ ဓာတ်သတ္တုအကြီးစားထုတ်လုပ်ရန်ခွင့်ပြုလိုက်သည် -

၁။ ခွင့်ပြုမိန့်ရရှိသူ၏

(က) အမည်နှင့်နိုင်ငံသားစိစစ်ရေးကတ်ပြားအမှတ် -

(ခ) အဖွဲ့အစည်းအမည်နှင့် - **ဘလူးဗိုင်းမွန်းဘီလပ်မြေကုမ္ပဏီလီမိတက်**
အဖွဲ့အစည်းမှတ်ပုံတင်အမှတ် - **၄၈၁၄/၂၀၁၄-၂၀၁၅**

(ဂ) ဆက်သွယ်ရန်နေရပ်လိပ်စာ - **အမှတ်(၅၀၃)၊ ကွန်ဒို(အေ)၊ မင်းဓမ္မအိမ်ရာ၊**
တယ်လီဖုန်းအမှတ်၊ ဖက်(စ်)အမှတ်၊ - **မရမ်းကုန်းမြို့နယ်၊ ရန်ကုန်တိုင်းဒေသကြီး**
တဲလက်(စ်)အမှတ် - **ဖုန်း - ၀၁-၆၅၅၃၀၈၊ ၀၁-၆၅၅၃၀၉**

၂။ ခွင့်ပြုဧရိယာ၏

(က) တည်နေရာ (ကျေးရွာ၊ မြို့နယ်၊ - **လုပ်ကွက်(၁) ညောင်ပင်တောင်လုပ်ကွက်၊ လုပ်ကွက်(၂)**
ပြည်နယ်/တိုင်းဒေသကြီး) - **သရက်ရေချောင်းတောင်လုပ်ကွက်၊ ပြည်ညောင်ဒေသ၊**
သာစည်မြို့နယ်၊ မန္တလေးတိုင်းဒေသကြီး

(ခ) အကျယ်အဝန်း (စတုရန်းကီလိုမီတာ) - **၉၅၀ ဧက (၃.၈၄၄၅ စတုရန်းကီလိုမီတာ)**

(ဂ) နယ်နိမိတ်သတ်မှတ်ချက် - **မြေပုံညွှန်း၊ ၉၃ ဗီ/၅အယ်လ်အယ်လ်**
လုပ်ကွက်(၁)(၉၂၆၂၃၀၊ ၉၄၂၂၃၀၊ ၉၄၂၂၀၂၊ ၉၂၆၂၀၂)
လုပ်ကွက်(၂)(၉၂၆၂၀၂၊ ၉၂၆၁၀၉၊ ၉၀၆၁၀၉၊ ၉၀၆၂၀၂)
(ခွင့်ပြုမိန့်အမှတ်၊ ၀၀၀၄/၂၀၀၉ တွင် ပူးတွဲမြေပုံပါ
အကျယ်အဝန်းအတိုင်း)

၃။ ခွင့်ပြုဧရိယာ၏နယ်မြေ - **သာစည်မြို့နယ်အထွေထွေအုပ်ချုပ်ရေးဦးစီးဌာန**
အုပ်ချုပ်မှုဆိုင်ရာအဖွဲ့အစည်း -

၄။ တစ်ဆင့်သွားလာဝင်ထွက်ခွင့် - **သာစည်မြို့နယ်**

၅။ ခွင့်ပြုသည့်ဓာတ်သတ္တုအမျိုးအစား - **ထုံးကျောက် (စက်မှုတွင်းထွက်ကုန်ကြမ်း)**

၆။ ခွင့်ပြုသည့်ဓာတ်သတ္တုတူးဖော်မှုနှင့် - **တင်းလင်းဖွင့်တူးဖော်ခြင်း၊ အမှတ်(၁)သတ္တုတွင်းလုပ်ငန်းမှ**
ဆင့်တက်ပြုပြင်မှုနည်းစနစ် **သဘောတူခွင့်ပြုထားသော နည်းစနစ်နှင့် မြန်မာ့သတ္တုတွင်း**
ဥပဒေပုဒ်မ ၂(ည)ပါအတိုင်း

၇။ မူလခွင့်ပြုသက်တမ်းကာလ - **(၂၅)နှစ် (၁၂.၁၁.၂၀၀၉ မှ ၁၁.၁၁.၂၀၃၄ ထိ)**

၈။ ကုမ္ပဏီအမည်ပြောင်းစတင်ခွင့်ပြုသည့်နေ့စွဲ - **၂၃.၉.၂၀၁၅**

၉။ ခွင့်ပြုမိန့်ကုန်ဆုံးသည့်ရက်စွဲ - **၁၁.၁၁.၂၀၃၄**

၁၀။ ပုံသေမြေငှားရမ်းခ (Dead Rent) - **တစ်စတုရန်းကီလိုမီတာအတွက်တစ်နှစ်လျှင် ၂၀၀၀၀၀ ကျပ်နှုန်း**

၁၁။ ဓာတ်သတ္တုခွန် - **(၃ %)**

၁၂။ စည်းကမ်းချက်များ - **အောက်ပါစည်းကမ်းချက်များအတိုင်းတိကျစွာလိုက်နာရမည်။**

ပြည်ထောင်စုဝန်ကြီး
သတ္တုတွင်းဝန်ကြီးဌာန

Figure – 8: Document from the then Ministry of Mines

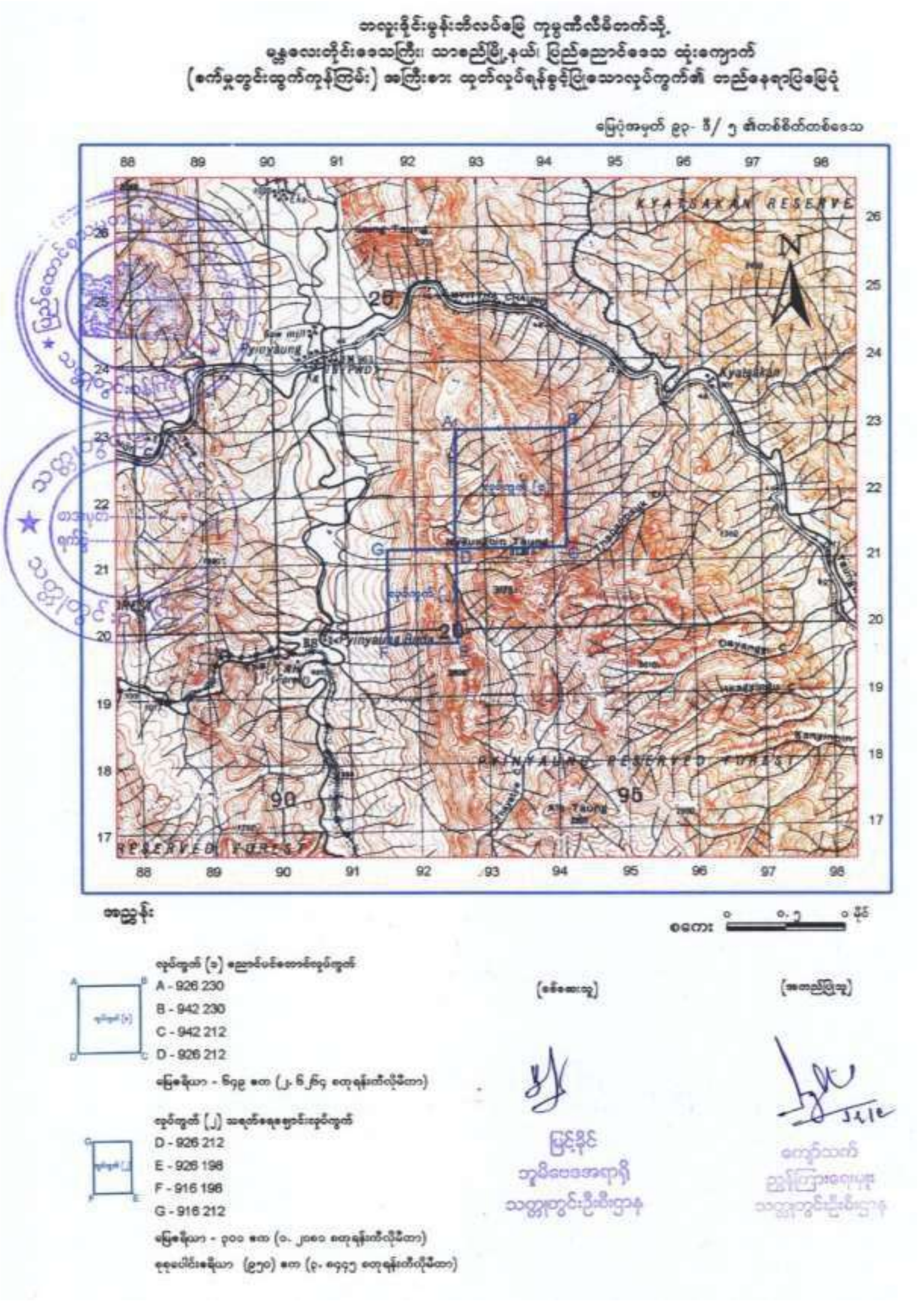


Figure – 9: Map of mining sites

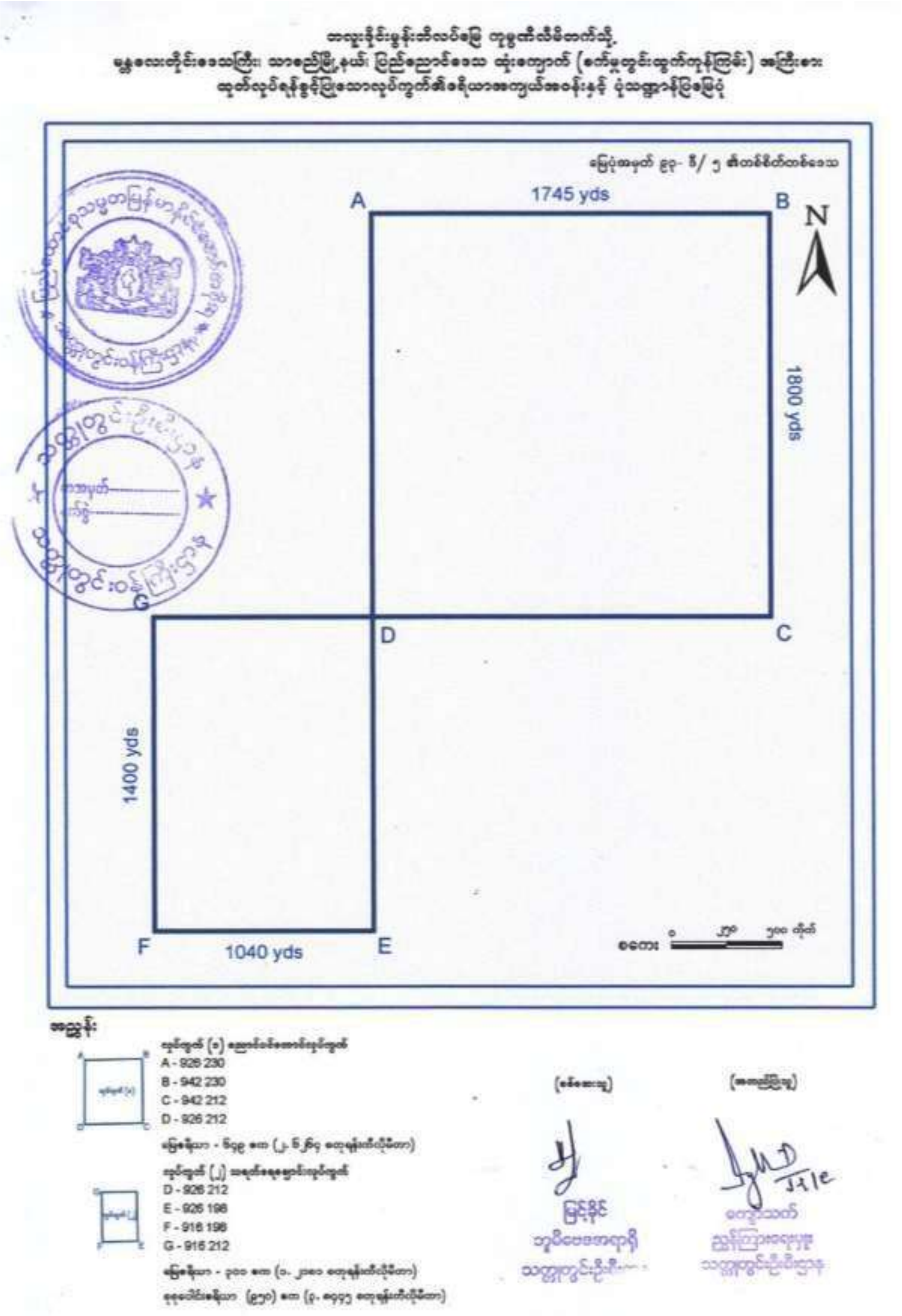


Figure – 10: Mining sites (diagramatic)

4.3 Project development and implementation time schedules

The scoping for the project was carried out since 2007. Approval from Myanmar Investment Commission (MIC) was obtained on 17-2-2011.

The new name of the company, Highland Cement International Co., Ltd, was registered on 22-12-2015 (Permit No.72 FC/2015-2016 (NPW); period of validity of permit: 22-12-2015 to 21-12-2020.).

As regards the permit from the then Ministry of Mines it will be expired on 11-11-2034. The new MIC permit (No.1083/2016) was obtained on 27-2-2016.

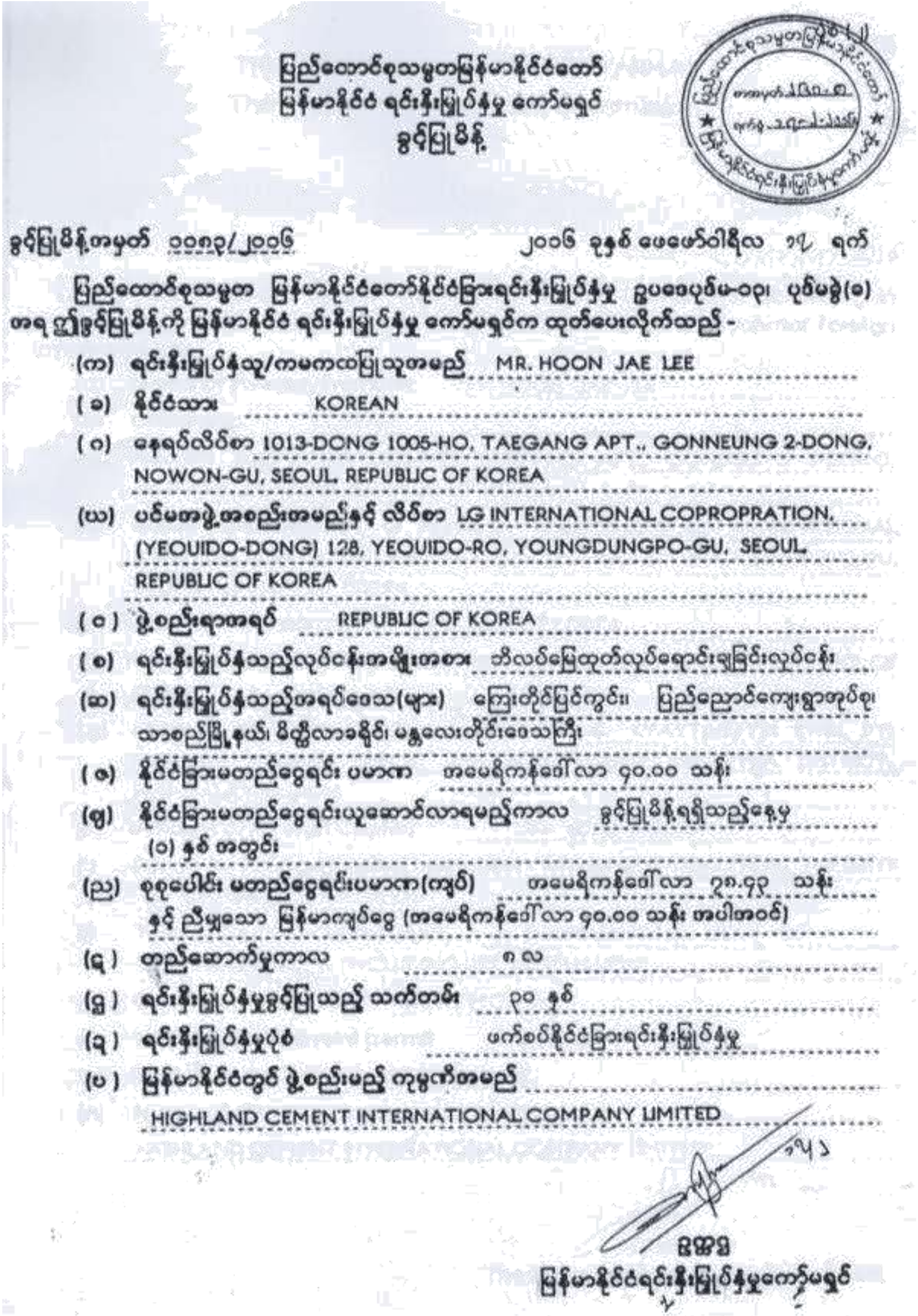
The Construction Phase has lasted for 2 years. The Operation Phase commenced on September, 2017 and will be completed on November 2034 (the then Ministry of Mines).

Pre-Construction Phase	Construction Phase	Operation Phase	Decommissioning Phase
← 1 year →	← 2 years →	← 25 years →	← 2 years →

So far the company has produced 445,000 tons of Portland Cement.

LOCATION POINT

Sr	Location	Area acre	Map Reading (93D/5LL)	Latitude	Longitude	Elevation
1	Plant Site	173	910212; 910198; 916212; 916198	20˚ 47' 34"	96˚ 24' 11"	341m
2	Residential	181	907232; 907223; 917232; 917223			
3	Quarry 1	649	926230; 942230; 942212; 926212	20˚ 47' 24"	96˚ 24' 42"	
4	Quarry 2	301	926212; 926196; 916198; 916212	20˚ 47' 50"	96˚ 24' 54"	
5	50 Ton Magazine			20˚ 47' 07"	96˚ 24' 28"	
6	North Pyinyaung Village			20˚ 49' 10"	96˚ 23' 51"	
7	South Pyinyaung Village			20˚ 47' 00"	96˚ 23' 59"	
8	Laterite		Purchase from Heho			
9	Gypsum		Purchase from Thibaw & Mauk Mel			
10	Coal		From Pinlon, Namsam,Kalaywa			
11	Clay		From lime stone Quarry			



ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်
မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှု ကော်မရှင်
ခွင့်ပြုမိန့်

ခွင့်ပြုမိန့်အမှတ် ၁၀၈၃/၂၀၁၆ ၂၀၁၆ ခုနှစ် ဖေဖော်ဝါရီလ ၁၇ ရက်

ပြည်ထောင်စုသမ္မတ မြန်မာနိုင်ငံတော်နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှု ဥပဒေပုဒ်မ-၁၃၊ ပုဒ်မခွဲ(ခ) အရ ဤခွင့်ပြုမိန့်ကို မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှု ကော်မရှင်က ထုတ်ပေးလိုက်သည် -

(က) ရင်းနှီးမြှုပ်နှံသူ/ကမကထပြုသူအမည် MR. HOON JAE LEE
(ခ) နိုင်ငံသား KOREAN
(ဂ) နေရပ်လိပ်စာ 1013-DONG 1005-HO, TAEGANG APT., GONNEUNG 2-DONG, NOWON-GU, SEOUL, REPUBLIC OF KOREA
(ဃ) ပင်မအဖွဲ့အစည်းအမည်နှင့် လိပ်စာ LG INTERNATIONAL COPROPRATION, (YEOUIDO-DONG) 128, YEOUIDO-RO, YOUNGDUNGPO-GU, SEOUL REPUBLIC OF KOREA
(င) ဖွဲ့စည်းရာအရပ် REPUBLIC OF KOREA
(စ) ရင်းနှီးမြှုပ်နှံသည့်လုပ်ငန်းအမျိုးအစား ဘိလပ်မြေထုတ်လုပ်ရောင်းချခြင်းလုပ်ငန်း
(ဆ) ရင်းနှီးမြှုပ်နှံသည့်အရပ်ဒေသ(များ) ကြေးတိုင်မြိုင်ကွင်း၊ ပြည်ညောင်ကျေးရွာအုပ်စု၊ သာစည်မြို့နယ်၊ မိတ္ထီလာခရိုင်၊ မန္တလေးတိုင်းဒေသကြီး
(ဇ) နိုင်ငံခြားမတည်ငွေရင်း ပမာဏ အမေရိကန်ဒေါ်လာ ၄၀.၀၀ သန်း
(ဈ) နိုင်ငံခြားမတည်ငွေရင်းယူဆောင်လာရမည့်ကာလ ခွင့်ပြုမိန့်ရရှိသည့်နေ့မှ (၁) နှစ် အတွင်း
(ည) စုစုပေါင်း မတည်ငွေရင်းပမာဏ(ကျပ်) အမေရိကန်ဒေါ်လာ ၄၈.၄၄ သန်း နှင့် ညီမျှသော မြန်မာကျပ်ငွေ (အမေရိကန်ဒေါ်လာ ၄၀.၀၀ သန်း အပါအဝင်)
(ဋ) တည်ဆောက်မှုကာလ ၈ လ
(ဌ) ရင်းနှီးမြှုပ်နှံမှုခွင့်ပြုသည့် သက်တမ်း ၃၀ နှစ်
(ဍ) ရင်းနှီးမြှုပ်နှံမှုပုံစံ ဖက်စပ်နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှု
(ဎ) မြန်မာနိုင်ငံတွင် ဖွဲ့စည်းမည့် ကုမ္ပဏီအမည် HIGHLAND CEMENT INTERNATIONAL COMPANY LIMITED

ဥက္ကဋ္ဌ
မြန်မာနိုင်ငံရင်းနှီးမြှုပ်နှံမှုကော်မရှင်

Figure-11: New MIC permit

4.4 Description of the project

4.4.1 Project site and size

The site is located at the western foot hill of the limestone mountain and on the eastern bank of Myit Thar rivulet. It is 1/2 mile north of South Pyi Nyaung village and 3 miles south of North Pyi Nyaung village, Tharzi Township.

The total area is 1308.91 acres comprising 173 acres, 181 acres, 649 acres and 301 acres for the factory, residential area, Nyaung Bin Taung mining site and Thayetyay Taung mining site, respectively. There is an additional 4.91 acres for the base camp in the western portion of the site.

4.4.2 Installation and infrastructure

The company has built its own access road, 2 miles northern to North Pyi Nyaung village. There are 3 major type of building, namely

1. Adminstrative building : Offices and gates,Briefing hall and Canteen ,ect.
2. Commercial building: Store and ware house
3. Residential building: Temporary and permanent residential houses
4. Industrial building

Major indusrial and commercial buildings in the plant site are-

1) Limestone crushing and conveying (Jaw crusher and hammer crusher)

2) Limestone preblending and storage

3) Clay and laterite storage (combined storage shed) , Clay crusher, laterite crusher and conveyor

   3-a) Raw proportioning bins (limestone, clay and laterite)

   3-b) Pregrinder

4) Raw grinding plant (Raw mill)

   4-a) Conditioning tower

   4-b) Main Bag Filter (Dust collector)

5) Raw meal silo

6) Preheater and calciner (Kiln Inlet)

7) Kiln and Stack

8) Central Control Room and Quality Control

9) Coal Mill

10) Coal storage shed and coal pre-blending

11) Coal dryer

12) Clinker cooling and storage silo and conveyor

13) Gypsum and additive crushing and storage

    13-a) Clinker, gypsum and additive proportioning station

14) Cement mill (cement grinding plant)

15) Cement silos

16) Cement packing

17) Cement bags storage

18) Main store (Ware house)

19) Mechanical and electrical workshop

20) Electrical main substation

21) Water storage tanks and water treatment plant

22) Canteen and Waste water treatment plant

23) Briefing Hall

24) Quarry office and equipment shed

25) Oil tanks

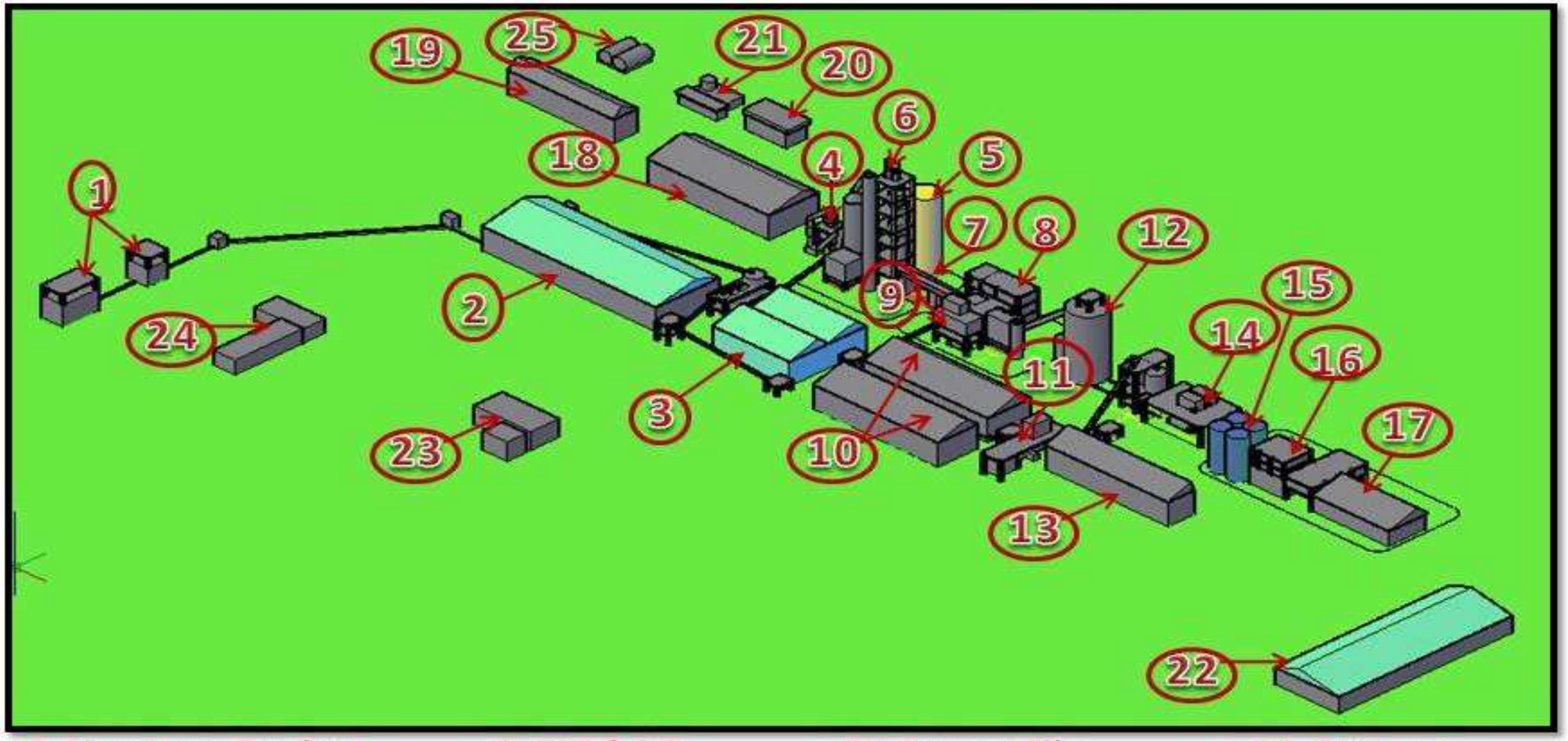
26) Compressor house

27) Weighing stations(2)

28) Magazine (explosives)

(See also **ANNEX** for details of all buildings and structures including dimension etc.)

Blue Diamond Cement Factory Layout Plan



1. Limestone Crusher
2. Preblending Storage
3. Clays & Laterite Storage
4. Raw Mill
5. Raw Meal Silo
6. Preheater
7. Kiln
8. CCR & QC
9. Coal Mill
10. Coal Storage
11. Coal Dryer
12. Clinker Silo
13. Gypsum Storage
14. Cement Mill
15. Cement Silo
16. Packing
17. Cement Bag Storage
18. Main Store
19. M & E Workshop
20. Main Substation
21. Water Treatment
22. Canteen
23. Briefing Hall
24. Quarry Office
25. Oil Tank

Figure-12: Aerial view of the factory and its environs

1. Limestone Crusher
2. Preblending Storage
3. Clays & Laterite Storage
4. Raw Mill
5. Raw Meal Silo
6. Preheater
7. Kiln
8. CCR & QC
9. Coal Mill
10. Coal Storage
11. Coal Dryer
12. Clinker Silo
13. Gypsum Storage
14. Cement Mill
15. Cement Silo
16. Packing
17. Cement Bag Storage
18. Main Store
19. M & E Workshop
20. Main Substation
21. Water Treatment
22. Canteen
23. Briefing Hall
24. Quarry Office
25. Oil Tank

B) **Capacity of machinery and capacity of storage**

(i) Limestone Crusher

(a) Jaw Crusher (primary crusher) - 250 ~ 400 Ton/hr, 185 kW

(b) Hammer Crusher (secondary crusher) - 250~350 Ton/hr, 560 kW

(ii) Preblending Storage - 17000 Tons

(a) Staker-250 Ton/hr, 48 kW

(b) Scraping Reclaimer - 150 Ton/hr, 95 kW

(iii) Clays & Laterite Storage - 10500 Tons

(a) Hammer Crusher - 60 ~ 90 Ton/hr, 75 ~ 55 kW

(b) Jaw Crusher - 20 ~ 52 Ton/hr, 55 kW

(iv) Raw Mill - (Φ3.8 x 8.6)m, 100 ~ 120 Tons/hr, 1600 kW

(v) Raw Meal Silo - 7620 Tons

(vi) Preheater - (5) Stage Preheater Calciner

(vii) Clinker silo (1 Nos.) - 19000 Tons

(viii) Gypsum Storage -5800 Tons

(a) Jaw Crusher -15 ~ 32 Ton/hr, 37 kW

(ix) Cement Mill (2 No;) - (Φ3.2 x 13) m, 40~45 Tons/hr, 1600 kW

(x) Cement Silo (4 No;) - 13100 Tons

(xi) Rotary packing (2) nos. capacity 100 ton/hr, 2400 bags/hr

(xii) Rotary kiln 3.5 x 54 m, Kiln capacity 1800 tons/day, Speed 0.438~4.38r/min

(xiii) Bag discharge belt conveyor (2) nos. capacity 120 tons/hr, speed 0.8 m/s

Note – See also ANNEX, for more.

Figure – 13: Weighing bridge (with a cement mixer in it, outside the factory compound)

Figure – 14: 50 Tons Magazine (outside the factory compound)

Figure – 15: Main office (Briefing Hall)

Figure – 16: Messing (Canteen)

Figure – 17: Workshop

Figure – 18: Jaw crusher

Figure – 19: Hammer crusher

Figure – 20: Limestone conveyor line

Figure – 21: Scraper reclaimer

Figure – 22: Gypsum and Additive Crusher and Storage Shed

Figure – 23: Coal shed

Figure – 24: Laterite crusher

Figure – 25: Clay crusher roller type

Figure – 26: Conveyor and four raw material bins (alumina and silica clay, Laterite and limestone) raw meal silo is background

Figure – 27: Conveyor from pre grinder to raw mill

Figure – 28: Roatary kiln (Length 54 m, diameter 3.5 m)

Figure – 29: Raw meal silo

Figure – 30: Clinker silo

Figure – 31: Cement silo

Figure – 32: at Packing Plant

Figure – 33: Finished product

Figure – 34: Conveyor for transporting cement bags

Figure – 35: Conveying cement bags onto the truck for marketing

Work force (During Operation Phase)

A total of 391 workers (employees) are employed during the operation phase. 381 are nationals while 10 are foreigners.

Staff organization

Sr. No	Description	Nos
1.	Foreign technician	10
2.	General manager	1
3.	Assistant General manager	2
4.	Manager	6
5.	Assistant manager	16
6.	Staff	356
	Total work force in plant site	**391**

Note – About 200 construction workers are employed during the construction phase

Working hours: 8 hrs/day; 48 hrs/week. Housing is provided for all workers; in the form of separate dormitory for male and female workers; and quarter for families.

Figure – 36: Housing for staffs

4.4.3 Production Processes (Brief description of the process of manufacturing)

Cement

Cement is one of the major construction materials, with hydraulic properties which develops strength when reacts with water. It is an inorganic compound which mainly composed of oxides of calcium, silicon, iron and aluminum. There are two processes namely wet process and dry process in cement manufacturing process. Nowadays wet process is obsolete because of high fuel consumption and more effect to environment.

Blue Diamond Cement plant operates with dry process technology of single string 5 stages cyclone preheater claimer kiln.

Raw materials

The raw materials are limestone, clay, laterite and gypsum. Coal as a form of coal powder, is used in coal burner. Limestone is major component of raw material and excavated from limestone quarry near to plant site. Clay also is excavated from limestone quarry area. Laterite comes from Pyinoolwin and Heho and gypsum comes from Thibaw and Maukmae. Fuel coal is from Pinlon, Namsan and Kalaywa.

The three main activities in cement manufacturing process are:

- Quarrying and raw materials preparation
- Clinker production
- Cement grinding and distribution

Generally there are 7 major steps in the production of cement:

1) Quarrying – (blasting and excavation)
2) Crushing and pre-homogenization of raw materials limestone, laterite and clay
3) Grinding (pulverization), homogenization and temporary storage of raw meal
4) Pre-heating and clinkerization (using coal as a fuel)
5) clinker cooling and temporary storage
6) Grinding clinker and gypsum
7) Cement storage, packing and distribution

Manufacturing process is explained detail in attached equipment flow diagram.

The process (cement manufacturing)

Quarrying

The limestone quarry is the first step in cement production. In the blasting area, drilling of blasting holes are made by hydraulic crawler drills according to mine design, the blasting pattern and type of raw material. After the drilling, controlled amount of explosives are filled into the holes for blasting. Mostly used explosives are 32mm and 60 mm emulsion type explosive and pilled form Ammonium Nitrate. Blasted limestone is excavated with excavator and transported to crusher for size reduction as it is the form of boulders. (Flow diagram: Limestone handling to storage.)

Crushing and pre homogenizing of raw materials

With the help of 2 stages crusher, Jaw crusher and Hammer crusher, reduces the size of limestone from 1 cubic meter to 25 mm. Limestone , excavated from different benches has different chemical composition and it is needed to make homogenization. Crushed limestone

from crusher is stacked onto stock pile in such a way that inherent $CaCO_3$ inconsistency is evened out.

Similarly other raw materials or corrective materials such as alumina clay, silica clay and laterite are excavated, crushed and stored in their respective bins. Pre homogenized limestone is mixed with other raw materials according to the calculated raw mix proportion to get required quality.

After mixing the raw mix is pre grind in the pre grinder before entering the raw grinding mill. (Flow diagram: Raw material handling to feed bin)

Grinding, homogenization and temporary storage of raw meal

Raw mix is ground in Raw Mill, a closed circuit, single compartment air swept tube mill. Grinding is done by impact and attrition of grinding media and fine powder is separated by air separator. In raw mill operation, removal of raw mix moisture by hot gas from pre heater, improves the grinding efficiency of raw mill and thermal efficiency of kiln. At the same time reducing the feed size in raw mill increase the reactivity of raw meal in the kiln. Outlet gas from the raw mill is sucked by ID fan and sent to stack passing main bag filter which reduces the dust content of stack gas to less than 50mg/Nm3. (Flow diagram: Raw meal grinding area)

The powdered raw meal is homogenized by air and circulation in blending silo so that chemical properties of raw meal gets equalized with respect to time.(Flow diagram: Blending and kiln feed area)

Pre heating and clinkerization (using coal as a fuel)

The homogeneous raw meal is preheated in Preheater with hot gas and the material is then calcined up to 90% in Proclaimer with waste heat gas and coal in calciner. The calcined raw meal is sintered into clinker in Rotary Kiln using coal fuel. Pulverized coal is used as a fuel in calciner and kiln. Fuel coal is crushed, dried in the dryer and preblended before grinding in the coal grinding tube mill.

Reaction and heating of raw meal is as follows:

30 – 300°C	-	evaporation of moisture of raw meal
400 – 900 deg C	-	Removal of structural water and OH group from clay mineral and calcination
Above 800	-	Formation of C2S, intermediate product aluminate and ferrite
Above 1250 ^{o} C	-	Formation of liquid phase (Aluminate and ferrite melt,) Crystallization of Alit and Belie i.e. completion of phase formation
1300 – 1240	-	Crystallization of liquid phase into mainly aluminate and ferrite

In pre heater gas enters from bottom cyclone and raw meal enters from top cyclone. Gas is sucked by induced draft fan from kiln which is placed at Preheater outlet. From last but one cyclone, raw meal goes into calciner where coal is fired. Tertiary air is sucked in calciner from cooler. After calciner, raw meal is carried to last cyclone by air and separated raw meal from cyclone goes to Kiln.

In pre heater, heat exchange between waste heat gas and raw meal takes place through direct heat exchange in riser duct. Separation of powder raw meal from gas is carried out in cyclone at each stage. Maximum calcination is carried out in calciner by burning coal.

The Kiln is cylindrical rotating furnace (3.5 m in diameter and 54 meter long) and installed slightly slant (3-4 degree) to carry the material to lower end when rotating. At lower end in the burner when coal is fired through using primary for conveying. Cooler secondary air is sucked into Kiln which is at high temperature (due to heat recuperate from clinker) Secondary air from cooler and primary air gets heated by combustion of coal. This air travels opposite to material flow and heat exchange between air and material takes place.

The major aim of the Kiln is to maintain clinker quality and minimize heat consumption in rotary kiln. The chemical composition of clinker consists of CaO, SiO_2, Al_2O, and FeO_3.

Clinker cooling and temporary storage

Red hot clinker is cooled in air quenching cooler and stored in clinker silo for finished grinding. Cooler is to recuperate maximum heat from clinker, to minimize clinker temperature and hence to maintain the clinker quality

Grinding clinker and gypsum

Cement product is produced by grinding clinker and gypsum in 2 open circuit Cement Mills (3.2 m in diameter and 13 m in length) Clinker and gypsum are mixed in proportioning station and fed into cement mills for fine size reduction. Gypsum is added in calculated amount to control setting time of finished product. (Flow diagram: Cement grinding area)

Cement storage, packing and distribution

Cement from cement mills is stored in 4 concrete silos and packed into 50 kg bags by 2 packers. 1.5 ton and 30 ton bulk loading are also loaded by 1.5 ton capacity jumbo bag and BCT truck.

The standard quality of Portland cement is; specification; EN-197.1 (2011); strength class 425 MPa (Mega Pascal). (Flow diagram: Cement silo and bulk loading area) (Flow diagram: Packing and dispatching)

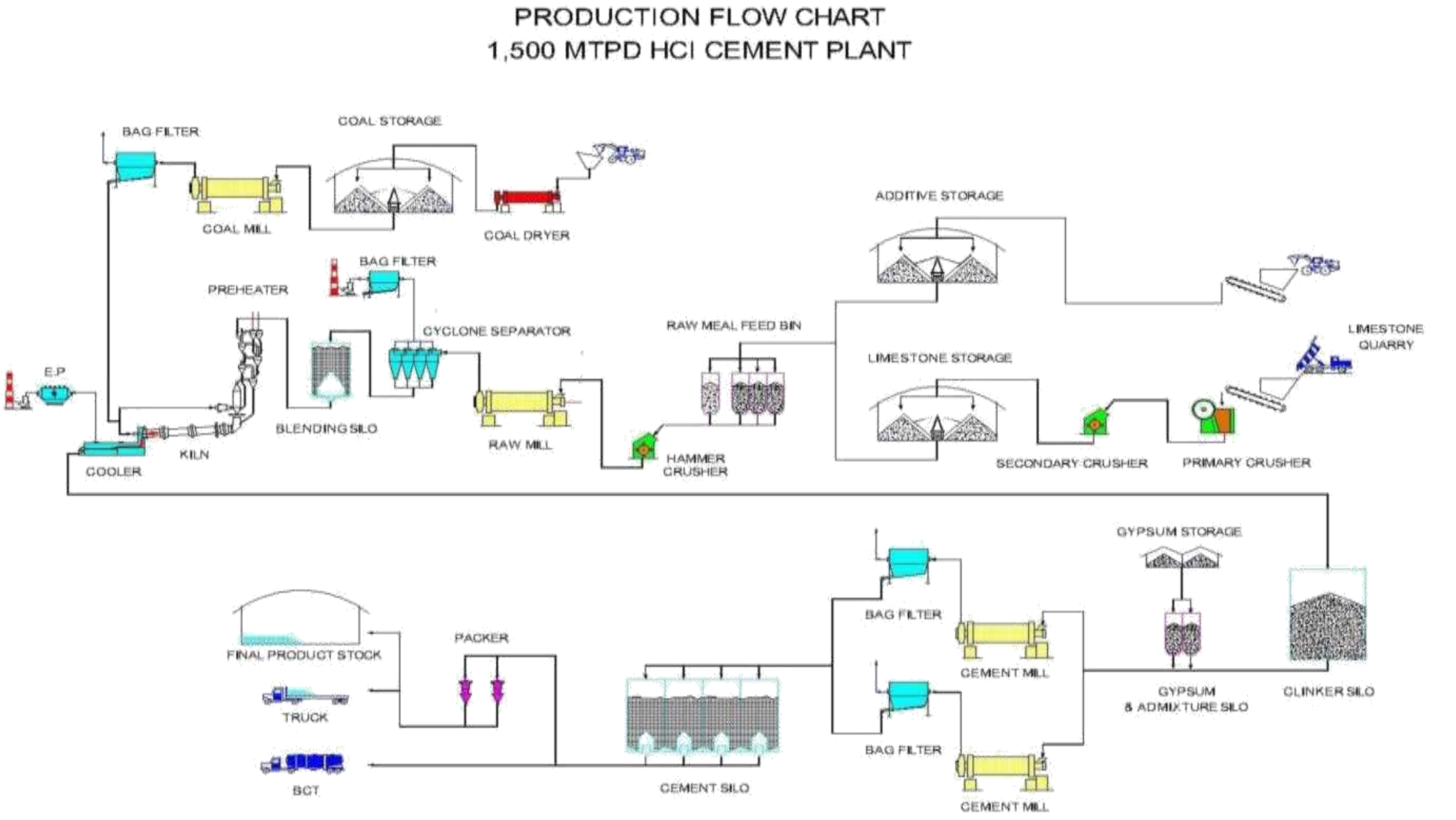


Figure – 37: Flow chart diagram of production process

Clinkerization process in brief

As mentioned earlier raw materials, limestone, laterite, clay and fuel coal burner are thoroughly ground to a fineness of about 10% retained on 170 microns mesh and thoroughly homogenized.

After addition of a small quantity of water the homogenized materials are formed into nodules of 8-10mm in size. This is done with a nodulizer pan that rotates at a suitable speed and at a suitable inclination.

The nodules are fed into the kiln at a temperature of 1400-1500ºC and transformed into clinker. (The chemical composition of clinker consists of CaO, SiO_2, Al_2O, FeO_3 chemical compounds.)

The clinker is cooled and discharged. Later it is ground together with gypsum additive (5 -7% gypsum) and formed into finish product (Portland cement: EN 197-1 (2000); strength class 42.5 MPa-52.5 MPa).

Production capacity (existing)	:	1500 tons/day (Portland cement; EN 197-1, (2000); strength class 525)
Working hour	:	24 hours/day (in three shifts)
Operational day	:	320 days/years
Operation hours	:	24 hours/day (in three shifts)
Shutdown/main Terence	:	about 45 days/year

4.4.4 Uses of materials and resources

a) Machinery, equipment and vehicles

1)	Wheel loader	2 nos
2)	Hydraulic crawler drills	2 nos
3)	Dozer 07 G	3 nos
4)	Crane 25 ton	2 nos
5)	Crane 50 ton	1 nos
6)	Crane 60 ton	1 nos
7)	Dump trucks (10 ton class)	14 nos
8)	Long trucks 5 ton	1 nos
9)	Breaker	1 nos
10)	Grader	1 nos
11)	Roller	1 nos
12)	Vehicles : Lifan	2 nos
	: Double Cab	3 nos
	: Minibus	1 nos
	: Staras	2 nos
	: Hiace	1 nos

Figure – 38: Heavy machinery

b) Raw materials requirement and properties of raw materials

<u>Annual raw materials requirement (Based on 1500 TPD and 320 days per year)</u>

Clinker production	480000 ton
Raw Meal Requirement	810000 ton
Limestone (@ 10% waste rock)	780000 ton
Clay (Alumina and Silica)	73000 ton
Laterite	28000 ton
Gypsum	20000 ton
Coal (20%-30% of clinker)	96000 ton - 144000 ton

Properties of raw materials

- Limestone $CaCO_3$; CaO_3> 48% ; lump size < 900mm
- Laterite (iron stone) FeO_3> 40% ; lump size ≤ 25mm
- Clay Al_2SiO - AlO_3> 15% ; lump size < 25mm
- Gypsum SO3 % > 30% ; lump size < 200mm
- Coal (subbituminous), C > 50% ; lump size ≤ 50mm

Properties of coal: carbon contentment 35% to 36%; sulfur content-0.8% to 2%; volatile matter 36% to 37%; moisture content 30% to 34 %; specific gravity- 1.35; and calorific value 7131 But/lb (3692 cal/kg) *(From secondary information). EIA report on coal mine from Kalaywa, area by Max Myanmar.

According to Geocamp Myanmar (2010) who had analyzed the subbituminous coal of Kalaywa are for Max Myanmar. The constituents are as follow;

- Fixed carbon (dry basis) : 52.50%
- Sulphur contest : 0.93%
- Volatile matters (dry basis) : 38.6%
- Moisture contest : 9.70%
- Specific gravity : 1.35%
- Calorific value : 11720 Btu/lb
- Ash (dry basis) : 8.87%

Raw materials and fuel procurement

Limestone and clay are obtained from the site and vicinity.

Limstone and clay are extracted from Thayet-yay-taung mountain (extraction site no.2) in the east. The area for extraction of clay is 2.5 acres. (shown below).

Laterite is procured fro Phin Oo Lwin (Inya) and Aung Bann, 32 km away. Gypsum is procuredis from Mauk Mai, 96 km away; coal is procured from Kalaywa, 456 km away.

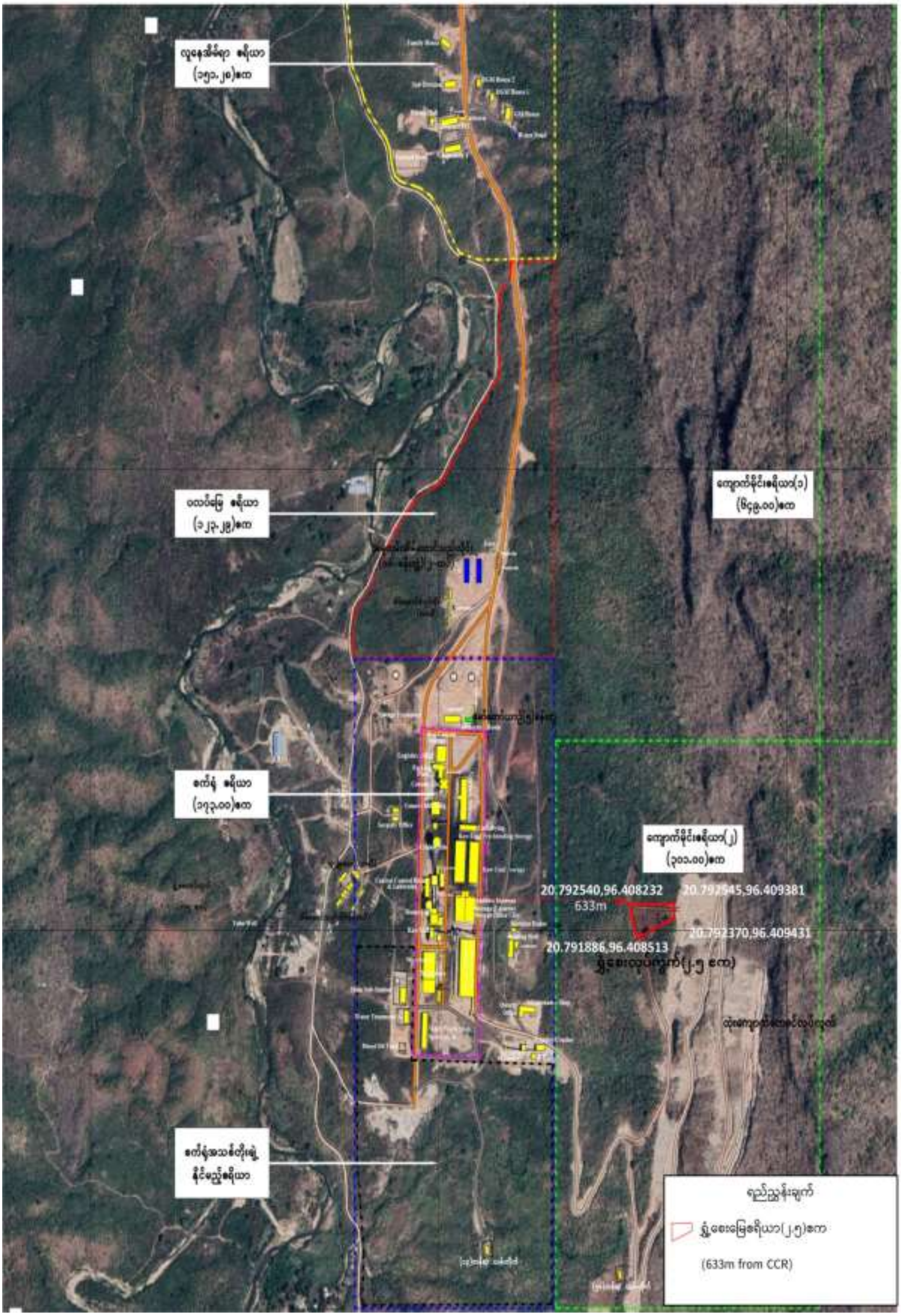


Figure – 39: Satellite image project site and clay site

Fuel and explosives requirement (annual)

<u>Coal</u>		
(KKca/kg>4000including moisture and other losses)	96,000	tons –144000 t
<u>Diesel</u>	300,000	gallons
<u>Petroleum</u>	6000	gallons
Engine oil, hydraulic oil etc	30,000	gallons

<u>Explosives</u>

(Accessories include cordex, detonators, and safety fuses etc)

For production 700000ton limestone×0.125kg per ton of lime = 87.5ton (60mm)

For development 80000ton×0.125 kg per ton =10tons (32mm)

Detonating cord 109000 meter (87500+21500)

Safety fuse 3500meter

No.8 Plain Detonator 1750 Nos

Properties of diesel: specific gravity 0.88; sulfur content 0.05% (wt); ash content 0.2%; calorific value – 44.8 mj/kg (from secondary information; interest)

Storage – Coal is stored in two warehouses (cap 100,000 ton each).

– Clay and laterite are stored in separate warehouse each with a capacity of 10500 tons

Gypsum is stored in a warehouse of 5800 tons capacity

Limestone – raw is stockpiled in open ground

– crushed and preblending is stored in warehouse 17000 tons capacity

Fuels – diesel and petrol are separately store in tanks in oil depot.

Capacity of diesel tanks 3,100 gallons.

Capacity of petrol tank 3,100 gallons.

To prevent spread of spill the area is bundled; spills are immediately removed. Warning sign for fuel depot is installed. Fire extinguishing equipment are kept and workers are trained for safety storage, handling, and uses of fuel oil.

Figure – 40: Fuel depots

Chemical requirement

Only small quantity is required for use in the quality control laboratory. None of them are toxic and hazardous and kept in different kind of bottles in the laboratory; no storage for bulky chemicals. All the chemicals are used for testing the quality of the product only. The list of chemicals is as follows:

<u>Quality Control Department</u>

<u>Chemical Materials List</u>

No	Item	Remarks
1	Ethylene Glycol 99% 25	
2	Methyl Cellulose	
3	Stearic Acid	
4	Sodium Acetate Trihydrate	
5	Sodium Hydroxide	
6	Potassium Hydroxide	
7	Triethanolamine	
8	Disodium Hydrogen Phosphate	
9	Magnesium Oxide	
10	Ethanol 99%	
11	Ethanol 95%	
12	Ethylenediamine Tetraacetic Acid Disodium Salt (EDTA)	
13	Calcium Carbonate	
14	White Vaselin	
15	Potassium Hydrogen Phthalate	

16	Soda Lime	
17	Methyl Cellulose	
18	Acetic Acid	
19	Potassium Chloride	
20	Copper (II) Sulfate Pentahydrate	
21	Sodium Carbonate Anhydrous	
22	Ammonium Chloride	
23	Ammonium Solution	
24	Potassium Fluoride Dihydrate	
25	Ammonium Nitrate	
26	Barium Chloride Dihydrate	
27	Hydrogen Peroxide	
28	Hydrofluoric Acid	
29	Hydrochloric Acid	
30	Phosphoric Acid	
31	Benzoic Acid	
32	Stearic Acid	
33	Oxalic Acid	
34	Glycerol	
35	Silica Gel	
36	Bismuth Nitrate Pentahydrate	
37	Potassium Permanganate	
38	Potassium Pyrosulfate	
39	Sodium Sulfosalicylate Dihydrate	
40	Sulphuric Acid	
41	Phenolphthalein	
42	Bromocresol Green	
43	Bromophenol Blue	
44	Methyl Red	
45	Damao Reagent	
46	L-Ascorbic Acid	
47	Diphenylamine Sulfonic Acid	
48	Mandelic Acid	
49	Calcein	
50	Potassium Sodium Tartrate Tetrahydrate	
51	Magnesium Oxide Bag	
52	Triethylamine	
53	Nitric Acid	
54	Solid Olefin	

The company had applied for a permit for the uses and storage of the above-mentioned chemicals. The permit was granted on 16-2-2018 by the Home Affairs Ministry of the Government of the Union of Myanmar. Virtually all chemical are used for raw water treatment before use (purification) and used water/sewage water treatment before discharged; and also for laboratory uses only.

The manufacturing of Port Land cement (pyro processing method) does not need any chemicals at all.

The chemical are kept on shelves in a separate store near the job. All chemicals are imported and labeled, with pictogram indicating mild acids and corrosive one.

After each testing (mostly titrates) the waste water containing chemicals are drained into the sink and washed. Used containers (bottles) are incinerated regularly.

Figure – 41: Building with CCR room, the laboratory and clinic

Figure – 42: Inside the laboratory

c) **Water and electricity sources**

Annual water requirement is 60000000 gallons; 180,000 gallons/day. Among them, domestic water requirement is 150000 gallons and make up water for cooling is 30000 gallons. No need for industrial uses.

Water is sourced from the nearby Myit Thar stream and collected in the four collector well beside the stream furnished with submersible pumps. The collected water is pumped into the water tank of capacity 70000 gallons and then pumped to water treatment plant where 4 water tanks of one 100m3, one 500 m3 and two 250 m3 capacity. All the tanks mentioned above are simple concrete tanks.

First purification of water is done by mean of sand filtration, iron removal and chlorine treatment. The water from the two 250 m3 tank is for the factory cooling use while the remaining 2 tanks are for domestic and firefighting uses. Cooling water is 100% recycled to the treatment plant where it is cooled down by cooling tower and ant scaling chemical treated. Make up water is added if necessary.

Water flow rate of Myit Thar stream gallon/hour is shown in the ANNEX. The daily water consumption gallons/day is also shown. It is estimated as about 1% of stream flow is used by the factory.

Waste water from domestic uses passes through waste water treatment plant where together with plant drain water aeration is applied and finally discharged into a ravine, not directly into the rivulet. There is no plan for sourcing ground water. The depth of ground water level is 170 feet. But water from nearby spring is transported to 50000 gallons and 100000 gallons tanks to supply residential area (Refer to flow diagram of water treatment and supply system). The stream flow rate and daily consumption of water are shown in ANNEX.

Figure – 43: Water sourced from Myit Thar stream bed

Figure – 44: Part of ground tank and pump house

Commitment

The company has made a commitment that ground water will not be sourced, and that only surface water from the stream and spring will be sourced. Water from the stream and spring are adequate.

U Kyaw Soe Win

Director

Electricity

Electricity was sourced from the Main substation at Ye Paung Sone village 4 miles away from the plant. At main substation 60 MVA transformer step down 132 KV to 33 KV and line connected to plant site transformer where 33KV step down to 6.6 KV. There are 4 emergency generators of 500 KVA, 110 KVA, 66 KVA, 30 KVA capacities for use in case of power outage. Electric Power annual requirement is estimated at 75000000 kWh.

Large amount of electricity has to be used in various processes, grinding of raw materials and finished products.

For conservation of electricity the company has considered for the use of solar panel where feasible. At the moment the two magazines have been provided with solar energy for lighting at night at the lamp posts for security reason. A solar panel company was hired for the feasible installation of solar panel at certain places eg. the office and residential quarters at night time lighting only. As the factory has adequate electricity form the national gridline electricity is not an issue.

Figure – 45: Substation

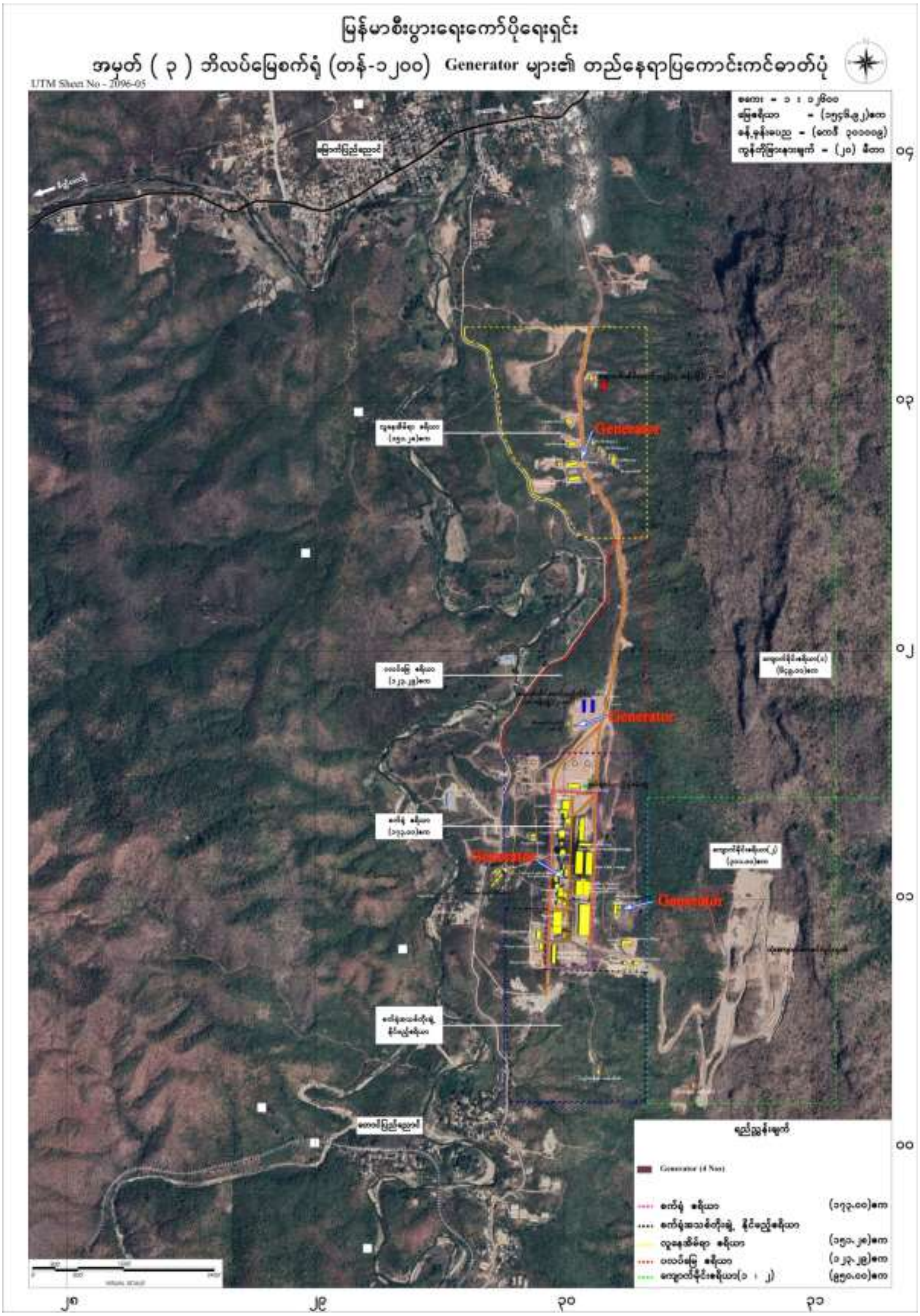


Figure – 46: Satellite image showing project site and spots where generators are installed

4.4.5 Wastes generated (solid, liquid, gases)

At the factory (industrial waste)

Industrial wastes in the form of cements/clinker dust, ash, slag, and point source emission from the kiln and especially from the stack.

The solid wastes in the form of ash, slag and cement dust are relatively small in quantity as almost hundred percent of the raw materials (limestone, clay, laterite) are physically and chemically transformed into clinker in the pyro process that involves intense heat leaving little residues. The main flue gas emitted is CO_2.

Very small amount of waste water is generated as 100% of the water is recirculated by cooling tower. Little water is need in "dry process".

At the office and staff quarter (domestic waste)

Small quantity of office waste and substantial quantity of domestic waste (solid and liquid) are generated.

The generations of waste, emission and disturbance (especially noise and vibration) are described in technical detail in **Chapter-6** on Impacts and Risk Assessment and Mitigation measures.

4.4.6 Measure to control emissions and disturbance (in brief)

The devices deployed by the company for controlling emission of dust, ash, particulates matters are filter bags (44 nos) and electrostatic precipitator (ESP) 1 no., all of them can reduce the exit gas dust content < 50 mg/NM3.Dust content of kiln stack gas is considerably reduced by applying filter bag house at raw mill outlet. Theoretically 95-99% of dust (PM) can be retained when ESP, with service of tilter bags are applied in combination.

But in this factory context the results are not always satisfactory yet. During the period of one year (20-11-2017 to 2-10-2018) PM_{10}, $PM_{2.5}$ were tested 7 times. (See ANNEX).

PM_{10} were within guideline values in 5 testing but higher in 2 testing. $PM_{2.5}$ was within guideline value in 2 testing but higher in 3 testing.

The whole parameters (PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO, CO_3, VOC, CO_2, NO, HC, CH_4) were within the guideline values. (See ANNEX).

Kiln stack emissions on the whole were generally within the guideline values. (See ANNEX).

The company is trying its best to reduce emission in compliance with NEQEG guideline. (ESP has to be cleaned and bag filters have to be changed regularly).

(CO_2 cannot be pragmatically controlled in a cement factory). No toxic and/or hazardous substances are generated in the manufacturing of cement.

Figure – 47: Bag filter unit

Figure – 48: ESP unit

Table-1: List of filter bags and one ESP including their capacities and installation areas

Sr.	Location	Item No.	Equipment List			Speed (m/min)	Dust content of air inlet and outlet per Nm^3		Motor (KW)	Area
			Type	Volume (m^3/h)	Filtering Area (m^2)					
1	Limestone Crushing & Conveying	1007	LMC64-6	22300	320	1	<200gm	<50mg	2.2	Limestone Crusher
2		1009	LQM64-5	17800	256	1	<200gm	<50mg	2.2	
3		1011	LQM32-4	6700	128	1.2	<30gm	<50mg	2.2	
4	Limestone Pre-blending & Conveying	1107	LQM32-4	6700	128	1.2	<30gm	<30mg	1.1	Preblending Storage
5		1109	LQM32-4	6700	128	1.2	<30gm	<30mg	1.1	
6	Combined Storage Shed	1306	LQM32-4	6700	128	1.2	<30gm	<30mg	1.1	Clay & Laterite Storage
7		1308	LQM32-4	6700	128	1.2	<30gm	<30mg	1.1	
8		1903	LQM32-4	6700	128	1.2	<200gm	<30mg	1.1	
9	Raw materials Proportioning & Conveying	1905	LQM32-4	6700	128	1.2	<200gm	<30mg	1.1	Clay & Laterite Storage area
10		1919	LQM32-5	8900	124	1.2	<200gm	<30mg	1.1	
11		1921	LQM32-6	8900	124	1.2	<200gm	<30mg	1.1	
12	Raw materials Grinding & Kiln Mill Dust Handling	2205		360000	7868		<100gm	<50mg	1.5	Raw Mill
13		2211	DMC-96	5180	72					
14	Raw Meal Silo	2326	LQM32-5	8928	124	1.2			1.1	Raw Meal Silo
15		2334	LQM32-5	8928	124	1.2			1.1	
16	Clinker Cooling & Exhaust Gas Treatment (EP)	2614	HSDC88	200000	87.6	0.7	<30gm	<50mg	0.37	Electrostatic Precipitator
17	Raw Coal Drying & Conveying	1612	APPC(M)-128 -8X2	144000	2400	1m/s	<100gm	<30mg	5.5	Coal Storage and Coal Dryer area
18	Raw Coal Drying & Conveying	1619	LQM32-5	7680	160	1.2				
19	Raw Coal Drying & Conveying	1621	PPC32-5	11520	160	1.2				

20	Coal Pre-blending & Conveying	1707	DMC80	3600~4800	60	1.2	<200gm	<50mg	1	
21	Coal Grinding System (Explosion Protection)	2709	APPC(M)-128-8X2	72000	1200	1	<1000gm	30mg	2.2	Coal Mill area
22		2722	LQM32-4M	6912	128	1.2	<60gm	<50mg		
23	Clinker transport & Storage	2818	LQM32-6	11520						Clinker Silo
24		2820	LQM32-6	11520						
25		2824	LQM64-5	17850						
26		2829	DMC-112	6500~6800	81	1.5	<200gm	<50mg	7.5	Coal Dryer
27		2830	DMC-112		81	1.5	<20gm	<50mg	7.5	
28	Gypsum Admixture Storage Shed	3103	LQM32-3	4600	96	1.2			1.1	Gypsum
29		3106	MC-80	4500	60	1.25			5.5	
30	Cement Mill	3405	LMC96-5	34560	480	1.2			5.5	
31		3407	LMC96-5	34560	480	1.2			5.5	
32	Cement Silo	3509	LQM32-6	11160	155	0.55			1.1	
33		3507	LQM32-6	11160	155	0.55			1.1	
34		3546	DMC-80	4500	60	1.4			0.4	
35	Proporationing Station & Conveying For Cement Grinding	3303	DMC-96	5200	72	1.25			7.5	Proporationing Silo
36		3311	LQM32-4	6900	128	1.2			1.1	
37		3313	LQM32-4	6900	128	1.2			1.1	
38	Cement Packing	3629	LMC96-4	23040	384	1			1.1	
39		3630	LMC96-4	23040	384	1			1.1	
40		3638	LQM32-4	6900	128	1.2			1.1	
41		3639	LQM32-4	6900	128	1.2			1.1	
42		3642	DMC-80	4500		1.5			5.5	
43		3643	DMC-80	4500		1.5			5.5	
44		3538	DMC-80	4500		1.4			1.1	
45		3536	DMC-80	4500		1.4			1.1	

4.4.7 Decommissioning/Mine closure and rehabilitation in brief

Because this will happen 25 plus years or so from now it is addressed very briefly.

(a) At the factory

The factory will be isolated and shut down. A decommissioning contractor and party will be hired to do the job. Buildings and structures will be brought down or demolished. Machinery and equipment will be dismantled.

Materials that are useable or saleable will be reused or put up for sale. Those that are obsolete will be systematically disposed of at the approved landfill. Old machinery/equipment will be sent to smelting mill as iron scraps.

The contractor and party will do all the tidying jobs for the compound.

Contaminated soil and polluted water, if any, will be disposed. Soil inside the compound and water (stream) in the vicinity will be tested with the aid of hired technicians. If soil is contaminated, probably with fuel oil, it will be removed and disposed off at an approved land fill. There is no likelihood for water contamination but water will be tested for the last time.

(b) Mine closure at quarry sites

All mining activities will be stopped. Management of overburden: Overburden and top soil are managed since the start of Operation Phase. Overburden and top soil are stockpiled separately. The management of overburden and top soil is mentioned in relative detail in **Chapter-6**.

The overburden will be managed so that there will be none remain after mine closure.

Retaining wall/bund

To prevent the sliding or erosion of overburden and top soil, especially during the rainy season, retaining wall is built around or on one side of the overburden and top soil. The retaining wall is furnished with weep hole for water drainage. The retaining wall is mentioned in **Chapter-6 and 8**.

During the Mine Closure Phase all or most of the retaining walls will be demolished and removed, since virtually no overburden will remain after the back filling works.

Management of pits, dents and depressions

Ugly pits, dents, voids and depressions will remain resulting from mining activities. All pits, dents and depressions will be backfilled, first with overburden and then back filled with top soil on top. This is done inorder to facilitate revegetation.

The ground is then leveled with a dozer. Soil compacted or soil profile destroyed by repetitive movements of heavy machinery or vehicles will be restored to its original condition as practical as possible.

Backfilling is mentioned in **Chapter-6.**

Management of contaminated soil and water

Due to accidental fuel oil spills the soil in the mining site can be contaminated (no other chemicals used). Technicians will be hired for testing of soil for the last time. Soil contaminated with fuel oil or other hydrocarbons will be removed and disposed at an approved landfill.

Although there is no chance of contamination of water hired technicians will perform the last water quality test during the Mine Closure Phase. (There is a stream in the vicinity.)

Revegetation/rehabilitation

The main task is replanting or revegetating the old site. First a nursery will be developed during the last period of the Operation Phase (one or two years before mine closure).

A variety of locally grown indigenous species of trees that are hardy and fast growing will be further selected for the nursery. For ecological point of view valuable trees such as teak, iron wood etc. should not be used since they cannot contribute to the restoration of the biodiversity of the area. Therefore, a great variety of plant species, regardless of their values, will be selected for rehabilitation work.

The main rehabilitation/replanting work includes: planting of tree saplings (from the prepared nursery); watering, tending, weeding of young plants; and regular application of fertilizers. Rehabilitation work will take up to 2 years.

The main objective is to restore the biodiversity and the natural landscape to its original condition as far as possible. Five percent of the budget (Ks 3,966,500,000) will be set aside for decommissioning, mine closure and rehabilitation works. Decommissioning and mine closure will take 6 months to complete while rehabilitation/restoration of the ecology will take at least 1½ years.

Out of 950 acre of limestone quarry, 735 acre is forest area and HCI has to make compensatory plantation in 20% of forest area (147 acre) within first five years.

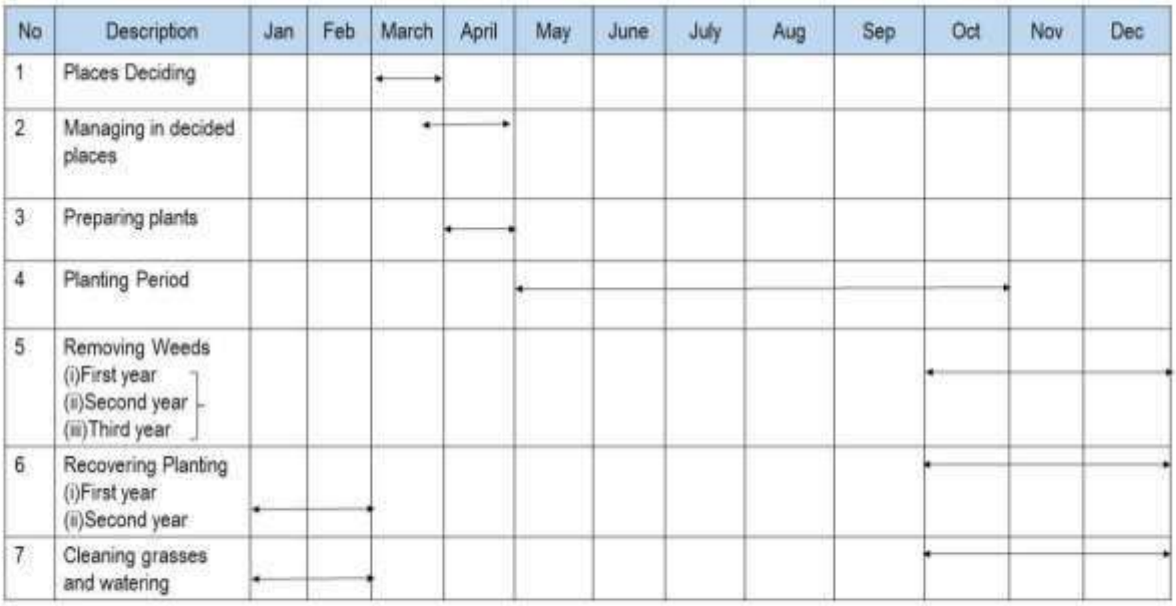


Figure – 49: Plan for compensatory planting of trees for 2017 (already implemented)

Figure – 50: Satellite image showing location of planting 2017 (North side and behind briefing hall)

Figure – 51: Satellite image showing location of planting 2017 (Behind chummeries and near the batching pla

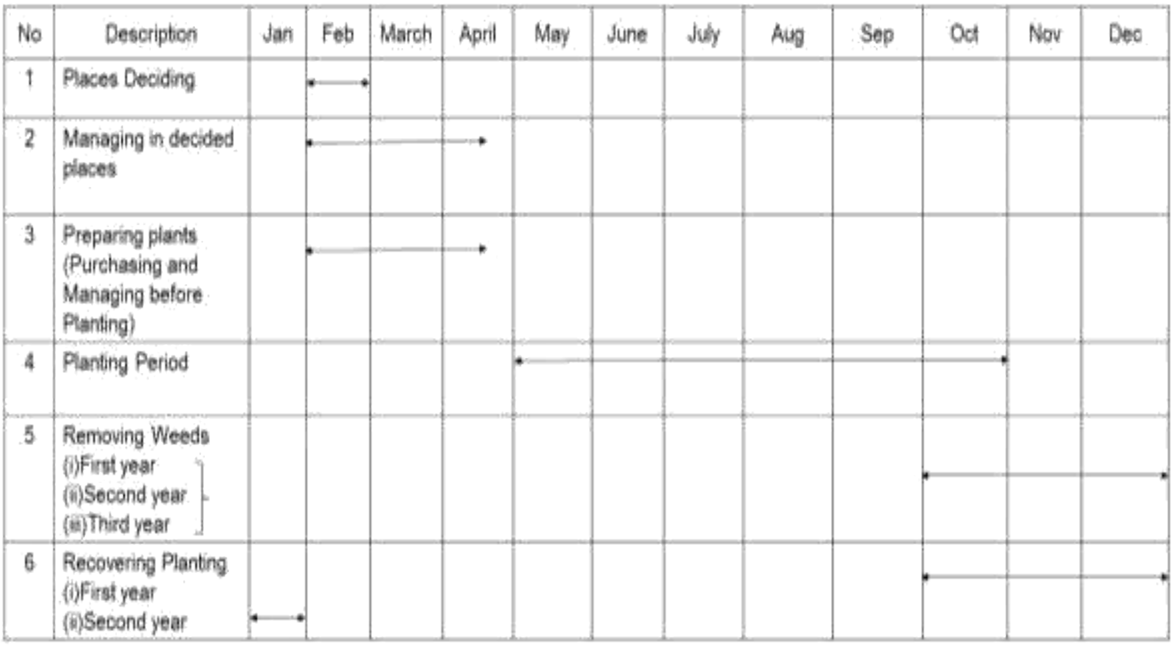


Figure – 52: Plan for compensatory planting of trees for 2018

Figure – 53: Satellite image showing location of planting 2018 (Left side of YCDC Street (behind the chummery)

4.5 Description of the selected alternative

Sometimes it is necessary to have Plan A and Plan B (alternative plan) for the implementation of a proposed project. This can ensure the project to progress smoothly and successfully even if a change in plan has to be undertaken. The alternative plan can be in form of alternative site for the project or alternative method or technology for the operation of the project and so on.

In the case of selection of project site if the original Plan A site is not appropriate the Plan B should be duly selected. For instance if Plan A site has the following issues:

i) It is inside a protected area or wildlife sanctuary or bird sanctuary

ii) It is too close to big lake or reservoir that serves as water drinking source for a city

iii) It is inside or too close to historical cultural and religious monuments or sites including archaeological ones

iv) It is inside or too close to agricultural land or animal farms

v) It is prone to natural disasters – floods, violent storm, land slide etc. and

vi) The issue of land disputes or land grabbing.

All these above-mentioned issues, particularly the last one, can provokes loud public outcry or mass protest and can eventually leads to political instability of the region, if not the whole country. In such a case there is no other choice but to discard Plan A and select Plan B for the long term benefit of the project. In this context we see no necessary alternative or better alternative for switching from Plan A to Plan B. The factory is now in the Operation Phase. There was/is no public outcry or mass protest and it seems the factory is in a certain degree of harmony with the local community.

In the case of alternate method or technology Highland Cement factory is now already applying dry process. The advantages of dry process will not be only in quantity but also in quality; and the dry process technology also considerably economize the cost of the operation given the fact this process requires less fuel and less electricity, following the basic principle of sustainably sound production of cement.

As regards demand alternative the company shall use electricity energy more efficiently rather than building more alternative generating capacity. The company shall also apply solar panels for domestic uses such as for offices, living quarters and guest houses, if possible.

Regarding input or supply alternative the company shall consider the harvesting and use of rainwater as far as possible for the conservation of water resource in the future. Rain water could be used for watering plants, suppressing dust, washing machinery and vehicles and other domestic uses.

This last option (alternative) is the "no go alternative" or "no project alternative". This last option (alternative) would mean no more development in the infrastructure of the country. The abundant natural resources (limestone) will remain unexploited and unused, while the infrastructure of the country e.g. roads, bridges, buildings and structures, will remain undeveloped. Or more cement will have to be imported from abroad and will have impact on the hard earned foreign exchange currency. The area will remain an unproductive degraded reserved forest area. None of the benefit generated from the limestone resources will be realized by the nation which still remains an LDC (Least Developed Country). This will have a significant impact on the infrastructure of the country and subsequently curtail the long term socio-economic development of the country.

As regards activities alternative employees shall be encouraged to use bicycles or walk to the work place to reduce overall fuel uses and to reduce carbon emission. They shall be educated and trained to "work smarter" rather than "work harder".

The company shall be prepared for any better alternative in the near future. As new technologies are emerging quite rapidly nowadays the company should be ready to adopt any state-of-the-art technology or any better alternative. This could also involve a change or an alternative in the design in structure and organization of the factory.

4.6 Comparison and selection of the preferred alternative

(a) **Project site alternative or location alternative** is out of the question. The area is ideal landscape for extraction of limestone, laterite and clay for the production of cement.

The company has been operating the factory since 2017 and the project is progressing well. It is now producing 1500 tons of Portland cement per day.

(b) **The "no go alternative" or "no project alternative"** is also out of context, since the project is progressing well.

(c) **As regards "technology alternative"** the company prefers the "dry process technology" to "wet process technology" because the former has many advantages. They are:

- The dry process needs little or no water
- The process is shorter and reduce time of process and reduce cost (cost of production is much lower than the wet process).
- The dry process is much more thermally efficient than the wet process and reduce power consumption by 20-30%
- The size of kiln needed is smaller.

- The need for fuel (coal) is lower (dry process needs 100kg of coal to produce 1 ton of cement while wet process need 350kg).
- Carbon dioxide emission is lower; 0.72 ton CO_2 /ton cement (in wet process it is 0.97 or more).
- Dry process technology is more modern and popular in the manufacturing of Portland cement. (However for manufacturing of special quality cement other than Portland cement wet process is still practiced in some cement factories in U.S.A

5. DESCRIPTION OF THE SURROUNDING ENVIRONMENT

As mentioned earlier the project site is half mile north east of Taung (South) Pyi Nyaung village and 2 miles south of Myauk (North) Pyi Nyaung village and is 44 miles east of Tharzi Town.

The total area of the project site is 1308.91 acres comprising 173 acres for the factory, 181 acres for the residential (employees) area, 649 acres for Nyaung-bin-taung mining/quarry site and 301 acres for Thayet-yay Taung mining/quarry site; and also an additional 4.91 acres for the base camp in the west.

Part of Nyaung bin Taung quarry site is within the Pyinyaung Reserved Forest Area. The project area encompasses a limestone mountain that runs generally from north to south. The factory compound is at the foothill of the western side of the mountain range. West of the factory compound is the Myit Thar Rivulet which generally flows from south to north. Half mile way in the south is Max Myanmar Cement factory.

5.1 Setting the study limits

The EIA study covered the whole project area of 1308.91 acres comprising, the factory premise, worker housing area (residential) and two mining sites and the near vicinity within a three miles radius including Taung (South) Pyi Nyaung village area and part of Myit Thar rivulet. North Pyi Nyaung, Oak-Kyinn and Mong-pin villages are later also incorporated in the EIA survey as they are within the 3 miles radius zone for socio-economic zone.
Biodiversity studies were carried out within the inner 2 miles radius, covering factory zone, housing zone and 2 mining site.

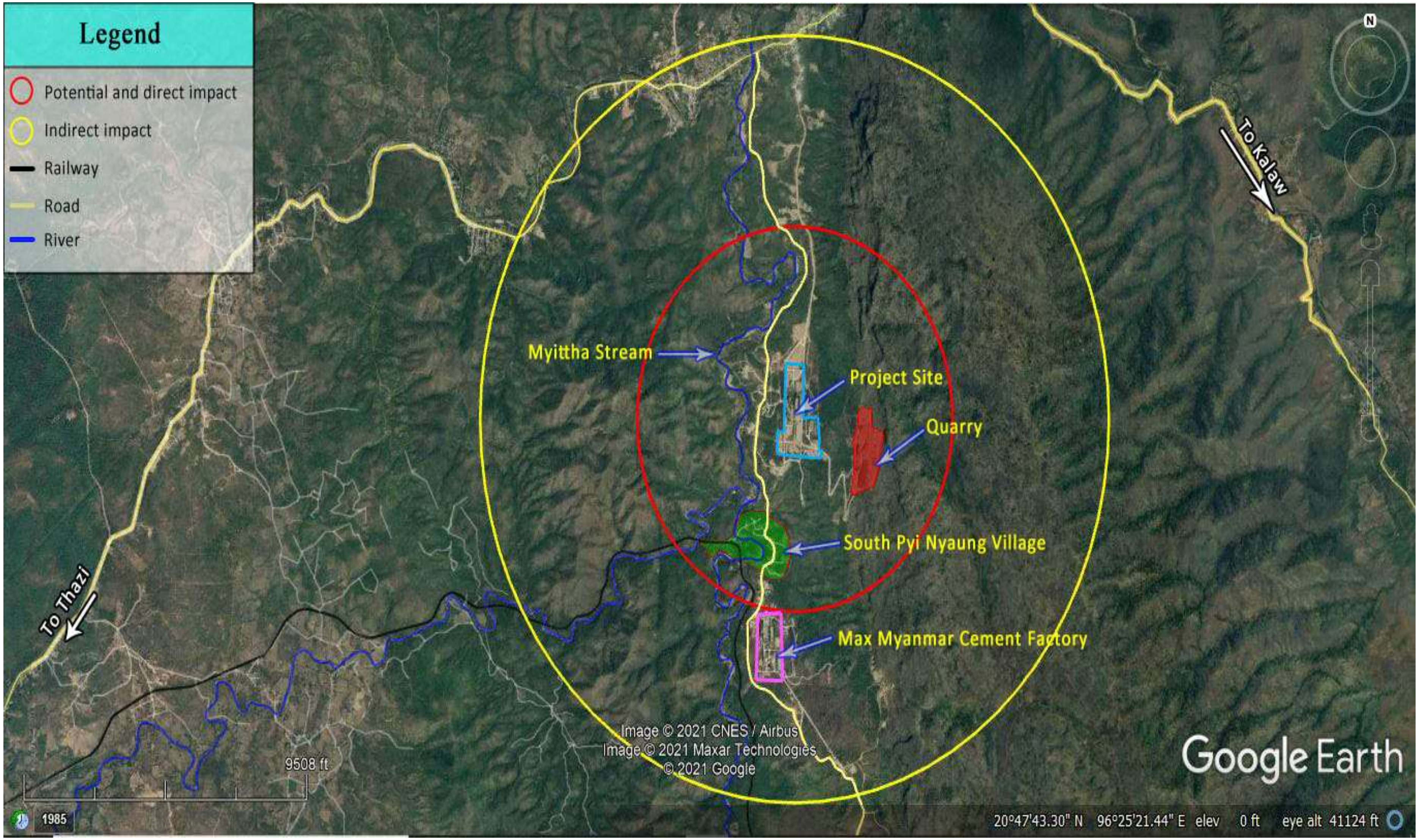


Figure – 54: Google satellite image showing project site and two miles radius area

5.2 Methodology and objectives

EIA works involve the visual inspection of the site and its environs, the surveying work and photography and the collection and documentation of baseline environmental and social data.

In short, the methodology comprises desktop survey, field study, consultation meeting and the gathering of information and data and report writing.

Desktop survey involves the reviewing of all available data, reports and literature, if any.

The physical parameters such as air quality, noise and vibration and water quality etc. are all primary data collected through the survey (water analysis has to be undertaken in Yangon).

The data on biodiversity are also primary data identified by EIA practitioners.

The socio-economic data includes both primary data, collected through visual inspection, and secondary data acquired through Key Informant Interview (KII) or from other Secondary Sources (SS).

The data on cultural and visual components are mostly primary ones gathered through observation and inspection (Some are secondary data/information gathered from interviews).

For measurement of ambient air quality/emission: Respiratory Dust Sampler, Environ-tech APM-460 NC; EPAS Air sampler; EPAS Haz Scanner are used. For noise: EXTECH Sound Level Meter are used. The water samples collected are brought back to Yangon and analysis is made at a registered laboratory, ISO, TECH Laboratory, at Insein.

Geological data are secondary information from the findings of the company's geologists in previous study.

Meteorological data (rainfall, temperature, humidity, wind speed) are all secondary data from the Meteorology unit of Tharzi Township Agriculture Department.

The tools and instruments for EIA study includes computer, GPS, Camera, telescope/binocular, hand lens, compass among others and all paraphernalia for botanical study and zoological study.

Google Earth Satellite image is also applied for the overview of the site and its environs.

Objectives

The main objective is the collection, recording and documentation of all the baseline and secondary data on the physical, biological, socio-economic, cultural and visual components of the area for the preparation of EIA report.

5.3 Public Administration and planning

At the moment there is no known industrial development plan for the area from the Union level, State level and Township level. There is also no known rural development, urban development and agricultural development plan for the area at the Union level, State level and Township level.

So far, there is no known plan for socio-economic development for either South Pyi Nyaung or North Pyi Nyaung Village. There is yet, no such plan for future agricultural development or industrial development for this area. There is yet, no such plan at the Union Government level, Mandalay Region level and at Tharzi Township level.

There may be certain rural development plan, (general socio-economic aspects) implemented by NGO or INGO in the area but the EIA team does not have yet any information about this.

There are also no other new project existing in this area.

In addition to Max Myanmar Cement factory, half mile away in the south there is also another factory the Apache Cement Plant, about 6 miles in the north.

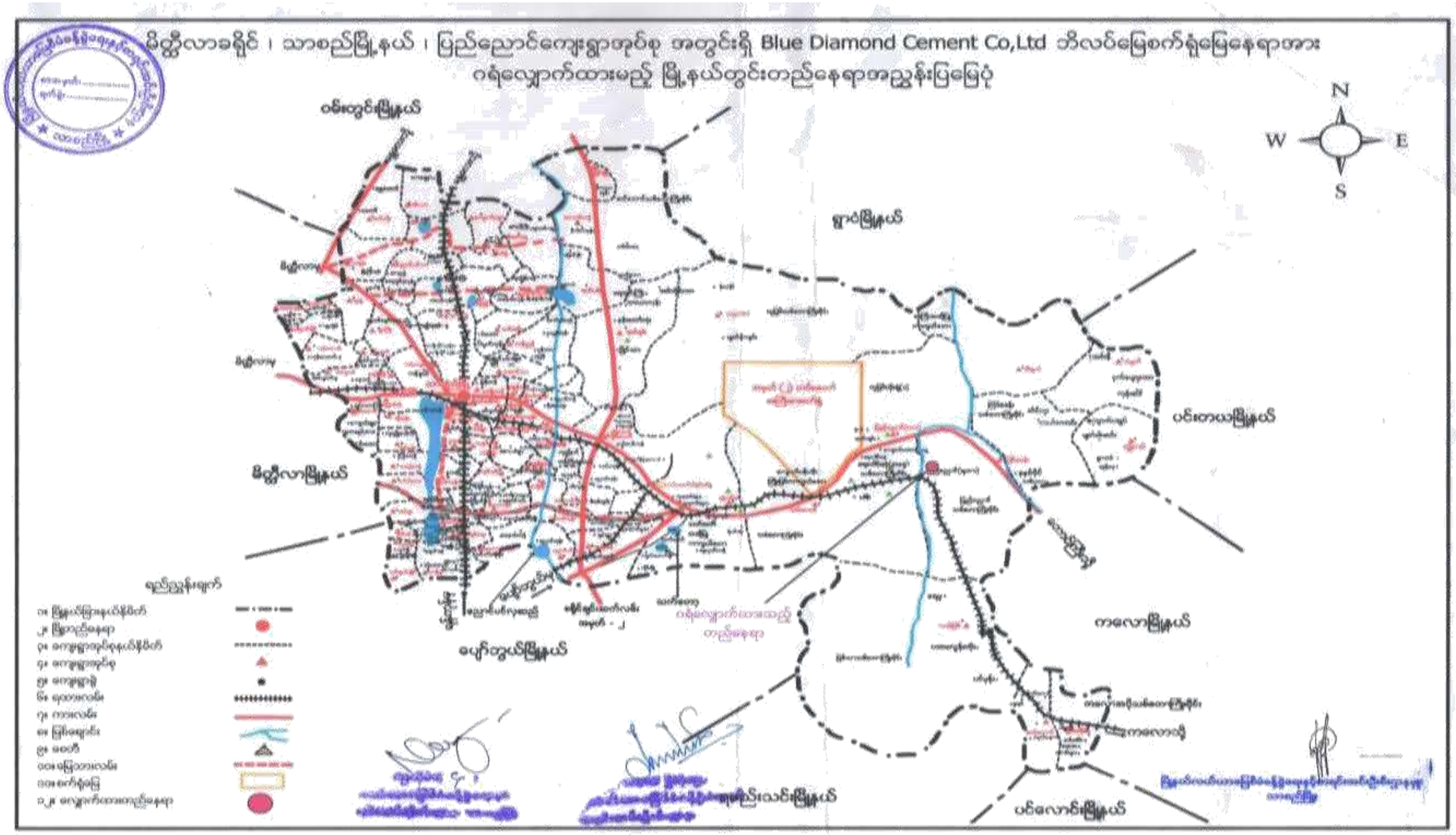


Figure – 55: Map of Tharzi Township

5.4 Legally protected area

Part of the Nyaung Bin Taung and Thayetyay Taung quarry sites in the east are within the Reserved Forest Area of Pyi Nyaung.

The forest is secondary forest, partially degraded but on the whole still in relatively good condition. Due to variation in elevation the forest is something like a mixture of mixed deciduous forest and ever green forest.

Up to the mid-nineteen sixties there were licensed loggers and timber traders. Illegal logging has become widespread during the Socialist Lanzin era. Even today there remains a few die-hard illegal loggers prowling in the forest and doing clandestine logging on the very few remaining big trees.

There are no parks or national parks, wildlife sanctuaries, scientific reserves, nature reserves, protected geological area or historically significant area in the vicinity.

5.5 Physical component of the surrounding environment

5.5.1 Topography

The area has karst topography, that is, an area of limestone formation characterized by small sinks, small ravines and underground streams terminated as springs.

The area is a rugged area with high limestone mountains and valleys. The Pyi Nyaung mountain range runs in a north to South direction. The mountains have relatively steep to very steep slopes.

The project is on the western side and foot hill of the mountain while the two quarrying sites are on the higher ground of the slope. The quarrying sites, Nyaung Bin Taung and Thayet-yay Taung are actually parts of the mountain range. West of the project site is the valley and the Myit Thar rivulet which flows generally from South to North.

The highest peak of the range is 2950 feet (899 m) above sea level while the average height is 2700 feet (823 m) asl. The slope at the foothill where the factory and residential area are situated is gradual. There are small gullies that transverse the slope with ephemeral streamlets or springs.

The elevation at the site is 341 masl while at the stream bed is 325 masl.

Figure – 56: Panoramic view of the area

5.5.2 Water resources

The main water course of the area is the Myit Thar rivulet (stream) which flows generally from south to north. Due to legal and illegal gold mininings taking places upstream the water is turbid for most time of the day and most part of the year.

There are a few small springs (terminal underground streamlets) along the foot hill of the mountain range.

The villagers used to source water from the Myit Thar rivulet, it is learnt. But after the water become turbid due to illegal and legal gold panning taking places upstream they dug small shallow water pools beside the rivulet for sourcing water. Many use rain water for drinking during the wet season.

Figure – 57: Myit Thar Stream (rivulet)

5.5.3 Geology and soil, hydrology/hydrogeology (secondary data from company's geologists)

Although the area is in the Mandalay Region it is in the south western part of the Shan Plateau. Geologically speaking the rocks of the Shan Plateau are basically composed of meta-sedimentary rocks, Paleozoic and Mesozoic carbonate classics and igneous rocks. This made the plateau to remain as a highland.

The project site is in the northern portion of Loi-an Group and Namyau Group, a long narrow geological formation which runs in a generally north to south direction.

East of this series is the narrow Yinmabin Metatorphics, Maw-chi series. West of Loi-an-Namyan Group is Taunyo Formation and Labyin Group.

Further east is the Plateau Limestone Group, also a narrow formation which runs in a north to south direction (**See Map- Figure - 58**)

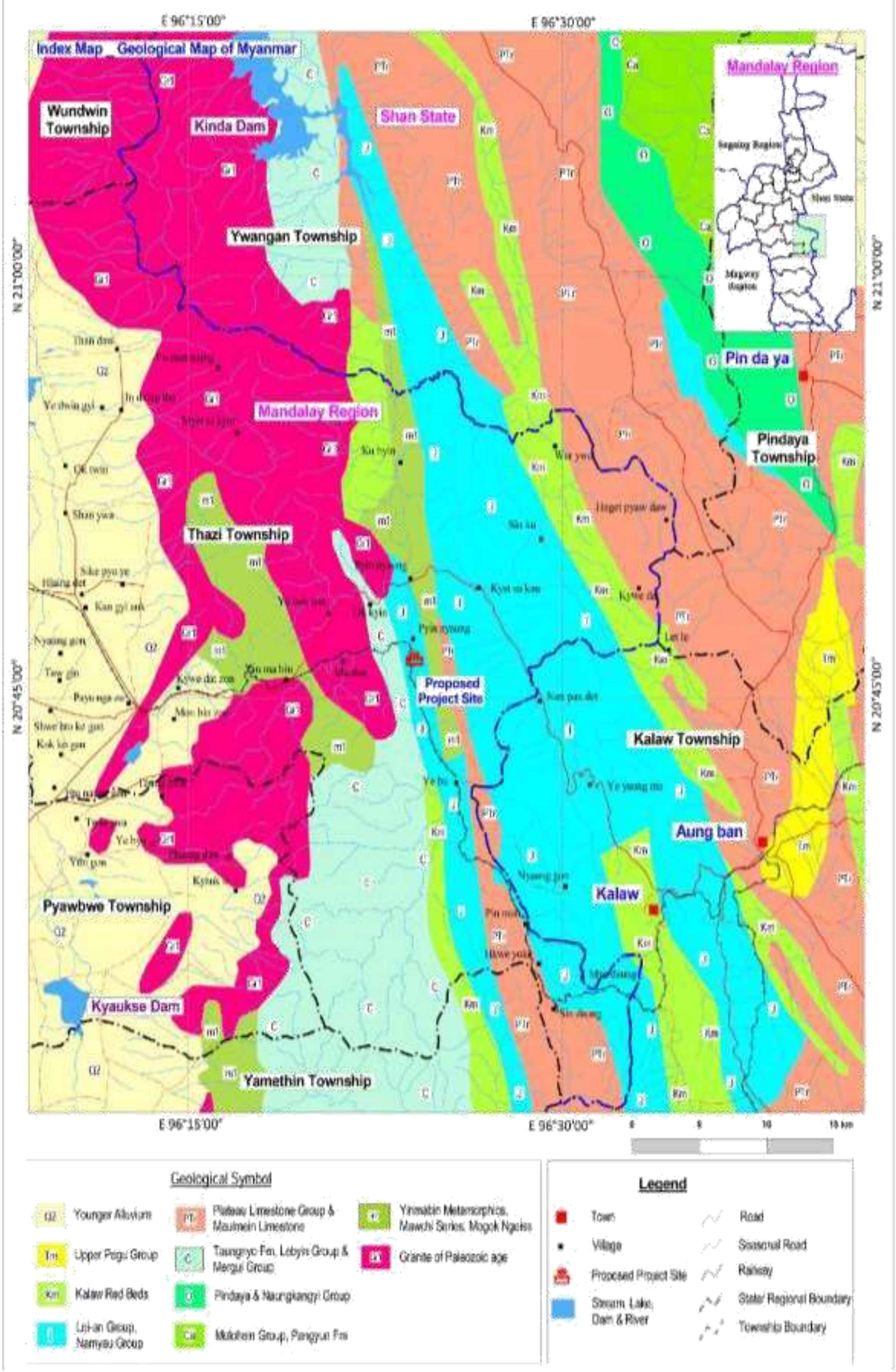


Figure – 58: General Geology of the study area

The formation at the site comprises interbedded sandstone, siltstone, mudstone and local limestone bands. The limestone rock of the area can be categorized into two types, namely calcite limestone (Upper Plateau Limestone) and dolomite limestone (Lower Plateau Limestone). "Plateau" refers to the Shan Plateau while the "upper" and "lower" refer to the layer of limestone.

Limestone is soft, massive or fine grained and occurs in the form of massive beds or extensive stratified formation or thinly bedded. The colours are brownish gray or brown to light gray. The chemical composition essentially consists of $CaCO_3$ up to 90% and mixed frequently with $MgCO_3$ and SiO_3. The geologists from Dagon University estimated that there are 118.5 million tons of limestone in the two quarrying site up to a depth of 60 feet.

Clay, Al_2 SO_4 $2H_2O$ is also present in the area; the colour is reddish brown, and of good quality as raw materials for the production of cement.

Soils

The soil of the area is Red Brown Forest Soil. This soil can be categorized into Dark Red Brown Forest Soil, Podzolied Red Brown Forest Soil and Lateritic Red Brown Forest Soil. These are typical soils of tropical evergreen forest of Myanmar. They usually occur on the well-drained hill slopes at the elevation from 1000 to 4000 feet above sea level.

The soils are well-structured and have a good grainage from 5.5 to 6.5, and usually have medium to heavy texture. The soils contain moderate quantity of humus and nutrients and such an area can be regarded as forest land of good productivity. Particularly, the soils at the lower elevation and foot hill are suitable for garden plantation but not so suitable for crops and cereals due to unfavorable soil conditions for crops.

Note: The company has so far did not carried out soil testing yet. Soil testing is essential. The company will conduct soil testing: later and incoporate the results of soil testing later in all regular semi-annual monitoring reports which will include air quality, noise level, water qualities and soil quality.

Hydrology/Hydrogeology

The Myit Thar stream is a fast flowing mountain stream where the depth of the water is generally about one foot. The gradient of the stream bed (from upstream to downstream) is relatively high resulting into fast flowing water. According to information from the villagers there was no precedent of flooding during the rainy season. And there is no plain in the vicinity to be flooded during wet season.

As mentioned earlier the water of the stream is turbid for most time of the day and most part of the year due to legal and illegal gold mining/panning taking places upstream.

There are a few springs at the foot hill (base) of the mountain range and all except one are ephemeral springs. The perennial spring, which is in the south is actually an underground streamlet terminated as a spring. (The water of this spring is also sourced by Max Myanmar Cement Company.)

5.5.4 Environmental quality

Water quality

(a) Surface water

The samples of water from the stream (coordinates: N. Lat. 20° 47' 29.08", E. Long. 96° 23' 52.39") and from the cooling tank (coordinates: N. Lat. 20° 47' 26.97", E. Long. 96° 24' 06.25") are collected and analysed at ISO, TECH Laboratory in Yangon and result is shown in the following Table.

Table-2: Surface water quality at site

Sr. No	Parameters	Existing values at stream	Cooling water tank	Cooling water return	NEQ/WHO guideline values
1	pH	7.5	8.4	8.5	6-9 S.U
2	Colour	Nil	Nil	Nil	15 TCU
3	Turbidity	2	2	2	5 NTU
4	Temperature	25	25	25	-
5	Chloride (as Cl)	6	7	6	250 mg/l
6	Total Hardness ($CaCO_3$)	216	266	268	mg/l
7	Sulphate (SO_4)	280	265	272	500 mg/l
8	Total Solids	280	265	272	50mg/l
9	Phosphate	Nil			2 mg/l
10	Iron	0.25	0.21	0.22	3.5 mg/l
11	Nitrate	Nil	Nil	Nil	50 mg/l

All values are generally lower than the National Environmental Quality (NEQ) guideline values prescribed by ECD.

Later Highland Cement International Co., Ltd has also hired technicians from the registered laboratory, ISO, Tech, Yangon who has under taken a series of water analysis at different spots inside the factory component and in housing area (chummery) at different times (2017 and 2018).

The results are shown in the ANNEX.

(b) Effluent

The effluent water from the factory (coordinate: N. Lat. 20° 47' 48.08"; E. Long. 96° 24' 01.65") is collected and analysed at the said laboratory and the result are shown below.

Table-3: Effluent water at site

Parameter	Existing values		NEQ guideline value
	Waste water (input)	Waste water (output)	
5 day biochemical oxygen demand	20		9 mg/l
Arsenic	Nil		Nil
Chemical oxygen demand	64		32mg/l
Chlorine (total residual)	6		16mg/l
Copper	Nil		Nil
Cyanide (free)	Nil	Nil	0.1 mg/l
Fluoride	0.3	0.1 mg/l	20 mg/l
Iron	0.36	0.18mg/l	3.5 mg/l
Lead	Nil	Nil	0.1 mg/l
pH	8.6	8.2S.U.[a]	6-9 S.U.[a]
Sulphide	52	46mg/l	1 mg/l
Temperature increase	25	25ºC	<3[b] ºC
Total suspended solids	222	260	50 mg/l
Zinc	Nil	Nil	2 mg/l

[c] Standard unit

[d] At the edge of a scientifically established mixing zone which takes into account ambient water quality, receiving water use, potential receptors and accumulative capacity; when the zone is not defined, use 100 meters from the point of discharge.

The values of chloride, sulphide and total suspended solid are higher than the guideline values. The reasons are unknown. All possible causes are considered but no remedy is known now.

Later Highland Cement Co., Ltd has also hired the technicians from the certified laboratory, ISO, TECH, Yangon which has analyzed a series of waste water and industrial water from different sport within the project site at different time (2017, 2018)

Air quality

(a) Ambient air

The ambient air quality at the site (coordinate: N. Lat. 20 47' 31"; E. Long. 96 24' 17") was measured by technicians from the Occupational and Environmental Health Division and the result is shown in the following Table.

Table-4: Ambient air at the site

Parameter	NEQEG Guideline	Time	Plant Site (30.8.18)	Plant Site (2.10.18)	MESC (20.12.17)	OEHD (16.1.18)	OEHD (16.3.18)
pM_{10}	50µg/m^3	24 hr	23.0	33.1	36.5	95.1	252.5
So_2(Sulphure Dioxide)	400µg/m^3	24 hr	120.9	116.8	33.7	32.7	110.9
No_2 (Nitrogen Dioxide)	200µg/m^3	1 hr	52	20.3	55.2	62.2	68.8
Co(Carbon Monoxide)	30000µg/m^3	24 hr	0.1	0.1	66.4	445	527
O_3 (Ozone)	100µg/m^3	8 hr	93.3	49.5	17.2	22.6	23.7
Co_2 (Carbon Dioxide)	-	24 hr	610.9	593	-	-	-
NO(Nitrogen Oxide)	600µg/m^3	24 hr	6.1	7.5	-	-	-
VOC(µg/$m^{3)}$	-	-	-	-	25.2	205	24.1
HC(ppm)	-	-	-	-	447	423	378
CH_4(ppm)	-	-	-	-	5489	5295	4367

MESC – Myanmar Environment Sustainable Conservation consultant

OEHD – Occupational and Environmental Health Division Ministry of Health and Sports

Figure – 59: Air sampler

(b) Noise levels

Noise levels at the factory and at Taung Pyi Nyaung village were tested and the results shown in following **Table-5 and 6**.

Table-5: Noise levels at factory

<table>
<tr><th rowspan="2">Receptor</th><th colspan="2">One hour LAeq (dBA)[a] (NEQEG Guideline value)</th><th>Cement mill</th><th>Coal mill</th><th>Kiln</th><th>Raw mill</th></tr>
<tr><th>Day time 07:00 - 22:00

(10:00 - 22:00 for public holidays)</th><th>Night time 22:00 - 07:00

(22:00 - 10:00 for public holidays)</th><th>20°47'39.94"N, 96°24'10.06"E
Day time</th><th>20°47'34.75"N, 96°24'10.86"E
Day time</th><th>20°47'33.61"N, 96°24'9.91"E
Day time</th><th>20°47'31.18"N, 96°24'9.59"E
Day time</th></tr>
<tr><td>Industrial, commercial</td><td>70</td><td>70</td><td>98.45</td><td>98.69</td><td>95.27</td><td>101.34</td></tr>
</table>

Figure – 60: Nosie level detector

Note - later more noise level are measured by the company at 4 spots. (See also ANNEX sound test).

Note – The noise levels at 4 spots (cement mill, coal mill, kiln and raw mill) are all higher than the guideline value of 70 dBA. But are should remember that the guideline value of 70 dBA is for the industrial or commercial areas as a whole, not inside a noisy factory. In a noisy factory like cement factory there are certain specific spots, with noisy machinery such as cement mill, coal mill, Kiln and raw mill where all machinery are running. The noise levels from these spots will be always higher than the guideline value generally for the whole industrial area. (There are also certain spots inside the factory compound when the noise level is within the guideline value e.g. at office, warehouse, silos area, packing area, canteen, workshop, etc.).

The only plausible ways to mitigate the high noise level are:

- wearing of ear plugs or ear muffs by workers who have to work near the noise machinery for long hours (the company has done this)
- planting of fast growing trees all around the factory compound (the company has done this)

(Theoretically eco-friendly machinery that emit lower noise level can be procured from certain industrialized countries) in the first place; but not practical now since the factory is already in operation).

Figure – 61: Satellite map showing points where noise levels are measured at Taung Pyinyaung

Table-6: Noise levels at Taung Pyinyaung village

Receptor	One hour LAeq (dBA)[a]		Cement mill	Coal mill	Kiln	Raw mill
	Day time 07:00 - 22:00 (10:00 - 22:00 for public holidays)	Night time 22:00 - 07:00 (22:00 - 10:00 for public holidays)	Day time	Day time	Day time	Day time
Residential, institutional, educational	55	45	43.89	50.15	54.11	47.53

Note – Highland Cement International Co., Ltd has first hired the consultant firm, MESC, fort the writing of this EIA report. Not complacent with has the results the company has latter hired technicians from OEHD, ECD, ISO (a private laboratory) and Apache (another cement company) for the further measurement of air, water quality and noise level and stream water flow rate. These were carried out several time and further results are also shown in the ANNEX.

Note – The company has so far did not measure the noise levels along the transportation road for raw materials and final product yet. This will be conducted later and shown in every regular semi-annual monitoring report.

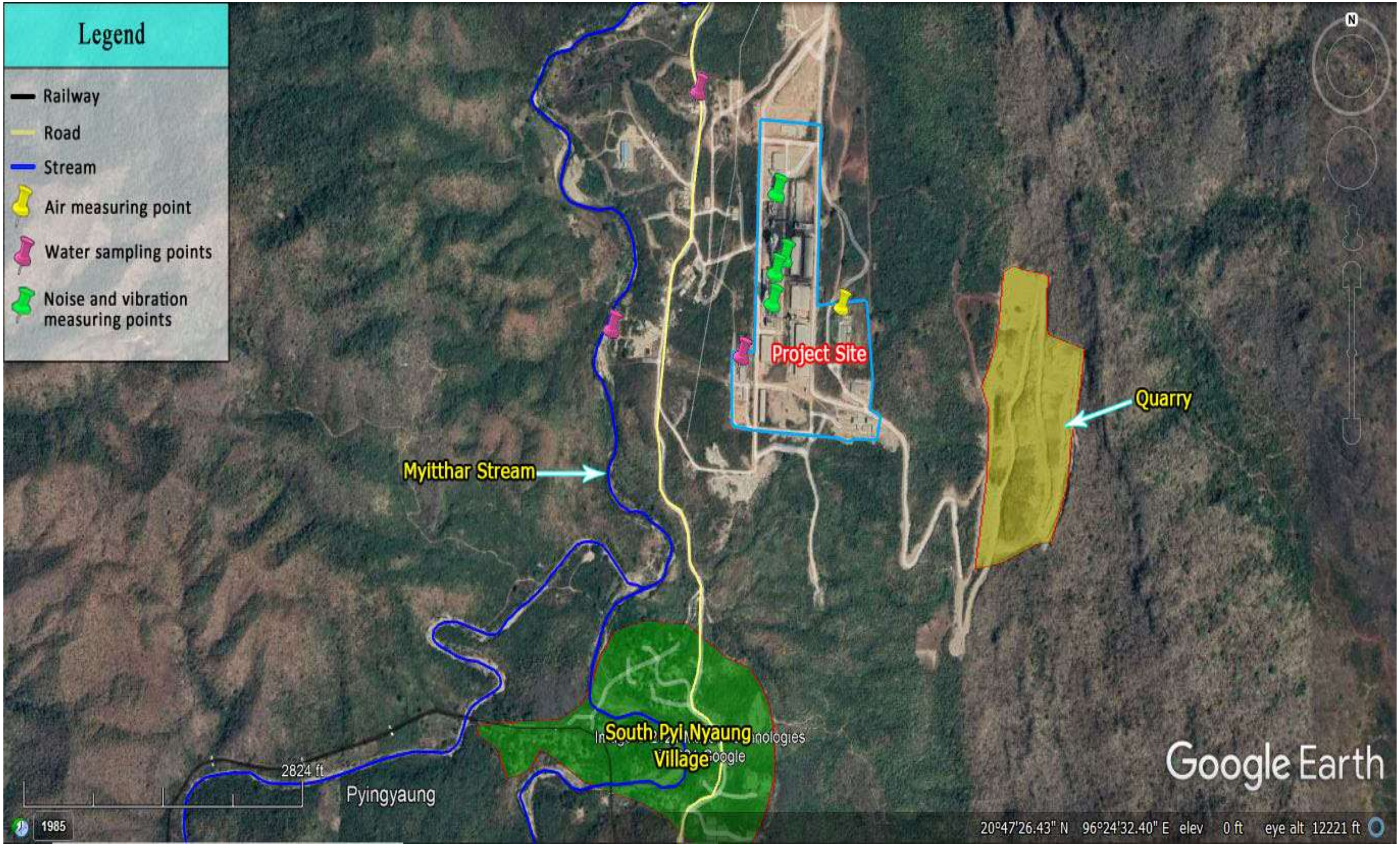


Figure – 62: Google satellite image showing spots where air, water and noise levels were measured

5.5.5 Climate

The climate is tropical monsoon climate with a hot and dry season (premonsoon), a rainy season with moderate rainfall (monsoon) and a cool season (postmonsoon).

The hot dry season (summer) is from March to June and it is a period of hot spell. The monthly maximum temperature for year (2016) was recorded at 44.5 ºC in April.

The cool season (winter) starts from November to and continues till the end of February. The monthly minimum temperature for year (2013) was recorded at 6.4 ºC in December.

The rainy season (monsoon season) starts from the middle of June to the end of September. This is just the generalized picture for the rainy season. During the last seven years there were substantial (but not regular) rains in May and October. For last year (2016) the total annual rainfall was only 869mm. The monthly heaviest rainfall for 2011 was recorded as 362mm in August.

Table-(7), (8), (9) and **(10)** show the monthly maximum, minimum mean temperature, rainfall humidity and wind speed during the last eight years (2010--2017). Data were secondary ones acquired from the Meterological unit of Tharzi Township Agriculture Department.

Table-7: Monthly minimum and maximum temperature (ºC) of Tharzi Township during 2010-2018

Monthly maximum temperature												
Max	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
2010	35.8	38.0	40.5	43.0	43.6	38.6	36.5	36.8	37.0	36.5	35.8	34.2
2011	34.5	37.8	39.7	40.7	38.3	37.7	36.5	35.0	37.0	36.0	35.0	34.5
2012	33.0	38.8	40.0	41.0	41.0	37.0	36.0	35.8	36.0	37.8	37.0	34.5
2013	34.4	41.5	41.6	42.5	41.5	37.0	36.5	35.0	36.2	35.5	34.0	33.6
2014	34.0	37.5	41.0	41.6	39.8	39.5	37.4	35.5	37.5	36.6	37.0	35.5
2015	35.4	37.6	40.5	41.8	41.8	38.0	36.4	35.6	36.5	35.6	35.4	34.0
2016	32.0	38.2	39.8	44.5	42.5	37.0	37.6	34.3	35.4	35.4	34.4	33.5
2017	35.0	37.4	38.8	42.5	40.3	36.7	34.4	35.5	36.4	35.6	35.0	32.6
2018	32.0	37.5	38.6	40.0	38.0	36.5						

Monthly minimum temperature												
Min	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
2010	6.7	8.3	15.8	24.3	23.3	24.8	24.3	24.1	23.2	20.2	16.1	7.8
2011	7.6	10.0	13.3	20.3	23.1	24.4	23.7	23.6	23.7	20.9	12.2	9.7
2012	8.2	10.3	13.6	21.0	23	23.9	23.3	23.7	23.0	16.7	17.6	9.2
2013	9.4	10.6	16.3	21.1	21.8	24.2	24.0	23.0	22.8	19.6	16.6	6.4
2014	9.5	9.8	15.4	19.5	23.4	24.0	24.0	23.5	23.5	20.0	12.0	10.6
2015	8.5	11.0	15.5	21.6	23.3	24.0	23.2	24.0	23.6	20.8	12.7	11.8
2016	8.5	11.0	17.8	21.7	23.4	23.7	22.0	24.4	23.5	22.5	13.5	13.6
2017	9.6	12.8	15.0	21.5	23.0	24.5	24.0	23.4	23.2	20.0	15.6	10.0
2018	9.2	11.4	15.0	21.4	21.5	24.0						

During the last eight years, the month April, 2016 had recorded the highest temperature (44.5ºC) while December 2013 had the lowest temperature record (6.4 ºC).

Table-8: Shows the monthly rainfall and total rainfall of Tharzi Township during the last seven years (2010-2017)

Month	Total rainfall per month (inch)							
	2010	2011	2012	2013	2014	2015	2016	2017
January	-	0.39	-	Trace	-	1.97	-	0.43
February	-	0.08	-	-	-	-	Trace	-
March	0.32	1.12	0.12	-	-	Trace	-	0.12
April	0.32	2.61	5.78	0.39	1.73	0.43	0.12	3.07
May	3.31	6.30	2.67	5.47	1.65	2.32	2.48	7.76
June	1.15	6.84	4.49	4.45	2.05	2.68	8.74	2.40
July	3.01	4.00	3.94	0.91	0.95	4.02	5.98	3.15
August	6.87	11.27	2.91	11.26	6.10	1.93	7.83	7.00
September	9.21	7.20	13.31	11.29	0.90	4.09	9.61	12.95
October	9.25	9.60	3.89	5.39	5.08	2.52	6.45	7.68
November	-	-	0.71	0.20	0.32	0.12	3.98	1.18
December	1.18	1.03	0.87	0.16	-	0.04	-	Trace
Total rainfall	**34.62**	**50.44**	**38.69**	**39.52**	**18.78**	**20.12**	**45.19**	**45.74**

A comparison of rainfall patterns during the last eight years (2010-2017) revealed that the year 2011 had the highest annual total rainfall --- 50.44inch while the year 2014 had the lowest --- 18.78 inch.

Table-9: Monthly humidity (%) of Tharzi Township during (2015-2017)

Month	Humidity (%)		
	2015	2016	2017
January	56	59	49
February	39	43	40
March	35	38	34
April	42	51	37
May	52	58	51
June	61	70	68
July	66	72	72
August	68	75	74
September	64	76	74
October	68	76	75
November	60	71	72
December	55	69	64

A comparison of the values of mean monthly humidity (%) for the last three years showed that the highest value, 76, occurred in September and October, 2016 while the lowest, 34, occurred in March, 2017.

Table-10: Monthly wind speed (mph) of Tharzi Township during (2015-2017)

Month	Wind speed (mph)		
	2015	2016	2017
January	1.2	1.2	1.0
February	1.0	1.7	1.2
March	1.7	2.0	1.7
April	2.8	4.1	2.7
May	4.4	3.8	2.5
June	5.3	3.4	3.2
July	4.6	2.6	2.7
August	3.1	2.0	2.7
September	2.7	1.6	1.5
October	1.2	1.0	1.2
November	1.2	1.0	1.0
December	1.1	1.0	1.1

The highest wind speed (5.3 mph) was recorded in June while the lowest was recorded in January, February, October, November and December (1.0 mph). The direction of prevailing winds were generally from South West to North East during the rainy season while during the cool season the general direction were from North East to South West. But during the hot dry season the winds were irregular and there were no perceptible prevailing wind with regular direction.

Note – The Company is not in a position to set up its own sub-meteorological station and monitor the speed direction of wind the whole year wound (in order to effectively monitor emission dispersal).

5.5.6 Vegetation cover

The forest is secondary forest and on the whole partially degraded due to anthropogenic activities. Vegetation cover (canopy cover) though is quite high about 70-80%. At the substrate there are little open, dry and barren areas but only shady and/or moist area. Few open spots, if any, are at least covered by grass or small herbs. This is just generalized picture of the forest area not yet disturbed by mining or quarry. (At the mining/quarry spots vegetation cover is zero.)

5.5.7 Natural hazards

There were no precedents of natural hazards such as earth quakes, extreme weather events, floodings, droughts and major wild fires etc. within memories of 5 decades, it is learnt. (from KII interview only)

When the unprecedented major floods that wreaked havoc on 11 of the 14 states and Regions of the country occurred in 2015 this area was luckily spared. A glimpse at the meteorological data during the last seven years did not reveal any extreme events regarding monthly rainfalls and monthly temperature. The data did not also reveal any evidence to speculate for global warming or climate change. (No sign of gradual increases in temperature over the last 7 years or the gradual decrease in rainfall over that period.)

The infamous Sagaing Fault line which runs from north to south is far away in the west.

Typical natural hazards and disaster in Myanmar include floods, storm and cyclone, droughts, landslides, earthquakes and UXO (UXO is actually not a natural hazards but is includes as it is a hazard not related to the design and operation of a project).

In this proposed project site and the surrounding area there was no precedent of disasters such as major floods, and major earthquakes. There is no likelihood of flood as the elevation of the site is 390 meters zabove sea level. Regarding earthquakes there are no substantial fault lines, fissures, fracture zone in the area. The major faultline, the Kyauk Kyan Fault which runs from north to south and extending southeast wards is hundreds of miles away in the north. Another faultline, the Shan Scrap fault zone is also hundreds of miles away.

There were/are no precedents of landslides along the slope of the Thayet-yay-chaung Taung Mountain Range, it is learnt.

Blasting can cause landslide but there were no precedents of landslide due to direct blasting impact, so far, it is learnt. Blasting were usually carried out during dry months or during dry days. However, vibration from blasting can affect geological structure and indirectly lead to landslide during heavy rains.

There were/are also no precedent of excessive rainfall, or droughts in the area, it is learnt.

There were/are no precedents of local people either killed or maimed by UXO, in this area, it is learnt.

On the whole natural hazards or disaster risk for the area is very low or almost non-existence.

5.6 Biological components of the surrounding environment

5.6.1 Flora species

Flora study encompasses the vegetation on the top, slope and foot hill of the mountain, the mildly undulating low land in the south, along the bank of Myit-thar Stream, and around and near the vicinity of the factory compound. The study area covers approximately 16 sq. miles. That is within the inner two miles radius of the whole 3 miles radius area.

As the area for the factory premise and residential area (worker housing) have been cleared the unfragmented forest areas remain only on the tops and western slopes of the two small mountains, the Nyaungbin Taung and the Tha-yet-yay Taung which are inside the Reserved Forest area. 11 quadrats plots each were designated on each mountain area this was done for biodiversity studies specially taxoemic and basic ecological studies. The 2 miles radius corners all the project site of 1308.91 acres include factory premise and housing area and 2 mining areas. The forest at the foot hill areas and plains are mostly cleared and remain greatly fragmented.

The survey work lasted for nine days from 11-7-2015 to 19-7-2015.

Special studies were also conducted on the strip of riparian vegetation along the stream bank; a patch of mixed deciduous (Indaing) vegetation in the South; and the vegetation inside and in the vicinity of the village. No plots were designated there due to fragmented state.

The methodology applied was simple classic taxonomic and ecological study method. No attempt was made to calculate diversity index, species evenness and species richness that involved rather complex formulae intended for pure academic purpose or pure research purpose.

After all, most, if not all, trees would be gone sooner or later within 30 years due to the quarrying of limestone.

The only remediation work is effective reforestation and rehabilitation of the ecology (forest) after the operation of the quarries/mining spots.

Note: During the last EIA trip quantitative study/sampling that involves 11 quadrat plot (20m x 20m) inside Nyaungbin Taung quarry site and 11 quadrat plot inside Tha-yet-yay Taung quarry site are conducted and community per quadrat is shown. The forest remains in the two mountain area; the forest of the whole area is mostly fragmented.

The coordinates for each quadrat and per vegetation community (species composition per quadrat) is shown below.

(A) At Nyaungbin Taung site

Plot-1: N.Lat. 20˚ 47' 48.3"; E. Long. 096˚ 24' 50.0"; elevation: 681 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Bauhinia sulphurea* Fischer.	Swedaw	Caesalpiniaceae	T
2	*Bombax insigne* Wall.	Di-du	Bombacaceae	T
3	*Cassia fistula* L.	Ngu	Cassalpidiaceae	T
4	*Hyptianthera stricta* Wight & Arn	Kyetyo	Rubiaceae	ST
5	*Millettia pendula* Benth.	Thin win	Fabaceae	T
6	*Spondias pinnata* L.	Taw gwe	Anacardiaceae	T
7	*Tectona grandis* L.F	Kyun	Verbenaceae	T
8	*Terminalia bellerica* Roxb.	Thit seint	Combretaceae	T

Plot-2

N. Lat. 20˚ 47' 51.1"; E. Long. 096˚ 24' 48.8"; elevation: 690 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Bombax insigne* Wall.	Di-du	Bombacaceae	T
2	*Celtis tetrandra* Roxb.	Thit-pok	Ulmaceae	T
3	*Ficus obtusifolia* Roxb.	Nyaung gyat	Moraceae	T
4	*Holarrhena antidysenterica* Wall.	Lettok-gyi	Apocynaceae	T
5	*Lagerstroemia villosa* Wall. Ex Kurz.	Zaung bale	Lythraceae	T
6	*Millettia pendula* Benth.	Thin win	Fabaceae	T
7	*Pterocarpus indicus* Willd.	Padauk	Fabaceae	T
8	*Sterculia versicolor* Wall.	Shaw phyu	Sterculiaceae	T
9	*Tectona grandis* L.F	Kyun	Verbenaceae	T
10	*Terminalia arjuna* Wight & Arn.	Tauk kyan	Combretaceae	T
11	*Xylia xylocarpa* Roxb.	Pyinkado	Mimosaceae	T

Plot-3

N. Lat. 20˚ 47' 53.1"; E. Long. 096˚ 24' 45.4"; elevation: 706 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Anogeissus acuminata* Wall.	Yon	Combretaceae	T
2	*Bombax insigne* Wall.	Di-du	Bombacaceae	T
3	*Celtis tetrandra* Roxb.	Thit-pok	Ulmaceae	T
4	*Diospyros montana* Roxb.	Gyok	Ebenaceae	T
5	*Ficus infectoria* Roxb.	Nyaung gyin	Moraceae	T
6	*Garuga pinnata* Roxb.	Chinyoke	Burseraceae	T
7	*Millettia pendula* Benth.	Thin win	Fabaceae	T
8	*Pentaceae burmanica* Kurz.	Kathi ka	Tiliaceae	T
9	*Pterocarpus indicus* Willd.	Padauk	Fabaceae	T
10	*Sterculia versicolor* Wall.	Shaw phyu	Sterculiaceae	T
11	*Tectona grandis* L.F	Kyun	Verbenaceae	T
12	*Terminalia arjuna Wight & Arn.*	Tauk kyan	Combretaceae	T
13	*Xylia xylocarpa Roxb.*	Pyinkado	Mimosaceae	T

Plot-4

N. Lat. 20˚ 47' 54.4"; E. Long. 096˚ 24' 43.5"; elevation: 710 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Albizia odorantissima* (L.F.) Benth.	Taung magyi	Mimosaceae	T
2	*Anogeissus acuminata* Wall.	Yon	Combretaceae	T
3	*Bauhinia sulphurea* Fischer.	Swedaw	Caesalpiniaceae	T
4	*Bombax ceiba* L.	Let-pan	Bombacaceae	T
5	*Bombax insigne* Wall.	Di-du	Bombacaceae	T
6	*Celtis tetrandra* Roxb.	Thit-pok	Ulmaceae	T
7	*Dillenia parviflora* Martelli	Zinbyun	Dilleniaceae	T
8	*Diospyros montana* Roxb.	Gyok	Ebenaceae	T
9	*Diospyros montana* Roxb.	Gyok	Ebenaceae	T
10	*Ficus infectoria* Roxb.	Nyaung gyin	Moraceae	T
11	*Garuga pinnata* Roxb.	Chinyoke	Burseraceae	T
12	*Hymenodictyon orixense* Roxb.	Khu than	Rubiaceae	T
13	*Macaranga denticulata* Muell.Arg	Phet-wun	Euphorbiaceae	ST
14	*Millettia pendula* Benth.	Thin win	Fabaceae	T
15	*Pentaceae burmanica* Kurz.	Kathi ka	Tiliaceae	T
16	*Pterocarpus indicus* Willd.	Padauk	Fabaceae	T
17	*Sterculia versicolor* Wall.	Shaw phyu	Sterculiaceae	T
18	*Tectona grandis* L.F	Kyun	Verbenaceae	T
19	*Terminalia arjuna* Wight & Arn.	Tauk kyan	Combretaceae	T
20	*Xylia xylocarpa* Roxb.	Pyinkado	Mimosaceae	T

Plot-5

N. Lat. 20˚ 47' 57.4"; E. Long. 096˚ 24' 42.6"; elevation: 706 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Bombax insigne* Wall.	Di-du	Bombacaceae	T
2	*Lagerstroemia speciosa* L.	Pyinma	Lythraceae	T
3	*Millettia pendula* Benth.	Thin win	Fabaceae	T
4	*Sterculia versicolor* Wall.	Shaw phyu	Sterculiaceae	T

Plot-6

N. Lat. 20˚ 47' 58.4"; E. Long. 096˚ 24' 43.1"; elevation: 678 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Albizia odorantissima* (L.F.) Benth.	Taung magyi	Mimosaceae	T
2	*Cassia fistula* L.	Ngu	Cassalpidiaceae	T
3	*Croton persimilis* Muell.	Thayin gyi	Euphorbiaceae	ST
4	*Dillenia parviflora* Martelli	Zinbyun	Dilleniaceae	T
5	*Lagerstroemia tomentosa Presl.*	Leza	Lythraceae	T
6	*Lagerstroemia villosa Wall. Ex Kurz.*	Zaung bale	Lythraceae	T
7	*Millettia pendula Benth.*	Thin win	Fabaceae	T
8	*Pterocarpus indicus Willd.*	Padauk	Fabaceae	T
9	*Stereospermum personatum (Hassk.)*	Than-tay	Bignoniaaceae	T
10	*Xylia xylocarpa Roxb.*	Pyinkado	Mimosaceae	T

Plot-7

N. Lat. 20˚ 47' 59.6"; E. Long. 096˚ 24' 44.2"; elevation: 690 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Anogeissus acuminata* Wall.	Yon	Combretaceae	T
2	*Bombax ceiba* L.	Let-pan	Bombacaceae	T
3	*Bombax insigne* Wall.	Di-du	Bombacaceae	T
4	*Chukrasia tabularis* A.Juss	Yin ma	Meliaceae	T
5	*Ficus infectoria* Roxb.	Nyaung gyin	Moraceae	T
6	*Garuga pinnata* Roxb.	Chinyoke	Burseraceae	T
7	*Heterophragma adenophylla* Wall.	Phet-than	Bignoniaceae	T
8	*Lagerstroemia tomentosa* Presl.	Leza	Lythraceae	T
9	*Lagerstroemia villosa* Wall. Ex Kurz.	Zaung bale	Lythraceae	T
10	*Pterocarpus indicus* Willd.	Padauk	Fabaceae	T
11	*Sterculia versicolor* Wall.	Shaw phyu	Sterculiaceae	T

Plot-8

N. Lat. 20˚ 48' 01.0"; E. Long. 096˚ 24' 45.1"; elevation: 697 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Aegle marmelos* L.	Okshit	Rutaceae	T
2	*Albizia odorantissima* (L.F.) Benth.	Taung magyi	Mimosaceae	T
3	*Bauhinia sulphurea* Fischer.	Swedaw	Caesalpiniaceae	T
4	*Bombax ceiba* L.	Let-pan	Bombacaceae	T
5	*Cassia fistula* L.	Ngu	Cassalpidiaceae	T
6	*Cassia fistula* L.	Ngu	Cassalpidiaceae	T
7	*Chukrasia tabularis* A.Juss	Yin ma	Meliaceae	T
8	*Diospyros montana* Roxb.	Gyok	Ebenaceae	T
9	*Ficus obtusifolia* Roxb.	Nyaung gyat	Moraceae	T
10	*Lagerstroemia villosa* Wall. Ex Kurz.	Zaung bale	Lythraceae	T
11	*Millettia pendula* Benth.	Thin win	Fabaceae	T
12	*Pentaceae burmanica* Kurz.	Kathi ka	Tiliaceae	T
13	*Phyllanthus simplex* Retz	Shit-sha	Euphorbiaceae	S
14	*Sterculia versicolor* Wall.	Shaw phyu	Sterculiaceae	T
15	*Tectona grandis* L.F	Kyun	Verbenaceae	T
16	*Xylia xylocarpa* Roxb.	Pyinkado	Mimosaceae	T

Plot-9

N. Lat. 20˚ 48' 01.8"; E. Long. 096˚ 24' 45.8"; elevation: 707 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Dillenia parviflora* Martelli	Zinbyun	Dilleniaceae	T
2	*Diospyros montana* Roxb.	Gyok	Ebenaceae	T
3	*Garuga pinnata* Roxb.	Chinyoke	Burseraceae	T
4	*Heterophragma adenophylla* Wall.	Phet-than	Bignoniaceae	T
5	*Hymenodictyon orixense* Roxb.	Khu than	Rubiaceae	T
6	*Hyptianthera stricta* Wight & Arn	Kyetyo	Rubiaceae	ST
7	*Lannea coromandelica* Merr.	Na-be	Anacardiaceae	T
8	*Millettia pendula* Benth.	Thin win	Fabaceae	T
9	*Spondias pinnata* L.	Taw gwe	Anacardiaceae	T
10	*Sterculia versicolor* Wall.	Shaw phyu	Sterculiaceae	T

Plot-10

N. Lat. 20˚ 48' 05.4"; E. Long. 096˚ 24' 47.9"; elevation: 749 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Albizia odorantissima* (L.F.) Benth.	Taung magyi	Mimosaceae	T
2	*Anogeissus acuminata* Wall.	Yon	Combretaceae	T
3	*Bombax ceiba* L.	Let-pan	Bombacaceae	T
4	*Cassia fistula* L.	Ngu	Cassalpidiaceae	T
5	*Chukrasia tabularis* A.Juss	Yin ma	Meliaceae	T
6	*Dillenia parviflora* Martelli	Zinbyun	Dilleniaceae	T
7	*Diospyros montana* Roxb.	Gyok	Ebenaceae	T
8	*Grewia rothii* DC.	Tayaw	Tiliaceae	ST
9	*Hyptianthera stricta* Wight & Arn	Kyetyo	Rubiaceae	ST
10	*Phyllanthus simplex* Retz	Shit-sha	Euphorbiaceae	S
11	*Tectona grandis* L.F	Kyun	Verbenaceae	T

Plot-11

N. Lat. 20˚ 48' 05.3"; E. Long. 096˚ 24' 48.5"; elevation: 935 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Bombax insigne* Wall.	Di-du	Bombacaceae	T
2	*Diospyros montana* Roxb.	Gyok	Ebenaceae	T
3	*Ficus pilosa* L.	Nyaung	Moraceae	T
4	*Heterophragma adenophylla* Wall.	Phet-than	Bignoniaceae	T
5	*Hymenodictyon orixense* Roxb.	Khu than	Rubiaceae	T
6	*Lannea coromandelica* Merr.	Na-be	Anacardiaceae	T
7	*Millettia pendula* Benth.	Thin win	Fabaceae	T
8	*Pentaceae burmanica* Kurz.	Kathi ka	Tiliaceae	T
9	*Terminalia bellerica* Roxb.	Thit seint	Combretaceae	T
10	*Xylia xylocarpa* Roxb.	Pyinkado	Mimosaceae	T

(B) At Tha-yet-yay Taung site

Plot-1

N. Lat. 20˚ 47' 12.4"; E. Long. 096˚ 24' 40.2"; elevation: 721 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Bauhinia sulphurea* Fischer.	Swedaw	Caesalpiniaceae	T
2	*Dillenia parviflora* Martelli	Zinbyun	Dilleniaceae	T
3	*Diospyros montana* Roxb.	Gyok	Ebenaceae	T
4	*Lannea coromandelica* Merr.	Na-be	Anacardiaceae	T
5	*Tectona grandis* L.F	Kyun	Verbenaceae	T
6	*Xylia xylocarpa* Roxb.	Pyinkado	Mimosaceae	T

Plot-2

N. Lat. 20˚ 47' 11.5"; E. Long. 096˚ 24' 44.6"; elevation: 643 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Bauhinia sulphurea* Fischer.	Swedaw	Caesalpiniaceae	T
2	*Cassia fistula* L.	Ngu	Cassalpidiaceae	T
3	*Chukrasia tabularis* A.Juss	Yin ma	Meliaceae	T
4	*Dalbergia oliveri* Gamble.	Tama-lan	Fabaceae	T
5	*Dillenia parviflora* Martelli	Zinbyun	Dilleniaceae	T
6	*Ficus glomerata* Roxb.	Ye thapan	Moraceae	T
7	*Grewia rothii* DC.	Tayaw	Tiliaceae	ST
8	*Millettia pendula* Benth.	Thin win	Fabaceae	T
9	*Pterocarpus indicus* Willd.	Padauk	Fabaceae	T
10	*Shorea siamensis* Kurz.	Ingyin	Dipterocarpaceae	T
11	*Spondias pinnata* L.	Taw gwe	Anacardiaceae	T
12	*Sterculia versicolor* Wall.	Shaw phyu	Sterculiaceae	T
13	*Tectona grandis* L.F	Kyun	Verbenaceae	T
14	*Xylia xylocarpa* Roxb.	Pyinkado	Mimosaceae	T

Plot-3

N. Lat. 20˚ 47' 10.6"; E. Long. 096˚ 24' 47.1"; elevation: 693 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Bombax ceiba* L.	Let-pan	Bombacaceae	T
2	*Bombax insigne* Wall.	Di-du	Bombacaceae	T
3	*Chukrasia tabularis* A.Juss	Yin ma	Meliaceae	T
4	*Chukrasia tabularis* A.Juss	Yin ma	Meliaceae	T
5	*Dillenia parviflora* Martelli	Zinbyun	Dilleniaceae	T
6	*Diospyros montana* Roxb.	Gyok	Ebenaceae	T
7	*Grewia rothii* DC.	Tayaw	Tiliaceae	ST
8	*Heterophragma adenophylla* Wall.	Phet-than	Bignoniaceae	T
9	*Lannea coromandelica Merr.*	Na-be	Anacardiaceae	T
10	*Tectona grandis L.F*	Kyun	Verbenaceae	T
11	*Xylia xylocarpa Roxb.*	Pyinkado	Mimosaceae	T

Plot-4

N. Lat. 20˚ 47' 09.5"; E. Long. 096˚ 24' 48.8"; elevation: 732 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Cassia fistula* L.	Ngu	Cassalpidiaceae	T
2	*Dillenia parviflora* Martelli	Zinbyun	Dilleniaceae	T
3	*Diospyros montana* Roxb.	Gyok	Ebenaceae	T
4	*Heterophragma adenophylla* Wall.	Phet-than	Bignoniaceae	T
5	*Lannea coromandelica* Merr.	Na-be	Anacardiaceae	T
6	*Millettia pendula* Benth.	Thin win	Fabaceae	T
7	*Pterocarpus indicus* Willd.	Padauk	Fabaceae	T
8	*Spondias pinnata* L.	Taw gwe	Anacardiaceae	T
9	*Sterculia versicolor* Wall.	Shaw phyu	Sterculiaceae	T
10	*Terminalia arjuna* Wight & Arn.	Tauk kyan	Combretaceae	T

Plot-5

N. Lat. 20˚ 47' 08.2"; E. Long. 096˚ 24' 49.9"; elevation: 749 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Chukrasia tabularis* A.Juss	Yin ma	Meliaceae	T
2	*Dillenia parviflora* Martelli	Zinbyun	Dilleniaceae	T
3	*Diospyros montana* Roxb.	Gyok	Ebenaceae	T
4	*Hyptianthera stricta* Wight & Arn	Kyetyo	Rubiaceae	ST
5	*Lagerstroemia villosa* Wall. Ex Kurz.	Zaung bale	Lythraceae	T
6	*Lannea coromandelica* Merr.	Na-be	Anacardiaceae	T
7	*Pterocarpus indicus* Willd.	Padauk	Fabaceae	T
8	*Spondias pinnata* L.	Taw gwe	Anacardiaceae	T
9	*Sterculia versicolor* Wall.	Shaw phyu	Sterculiaceae	T
10	*Tectona grandis* L.F	Kyun	Verbenaceae	T
11	*Terminalia arjuna* Wight & Arn.	Tauk kyan	Combretaceae	T
12	*Xylia xylocarpa* Roxb.	Pyinkado	Mimosaceae	T

Plot-6

N. Lat. 20˚ 47' 09.1"; E. Long. 096˚ 24' 50.0"; elevation: 777 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Afzelia martabanica* J.Leonard	Pyin-padauk	Caesalpiniaceae	T
2	*Bombax ceiba* L.	Let-pan	Bombacaceae	T
3	*Erythrina suberosa* Roxb.	Kathit	Fabaceae	T
4	*Heterophragma adenophylla* Wall.	Phet-than	Bignoniaceae	T
5	*Millettia pendula* Benth.	Thin win	Fabaceae	T
6	*Shorea siamensis Kurz.*	Ingyin	Dipterocarpaceae	T
7	*Spondias pinnata L.*	Taw gwe	Anacardiaceae	T
8	*Sterculia versicolor Wall.*	Shaw phyu	Sterculiaceae	T
9	*Terminalia arjuna Wight & Arn.*	Tauk kyan	Combretaceae	T
10	*Terminalia arjuna Wight & Arn.*	Tauk kyan	Combretaceae	T
11	*Xylia xylocarpa Roxb.*	Pyinkado	Mimosaceae	T

Plot-7

N. Lat. 20˚ 47' 10.7"; E. Long. 096˚ 24' 50.8"; elevation: 804 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Bombax insigne* Wall.	Di-du	Bombacaceae	T
2	*Dillenia parviflora* Martelli	Zinbyun	Dilleniaceae	T
3	*Ficus lacor* Buch. Ham.	Nyaung gyin	Moraceae	T
4	*Ficus palmata* Forssk.	Kala thapan	Moraceae	T
5	*Heterophragma adenophylla* Wall.	Phet-than	Bignoniaceae	T
6	*Hymenodictyon orixense* Roxb.	Khu than	Rubiaceae	T
7	*Lannea coromandelica* Merr.	Na-be	Anacardiaceae	T
8	*Millettia pendula* Benth.	Thin win	Fabaceae	T
9	*Pentaceae burmanica* Kurz.	Kathi ka	Tiliaceae	T
10	*Xylia xylocarpa* Roxb.	Pyinkado	Mimosaceae	T

Plot-8

N. Lat. 20˚ 47' 17.0"; E. Long. 096˚ 24' 54.4"; elevation: 772 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Albizia odorantissima* (L.F.) Benth.	Taung magyi	Mimosaceae	T
2	*Bauhinia sulphurea* Fischer.	Swedaw	Caesalpiniaceae	T
3	*Dillenia parviflora* Martelli	Zinbyun	Dilleniaceae	T
4	*Garuga pinnata* Roxb.	Chinyoke	Burseraceae	T
5	*Millettia pendula* Benth.	Thin win	Fabaceae	T
6	*Pentaceae burmanica* Kurz.	Kathi ka	Tiliaceae	T
7	*Stereospermum personatum* (Hassk.)	Than-tay	Bignoniaaceae	T
8	*Tectona grandis* L.F	Kyun	Verbenaceae	T

Plot-9

N. Lat. 20˚ 47' 18.5"; E. Long. 096˚ 24' 57.5"; elevation: 651 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Celtis tetrandra* Roxb.	Thit-pok	Ulmaceae	T
2	*Dillenia parviflora* Martelli	Zinbyun	Dilleniaceae	T
3	*Ficus obtusifolia* Roxb.	Nyaung gyat	Moraceae	T
4	*Macaranga denticulata* Muell.Arg	Phet-wun	Euphorbiaceae	ST
5	*Pentaceae burmanica* Kurz.	Kathi ka	Tiliaceae	T
6	*Stereospermum personatum* (Hassk.)	Than-tay	Bignoniaaceae	T

Plot-10

N. Lat. 20˚ 47' 41.7"; E. Long. 096˚ 24' 40.0"; elevation: 586 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Anogeissus acuminata* Wall.	Yon	Combretaceae	T
2	*Dalbergia oliveri* Gamble.	Tama-lan	Fabaceae	T
3	*Diospyros montana* Roxb.	Gyok	Ebenaceae	T
4	*Garuga pinnata* Roxb.	Chinyoke	Burseraceae	T
5	*Hymenodictyon orixense* Roxb.	Khu than	Rubiaceae	T
6	*Lagerstroemia villosa* Wall. Ex Kurz.	Zaung bale	Lythraceae	T
7	*Lannea coromandelica* Merr.	Na-be	Anacardiaceae	T
8	*Millettia pendula* Benth.	Thin win	Fabaceae	T
9	*Shorea siamensis* Kurz.	Ingyin	Dipterocarpaceae	T
10	*Sterculia versicolor* Wall.	Shaw phyu	Sterculiaceae	T
11	*Tectona grandis* L.F	Kyun	Verbenaceae	T
12	*Terminalia arjuna* Wight & Arn.	Tauk kyan	Combretaceae	T
13	*Terminalia arjuna* Wight & Arn.	Tauk kyan	Combretaceae	T
14	*Terminalia bellerica* Roxb.	Thit seint	Combretaceae	T

Plot-11

N. Lat. 20˚ 47' 25.1"; E. Long. 096˚ 25' 00.9"; elevation: 624 masl.

No	Scientific Name	Vanicular Name	Family Name	Habit
1	*Bauhinia sulphurea* Fischer.	Swedaw	Caesalpiniaceae	T
2	*Celtis tetrandra* Roxb.	Thit-pok	Ulmaceae	T
3	*Croton persimilis* Muell.	Thayin gyi	Euphorbiaceae	ST
4	*Hymenodictyon orixense* Roxb.	Khu than	Rubiaceae	T
5	*Lagerstroemia villosa* Wall. Ex Kurz.	Zaung bale	Lythraceae	T
6	*Terminalia bellerica* Roxb.	Thit seint	Combretaceae	T

The total area of the 22 quadrat of 20m x 20m is equavilent to only 5% of the total area of two quarry sites. But the quadrants are systematically and very evenly distributed so that the species composition fairly represents the true picture of community structure of the whole area. The 239 species of natural plant shown in **Table-11** and are all species found both inside and outside the two quarry sites. The qualitative study during the first EIA trip (July 2015) involved transect walk across and around the whole site, along the bank of the stream (for riparian vegetation inside the village (artificial vegetation) and also at certain spots with rather peculiar ecological riches. Sometimes crisscrossing inside the area is also performed. It was a rapid assessment study involving visual inspection and on the spot identification, an internationally accepted practice, for qualitative study, of flora.

Diversity

The inventory of plant species recorded for the whole area is shown in **Table-11**.

Table-11: List of plant species (natural vegetation) found and recorded

No.	Scientific Name	Common Name	Family Name	Habit
1	*Abrus precatorius* L.	Ywe	Mimosaceae	C/C
2	*Acacia pennata* L.	Suyit	Mimosaceae	S
3	*Acacia rugata* Buch.Ham	Kinmum gyin	Mimosaceae	S
4	*Adiantum capillus-veneris* L.	hair-fern	Pteridaceae	H
5	*Adiantum caudatum* L.	Walking-fern	Pteridaceae	H
6	*Aegle marmelos* L.	Okshit	Rutaceae	T
7	*Afzelia martabanica* J.Leonard	Pyin-padauk	Caesalpiniaceae	T
8	*Albizia odorantissima* (L.F.) Benth.	Taung magyi	Mimosaceae	T
9	*Alpinia allughas* Roscoe.	Gonmin	Zingiberaceae	H
10	*Alstonia scholaris* L.	Taung ma yoe	Apocynaceae	T
11	*Alternanthera sessilis* L.	PuzunSaYaing	Amaranthaceae	H
12	*Alysicarpus vaginalis* L.	Thanma naing kyaukma naing	Fabaceae	S
13	*Amaranthus gracilis* Desf.	Hinnu new yaing	Amaranthaceae	H
14	*Amaranthus spinosus* L.	Hinnu nwe subauk	Amaranthaceae	H
15	*Amorphophallus campanulatus* Blume	Wa-u	Araceae	H
16	*Andrographis paniculata* Wall.	Shan-say-khar	Acanthaceae	S
17	*Anisochilus carnosus* Wall.	Feverfeaf	Lamiaceae	H
18	*Anogeissus acuminata* Wall.	Yon	Combretaceae	T
19	*Antidesma bunius* L.	Kinbalin	Euphorbiaceae	ST
20	*Ardisia humilis* Vahl.	Kyet-ma-oak	Myrisinaceae	ST
21	*Areca triandra* Roxb.	Taw kun thi	Arecaceae	ST
22	*Aristolochia acuminata* Roxb.	Aristolochia	Aristolochiaceae	C/C
23	*Artemisia pallens* Wall. Ex JC.	Dawna-pan	Asteraceae	H
24	*Arundina graminifolia* (D.Don) Hochr.	Myet-thit-kwa	Orchidiaceae	E
25	*Asparagus racemosus* Wald.	Shin matet	Liliaceae	C
26	*Asystasia gangetica* L.	Chinese violet	Acanthaceae	H
27	*Bambusa burmanica* Gamble.	Hnee-wa	Poaceae	B
28	*Bambusa polymorpha* Munro.	Kyathaung wa	Poaceae	B
29	*Bambusa villosula* Kurz.	Ta-bin-daing-wa	Poaceae	B
30	*Bauhinia ornata* Kurz.	Swedaw-new	Caesalpiniaceae	C/C
31	*Bauhinia sulphurea* Fischer.	Swedaw	Caesalpiniaceae	T
32	*Begonia parvulifora* A.*DC*	Tree begonia	Begoniaceae	H
33	*Begonia roxburghii* A.DC	Kyauk-chin-pan	Begoniaceae	H
34	*Bidens alba* DC.	Ta-sae-ark	Asteraceae	H
35	*Blumea densiflora* DC.	Phon-mathein	Asteraceae	S
36	*Boerhavia repanda* Willd.	Payan nawa	Nyctaginaceae	H

37	*Boesenbergia rotunda* Roxb.	Seik phoo	Zingiberaceae	H
38	*Boesenbergia thorelii* Loes.	Seik-phoo	Zingiberaceae	H
39	*Bombax ceiba* L.	Let-pan	Bombacaceae	T
40	*Bombax insigne* Wall.	Di-du	Bombacaceae	T
41	*Bothriochloa bladhii* Retz.	Myet-hmwe	Poaceae	G
42	*Bothriochloa pertusa* L.	Padaw pyu	Poaceae	G
43	*Breynia rhamnoides* Muell.	Gonnyin-ya	Euphorbiaceae	S
44	*Buchanania lanzan* Spreng.	Lun-bo	Anacardiaceae	T
45	*Butea parviflora* Roxb.	Pauk new	Fabaceae	C
46	*Caesalpinia digyna* Rottl.	Kalein	Caesalpiniaceae	C/C
47	*Calotropis gigantea* L.	Mayo-gyi	Asclepiadaceae	S
48	*Calotropis procera* (Ait.)R.Br.	Mayo	Asclepiadaceae	S
49	*Carica papaya* L.	Thinbaw	Caricaceae	ST
50	*Cassia fistula* L.	Ngu	Cassalpidiaceae	T
51	*Cassia tora* L.	Dangywe	Caesalpiniaceae	S
52	*Cayratia trifolia* (L.) Domin	Man-thone-gwa	Vitaceae	C
53	*Cedrela microcarpa* DC.	Tawtama	Meliaceae	T
54	*Cedrela toona Roxb.*	Taung tama	Meliaceae	T
55	*Ceiba pentandra L.*	Le-moh-pin	Bombacaceae	T
56	*Celtis tetrandra Roxb.*	Thit-pok	Ulmaceae	T
57	*Cephalandra indica Naud.*	Taw-kinmon	Cucurbitaceae	C/C
58	*Cephalostachyum pergracile Munro*	Tin-wa	Poaceae	B
59	*Chloris barbata Sw.*	Sinngo-myet	Poaceae	G
60	*Chromolaena odorata (L.)*	Bi-zet	Asteraceae	S
61	*Chrysopogon aciculatus Retz.*	Naukpo-myet	Poaceae	G
62	*Chukrasia tabularis A.Juss*	Yin ma	Meliaceae	T
63	*Cinnamomum tamala Nees.*	Maza	Lauraceae	T
64	*Cissus discolor Blume.*	Ngwe-gya	Vitaceae	C/C
65	*Cissus repens Lam.*	Nga-yaung-kin-che	Vitaceae	C/C
66	*Clausena excavate Burm.F*	Seik-nan	Rutaceae	S
67	*Clerodendron villosum Blume.*	Petka	Verbenaceae	H
68	*Clerodendrum petasites Lour.*	Petka	Verbenaceae	S
69	*Clerodendrum seratum Spreng.*	Yin-bya	Verbenaceae	S
70	*Clitoria ternatea L.*	Aung-me-nyo	Fabaceae	C
71	*Colocasia affinis Schott.*	Pein	Araceae	H
72	*Colocasia esculenta L.*	Mahuya pein	Araceae	H
73	*Commelina obliqua Ham.*	Myet-kyut	Commelinaceae	C
74	*Costus speciosus Smith.*	Phalan-taung-hmwe	Costaceae	S
75	*Crotalaria sericea Retz.*	Taw-paik-san	Fabaceae	S

76	*Croton joufra Roxb.*	Thayin kado	Euphorbiaceae	T
77	*Croton persimilis Muell.*	Thayin gyi	Euphorbiaceae	ST
78	*Cryptolepis buchanani Roem & Schult*	Na-sha-gyi	Asclepiadaceae	C/C
79	*Curcuma comosa Roxb.*	Sanwin-yaing	Zingiberaceae	H
80	*Curcuma longa L.*	Nanwin	Zingiberaceae	H
81	*Curcuma ornata Wall*	Marlar	Zingiberaceae	H
82	*Curcuma petiolata Roxb.*	Marlar	Zingiberaceae	H
83	*Curcuma roscoeana Wall.*	Marlar-ni	Zingiberaceae	H
84	*Cyathula prostrata L.*	KyetMaukSuPyan	Amaranthaceae	H
85	*Cymbidium aloifolium L.*	Thit tat lin nae	Orchidiaceae	E
86	*Cynodon dactylon (L.) Pers.*	Myay-sar-myet	Poaceae	G
87	*Dactyloctenium aegyptum L.*	Myet-lay-gwa	Poaceae	G
88	*Dalbergia cultrata grah.*	Yin-daik	Fabaceae	T
89	*Dalbergia oliveri Gamble.*	Tama-lan	Fabaceae	T
90	*Dalbergia rimosa Roxb.*	Daung talaung	Fabaceae	ST
91	*Dendrecalamus strictus Nees.*	Myin-wa	Poaceae	B
92	*Dendrocalamus giganteus Munro.*	Wa-bo-gyi	Poaceae	B
93	*Dendrocalamus longispathus Kurz.*	Wanet	Poaceae	B
94	*Desmodium cephalotes Wall.*	Lauk-min	Fabaceae	S
95	*Desmodium gyrans DC.*	Say-ka-myin	Fabaceae	S
96	*Dillenia parviflora Martelli*	Zinbyun	Dilleniaceae	T
97	*Dinochloa andamanica Kurz.*	Wa-new	Poaceae	B
98	*Dioscorea alata L.*	Taw-myauk-u	Dioscoreaceae	C/C
99	*Dioscorea esculenta Lour.*	Wet-ka-u	Dioscoreaceae	C/C
100	*Dioscorea sativa L.*	Kadu u	Dioscoreaceae	C/C
101	*Diospyros montana Roxb.*	Gyok	Ebenaceae	T
102	*Diospyros variegata Kurz.*	Te	Ebenaceae	T
103	*Dipterocarpus pilosus Roxb.*	Ka-nyaung	Dipterocarpaceae	T
104	*Dipterocarpus tuberculatus Roxb.*	In	Dipterocarpaceae	T
105	*Dracaena angustifolia Roxb.*	Dandagu	Dracacnaceae	S
106	*Dregea volubilis Benth.*	Gwedauk new	Asclepiadaceae	C/C
107	*Drimycarpus racemosus HK.*	Taung thitsi	Anacardiaceae	T
108	*Echinochloa colona Link.*	Be-sar-myet	Poaceae	G
109	*Echinochloa crus-galli L.*	Myet-thi	Poaceae	G
110	*Eclipta alba (L.)Hassk*	Kyeik-hman	Asteraceae	H
111	*Elephantopus scaber L.*	Sin-chae	Asteraceae	H
112	*Eleusine indica (L.) Gaertn.*	Sinngo-myet	Poaceae	G
113	*Emblica officinalis Gaertn.*	Zibyu	Euphorbiaceae	T
114	*Entada pursaetha DC.*	Do-new	Mimosaceae	C

115	*Erythrina suberosa Roxb.*	Kathit	Fabaceae	T
116	*Euphorbia bifida L.*	Say-pale	Euphorbiaceae	H
117	*Euphorbia heterophylla L.*	Kywe kyaung myinsi	Euphorbiaceae	S
118	*Euphorbia hirta L.*	KyweKyaungminSay	Euphorbiaceae	H
119	*Euphorbia nivulia Buch. Ham*	Shazaung	Euphorbiaceae	ST
120	*Euphorium odoratum L.*	Taw bezat	Asteraceae	S
121	*Ficus glomerata Roxb.*	Ye thapan	Moraceae	T
122	*Ficus hirta Vahl.*	Thaphan	Moraceae	T
123	*Ficus infectoria Roxb.*	Nyaung gyin	Moraceae	T
124	*Ficus lacor Buch. Ham.*	Nyaung gyin	Moraceae	T
125	*Ficus obtusifolia Roxb.*	Nyaung gyat	Moraceae	T
126	*Ficus palmata Forssk.*	Kala thapan	Moraceae	T
127	*Ficus pilosa L.*	Nyaung	Moraceae	T
128	*Ficus religiosa L.*	Bawdi nyaung	Moraceae	T
129	*Gardenia erythroclada Kurz.*	Hman ni	Rubiaceae	T
130	*Garuga pinnata Roxb.*	Chinyoke	Burseraceae	T
131	*Gastrochilus calceolaris D.Don*	Kyet-tu-yway-pan	Orchidiaceae	E
132	*Gentiana kurroo Royle*	Saygagyi	Gentianaceae	H
133	*Globba orixensis Roxb.*	Waso	Zingiberaceae	H
134	*Grewia hirsuta Vahl.*	Kyet-tayaw	Tiliaceae	S
135	*Grewia rothii DC.*	Tayaw	Tiliaceae	ST
136	*Gynandropsis gynandra (L.)Merr.*	Hingala	Capparaceae	H
137	*Haldina cordifolia*	Hnaw	Rubiaceae	T
138	*Harrisonia perforata Merr.*	Sugyin	Simaroubaceae	ST
139	*Heterophragma adenophylla Wall.*	Phet-than	Bignoniaceae	T
140	*Hibiscus sabdariffa L.*	Chinbarung	Malvaceae	S
141	*Hibiscus surattensis L.*	Taw chin baung	Malvaceae	S
142	*Hiptage benghalensis L.*	Bein new	Malpighiaceae	C
143	*Holarrhena antidysenterica Wall.*	Lettok-gyi	Apocynaceae	T
144	*Holoptelea integrifolia Planch.*	Pyauk seik	Ulmaceae	T
145	*Homalium tomentosum Benth.*	Myauk chaw	Flacourtiaceae	T
146	*Homonoia riparia Lour.*	Ye-tagyi	Euphorbiaceae	S
147	*Hymenodictyon orixense Roxb.*	Khu than	Rubiaceae	T
148	*Hyptianthera stricta Wight & Arn*	Kyetyo	Rubiaceae	ST
149	*Ipomoea alba L.*	Kyahin	Convolvulaceae	C/C
150	*Kaempferia rotunda L.*	Pan gamon	Zingiberaceae	H
151	*Lagerstroemia speciosa L.*	Pyinma	Lythraceae	T
152	*Lagerstroemia tomentosa Presl.*	Leza	Lythraceae	T
153	*Lagerstroemia villosa Wall. Ex Kurz.*	Zaung bale	Lythraceae	T

154	*Lannea coromandelica Merr.*	Na-be	Anacardiaceae	T
155	*Lantana aculeata L.*	Seinnaban	Verbenaceae	S
156	*Lasia spinosa (L.) Thw.*	Za-yit	Araceae	H
157	*Leea macrophylla Roxb.*	Kya-phetgyi	Leeaceae	H
158	*Leucanena leucocephala Lam.*	Aweya	Mimosaceae	T
159	*Leucas cephalotes Spreng.*	Pingu hteik peik	Lamiaceae	S
160	*Litsea glutinosa Lour.*	Ondon	Lauraceae	T
161	*Luffa aegyptiaca Mill.*	Tha but new	Cucurbitaceae	C/C
162	*Macaranga denticulata Muell.Arg*	Phet-wun	Euphorbiaceae	ST
163	*Melanorrhoea usitata Wall.*	Thit-si	Anacardiaceae	T
164	*Microcos paniculata L.*	Mya-ya	Tiliaceae	ST
165	*Mikania micrantha H.B.K*	Bi-zet-new	Asteraceae	C
166	*Millettia pendula Benth.*	Thin win	Fabaceae	T
167	*Mimosa pudica L.*	Hti-ka-yon	Mimosaceae	H
168	*Mimosa rubicaulis Lam.*	Bilatt tikayon	Mimosaceae	H
169	*Mitragyna diversifolia Havil.*	Binga	Rubiaceae	T
170	*Momonoia ripania Lour.*	Fish poision	Euphorbiaceae	S
171	*Mucuna pruriens L.*	Khwe laya	Fabaceae	C
172	*Musa ornata Roxb.*	Taw-nget-pyaw	Musaceae	H
173	*Mussaerda frondosa L.*	Pwintu ywet tu	Rubiaceae	S
174	*Neoalsomitra sarcophylla (Wall.)Hutch*	Kyi-ah	Cucurbitaceae	C
175	*Oldenlandia corymbosa L.*	Hingalar	Rubiaceae	H
176	*Oroxylum indicum L.*	Kaung sha	Bignoniaceae	ST
177	*Paederia lanuginosa Wall.*	E-bok-new	Rubiaceae	C/C
178	*Passiflora foetida L.*	Taw-suka	Passifloraceae	C/C
179	*Pavetta indica L.*	Za-gwepan	Rubiaceae	S
180	*Pentaceae burmanica Kurz.*	Kathi ka	Tiliaceae	T
181	*Phrynium capitatum King ex. Baker*	Taung-sin-phet	Marantaceae	H
182	*Phyllanthus acidus L.*	Thinbaw-zi-phyu	Euphorbiaceae	ST
183	*Phyllanthus maderaspatensis L.*	Taung-zi-phyu	Euphorbiaceae	S
184	*Phyllanthus simplex Retz*	Shit-sha	Euphorbiaceae	S
185	*Platycerium coronarium Desv.*	Staghorn fern	Polypodiaceae	F
186	*Podocarpus neriifolius D.Don*	Thitmin-po	Pondocarpaceae	T
187	*Polyalthia crassa Parker.*	Thabut-thein	Annonaceae	T
188	*Polygonum barbatum L.*	Kywe-lae-chaung	Polygonaceae	H
189	*Polygonum chinese L.*	Maha-gar-kyan-sit	Polygonaceae	H
190	*Polypodium vulgare L.*	Polypody	Polypodiaceae	F
191	*Pterocarpus indicus Willd.*	Padauk	Fabaceae	T
192	*Randia longiflora Lam.*	Kywe-gyo	Rubiaceae	S

193	*Rauvolfia serpentina (L.) Benth.*	Bonme yaza	Apocynaceae	H
194	*Ricinus communis L.*	Kyet-su	Euphorbiaceae	ST
195	*Ruellia tuberosa L.*	Naga-hmaing	Acanthaceae	H
196	*Saccharum spontaneum L.*	Thekke-gyi	Poaceae	G
197	*Samanea saman Merr.*	Ko-kko	Mimosaceae	T
198	*Schrebera swietenioides Roxb.*	Than-thay	Oleaceae	T
199	*Scoparia dulcis L.*	Dan thuka	Scrophulariaceae	H
200	*Sesbania paludosa Roxb.*	Nyan	Fabaceae	S
201	*Shorea obtusa Wall.*	Thit ya	Dipterocarpaceae	T
202	*Shorea siamensis Kurz.*	Ingyin	Dipterocarpaceae	T
203	*Sida acuta Burm*	Ta-byet-si-ywet-chon	Malvaceae	H
204	*Smilax china L.*	Sein-nabaw-gyi	Smilaceae	C/C
205	*Smilax macrophylla Roxb.*	Katcho	Smilaceae	C/C
206	*Smilax perfoliata Lour.*	Sein-nabaw	Smilaceae	C/C
207	*Solanum indicum L.*	Kazaw kha	Solanaceae	S
208	*Spondias dulcis Forst.F.*	Gwe cho	Anacardiaceae	T
209	*Spondias mangifera Willd.*	Gwe	Anacardiaceae	T
210	*Spondias pinnata L.*	Taw gwe	Anacardiaceae	T
211	*Stachytarpheta indica Vahl.*	Aseik-taya	Verbenaceae	H
212	*Stephania discolor Spring.*	Taung -kya	Menispermaceae	C/C
213	*Stephania rounda Lour.*	Taung kya	Menispermaceae	C
214	*Sterculia versicolor Wall.*	Shaw phyu	Sterculiaceae	T
215	*Strychnos nux-vomica L.*	Ka baung	Loganiaceae	T
216	*Synedrella modiflora L.*	Bizat-hpo	Asteraceae	H
217	*Syzygium asimile Thw.*	Thabye	Myrtaceae	T
218	*Syzygium jambos (L.) Alston*	Thabye nyo	Myrtaceae	T
219	*Tectona grandis L.F*	Kyun	Verbenaceae	T
220	*Terminalia arjuna Wight & Arn.*	Tauk kyan	Combretaceae	T
221	*Terminalia bellerica Roxb.*	Thit seint	Combretaceae	T
222	*Terminalia chebula Retz.*	Phan-kha	Combretaceae	T
223	*Terminalia oliveri Brandis*	Than	Combretaceae	T
224	*Tinospora cordifolia Miers.*	Sin-don-ma-new	Menispermaceae	C
225	*Tinospora crispa Miers*	Hku-sang-ma-nwai	Menispermaceae	C
226	*Tinospora nudiflora Kurz.*	Sin-thama-new	Menispermaceae	C
227	*Toddalia asiatica L.*	Shint-ma-tet	Rutaceae	S
228	*Trema orientalis* L.	Kywe sa	Ulmaceae	ST
229	*Tridax procumbens* L.	Coat button	Asteraceae	H
230	*Typhonium trilobatum* L.	Pein	Araceae	H
231	*Tyrsostachys oliveri* Gamble	Thana wa	Poaceae	B

232	*Urena lobata* L.	Kat-si-nae-gyi	Malvaceae	S
233	*Vernonia cinerea* L.	Kadu pyan	Asteraceae	H
234	*Vitis trifolia* L.	Taw-saupyit	Vitaceae	C
235	*Xylia xylocarpa* Roxb.	Pyinkado	Mimosaceae	T
236	*Zehneria umbellata* Thawaites	Kyet-sha	Cucurbitaceae	C/C
237	*Zingiber cassumunar* Roxb.	Meik-tha-lin	Zingiberaceae	H
238	*Ziziphus oenoplia* Mill.	Mauk zi	Rhamanaceae	S/C
239	*Ziziphus rugosa* Lam.	Taw-zi	Rhamanaceae	ST

Table-12: List of plant species (artificial vegetation) found and recorded

No	Scientific Name	Common Name	Family Name	Habit
1	*Albizia lebbek* Benth.	Kokko	Mimosaceae	T
2	*Bambusa wamin* E.G.Camus.	Wamin	Poaceae	B
3	*Cassia siamea* Lam.	Mezali	Caesalpiniacae	T
4	*Codiaeum variegatum* L.	Ywethla	Euphorbiaceae	S
5	*Duranta repens* L.	Bo-kadaw-myet-hkon	Verbenaceae	S
6	*Eucalyptus globulus* Labill.	Eu-ca-lit	Myrtaceae	T
7	*Grevillea robusta* A.Cunn.ex.R.Br.	Khar-daw-hmi	Protaceae	T
8	*Ixora coccinea* L.	Pon-na-yeik	Rubiaceae	S
9	*Livistona jenkinsiana* Griff.	Taung htan	Arecaceae	T
10	*Livistona speciosa* Kurz.	Taw-htan	Arecaceae	T
11	*Mangifera indica* L.	Mango	Anacardiaceae	T
12	*Mimusops elengi* L.	Khaya	Sapotaceae	T
13	*Nerium oleander* L.	New-tha-gee	Apocynaceae	C/C
14	*Plumeria alba* L.	Tayok-saga	Apocynaceae	T
15	*Poinciana regia* Bojer.	Sain-pan	Caesalpiniacae	T
16	*Pterocarpus indicus* Willd.	Padauk	Fabaceae	T
17	*Swietenia macrophylla* King.	Mahogany	Meliaceae	T
18	*Thuja occidentalis* L.	Kyauk-pan-pin	Cupressaceae	ST

T - Tree

ST - Small Tree

H - Herb

S - Shrub

S/C - Shrub/Climber

C - Climber

C/C - Climber/Creeper

B - Bamboo

G - Grass

F - Fern

E - Epiphyte

Figure – 63: *Commelina communis L.*

Figure – 64: *Argostemma khasianum* C.B. Clarke.

Figure – 65: *Passiflora foetida L.*

Figure – 66: *Cassia occidentalis L.*

Figure – 67: *Curcuma roscoeana Wall.*

Figure – 68: *Rauvolfia serpentina (L.) Benth*

Figure-69: ***Begonia roxburghii*** **A.DC**

Figure-70: ***Kaempferia rotunda*** **L.**

Figure-71: ***Euphorbia heterophylla*** **L.**

Figure-72: ***Stachytarpheta indica*** **Vahl**

Figure-73: ***Leea hirta*** **Banks.**

Figure-74: ***Celtis tetrandra*** **Roxb.**

Figure-75: *Terminalia arjuna* Wight & Arn.

Figure-76: *Lagerstroemia speciosa* L.

Figure-77: *Terminalia chebula* Retz.

Figure-78: *Crotalaria sericea* Retz.

Figure-79: *Cycas rumphii* Miq

Figure-80: *Amorphophallus campanulatus* Blume

Figure – 81: ***Lantana camara*** **L.**

Figure – 82: ***Gardenia erythroclada*** **Kurz.**

Abundance/dominance, general pattern

Based on frequency distribution and density the **most** abundant tree in term of number are:

Sterculia versicolor followed by *Chukrasia tabuleris* and *Pterocarpus indicus*.

In small trees *Croton persimilis* dominates others followed by *Grewa rothi*.

The most abundant shrub is *Momonoia ripania* and that is followed by *Crotalaria sericea*.

The most dominant bamboo is *Dandrocalances strictus* followed by *Bambusa burmanica*.

On the top and upper slope of the mountain the family Dipterocarpaceae dominates others while in the lower slope, foot hill and low lying area member of the family Euphorbiaceae dominated all others.

Rare, endangered and vulnerable species

On the whole big trees were very rare. Big trees with GBH (Girth at Breast Height) of 300cm represented less than 1% of the whole study area. Those large trees were indeed trees that were neglected by loggers due to very low quality wood. Trees of quality timber such as *Tectora grandis* and *Xylia xylocarpus* remained only as small trees, inconspicuous and were rare.

14 species of trees were in the IUCN Red list, as Endangered (EN), Vulnerable (VU) and

Least Concern (LC). They were as follows:

Gentiana kurroo (EN); *Ptercarpus indicus* (VU); *Adiantum capilla-nanoris, Bauhimia ornata Curcuma ornata,* C *roceoni, Delbergia rimosa Dendrocalamus gigantenea, Dipterocorpus tuberculatus, Homonoie riparia, Mimosa pudica, Podocerpus nerlifolium, Saccharum spontaneum* and *Shorea obtusa* (LC).

The Ret List (IUCN Status) was actually for the global perspective. In this area *P. indicus* (VU) and the LC, namely, *B. ornata, D. rimosa, D. gigantenia D. tuberculatus, M. pudica, S. obtusa* were still common in the area.

No tangible way to tackle this issue given the fact that the forest will be gone after two or three decades of mining/quarry activities. The pragmatic way is reforestation/revegetation after the project, which will make the area green again. But the original ecology and biodiversity will never be the same again because the rehabilitated forest will be just plantation forest.

Species of economic and health/nutritious values

There were trees of economic importance, particularly for the extraction of timber. But all big trees, with the exception of trees with very low quality wood were gone. Only small trees of quality wood remained. There were still a very few isolated trees of medium wood quality, especially those of the Dipterocarpaceae family.

This secondary vegetation still provided fuel wood for the villagers.

Medicinal plants still existed in this secondary forest but were not economically viable due to the scarcity of the plants. Rudimentary bamboo thickets and rattan could be still found here and there; all were stunt. For quality bamboo and rattan the locals have to go upstream in the jungle.

Mushrooms and bamboo shoots were still available during the rainy season. These were collected either for household consumption or for sale.

The impact of the project on the biodiversity particularly vegetation will be significant indeed. This together with mitigation measures to be put in place is mentioned later in **Chapter-6.**

5.6.2 Fauna species

5.6.2.1 Avian fauna (birds)

The survey work on avian fauna lasted for 9 days, from 11-7-2015 to 19-7-2015.

Methodology in brief

To survey the whole area evenly and to get a good section of the area surveyed 4 transect lines and 19 points were designated. These were laid down or set up basically at two different areas, one on the slope and one on the foot hill.

Transect A. - Along the slope from N to S and then turned to West when the line ended at a cliff. Five points were designated along this transect line.

Transect B. - From West to East and then North, due to topography constraint, along one limestone ridge. Seven points were designated along this line.

Transect C. - From West to East, up the mountain. Four points were marked along the line.

Transect D. - In the foot hill and low lying area generally in N to S direction. Three points were designated along this line.

The survey work was carried out from 07:30 hours till dark, with only one recess for lunch.

Table-13: Location and forest type of study areas

Transect no.	Point	Coordinate	Altitude (m)
A	1	N 20° 47' 41.7" E 96° 24' 46.1"	645
	2	N 20° 47' 46.6" E 96° 24' 50.9"	741
	3	N 20° 48' 05.6" E 96° 24' 57.1"	804
	4	N 20° 48' 23.6" E 96° 24' 46.1"	742
	5	N 20° 48' 28.9" E 96° 24' 29.9"	468
B	1	N 20° 47' 34.6" E 96° 24' 53.3"	326
	2	N 20° 47' 54.1" E 96° 25' 06.9"	786
	3	N 20° 47' 48.0" E 96° 25' 29.0"	906
	4	N 20° 47' 53.4" E 96° 25' 41.5"	866
	5	N 20° 48' 08.2" E 96° 26' 02.1"	593
	6	N 20° 48' 30.5" E 96° 26' 28.8"	349
	7	N 20° 48' 53.4" E 96° 26' 27.4"	275
C	1	N 20° 47' 04.7" E 96° 24' 30.4"	469
	2	N 20° 47' 04.5" E 96° 24' 43.2"	647
	3	N 20° 46' 58.4" E 96° 24' 48.8"	727
	4	N 20° 46' 59.3" E 96° 24' 15.6"	371
D	1	N 20° 48' 29.1" E 96° 24' 13.4"	323
	2	N 20° 48' 03.2" E 96° 24' 10.2"	298
	3	N 20° 47' 52.0" E 96° 23' 48.2"	283

Diversity

A total of 70 species of avian fauna (birds) belonging to 37 families were found, identified and recorded. Checklist of birds recorded was shown in **Table-14**.

Table-14: List of birds found and recorded

No.	Family name & Common name	*Scientific name*
	PHASIANIDAE: PERDICINAE Partridges, francolins	
1	Chinese Francolin	*Francolinus pintadeanu*
	PHASIANIDAE: PHASIANINAE: Pheasants & junglefowl	
2	Red Junglefowl	*Gallus gallus*
	FALCONIDAE: ACCIPITRINAE: Hawks, eagles & allies	
3	Crested Serpent-Eagle	*Spilornis cheela*
4	Besra	*Accipiter virgatus*
	TURNICIDAE: Buttonquails	
5	Barred Buttonquail	*Turnix suscitator*
	COLUMBIDAE: COLUMBINAE: Typical pigeons & doves	
6	Spotted Dove	*Streptopelia chinensis*
	CUCULIDAE: CUCULINAE: Old World cucukoos	
7	**Drongo Cuckoo**	Surniculus lugubris
	CUCULIDAE: PHAENICOPHAEINAE: Malkohas & allies	
8	**Green-billed Malkoha**	Rhopodytes tristis
	CUCULIDAE: CENTROPODINAE: Coucals	
9	**Greater Coucal**	Centropus sinensis
	STRIGIDAE: Typical owls	
10	**Collared Scops-Owl**	Otus lettia
11	**Asian Barred Owlet**	Glaucidium cuculoides
	APODIAE: APODINAE: Typical swifts	
12	**Himalayan Swiftlet**	Aerodramus brevirostris
13	**Asian Palm-Swift**	Cypsiurus balas
	APODIDAE: HEMIPROCNINAE: Treeswifts	
14	**Crested Treeswift**	Hemiprocne coronata
	CORACIIDAE: Rollers	
15	**Indian Roller**	Coracias benghalensis
16	**Dollarbird**	Eurystomus orientalis
	ALCEDINIDAE: HELCYONINAE: Larger kingfishers	
17	**White-throated Kingfisher**	Halcyon smyrnensis
	MEROPIDAE: Bee-eaters	
18	**Blue-bearded Bee-eater**	Nyctyornis athertoni
19	**Little Green Bee-eater**	Merops orientalis
20	**Chestnut-headed Bee-eater**	Mecops leschenaulti
	UPUPIDAE: Hoopoes	
21	**Common Hoopoe**	Upupa epops
	BUCEROTIDAE: Hornbills	
22	**Oriental Pied Hornbill**	Anthracoceros albirostris

	RAMPHASTIDAE: MEGALAIMINAE: Asian barbets	
23	**Lineated Barbet**	Megalaima lineata
24	**Coppersmith Barbet**	Megalaima haemaccephala
	PICIDAE: PICINAE: Typical woodpeckers	
25	**Greater Flameback**	Chrysocolaptes lucidus
	PITTIDAE: Pittas	
26	**Hooded Pitta**	Pitta sordida
27	**Blue-winged Pitta**	Pitta moluccensis
	ORIOLIDAE: Orioles & allies	
28	**Black-hooded Oriole**	Oriolus xanthornus
	ARTAMIDAE: Woodswallows	
29	**Ashy Woodswallow**	Artamus fuscus
	GENERA INCERTAE SEDIS: Woodshdrikes, flycatcher-shrikes	
30	**Bar-winged Flycatcher-Shrike**	Hemipus picatus
	AEGITHINIDAE: Ioras	
31	**Common Iora**	Aegithina tiphia
	DICRURIDAE: Drongos	
32	**Black Drongo**	Dicrurus macrocercus
33	**Ashy Drongo**	Dicrurus leucophaeus
34	**Greater Racket-tailed Drongo**	Dicrurus paradiseus
	MONARCHIDAE: Monarchs, paradise-flycatchers & allies	
35	**Black-nape Monarch**	Hypothymis azurea
	CORVIDAE: Crows, nutcrackers, magpies, jays, treepies & allies	
36	**Red-billed Blue Magpie**	Urocissa erythrorhyncha
37	**Rufous Treepie**	Dendrocitta vagabunda
	LANIIDAE: Shrikes	
38	**Long-tailed Shrike**	Lanius schach
	NECTARINIIDAE: Sunbirds & spinderhunters	
39	**Olive-backed Sunbird**	Cinnyris jugularis
40	**Ruby-cheeked Sunbird**	Chalcoparia singalensis
	DICAEIDAE: Flowerpeckers	
41	**Scarlet-backed Flowerpecker**	Dicaeum cruentatum
	CHLOROPSEIDAE: Leafbirds	
42	**Blue-winged Leafbird**	Chloropsis cochinchinesis
43	**Golden-fronted Leafbird**	Chloropsis aurifrons
	ESTRILDIDAE: LONCHURINAE: Java Sparrow, munias,	
44	**White-rumped Munia**	Lonchura striata
45	**Scaly-breasted Munia**	Lonchura punctulata
	PASSERIDAE: Sparrows & allies	
46	**Eurasian Tree-Sparrow**	Passer montanus

	SITTIDAE: Nuthatches	
47	**Velvet-fornted Nuthatch**	Sitta frontalis
	STURNIDAE: STURNINAE: Mynas, starlings & allies	
48	**Jungle Myna**	Acridotheres fuscus
	MUSCICAPIDAE: SAXICOLINAE: Shortwings, robins, redstarts,	
49	**Pied Bushchat**	Saxicola caprata
	MUSCICAPIDAE: MUSCICAPINAE: Old World flycatchers & allies	
50	**Blue-throated Flycatcher**	Cyornis rubeculoides
51	**Oriental Magpie-Robin**	Copsychus saularis
52	**White-rumped Shama**	Copsychus malabaricus
	PARIDAE: Typical tits	
53	**Sultan Tit**	Melanochlora sultanea
	PYCNONOTIDAE: Bulbuls	
54	**Black-crested Bulbul**	Pycnonotus flaviventris
55	**Streak-eared Bulbul**	Pycnonotus blanfordi
56	**Red-whiskered Bulbul**	Pycnonotus jocosus
57	**Red-vented Bulbul**	Pycnonotus cafer
	HIRUNDINIDAE: HIRUNDININAE: Martins, swallows & allies	
58	**Striated Swallow**	Cecropis striolata
	CETTIIDAE: Abroscopus warblers, Mountain Tailorbird,	
59	**Yellow-bellied Warbler**	Abroscopus superciliaris
	TIMALIIDAE: Babblers	
60	**Yellow-eyed Babbler**	Chrysomma sinense
61	**Brown-cheeked Fulvetta**	Alcippe poioicephala
62	**White-browed Scimitar-Babbler**	Pomatorhinus schisticeps
63	**Pin-Striped Tit-Babbler**	Macronus gularis
64	**Chestnut-capped Babbler**	Timalia pileata
65	**Puff-throated Babbler**	Pellorneum ruficeps
66	**White-crested Laughingthrush**	Garrulax leucolophus
67	**Lesser Necklaced Laughingthrush**	Garrulax monileger
	CISTICOLIDAE: Cisticolas, tailorbirds, prinias & allies	
68	**Dark-necked Tailorbird**	Orthotomus atrogularis
69	**Common Tailordbird**	Orthotomus sutorius
70	**Grey-breasted Prinia**	Prinia hodgsonii

In term of diversity the family Tamallidae dominated all other families and was represented by 8 species. That was followed by the family Pycnodontidae with 4 species and then Muscicapididae, Dicruridae, and Menopidae with 3 species each. The remaining 32 families were represented by only 1 – 2 species each.

Figure – 83: ***Glaucidium cuculoides***

Figure – 84: ***Chloropsis cochinchinesis***

Figure – 85: ***Pomatorhinus schisticeps***

Figure – 86: ***Nyctyornis athertoni***

Figure – 87: ***Spilornis cheela***

Figure – 88: ***Pitta moluccensis***

Distribution, abundance/dominance

Generally there were more birds in the foot hill, along the bank, the bamboo thickets and plantation that were in low altitude area. 63% of the individual birds were found, here, while 37% were found on the slope, higher altitude area. Exceptional cases: birds of various species aggregated on trees on either altitude which bore fruit for the birds.

One remarkable, mini-distribution pattern was that the yellow bird warbler, the black nape monarch and the white crested laughing birds were found plentifully at high altitude area but not on the foothill and plain.

All the birds found were commonly found species; tree birds and forest birds. No endemic species were found. Migratory birds from faraway places were also not found. (Actually this was not a migration season for birds.)

The common house sparrow, *Passer domesticus,* so common in most part of Myanmar was not found.

With the exception of the jungle fowl, *Gallus gallus* whose habitat was on land all other birds were tree-dwellers. Swiftlets and swallows could be termed aerial birds spending most of their time flying around.

In term of abundance and dominance the grey breasted prinia was the dominant species (30 individuals were found). That was followed by the three species of bulbul, namely, the streak ear bulbul, the red vented bulbul and the black-crested bulbul, together with coppersmith barbet with 20 individual each. These three bulbul species and the coppersmith barbets were the second dominant species. The third dominant species were, the striated swallow, the pin-striped tit-babler, the spotted dove and the green bee-eaters represented by 15 individual each. The Himalayan swiftlet, the scaly breasted munia, the yellow bird warbler and the common tailored bird were rather plentiful. The Asian plain swiftlet, the black nape monarch and the crested laughing thrush were common.

The remaining species were rare to very rare. This was the generalized picture for the whole study area. As regards the high elevation area the pin-striped tit-babbler (which is also abundant in low land area) dominated all others. That was followed by the yellow bird warbler, and then the white crested laughing thrust which were absent at the foot hill and plain.

The remaining species shown in the table were rare to very rare.

Rare and endangered species

The large oriented Pied Hornbill, *Anthracoceros albriostris* was known to inhabit or temporarily migrating into this area.

As mentioned earlier, all the species found were common species. None of them were included in the IUCN Ret List.

The area was not in the designated Important Birds Area (IBA) or Protected Areas System (PAS) of Myanmar. There was no lake or wetland nearby which acted as birds sanctuary or area where birds aggregated.

Species of economic and health/nutritious values

The jungle fowl *Gallus gallus* was priced as food for its meat and exploited. But very few were found. There were no bird hunters or trappers.

Doves and barbets were also priced for their meat. In fact the local people consumed any available birds, big and small.

There was no illegal trading of birds to Thailand such as the cases of red vented bulbul, streak ear bulbul and spotted dove which took place in Kayin and Mon states particularly, at the border area.

The inevitable destruction of the forest due to the project would affect the avian fauna to a certain extent. But unlike land animals birds are very mobile and could fly away easily to other suitable habitats. The area is not isolated but contiguous with thick jungle upstream.

5.6.2.2 Herpetofauna (Amphibian and reptiles)

The survey work for herpetofauna lasted for 9 days, from 11-7-2015 to 19-7-2015.

Methodology in brief

As the habitats of amphibian and reptiles on the whole are site specific, for instance, water pools, shady and moist area, under litters detail study was focused on these micro-habitats or niches.

The survey work mainly involved walking and visual inspection. No traps or snares were used. Surveys were carried out twice a day; one during day time and the other one during night. Virtually all amphibians are nocturnal and many reptiles are also nocturnal in habits. They are more active at night and the chance for encounter is much higher. The animals were captured with specially modified stakes, net and scoops. Small rubber rings were also used to shoot at small reptile (lizards and skinks) and small amphibian (frog). The idea was not to kill the small animals but only to daze them by shooting at the head. With the exception of a few to be killed and preserved in formalin or alcohol for later detail study, most were released after observation and recording. The study involved the morphometric characters: - size, shape, pattern of spots, stripes, colour, and bodyweight and body length. The measurement of length included total length, head, length and width, snout vent length, tail length, scales and scales row (for reptiles). For amphibian the more or less same methods was applied (care has to be taken when handling dazed snakes).

Diversity

A total of 17 species of herpetofauna belonging to 8 families were found, identified and recorded. 12 species were reptiles while 5 species were amphibian (all frogs but no toad). Of the 12 species of reptiles 7 were lizards and skinks while 5 were snakes (no venomous snakes were found). The species recorded were shown in **Table-15**.

Table-15: List of herpetofauna found and recorded

No.	Family Name	Scientific Name	Common Name	IUCN
1	Dicroglossidae	*Fejervarya limnocharis*	Paddy Frog	LC
2		*Limnonectes kuhlii*	Broad-headed Frog	
3	Microhylidae	*Microhyla pulchra*	Marbled Narrow-mouthed Frog	
4	Rhacophoridae	*Polypedates lecomystax*	White-lipped Treefrog	LC
5		*Chirixalus doriae*	Double-spotted Whipping Treefrog	LC
6	Agamidae	*Calotes veriscolor*	Garden Fence Lizard	
7		*Calotes mystaceus*	Blue Forest Lizard	
8	Gekkonidae	*Gekko gecko*	Tokay Gecko	
9		*Hemidactylus frenatus*	House Gecko	
10		*Hemidactylus garnotii*	Garnot's House Gecko	
11	Scincidae	*Eutropis macularia*	Little Ground Skink	
12		*Sphenomorphus maculatus*	Dark-sided Forest Skink	
13	Colubridae	*Boiga orchracea*	Tawny Cat Snake	
14		*Chrysopelea ornata*	Ornate Flying snake	LC
15		*Dendrelaphis pictus*	Painted Bronzeback Tree Snake	
16		*Orthriophis taeniurus*	Cave Racer	
17	Typhlopidae	*Ramphotyphlop braminus*	Brahminy Blind Snake	

In term of species diversity and species composition (family wise), the reptile family Colubridae dominated all other herpetofauna. That was followed by the gecko family, Gekkonidae and the frog family, Dicroglosidae. Colubridae was represented by 4 species, Gekkonidae and Dicroglosidae, by 3 species each. The remaining 5 families were either represented by two or one species each.

Figure – 89: ***Polypedates leucomystax***

Figure – 90: ***Microhyla pulchra***

Figure – 91: ***Calotes mystaceus***

Figure – 92: ***Eutropis macularia***

Figure – 93: ***Boiga orchracea***

Figure – 94: ***Chrysopelea ornata***

Figure – 95: ***Orthriophis taeniurus***

Figure – 96: ***Ramphotyphlop braminus***

Distribution, abundance/dominance

Generally there were more herpetofauna in the foot hill and lower plain than on the slope and higher elevation although the forest was generally greener at higher elevation.

With the exception of tree frog all other frog species concentrated in the low altitude area especially near the stream. One species of frog, *Limnonectes kuhlii* had specific micro-habitat or niche. It was found only around a small pool at the higher elevation. The skinks were also more numerous in the foot hill and low plain. The lizards were rather evenly distributed but the geckos and house lizards were mostly found in and around the village. The snakes were also rather evenly distributed. That was just the generalized picture; actually all were mostly found in their specific micro-habitat, or niches mentioned above, regardless of the elevation.

In term of individual number for frog the species *Polypedates leucomystax* dominated all others followed by *Microphyla pulchra* and *Chirixalus doriae*.

As for lizards the species *Calotes versicolor* was very common while *Hemidactylus frenatus* was fairly common. In the case of skinks *Eutropis macularia* were common while others were rare.

Snakes on the whole were rare.

Most herpetofauna were encountered only during night time surrey, especially during a moonless night.

Rare and endangered species

According the IUCN Red List (2017) 4 species were listed as Least Concern (LC). They were two species of frogs, the paddy frog *Fejervarya limnocharis;* the common tree frog, *Polypedates leucomystax,* and the lizard *C. versicolor* and the flying snake *C. ornata*.

The big lizard, the water monitor lizard *Varanus* sp was known from this area; but was not found during this survey.

Species of economic and health/nutritious values

The big water monitor lizard was priced a food for its meat and most of all its eggs which could catch a very high price. But this species was probably depleted due to exploitation.

The local people consumed the meat of snake if it is available. However there were no villagers hunting for snakes as in the neighbouring country, Thailand. There was also no illegal trading of snakes for export to China, taking place in this area.

5.6.2.3 Mammalian fauna

The survey work for mammalian fauna lasted for 9 days, from 11-7-2015 to 19-7-2015.

Methodology in brief

As the wildlife was very rare and the chance for encounter was exceedingly low no systematic transect line, plots and points were designated.

The survey work mainly involved prowling stealthily in the forest looking for mammals. It was a direct intensive search carrying out day and night. Night time survey was more important for large mammals on ground. Day time survey was good for small tree dwelling mammals, such as squirrels. Photographs were taken whenever possible. Focus was also made at expected spot, such as in the valley with luxuriant grass; at spring where mammals were supposed to came and drink water in the afternoon; and at the foot of certain trees which bear fruits, supposed to be eaten by mammals during night time and also in well-shaded spot and undergrowth where the animals were supposed to rest.

The survey method also involved searching for tell-tale signs or evidences such as new or fresh scats, foot prints, scratches, tracks and trails etc. Scats and foot prints are specific and so the animal could be identified quite correctly based on these two evidences.

Another main work was gathering information from hunters (who were very few indeed) and also from old and retired hunters. That was simply gathering secondary data, and looking for recently acquired trophies (horns), leathers and other body parts of the wild animals, if any.

Diversity

A total of 14 species of mammals including those actually found (primary data) and those gathered from the information (secondary data), were recorded. They belong to 12 families under 6 orders.

The families were Tupaiidae under Order Scandentia; Families Lorisidae and Cercopithecidae under the Order Primates; Families Viverridae, Herpestidae and Felidae under the Order Carnivora; Families Suidae, Ceridae and Bovidae under the Order Atriodactyla; Families Sciuridae, and Muridae under the order Rodentia and Family Leporidae under the order Logomorpha.

The list of mammal species recorded for the area was shown in **Table-16** together with the mode of recording, whether from actual sighting or from information (secondary source).

Table-16: List of mammals found and recorded

Sr. no.	Order	Family	Common Name	Scientific Name	IUCNRedlist	CITES	Type of evidence	Track&Sign	Information	Bodypart
1	Scandentia	Tupaiidae	Northern Tree shre w	*Tupaia belangeri*			sighting	√		
2	Primates	Lorisidae	Slow Loris	*Nycticebus coucang*	VU		information		√	
3		Cercopithecidae	Rhesus Macaque	*Macaca mulatta*	LC		information		√	
4	Carnivora	Viverridae	Common Palm Civet	*Paradoxurus hermaphrodites*		III	information		√	
5		Herpestidae	Small Asian Mogoose	*Herpestes javanicus*			information		√	
6		Felidae	Leopard Cat	*Prionailurus bengalensis*	LC		information		√	
7	Atriodactyla	Suidae	Eurasian Wild Pig	*Susscrofa*	LC		footprint, scats, information	√	√	
8		Cervidae	Red Muntjac	*Muntiacusmuntjak*	LC		information, sighting	√	√	
9		Bovidae	Southern Serow	*Capricornis sumatraensis*	VU		information		√	
10	Rodentia	Sciuridae	Phayre's Squirrel	*Callosciurus phayrei*	LC		sighting	√		
11			Variable Squirrel	*Callosciurus finlaysonii*			sighting	√		
12		Muridae	House Rat	*Rattus rattus*			sighting	√		
13			White-bellied Rat	*Niviventer fulvescens*	LC		sighting	√		
14	Lagomorpha	Leporidae	Siamese Hare	*Lepus peguensis*			scat, information	√	√	

Of the 14 species recorded only 6 species were actually found during the survey trip. All these were small mammals: rats and squirrels while running or moving (only at a glance). With the exception of the red muntjac, which was spotted at night, all large mammals recorded were from secondary source (data).

The Eurasian wild pig and the Siamese hare had their fresh foot prints and scats remained as evidence and for identification.

Figure – 97: *Niviventer fulvescens*

Distribution, abundance/ dominance

Since very few animals, both in species (biodiversity) and numbers (bio-mass) were found it was not practical to consider their distribution, abundance and dominance.

Small mammals such as squirrels and forest rats which are still quite common have different distribution patterns and habitats. Squirrels are tree dwellers living on trees either among the leaves or small branchy or either in nests (especially for nursing mothers and litters).

As for the large mammal found (the red muntjac) and other two that have their tell-tale evidences left (wild pig and hare) this forest was no longer their true habitat, but just a place for foraging for food at night.

Rare and endangered species

With the exception of squirrels (especially Phayre's squirrel) and rats all other relatively large to large animals were rare to very rare (even no longer exist in the area, it is learnt).

As regard status of species conservation of IUCN the slow loris, *Nycticebus coucang* and the Southern serow *Capriconis sumatraensis* were list as Vulnerable (VU) in IUCN Ret List (2015). Those listed in the Red List as Least Concern (LC) were: the Rhesus macaque, *Macaca mullato;* Leopard Cat, *Prionailurus bengalensis;* Eurasian wild pig, *Sus scrofa;* red muntjac, *Muntiacus vnuntjak;* Phayre's squirrel, *Callosciurus phayrei* and the white bellied rat, *Niviventer fulvescens*.

The common palm civet, *Paradoxurus hermaphrodites* was listed in CITES (2017) List because of the trading of the animal for its meat and hide.

The above mentioned facts were just the generalized global perspective. The reality here was more serious than the IUCN's VU and LC and CITES index. Most species were threatened or endangered and some were already depleted in this area.

From the information gathered from old hunterss and knowledgeable villagers it was learnt that up to a decade ago (when the forest was already degraded to large extent) there were a variety of wild animals such as pangolin, porcupines, monitor lizard, monkey, gibbon, macaque, mongoose, other civets, wild pig, muntjac, samber, flying fox and even bear. Virtually all these animals no longer exist in this area. Only on rare occassions a few entered the area at night foraging for food temporarily

Species of economic and health/nutritious values

Hunting or trapping was once carried out by a few hunters and trapper. Today only one or two part time hunters remained, who on rare occasion hunted small animals. This was done just for household consumption or sometime for supplementing the meager income. It was no longer practical to eke out a living by hunting alone. For most of the time the hunter had to involve in doing available odd jobs. There was no illegal trading of wild animals for export to China, given the scarcity of these animals.

5.6.2.4 Aquatic organisms

Only plankton and fish were studied.(no prawn and also no aquatic angiosperm plants or hydrophytes present; typical of fast flowing mountain stream). Aquatic survey was carried out from 12-7-2015 to 15-7-2015 including a survey trip to the fish market at North Pyi Nyaung village.

Methodology in brief and main parameters measured

Plankton study was made for basic aquatic taxonomy and ecology. Fish study was for icthyological and fisheries resource study.

Plankton

A plankton collecting station (point) was designated in the stream near the proposed site. Plankton were collected with a standard plankton net. Plankton were preserved in 4% formaldehyde solution for detail microscopic later in Yangon.

Coordinates - N. Lat 20° 47' 0.2"; E. long 96° 23' 56.3"; elevation 113m asl

Fish

The information on fish is only from secondary information from the villagers.

In order to know the ichthyological condition and fishery status of the area a survey visit to the fish market at North Pyi Nyaung village (the larger village) was made. Most of the fish at the market were either marine or brackish water fish that come from Yangon. A few fresh water fish were all cultured species that also come from Yangon. There was no substantial fishery in the region.

Diversity

a) Plankton

A total of 66 species/taxa of plankton were found, identified and recorded. They were 45 species of phytoplankton and 21 species/taxa of zooplankton, including insect larvae.

The list of plankton/taxa was shown in **Table-17**.

Table-17: List of plankton species/taxa from Myit Thar stream

Sr. No	Species/taxa	Remark
	Phytoplankton	
	(i) Diatom	
1.	*Cyclotella striata*	
2.	*Cymbella ventricosa*	
3.	*Diatoma elongatum*	
4.	*D. vulgarae*	
5.	*Eunotia gracilis*	

6.	*Fragillaria capucina*	
7.	*F. Crotonesis*	
8.	*Gomphonema constrictum*	
9.	*Gyrosigma balticum*	
10.	*Melosira italic*	
11.	*Navicula cari*	
12.	*N. gracilis*	
13.	*N. lanceolata*	
14.	*N. viridis*	
15.	*Nitzschia amphibian*	
16.	*N. gracilis*	
17.	*N. longissima*	
18.	*N. scalaris*	
19.	*N. sigma*	
20.	*Pleurosigma elongatum*	
21.	*P. tasciola*	
22.	*P. intermedium*	
23.	*Rhopalodia gibberula*	
24.	*Surirella robusta*	
25.	*Synedra affinis*	
26.	*S. tbulata*	
27.	*S. ulna*	
	(ii) Blue green algae	
28.	*Microcystis incerta*	
29.	*Oscillatoria curviceps*	Mostly short trichome due to rapid stream
30.	*O. Formosa*	Mostly short trichome due to rapid stream
31.	*O. limosa*	Mostly short trichome due to rapid stream
32.	*O. subbrevis*	Mostly short trichome due to rapid stream
	(iii) Green algae	
33.	*Ankistrodesmus falcatus*	
34.	*Closterium ehrenbergi*	
35.	*Cosmarium botrytis*	
36.	*Microspora sp*	
37.	*Mougeotia japonica*	Vegetative phase only
38.	*M. scalaris*	Vegetative phase only
39.	*Rhizoclorium hieroglyphiceum*	
40.	*Spirogyra ahmedabadensi*	Vegetative phase only
41.	*S. biformis*	Vegetative phase only
42.	*S. setiformis*	Vegetative phase only
43.	*S. verruculosa*	Vegetative phase only
	(iv) Dinoflagellates	
44.	*Ceratium hirundenella*	
45.	*Glenodinium sp*	

	Zooplankton	
	(i) Protozoa	
46.	*Centropyxis ecornis*	
47.	*Cryptodifflugia sp*	
48.	*Difflugia corona*	
49.	*D. globulosa*	
50.	*Heleopora sp*	
51.	*Holophrya sp*	
52.	*Plagiopyxis sp*	
53.	Unidentified testacid protozoan	Unidentified
	(ii) Nematoda	
54.	Unidentified mematode	Unidentified
	(iii) Rotifera	
55.	*Brachionus caudatus*	
56.	*Brachionus sp*	
57.	*Keratella vulga*	
	(iv) Crustacea	
58.	*Ceriodaphnia sp*	
59.	*Cyclops spp*	
60.	*Diaphanosoma brachyurum*	
61.	Nauplii of copepods	Nauplius larvae; unidentified
	(v) Insecta	
62.	Alderfly larvae (Megaloptera)	Identified only to order level
63.	Mayfly larvae (Ephemenoptera)	Identified only to order level
64.	Ripple beatle larvae (Coleoptera)	Identified only to order level
65.	Stone fly larvae (Plecoptera)	Identified only to order level
66.	Unidentified insect larvae	Unidentified (probably two orders)

Regarding the percentage composition of taxonomic groups of the plankton the result revealed that:

- among phytoplankton 60% were diatom; 24% were green algae; 11% were blue green algae while the remaining 5% ,dinoflagellates
- among zooplankton 38% were protozoan; 23% were insect larvae; 19% were crustacean; 14% were rotifers and 6% were nematodes

Distribution, abundance/dominance

The very shallow (less than 1m depth) and rapid water did not favour the stratification of water into upper layer (epilimnion) and lower layer (hypolimnion) that could lead to different mini-distribution pattern. The fast flowing water (lotic water) influences all the aquatic organisms into a homogenous lotic water environment (all are lotic water species).

There were no stagnant pools or slow moving whirlpools, big and small in the vicinity; no lentic water environment which could act as mini-habitat for lentic water species.

In term of abundance (number) the unicellular diatoms exceedingly dominated all others. The individual cells of species under the genera *Navicula* and *Nitzschia* were the most abundant; followed by individual number of species under the genera *Surirella, Frgillaria* and *Synedra.*

In the filamentous algae, individual of species under the green alga *Spirogyra* dominated all other followed by species under another green alga *Mougeotia,* and the individuals of species under the blue green alga *Oscillatoria*.

Rare and endangered species

Blue green algae very commonly found in fresh water environment in Myanmar were rare in this lotic water environment.

Dinoflagellates were very rare.

The phytoplankton and zooplankton were not yet included in the IUCN Ret list (probably due to small size and not easily recognizable).

Species of economic and health/nutritious values

Fresh water plankton are not utilized as food in Myanmar (only certain marine plankton species, were utilized, especially macro and megalo-zooplankton species).

b) Fish

Diversity

The diversity was very low. Only six species were recorded (the data of one species, *Ompok bimaculata* was obtained from secondary source).

Species list was shown in **Table-18**.

Table-18: Species list of fish recorded from the Myit Thar stream, in the study area

No	Order	Family	Species	Common name	Local name
1.	Beloniformes	Belonidae	*Xenotodon cancilla*	Freshwater gar fish	Nga-paung-yoe
2.	Channiformes	Channidae	*Channa orientalis*	Burmese snake head	Nga-yant-gaung toe
3.	Cypriniformes	Cyprinidae	*Barbus ruber*	Red tailed cyprinid	Nga-mee-ni
4.	Cypriniformes	Cyprinidae	*Barbus sp*	-	Nga-khone-me
5.	Cypriniformes	Cobitidae	*Botia histrionia*	Burmese sand eel	Nga-tha-lei-doe
6.	Siluriformes	Suliridae	*Ompok bimaculata*	Butter catfish	Nga-nu-thann

All the fish were small fish and were smaller than the average sizes (fish in isolated stream tend to be larger in size; but not here).

Fish were scare due to the pollution of the stream caused by illegal gold mining taking place in the upstream, it was learnt.

It was not possible to study the abundance/dominance of the fish in the stream due to the scarcity of these aquatic animals.

All the six species were hardy to very hardy species and could thrive in any fresh water environment provided it was not too polluted. *Channa ovientalis* was the hardiest species of all.

Rare and Endangered species

None of these fish were in the IUCN Red List.

Species of economic and health/nutritious values

All were edible fish and consumed by the local community. The locals caught the fish just occasionally for household consumption only or in a few cases for supplementing their meagre incomes. Due to scarcity of fish no villager could eke out a living as a fisherman; he has to do other odd jobs for survival. Myit Thar stream could not support even a small scale subsistence fishery and the condition become worse due to severe pollution by illegal gold mining in the upstream area.

5.7 Infrastructure and services of the area

Before the establishment of the two cement factories in the area Taung Pyi Nyaung village is accessible only by railway (there is the small Taung Pyi Nyaung railway station). The village was then connected with North Pyi Nyaung village, 2 miles away in the north, by only a trail or footpath. Thank to the access roads constructed by both Max Myanmar Cement Company and Highland Cement Company the village is now also easily accessible by cars. (The villagers now mostly used this motor road rather than the railway as trains are very few and far between; only 3 up and 3 down train a day.) Many households have access to electricity, provided by the companies. (Houses are widely scattered on rugged terrain and so not practical to provide electricity for all households yet.) As in the cases of most rural village them are no public water systems, water is sourced from shallow wells.

The infrastructure and services for 5 villages, namely, South Pyi Nyaung (Ya-htar), North Pyi Nyaung (Carr), Lei Sa Pin, Oak-kyin and Mong-pin are summarized in the following tabulated form.

Table-19: Data on infrastructure and services of 5 villages

Sr. No.	Infrastructure and services data	Villages				
		South Pyi Nyaung	North Pyi Nyaung	Lei Sa Pin	Oak-kyin	Mong-Pin
1.	Accessibility Motor road	√	√	√	√	√
	Railway	√	-	-	-	-
2.	Access to gridline electricity	10% of house hold along the transmission line	90% of households	×	50% of households	70% (solar)
3.	Education School	Post primary	High School	×	×	Affiliated Middle School
	Number of students/teachers	108/8	28	×	×	288/14
4.	Health facilities Clinic	×	√	×	×	×
5.	Village library	×	√	×	×	×
6.	Government building and public building	Rail way station	×	×	×	×

5.8 Socio-economic components of the surrounding environment

The generalized incomes and livelihoods of the villagers of South Pyi Nyang, North Pyi Nyaung, Lei Sapin, Oak-Kyin and Mong-pin are as follows.

Table-20: Data on basic socio-economic aspects of 5 villages

Sr. No.	Socio-economic aspects/parameters	Villages				
		South Pyi Nyaung	North Pyi Nyaung	Lei Sa Pin	Oak-kyin	Mong-Pin
1.	Population	700	2990	230	615	300
	Male	344	1488	112	302	153
	Female	356	1502	118	313	147
2.	Religion (%) Buddhist	100%	100%	100%	100%	100%
	Christian	-	-	-	-	-
	Other etc	-	-	-	-	-

3	Ethnicity					
	Bamar	100%	100%	100%	100%	100%
	Kayin	-	-	-	-	-
	Shan	-	-	-	-	-
	Others etc	-	-	-	-	-
4.	Education status					
	Lateracy rate (adults)	82%	85%	78%	74%	72%
5.	Living condition					
	Wooden house	99	585	45	88	48
	Brick house	1	30	1	3	-
	Wood/ brick house	29	25	1	5	6
	Two storey house (brick)	-	15	-	2	6
	Bamboo house	1	35	3	2	-
6.	Material possession					
	Car (Nos.)	1 sedan	10 sedan	-	5 sedan	1 sedan
		5 trucks	50 trucks	4 trucks	8 trucks	11 trucks
	Motorcycle (%)	100%	100%	30%	90%	95%
	Television set (%)	30%	90%	2%	90%	70%
	Hand phone	80%	100%	100%	80%	100%

* From visual inspection and KII secondary data.

5.8.1 Livelihoods and incomes

The livelihoods and income of the people of the five villages are shown in tabulated form.

Table-21: Data on main livelihoods and incomes of 5 villages

Sr. No.	Livelihoods and income	Villages				
		South Pyi Nyaung	**North Pyi Nyaung**	**Lei Sa Pin**	**Oak-kyin**	**Mong-Pin**
1.	Livelihood/occupation (percentage of households)					
	Farmer by (%)	13%	15%	10%	22%	20%
	Main crops	-	-	-	-	-
	Rice	-	-	-	√	√
	Sesame	-	-	√	-	√
	Maize	-	-	-	-	√
	Others	√	√	√	-	-
	Orchards	-	√	-	√	-
	(Mango, banana, guava, growers)	-	√	-	(√)	-
	Lime extraction powder production	25%	15%	-	-	-
	Seasonal job/ Odd jobs by (%)	22%	20%	25%	30%	30%
	Wood/bamb cutter	-	-	-	√	-
	Sterculia cutter	-	-	-	√	-
3.	Employed by the companies (in numbers)					
	At Highland Cement	20 persons	45 persons	×	×	×
	At Shwe Taung Cement	×	50 persons	×	50 persons	×
4.	Government services (in number)					
	Teacher	1	2	×	×	×
	Soldier	×	3	×	×	×
	Policeman	×	3	×	×	×
	Nurse	×	×	×	×	×
5.	Annual income per household (in percentage)					
	Less than 10 lakh (kyats)	10%	10%	40%	10%	20%
	11-20 lakh kyat	40%	25%	40%	30%	50%
	21-30 lakh kyat	20%	15%	%	30%	10%
	31-40 lakh kyat	20%	5%	%	10%	10%
	41-50 lakh kyat	10%	30%	%	10%	%
	51 and above	%	5%	%	%	%
	Unknown (cannot estimate annual income)	%	10%	20%	10%	10%

- Based on HHI on 10% of households encompassing main livelihoods.
- The daily wages in this area range from Ks 5000- Ks 7000 in Lei Sa Pin and Ks 3000-Ks 6000 in North Pyi Nyaung. The remaining three villages are between Ks 3000- Ks 7000.

5.8.2 Access to public services and natural resources

North Pyi Nyaung is big village (with the status of village tract) and is on the Tharzi-Kalaw Highway and so is easily accessible by cars. So too are the smaller Lei Sapin, Oak-kyin and Mong-pin villages which are also on the same highway. South Pyi Nyaung is accessible by train and south Pyi Nyaung railway station is on the Tharzi-Kalaw railway line. The village is now accessible by car due to the construction of access roads from North Pyi Nyaung to the two cement factories by the two companies operation their cement factories near the village.

North Pyi Nyaung, Oak-kyin and Mong-pin villages are on the National Gridline and so have access to electricity. Taung Pyi Nyaung village is electrified with the aid of the two companies, Max Myanmar cement and Highland Cement International. (However village electrification cannot provide electricity for all households yet.)

The villagers of North Pyi Nyaung source water mostly from shallow wells but also from deep tube well.

The locals of Oak-kyin and Mong-pin source their water from Tharlun Stream as well as from their own shallow wells and tube wells.

Formerly the source of water for the villagers of South Pyi Nyaung is the Myit-thar Stream. But now as the water is turbid for most part of the year the villagers have scooped out small shallow water pools beside the stream bed to get clear water. Many harvest rain during the rainy season.

The main non-living natural resource of the area is the limestone mountain. Many villagers are involved in small scale (subsistence) quarrying of limestone for use as construction raw materials. Many also bake limestone for the production of lime powder (quick lime).

Regarding living natural resources fuel wood is collected from the nearby forest. A few also produce charcoal from the wood of the forest. A few are also involved in logging and timber extraction, mostly by illegal means.

A few villagers are also involved in the harvesting of goods e.g. vegetable, fruits, bamboo shoots and mushroom (during wet season) from the forest.

All villages are accessible by car. North Pyi Nyaung, Lei Sapin, Oak Kyin and Mong-pin villages are on the Mandalay-Kalaw Highway. South Pyi Nyaung is also accessible by train; it has a railway station.

Only North Pyi Nyaung is wholly electrified; while Oak-kyin has 50% of its households electrified. 10% of the households of South Pyi Nyaung (those that are along the transmission line from North Pyi Nyaung to Yadanar Saing Kaung Myat Cement Factory) are electrified. Lei Sa Pin and Mong-pin have no electricity. Solar panels and candles are used for lighting in most villages. In North Pyi Nyaung 50% of the household use electricity for cooking while 50% use charcoal. In the other 4 village either charcoal or fuel wood are used.

Each village has shallow wells and fewer tube wells for sourcing water.

Most of the households of North Pyi Nyaung source their water from Myit Thar Chaung. Shwe Taung Cement Company has built a water purification plant for the village. Lei Sa Pin village also source water from Myit Thar Chaung but some household source their water from a spring with PVC pipes to their houses. The people of Oak-kyin and Mong-pin villages source their water from Thar Lunn Chaung.

The main non-living natural resources of the area are limestone and forest products. Many villagers are involved in small scale limestone quarry for extraction of construction materials. Some produce lime powder from limestone.

As regards living natural resources timber wood is extracted from the nearby forest area but the main harvested goods are fuel wood (fire wood) and charcoal where the large majority of the local have to rely for cooking. There are no other important forest resources other than fuel wood and charcoal. There is no minor fishery in the area.

5.8.3 Land use

The land uses pattern around North Pyi Nyaung, Oak-kyin and Mong-pin areas remain more or less uncharged for several decades. The land use is a mixture of agricultural area, (field, farms and plantation), residential areas (villages and hamlets) and the forest.

However the land use pattern around South Pyi Nyaung has changed greatly due to the establishment of Max Myanmar and Highland Cement International Cement Plants. The forest of the whole mountain range which runs from north to south east of the village used to be Pyi Nyaung Reserved Forest Area. Now a substantial part of the reserved forest is converted to an industrial area (with two cement plants).

A large portion of the mountain range has become quarry sites (1308 acres by Highland Cement International and 900 acres by Max Myanmar Co., Ltd) and most original vegetation is gone. However the large majority area of the whole mountain range outside the project areas remain green or in relatively good shape.

Of the three villages, Taung Pyi Nyaung has very limited cultivated area.

Table – 22: Land uses (in acres) of the five villages

Sr. No.	Land uses in acres	Villages				
		South Pyi Nyaung	North Pyi Nyaung	Lei Sa Pin	Oak-kyin	Mong-pin
1.	Paddy field	2	12	NA	13	8
2.	Farm land	261	238	NA	252	344
3.	Plantation (orchard)	27	31.281	NA	20	9
4.	Reserved forest	-	13140	NA	13192	-
5.	Vacant/Fallow lands	-	-	NA	210	36
6.	Mining area	30	-	NA	-	-
7.	Road area	3	-	NA	9	9
8.	Rivulet/stream area	92	94	NA	73	82
9.	Industrial area	-	-	NA	2710	116.32
10.	Village area	65	64	NA	57	48
11.	Monastery and cemetry areas	66	63	NA	33	25
12.	Others	1595	154	NA	1382	1161

* * From KII data

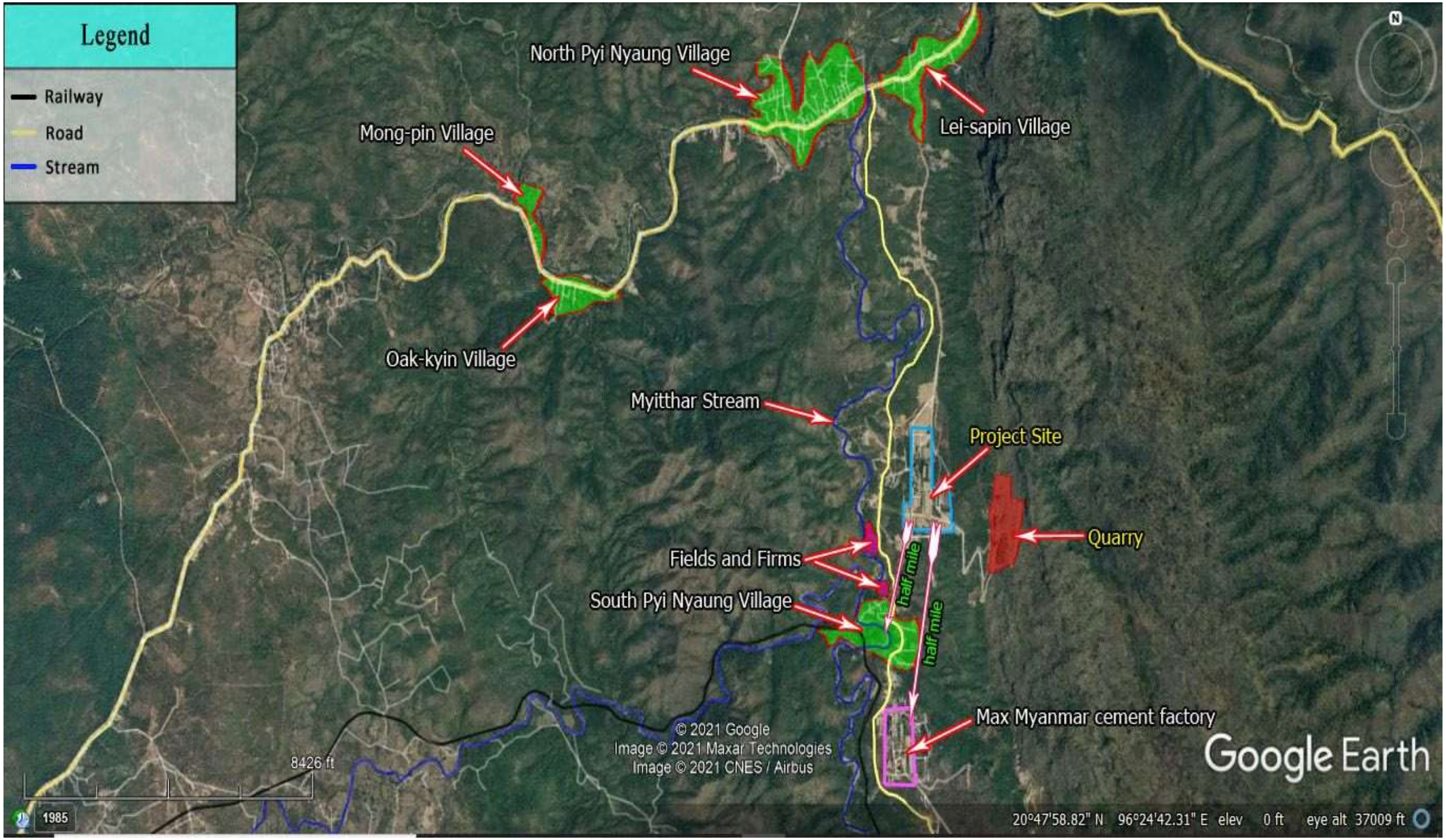


Figure – 98: Satellite image showing position of five villages in relation to project site

5.8.4 Population distribution

North Pyi Nyaung, being a large village with the status of a village tract has the largest population.

5.8.5 Other socio-economic status

Table-23: Basic data on other socio-economic status

Sr. No.	Other socio-economic status parameters	Villages				
		South Pyi Nyaung	North Pyi Nyaung	Lei Sa Pin	Oak-kyin	Mong-Pin
1.	Povery rate	Relatively high	Relatively high	High	Very high	Very High
2.	Unemployment rate	Relatively high	High	Relatively high	High	High
3.	Iliteracy rate	15%	12%	22%	26%	28%

Note: Based on HHI on 10% of the households covering different occupations.

5.9 Public health components of the surrounding environment (shown in tabulated form)

As in the cases of all rural areas the health status is generally low.

Table-24: Basic data on health component of five villages

Sr. No.	Health status (parameters)	Villages				
		South Pyi Nyaung	North Pyi Nyaung	Lei Sa Pin	Oak-kyin	Mong-Pin
1.	Health status (general)	Low	Low	Low	Low	Low
2.	Health facilities Village clinic	-	1	-	-	-
	Private clinic	×	×	×	×	×
	Health services-nurse/mid wife etc	-	1	-	-	-
	Data on mortality and morbidity	NA	NA	NA	NA	NA
	HIV/AIDS	NA	NA	NA	NA	NA
3.	Health issue Malaria	Malaria	Malaria	Malaria	Malaria	Malaria
	Dengue	-	-	-	-	-
	Chlolera etc	-	-	-	-	-

- The nearest sub-township hospital is at Yin-mar-bin village. The nearest township hospital is in Tharzi Town.

There can be certain impact on the socio-economic life of the villagers of South Pyi Nyaung in the form of noise and vibration and other unanticipated social impacts--- eg. quarrel, brawls, tension. But all can be mitigated. There can be no impact on the socio-economic life of the people of the other four villages, namely, North Pyi Nyaung, Lei Sapin, Oak-kyin and Mong-pin.

5.10 Cultural components of the surrounding environment (religious, cultural, historical, archeological, attributes - etc) (shown in tabulated form)

The large majority (about 90%) of the locals of the 5 villages are Bamar Buddhists. At south Pyi Nyaung 100% are Buddhists.

Local people here are just like many Bama Buddhist whose main region is Buddhism but many also worship or rather pro pitiable the "nats" or guardian spirits: this old tradition had existed in Myanmar even before the arrival of Buddhism into this part of the country about 1000 years ago during the region of the great king Anaw-ra-hta.

Offertory for the “nat” spirits usually include one coconut and 3 or 5 combs of banana arranged on a receptacle, usually a tray or large bowl. Or the offertory can be simply a coconut (nat-ohn-thee) hung at the wall or post.

Bamars believe in so many nat spirits while the minority or ethnic groups have also their own nat spirits.

Many villages in Myanmar usually have a nat shrine for each village (a shrine for the guardian spirit of the village).

There is no known annual or seasonal festival for nat spirit in this area.

As regards cultural heritage there are no historical monuments, no archeological site or object, and no site of natural, cultural, educational and spiritual values in this area. There are no sacred sites, sacred rocks, sacred trees etc in this area.

Construction workers as well as quarry workers are instructed to report back promptly if they happen to find archeological objects or evidences and, of course, UXO while performing their work.

Table-25: Cultural components of five villages

Sr. No.	Religious, cultural, historical, archeological, attributes - etc	Villages				
		South Pyi Nyaung	North Pyi Nyaung	Lei Sa Pin	Oak-kyin	Mong-Pin
1.	Village pagoda	×	√	×	√	×
2.	Village monastery	1	1	×	1	×
3.	Number of monks, novices, num etc	5 Monks	4 Monks	×	6 Monks and 10 novices	1 Monk and 1 Novice
4.	Village "Nat" shrine	-	-	-	-	-
5.	"Bo" tree or large sacred tree	-	-	-	-	-
6.	Nat worshippers	Present	Present	Present	Present	Present
	present/absent					
7.	Churches/others	×	×	×	×	×
8.	Historical monument (site/structure)	×	×	×	×	×
9.	Archeological monument (site, structure, objects, etc)	×	×	×	×	×

- No annual pagoda festival or grand religious festival. No annual or seasonal Nat festival.
- Only normal religious events on full moon days, new moon day and the two 8th days of the Burmese months.

There can be no impact on the cultural components of the five villages due to the implementation of the project.

Commiment

The project proponent, Highland Cement International Co., Ltd has made a commitment not to impact on the cultural component, (cultural and relagion heritages) of the surrounding area due to the operation of the project.

U Kyaw Soe Win

Director

5.11 Visual components of the surrounding environment

The area is a rural area but is not so remote; both North Pyi Nyaung, the largest village, and Lei Sapin, Oak-kyin, Mong-pin being the Tharzi-Kalaw high way. South Pyi Nyaung was quite a remote village with rugged terrain before the emergency of access roads built by the two companies.

Actually there are no beautiful landscapes or spots of aesthetic beauty to attract tourists.

There are no historical or religious monuments, or outstanding landmark.

The limestone mountain near North Pyi Nyaung and close to South Pyi Nyaung is actually the major landmark of the area. The two cement projects, one by Max Myanmar and the other by Highland Cement Int. will surely and significantly impact the mountain and its micro-ecosystem. After 25 plus years of operation large portion of the mountain and its vegetation will be gone. That will be tantamount to the sacrifice of a small ecosystem (the mountain ecosystem) for the scale of infrastructural development, hence national development. And this is the way all developing countries have to be developed and there is no other way around.

The loss of the mountain and its non-living resources, (limestone, clay, laterite) is inevitable and irreversible. But the loss of the living resources, that is vegetation, can be reversed by mean of compensatory replanting of trees. Effective and meaningful reforestation of the affected area can result in the restoration/rehabilitation of the ecology of the area to a great extent.

6. IMPACT AND RISK ASSESSMENT AND MITIGATION MEASURES

6.1 Impact and risk assessment methodology

Impacts assessment is based from previous personal practical experiences and also from theoretical knowledge from available references for conducting EIA.

Prediction and identification of the impacts, both negative and positive, and subsequent assessments were made after comprehensive group discussion with EIA practitioners and appraisers.

The visual inspection of the proposed project site was essential for the prediction, identification and assessment of the impacts.

In fact visual inspection is the best methodology for impact prediction, anticipation, identification and assessment.

In addition sense of hearing (accoustic) and sense of smelling (factory) are valuable tools for impact assessment. These are internationally accepted practices. The theoretical aspect of impact assessment that involves complex formulae and equations, mathematical and/or computer modelling, computer stimulation are the works of academecians and are beyond the scope of this pragmatic EIA study.

These are impressive indeed, but in the real world it can go wrong. Sometimes is idealistic but not realistic. Afterall EIA can be conducted without involving the theoretical aspects, especially for a developing country like Myanmar where realistic and pragmatic approach is necessary.

To uphold a standard EIA report the impacts assessment are made encompassing all the four phases, namely, Preconstruction, Construction, Operation and Decommissioning Phase. The assessments also cover all the five environmental components of the surrounding environment, namely, the physical, biological, socio-economic, cultural and visual components.

Predictions and assessments of impact/potential impacts are extrapolated from all the main activities involve in cement project. The main activities such as clearing of vegetation for site and access road, the construction activities during the whole Construction Phase and most of all operation activities during the whole long Operation Phase and lastly all activities during the Decommissioning Phase.

Since impacts are the resultants of the above-mentioned activities. Each and every activity and the resultant impacts are considered, predicted, identified and assessed. Mitigation measure for each and every impact/potential impact is then prescribed.

6.2 Impact and risk identification, Assessment and Mitigation

6.2.1 Identification and assessment of environmental impact

6.2.1.1 During The Preconstruction Phase

Generally speaking there should be no negative impacts during this Pre-Construction Phase. However negative/potential negative impacts of socio-economic aspects can happen as follows:

6.2.1.1.1 Potential polarization of locals into pro-project and anti-project groups due to instigation by activists and/or radical environmentalists and mitigation measures to be taken

Instigation and agitation by radical environmentalists who are usually against all infrastructure developments and activists who are usually anti-big business and anti-authority can polarize the locals into pro-project group and anti-project groups.

Agitation by activists can even lead to public outcry and political instability of the region. Whether these activists are doing such thing in good faith, eg- for environment and human rights or doing such thing merely for publicity is sometimes questionable. Certain media are also usually adding fuel to the fire.

On the other hand many big companies in Myanmar usually have little regards for the environment and the community.

This is one the main reason why developmental projects are usually objected by the locals who are quite easily swayed by lobby of activists and/or environmentalists.

Mitigation measures to be taken

Of course there is no quick fix measure for this social impact. Transparency and the good will shown by the company will tackle most of the issues. The Corporate Social Responsibility (CSR) action taken by Highland Cement International Company is an effective measure for solving the issue. Prioritizing the local people for employment in the factory is an effective way of corrective measure for the negative impact. (This is exactly what the company is doing).

Building of good relation between the company and the local community is most important of all. (In this project context this anticipated impact did not happen.)

6.2.1.1.2 The potential hiking of price of land and property and mitigation measures to be taken

Another main impact is the hiking of the price of land property by greedy speculators. The price of land can go up considerably even before the construction of the factory. Even rumours can lead to the hiking of land and property price. This is what is really happening now in this area. The establishment of the cement factory together with the easy access to the area due to the construction of hard top (concrete) access road to the factory has now resulted in the increase of land price.

Mitigation measures to be taken

There is no remedy for inflation in price of land and property. The prices of land property are always on the high and this can be only stoically or rationally considered simply as a way of life in this country.

It is important that employees of the cement factory, especially the executive and management members should not personally get involve in land price speculation.

6.2.1.2 During The Construction Phase

The Construction Phase starts after the Planning Phase. In this cement factory context the Construction Phase will last two years.

The works during the Construction Phase generally involve the fencing of the site, clearing of land, construction of temporary housing facilities for workers, sourcing of water and electricity, mobilization of materials and workers to site and the actual construction of the factory.

There will be, no doubt, many negative impacts during this phase. The followings are real or potential impacts identified or predicted and assessed.

6.2.1.2.1 Impact of mobilization and preparation actions and mitigation measures to be taken

Mobilization action, preparation action and transportation action in early phase and later phase of construction can cause nuisance to the public or road users.

The rapid mobilization of large volume of building materials, timber, bricks, cement, sand, gravel, iron materials, etc. can overspill inside or outside the site and on the road side. These can cause nuisance and also hinder the smooth and easy movement of people in the area and also vehicles and motorcycles.

Heavy trucks and heavy machinery parking in an unkempt manner can also cause nuisance and inconvenience to the locals.

Mitigation measures to be taken

Carefully plan for mobilization, storage and preparation works. Have logistic plan for heavy trucks loaded with building materials.

Plan and implement the breakup of the lease into area for factory and facilities, area for residents for office, for parks – for warehouse, stores, area for green belt – etc.

The area used to be a quiet remote area. The actions mentioned above during the Construction Phase can cause nuisance to the local people. Restrict the movement of trucks according to schedules.

All materials for construction should be systematically piled up or stored with the site. Do not overspill them outside the site or on the road side. There is the potential issue of theft.

Fence the site securely and deploy guards or watch men.

6.2.1.2.2 Impact on traffic and mitigation measures to be taken

This is related to the pervious impact. The mobilization of huge quantity of construction materials of all sorts by means of heavy trucks and also the mobilization of heavy machinery will represent a noticeable increase in the number of heavy trucks travelling along the highway.

There can be no problem on the 4 miles concrete access road as the only traffic is by motorcycle or pedestrians. But the intersection at the highway (Meik-hti-la---Taunggyi highway) can represent a potential hazard to other road users (drivers) as slow moving large trucks entering and turning off the highway which has relatively heavy traffic. Heavy trucks will increase the wear and tear of the highway road.

Mitigation measures to be taken

Plan and implement traffic management. Schedule the logistics; avoid rush hours; if possible avoid road with heavy traffic.

Avoid over loading vehicles; loading must comply with the requirement of the Road Authority; always check the total weight when loading heavy machinery; for instance, excavator, crane, lift, dozer etc. on large truck.

Educate the truck drivers; heavy trucks should be driven slowly and practice defensive driving; set up speed limit on the access road; set up traffic sign board at the intersection.

Undertake regular maintenance of cars and motorcycles. Local community should be able to file complaint regarding traffic issue.

6.2.1.2.3 Impact on air environment and mitigation measures to be taken

a) Nature of impact: dust

Dust is the main issue during Construction Phase. Wind direction plays an important role in the impact. The clearing of land and earth works such as excavation, digging and refilling of earth greatly generate dust. Vehicular movements as well as operations of other equipment, engines and pumps emit lot of dust. The loading and unloading of building materials such as sand, earth, cement, gravel, lime powder and the stockpiling of these materials also generate dust. The batching of cement also emits a lot of dust.

Dust is mainly in the form of large particulate matter PM_{10} quite easy to protect with face masks or ear or nose covers. But the smaller $PM_{2.5}$ is difficult to protect and more risky. SO_2, NO_x, CO and VOC are also usually associated with dust.

Nuisance and health impact are associated with increased level of dust.

b) Nature of impact: smoke, flue gases

Smoke generated during Construction Phase will be low. The source of emission is from vehicles and some machines used during construction works, such as engines and pumps.

Health impact associated with smoke increased with level of smoke. The emission of Green House Gas can leads to global climate change.

The usual components of smoke are NO_x, SO_2, CO, CO_2, methane, VOC, $PM_{2.5}$.

Mitigation measures to be taken

a) Mitigation for dust

When clearing the ground vegetation must be removed together (mixed) so that the plant material helps to hold the soil. Or vegetation can be stripped and spread on the newly made soil stockpile; this will minimize emission of dust due to wind. As mentioned earlier, avoid clearing vegetation too far advance of construction.

Spray water regularly for suppression of dust. Plant trees at vacant spots; select hardy, fast growing species and create green zone and green belt. Trees play an important role in minimizing dust; they reduce wind speed and trap a lot of dust.

Restrict vehicular movements; car driven at reduced speed generates much lesser dust; maintain road clear of mud and dirt. Limit open stockpile of earth and minimize drop height when loading and unloading earth. Stop earth works eg- digging, excavation, loading, unloading etc. for a while when strong wind is blowing.

Provide Personnel Protection Equipment (PPEs) such as face mask, nose and mouth cover, to workers exposed to dust during earth works or other construction works and so on.

Manage dust and smoke as practical as possible. Try to meet the NEQ (emission) guideline values prescribed by ECD. The local community should be able to file complaints regarding dust and smoke.

b) Mitigation for smoke

Regularly check the engine of vehicles and other machines; well-maintained and operated engines reduce smoke emission; use fuel oil with low sulphur; use environmentally friendly up-to-date instrument, for example, engine with higher fuel efficiency; equip instruments and machines with air pollution control devices to minimize exhaust emission. (These may not be readily available but Highland Cement International Co., Ltd shall consider this for the near future.)

Avoid vehicles and instruments left running unnecessary; avoid open burning of solid wastes of all kinds, through segregate, recycle and then for disposal at approved dump site (land fill).

Keep equipment, machinery and vehicles well-maintained and well operated to minimize smoke.

Provide PPEs such as nose and mouth covers and face masks to workers exposed to smoke. Trees in the site will effectively sequestrate (remove) CO_2 in the smoke. Therefore, plant trees.

6.2.1.2.4 Impact: noise and vibration and mitigation measures to be taken

During the Construction Phase the source of noise are from construction such as cement batching, carpentry work that involve noisy saws and planes, noisy drilling machine and the sound of hammers etc. Movements of vehicles, loading and unloading of materials etc. also produce noise. Gravel roads also produce more noise than tarred ones.

Environmental noise level, that is acceptable rating level for noise (International Standard) is around 45dBA during daytime and 35dBA at night. Internationally accepted noise level in the work place should not exceed 85dBA. Prolonged exposure above 85dBA can impair hearing and can be a major health impact. Noise generally causes nuisance and disturbance to the community.

Vibration is generated from machinery or mechanical operation during construction work and also from heavy vehicles on the access road. Vibration is usually associated with loud noise; it can damage machines and equipments and also buildings or structures. The handling of equipment can cause hands-arms and body vibration.

Mitigation measures to be taken

Plan and implement in the Preconstruction Phase for procurement of equipment and vehicles that are eco-friendly and emit lower noise level.

As the project site is isolated noise is not an issue for the community. Noise can have minor impact on the employees.

The best way to mitigate noise is at its source. Noise specification of equipment and vehicles shall be taken into consideration when ordering equipments and vehicles. (This will be mentioned in EMP in Planning Phase.)

All noisy machines and equipment shall be fitted with noise muffler or silencers. Place noisier machines away from other working units. No construction work at night. Schedule high noise activity only at certain period during day time hours.

Big trees and vegetation, if any, in and around the project site effectively absorb noise. Keep trees intact as far as possible; avoid unnecessarily cutting of trees.

Provide adequate PPEs such as ear muffs, ear plugs etc. to workers at all activities/locations that exceed permissible occupational noise level limit standard (85dBA).

Vibration due to heavy truck from road can be mitigated by ensuring a flat and smooth road surface; paved road is much better than unpaved road; tarred road is better than concrete road. Limit the speed of vehicular movements to reduce noise and vibration.

Well-maintained and well-operated machine produce less vibration, therefore, give priority to maintenance and efficient operation of machines. Foundation for the installation of the machine shall be firm and durable. This reduces vibration and protects machinery and equipment from damage. It is standard practice to mount machines in such a manner to minimize vibration. Install vibration absorbers where possible.

Plan and execute the management of noise and vibration as practical as possible.

Try to meet the NEQ (emission) guidelines for noise level prescribed by ECD (Noise level for day time 55-70dBA; night time 45-70dBA).

The community should be albe to file complaint regarding noise and vibration.

6.2.1.2.5 Impact on soil and mitigation measures to be taken

The earth work which is an integral part of construction work can alter the profile and structure of soil. Spillage of fuel oils and chemicals during the construction work, from machinery and vehicles can contaminate the soil.

There is also the potential of erosion of soil and soil loss due to the removal of vegetation for access road construction and the mining facility. Other impacts are: soil compaction due to repetitive movement of vehicles and heavy machinery and the potential percolation of domestic sewage into the sub-surface layer and hence underground water.

If the construction work happen to be during the rainy season there is the potential for erosion of soil and siltation and sedimentation of natural drainage system or water course, The Myitthar stream. Solid waste generated during the Construction Phase in the form of debris; construction tailings, can have impact on the land if not managed in time.

Mitigation measures to be taken

Plan and execute the management and conservation of soil; avoid unnecessarily destruction of soil profile during the construction work.

When doing the clearing work or excavation of earth, remove top soil with vegetation (grass, herbs) on it. Stockpile top soil in conical heaps; allow grass and herbs to grow on top soil. Remove and stockpile subsoil separately. Maintain the topsoil against erosion. When filling of earth has to be done; replace, first, the subsoil and then the top soil on top. This will greatly help in greening or landscaping work.

Maintain all vehicles and machinery to prevent spill of fuel oil and hydraulic oil. Avoid washing down oil spill with water because this will only help percolate oil underground. Soak oil spill and then dispose the soak at approved disposal site. Pave vehicles and cranes parks and collect run off; bund the fuel depot to prevent spreading of spilled oil. Properly train workers with respect to handling of fuel and cleanup of spills.

For disposal of domestic waste water construct a small septic tank together with soak pit to collect the sewage from kitchen, bath etc. Occasionally sprinkle sand or dirt into the pit latrines to mitigate the impact of bad odour. The pit latrines may not be a serious issue for ground water as the Construction Phase last for at most, two years.

Schedule the construction works so that large area of soil were not laid bare during the monsoon months. Do not clear the land in advance more than necessary. Phase the earth work (in the early period of construction) so that it was limited to workable size only to a minimum area.

Resurface and stabilized the exposed ground surface as soon as possible, that is, after earth work.

To prevent subsequent siltation or settlement, drain or ditch must have adequate backfill and after completion of back fill the surface should be restored to its original condition. Prevent wash water from carrying earth and materials into drainage system causing siltation.

Manage the overall erosion and sedimentation control during the Construction Phase, particularly during the rainy season. Soil compacted by heavy and vehicles shall be raked and restored to original condition.

Pit and dents shall be backfilled and ground will be leveled after construction work.

6.2.1.2.6 Impact on water environment and mitigation measures to be taken

The water requirement during the Construction Phase will be less than that of during the Operation Phase. However a relatively large quantity of water has to be used in mason work or concrete work. The suppression of dust and the watering of plants as well as washing vehicles and machinery need quite a lot of water. The domestic consumption by more than 200 construction workers can have certain impact on the water. But as large quantity of water will be readily available from the river water will never be an issue during this Construction Phase.

However there can be potential contamination of the surface river water due to spillages of oil, chemicals and contaminated runoff sources from contaminated soil. If the Construction Phase coincides with the rainy months there is the potential for erosion and siltation due to earth work and removal of top soil. The dumping of debris by undisciplined workers can also have certain impact on the river surface water.

There can be also potential contamination to ground water due to percolation of oil and hydrocarbons and chemically contaminated water. There can be also potential contamination of ground water due to seepage of ablutions and domestic wastes generated from activities of construction workers.

There can be also domestic sewage which can percolate into ground water.

Mitigation measures to be taken

Even though there is the big stream Myit Thar rivulet nearby and the use of water during the Construction Phase is relatively less than the Operation Phase it is good to practice water conservation. Try to minimize the use of water; apply low consumption appliances. Discipline workers for conservation of water for domestic uses. Rain water shall be harvested for drinking purpose and other uses during the rainy months.

The following measures will be also taken:

- Ensure that construction activities do not impact the surface water of the river.
- Avoid disposal of debris, trash, construction tailings into the river. These shall be disposed off at an approved landfill.
- Also avoid disposal of untreated waste water.
- Manage the stability of top soil, prevent erosion and also prevent construction materials, e.g. sand, earth debris etc getting into river causing siltation and sedimentation.

Fuel depot shall be kept away from the river and be bunded to protect surface water from spill. Avoid accidental spillage of fuel oil and chemicals into the river. Also avoid spillage of oil on the soil which can percolate and contaminate the ground water. Oil and chemical spills shall not be washed down with water but absorbents or saw dust should be applied. Maintain vehicle and machinery to prevent spillages resulting in ground water contamination.

Manage temporary latrines (during the Construction Phase) at the site to prevent eventual contamination of ground water; spread soil or ash regularly into the latrine.

6.2.1.2.7 Impact on waste disposal and mitigation measures to be taken

The waste here refers to construction tailings and debris and domestic waste (solid and liquid) generated by construction workers during the Construction Phase.

Solid waste generated during the Construction Phase will be large quantity of debris in the form of bits and pieces of building materials, iron materials, timber, soft wood, bamboo, used as scaffolds, left over construction tailings.

Many of the leftover materials are unused or surplus materials because even well-experienced planning and design engineers may not be able to estimate the exact quantity of building materials to be used. There will always be unused or surplus timbers and other building materials. Unless systematically resold, reused and recycled and systematically disposed these materials can pose a great impact on the area. After one year of construction work, ill-disciplined workers without good house-keeping practice can also litter the site to a great extent.

Domestic waste (solid and liquid) comes from office; housings for workers, kichen, messing hall etc.

The waste can be in the form of solid waste, waste water and spill or leak that contaminated the soil.

Solid wastes from the camp is in the form of domestic waste and office waste, while waste water is in the form of domestic waste (from kitchen, toilet, bath) and oil spill or leakage.

For a project with more than 200 construction workers the solid waste as well as waste water could be substantial if mitigation measures were not taken.

The spill or leakage of fuel oil, and grease etc could be also substantial if there is a lack of discipline among the workers.

Mitigation measures to be taken

Plan and execute the management of waste (solid and liquid) and try to meet the statutory requirements regarding waste (solid, liquid) disposal.

All unused or surplus building materials can be sold to others who need it. The large majority of debris can be also put up for sale since most can be reused or recovered. Even left over building materials can be sold. Those that should be disposed off should be disposed at an approved land fill. Always avoid open burning of debris.

The best thing to do would be to hire a contractor for the clearing job after the Construction Phase.

There will not be any substantial waste water during the Construction Phase. All required water will be used mostly for domestic consumption.

Domestic waste water from temporary housing or camp will go to a small septic tank and associated soak pit. Instead of toilets, pit latrines are provided during the Construction Phase and so there will be no sewage from toilets. From purely environmentalist point of view, pit latrines are not so eco-friendly since it can have impact or ground water. But this is so far the pragmatic way of implementing sanitation during the temporary Construction Phase.

Discipline workers for good house-keeping practice; demand the building contractor to do this and ask him to take responsibility for the conducts of his construction workers.

6.2.1.2.8 Impact on biodiversity and mitigation measures to be taken

The first main negative impact during the Construction Phase is on the biodiversity of the area. This would be in the form of habitat fragmentation, habitat disturbance, habitat destruction, habitat degradation and habitat loss. First the vegetation has to be cleared for the construction of the 3 miles long access road. The clearing of vegetation and land for the site and for the 4 miles access road will have substantial negative impact on the flora and fauna even though the area was a partially degraded reserved forest. At least 173 acres of forest or bush has to be cleared first for the construction of the factory. Moreover 181 acres for residential area has to be cleared. Vegetation on both sides of the access road has also to be cleared. The impact on the biodiversity especially plants is, no doubt, substantial. The clearing of forest or bush, the excavation of earth, the noise and visual intrusion arising from land clearing activities and transportation activities have great negative impacts on the fauna of the area. The more than 200 workers in the construction site during this phase often resulted in increase pressure on living natural resources of the area and the disturbance of the wildlife, due to habitat fragmentation. The illegal hunting or trapping, if any, of wild animals, big or small will only exacerbate the problem.

The impact on the flora and fauna of the area will be as follow:

a) Flora

- Destruction and removal of natural vegetation during construction of access road and site clearance including area to be inundated.
- Damage to natural vegetation due to deposition of dust emitted during vehicular movements and exploration activities, restricting photosynthesis.
- Probable cutting of trees for use as fire wood by local workers.
- Damage to natural vegetation due to spillage of hydrocarbons and chemicals.
- Potential major damage due to accidental bush/forest fire caused by careless workers.

b) Fauna

- Potential direct impact on threatened faunal species.
- Potential habitat, fragmentation, destruction and loss.
- Potential damage on wildlife and birds breeding grounds, nesting, foraging or roosting in the project area due to construction activities.
- Potential disturbance due to noise and visual intrusion due to construction activities which will scare away the wildlife.
- Potential limitation of movement for land fauna (wildlife) and also for domestic animals.
- Potential injury or death of animals due to spillages of hydrocarbons and also due to vehicular movements.
- Potential loss of wildlife due to hunting or trapping of animals by workers, if any.

Mitigation measures to be taken

Partial rehabilitation of some parts of the site shall be implemented; plant fast growing trees to partially restore the original landscape. Consider for the establishment of green zone or green belt and aesthetic landscaping after the Construction Phase. Leave original big trees, if any, as intact as possible.

Avoid unnecessary clearing of land and cutting of vegetation. The construction shall be progressive, that is, implement as soon as a portion of the site is ready for construction.

Do not clear vegetation too far advance of construction. Also avoid unnecessary clearing of land and cutting of trees along both sides of the access road to the mine town.

Keep original big trees, intact. Plant trees and grass in vacant spot and consider for the establishment of green zone or green belt.

Prohibit hunting or trapping of wild animals, even small ones including rodents and birds.

Effective planting of trees and grass shall be started as soon as the construction works are completed. Refuge area (nesting, resting, breeding and feeding) shall be defined for small animals such as birds and rodents.

More trees of various species shall be planted during the Operation Phase, not only in the premise of the mine town but also in the vicinity. This will help restore the damaged mini-ecosystem of the area. Avoid planting of only one species of economic important plant, for instance, teak. From economic perspective this is viable. But from ecological perspective this will only lead to the emergence of mono-specific teak plantation, which is not ecologically viable. Only a forest with a variety of trees can restore the ecosystem to a certain extent.

Aim for the revegation (rehabilitation) of at least 20% of the project site after the Construction Phase.

Plan for minimum disturbance to the flora and fauna during the Construction Phase. Always avoid open burning of debris and educate workers for fire awareness; get rid of all trash that can cause fire.

Try to stop illegal logging and rock mining; inform the authority if there is any.

Prevent the potential injury or death of wildlife due to vehicular movements especially during night time. Avoid the excessive use of bright light at night for long hours to prevent the aggregation and eventual death of insects. Offensive lights at night will also scare way wildlife. Identify sensitive species which need to be avoided; avoide the disturbance of animal habitats eg- nets, breeding ground as far as possible. Promote environmental awareness to workers. Plan and implement protection and conservation of flora and fauna as practical as possible.

6.2.1.2.9 Potential socio-economic impacts and mitigation measures to be taken

As regards potential social impact it can be a two-way impact. The project which attracts a large number of construction workers can have an impact on the workers which come from different parts of the country. On the other hand, these workers can have an adverse impact on the project.

Such an issue usually occurs during the Construction Phase. When a large number of workers are camped inside the site there is always the potential of the occurrence of undesirable social issues. Some examples are: disputes, quarrels, brawls among themselves or with locals; theft; misappropriation of materials and money, vandalism, unethical sexual practices or sexual offences and so on. All these have potential to hinder the progress of construction works.

Other impacts on the socio-economic component can be:

- Potential damage to existing roads caused by movement of heavy trucks and machinery; and continual uses of vehicles moving to and from the sites can impact the safety of people and domestic animals.
- Generation of dust, and noise causing potential disturbance or nuisance to the local people.
- Potential contamination of local drinking water sources due to construction activities.
- Potential negative impact on the residential area and damage to houses, dwellings and properties.
- Potential negative impact on the agriculture land, eg. fields, farms, plantation etc.
- Frictions can occur between workers and locals.
- Potential siltation of nearby Myit Thar rivulet during rainy season.

Mitigation measures to be taken

Education and disciplinary action are necessary. Ask the building contractor to discipline his construction workers and to take responsibility for the conducts of his workers. Take and apply punitive measures such as suspension or sacking of the wrongdoer.

Keep separate dormitory (housing) for male and female construction workers; the two housings must be appropriately far apart. Provide adequate sanitation for workers eg- latrine, bath, small septic tank and adjoined soak pit for treatment of waste water.

Prohibit the drinking of alcohol and the use of narcotics in the site.

Educate the workers for dealing with the locals; educate them to respect the local culture, etiquette and custom. Do not let the construction workers mingle freely with the locals.

Prevent all kinds of quarrels and brawls taking place between the workers and the local community. Draw up a plan and manage misbehaviour and social illness among workers.

Plan to avoid the potential negative impacts on the socio-economic life of the locals as well as workers.

Try to build and maintain good relation with the locals; conduct public consultation from time to time so that the locals will have a positive perception of the project; consider and plan for more CSR activities.

Do not get involve in land and property speculation activities with the locals.

Community should be able to file complaints regarding any grievances.

Promptly repair the property damage of the locals, if any. Promptly provide generous compensation if there is any damage or loss of land and property.

6.2.1.2.10 Impact due to lack of occupational health and safety measures

Accidents can occur from time to time during construction work either to construction workers or neighbours if they happen to come near the site. The issue can become quite serious if the workers are ill-disciplined and not well-managed. Certain accidents can be fatal.

Accident can happen due to unskilled workers or careless workers during the Construction Phase. Construction work is rather hectic in nature and it is quite difficult to create accident free working environment especially when large number of construction workers are involved.

Accidents in the work place can be in the form of slips and falls; the risk associated with working at height; struck by objects; struck by moving or rotating machinery risk associated with hot work and work in confined space; eyes hazard, electrocution due to faulty electric devices etc.

The potential for fire breakout cannot be totally ruled out.

The hazard at the work place can be in the forms of exposure to severe heat, to high level of noise and vibration, to dust and smoke and to chemical and toxic substances.

The lack of emergency and health service can be a constraint regarding provision of health care for workers in potential emergency. If an accident that effect many people occurs the available service in the area may be prone to inadequate. The township hospital at Tharzi, of course, cannot solve such a serious problem. Most of the serious health cases are to be referred to the Mandalay General Hospital.

Unless there is no plan well-planned and well-managed for emergency and logistics the issue can be serious.

Mitigation measures to be taken

The company shall first of all taken into consideration all the potential chemical hazards, physical hazards, biological hazards and other hazards such as dust, noise, heat, confined space, radiation etc and create safety conditions for all work places.

Employees shall be trained for good working practice, good industry practice, good safety practice and good housing practice so that these good practices will be ingrained in each and every employee's mind.

The training shall be adequate and effective; if possible provision of manuals to certain employees will be made.

The authority shall try to avoid and prevent accidents and also try to achieve zero accident at the work places. Employees shall be trained for health education and hygiene; a few shall be trained in First Aid Training. Adequate First Aid Kits shall be kept and stocked with adequate medicines and drugs.

All employees shall be trained for basic Occupational Health and Safety (OHS) training.

The basic requirements for work place shall be considered, eg -- integrity work place structure, work place and exit, fire precaution, toilets and baths, potable water supply, clean eating area, lighting safe access, first aid, air supply, work environment temperature etc. and appropriate conditions shall be created (already mentioned above).

In addition, community health and safety shall be also taken into consideration for the nearby villages.

Careful planning of emergency procedures shall be formulated and implemented. Train at least five workers for first aid training while another ten workers for firefighting.

Provide adequate First Aid Kits, Fire extinguishers (cylinder) and water jet pumps. Most of all provide Personnel Protective Equipment (PPE) to workers exposed to dust, smokes, heat, vibration etc.

For emergency response, organize regular mock drills for first aid works and also mock drills for firefighting.

Display phone numbers and addresses of nearest Red Cross Society, Ambulance Service, Fire Brigade, Police Station, Tharzi General Hospital and Mandalay Hospital on the wall so that every worker can see easily.

Measures for major accident and emergency

- Basic first aid and basic Fire-fighting trainings for workers.
- Draw detail plan for prevention of fire and emergency plan for fire out break. (Highland Cement International Co., Ltd has already drawn up a plan for this, in Burmese version, no date shown, for fire prevention).
- Provision of firefighting suits and equipments (fire engine, truck), water jet pumps, installation of hydrants around the plant; water ponds to be always filled with water etc.
- Training and drill workers on emergency procedures including contingency measures.
- Effective emergency response plan (including displaying of phone number and address of nearest Fire Brigade, Ambulance Service, Hospital and Police Station).
- To take out Insurance for the project and Insurance for Fire; Life Insurance for each and every employee should be taken into consideration.

6.2.1.2.11 Potential security issue and mitigation measures to be taken

The Construction Phase is the period when it is usually difficult to maintain security. The working atmosphere is rather fluid and dynamic in nature. The in (entering the jobs) and out (quitting the jobs) of workers tend to happen almost all the time. This is the period when cases of thefts, misappropriations and vandalisms happen most.

Unlike the permanent employees during the Operation Phase who are well-disciplined, the temporary workers during the Construction Phase are usually quite difficult to discipline. The building contractor usually has no chance to hand pick them but to select them in haste due to the nature of construction work.

There is always the potential security issue for the mine town. If left unchecked the construction workers can pose a potential for security issue.

South Pyi Nyaung village is not far away from the site. So the site is not so isolate some of the locals may pose a potential security issue for the project.

Mitigation measures to be taken

Draw up a plan and implement security management.

The fencing or walling of some compounds of the site, eg. office and compound, power house, substation etc shall be undertaken to keep the intruder at bay.

Access control must be implemented. Security gates must be set up; set up watch towers if necessary; no unauthorized access is permitted. The company and the building contractor must prohibit the workers from entering the neighboring village without preauthorization from the company or the elders of the villages. All entering and leaving of the site should be checked. Do not let the construction workers mingle freely with the locals.

Identity Card (ID) for workers may not be necessary.

Heavy building materials (which cannot be lifted easily) such as iron bars, iron rod, big timber etc. and materials of less value, for example, bricks, sand, gravel etc. can be piled up in the open. Materials of certain value, for instance, iron work, timber work, frame, iron nails, and associates, corrugated iron sheets, glass panels, bags of cement etc. must be kept in store or ware house under lock and key.

Ask the contractor to discipline his construction workers.

The condition shall include punitive measures if found to be in contravention of the requirement, for instance, suspension or termination of the employment.

6.2.1.2.12 Visual impact and light at night and mitigation measures to be taken

As noise is considered pollution bright light at night is also considered pollution. Children living in bright cities no longer have the chance to enjoy looking at the twinkling stars high up in the sky at night. Some environmentalists view this as an infringement on the basic human right of the children.

At the end of Construction Phase the cement factory will come into view. The big silos and other big structures together will the 85 m tall smoke stack are conspicuous in an area with bush and degraded forest. The factory is not in harmony with its surrounding and therefore, no doubt, has certain impact on natural scenery of the area. This can be considered as visual negative impact or simply sight pollution.

Conditions are dark at night in this area prior to the establishment of factory. So the local community, even from a distance, can have the so-called lighting offensive at night. Especially bright light on the facade or front of the factory can have potential to increase the visual impact at night. Bright white light at night has the potential to attract hundreds of insects from the vicinity and kill them.

Mitigation measures to be taken

Create green lawns, green zone and green belt as soon as construction work has completed. (Trees can be planted in available vacant plots even during the Construction Phase). Reforestation of the area surrounding the factory premise must be also implemented; the sooner the better. This will greatly mitigate the visual impact, without green lawn and green trees the factory will looks like an outcropping complex amid a partially degraded forest.

There was/is no tourist establishment or scenic feature in this area that could attract establishment of tourism and so the visual impact imposed by the newly built factory is negligible. Actually there is no scenic spot of tourist attraction to be impacted.

Provide appropriate lighting only for security reason. Avoid excessive use of light at night. Follow the principle of Singapore (Dim City) that save energy rather than that of Hong Kong (Bright City) which uses excessive lighting for advertisement and for ostentatious purpose.

A lamp installed at the top of the 85 m high stack will ensure that the stack does not pose hazard for air planes.

- Select electric equipment that are durable, water proof, and heavy duty type.
- Conserve electricity; minimize light spill outside.
- Position the lamps at the lamp post at the periphery aslant (not out ward) so as not to be offensive to neighbor fauna in the surrounding.
- White light at night attracts and can kill hundreds of insect; therefore use only yellow light (switch off the light for a moment if too many insects aggregate)
- Consider for the use of solar lighting at night, if possible.

6.2.1.2.13 Positive (beneficial) impacts during the Construction Phase

The positive or beneficial impacts during the Construction Phase are in socio-economic aspects. The economic benefits to the region are expected to be substantial.

The proposed project will invigorate and boost the local economy and will bring economic benefits to people who are involve in extraction/production and sale of building materials of all sorts, both raw materials and manufactured goods.

Contractors of raw materials such as sand, gravel and bricks get the chance for doing lucrative and brisk business in providing these raw materials for sales. The extraction or production of these raw materials will also provide jobs for many locals.

Timber merchants and merchants of soft wood and bamboo (for scaffolding) as well as merchants of construction merchandize such as iron rods, bars, iron works and nails, roofing, aluminum sheet, glass panels, cement and so on can promote their sales. At the same time more jobs for the locals can be provided by these merchants; small business men and small sub-contractors will be also benefited by the production, extraction and sale of these building merchandize.

The proposed project has provided jobs for about 200 construction workers for 2 years. This is quite a substantial contribution to provision of jobs for young people and unemployed people, partially solving unemployment problem when unemployment is high in the country. Many unskilled workers will have the chance to become skilled workers during the period of one year.

Highland Cement International Company shall bear in mind that while negative impacts should be mitigated or minimized positive impacts should be promoted or enhanced.

6.2.1.3 During The Operation Phase

During this long Operation Phase the impacts/potential impacts are long term. The main negative impacts associated with cement production are: the quarrying activities and activities inside the factory.

The blasting of a limestone mountain and the burning of coal and other raw material inside the factory are the two anathemas for emotional environmentalist. Cement industry is considered a significant contributor to global CO_2 emission. But when it comes to the infrastructure development of an LCD country the pragmatic way of thinking and reasoning should override emotional view associated with the environment.

6.2.1.3.1 Impact: blasting and quarry activities and mitigation measures to be taken

To extract the raw materials for cement such as limestone, blasting has to be carried out first. The company uses emulsion type explosive for blasting the rock. The impacts posed by blasting includes physical injury (accidentally), loud noise and vibration.

Physical injury or even fatality can happen if chunks or pieces of rock burst out (fly rock) and fall upon employees due to huge explosion associated with blasting.

The sound of explosion is very loud indeed and this can easily impair hearing and pose a major health issue. The sound of explosion is the most severe noise pollution of the project and can has impact on the local people of South Pyi Nyaung which is just about half mile away.

Other quarry activities such as drilling (before blasting), excavation, shoveling, stockpiling, crushing, grinding, screening, collection and transportation of limestone and other materials inevitably cause noise pollution at least in the quarry site.

Vibration associated with loud explosion will have certain impact on the environment. It will scare wildlife away and can have impact on tall building or at least 2-storey brick houses in the vicinity. Repeated explosions and vibrations over a long time can substantially damage any brick building.

Minor land slide can occur in the mountain side due to explosion and vibration.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

- Select only mineralized spot (that is spot where limestone exist) for blasting. If the whole mountain is solid limestone then carry out systematic blasts (portion after portion or block after block of the mountain). Do not blast randomly which will result in ugly voids or dents occurring here and there all over the mountain.
- If possible fence off the blasting area to prevent children and pets (dogs, cats) straying into the area.
- Select appropriate explosives (not explosives for military purpose) (uses emulsion type) (Already mentioned in **Chapter-4**).
- Keep explosives in maximum security depot, magazine, approved by military engineers (Re: the Explosive Substance Act 1908).
- Install lightning rod for prevention of lightning strike.
- All drilling and blasting must be strictly supervised (to be careful is not enough- utmost care should be taken when handling explosives).
- Use standard detonation fuse, materials for blasting.
- Ensure that the temporary shelter during blasting is safe.
- Blasting must be restricted to a limited part of the day (designate definite hour for routine blasting) Highland Cement team leader has already designated time table for blasting and this has been already made known to the villagers.
- Loud and clear sound of warning siren should be given just before blasting.
- The timing for blasting must be set to produce minimum vibration.
- Perform slant drilling to maximize rock fragmentation rather than higher sound level and vibration.
- Perform delay action blasting for safety precaution.
- Avoid blasting when strong wind is blowing or when there is heavy rain.
- If blasting has to be done 1-3 days after heavy rain re-inspect the site before blasting as undesirable land slide can occur.
- Provide adequate PPEs, ear plugs, ear muffs, helmet for employees; keep a separate First Aid Kit for quarry site.

6.2.1.3.2 Impact on air environment (dust, smoke) and mitigation measures to be taken

Air pollutants from cement industry are dust and smoke. Smoke/gaseous emission can be both point source emission (from the stack) and fugitive emissions from vehicles, machinery, burning of debris etc.

At the quarry

Dust is generated at the quarry due to drilling, blasting, excavation and transportation (loading and unloading) activities. Blasting activity generate large quantity of dust. Vehicular movement also generate dust.

Dust is also generated at the crusher site (jaw crusher, hammer crusher) beside the quarry.

Smoke (gaseous emission) is generated at the quarry site due to activities of excavator, dozer, wheel loader and heavy truck in the form of fugitive emission.

The mined out/quarried out Limestone is conveyed to the factory by conveyor belt and so substantial amount of dust is also generated along the conveyor belt line.

At the factory

Dust in the form of fly ash and down ash is generated in clinker, cement mill and coal mill; the so-called dust associated with smoke. Cement/clinker dust is the main issue for all cement factories.

However, the manufacturing of cement applying pyro process generate small quantity of dust (fly ash, down ash) as all the raw materials limestone, clay and laterite are all transformed into clinker leaving any small quantity of dust (fly ash, down ash). Generally the production of 1 ton of Portland cement generates only 1 kg of such dust. In this factory which produces 1500 tons cement/day the quantity of fly ash and down ash generates is 1500 kg/day. These are effectively mitigated is 1500 /day. These are effectively mitigated is 1500 /day. These are effectively mitigated by application of ESP and series of bag filters (44 nos).

Dust (cement dust) is also generated at the packing and storage areas of cement and during the loading of cement on trucks for distribution (and also during transportation if not well-managed).

Vehicular and machinery movements inside the factory compound generate dust. The erosion of ground surface due to strong wind generates dust. Strong wind can also generate dust from coal stockpile and temporary stockpile of cement dust and ash.

Smoke (emission) is mainly generated from the stack in the form of point source emission.

Other sources are at the kiln and from clinker cooling.

Vehicular movements and operation of machinery inside the factory compound also contribute to gaseous emission (smoke) in the form of fugitive emission.

Discriminate burning of debris and trash also generates smoke.

Components of dust and smoke

Dust components usually include heavy metal (lead, mercury, cadmium), thallium, iron oxide, calcium, carbon, manganese, silicon compounds etc. dust is mainly in the form of suspended particulate matter (SPM or PM). The smaller PM such as $PM_{2.5}$, PM_1 (also called Respiratory Particulate matter, RPM) post more health hazard than the larger PM.

Emission from smoke stack includes mainly SO_2, NO, NO_2, CO, CO_2, hydrocarbon and PM, mainly the smaller $PM_{2.5}$. Smoke therefore poses more risk than dust.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

(a) For dust

- Comply with ECD's NEQ emission guidelines
- Stop drilling, blasting, excavation and loading when strong wind is blowing.
- Spray water for suppression of dust --- eg. at the quarry, crusher area, on dusty road, dusty work area. Water spray can reduce the generation of dust to 90%, it is learnt. As fugitive emission of dust is of highest magnitude along the dusty haulage road the company bas prioritized the spraying of water along the haulage road.
- Sweep the work site clear of dust from time to time; sweep the road surface, and sweep the cement packing area regularly.
- Use tubular conveyor belt rather than open belt (the company has already used tubular conveyor).
- Minimize drop height during loading and unloading of materials --- eg. limestone, coal, cement bags.
- Cover trucks loaded with coal, gypsum, cement etc with tarpaulin to prevent spread of dust during transportation.
- Reduce the spread of vehicle on dusty road. (A reduction of speed from 30km/hr to 25km/hr can reduce the generation of dust to 50%, it is learnt). Dust generated from vehicular movements may not have any impact on south Pyi Nyaung Village which is a little more than half mile in the south west; all the trucks go to the north, to the Meitila-Kalaw High way.

- Maintain the stockpiles of coal, cement dust, ash at a minimum height to reduce wind erosion that generate dust (The roofing of the shed shall be low and curve in shape to reduce wind effect).

- The cement dust/clinker dust collected during manufacturing process is recycled.

- Ash can be also re-used as additives in cement manufacturing, it is learnt.

- Install Electrostatic precipitator and bag filters to mitigate dust (the company has one ESP and 44 bag filters installed at the factory). (The company has tested ambient air quality for 7 times and stack emissions for 10 times. Generally most parameters were within guidelines values with a few exceptional cases. The results are not always satisfactory yet. The company is trying to achieve the guideline values). See ANNEX.

- Trees trap dust and therefore plant trees in all available space.

- Provide adequate PPEs, eg. face marks, nose and mouse covers for workers exposed to long hours of dust.

Figure – 99: Spraying water for suppression of dust at the site (one of the options), especially along the dusty haulage road

(b) For smoke (gaseous emission)

- Comply with ECDs NEQ emission guidelines.

- Install Electrostatic Precipitator (ESP), filters and other to mitigate dust, and ash. (A combination of ESP and series of filter can absorb up to 95% of PM in the gases emitted, it is learnt). The company has installed 44 bag filters and one ESP.

- Ensure the efficient burning of coal (Effective burning at a constant high temperature ensure. Complete combustion contributes to minimization of smoke and ash, denitrification and also minimization of many harmful substances, compounds and element, it is learnt). Keep the coal dry; use a coal dryer, if possible.

- Select coal with low sulphur content to reduce emission of SO_2 and NO_x, if that is possible (Grade I anthracite coal is not available in Myanmar; only subbituminous coal is available. The sulphur content is relatively low 0.4 wt%).

- Desulphurization by dozing lime water is not necessary because large quantity of limestone, $CaCO_3$, CaO_3, is burnt in the process.

- Avoid open burning of debris and trash inside the factory premise; use incinerator if necessary or regularly dispose the solid waste at the approved landfill rather than burning it.

- Limit the use of vehicles, moving machinery inside the compound to reduce fugitive emission.

- Test air quality annually.

- Provide adequate PPEs; face masks, nose and mouth covers to workers exposed to long hour of smoke and gas emission.

(It is not yet feasible to reduce or minimize Co_2 emission or carbon emission. The harsh reality is that the global economy as well as National Economy cannot survive without carbon).

It is estimated that for every ton of Portland cement produced:

- About 700 kg of CO_2; 0.5kg of SO_2 and 1kg of NO_x are generated, it is learnt. The factory with a capacity to produce 1500 tons of cement per day can therefore emit up to 1050 ton CO_2 / day, 750 kg of SO_2 and 1500 kg of NO_x per day. The company shall consider for the installation of continuous monitoring device for the continuous monitoring of CO_2 emission, in the nearfuture.

Figure – 100: Bag filter house

Figure – 101: ESP unit

Note: The results of the measurement of ambient air and air emission are show in Chapter-5 together with the NEQ guideline value

The cement industry contributes to about 5% of global anthropogenic CO2 emission making a cement industry a important sector for CO2 emission mitigation strategies.Of the CO2 emitted by the cement industry 50% results from the calcination process of limestone,40% from the combustion of fuels in the kiln, 5% from transportation and 5% from electricity used in manufacturing operation. CO2 production from cement plant is 0.7 ton to 1.1 ton CO2 per 1 ton cement. Co2 emission can be reduced by following ways:

1. Energy efficiency improvement- Through using energy efficient equipment and technology (for eg. Using dry procee in stead of wet procee , using dry process preheater calciner in stead of dry process with preheater only) we can reduce energy consumption and reduce CO2 emission and at the same time reduce cost of production.

2. Fuel switching by use of waste as alternative fuel- Using certain waste as a fuel is seen as important opportunity to reduce the long –cycle carbon emission diminishing their disposal requirement and reducing the use of fossile fuel.
3. Blended cement- By using the industrial by product and mineral in cement production as blended cement can reduce the clinker /cement ratio.
4. Plantation-Plantation can reduce O2 content of air. By selective plantation (for eg. Bamboo plantation) CO2 content of ambient air can be reduce effectively.
5. CO2 capture and storage by scrabing with some chemical.

In Blue Diamond Cement plant, it is now using 1.3 and 4. Blue Diamond Cement's manufacturing process is dry process and one string 5 cyclone pre heater calciner which is the most energy efficient and low fuel consumption of its capacity. In cement grinding plant it use additives to blend with clinker withot affecting the specified quality if cement.That is to reduce the clinker/cement ratio and at the same time lowering the CO2 emission pef cement production.

Moreover, Blue Diamond Cement plant maintains the existing forest and plantation around the plant site area and residential area as much as possible and makes green belt plantation.

Highland Cement International Co., Ltd is not yet in a position to procure and install continuous Monitoring Device (continuous flue gas analyser) at the stack for continuous monitoring of CO_2. This is taken into consideration and the long any will later follow the example of Ngwe Yi Pale' Company which has installed continuous flue gas analyser.

6.2.1.3.3 Impact: stockpiling of mined/quarried out materials and overburden and mitigation measures to be taken

Huge amount of quarried out materials (limestone, abalaster, clay, laterite etc) and overburden are generated in quarry activities. A wide area is needed to stockpile them. While the required materials (limestone etc) is evacuated and replaced from time to time the overburden usually remains forever, unless there is a chance to utilize it.

The overburden and top soil will have great impact on the area, altering the soil profile, changing or blocking the natural drainage system of the area and also the stream if there is one nearby, severely impacting the aquatic life of the stream. Erosion and sliding of overburden and top soil are usually the main issues that impact the environment.

Overburden and top soil has an impact on the relief and topography of the area. Large mounds of overburdens at the quarry sites are really an ugly sight.

However as the mountain is sheer limestone mountain with thin layer of top soil the quantity of overburden and top soil is relatively small. (In general mining of mineral the ratio of overburden top soil to the mineral can be about 10:1. Here it is the opposite; 1 overburden: 10 limestones).

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

- To mitigate impact on biodiversity do not clear more vegetation than needed for temporarily stockpiling of mined out limestone/clay.
- Systematic removal and stockpiling of overburden; do not dump overburden on slope, in valley; the overburden must not block the natural drainage system and change the course of water flow during rain.
- Stabilize overburden; first level the ground for stockpiling of overburden; the height must not be more than 30 feet, the slope must not be greater than 37º; plant herb or grass or let them grow on the overburden.
- Always avoid spill from overburden reaching stream, village and cultivated land, prevent spilling, sliding by all means--- eg. build retaining wall, or bund or bench.
- Always check erosion and flooding during the rainy season.
- Backfill mined out/quarried out pits with overburden.
- Separate top soil and subsoil of overburden; top soil for creation of green belt (planting of trees), sub soil could be used for construction work, earth filling work.
- Used the unused overburden later for rehabilitation work after mine closure.
- Take utmost care not to cause collateral damage to the surrounding.

6.2.1.3.4 Impact: loss of non-living resources (limestone, clay, laterite etc) and mitigation measures to be taken

Not only living natural resources (biodiversity) are impacted by quarry activities but also non-living natural resources (limestone, alabaster, clay, laterite etc.) are impacted. These non living natural resources are lost forever since they are not renewable. So the impact is inevitable, and irreversible. By the end of the Operation Phase the whole limestone mountain can be gone. Its depend on the skillfulness of quality control engineer, process engineer and minning engineer. Instead of using high grade of limestone only it should be used high grade and medium grade proportionally. Quality control department should make raw mix design and raw mix calculation based on the fact that to extend the life of quarry. That means using limestone of high grade and low grade proportionally to minimize the wastage of limestone and extend the life of quarry.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

As the loss of the limestone mountain (non-living natural resource) is inevitable and irreversible there can be no tangible mitigation measure for this. This matter should be considered on a very pragmatic way. The loss of the mountain and the resources is compensated by the gain in infrastructure development and hence the national development (since cement is the essential material for infrastructure development). After all there are thousands of mountains of limestone in the country and so the loss of one is not a serious loss. To gain a thousand kyat one has to give away a hundred kyat (Htaung-myin-yar-sunt) as a Burmese saying goes.

This is tantamount to a small sacrifice for the sake of national infrastructure development.

Geologists of the company shall try to estimate the capacity of the mountain as accurate as possible. (At the moment it is estimated that the two quarries contain 118 million tons of limestone. As the annual requirement is 650,000 tons the resources can last for more than 100 years.) Quarry engineers shall check and calculate the extraction rate of limestone (and also clay, laterite) on a weekly, monthly and yearly basis. This is to spare the mountain from over extraction which will eventually leave huge piles of limestone unused and overburden after the completion of the Operation Phase, 20 or 30 years later.

In the same way the quarry engineers shall calculate and estimate the sustainable utilization of clay, laterite, and gypsum. Coal is not an issue --- the company has its own coal mines.

Ensure that the extraction of these raw materials does not involve child labour and/or forced labour.

Figure – 102: Stockpiling of limestone

6.2.1.3.5 Impact: noise and vibration and mitigation measures to be taken

Extremely loud noise and severe vibration are generated during the blasting of the limestone, laterite etc. But this is limited to a few seconds every other day. But this EIA is concerned only with activities at factory. Excavation and transportation of the raw material (limestone) would inevitably cause noise pollution in the area. (This is already mentioned in the impact of blasting.). When compared with a steel factory.

Activities at primary and secondary crushers also generate and loud noise. But the high level of noise is continuous throughout the crushing activities. In fact the crusher department is the noisiest spot. In the factory compound the main noise generating sources are generators and compressors. On the whole the noise level inside a cement factory is low or relatively low.

Vehicular movements and movement of heavy machinery also generate noise.

Increase of ambient noise level will cause disturbance or nuisance for the employees, but working in noisy workplace for long hours can impair hearing.

There can be damage to local structures due to vibration. Vibration and loud noise are one way or another, associated.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

Provide adequate PPEs such as ear muffs, ear plugs and ear protectors for employees at the quarry site and crusher departments (noisy locations that exceed permissible occupational noise level limit standard.)

Select low noise equipment; install mufflers at air inlets or outlets of the fan and air compressors. Install sound insulation cover (lattice work of woods) or barrier wall of the work place. Place noisier sources farther away in overall design.

The crusher department is far away the main factory and office where most employees are concentrated. (Actually it is not practical to mitigate the high noise level generating from a crusher. it is also not practical to install barrier wall around a crusher. The only plausible way of mitigation is provision of adequate PPE, ear plugs, ear muffs for workers at the crusher.) Build sealed or semi-sealed workshop, if possible.

Heavy trucks and heavy machinery also generate loud noise and vibration. Reduce the speed of heavy trucks when driving inside or in the vicinity of the factory compound. Ensure that the surface of the road is smooth to reduce vibration effectively. Install silencers/noise abators on trucks and machinery, if possible. The installation of air-conditioned cabins for excavator and/or dozer operators is widely practiced in most countries.

Conduct regular noise monitoring to ensure that noise level during all times are within noise exposure standard. (Portable small noise test kit is very useful.)

For mitigation of vibration install vibration insulators or vibration absorbers (shock absorbers) on machine that vibrate violently. Prolonged vibration can damage machinery and instruments.

Suitable foundation design shall be implemented at the earliest Planning Phase of the project, for the long term operation. Vibration in the vicinity must be below acceptable level.

Fortunately there is no tall structure in the village to be impacted by vibration from the blasts at the quarry site.

Activities inside the factory compound and at the crusher cannot be heard from South Pyi Nyaung, the nearest village, which is little more than half mile away in the south east. But very loud noise and vibration resulting from blasting can be heard and felt at the village.

Note: It is thought that the level for air blasting is within 115 and 120 dB linear (normal blasting).

Note: The result of measurement of noise level is shown in **Chapter 5** and compared with the NEQ guideline values prescribed by ECD.

Figure – 103: Wearing PPE

6.2.1.3.6 Impact on water environment and mitigation measures to be taken

Even though the manufacturing technology is the "dry process" the factory still has to utilize large quantity of water for the production of 1500 tons of Portland cement. This can have impact on the water resource of the area. The domestic consumption of water by 290 employees and families can also have considerable impact on water resource.

The daily requirement of water is estimated at 180,000 gallons/day. Water is sourced from a nearby spring at the foot of the mountain. There are also additional shallow well (collector wells) beside Myit Thar stream bed and so water availability is not really an issue during the dry months. The water flow rate of the stream gallons/hour is measured monthly and it estimated that only 1% of the stream water flow is utilized.

The water of Myit Thar stream used to be the source of drinking and domestic uses for the villagers of South Pyi Nyaung. But due to gold mining/panning (both legal and illegal) taking places up-stream the water is turbid for most part of the year. The villages have to dig or scoop small shallow wells beside the stream bed for drinking water.

The waste water associated with the operation of the factory is negligible. All the water drawn up for cement production is virtually used in the dry process. So there is almost no industrial waste water to impact the surrounding area.

Highland Cement International Co., Ltd has its water treatment plant a cooling tower and a sewage treatment plant. The domestic waste water is treated before flowing through the drainage system for final discharge.

However there can be potential contamination of stream water due to unmanaged dumping of solid waste and liquid into the stream as well as spillage of oil, chemicals and contaminated runoff source from contaminated soil, especially during the rainy season. There is also the potential for erosion and siltation due to activities at the factory and at the quarry during the rainy season.

There can also be contamination of ground water due to percolation of oil and hydrocarbons and chemically contaminated water. There can be also contamination of ground water due to seepage of domestic wastes.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

Reduce water consumption as far as possible; carefully supervise water consumption. Water saving measures such as recycling of water, collection of washing and cooling water and the reuse of treated waste water for watering plants and lawn and also for dust suppression must be implemented. Also collect storm water for use in dust suppression and watering plant.

Conduct routine inspection and maintenance of water tanks, ponds, equipments, pipes etc. to minimize or stop water leak or spill. Promote good housekeeping practice for employees for sanitation and for saving water.

Collect rain water as much as possible during the rainy season or raining days for later use.

Build new ponds, and install new tank for water.

Develop a detail monitoring plan to monitor spring water at the foot hill and the surface water level in the stream; select water quality parameter such as temperature, pH and total alkalinity for monitoring.

Ensure that the consumption of water is within the work frame (180,000 gallons/day).

Select plant and grass species that need less water in landscaping, garden and lawns to reduce the use of water.

Avoid by all means the dumping of solid and liquid waste into the stream (educate and train workers).

Avoid by all means the accidental spillage of fuel oils and chemicals into the stream.

Should spillage of fuel oils or chemicals occurs on the soil do not wash down with water but use absorbents eg. rug, saw dust etc to remove the spill.

Prevent erosion and siltation into the stream either from activities in the factory compound and from the quarries (during rainy season).

Domestic waste water from residential area and from factory premise shall be treated before discharge. Industrial waste water, if any, shall be treated before discharge.

The local community should be able to file compliant regarding the impact on the stream water, if any.

The company has one water treatment plant a cooling tower and one sewage treatment plant. As mentioned earlier raw water is not used for either industrial or domestic purposes but treated before use. Raw water treatment involves sand filteration, iron removal and chlorine treatment (including the application of zerguard (5681) and Phaninox 1chemicals)

"Dry process" needs little water but only for cooling. The water from two $250m^3$ tank is for factory cooling (industrial use) while water from another two tank, ($500m^3$ and $100\ cm^3$) is for domestic and firefighting. The water from $100m^3$ tank is stored for emergency firefighting only.

The used hot water is cooled at the cooling tower and 100% recycled. Water loss due to evaporation is replenish from time to time the used water/domestic waste water/sewage water is treatment before discharge. Waste water treatment involves the application of the chemical poly aluminium chloride (chemical treatment) and vigorous aeration of waste water (biological treatment) before discharge.

<u>Waste water generated</u> – of the water from 500 m3 tank (130,000 gallons) the daily actual domestic consumption is about 100,000 gallons, of which 33,000 gallons is lost through consumption and 67,000 gallons end of as waste water which is treated before discharge (from water consumption ratio formula 33:37).

Domestic waste water includes black water (sewage) from toilet and gray water from baths, basin/sinks, and kitchen.

Untreated sewage contains water, nutrient (nitrogen, phosphorus), solid organic matter pathogens, (bacteria, viruses, protozoa), helminthes and intestinal worms, oils and grease.

Black water (toilet water) contains feces, urine, pieces of toilet papers, toilet flush; all end up in septic tanks and soak pits.

Gray water is treated before discharge.

Gray water also contains very small quantities of chemicals from the factory laboratory.

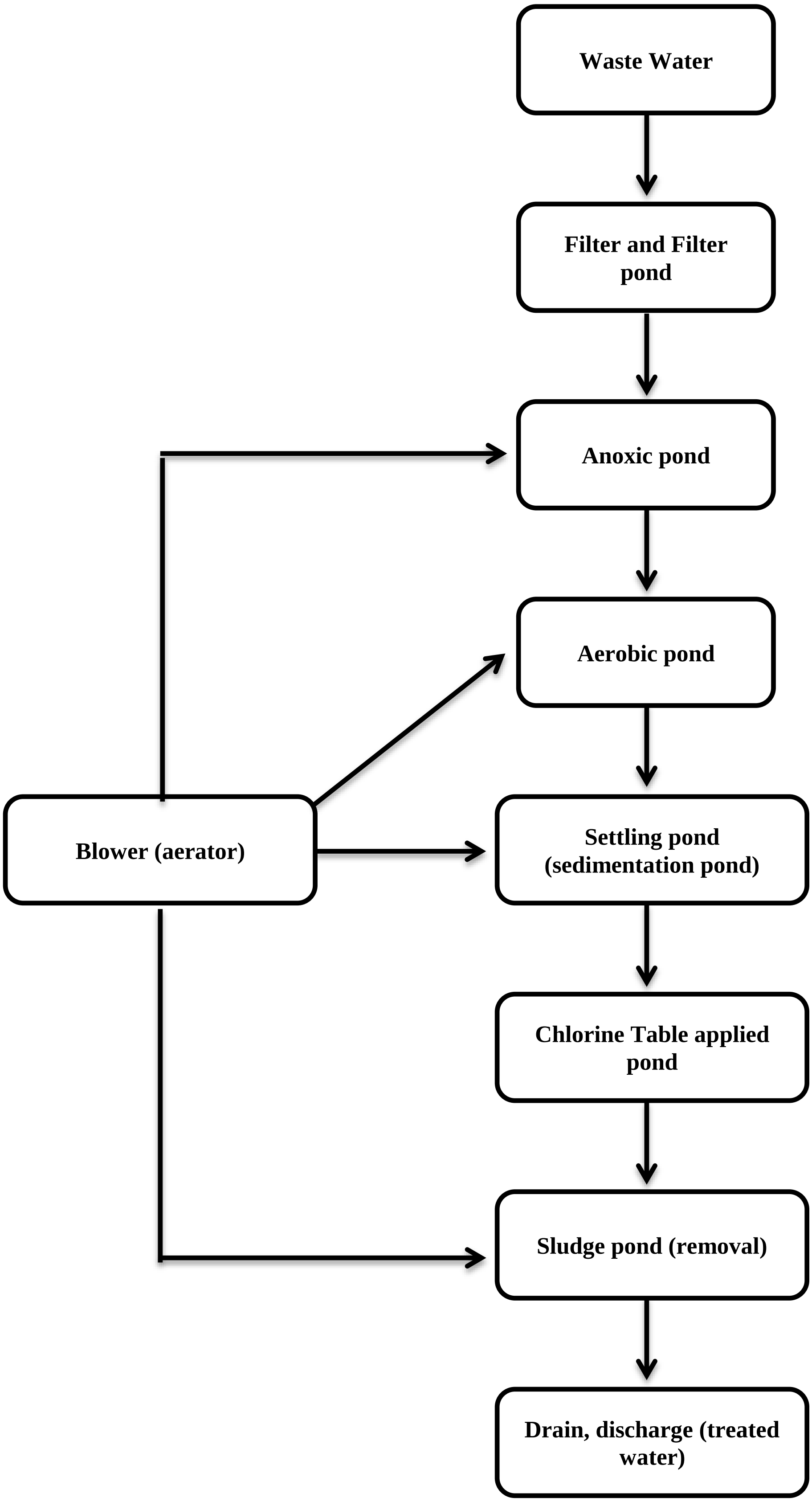
<u>Waste water from the factory lab</u>

The waste water includes a variety of chemicals used in the lab. After each analysis the solutions in the glass ware are poured into the sink. All the glass wares are washed in the sink. But only small quantity of chemicals have be used and it is not practical to estimate the amount waste water generated from the lab. It is roughly estimated that only two gallons of waste water is generated from the lab.

<u>Sewage/waste water treatment process in brief</u>

Sewage flows through steel mesh and solid matters, if any, are retained and removed (physical treatment). In the sewage treatment tank chemical dozing with poly aluminium chloride is undertaken (chemical treatment) the chemically treated sewage water flows into the aeration tank and continuous aeration is done. (Biological treatment: aeration facilitates the blooming of bacteria and blue green algae which consumed up all organic waters in the water). The biological treated sewage water is discharge into a ravine just north of the residential quarter.

Simplified flow chart:



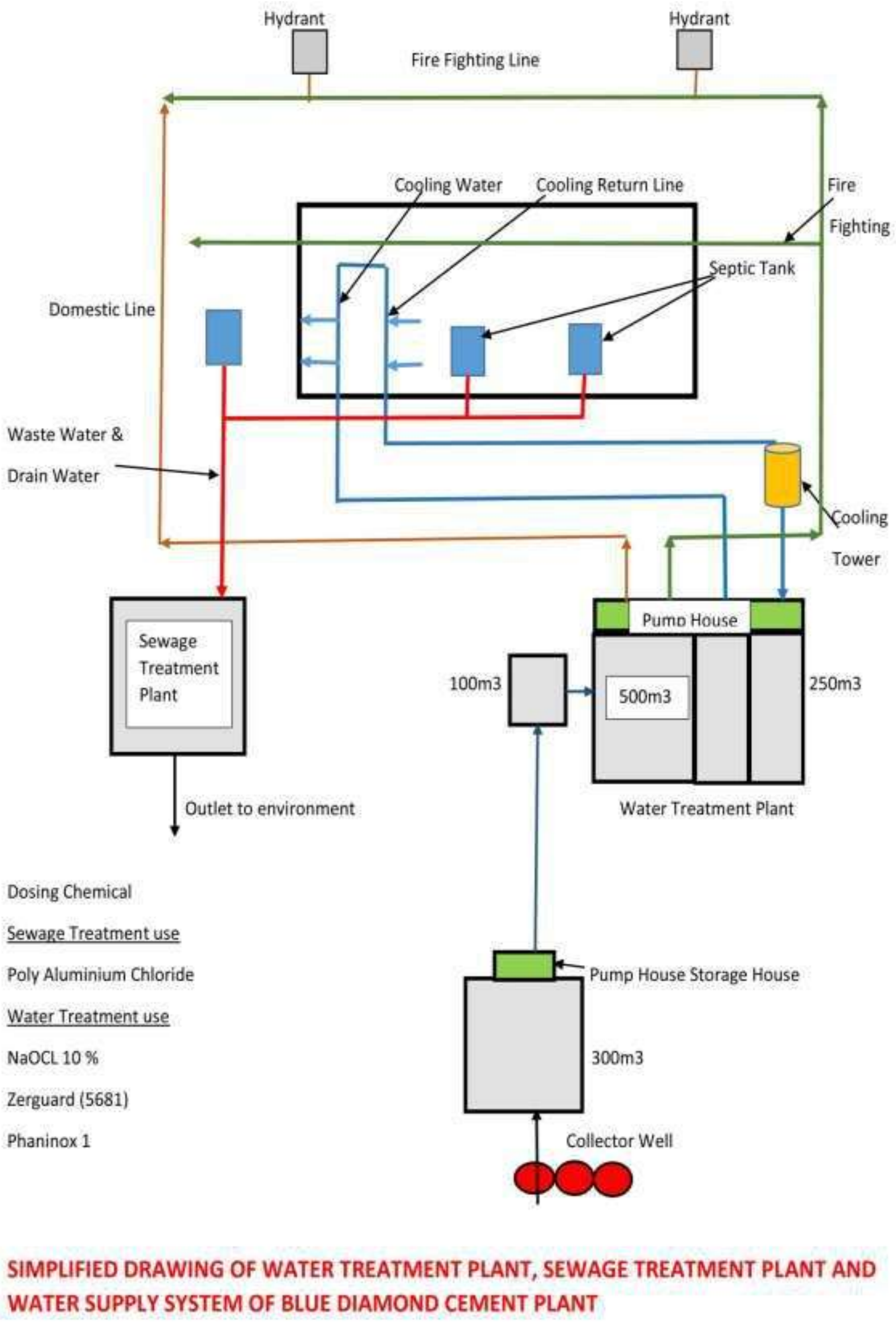


Figure – 104: Water treatment system

Note: The company will ensure that the waste water values are within the NEQEG values by all means as far as possible.

Figure – 105: Water treatment plant

Figure – 106: Sewage treatment

6.2.1.3.7 Impact on biological component (biodiversity) and mitigation measures to be taken

The impact on biodiversity during the commencement of the Construction Phase is already mentioned. The impact due to quarry activities is often higher than during the Construction Phase. Forest has to be cleared for quarry; the drilling, blasting, excavation and transportation activities will scare all the wildlife away. While the Construction Phase last for two years quarry activities will last for 20-30 years (the whole Operation Phase). So there is no doubt that the impact on the biodiversity will be high. The site selected for the factory was previously a partially degraded Pyinyaung Reserved Forest. The quarry site, however, was previously a mountain with relatively lush green vegetation.

Moreover the area of the factory and its premise is only 173 acres while the combined areas of two quarries, is 930 acres. This can be simply calculated that the impact of quarries on the ecosystem is five times higher than that of the factory.

When all the limestone at a spot inside the designated quarry area is quarried/mined out the quarry work has to move to a new spot within the quarry area of 930 acres. Vegetation has to be cleared for this new quarry spot. Then when the limestone is all mined out the work has again to move to another new spot where the clearing of vegetation has to be undertaken. In this way after 2-3 decades of quarrying most or all the vegetation within the designated area will be gone. The impact on the biodiversity, especially flora, is significant indeed.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

Avoid clearing more trees than really necessary for quarry activity. Also avoid clearing more trees than necessary for the site for stockpiling limestone and the over burden.

Effort shall be made to plant trees in the periphery of the site. Shall try to save as many original trees as possible. Also try to restore the remaining original trees as far as possible. Protection strategy is better than replacement approach when mitigating impact on biodiversity. Therefore shall select locally occurring trees rather than introducing new ones when planting trees.

Overburden and top soil shall be kept separately; overburden is for backfilling pits, dents, depressions while top soil is for planting trees.

Reforestation of the affected spots shall be undertaken as soon as possible. The company shall not wait until the end of the Operation Phase but shall commence the planting of trees whenever the work at a quarry spot is finished. The company has already established a nursery and carried out the compensatory replanting of tree saplings in four spots.

The company has created green lawn and green belts inside the premise of the factory and the residential area.

Of the project area of 1308.91 acres, 750 acres are within the Reserved Forest area. The company has also a plan for compensatory replanting or reforestation of 20% of the project area (about 260 acres). At the moment the company has already planted more than 10000 trees. The company has also planted teak saplings in 40 acres of the affected area and the young plants are growing well.

Figure – 107: Compensatory plantation of trees

6.2.1.3.8 Impact of waste disposal (solid, liquid) and mitigation measures to be taken

At the quarry

Large quantity of unwanted material (overburden) and top soil are usually generated. But as the mountain is sheer limestone mountain with relatively thin top soil the magnitude is quite low. Relatively low quantity of overburden and top soil are generated in this quarry context. Unlike mineral mining which generate huge quantity of overburden the mining of limestone mountain generate very small quantity of overburden.

At the factory

The main industrial wastes at the factory are the cement dust/clinker dust and ash (Already mentioned in impact on air environment **6.2.1.3.2**). As all the raw materials, limestone, clay and laterite are physically and chemically transformed totally into clinker there is little industrial waste left, only small quantity of cement/clinker dust and ash. (It is estimated that for every ton of Portland cement produced only up to 1 kg of waste (cement dust and ash) is generated; dust emission is at most 19 m/per kg cement, it is learnt). In this factory context which produces 1500 tons of cement the waste generate is 1500 kg/day.

Cement dust is also generated from packing area, storage area and at loading (on truck) area, but only in small quantity. Cement dust is indeed the main occupational hazards for workers in a cement factory, it is learnt.

Cement dust can be reused for the manufacturing of cement but so far, the company has not done this yet.

As regards waste water there is virtually no industrial waste water. The dry process uses up all water and nothing is left of industrial waste water. The office waste water is minimal while the domestic waste water at the staff quarters e.g. kitchen waste water, sanitary waste water are quite substantial.

Liquid wastes (used fuel oil, engine oil, grease etc.) are either gave away or sold to Third Party.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

At the quarry

- Carefully select quarry spot to reduce overburden and tops soil generation.
- Ensure for systematic stockpiling of overburden and top soil; do not dump overburden/top soil on slope and in valley; level the ground for stockpiling; build retaining well.
- Avoid spilling, erosion and sliding of overburden, top soil.
- After work completion at a quarry site backfill the pits and tents resulting from quarry activities. (See also mitigation for overburden, top soil and mined out materials mentioned earlier.)
- Overburden can be used for construction while top soil is good for reforestation.
- Provide PPEs mouth and nose covers for workers exposed to dust for long hour at the quarry site.

At the factory

- Construct a temporary dumping site for dust and ash generated from the factory. (The company has a common shed with roofing where dust and ash are stored at separate apartment and later disposed off at the approved landfill. The company has not used the cement dust for recycle or ash as additive for cement production yet.)
- Train workers for the systematic collection, storage and disposed of the waste.
- Provide PPE for workers exposed to dust for long hours at the factory.

Note: The application of series of bag filters (dust collectors) and ESP is already mentioned earlier.

As regards domestic solid waste (at office and at staff quarters):

- Separate waste into at least two categories – recyclable and non-recycle
- Calculate waste generated on a weekly basis, if possible
- Avoid disposal of solid waste into the open, inside or outside the factory compound
- Also dispose domestic wastes at the approved landfill in the south. (The landfill is simply a large pit with a dimension of 30 m x 15 m x 11 m. (shown below)
- Avoid open burning of waste; use incinerator, if available
- Follow the 5Rs principles of waste minimization (reduce, reuse, recover, recycle and redesign).
- Educate and train workers for handling of waste and also for good housekeeping practice.

As regards waste water:

- Avoid discharge of waste water into Myit Thar stream. Treat waste water before discharge. (The factory has a sewage treatment plant and also a water treatment plant for purification of water in the first place already mentioned earlier.)
- Water used for washing machinery and vehicles can be reused--- eg. for dust suppression and for watering plants
- Educate and train worker for minimization of water use in the first place.
- Test the water quality as well as effluent annually.
- The local community should be able to file compliant regarding waste disposal.

Figure – 108: Domestic waste bins at the site

Figure – 109: Landfill

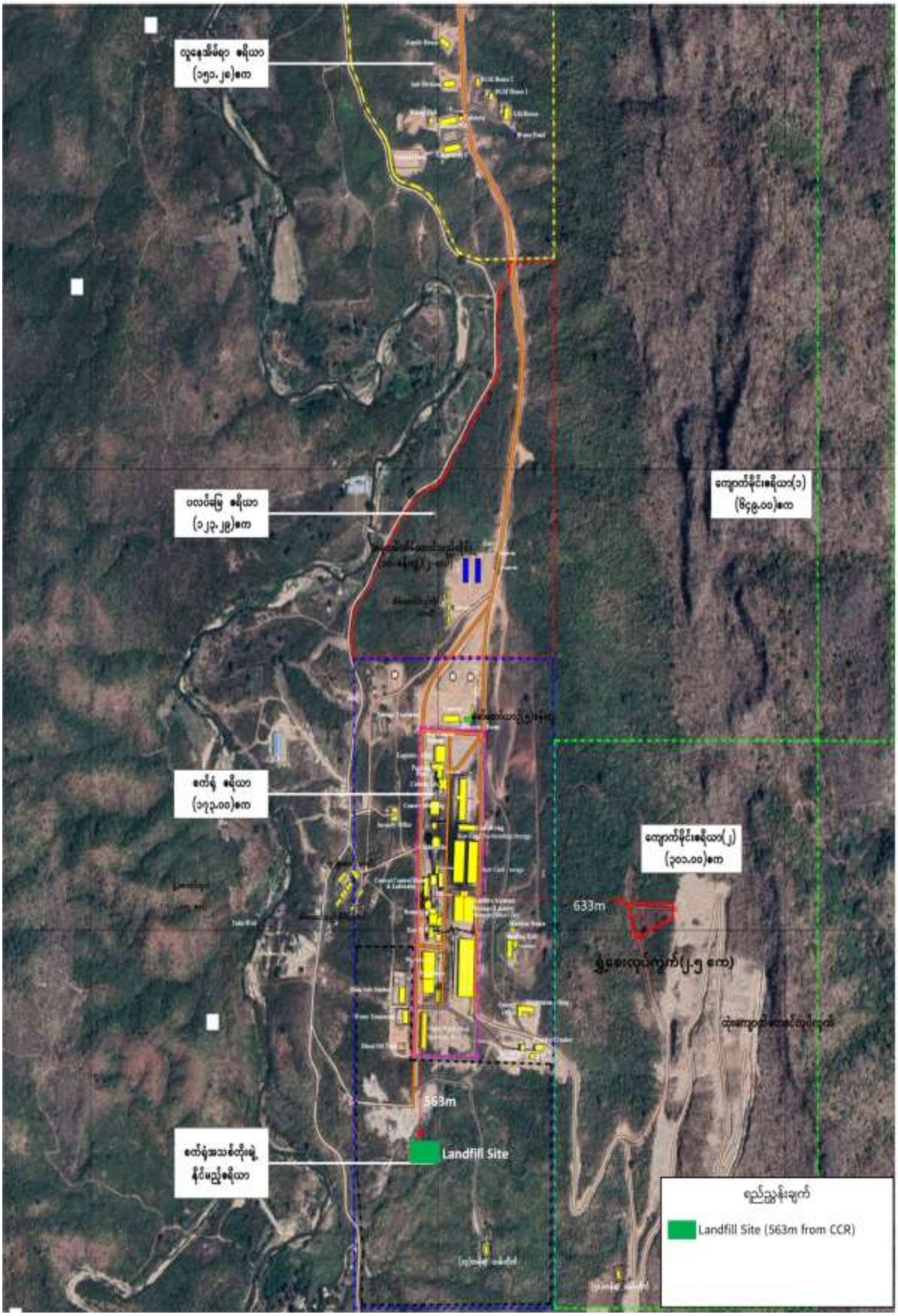
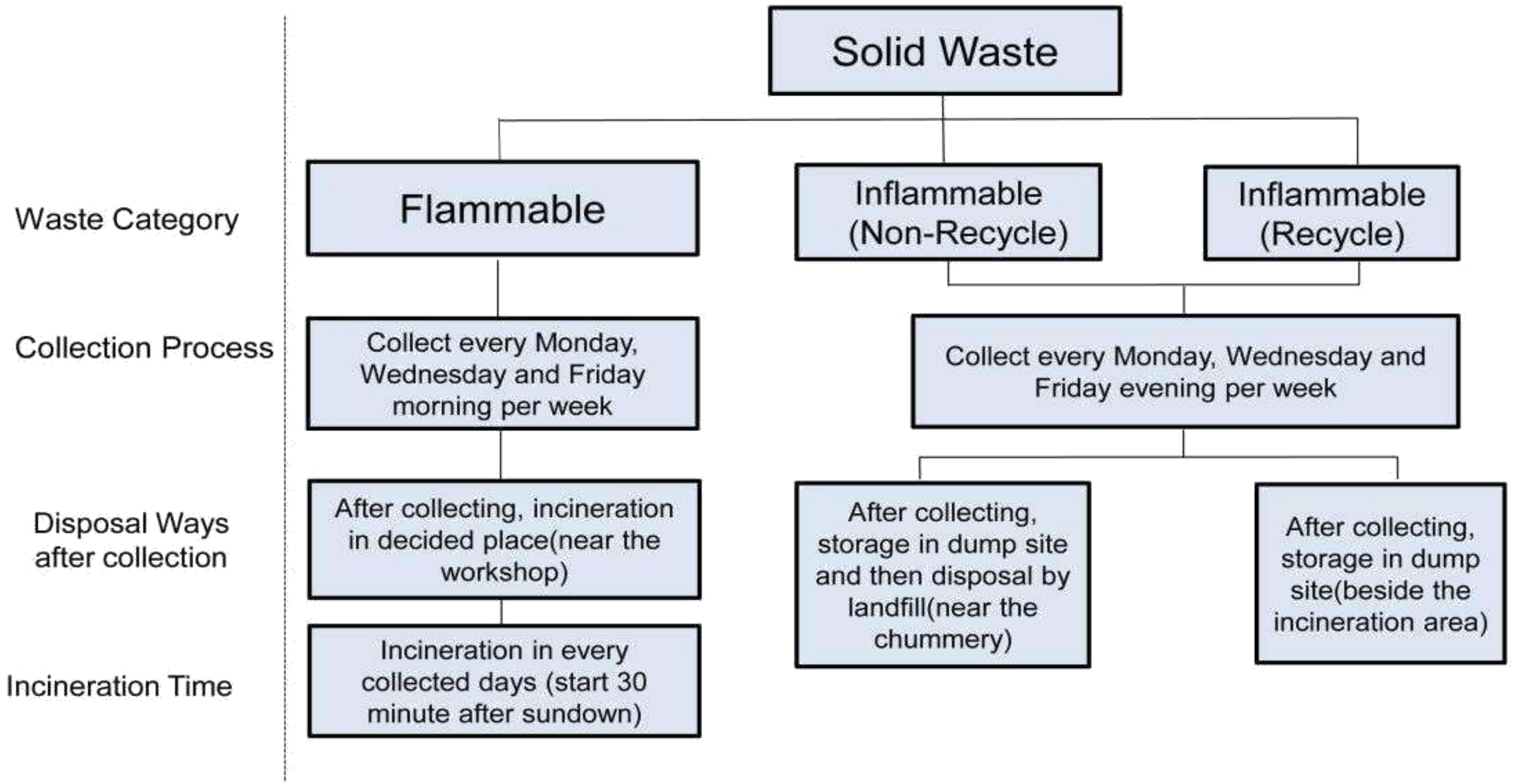


Figure – 110: Satellite image showing project site and landfill



Note) Collect the recycle waste (used-oil, used-grease, used-paper and used-bottles) and sell to third party.

Figure – 111: Waste disposal plan practiced worldwide (the company has followed this plan)

Solid waste

Industrial solid waste:

E.g. – Ash and cement dust; about 1502 kg of ash and cement dust is generated daily. These are temporary stored in a shed with roofing and monthly disposed at the land fill in the north. The company has so far not reused these ash and cement dust.

– The use filter bags and plastic and tin containers which are generated from time to time are also industrial waste and are incinerated in every collected day some plastic materials are recycled.

The disposal plan is shown in the figure above. Solid waste here refers mainly to domestic waste from the factory area and residential area.

They are categorized into flammable, inflammable (Non-recycle) and inflammable (recycle). All are temporary kept in waste bins as shown in figure.

Collection is done on every Monday, Wednesday and Friday.

– Flammable wastes are incinerated every collected day after sun set. The incinerate area is near the land fill.

Inflammable (both recyclable and non-recyclable) are also collected on every Monday, Wednesday and Friday. Most of the Recyclable sold waste, paper, plastic materials, bottle, iron scrap, if any, are gave away or sold to Third Party; some are disposed.

There inflammable solid wastes are first temporary stored in dump site and later disposed into the approved landfill (a large landfill). A few waste e.g. from clinic are temporarily stored at the dump site and incinerated at the nearby incineration site.

The landfill (concrete structure) and incineration site are north of the factory near the residential quarter, at the foot of the mountain.

6.2.1.3.9 Impact on traffic and mitigation measures to be taken

This is already mentioned in the Construction Phase but the potential impact in the Operation Phase will be long term.

As the production capacity is high the logistics of procurement of raw materials, coal from Kalaywa, laterite from Pyin Oo Lwin (Inya) and gypsum from Mauk-mei would involve many trucks and would have substantial impact on the traffic.

The company has kept few trucks of its own but relies on the contractor basis for the procurement of raw material and the distribution of cement.

As the demand for cement is always high cement traders would come with their own trucks or hired trucks right to the company warehouse and buy bags of cement right away..

As the trucks of the contractors or traders are not under the control of Highland Cement International Company the mitigation measures for the impact on traffic are, of course, not necessary.

However, the company shall at least take responsibility on the traffic on its 4 miles access road.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

- Draw up a traffic management plan (even though the traffic is light; road users are mostly motorcyclists and pedestrians).
- Set up sign board at road intersection (of access road and highway) to direct heavy truck drivers to reduce speed at this intersection.
- Vehicular movements to be scheduled to avoid peak hours.
- Heavy trucks with big load to be travelled at reduced speed.
- Educate the company drivers in defensive driving.
- Also ask all other truck drivers who are involved in the transportation of the raw materials and the finished products (cement) of the company to comply with rules regarding Highway Law, 2000.
- Avoid overloading of truck; comply with motor vehicle law, 2015.
- Always cover load with tarpaulin to avoid spillage during transportation.
- Keep a log book each for all company vehicles.
- Check the arrival of all trucks loaded with raw materials (coal, gypsum etc.) and the departure of all trucks loaded with cement bags; and also arrival and departure of all office cars.
- The local community should be also to file compliant regarding traffic.

6.2.1.3.10 Impact of power supply on national demand and vice versa and mitigation measures to be taken

The annual total electricity consumption is estimated at 700,000 units. This is a substantial increase in national power demand given the fact that the whole national consumption is only about 2000 plus MW.

The nation is witnessing power outage from time to time due to defect in electricity or due to natural disaster or due to deliberate load shedding. Because there is no efficient means of regulating power supply so far, the easiest and pragmatic way is load shedding whenever there is case of over load. This is probably the pragmatic policy of electricity authority. There were/are precedents of load shedding practiced in the industrial zone of Yangon, and other parts as well. The company should not rely entirely on the national grid line.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

- Plan to minimize power consumption; this includes selection of machinery and equipment that minimize energy consumption.
- Apply direct solar water heating if necessary.
- Use low energy efficient lighting.
- Educate employees to save energy as much as possible.
- Establish an independent power generation facility or substation.
- Design contingency measures and/or downtime procedures to implement in case of power failure.
- Backup system or backup generators must be installed (The company has a substation and also a 300 KVA backup generator).
- Have regular consultation with electricity authority.
- Regularly monitor and check the consumption of electricity – consumption shall be within the work frame of 700,000 units per year.

6.2.1.3.11 Impact: exposure to intense heat and occupational and health hazards and mitigation measures to be taken

This is already addressed in the Construction Phase. But the potential impacts during the Operation Phase are long term. When employees are working at a workplace for many months attentiveness tends to slacken and cases of accidents and emergencies can occur from time to time.

The lack of good engineering practice, good working practice good house-keeping practice, good safety practice and lack of health education and awareness and hygiene can all lead to undesirable consequences and have negative impacts on the project.

Exposure to heat at the kiln is a significant issue. Although the performance of kiln is remotely regulated and controlled at the control room workers have to be exposed to the intense heat from time to time. Another possible hazard is fire and explosion at kiln.

Another main issue is inhalation of cement dust clinker dust which is the biggest issue. Air pollution is the main hazards in a cement factory.

Another hazard is exposure to high level noise at the crushers.

Other common hazards are eyes, skin and respiratory track irritation (due to dust, ash); inadequate safety guards on machine/equipment; strips, slips and falls, minor or major accidents due to contact with moving rotating and reciprocating machinery. (In fact all parts of the machinery which move while the machine is working is hazardouds).

The occupational health and safety hazards at the quarry site are:

- Unintended explosion, effect of blasting (due to lack of blast area security) and hit by fly rocks.

These are primary cause of injuries and deaths. The other issues are extremely high noise level and vibration. Generally the work at the quarry is more risky than that at the factory.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

- All workers must pass a medical examination prior to being employed.
- Educate, train and supersize workers for good working practice, good safety practices, good housekeeping practice and good hygiene practice until all these good practices become good habits that ingrained in their mind sets. Also hazardous work place awareness, identify unsafety places.
- Provide adequate PPEs for workers that are exposed to dust, smoke, loud noise, and heat etc. eg. helmet, mask, gloves, boots, outfits for workers exposed to intense heat; ear muff, and ear plugs for those exposed to high level noise etc.
- Implement safe and effective procedure for storage and transport of hazardous materials.
- Bund all storage area of fuel, lime, chemicals etc (The company has a fuel depot and chemical store).

- Train workers for the safety handling of fuel oil; and also laboratory personal for handling of laboratory chemicals, although very small in quantity.
- Basic first aid and basic Firefighting trainings for workers (The company has conducted two trainings with the help of Township Fire Brigade).
- Draw detail plan for prevention of fire and emergency plan for fire out break (The company has already has planned for this: fire prevention document: Htoo: Ba Ma La (Pa Nya)/9211/2015. Dated 7-7-2015).
- Provision of firefighting suits and equipments (fire engine, truck), water jet pumps, installation of hydrants around the plant; water ponds to be always filled with water etc. The company has also installed 7 firefighting stands, comprising 35 extinguishers: some buckets, bamboo poles, bamboo lattices etc.) at appropriate places.
- Organize Occupational Health and Safety training from Ministry of Labour, Immigration and Population. (The company has already done this.)
- Training and drill work on emergency procedures including contingency measures. (This has already been done once.)
- Effective emergency response plan (including displaying of phone number and address of nearest Fire Brigade, Ambulance Service, Hospital and Police Station).
- To take out Insurance for the Cement plant and Insurance for Fire; Life Insurance for each and every employee should be taken into consideration.
- Train workers for awareness of health and hygiene. (Monthly checking clinic and canteen).
- Proper sanitation facility--bath rooms, toilet etc.
- Regular waste collection, pest control, training for good house-keeping practices.
- Full medical care for workers including regular medical checkup.
- Manage to meet all statutory requirements (rules, regulation, Factory Act, Labour Act).

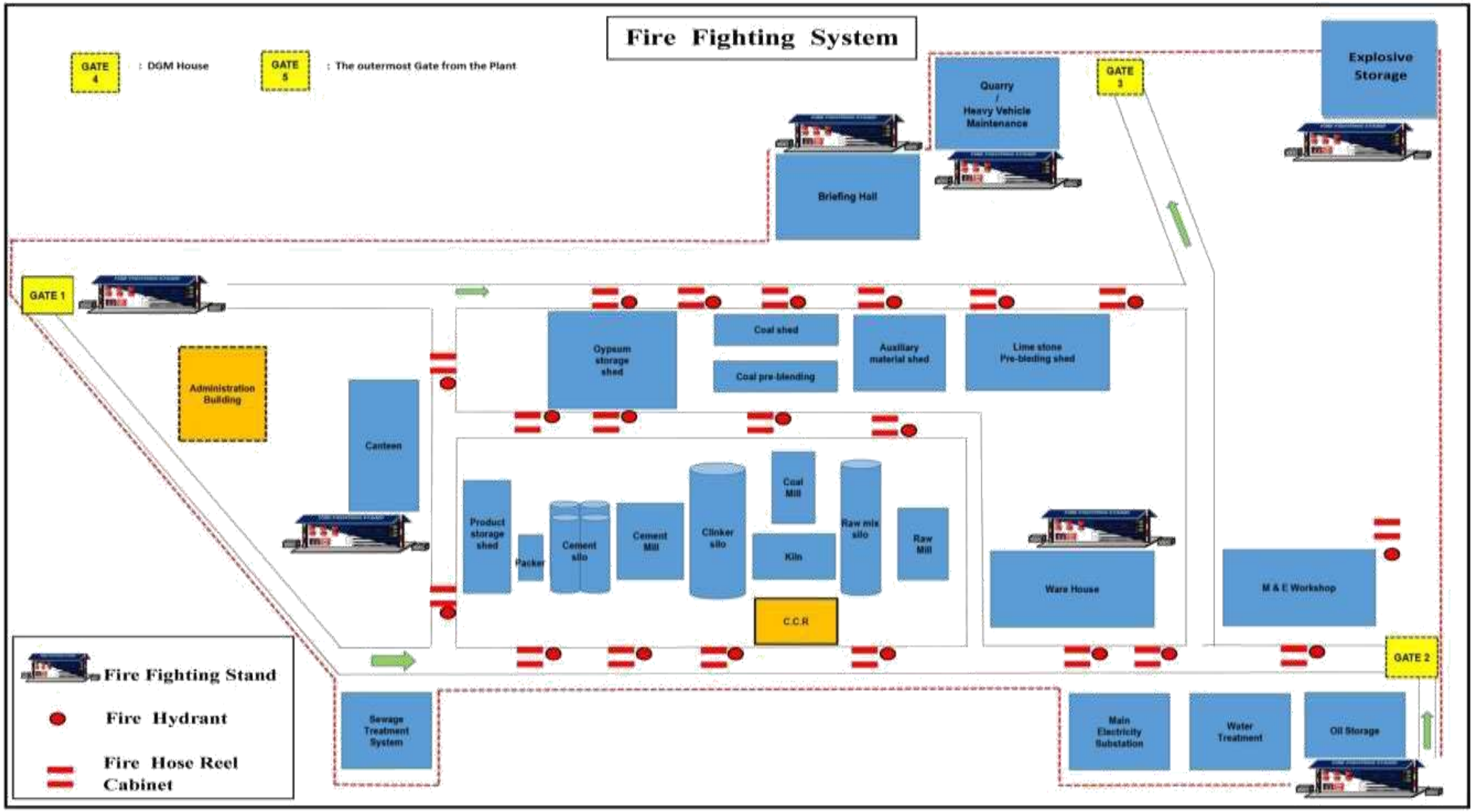


Figure – 112: Firefighting plan at the site

Figure – 113: OHS training session

Figure – 114: Firefighting training and drill

Figure – 115: Firefighting stands (traditional)

Firefighting trainings and safety trainings

No.	Description	Date
1.	Firefighting training	20-3-2017 to 2-3-2017
2.	Firefighting training	5-3-2018 to 7-3-2018
3.	Firefighting training	10-9-2018 to 12-9-2018
4.	Firefighting training	6-5-2019 to 8-5-2019
5.	Firefighting training	20-1-2021 to 22-1-2021
6.	Safety training	12-5-2017 to 13-5-2017
7.	Safety training	10-5-2018 to 11-5-2018
8.	Safety training	20-12-2018 to 21-12-2018
9.	Safety training	8-10-2019 to 11-10-2019

6.2.1.3.12 Potential social impacts and mitigation measures to be taken

These are already mentioned in the Construction Phase. Such cases are unlikely to occur during the Operation Phase as all workers are handpicked by the executive members of the factory. Unlike the blue collar construction workers who are employed for short term (two years) the workers in the Operation Phase are permanents workers. It is expected that they are better well-disciplined than the construction workers.

Any way the authority of the factory has to deal with these workers on a long term basis.

Measures for creating a peaceful and productive atmosphere should be taken into account.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

Educate employees to be good workers who are dutiful, well-disciplined and diligent. Give them proper training on factory and work place regulation, and code of conducts. (These are normal practices in all factories and work places.)

As for dealing with local community educate them regarding local cultural behavior and awareness to achieve responsible and healthy community interactions.

The company shall deal with the employees on a fair and square basis. The company shall be aware of widespread cases of workers unrest in Yangon as a result of overworked, underpaid, and unhealthy relation between the employees and the factory authority.

In addition to regular medical checkup, voluntary HIV testing on the workers is necessary as they are permanent workers of the factory. (HIV awareness campaign and voluntary HIV testing have yet to be implemented.)

As regards public relation:

- consider hiring locals in the future when there are vacant posts, especially unskilled jobs
- try to reduce/eliminate the potential impact to quality of existing life style of the local community in the area. Avoid the impacts of quarry activities on their village, the infrastructure, land and farms, on drinking water sources, on the natural resources they are dependent upon and on their livelihood etc.
- (**Note:** There are no substantial impacts on the field, farms, water sources and infrastructures. But the impact on the forest, their natural resources, is inevitable. Compensatory replanting has been already carried out.)
- avoid the impact of quarry activities on the cultural component such as Buddhist Monastery, Pagoda, historical monument, if any. (Actually these are not impacted.)
- implement CSR programme for the community. (Certain CSR actions had been already taken by Highland Cement International Company)
- maintain cordial relation with the local community
- listen to the views, thoughts and opinion of the local people, heed to their concerns (See also **ANNEX** for implementaion of CSR by the company)

6.2.1.3.13 Impact: Potential security issue and mitigation measures to be taken

This is already mentioned in the Construction Phase when about 200 workers were employed. Unlike the hectic nature of work during the Construction Phase the working atmosphere during the Operation Phase is stable, with fewer workers.

However security situation tends to slacken when a factory is running for several years. So for the long term Operation Phase the plan for security should be more practical. It is expected that the employee hand-picked by the factory authority will not pose any security threat to the factory. But outsiders, the local people, at one time or another can cause security problems such as theft, vandalism etc.

In this era of terrorism sabotage by terrorists cannot be ruled out. Also sabotage by destructive elements with anti-big business, anti-corporate and anti-cronyism mind set cannot be ruled out.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

Security shall be planned for the long term. The wall of the factory compound shall be good and reliable enough to keep the intruder at bay. Educate security personnel of the factory to be attentive and dutiful. Always restrict the access to the factory; if necessary set up watch towers.

All workers, both white and blue collar, shall wear factory uniform and keep ID card for easy identification.

Security shall be tight throughout the entire Operation Phase.

- regularly check the fence and wall of the factory compound to ensure adequate security
- no unauthorized person on site
- security guards at entrances; and patrol inside at night
- keep things under lock and key as far as possible; take regular locks inspection
- also post security guards or watch men at quarry site

6.2.1.3.14 Impact: public perception and mitigation measures to be taken

This is already mentioned in the Construction Phase. It is quite difficult to identify the public perception. Activists and radical environmentalists can make the local communities to have a negative perception on the factory. Ill-disciplined and rowdy workers, particularly construction workers, can leads to negative perception on the factory by the locals.

During the Construction Phase the local people may have high hope and expectation for employment. But later they may become disillusioned if their hope of employment is not realized to full extent as the factory can never employ each and every one who wants a job.

Good relation with the local community will have positive impact on the factory while the impact will be negative if the relation is bad.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

There is no quick fix solution or remedy for this issue. Try to achieve good relation with the local community. Appoint one or two relation officers/liaison officers to deal with the locals. Heed to the views, opinions and concerns of the locals as far as possible.

The company has a Complaint and Grievance Mechanism (CGM) programme for tackling any issue related with the local community.

Communicate the availability of job opportunities to the locals from time to time.

Consider hiring more locals when there are vacant posts. (Of the existing 289 employees 79 are locals from South Pyi Nyaung and within the area of Yinmar Pin, Tharzi, Hlaing Tet and Meikhtilar.)

Maintenance and immediate repairing of any damages caused by project operation on public or private structures, for instance, road, water network supply, irrigation canals, electric cables etc.

Consider and implement social assistant programme, the CSR, in the area. (The company had already implemented this; this is mentioned in **Chapter-8** and **ANNEX**.

Prioritize the purchase of food, provision and commodities from the local market as far as possible.

For the long term success of the factory a peaceful social environment is necessary.

6.2.1.3.15 Impact: a change in relief (topography) and eventual alteration of landscape and mitigation measures to be taken

The quarry operation usually last for the whole Operation Phase (20-30 years). The quarry operation can result in the change in mountain relief in the first few years to an alteration of the environment at landscape and ecosystem level in the remaining years. By the end of the Operation Phase the whole mountain can be gone. This is the most severe impact as far as landscape is concerned.

The excavation of raw materials (limestone, laterite, clay) and the creation of quarry (mine) voids also alter the soil profile, hydrology, topography and nutrient status of the substrate. Stream flow and drainage pattern may also alter due to quarrying activity, especially during rainy season. Soil erosion, increase in sedimentation and alteration of water course can also happen if the quarry is not far from a stream or rivulet.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

There is actually no easy measure to mitigate the change in the relief and the eventual alteration of the landscape due to prolonged period of quarrying activities.

The practical way is to restore forest in the periphery of the quarry site. Select natural trees that are locally occurring species which need not to adapt with the environment and can grow easily.

Do not clear the forest more than necessary before starting quarry activity.

Carefully select mineralized area, that is, spots where there is limestone or clay etc. Avoid blasting the area (spot) on the mountain side with no mineral (limestone). (The company engineers have exactly done this.)

If the whole mountain is solid limestone rock then there is no need to select special blasting area. However blasting shall be systematically carried out, one portion or block of mountain at a time, rather than random blasting here and there leaving ugly large holes, voids and dents everywhere.

After completion of quarry at one site ensure that all the pits and dents are backfilled and no overburden remain before moving to another quarry spot. Level the ground as practical as possible and duly undertake compensatory replanting of trees and eventual rehabilitation of the ecology of the mined out quarry site. Do not wait until the end of the Operation Phase. Carry on reforestation on a case by case basis.

Plant fast growing trees especially between the factory and the damaged quarry hill to conceal the ugly view, and to mitigate visual impact (Seen from the access road, the factory with the devastated hill in the background is really on ugly site, as far as environmental aspects is concerned). Restore the natural drainage system as practical as possible.

6.2.1.3.16 Positive (beneficial) impact during the Operation Phase

There are many positive or beneficial impacts during the Operation Phase and they are long term in duration.

The main positive impacts in brief are:

The creation of permanent jobs as well as part time jobs; fostering the economy of the local area, local region and also the nation; upgrading of physical infrastructure such as school, clinic, library, monastery and roads; decrease public health risk and in one way or another raising the living standard of many locals; and finally contribution to the improvement of the construction sector and hence, infrastructure of the country.

The first positive impact that can be easily seen is the creation of jobs. About 289 workers are employed permanently (during the Operation Phase). There can still be employment opportunities for vacant posts from time to time. The door is still open for this. About 80 locals from Tharzi, Meik-htila, Aung Bann Township were already employed for permanent jobs. There included 15 villagers from the nearby village Hlaing Tet, 8 villagers from Pyi Nyaung and 4 from Yinn Mar Pin and 1-3 from Kyar-bet-kone, Kwei Tart Son, Ye-paung Sone village in Tharzi Township. Of the 289 permanent employees to be employed during the Operation Phase 10 will be foreigners. The salaries for 279 nationals would range from Ks 144,000 to Ks 1,200,000. These employees could enjoy social benefits, free ferry, free lodging and overtime wages. There would be workers welfare, tea-shop and snack shop with reduced price. The injured and the sick would have free treatment at the factory clinic. Since foreign workers would be involved there would be the chance of skill transfer and technology transfer from them to the local workers.

The parallel access road constructed by Highland Cement International Company had also greatly improved the infrastructure the area.

The factory has boosted the local economy to same extent and improved the standard of living of the locals for a certain extent. Highland Cement International Co., Ltd has so far spent Ks 164,730,100 for implementation of CSR for the area encompassing South Pyi Nyaung, North Pyi Nyaung, Yau Paung Sone, Yin Mar Bin – villages etc.

The benefit goes beyond the region. Companies or enterprises that produce raw material such as coal and gypsum have now the chance to do or expand the business and thus indirectly providing more jobs. Business men involve in wholesale distribution or retail sales can boost their business and thereby in one way or another indirectly create job opportunities.

The benefit that would accrue to the nation was in the form of direct investment of Ks 79,330 million including US$ 29 million. This would contribute to the increase in the GDP of the country. The follow up economic benefit to the country in the form of tax would also contribute to the economy in certain way.

Above all, the project would greatly contribute to the development of national infrastructure and construction sector of the country.

While Highland Cement International Co., Ltd shall mitigate or minimize all negative impacts it shall, on the other hand, maximize the positives impacts to their optimum.

6.2.1.4 During the Decommissioning/Mine closure Phase

Because this will happen 25 or 50 years from now this will be only summarized. Several decades ago this phase was also known as Abandonment Phase because at the end of the Operation Phase the project component simply walked away and left the site. But in this era of environmental awareness systematic decommissioning and rehabilitation has to be done.

(The decommissioning and rehabilitation tasks are already described briefly earlier **in Chapter 4** and will not be repeated here). Only the potential impacts anticipated are briefly mentioned.

6.2.1.4.1 Potential accidents at work place and mitigation measures to be taken

Dismantling and demolition works are actually construction works in reverse. By the time the decommissioning/mine closure stage has arrived the buildings and structures are already old. There can arise certain accidents in the work place if dismantling, demolishing and clearing works are not well-managed.

The probability for accidents is higher when dismantling/demolishing an old building than when building a new one.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

- Plan and manage for safe and effective decommissioning/mine closure.
- Hire a decommissioning/mine closure contractor and party to do the decommissioning work at the factory site and mine closure work at the quarry site.
- Ask the contractor to create a safety environment for all his workers – an accident free work place during the decommissioning/mine closure period. Ask him also for tidying up the whole area, the factory compound and the quarry sites. Backfill all the pits, dents and depressions resulting for quarry activities. Restore the soil to original candid in as far as possible.
- Revegatate the whole area, both the factory compound and the quarries.
- Dispose those that are no longer useable at an approved land fill.
- Machinery and equipment that are obsolete must be made into iron scrap and sent to smelting mill.
- Put up for sale or reuse certain equipment that is still usable.
- Also put up for sale old construction materials that is still saleable or usable. (Dispose those that are no longer usable at approved land fill.)

6.2.1.4.2 Potential residual impacts and mitigation measures to be taken

At the end of the long Operation Phase there can be residuals of fuel oil and/or chemical on the soil due to unnoticed accidental spills inside the factory compound during the long Operation Phase. Soil will be contaminated over a long period but may remain unnoticed.

The same conditions can happen at the quarry site.

Mitigation measures to be taken

Highland Cement International Co., Ltd shall take the following mitigation measures:

- Plan and manage for effective removal and clearing of all residuals.
- Test the soil for any contamination by fuel oils or hydrocarbons; hrie technicians (no chemicals are used throughout the Operation Phase in production work).
- Also test the water in the vicinity for pollutants; hire technicians.
- Remove soils contaminated by fuel oils and chemical-; dispose at an approved land fill.
- Ensure that all contaminates are removed; conduct final chemical testing.
- Also remove all other residuals, if any, resulting from 3 plus decades of activities.
- Test the air, water and soil for the last time to ensure that none are contaminated; no trace of pollution left.
- Restore the soil to its natural condition as far as possible and commence rehabilitation task; continue the work until a green zone is created (or) put up the plot for sale (or) redeploy the plot for any business.
- Ensure that after Decommissioning/Mine closure Phase future public health and safety are not compromised.
- Adverse socio-economic impacts after Decommissioning/Mine closure are minimized and socio-economic benefits are maximized.
- The after-use, if any, of the old site is beneficial and sustainable for the long run.

6.2.2 Identification and assessment of the likelihood and severity of natural and industrial hazards relevant to the project

There were/are no precedents of severe natural hazards or disasters such as earthquake, violent storm, severe flood, extreme weather condition, draught etc, in this area within memories. But there used to be small wild fires broken out during the dry seasons from time to time.

The area is well-sheltered and far away from the coast. It is a rugged terrain at the eastern base of a mountain range. The only water course is the Myit Thar rivulet which flows generally from south to north; no low flat land to be flooded during the wet season. The area does not have heavy rainfall but rather have a relatively dry zone climate. There were also no precedents of draught.

There is no major fault line or fracture zone in and near the area.

However there can be industrial hazards resulting from the activities of the project.

The first industrial hazard is in the form of destruction and loss of habitats due to the implementation of the project. The clearing of forest for the Construction of access road, the Construction of the factory and later for quarry site preparations pose a severe industrial hazards on the biological components of the area, but not on human.

It is the industrial hazards resulting from activities at site and at the cement factory that can be termed true hazards for human being.

At the quarry site

Blasting for the extraction of limestone is considered a hazardous task. The physical hazards associated with blasting are:

- Unintended explosion or accidental explosion
- Hit by fly rocks and other injuries
- Injuries due to lack of security in blasting area
- Rock falls and slides due to fault of bench face facility
- Machinery accidents
- Probable vehicular accident

The first three are serious and significant hazards. Accidental land slide due to blasting can be a serious hazards but this is unheard of in Myanmar's quarries.

Another physical hazards associated with blasting at quarry is extreme loud noise and vibration, though both are very momentary.

(Protection, mitigation measures for these risks and impacts are already described earlier in this chapter.)

At the factory

The most serious industrial hazards, if this can be called a hazard, is the pollution of the air environment due to the operation of cement factory. When it comes to polluting the atmosphere with carbon emission, cement factories stand second only to coal-fired thermal plants, it is learnt. It is internationally agreed that cement factories contribute to global warming and hence climate change due to emission of greenhouse gases (GHG) that include SO_2, NO_x, CO_2, CO, Hydrocarbon etc. This GHG is considered a serious industrial hazard for mankind.

Carbon emission from a cement factory is huge. It is estimated that for every ton of Portland cement produced 0.7 by 0.9 ton of CO_2 is generated. Multiply these 0.7 tons by 1500 tons

(produced at the cement factory) and result is a staggering 750 tons of CO_2 generates each day. (However when compare with the four top global air polluters, namely China, USA, India and Russia, the quantity of CO_2 emission at this plant will be just like the smoke from the burning of a joss stick!). But the company shall not be complement with this fact. It will do its utmost to reduce carbon emission as practical as possible. After all the reduction of carbon emission is the duty of everyone for the long term survival of mankind.

The company has installed 43 bag filters, (dust collectors) and one electrostatic precipitator to mitigate this impact especially PM. (This and other measures are already described earlier.)

The factory is a modern factory and modern factories are very different from factories of yesteryears, which used to spew out billows and billows of dark smoke into the atmosphere; thank to the environmental awareness prevailing in the world today. Even in a state-of-the-art cement factory it cannot yet totally erase carbon emission. The atmosphere is still polluted by carbon emission from cement factories, and this is still inevitable. This can be simply rationalized as a small sacrifice of the air environment for national development; cement is an essential materials for the construction sector and hence the infrastructure development of the nation.

The most significant industrial hazards, this can be called real industrial hazard, is cement/clinker dust. Physical hazards due to cement/clinker dust are in the forms of:

- Inhalation of the dust that can cause serious health problems (respiratory tract, lung)
- Dermal contact with dust which can cause irritation of skin and eyes.

Cement/clinker dust poses the most serious industrial hazards to workers at a cement factory.

- Occasional exposure to extreme heat (1400 ^{o}C) at the Kiln is also a significant industrial hazard for workers. (The Kiln is remotely controlled and regulated but an occasional exposure is inevitable.)
- Probable fire and explosion is also a potential serious hazard though never heard of in Myanmar, where private cement factories are now operating.

Other industrial hazards, which can be insignificant or significant, inside a cement factory are:

- Accidents and injuries due to trips, ships and falls
- Accidents and injuries due to hit by machinery and vehicles. (moving, rotating, reciprocating)
- Over exertions, working in awkward position for long hours – etc.

No industrial hazard, in the form of chemical hazards, is anticipated as no chemicals are used in the production of cement. (Of course there are very small quantities of chemicals in the quality control laboratory.)

No industrial hazard, in the form of biological hazards, is anticipated as no organisms/microorganisms are involved. (The company has not yet applied the biological treatment of wastewater by applying-bacteria, blue green algae, micro algae.)

6.2.3 Characterization and assessment of any residual impacts and ricks

During the Construction Phase

During the construction large quantity of construction tailings and debris will be generated but there will be no issue of residual impact as all the debris will be removed and cleared after completion of construction.

There can be certain spills of chemical product, such as emulsion paint, varnished, sprays, epoxy resin, adhesives etc. during the finishing works of construction. Such spill will be cleared after each working session; there will be no residual impact.

Since the project site has been tidied up after the Construction Phase. There was/is no residual left after the Construction Phase.

During the Operation Phase

The factory will generate substantial quantity of waste (dust, ash) and liquid waste. There can be residual impact on the surrounding if these industrial wastes are not well-managed. The residual impact at the quarry and vicinity can be in the forms of holes, pit, dent, overburden, unwanted material here and there if not well-managed in the first place.

There can be certain small oil spills at the car park, at pump house, compressor house, engine house etc. but these will be remediated immediately (the use of absorbent rather than washing down with water to prevent the small spills percolating into underground water). Accidental oil spills on the whole will be minor ones. Since oil spills, if any, will be immediately removed there is no chance of contamination and residual impact.

Mild chemicals such as chlorine and derivatives can be used from time to time as disinfectant and also for the treatment of water. There can be no residual impact of chlorine as the water will be finally discharged or drained. The technology for chlorine treatment is the same classical treatment practiced worldwide and is of little environmental concern. No actual residual impact is envisaged.

It is probable that pesticides, herbicides, insecticides and rodenticides may be used from time to time but always, in very small quantity, e.g. in nursery and reforestation. This can be easily mitigated. There can be no residual impact of these chemicals, as only small quantity will be used and only for very short periods, only on rare occasions.

During the Decommissioning/Mine closure Phase

After the long Operation Phase the Decommissioning process and Rehabilitation process will have to be effectively implemented. Everything that remained of the cement factory site and quarry site will have to be cleared; the soil if contaminated by fuel oil and chemicals will be removed and disposed at an approved landfill or dumping site. Materials that are still usable will be reused will be put up for sale.

Restoration of the forest and ecology will be carried out. Pits and dents will be backfilled and the ground, leveled. Replantation of trees will be carried out; effective rehabilitation of the area will be undertaken. Therefore no residual impacts are anticipated after the completion of the project.

The company believes that there will be no considerable residual impact (s) to remain during or after the project. The company also believes that all the mitigation measures prescribed earlier can mitigate or remediate all the negative impacts mentioned earlier.

Therefore, no substantial residual impacts are anticipated during the whole life of the project, from the Preconstruction Phase to the Decommissioning Phase.

However, in case there is any residual left manual removal of residuals and contaminated soil will be undertaken. The soil will be removed and disposed of at an approved landfill. After that the soil will be tested for the last time to ensure that there is no residual left. The general guidelines for the removal of residuals and the hence the guidelines for decommissioning are:

Towards sustainable decommissioning sitercource.worldbank.org>resources

Decommissioning process guide http://its.edu>...>archive

Decommission phase procedures HUD http://www.hud.gov

6.2.4 Risk assessment

Risk assessment is a process that involves measurements of risk to determine, prioritize and to enable identification of appropriate level of risk treatment. Risk is a function of likelihood and consequence.

Risk score = Likelihood x Consequence (or)

Risk score = (Probability x Exposure) x Consequence

Pundits from different nations have formulated a great variety of risk ranking criteria based from different occupational aspects.

The objectives of risk assessments are:

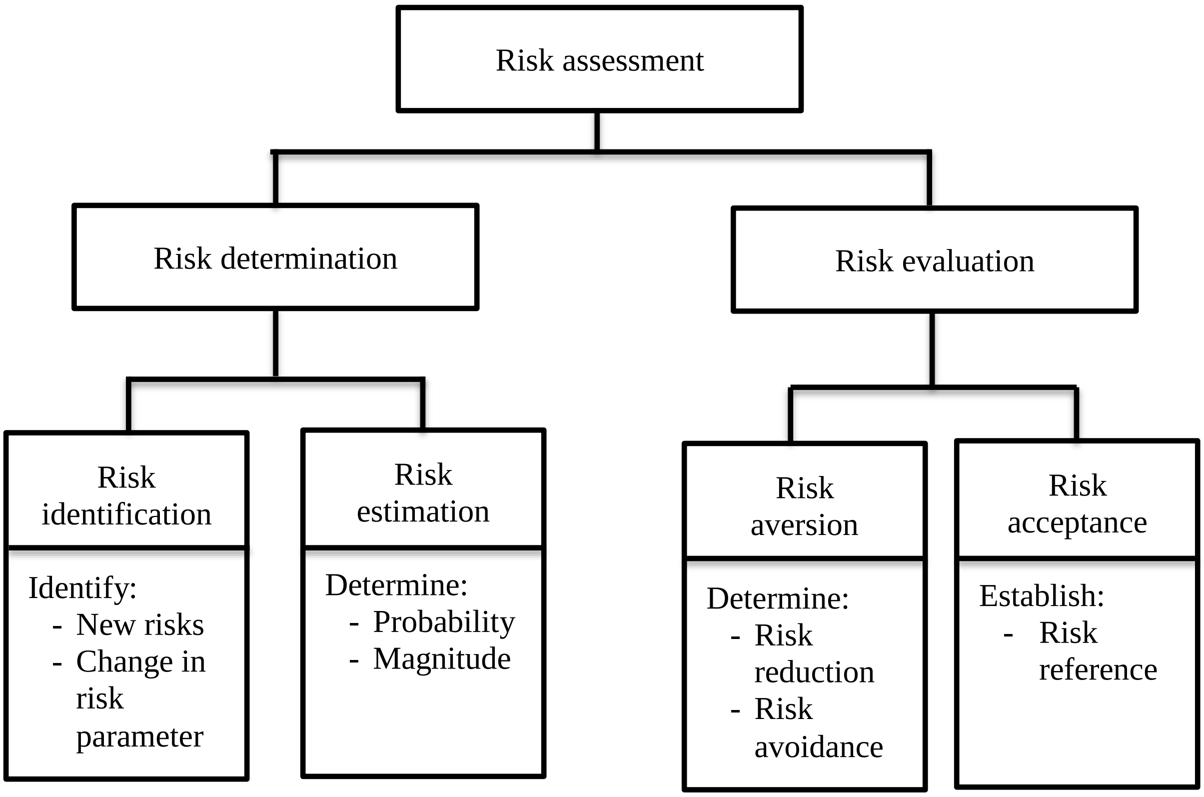
- To prevent injuries and illness
- To remove a hazard or reduce the level of its risk
- To create a safer and healthier workplace

Risk assessments and management in brief

- Fully scope the risk assessment.
- Identify all hazards (potential hazards) and threats.
- Describe who might be harm.
- Evaluate the risks (high, medium, low, how bad, how often)
- Document and record the findings.
- Exchange information with others.
- Prepare for follow-up after risk assessment.
- Apply integrated risk mitigations.
- Regularly check the effectiveness of the risk assessment, management and mitigation programme.
- Review the risks assessment and management.

Although there are differences in the ways in which risk assessment is accomplished in different countries they usually contain three steps: risk identification, risk estimation and risk evaluation.

This can be simplified in diagram as from Rowe, 1980.



While "Hazard" is a source of potential harm or injury or loss "Risk" is the probability of occurrence of hazard.

Risk assessment is the work of expertise mathematicians, statisticians, computer programmers and specialists, medical scientist, engineers etc. and the works involves the application of models, mathematical models, computer models, complex equations and formulae etc. In other word it is purely academic in nature or pure research in nature and beyond the scope of this EIA study which emphasizes on environmental aspects.

In this EIA report context the pragmatic approach method such as Experts Judgement methods (Experts Consensus Method and Ad hoe Method) together with IFC table of risk ranking are applied for qualitative assessment of risks and impacts.

(Experts judgement method may not be accurate but will never go wrong.)

IFC Table of risk assessment

Likelihood/probability x consequence/outcome = Final outcome

Likelihood (probability)	Consequence				
	very low (negligible) 1	low (minor) 2	medium (moderate) 3	high (major) 4	very high (extreme) 5
Almost certain (Definite) 5	5	10	15	20	25
Highly probable (likely) 4	4	8	12	16	20
Probable (moderate) 3	3	6	9	12	15
Unlikely (improbable) 2	2	4	6	4	10
Rare (very importable)	1	2	3	4	5

Scoring : 1 – 2 very low to low

8 – 12 medium

15 – 25 high to very high

The criteria for risks and impacts depicted in the following tabulated forms are in one way or another pragmatic assessment of real and potential impacts which can be construed as (or which is tantamount to) assessment of hazards and risks.

For pragmatic purpose of risk assessment certain governmental departments or agencies in other countries have provided guideline for risk assessment for different occupations for example. For example, the Ministry of Environment and Forest of the government of India has prescribed guidelines for risk assessment for mining's and quarries etc.

One relatively reliable way of risk assessment is to collect all data or records on accidents or mishaps that have occurred previously at various coal-fired power plants throughout the nation. Then analysis on these data is made and subsequent risk assessment is conducted (not applicable in Myanmar yet).

Another point to be born in mind is that risk assessment can be done only from negative or pessimistic perspectives. It is not practical to make risk assessment from positive or optimistic point of view. (No risk can be anticipated from optimistic point of view.)

The final outcome in risk assessment, therefore are simply worst case scenario. But in the real world worst case scenario very rarely happen.

No developmental project is devoid of risk; the risk may be low or medium or high; almost all can be mitigated to a great extent.

The company shall look into the nature of all those impacts and assess the risks and follow the preventive, corrective and mitigation measures prescribed in this EIA report.

Table – 26: Overall risks and impacts assessment during the Construction Phase (Qualitative assessment based from Expert judgment and IFC table)

Sr. No	Nature of impacts	Extent	Duration	Level of impact	Frequency	Intensity	Significance	Probability	Remarks
1.	Impact of mobilization and preparation actions	Foot print	Short term	Level 1-2	OI	L	IS	P	-
2.	Impact on traffic	Along the road	Short term	Level 1-2	S	L	IS	P	-
3.	Impact on air environment	Foot print	Short term	Level-1	OI	L	IS	D	-
4.	Impact: noise and vibration	Foot print	Short term	Level-1	OI	L	IS	D	-
5.	Impact on soil	Foot print	Short term	Level 1-2	OI	L	IS	P	-
6.	Impact on water environment	Myit Thar stream	Short term	Level-1	S	L	IS	P	-
7.	Impact of waste disposal	Myit Thar stream	Short term	Level 1-2	S	L	IS	D	-
8.	Impact on biodiversity	Foot print & beyond	Short term	Level 3-4	OI	M-H	IS-Sg	D	-
9.	Potential socio-economic impact	Foot print & beyond	Short term	Level-1	R	L	IS	VIP	-
10.	Impact luck of emergency and health service	Foot print	Short term	Level-1	R	L	IS	VIP	-
11.	Impact: Potential security issue	Foot print	Short term	Level-1	R	L	IS	VIP	-
12.	Visual impact and lighting	Foot print & beyond	Short term	Level-1	OI	L	IS	D	-

Table – 27: Overall risks and impacts assessment during the Operation Phase (Qualitative assessment based from Expert judgement and IFC table)

Sr. No	Nature of impacts	Extent	Duration	Level of impact	Frequency	Intensity	Significance	Probability	Remarks
1.	Impact on air environment	Foot print & vicinity	Long term	Level 3-4	OI	M	Sg	D	-
2.	Impact: stockpiling of mined out materials and overburden	Foot print	Long term	Level-3	OI	L-M	Sg	D	-
3.	Impact: loss of non-living resources limestone etc	Foot print	Long term	Level 2-3	OI	M	Sg	D	-

4.	Impact: noise and vibration	Foot print	Long term	Level 3-4	OI	M	IS-Sg	D	-
5.	Impact on water environment	Foot print & beyond	Long term	Level-3	OI	M	IS-Sg	D	-
6.	Impact on biodiversity	Foot print	Long term	Level-3	OI	M	Sg	D	-
7.	Impact of waste disposal	Foot print	Long term	Level-2	OI	L-M	IS-Sg	P	-
8.	Impact on traffic	Along the road	Long term	Level-2	OI	L	IS	P	-
9.	Impact of power supply on national demand and vice versa	Foot print & beyond	Long term	Level-2	OI	L-M	IS	D	-
10.	Impact: exposure to heat and other occupational and health hazards	Foot print	Long term	Level 2-3	OI	M	IS-Sg	HP	-
11.	Potential socio-economic impact	Foot print & beyond	Long term	Level-2	OI	L	IS	R	-
12.	Impact: potential security	Foot print	Long term	Level-2	OI	L	IS	R	-
13.	Impact: public perception	In the local community	Long term	Level-2	OI	L	IS	R	-
14.	Impact: a change in relief and alteration of landscape	Foot print & vicinity	Long term	Level 3-4	OI	M	Sg	D	-

Note – The final outcome without mitigation measures taken. Almost all can be mitigated.

Explanation

Level of impacts

Level 1 = Very low/negligible/insignificant

Level 2 = Low/minor (can have impact on biodiversity and environment to certain extent)

Level 3 = Medium/moderate

Level 4 = High/major (short duration)

Level 5 = Very high/Extreme/catastrophic (long duration)

Frequency of impacts

F = Frequently

O = Often

OI = Often (isolated case)

S = Seldom

R = Rarely

Intensity

VH = Very high

H = High

M = Medium

L = Low

Probability

VIP = Very improbable/rare

IP = Improbable/unlikely

P = Probable/moderate

HP = Highly probable/likely

D = Definite/almost certain

Significance

IS = In-significance

IS-Sg = In-significance to significance

Sg = Significance

6.2.5 Comprehensive monitoring plan

Monitoring plans for Construction, Operation and Decommissioning Phases are shown in tabulated forms.

Table-28: Overall monitoring plan during the Construction Phase

Sr. No	Components	Parameters to be monitored	Frequency	Responsible persons
1.	Weather	- monitor weather listen to weather news (meteorology news), forecasts	- Daily - Daily	- EMP cell members
2.	Mobilization and preparation works	- monitor the haulage of trucks - monitor stockpiling, storage of building materials	- Daily - Weekly	- EMP cell members - EMP cell members
3.	Traffic	- monitor schedule of vehicle movements	- Weekly	- EMP cell members
4.	Air environment	- monitor SO_2, NO_2, PM and others parameters described in NEQ guideline, if possible	- Once	- Hired technicians

5.	Noise and vibration	monitor noise level in dBA	- Once	- Hired technicians
6.	Contamination of soil and ground water	- monitor spillage of fuel oil, grease, hydraulic oils etc	- Weekly	- EMP cell members
7.	Erosion and siltation	- monitor earth work and drainage system	- Weekly (during rainy season)	- EMP cell members
8.	Water environment	monitor pH, oil & grease, TDS, TSS, BOD, COD and other parameters described in NEQ guideline	- Once	- Hired technicians
9.	Waste (solid), construction tailings, debris	- monitor type, amount generated, reused, recycled, transported off site and disposal	- Weekly	- EMP cell members
10.	Biodiversity component	monitor clearing of forest - monitor the nursery of saplings for planting during Operation Phase	- Monthly - Monthly	- EMP cell members - EMP cell members
11.	Social illness; disciplinary action	- monitor the conducts of workers - monitor the effectiveness of disciplinary action - monitor grievance redress mechanism log book	- Weekly or monthly - From time to time - From time to time	- EMP cell members - EMP cell members - EMP cell members
12.	Occupational health and safety and emergency plan	monitor facilities for emergency preparedness - monitor emergency and response programme - monitor training (firefighting and first aid) and drills and their effectiveness	- Quarterly - From time to time - Regularly	- EMP cell members - EMP cell members - EMP cell members
13.	Potential security	- monitor performance of security staffs	- From time to time	- EMP cell members
14.	Construction work	- monitor overall construction work for health and safety	- Daily	- EMP cell members
15.	Material procurement and consumption	- monitor procurement of building materials, and consumption	Weekly or monthly	- EMP cell members
16.	Fuel oil consumption	- monitor oil purchased, used, used oil generated, oil waste	- Weekly or monthly	- EMP cell members
17.	Routine operation of equipment	- monitor operation hours of equipment - distance traveled of vehicles, log books	- Weekly - Weekly	- EMP cell members - EMP cell members

Table-29: Overall monitoring plan during the Operation Phase

Sr. No	Components	Parameters to be monitored	Frequency	Responsible persons
1.	Weather	- monitor weather - listen to weather news, forecasts	- Daily - Daily	- EMP cell members - EMP cell members
2.	Limestone/clay, laterite, processing, crushing, grinding, screening, transport, stockpiles	- monitor crusher, grinder, screen performance - stockpile of pulverized limestone (quantity) - truck or conveyor	- From time to time - From time to time - From time to time	- EMP cell members - EMP cell members - EMP cell members
3.	Overburdens	- monitor locations, size and stability condition	- Monthly (rainy season)	- EMP cell members
4.	Erosion and siltation (at around the quarries)	- monitor overburden, natural drainage system	- Weekly (rainy season)	- EMP cell members
5.	Monitor activities inside factory	Monitor: milling; preheating and clinkerization, clinker cooling and storage; grinding, gypsum addition, packing and storage	- Daily	- EMP cell members
6.	Routine operation of equipment (both at factory & villages)	- monitor operation hours of equipment and machines - monitor distance travelled of vehicles - monitor log books	- Weekly - Weekly - Weekly	- EMP cell members - EMP cell members - EMP cell members
7.	Air quality (at the factory and nearby villages)	- monitor SO_2, NO_2, PM CO, O_3, VOC and other parameters described in NEQ guideline, if possible	- Semi-annually or as reqiured	- Hired technicians
8.	Air emission	- monitor SO_2, NO_2, PM, CO, SPM, PM_{10}, $PM_{2.5}$, other parameters described in NEQ guideline, if possible - monitor the wearing of PPE	- Semiannually or as required - Weekly or monthly	- Hired technicians - EMP cell members
9.	Noise and vibration (at the factory and nearby villages)	- monitor noise level in dBA - wearing of PPE at quarry/mine site	- Quarterly - From time to time	- EMP cell members - EMP cell members
10.	Water	- monitor water consumption - monitor flow rate and water level at stream	- Weekly - Monthly	- EMP cell members - EMP cell members

11.	Solid waste (at the factory)	- monitor industrial, domestic, office wastes, debris; amount generated, recycled, or reused; check work place	- Monthly	- EMP cell members
12.	Waste water (at the factory)	- monitor amount generated, treatment (septic tank, common treatment tank)	- Monthly	- EMP cell members
13.	Traffic (on the access road & main road)	- monitor schedule of vehicle movement, log book for each vehicle	- Weekly	- EMP cell members
14.	Materials procurement	- monitor all materials of coal and gypsum - monitor all materials purchased and consumed	- Monthly - Monthly	- EMP cell members - EMP cell members
15.	Fuel oil consumption	- monitor oil purchased, used, used oil generated, oil waste	- Monthly	- EMP cell members
16.	Biodiversity (around the factory & at quarries)	- inspect selection of new quarry site - monitor clearing of vegetation - monitor reforestation effort	- Before starting a new site - Ditto - Monthly	- EMP cell members - EMP cell members - EMP cell members
17.	Social illness (at the factory and living quarter)	- check disciplinary action taken - monitor conducts of workers - monitor grievance redress mechanism log book	- From time to time - Regularly - Regularly	- EMP cell members - EMP cell members - EMP cell members
18.	Occupational health and safety and emergency	- inspect facilities for emergency preparedness - monitor training (firefighting and first aid) and drill for emergency - monitor overall occupational health and safety including - occupational accident and diseases	- Quarterly - Regularly - From time to time	- EMP cell members - EMP cell members - EMP cell members
19.	Security (for factory and quarry)	- monitor performance of security staffs	- Weekly	- EMP cell members
20.	Capacity building	- monitor effectiveness of capacity building programme and other training including first aid	- From time to time	- EMP cell members
21.	Compliance with regulation, a legal requirement	- monitor all main activities to ensure compliance with legal requirement and corporate - commitment	- Monthly	- EMP cell members
22.	Effectiveness of mitigation measures	- monitor mitigation measures taken and check their effectiveness	- From time to time	- EMP cell members

Table -30: Overall monitoring plan during the Decommissioning

Sr. No	Component to be monitor	Parameters to be monitored	Frequency	Responsible persons
1.	At the factory	- monitor the decommissioning works; dismantling, demolishing works	- Daily or weekly	- Hired contractor & EMP cell members
2.	At the factory	- monitor the clearing and tiding work, leveling of ground, restoration of soil	- Weekly	- Hired contractor & EMP cell members
3.	At the factory	- monitor the removal of contaminated soil, if any	- Once	- Hired contractor & EMP cell members
4.	At the factory	- monitor the testing of soil and water	- For the last time	- Hired Technician
5.	At the quarry	- monitor the backfilling of pits, holes, dents, by Overburden - monitor the leveling of Ground	- Daily or weekly - Daily or weekly	- EMP cell members - EMP cell members
6.	At the factory	- monitor the removal of all remaining overburden, retaining well & other remain	- Daily or weekly	- EMP cell members
7.	At the factory	- monitor the testing of soil and water at nearby water	- From time to time	- Hired technicians
8.	Both at the factory & quarry	- Monitor the rehabilitation works planting of trees; restoration of ecology	- Weekly & monthly	- EMP cell members

7. CUMULATIVE IMPACTS ASSESSMENT

7.1 Definition

Cumulative environmental effects can be defined as effects on the environment which are caused by the combined result of past, current and future activities. Over time, direct or indirect human activities combine to collectively impact the environment.

Cumulative impacts are those that resulted from the successive, incremental and/or combined effect of a project, when added to other existing projects.

7.2 Processes or steps

General process or steps for implementing C1IA involve 5 steps:

Step 1 - Scoping Phase

Step 2 - Establish information or baseline status of VESC

Step 3 - Assess CI on VESC

Step 4 - Assess significance of predicted CI

Step 5 - Management of CI; plan design and implementation

As regards the processes for CIA these could be put in this way:

CIA is:

a) a process of analyzing the potential impacts and risks of proposed project in the context of potential effects of human activities and natural environmental and social external drivers on the chosen VESC over time

b) a process of proposing concrete measures to avoid, reduce, or mitigate such CIs and risks to the extent possible

The management for implementation of negative impacts during the Construction, Operation and Decommissioning/Mine closure Phases are actually integral parts of Cumulative Impacts Management (CIM). The logic is that if effective mitigation measures over the years, that is, during the Construction, Operation and Decommissioning/Mine closure Phases were implemented the cumulative impacts will be minimized or reduced.

Responsibility for CIM

The project proponent is responsible for the management of cumulative impacts due to the implementation of the project.

Shared responsibility for management of Cumulative Impacts (CI) is necessary when a series of projects are operating in an area (e.g. Max Myanmar and Apache companies operating in the area).

7.3 Simplified CIA

In developed and industrialized countries the subjects of CIA and CIM have developed to an advanced phase. But actually these subjects are the works of scholars or pure academicians that involve the application of a variety of computer programming's, complex mathematical models or a mathematical formulae and statistics calculations and manipulations. These are outside the domain of ordinary people including the businessmen (the project proponent/and the EIA/IEE consultants.

In this cement factory and quarry context a very simplified way of addressing CIA is mentioned.

(a) During the Construction Phase

Cumulative impacts can be detected even during the short and temporary Construction Phase.

The clearing of vegetation for the construction of access road and for the construction of factory in the early phase of construction happened more or less at the same time. This can be termed as simultaneous or combined cumulative impact on the habitat. Although relatively short in duration the impact is significant. However after completion of construction work there will be no more impact.

If the short duration of 2 years of Construction Phase is divided and subdivided into months, weeks and days then there are month after months, week after weeks and day after day impacts of construction work. These impacts can be termed cumulative impacts (incremental or successive cumulative impacts) during the relatively short Construction Phase.

Solid wastes of all kinds, especially construction tailings, debris, domestic wastes and trash from office, kitchen etc., if not managed and regularly disposed of will accurate over the months (incremental cumulative impact).

Impacts during the Construction Phase are temporary (2 years) and can be mitigated effectively.

(b) During the Operation Phase

It is during this long Operation Phase that certain cumulative impacts are magnified and some are non-mitigable and irreversible.

(i) Carbon emission (cumulative impact into the atmosphere)

The first and foremost cumulative impact is the emission of CO_2 into the atmosphere. Green House Effect that leads to global warming is the result of accumulation of CO_2 into the atmosphere from different sources all over the world.

As mentioned earlier the dry process production of 1 ton of Portland cement generates 0.7 tons of CO_2 into the atmosphere. In this Highland Cement Plant context that means 1500 tons of cement multiplied by 0.7 ton and equipment to 1050 tons of CO_2/day. Multiply this by 365 days and then by 30 years and the result will be staggering (11,497,500 tons CO_2). Although Cement factories applying modern technology have improved a lot in reducing carbon emission effective minimization of emission especially CO_2 has yet to be achieved.

In the same way 750 kg of SO_2 and 1500 kg of NO_x are generated per day. After a period of 30 years 8,100,000 kg (8100 tons) of SO_2 and 16,200,000 kg (16200 tons) of NO_x will be generated.

SO_2 and NO_x can be mitigated to a great extent, but CO_2 cannot be effectively mitigated. Therefore, this cement factory will contribute to global warming and climate change to a small extent since CO_2 is a GHG.

(But when compared to the emission by tour top global emitters, namely, China, USA, India and Russia as mentioned earlier the emission from this cement plant is negligible. The quantity emitted will be just like the small quantity of smoke emitted from the burning a joss stick!) However, the company has done its best shall do its best to tackle this issue has done it best to mitigate this impact and shall continue to do so.

(ii) <u>Destruction of forest/habitat (cumulative impact on flora/habitat)</u>

Another significant cumulative impact is the destruction of forest and habit. As mentioned earlier forest has to be cleared for the construction of access road and for the construction of the factory and facility. This impact ceases after construction. But the clearing of forest has to be continued for the preparation of quarry sites. When the limestone is quarried out the quarry has to move to another site and more clearing of forest has to be done. After 2 or 3 decades the cumulative impact on the flora will be very significant.

However, since flora/forests are living natural resources the negative impact can be reversible.

The compensatory planting of trees and the reforestation of the affected areas and affective/rehabilitation will surely tackle most of this issue. Biological or living resources are renewable to a great extent. (Mitigation/corrective measures are already described.)

(iii) <u>Loss of non-living natural resources (cumulative impact on the non-living resources)</u>

Another significant cumulative impact is the loss of non-living resources, limestone, clay, and laterite. The annual requirement for limestone, clay, laterite and gypsum are 650,000 tons, 100,000 tons, 50,000 tons and 22,000 tons,

respectively. When the figure for limestone is multiplied by 30 years the result is a staggering 19,500,000 tons. These raw materials are non-living ones and are not renewable. The impact and loss is irreversible and inevitable – the only plassible way to try to achieve sustainable extraction of these non-living resources as practical as possible.

(iv) Accumulation of overburden, pits, dents, etc. (cumulative impact on soil structure)

Another significant cumulative impact is accumulation of great mounds of overburden and pits, and dents here and there in the area after the completion of quarry works. If not well-managed in the first place this cumulative (incremental or successive) impact can be serious. Ugly mounds of overburden, and pits and dents will remain all over the places.

But this cumulative impact can be effectively mitigated. Backfilling of pits and dents with overburden and top soil, leveling of ground, compensatory planting of trees can tackle this issue (already mentioned earlier). The company shall not wait until the completion of the long Operation Phase. When work at a quarry site is finished restoration of the soil, replanting of trees and rehabilitation of the ecology of the effected spots will be duly undertaken without hesitation.

(v) Minor accumulative impact

Waste in the form of cement/clinker dust, fly ash and down ash are generated. But on the whole the quantity generated is small: the production of 1 ton of Portland cement generates only 20-50 g of dust and at most 1 kg of waste, it is learnt. This can be mitigated/quite effectively (already mentioned earlier). However if not well-managed the accumulative impacts of dust and ash over the long years can be quite substantial.

(c) Simultaneous/cumulative impacts from other sources

So far, the cumulative impacts mentioned above are those from only one source, the Highland Cement Plant and its quarry.

There is another big cement plant and associated quarry owned by the Max Myanmar Company about half mile in the south. There is also a big cement plant, Apache Cement Plant owned by Shwe Taung Co., Ltd about 5 miles away in the northwest.

When the simultaneous cumulative impacts as well as successive/incremental impacts for the 3 factories are taken into consideration the cumulative impacts will be very significant indeed. When the holistic cumulative impacts from all sources are considered it will be very huge impact. The company is not in a position to assess the impacts from Max Myanmar and Apache Cement Plants or their quarries. It is not civilized and may be even risky to pose one's nose into the affair of another especially when it is an environmental affair.

The simultaneous cumulative impact and incremental (successive) impact of the three factories can be determined only when all the data, information, facts and figures from all these three factories are available. Only the authority like ECD has the authority to ask for data and information from all these three factories.

The only plausible way, therefore, is a cumulative impact of the three factories can be assessed only under the guidance and supervision of ECD. Only a special investigation team or commission set up by ECD can carry out the cumulative impact assessment for the 3 factories in an official way.

<u>Highland cement factory's contribution of cumulative impact at the region</u>

Since the information and data from Max Myanmar Cement factory and Apache cement factory cannot be obtained only the cumulative impact contributed by Highland Cement factory can be given.

The successive to incremental cumulative impact over a period of 30 years will be:

- Emission of CO_2 - 11497500 tons of limestone
- Emission of SO_2 - 8100 tons (can be mitigated)
- Emission of NO_x - 16200 tons (can be mitigated)
- Dust/ash (PM10, PM2.5) are effectively mitigated. The factory has 1 ESP and 44 bags filters.
- Cumulative impact on flora/habitat – 1308.91 acres (can be mitigated and reversible)
- Cumulative impact (loss) of natural resources:
  - (i) 19,500,000 tons of limestone
  - (ii) 3,000,000 tons of clay
  - (iii) 1,500,000 tons of laterite
  - (iv) 660,000 tons of gypsum, (cannot be reversible)
- Accumulation of overburdens pits, dents, depression – (cannot be effectively mitigated)

<u>General mitigation for cumulative impacts</u>

Emission of CO_2 cannot be mitigated. The only plausible way is the creation of green belt in the factory compound and to vicinity to sequestrate CO_2 by plants; this can partially remedy the emission.

SO_2 and NO_x can be mitigated. The manufacturing of cement uses limestone as raw materials and limestone is effective for desulphurization. Therefore, SO_2 cannot be an issue in cement production.

NO_x can be mitigated by mean of complete combustion method which is applied in this factory.

Dust/ash are effectively mitigated by 1 ESP machine and 44 bags filters.

The loss of flora and habitat can be effectively mitigated and can be reversed. The company has a plan for compensatory replantation of all disturbed area. Reforestation is already started and will continue after Decommissioning Phase.

Loss of natural resources, limestone, clay, laterite and gypsum cannot be mitigated. However, the company has educated and trained its employees not be over extract or over use their natural resources.

8. ENVIRONMENTAL MANAGEMENT PLAN

Objectives

Environmental Management Plan (EMP) is the key to ensure that the environmental quality of the area does not deteriorate due to the implementation of a project. EMP involves the management of overall environmental issues, including the physical, biological, socio-economic, cultural and visual issues.

The negative impacts and subsequent mitigation measures to be taken are integral parts of EMP. EMP has to be based on all impacts and their subsequent mitigation measures to be taken, big or small. Therefore, EMP is a frame work for the implementation and execution of mitigation measures.

The objectives of EMP are:

- To ensure that mitigation measures are implemented.
- To establish systems and procedures for this purpose.
- To monitor the effectiveness of mitigation measures.
- To ensure compliance with environmental laws and regulations.
- To take any necessary actions when unforeseen impacts occur,

8.1 Project description by project phase

The project site is located at the western foot hill of the Limestone Mountains and on the eastern bank of Myit Thar stream. It is ½ mile north of South Pyi Nyaung village and 3 miles south of North Pyi Nyaung village, Tharzi Township.

The total area is 1308.91 acres comprising 173 acres, 183 acres, 649 acres and 301 acres for the factory compound, residential area (worker housing), Nyaung Bin Taung mining site and Tha-yet-yay Taung mining site, respectively.

The estimated budget is kyats 79,330 million including US $ 29 million.

The factory has a capacity of producing 1500 tons of Portland cement plant perday. The manufacturing method is the "Dry Process" method.

Electricity is sourced from National Gridline on the high way at Yay Paung Sone village.

Water is sourced from a spring in the south and also from shallow tube well (collector wells) beside Myit Thar stream.

The raw materials are limestone, clay, laterite, gypsum and coal. Limestone and clay are mined at the vicinity. Laterite, gypsum and coal are procured from Aung Bann, Mauk Mai and Kalaywa, respectively.

There are 391 employees (Operation Phase) and 10 are foreign technicians. Working hours are 8 hrs/day; (in three shifts) and operation day are 320 day/year.

8.2 Health policies and commitments, legal requirements and institutional arrangements

Environmental, socio-economic policy/principle commitment, legal requirement and institutional arrangement of NECCCCC and ECD are already described in **Chapter-3**. This is not a standalone EMP report these will not be repeated here. 31 laws, rules, guidelines are described; relevant sections and sub-suctions are reproduced.

International convention, guideline, legal institution frame work, National Environmental Quality (emission and effluent) guidelines by ECD are mentioned in Chapter 3.

8.2.1 Health policy

The health policy of the Nation is "Health for All".

The policy guidelines for health service provision and development have been provided in the constitution. **Article-28** of the constitution of the Republic of Union of Myanmar (2008) States that:

The Union shall:

i) earnestly strive to improve education and health of the people Article 367:

Every citizen shall, in accord with the health policy laid down by the Union, have the right to health care.

National Health Policy (1993)

The National Health Policy was developed with the guidance of the National Health Committee in 1993.

The National Health Policy has placed "Health for All" goal as a prime objective. There are 15 main points regarding the National Health Policy (1993). The first main point No.1 is:

- to raise the level of health of the country and promote the physical and mental well-being of the propel with the objective of achieving "Health for All"

The main point, No.9 concerns environment which states:

- to intensity and expand environmental health activities including prevention and control of air and water pollution

Health Legislation

Certain portion of health legislation also addresses environmental sanitation and communicable disease prevention, as far as environmental affair is concerned. That includes the control of disposal of human and other wastes, concerns for water purity and hygiene of housing and food sanitation.

Certain health legislation that are relating in one way or another, to environmental affairs are:

- The Public Health Law (1972), which includes environmental sanitation and cleanliness of food, among others
- Prevention and control of communicable Diseases Law (1995) (Revised 2011)

  This law describes measures to be taken in relation to environmental sanitation, among others.
- The control of smoking and consumption of Tobacco Product Law (2006)

  This law describes the creation of tobacco smoke free environment, among other. This is of relevant at the work place and project site where many employees are working.

Health Development Plan and Myanmar Health Vision 2030

This long term plan has been drawn up to meet any future health challenge. This plan has 9 main objectives and one of them is:

- to develop a health system in keeping with the changing political, socio-economic and environmental situations

8.2.1.1 National Environmental Health Agenda

Environmental Health is actually one of the integral parts of Environmental Protection and Conservation aspect. EIA, IEE and EMP works normally encompass the physical, biological, socio-economic, cultural and visual components of the surrounding environment. The third component, which is, socio-economic, includes public health component, (mortality and morbidity, diseases, accident and injuries etc.).

The Occupational and Environmental Health Division under the Department of Public Health is the focal point agency concerning Occupational and Environmental Health aspects.

This Department (Division) is involved in:

- environmental monitoring eg- air quality, water quality
- work place assessment eg- air quality, waste and water quality, heat stress, light, noise level

Health Impacts Assessment (HIA) and Social Impacts Assessment (SIA) are actually important parts of environmental protection and conservation works.

8.2.1.2 Environmental, Health and Safety (EHS)

The International Finance Corporation (IFC), a division of World Bank, has prescribed EHS general guidelines for general industrial practices. It provides guidance to users on EHS issues in doing their business.

The applicability of the EHS guideline shall be tailored to the hazards/risks or impacts identified as the result of EIA.

The IFC's EHS General Guidelines encompass Environmental, Occupational Health and Safety (OHS) and Community, Health and Safety (CHS).

Environmental health and safety (EHS)

EHS covers the following:

a) air emission and ambient air quality

b) energy conservation

c) waste water and ambient water quality

d) water conservation

e) hazardous materials management

f) waste management

g) noise management and

h) contaminated land management

Occupation Health and Safety (OHS)

The Occupation Health and Safety guideline by IFC encompasses:

- general facility design and operation
- physical hazards
- chemical hazards
- biological hazards
- radiological hazards
- Personal Protective Equipment (PPE)
- special hazard environments
- communication, training and monitoring

Community Health and Safety (CHS)

The Community Health and Safety guideline by IFC encompasses:

- water quality and availability
- structural safety of project infrastructure
- life and fire safety L&FS
- traffic safety
- transport of hazardous materials and disease prevention
- emergency preparedness and response

8.2.1.3 Occupational Health and Safety (OHS) by ILO

OHS is defined by International Labour Organization (ILO) as:

- The science of the anticipation, recognition, evaluation and control of hazards arising in or from the work place that could impair the health and well-being of workers taking into account the possible impact on the surrounding communities and the general environment.

Some core principles of OHS

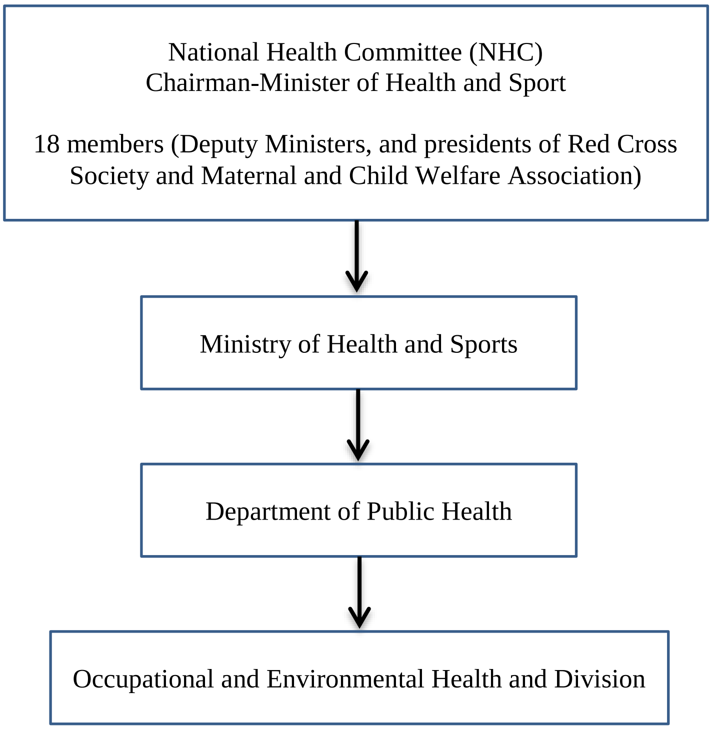
- All workers have rights and employers must ensure that:
  - work should take place is a safe and health working environment;
  - condition of work should be consistent with worker's well-being and human dignity;
- Occupational safety and health policy must be established
- Social partners (employers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

8.2.2 Legal requirements

This has been already described in detail earlier in **Chapter-3**, including among others, applicable laws and rules, requirements, national and international standards and guidelines. These will not be repeated here.

8.2.3 Institutional Arrangement

Institutional Arrangement (organization)



The National Health Committee (NHC) is an umbrella organization comprising 18 members from 9 ministries and one member of Nay Pyi Taw Council, and presidents of Red Cross Society and Maternal and Child Welfare Association.

The Chairman of NHC is the Union Minister of Health and Sports while the Vice Chairman is the Union Minister of Labour. 9 deputy ministers under 9 ministries, a member of Nay Pyi Taw Council, the president of Red Cross Society, and the presidents of Maternal and Child Welfare Association are also members of NHC.

The Deputy Minister of Health and Sports is the secretaries while the Director General of Department of Health Planning, is the Joint secretary.

The Occupational and Environmental Health Division (OEHD) under the Department of Public Health is the focal agency involves in environmental and health affairs.

The occupational and Environmental Health Division is involved in implementing Environmental Health Programme in the country.

At the moment it is involved in:

- Environmental monitoring: on air quality and water quality
- Medical monitoring: health assessment on workers (periodic medical examination, performing physical examination, chest X-ray, biomarker survey on workers)
- Work place assessment: eg- on air quality, waste (solid) and waste water, heat stress and light, noise level, soil quality, water sanitation and hygiene etc. in certain factories.
- Assessment of environmental health probably related to climate change and general health impact assessment.

8.3 Summary of impact and mitigation measures and overall MP

Mitigation is an integral part of EMP and therefore, EMP has to be based on each and every impact and subsequent mitigation measure. (EMP and mitigation are the different side of the same coin.

These have been already described in technical detail earlier in **Chapter-6**. The number of impacts (significant and insignificant) identified during the Preconstruction Phase, Construction Phase, Operation Phase and Decommissioning Phase/Rehabilitation Phase is: 2, 12, 15 and 2 respectively. Mitigation measures to be put in place for all impacts are also described in meticulous details in **Chapter-6**. These will not be repeated here as this is not a standalone EMP report. Only enumeration of the impacts/potential impact is made as follow.

(a) The impacts/potential impacts during the Preconstruction Phase are:

- Potential instigation by anti-big business activists that can lead to polarization of local's people into pro and anti- project groups
- Potential hike in price of land and property.

(b) The impacts/potential impacts during the Construction Phase are:

- Impact of mobilization and preparation actions
- Impact on traffic
- Impact on air environment
- Impact: noise and vibration
- Impact on soil
- Impact on water environment

- Impact of waste disposal
- Impact on biodiversity
- Potential socio-economic impact
- Impact: lack of emergency and health services
- Potential security issue
- Visual impact and lighting at night

(c) The impacts/potential impacts during the Operation Phase are:

- Impact on air environment
- Impact: stockpiling of mined out materials, overburden and top soil
- Impact: loss of non-living resources
- Impact: noise and vibration
- Impact on water environment
- Impact on biodiversity
- Impact of waste disposal
- Impact on traffic
- Impact of power supply on national gridline and vice versa
- Impact: exposure to heat and other occupational and health hazards
- Potential social impacts
- Potential security issue
- Impact: public perception
- Impact: a change in relief and alteration of landscape

(d) The impacts/potential impacts during the Decommissioning/Mine closure Phase are:

- Potential accident at work place
- Potential residual impacts

Mitigation/remediation/corrective measures for all these impacts are also already described earlier (**Chapter-6**) and will not be repeated here.

8.4 Overall budget for implementation of the EMP

Since EMP involves the management of all environmental issues there have to be adequate budget for the implementation of EMP.

This budget will be only for the implementation of EMP but it will cover the procurement of certain devices, and equipment for uses in monitoring and certain materials for uses in emergency aspects e.g. PPEs first aid facility medicines etc.

In order to effectively execute EMP and MP the company has set up a fund for the implementation of EMP and MP (in addition to a separate fund for the implementation of CSR). 1 percent of the project budget (Ks. 793,300,000) is set aside for EMP fund which will cover the initial costs and the recurring expenses for the effective implementation of EMP and MP.

8.4.1 Fund for EMP

The sub-budgets allotted for each programme under EMP are as follows:

- Cost for organizing EMP - 3% of EMP fund (Ks 23,799,000)
- Cost for capacity building and training - 7% of EMP fund (Ks 55,531,000)
- Cost for procurement of equipment and materials - 25% of EMP fund (Ks 198,325,000)
- Cost for operation of equipment - 5% of EMP fund (Ks 39,665,000)
- Cost for execution and dissemination of EMP in the form of:
  - (a) Taking mitigation action - 25% of EMP fund (Ks 198,325,000)
  - (b) Monitoring action - 20% of EMP fund (Ks 158,660,000)
- Cost for emergency/contingency (allotted for probable emergency cases) - 10% of EMP fund (Ks 79,330,000)
- Miscellaneous (documentation, reporting and causal fees two villagers, who are members of EMP cell) - 5% of EMP fund (Ks 39,665,000)

Labour cost will be kept at a minimum. Only staffs will be involved in the implementation of EMP. Staff will be first trained for this EMP purpose.

Most of the EMP fund will be used up for the procurement and operation of equipment and materials that are essential for the execution of EMP. E.g. firefighting equipment such as fire extinguishers, water jet pumps and other accessories; Personnel Protective Equipment (PPEs) such as outfit, helmet, boots, gloves, goggle, mask, ear plug/ear muff, etc. And also potable equipment for casual measurement of water and air one water pond for firefighting shall be also constructed. In addition adequate First Aid Kits with adequate medicine and drugs and other First Aid Kit accessory will have to be purchased.

Most of the EMP fund will be used up for the implementation of mitigation measures (which an integral part of EMP) and implementation of MP (which is also integral part of EMP). Mitigation and Monitoring have to be carried out almost on a routine basis or daily basis, and that is why a large percentage of EMP has to be used. Sometime experts and/or technicians have to be hired since certain physical and chemical parameters cannot be tested or measured by the staffs of the hotel.

For capacity building and for training for emergency trainers from Fire Brigade and trainers from the Red Cross Society will have to be hired.

The cost for emergency/contingency programme is difficult to estimate. Unfortunately if a major accident happens this fund has to be considerably increased.

The above mentioned cost estimation is based on the current unit price. Because the project will be implemented over many years (even decades) price fluctuation and inflation will be unavoidable. A contingency amount shall be prepared for any unavoidable event in the future.

8.4.2 Organization to implement EMP

Finally, to effectively carry out the EMP works a small organization, the EMP cell, has to be formed.

EMP cell

An EMP cell (a small organization) is formed for the effective implementation of EMP and MP. The cell members include the manager, who is the EMP cell leader, 2 engineers, 2 technicians. This EMP cell is also the monitoring committee. Two local villagers are added to this monitoring committee.

Highland Cement International Co., Ltd (cement plant) has formed the EMP cell as follows:

Sr. No.	Name	Designation	Responsibility
1.	U Aung Zaw Myint	Manager	EMP cell leader
2.	U Tin Khaing	Engineer	EMP cell member
3.	U Myint Oo	Engineer	EMP cell member
4.	U Kyi Myint	Technician	EMP cell member
5.	U Min Zaw Htet	Geologist	EMP cell member
6.	U Win Tint	Villager	EMP cell member
7.	U Win Naing	Villager	EMP cell member

Later 5 employees or more will be added to the list of the EMP cell members, as ad hoc members or alternate members.

The monitoring works will cover the Construction Phase, Operation Phase and Decommissioning Phase of the project life. The EMP cell leader (monitoring committee leader) and members are responsible for execution of the EMP and monitoring programme.

They shall be specially trained for doing this. As for monitoring specific parameters e.g.- air quality, water quality and soil, technicians or experts from Yangon shall be hired to do the analysis works.

It is not pragmatic for the EMP members, especially the five employees, of the company to get involve solely in EMP and MP activities because their main task is running the cement factory work while EMP and MP activities are actually supplementary works. The company shall not be in a position to set aside 5 well-paid employees just to engage in EMP or MP work alone; it will otherwise result in under-staffed situation for the project. Therefore the EMP cell leader and members have also to get involved in the routine operation work as far as possible. An additional 5 employees will be deployed as assistant EMP cell members. In addition 25 workers will be trained for this purpose.

8.5 Management and monitoring sub plans by project phase

In addition to management plan and monitoring plan is of paramount importance for the successful implementation of EMP.

The objectives are:

- To measure impacts that occur during the four phases of the project
- To ensure compliance with statutory requirements
- To determine the effectiveness of mitigation measures and other measures, and
- To assist in the implementation of EMP

Environmental and social management sub-plans

The sub-plans cover all Project Phases (Preconstruction Phase, Construction/Mine Development Phase, Operation Phase, Decommissioning/Mine Closure Phase and Post Closure/Rehabilitation Phase). For practical purpose the Preconstruction Phase is omitted.

This sub-plans address such environmental and social issues as: noise and vibration, waste, hazardous waste, waste water and storm water, air quality, odour, chemicals, water quality, erosion and sedimentation, biodiversity, occupational health and safety, community health and safety, cultural heritage, employment and training and emergency response plan (ref. EIA guideline for mining sector; Technical guidance, October , 2018).

For pragmatic purpose these are outlined in tabulated forms.

I. During the Construction Phase

Sr. No.	Potential issue	Sub-plans (mainly for taking mitigation measures)	Responsible persons	Cost estimate (One year)	Time frame/ frequency
1.	Noise and vibration	- Plan in the Preconstruction Phase for procurement of equipment, and vehicles that emit lower noise level. - Comply with ECD's NEQEG guidelines for noise level. - Install silencers and mufflers. - Avoid construction work at night. - Provide PPE to workers exposed to prolonged high noise level. - Manage vibration of machine, equipment and vehicle. - Limit the speed of vehicles.	5 ESMP cell members, 25 trained workers	Ks. 1,000,000 Hired technicians for noise level testing	Semi-annually
2.	Waste	- Designate separate dumping site for vegetation waste, overburden and topsoil; ensure that the site are stable; give away vegetable waste (trees) to locals for fire wood. - Regularly collect waste at camp in waste bins and dispose at approved landfill (or dumping) site.	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Construction Phase; occasionally, weekly, monthly as required
3.	Hazardous waste	- Not generated.	-	-	-
4.	Waste water and storm water	- Create systematic drainage at the camp site to manage waste water; ensure that it does not enter the stream; also to manage storm water. - Create suitable drainage at mining site to manage storm water. - Keep natural drainage of the slope intact; do not block or alter as far as possible. (Ensure that the construction of series of access road, in-mine roads, ramps does not damage the natural drainage as far as possible.) - Ensure that overburden and top soils stockpiles, from not effected by storm water.	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Construction Phase; occasionally, weekly, monthly as required

5.	Air quality	- Comply with ECD's NEQEG emission guidelines. - Plan in the Pre-Construction Phase for the procurement of equipment, vehicles that emit less smoke (to be certified for emission compliance). - Keep equipment and vehicles well-maintained, well-operated and well-lubricated to reduce smoke emission. - Use machinery and vehicle with low emission rate; use fuel with low sulphur content. - Avoid open burning of debris. - Spray water for suppression of dust. - Restrict vehicular movement; maintain road clear of mud and dirt. - Limit open stockpile of earth, sand etc. - Provide PPE to workers who are exposed to smoke or dust for long period.	5 ESMP cell members, 25 trained workers	Ks. 3,000,000 Hired technicians for air quality testing	Semi-annually
6.	Odour	- Not generated.	-	-	-
7.	Chemicals	- Not used during Construction Phase.	-	-	-
8.	Water quality	- Avoid water bodies as far as possible when constructing or building roads - Storage of fuel oil as well as used fuel oil should be done in a designated bunded side until removal - Maintain vehicles and machinery adequately to prevent spillages resulting in surface water contamination - When handling fuel oil avoid accidental spillages into the surface water; should spillages occur implement appropriate clean up immediately. - Avoid disposing of waste (both liquid and solid) into water bodies.	5 ESMP cell members, 25 trained workers	Ks. 1,000,000 Hired technicians for water quality testing	Semi-annually

		- Top soil should be allowed to naturally vegetate in order to stabilize soil particles and thus preventing erosion and limiting siltation to avoid pollution of water by all means.			
9.	Erosion and sedimentation	- Implement erosion control/management when the natural slope is more than 20°. - Minimize length and steepness of slope (conduct land cutting, land filling and land construction). - Minimize the area of bare soil exposed as practical as possible (do not clear the vegetation more than necessary leaving large area of bare land). - Run-off from areas adjacent to the site will be diverted around disturbed areas (construction of small diversion canal/drainage). - Control sediment (build sediment trap or dam where necessary). - Prevent sliding and erosion of overburden stockpiles and top soil stockpile as far as possible: let grass and vegetation naturally grow on stockpile for stabilization. - Ensure that the slope of a stockpile is not more than 37°. - Ensure that run-off from the site is discharged at non-erosive velocities; discharge will be to location that do not adversely impact the natural waterways (the stream).	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Construction Phase; occasionally, as required
10.	Biodiversity	- Do not clear vegetation more than necessary for the construction of access road and quarry site. - Prevent the spillages of hydrocarbons which has negative impact on plants especially on the root system - Restrict the collection of fire wood. - Avoid open burning of debris. - Educate workers for fire awareness and protection. - Identify sensitive species and habitats and try to avoid such spots as far as possible.	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Construction Phase; occasionally, as required

		- Promote environment awareness to workers. - Try to stop illegal logging; inform the authority if there is any. - Implement rehabilitation to promote natural vegetation establishment after completion of quarry at a site. - Ensure that mine works have minimal disturbance or wildlife. - Restrict vehicular movement to the access road to prevent habitat disturbance of birds and animals. - Prohibit the hunting and/or trapping of wild animals. - Prevent the potential injury or death of wildlife due to vehicular movements especially during night time. - Avoid the use of excessive bright light for long hours at night to prevent the aggregation and eventual death of large number of insects (offensive bright light in the forest at night will also scare away wild animals from their natural foraging or breeding ground).			
11.	Occupational Health and Safety	- Creation of a safe working place and working condition. - Facilities will have adequate space for all kinds of activities, e.g. excavation, transportation, crushing, site for stockpiles, etc. - Provision of adequate lavatory facility, bath and washing area; provision of adequate potable drinking; provision of health living spaces and clear eating areas, provision of first aid at all times for workers (the company has its own clinic). - For practical purpose provide First Aid Training for some workers with the assistance of Township Red Cross society; will provide adequate first aid facility including first aid kits, medicines and drugs. - Provide training for Occupational Health and Safety; training for good safety practice, for personal safety (preventing accidents, injuries), basic hazards awareness, and site specific hazards, (especially at mining sites).	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Construction Phase; occasionally, as required

		- Provide training on safety handling and operation of machinery equipment, safety storage and handling of fuel oils. - Will provide adequate PPEs to workers where and when necessary to ensure the basic health protection and safety of workers. - Safe work procedure for all electrical works covering construction, operation and decommissioning and demolition works. - Educate and train drivers, particularly heavy truck drivers for safety driving and defensive driving; ensure that the access road is not bumpy and safe for driving. - Try to achieve zero accidents in excavation, hauling and transportation activities including traffic. - Ensure that workers are not subject to excessive repetitive motions, over exertion and excessive manual handling; if possible will use mechanical labour rather than manual labour as practical as possible to reduce fatigue, strain and injury on workers.			
12.	Community Health and Safety	- Will control smoke and dust as practical as possible; will avoid open burning of debris and trash so that smoke will not reach the village; educate the driver to lower speed when passing through the village (the reduction of speed from 40 km to 35 km can reduce dust to 50%, it is learnt). - Ensure that the water ponds do not become breeding ground for mosquitoes; regularly changing of water; application of mild chlorination; annihilation of mosquito larvae by all means; educate workers to use mosquito's nets at night and provision of mosquito nets.	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Construction Phase; occasionally, as required

		- Also ensure that domestic solid wastes, liquid waste water and drainage do not become breeding ground for flies, mosquitoes and insect for prevention of vector borne diseases and water borne or water related disease. - Will prevent the occurrence and spread of infectious and communicable diseases by all means; will undertake health awareness and educations initiative (health education campaign) in local community as far as possible. (the company has its own clinic where villagers are given free medicare) - Avoid/minimize by all means, vector borne, water borne (water based, water related disease and communicable diseases that would result from project activities. Liaise with Township Health Authority regularly. - Avoid/minimize by all mean spread of diseases from workers. Educate long distance truck driver regarding sex education example for use of prophylactic condom; prevent spread of STD, HIV/AIDS. - Educate workers regarding code of conducts, social conducts, etiquette and local culture and tradition. - Educate drivers for safe driving and defensive driving and to comply with rules and regulation regarding traffic; also conduct road safety education campaign for the local community, if possible; locals should be able to file complaint regarding traffic. - Comply with law and regulation relevant to transportation of hazardous materials such as fuel oils; also plan for measures for preventing and/or mitigation the consequence of accidental release/spill of hazardous materials (fuel oil); avoid/minimize community exposure to hazardous materials.			

		- Develop emergency preparedness and emergency response plan and contingency plan (action plan) for effective implementation when necessary; provide operation manuals for external emergency plan and internal emergency plan for all workers and if necessary also to local community and government inspectors. Conduct rehearsals or drills for such plan. Cooperation with local community and authority in preparation of emergency plan.			
13.	Cultural heritage	- Ensure that mining activities have no impact on the Buddhist monastery. - Monitor the situation. - Pay courtesy visit (obeisance visit) occasionally to the abbot monk and offer cash and kinds and build good cordial relation. - Get involve in religious festivals; provide donations.	5 ESMP cell members, 25 trained workers	Free of charge	From time to time
14.	Employment and training	- Plan for human resource development. - Prioritize employing locals as far as possible. - Organize new task employees for job training. - Also provide systematic induction training for new workers to enable them to do their jobs efficiently. - Induction training will cover: general training; skill training for efficiency and mandatory training relating to health and safety (e.g. safety operation of machinery and handling of hazardous materials). - Educate and train them for good working practice, good safety practice, good health and hygine practice and good environmental awareness practice until all these practices are ingrained in their mind sets and become good habits.	Company authority and ESMP cell members, officers from government department for training and educating	Ks. 10,000,000 (honourarian fees, courtesy gift)	From time to time as required

		- Educate and train them for familiarization with negative impacts and subsequent taking of mitigation measures. - Educate and train them for basic eco-friendly behaviours e.g. good house-keeping practice, do not litter, do not dirty your place, minimize the use of water, fuel.			
15.	Emergency response	- Prepare Emergency Response Plan (ERP) and team to prevent fatilities and injuries, to reduce damage and to protect environment and community. - Prepare emergency preparedness plan execute the plan. - (Emergency Response Plan will cover emergency resources, emergency preparedness and training, emergency response procedures, administration of the plan, communication and procedures, and debriefing and post-traumatic stress procedures.) - For practical purpose provide training for firefighting, training for First Aid and Rescue. - Provide facilities (e.g. firefighting equipment, suit, first aid kits, emergency vehicle. - Display phone numbers of Firefighting Department, Ambulance Services, Red Cross Society, Hospital and Police Station.	5 ESMP cell members, 25 trained workers	Ks. 14,420,000 (Set aside for emergency case, for educating and training by government officials)	Once during Construction Phase

II. During the Operation Phase

Sr. No.	Potential issue	Sub-plans (mainly for taking mitigation measures)	Responsible persons	Cost estimate (One year)	Time frame/ frequency
1.	Noise and vibration	- Comply with ECD's NEQEG noise level guidelines. - Restrict or limit vehicular and heavy machinery movements. - Plan for appropriate choice of machinery and vehicles (that emit low noise level); method of working, efficient material handling. - Installation of noise abating devices e.g. silencers, mufflers. - Well-operated and well-maintained vehicles and machinery generate lower noise level and prevent undesirable noise level. - Develop green belt (plant trees) around the mining site; trees abate noise and serve as noise sink (pollution sink). - If necessary install vibration absorbers or vibration absorbers or vibration abators. - Provide adequate PPE e.g. ear muffs, ear protectors to workers exposed to long hours of high noise level; fix excavator, bulldozer with air conditioned cabin for operators. - Conduct regular noise monitoring to ensure that the levels are within noise exposure standard (not higher than 85-90 dBA).	5 ESMP cell members, 25 trained workers	Ks. 1,000,000 Hired technicians for noise level testing	Semi-annually
2.	Waste	- Keep top soil and overburden separately. - Manage for the stockpiling of overburden and top soil; no spill over, no sliding, no erosion, no blocking of natural drainage system; no entering into stream, cultivated areas and village area. - The stockpiles (of top soil or overburden) must have a maximum slope of not more than 37º for effective stabilization. - Backfill mined out pits, holes, with overburden.	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Operation Phase; occasionally, weekly, monthly

		- Avoid all collateral damages due to mining and stockpiling of overburden and top soil as far as possible. - Instruct workers for proper handling and disposal of wastes e.g. at the factory site and residential area. - Separate solid waste into categories, use separate bins, disposed at approved landfill. - Dispose waste only after all waste preventive and recycling strategies have been undertaken. - No disposal of waste water outside (on land or into water body). - Educate and train workers for good house-keeping practices.			
3.	Hazardous waste	- No hazardous waste envisaged. - Used fuel oil, engine oil will be collected in drums and give away to recyclers.	5 ESMP cell members, 25 trained workers	Free of charge	Throughout Operation Phase; occasionally, weekly, monthly
4.	Waste water and storm water	- Create systematic drainage at the camp site to manage waste water; ensure that it does not enter the stream; also to manage storm water. - Create suitable drainage at mining site to manage storm water. - Keep natural drainage of the slope intact; do not block or alter as far as possible. (Ensure that the construction of series of access road, in-mine roads, ramps do not damage the natural drainage as far as possible.) - Ensure that overburden and top soils stockpiles, from not effected by storm water. - Avoid the flowing of storm water into mine pits, create more small diversion canal. - Recycle water at the factory as far as possible (100%) applying cooling tower and reused the water.	5 ESMP cell members, 25 trained workers	Ks. 1,000,000 Hired technicians for water quality testing	Occasionally by ESMP cell member, semiannually for hired technicians

		- Install water treatment for both industrial waste water and domestic waste water and finally discharge treated water. - Test the water quality as well as waste water at the laboratory.			
5.	Air quality	- Comply with ECD's NEQEG emission guideline. - Do not clear the vegation (grass) and leave the land have more than necessary. - Consolidate and compact all areas to prevent generation of dust due to wind. - Stop excavation/extraction for a while when strong wind is blowing. - Spray water adequately to suppress dust. - Reduce the speed of vehicle to reduce dust generation. - Restrict vehicular movement; maintain road, clear of mud and dirt. - Avoid open burning of debris or solid waste. - Keep equipment and vehicles well- maintained to reduce smoke. - Install ESP and a series of bag filters (44) to mitigate air emission. - Regularly collect the cement dust, fly ash, down ash and temporary store them at respective shed for final discharge. - Reuse some of the cement dust in cement manufacturing. - Ensure that emission value is within ECD's guideline values. - Provide PPE (e.g. face masks, mouth and nose covers, gas masks) to workers exposed to long hours of dust and smoke; fit excavator with air conditioned cabin for operators.	5 ESMP cell members, 25 trained workers	Ks. 3,000,000 Hired technicians for air quality testing	Semi-annually

6.	Odour	- Not generated.	-	-	-
7.	Chemicals	- Chemical are not used in limestone mining. - A variety of chemicals (more than 50) are used for testing of water and maintenane of water quality but only small amount are used. - All chemicals are ketpt separately in store near the laboratory. - The used water at the laboratory is simply drained into the drainage system (no special treatment required).	-	-	-
8.	Water quality	- Plan and manage for preventing pollution on the water environment. - Manage so that mining activities will not impact the surface water of Myit-thar stream. - Manage for the stability of top soil and oveburden to prevent erosion and sliding and siltation; not to impact surface water flow dynamic or alter water courses and not to impact on aquatic biodiversity. - Fuel oil depot is away from a stream; the depot is bunded to protect surface water from oil spill. - Avoid disposing of waste (liquid and solid) into water bodies. - Manage water conservation; reduce water consumption. - Apply a monitoring plan for water quantity and quality based on simple parameter e.g. temperature, pH and total alkalinity. - Adequately maintain vehicle and machinery to prevent spillages resulting in groundwater contamination. - Avoid spillage during the handling of fuel oil. - Should accidental spillages occur implement appropriate clean up immediately; do not wash down spill with water; use absorbents or saw dust for clean-up. - Conduct water quality testing at the factory regularly.	5 ESMP cell members, 25 trained workers	Ks. 1,000,000 Hired technicians for water quality testing	Semi-annually

9.	Erosion and sedimentation	- Implement erosion control/management when the natural slope is more than 20°. - Minimize length and steepness of slope (conduct land cutting, land filling and land construction). - Minimize the area of bare soil exposed as practical as possible (do not clear the vegetation more than necessary leaving large area of bare land). - Run-off from areas adjacent to the site will be diverted around disturbed areas (construction of small diversion canal/drainage). - Control sediment (build sediment trap or dam where necessary). - Prevent sliding and erosion of overburden stockpiles and top soil stockpile as far as possible: let grass and vegetation grow on stockpile for stabilization. - Ensure that the slope of a stockpile is not more than 37°. - Ensure that run-off from the site is discharged at non-erosive velocities; discharge will be to location that do not adversely impact the natural waterways (the stream). - Ensure that the main access road, in-mine roads, ramps, berms are stable and not easily eroded. - Stop mining activities during rainy season, especially during days with heavy rain. - Construct sediment traps bars and bank, to contain erosion where necessary.	5 ESMP cell members, 25 trained workers	Free of charge	Occasionally, weekly, monthly
10.	Biodiversity	- Plan for minimum disturbance to the flora when conducting mining activities. - Do not clear vegetation more than necessary. - Restrict the movement of vehicles to the access road. - Restrict the collection of fire wood. - Avoid open burning of debris.	5 ESMP cell members, 25 trained workers	Free of charge	Occasionally, weekly, monthly

		- Educate workers for fire awareness and protection; get rid of all debris that can cause fire. - Identify sensitive species and habitats and try to avoid such spots as far as possible. - Implement rehabilitation to promote natural vegetation establishment after completion of mining at a site. - Restrict vehicular movement to the access road to prevent habital disturbance of birds and animals. - Prohibit the hunting and/or trapping of wild animals. - Prevent the potential injury or death of wildlife due to vehicular movements especially during night time. - Avoid the use of excessive bright light for long hours at night to prevent the aggregation and eventual death of large number of insects. - Identify sensitive species which need to be avoided; avoid the disturbance of animal habitat such as nest and breeding ground.			
11.	Occupational Health and Safety	- Plan and manage for safe working environment. - Try to achieve zero accidents at work place. - Educate and train workers for good working practice, good safety practice and good health and hygiene practices. - Provide adequate PPEs for workers who are exposed to heat, dust, smoke, loud noise etc. - All workers must pass a medical examination in the first place before being employed. - Implement safe and effective procedures for storage, transportation and handling of hazardous materials (the company has a magazine for explosives, and a safe fuel depot). - Have detail plan for prevention of fire and emergency. - Organize basic First Aid Training and Fire Fighting Training.	5 ESMP cell members, 25 trained workers	Ks. 2,000,000 (fees and courtesy gifts)	From time to time as required

		- Provision of firefighting equipment. - Provision of First Aid Kits, medicines and drugs. - Organize mock drills for firefighting and first aid training. - Display addresses and phone numbers of Fire Bridge, Ambulance Service, Red Cross Society, Hospital and Police Station so that every can see easily. - Take out insurance for the project and also fire insurance. - Provide adequate proper sanitation facility e.g. bath rooms, toilets etc. - Safe work procedure for all electrical works covering construction, operation and decommissioning and demolition works. - Educate and train drivers, particularly heavy truck drivers for safety driving and defensive driving; ensure that the access road is not bumpy and safe for driving. - Ensure that nobody parts (extremities such as hands, fingers) are kept out of harm way during operation equipment. - Ensure that workers are not subject to excessive repetitive motions, over exertion and excessive manual handling; if possible will use mechanical labour rather than manual labour as practical as possible to reduce fatigue, strain and injury on workers.			
12.	Community Health and Safety	- Will control smoke and dust as practical as possible; will avoid open burning of debris and trash so that smoke will not reach the village; educate the driver to lower speed when passing through the village (the reduction of speed from 40 km to 35 km can reduce dust to 50%, it is learnt). - Locals should be able to file complaints regarding dust, noise and vibration.	5 ESMP cell members, 25 trained workers	Free of charge	From time to time as required

		- Ensure that the water ponds do not become breeding ground for mosquitoes; regularly changing of water; application of mild chlorination; annihilation of mosquito larvae by all means; educate workers to use mosquito's nets at night and provision of mosquito nets. - Also ensure that domestic solid wastes, liquid waste water and drainage do not become breeding ground for flies, mosquitoes and insect for prevention of vector borne diseases and water borne or water related disease. - Will prevent the occurrence and spread of infectious and communicable diseases by all means; will undertake health awareness and educations initiative (health education campaign) in local community as far as possible. During the long Operation Phase will consider for setting up a clinic at the site and provide health care for locals as practical as possible. - Avoid/minimize by all means, vector borne, water borne (water based, water related disease and communicable diseases that would result from project activities. Liaise with Township Health Authority regularly. - Avoid/minimize by all mean spread of diseases from workers. Educate long distance truck driver regarding sex education example for use of prophylactic condom; prevent spread of STD, HIV/AIDS. - Educate workers regarding code of conducts, social conducts, etiquette and local culture and tradition.			

		- Educate drivers for safe driving and defensive driving and to comply with rules and regulation regarding traffic; also conduct road safety education campaign for the local community, if possible; locals should be able to file complaint regarding traffic. - Comply with law and regulation relevant to transportation of hazardous materials such as fuel oils; also plan for measures for preventing and/or mitigation the consequence of accidental release/spill of hazardous materials (fuel oil and explosive); avoid/minimize community exposure to hazardous materials. - Develop emergency preparedness and emergency response plan and contingency plan (action plan) for effective implementation when necessary; provide operation manuals for external emergency plan and internal emergency plan for all workers and if necessary also to local community and government inspectors. Conduct rehearsals or drills for such plan. Cooperation with local community and authority in preparation of emergency plan.			
13.	Cultural heritage	- Ensure that mining activities have no impact on the Buddhist monastery. - Monitor the situation. - Pay courtesy visit (obeisance visit) occasionally to the abbot monk and offer cash and kinds and build good cordial relation. - Get involve in religious festivals; provide donations.	5 ESMP cell members, 25 trained workers	Free of charge	From time to time as required

14.	Employment and training	- Plan for human resource development. - Prioritize employing locals as far as possible. - Organize new task employees for job training. - Also provide systematic induction training for new workers to enable them to do their jobs efficiently. - Induction training will cover: general training; skill training for efficiency and mandatory training relating to health and safety (e.g. safety operation of machinery and handling of hazardous materials). - Educate and train them for good working practice, good safety practice, good health and hygine practice and good environmental awareness practice until all these practices are ingrained in their mind sets and become good habits. - Educate and train them for familiarization with negative impacts and subsequent taking of mitigation measures. - Educate and train them for basic eco-friendly behiviours e.g. good house-keeping practice, do not litter, do not dirty your place, minimize the use of water, fuel. - More specific training for mining as well as operation of heavy machinery and heavy trucks will be organized. - Review on the effectiveness of training will be done for improvement. - Regular monitoring of mining site/extraction site will be conducted.	Company authority and ESMP cell members	Free of charge	From time to time as required

15.	Emergency response	- Prepare Emergency Response Plan (ERP) and team to prevent fatalities and injuries, to reduce damage and to protect environment and community. - Prepare emergency preparedness plan execute the plan. - (Emergency Response Plan will cover emergency resources, emergency preparedness and training, emergency response procedures, administration of the plan, communication and procedures, and debriefing and post-traumatic stress procedures.) - For practical purpose provide training for firefighting, training for First Aid and Rescue. - Provide facilities (e.g. firefighting equipment, suit, first aid kits, emergency vehicle. - Display phone members of Firefighting Department, Ambulance Services, Red Cross Society, Hospital and Police Station. - Review on the effectiveness of training will be done for improvement. - Regular monitoring of mining site/extraction site will be conducted. - Mock drill for ERP will be conducted, on a regular basic; bi-annually.	5 ESMP cell members, 25 trained workers	Ks. 14,420,000 (Set aside for emergency case)	From time to time as required

III. During the Decommissioning Phase

Sr. No.	Potential issue	Sub-plans (mainly for taking mitigation measures)	Responsible persons	Cost estimate	Time frame/ frequency
1.	Potential accident at workplace	- Plan and manage for effective decommissioning of site. - Hire decommissioning contractor to do the work. - Dispose materials that are no longer useable; redeploy or put up for sale those that are useable. - Restore the ground and soil profile			
2.	Air quality and water quality	- Test air quality and water quality each for the last time to ensure that it is within guideline values and that water do not remain polluted.	5 ESMP cell members, 25 trained workers	Ks. 3,000,000 for air Ks. 1,000,000 for water Hired technicians	Semi-annually
3.	Soil quality	- Test soil quality for the last time to ensure that there the soil quality is polluted or contaminated with fuel oil.	5 ESMP cell members, 25 trained workers	Ks. 400,000 Hired technicians	Semi-annually
4.	Community health and safety	- Manage to ensure that community health and safety are not compromise during Decommissioning Phase.	5 ESMP cell members, 25 trained workers	Free of charge	From time to time

IV. During the Rehabilitation Phase

Sr. No.	Potential issue	Sub-plans (mainly for taking mitigation measures)	Responsible persons	Cost estimate	Time frame/ frequency
1.	Biodiversity	- Ensure that the replanted trees are well-reestablished. - Continue regular tending (weeding, application of fertilizer if necessary) of the replanted small trees at least 24 months; if necessary continue the tending of the plant until it is acceptable to return the site to the Forest Department.	5 ESMP cell members, 25 trained workers	Free of charge	Occasionally, weekly, monthly
2.	Community health and safety	- Ensure that the site safe for local community after Post Closure Phase.	5 ESMP cell members, 25 trained workers	Free of charge	Occasionally, weekly, monthly
3.	Air, water and soil quality	- Ensure that the site is rehabilitated and ecologically restored to its quasi-original condition.	5 ESMP cell members, 25 trained workers	Ks. 1,500,000 for air Ks. 500,000 for water Ks. 200,000 for soil Hired technicians (for the last time)	Once off cost

Note: The costs are for wages, hiring costs, and honorarium fees. PPEs and environmental devices (silencers, vibration absorbers etc) will be from the main budget. Occasionally means daily, weekly and monthly as required.

8.5.1 Programmes for effective execution of EMP

Reporting, capacity building and emergency programme are integral parts of EMP.

(d) Reporting programme

(i) Internal monitoring and inspection reporting

Each and every monitoring/inspection work carried out by members of EMP cell must be catalogued in relevant log books. The internal monitoring and inspection will also have to involve in checking the performance of machinery, equipment and vehicles or at least the regular monitoring/checking of the log books of machinery, equipment and vehicle. All these findings or observations have to be reported.

Members of the EMP and MP cell will also have to check the log book or registered book weekly or monthly. There shall be a monthly reporting session for effective communication with the EMP leader or authority.

(ii) Incident, accident and emergency reporting

In cases of incident and accident (including near miss) prompt reporting has to be carried out. This must be in the form of verbal reporting follows by written statement, after emergency and contingency procedures have been undertaken.

The written statement shall be more comprehensive and shall include the location and cause of accident, the time, extent and intensity and how actions for emergency and contingency procedures were taken. Estimate of loss will have to be followed later. Reporting on incidents of misbehavior such as quarrels, and brawls etc. may not be necessary. It is actually the duty of the security staff to take action.

(iii) Measuring performance indicators and interpreting and acting on the indicators

Based on the finding or observation from the monitoring or inspection on the performance of EMP and MP cell members a report on the performance including the assessment of the performance and it effectiveness or success has to be submitted to the authority. This will have to be undertaken on a regular basis and the performance has to be documented and registered.

It is very important to report regularly on evaluation of mitigation/corrective measures taken. Evaluation shall be made during regular monitoring/inspection works.

There shall be a mechanism for auditing the EMP and its implementation processes. This will involves reviewing all the log books, registered books, documents and reports. As mentioned earlier there shall be a separate log book for registering complaints and grievances, if any. Prompt reporting on complaints and grievance is necessary and the authority has to take necessary measures in a timely manner.

(iv) Reporting on training programmes

As mentioned earlier there must be regular monitoring and inspection of all training programmes provided, namely, capacity building training, training for safety and training for health, also training for quick response and preparedness such as drills and mock drills.

EMP cell members conducting monitoring and inspection works must be able to interpret and assess the overall condition of the training processes especially assessment of the effectiveness and applicability of each training.

Annual review shall be prepared and an Annual Environmental Management Report shall be submitted.

This annual report/review will summarize the key activities and environmental performance for the preceding 12 months. It will also include comprehensive review of monitoring results and complaints records, if any.

(b) Capacity building and training

The company shall train all the employees for good working practice and good safety practice until all these good practices become good habits and ingrained in their mind sets. All the trainings shall be adequate and effective.

Educate and train them for skill and efficacy in doing their routine jobs (provide manuals for all).

Educate and train them for the safety handling and operation of machinery and equipment; identify hazardous work place, unsafe place. Also for project site dafety.

Educate and train them for the safety handling of chemicals (especially hazardous ones) and fuel.

Provide OHS training with the help of officers from the Ministry of labour (already done).

Provide First Aid Training with the help of Township Red Cross Society. (Already done)

Educate and train them for the health and hygiene awareness, regular checking of clinic and canteen.

Educate and train them for the environmental awareness.

Will request officers from Mandalay ECD to give lecture.

Will request officers from Occupation and Environmental Health and Division (OEHD) to give training.

Provide Firefighting training with the help of Township Fire Brigade, (already done).

Educate some of them for familiarzation with negative impacts and train them for taking mitigation measure.

Educate them for basic ecofriendly behavior e.g. minimize the use of water, fuel, electricity etc.

Train them for conducting monitoring works regarding EIA procedure.

(c) Emergency plan, emergency responses and contingency procedure

The company shall first of all taken into consideration all the potential chemical hazards, physical hazards, biological hazards and other hazards such as dust, noise, heat, confined space, radiation etc. and create safety conditions for all work places.

The training shall be adequate and effective; if possible provision of manuals to certain employees will be made.

The authority shall try to avoid and prevent accidents and also try to achieve zero accident at the work places. All employees shall be trained for basic Occupational Health and Safety (OHS) training.(the company has already done this)

The basic requirements for work place shall be considered, eg -- integrity work place structure, work place and exit, fire precaution, toilets and baths, potable water supply, clean eating area, lighting safe access, first aid, air supply, work environment temperature etc. and appropriate conditions shall be created.

Careful planning of emergency procedures shall be formulated and implemented. Train at least some workers for first aid training while some for firefighting.(already done)

Provide adequate First Aid Kits, Fire extinguishers (cylinder) and water jet pumps. Most of all provide Personnel Protective Equipment (PPE) to workers exposed to dust, smokes, heat, vibration etc.

For emergency response, organize regular mock drills for first aid works and also mock drills for firefighting.

Display phone numbers and addresses of nearest Red Cross Society, Ambulance Service, Fire Brigade, Police Station, Tharzi General Hospital and Mandalay Hospital on the wall so that every worker can see easily.

Measures for accident and emergency

- Basic first aid and rescue training, basic Fire-fighting trainings for workers (the company has already done this).
- Draw detail plan for prevention of fire and emergency plan for fire outbreak. (Highland Cement International Co., Ltd has already drawn up a plan for this, in Burmese version for fire prevention) (**See ANNEX).**

- Provision of firefighting suits and equipment's (fire engine, truck), water jet pumps, installation of hydrants around the plant; water ponds to be always filled with water etc.
- Training and drill workers on emergency procedures including contingency measures.
- Take out Insurance for the project and Insurance for Fire; Life Insurance for each and every employee should be taken into consideration.

Accident like fire break out fire could not be totally ruled out given the nature of the work. In this EMP report emergency plan would mainly focus on emergency and contingency plan for outbreak of fire.

(i) Emergency procedures (generalized)

- First draw up a plan for prevention/mitigation measures for fire accident (the company has already drawn up plans for fire prevention and firefighting)
- Carefully plan for emergency response and procedures (the company has already done this)
- Provide firefighting training for some workers (the company has already done this)
- Provide adequate firefighting facility, water ponds, hydrants, water jet pumps, and fire extinguishers; provide adequate PPEs such as firefighting suits, if possible. (the company has already done this)
- Regularly check the firefighting facility, its readiness; ponds to be always filled with water
- Organize mock drills regularly and assess the effectiveness of drills and training; assess the readiness, quick response and quick evacuation processes (the company has already done this)
- Provide First Aid Training and rescue trainng for some workers (the company has already done this)
- Provide adequate first aid facility-such as stretchers, equipment, first aid kits including medicines; regularly check the condition of first aid facility
- Display addresses and phone numbers of Fire Fighting Brigade, Ambulance Service, Hospital's emergency department, police station etc so that everyone can see easily
- Set up effective alarm system and control system
- Take out insurance for the company; also insurance for fire and for disaster

(ii) Emergency response and contingency procedures (in brief)

The objectives of Emergency response are:

- To minimize confusion through effective delegation of responsibilities
- To minimize danger or safety risks by providing first aids
- To minimize damage to property and the environment by isolating the incident.

For fire accident (generalized)

- Sound the fire alarm (electronically or manually)
- Switch off main switch and implement rapid and effective firefighting process
- Rapid evacuation process for workers, important materials, belongings
- conduct rescue operation, First aid treatment, if any injury, and subsequent admission to hospital for serious cases
- Implement effective relief programme and implement follow up rehabilitation programme

Note – See also ANNEX for Fire prevention/fighting plan in Burmese version.

(d) Occupational Health and Safety (OHS) Plan

First of all the company shall plan and execute for the creation of a safe working environment and, particularly safety working place, following the guideline prescribed by IFC.

The Company shall educate, train and supervize its workers for good working practice, good practice and good house-keeping practice until all these good practice are ingrained in their mind sets and become good habits (will conduct special) induction course for newly employed workers).

The Company shall also educate and train them for good health practice, good hygiene practice and educate them for environmental awareness.

Specially workers will be educated, trained and supervized in the safety handling and operation of machinery and equipment. Safety manual hand books will be issued to all workers who are involved in the operation of machinery.

Workers will be specially trained in the handling and application of chemical (even if not toxic) and fuel and other substance.

Medial screening shall be conducted for all worker prior to employment (pre-employment medical screening) and periodic medical examination (every six months) shall be undertaken for all workers. The company shall consider for HIV and STD testing in the near future.

The Company shall install a room inside the compound as a clinic with adequate medicines and employ a certified medical doctor and one nurse in accordance with the 1971 regulation concerning factory (medical aspects). (This plan has yet to be executed.)

Adequate sanitation will be provided for worker housing and workers shall be trained for good house-keeping practice and good health and hygiene practices. The company shall liaise with Township Health Department on a regular basis.

Standard operating procedures for health and safety measures will be drawn encompassing; identification of risks, prevention, keeping a log book/record for accident; submitting the record book to Factories Inspection Department regularly, and plan for first aid procedures and subsequently admission to the nearest hospital (also partly mentioned in **Chapter-6**).

Special Induction Course/New Task employees training; installment of covers or rail guards for risky machinery; area signage; labeling of equipment and chemicals both risky and non-risky ones (in the forms of pictogram) will be undertaken.

Moreover the following subheadings concerning OHS guideline prescribed by IFC will be followed or at least referred to as far as possible. (These are summarized as follow.)

1) <u>General facility design and operation</u>

Work places shall be designed and equipped to protect OHS-; and prioritize structural integrity.

<u>Severe weather and facility shut down</u>

Work place structure shall be designed and constructed to withstand severe weather (e.g. violent storm, excessive rainfall) and also for an evacuation plan.

<u>Work place and exit</u>

Space at work place shall be adequate for all kinds of activities, emergency exists (e.g. fire exits) shall be constructed/installed.

<u>Fire precaution</u>

The workplace shall be designed in the first place for the prevent the start of fire; provision of firefighting equipment and also fire detector and alarm systems, if possible (Firefighting equipment, that is easily accessible and simple to use eg. portable fire extinguisher).

Lavatory and showers

Provision of adequate lavatory facility (toilets and washing area) with essential tissues papers and soaps etc.

Potable water supply

Provision of adequate potable drinking water that meets drinking water quality standards.

Clean eating area

Arrangement for provision of clean eating area for workers (not exposed to hazardous or noxious substances).

Lighting

Sufficient Natural Light or artificial illumination for worker safety and health.

Safe access

Provision of easy, safe and appropriate access in case of emergency.

First aid

Ensure that first aid can be provided at all times for workers. Provision of first aid with adequate medicine and drugs. Demarcate a place as first aid room/station.

Air supply

Sufficient fresh air shall be supplied and good ventilation system will be implemented (e.g. mechanical ventilation system such as fans and blowers). Ventilation and air cooling system shall be equipped, maintained and operated to prevent the spread of pathogenic microorganisms.

2) Communication and training OHS training

OHS training for all workers. In addition good working practice and good safety practice workers shall be also trained for personal safety (preventing injury), basic hazards awareness, site specific hazards and emergency procedure for fire evacuation and natural disaster.

New task employee training

Ensure that all workers shall receive adequate training and information prior to employment. The training shall cover: knowledge of materials, equipment and tools; known hazards in the operation and their control; potential risk to health; precaution to prevent exposure; hygiene requirement, wearing of PPEs and appropriate response to accidents.

Area signage

Appropriately mark hazardous areas (eg. electrical room, compressor rooms etc) chemical store, fuel depot etc. as well as emergency exit.

Signage shall be in accordance with international standards (eg. pictogram-easily understood by all).

Labeling of equipment

Label all bottles, containers for chemicals, both hazardous and non-hazardous.

3) Physical hazards

Rotating and moving equipment

Design and install machine to eliminate trap hazards and ensure that extremities (e.g. hands, fingers) are kept out of harm way during operation. Equipment shall be protected by a guard/device that prevents access to the moving part.

Design and install equipment so that regular servicing can be undertaken without removing the guarding devices.

Noise

Ensure that no workers shall be exposed to a noise level greater than 85 dBA for duration of more than 8 hours per day.

No unprotected ear shall be exposed to a peak sound pressure level (instantaneous) of more than 140 dBC.

Provision of PPEs e.g. ear plugs, ear muffs.

Apply acoustic insulating material (noise abator, silencer); isolate noisier equipment (install sound barrier); conduct periodic medical hearing check for workers exposed to long hours of high noise level.

Vibration

Avoid, prevent hand-arm vibration (e.g. use of hand tools) and whole-body vibration (standing/sitting on vibrating surface) by all means. Reduce or limit working hours for vibrating work.

Install vibration dampening pads or device.

Electrical

Check all electrical cords, cables and hand power tools for faults or leaks and immediately fix the faults.

Mark all electrical devices and lines with warning sign.

Label service rooms housing high voltage equipment.

Establish "No Approach" zone around or under high voltage power line.

Eye hazards

Use machine guards or splash shields or/and face and eye protection (PPE) such as goggle and face mask where necessary.

Welding/hot work

Provide welder goggles or full-face eye shield.

Provide protective suit for workers working near hot place.

Industrial vehicle driving and site traffic

Train operators in the safe operation of specialized vehicles and fork lifts; to strictly follow operating rules and procedures.

Ensure the operators undergo medical surveillance.

Ergonomics, repetitive motions and manual handling

Ensure that workers are not subject to excessive repetitive motions, over exertion and excessive manual handling. Use mechanical labour rather than manual labour as practical as possible to reduce injury and strain on workers e.g. use mechanical assists to reduce or eliminate exertions requirement to lift materials.

Implement programme that reduce unnecessary forces and exertions.

Working at height

Implement protection measures whenever a worker has to work at a height of more than 2 meters e.g. installation of guard rails; proper use of ladders and scaffolds; the wearing of safety belt and body harness.

Illumination

Work area light intensity shall be adequate for the general purpose of working inside a factory. If natural light is not sufficient energy efficient light sources (lamps, bulbs) with minimum heating emission shall be used.

4) Chemical hazards

Although all the chemicals used are non-toxic (only for water purification) the company shall educate and train its workers for the handling and application of chemicals. The company shall:

- Minimize the release of chemical into the work environment.
- Keep the number of workers exposed to chemical to a minimum.
- Label all chemicals (use pictogram).
- Wear PPEs where necessary.

Air quality

- Maintain the level of PM, emission at concentration below those recommended by ECD (Described in **Chapter-3**).
- Conduct work practices to minimize release of air contaminant eg. direct piping of liquid and gaseous materials; minimize handling of dry powdered materials; enclosed operation; local exhaust ventilation at emission point.

Fire and explosions

- Store flammable away from ignition sources and oxidizing materials.
- Fuel and flammable storage shall be at a remote spot.
- Storage unit with concrete floor and roofing at appropriate height (for ventilation and explosions venting).
- Keep adequate fire extinguishing equipment.
- Define and label warning sign for fire hazard area.
- Provide specific training for handling of flammable materials.

Corrosive, oxidizing and reactive chemicals

None of these are used at the factory.

Asbestos containing materials (ACM)

These materials are not used.

5) Biological hazards

The company does not use any biological agents (eg. bacteria, blue green algae, yeasts etc.) in the operation of the paper factory or the treatment of water.

As mentioned earlier workers will be educated and trained for health and hygiene and also environmental awareness to prevent the spread of air-borne, water-borne and vector borne disease. The company doctor and health staff will regularly liaise with the Township Health Department.

6) Radiological hazards

These are not anticipated; the company does not apply ultraviolet radiation for purification of water.

7) Personnel Protective Equipment's (PPEs)

The company shall provide adequate PPEs for all workers exposed to dust, emission, heat, high level noise, and those who have to handle chemicals and fuel and any one where and when PPEs are necessary.

Note: In case of occupational diseases or any diseases workers will be promptly admitted to the Thazi Township Hospital and, if necessary, to Yangon General Hospital.

In case of accident the injured workers will be given First Aid Treatment and subsequently admitted to Thazi Township Hospital and, if necessary, to Yangon General Hospital.

The factory doctor/nurse will treat only minor casual diseases and cases of minor accidents.

(e) Community Health and Safety (CHS) Plan (sources: IFC)

The company will implement the following: -

Evaluation of risk and impact

First of all evaluate potential risk and impact on the community and subsequent mitigation measures. Avoid/minimize the risk as far as possible.

Operate the project in accordance with Good International Industry Practice (GIIP).

Water quality and availability

Avoid/prevent adverse impact to the quality and availability of ground water and surface water resources, especially protect public drinking water sources at all times. Avoid the adverse impact on ground water (and soil) as far as possible.

Structural safety of project facility

Strictly follow the principle of good engineering practice and structural integrity during the designing and construction of the facility.

Avoid or reduce potential hazards posed to the public while accessing project facilities. Undertake hazard analysis to identify opportunities to reduce the consequence of a failure or accident.

Life and Fire Safety (L & F)

Design, construct and operate all now buildings accessible to the public in accordance with building, regulation and requirement and internationally accepted Life and Fire Safety (L & F) standards.

Provide fire prevention, means of egress (fire exit), detection and alarm system and emergency response plan. Train some staffs for firefighting and first aid training. Provide adequate firefighting equipment e.g. fire extinguisher.

Traffic safety

Also conduct road safety education campaign for the local community.

Transport of hazardous materials

Comply with law and regulation relevant to transportation of hazardous materials. Also plan for measures for preventing and/or mitigating the consequence of accidental release of hazardous materials (chemicals, substances).

Avoid/minimize potential for community exposure to hazardous materials.

Disease prevention

Prevent the occurrence and spread of communicable disease by all means. Undertake health awareness and education initiative (health education campaign) in local community and also provide health service for them as practical as possible.

Avoid/minimize water-borne, water-based, water-related and vector borne disease and communicable diseases that would result from project activities.

Avoid/minimize by all means spread of diseases from workers. Provide adequate medical treatment. Regularly liaise with Township Healthy Authority.

Emergency preparedness and response

Develop Emergency Preparedness and Response Plan and Contingency Plan (action plan) for effective implementation when necessary.

Provide operation manuals for External Emergency Plan and Internal Emergency Plan for all staffs, local community and government inspector. Conduct rehearsal or drills for such plans. Cooperate with local community and authority in preparation of emergency plan and review and update the plan occasionally.

Notify competent authority in the event of emergency those have occurred on the site, if any.

Implement safety audits for the facility and promote the execution of the overall environmental management system.

See also **ANNEX** for OHS and CHS by the company in Burmese Version.

8.5.2 Overall generalized EMP

In addition to implementing each and every sub-plan for management relating to each and every impact the company shall also implement the following overall generalized EMP.

- EMP for application of environmentally sound idea and technology
- EMP for procurement of ecologically friendly equipment and machinery
- EMP for air pollution (including noise, vibration) management
- EMP for water pollution management
- EMP for land pollution management
- EMP for protection of the socio-economic components and socio-economic life of the local community
- EMP for biodiversity protection and conservation
- EMP for good working practices and good safety practices
- EMP for conservation of water, fuel and electricity
- EMP for rehabilitation after completion of project
- EMP for maintenance of high Environmental Performance Standards (EPS)

These 11 points are simply enumerated in this report. (These are already mentioned in a direct or indirect ways in **Chapter-6** in the forms of mitigation/remediation measures).In addition to implementing each and every sub-plan for monitoring relating to each and every impact the company shall also implement the overall generalized monitoring plan which is already mentioned in **Chapter-6.**

8.6 Contents for each sub-plan (Management and Monitoring sub-plan, MMSP)

8.6.1 Objective

- To ensure that EMP is thoroughly planned and effectively implemented
- To ensure that all the negative impacts (both significant and insignificant) anticipated identified and accessed are thoroughly studied and heeded
- Most of all, to ensure that mitigation measures to be taken are duly implemented and
- To ensure that the EIA report is not a formality but a meaningful tool for operating the cement plant in an eco-friendly manner.

8.6.2 Legal requirement

The legal requirement for the implementation of this project and National Environmental Quality guideline values to be complied are already described earlier in **Chapter-3** also in part (environmental health) in the earlier part of this **Chapter-8**.

8.6.3 Overview maps, layout map, images etc.

These are already depicted in **Chapter-4** of this report.

8.6.4 Implementation plan

The management and monitoring sub-plan (MMSP) shall cover all the four phases of the project.

<u>During the Preconstruction (Planning) Phase</u>

First of all the authority of the company shall plan and manage for the application of environmentally sound idea and technology.

The authority of the company shall plan and manage for the procurement of eco-friendly machinery, equipment, vehicles and materials etc. (that generate less smoke, lower noise level, that consume less fuel oil, use fewer energy etc.).

The authority shall plan for prevention/mitigation of air, water and land pollution in implementing the project.

<u>During the Construction Phase</u>

The project proponent shall plan and manage for the construction of the cement plant in an eco-friendly manner. The use of eco-friendly building materials and the application of ecologically sound methodology in construction activities will be applied. All the impact/potential impacts anticipated for this construction will be taken into consideration and subsequent mitigation measures duly taken during the construction of the factory and also quarry site. The construction works will be undertaken with environmental awareness always in mind. The anticipated impacts during this phase will be always kept in mind and the mitigation measures to be taken will be duly taken.

<u>During the Operation Phase</u>

During this long Operation Phase the main task will be sustainable operation of cement factory, maintenance and repair works. These works will be undertaken with environmental awareness always in mind. The predicted or anticipated impacts during this long phase will be kept in mind and the subsequent mitigation measures to be taken will be duly put in place.

During the Decommissioning Phase/Rehabilitation Phase

After the end of the Operation Phase affective and meaningful decommissioning as well as mine closure tasks will be carried out. The project proponent will ensure that there is no residual impact left and there is no contaminated soil or substance left. After that effective revegetation of the site will be undertaken. In the aftermath of the project the site will be restored to its original condition.

8.6.5 Management Actions

EMP cell leader is responsible for all the management actions for implementation of EMP. The other 4 EMP cell members are also responsible for successful implementation of EMP.

In addition 25 workers specially trained for executing EMP are also involved in implementing EMP.

The main management actions cover –

- taking mitigation measures on a daily or weekly basis. (The EMP cell members will supervize and take part in taking mitigation measures. The 25 trained workers will take the mitigation action daily or weekly or monthly as required).
- taking monitoring action:
  (a) overall monitoring that covers almost all aspects of the project will be supervized or partially participated by EMP cells and 25 trained workers will conduct monitoring as required, daily, weekly and monthly.

  (b) as for special environmental quality (air, noise level, water, soil) monitoring/testing experienced technicians from various department will have to be hired. These will be conducted on a semi-annual basis and the environmental quality monitoring report will be submitted to Environmental Conservation Department (ECD) of MONREC a semi-annually.

Other management action to be taken by EMP cell members include: capacity building and training programme, emergency plan and training programme, regular reporting programme and procurement of equipment and materials for execution of EMP.

8.6.6 Monitoring plans

Comprehensive monitoring plans during the Construction, Operation and Decommissioning Phase are already shown in tabulated for in Chapter 6 (6.2.5).

The special monitoring plan for monitoring environmental qualities (air quality, noise level, water quality, soil quality) will be conducted every six months (semi-annually). These will have to be conducted with the aid of experienced technicians form various department. These technicians/experts will have to be hired.

Environmental quality monitoring/testing plan is shown in tabulated form below:

Semi-annual environmental qualities monitoring/testing (Operation Phase)

Sr.	Component	Parameter to be monitoring	Monitoring spots/ sites	Responsible person	Frequency	Cost estimate (once off cost)
1.	Air quality	PM_{10}, $MP_{2.5}$, SO_2, NO_2, CO, O_3, VOC, CO_2, NO, HC, CH_4	- Inside factory compound. (Coordinate 20°47'29.08"N, 96°23'52.39"E) - At the village (Coordinate 20°47'1.04"N, 96°24'0.09"E)	EMP cells members and hired technicians	semi-annually	Ks 3,000,000 (2 sites)
2.	Emission	Cadmium + Thallium, dioxins/furan; Dust; hydrogen chloride; hydrogen fluoride; mercury; nitrogen dioxide; PM10; sulphur oxide total metals (arsenic, lead, cobalt, chromium, copper, manganese, nickel, vanadium, antimony); total organic carbon	- At kiln stack: (Coordinate 20°47'34.02"N, 96°24'9.83"E) - At clinker cooling: (Coordinate 20°47'39.81"N, 96°24'12.86"E) - Cement grinding: (Coordinate 20°47'39.01"N, 96°24'10.15"E)	EMP cells members and hired technicians	semi-annually	Ks 4,500,000 (3 sites)
3.	Noise level	dBA	- At the cement mill, coal mill; kiln, raw mill (Coordinate 20°47'39.94"N, 96°24'10.06"E, 20°47'34.75"N, 96°24'10.86"E, 20°47'33.61"N, 96°24'9.91"E, 20°47'31.18"N, 96°24'9.59"E)	EMP cells members and hired technicians	semi-annually	Ks 350,000 (3 sites)

			- At the village (Coordinate 20°47'1.04"N, 96°24'0.09"E)			
4.	Water quality	pH; temperature; turbidity; suspended total solids; total hardness; nitrate; sulphate; phosphate; chloride; iron;	- At the surface water and waste water (Coordinate 20° 47' 29.08"N, 96° 23'52.39"E, 20° 47' 48.08"N; 96° 24' 01.65"E)	EMP cells members and hired technicians	semi-annually	Ks 80,000 (one sites)
5.	Waste water/ effludent	5 days, BOD, COD; arsenic; chlorine (total residual); copper; cyanide; fluoride; iron; lead; pH, sulphide; temperature increase, total suspended solids, zinc.	- At the village cultivated land (Coordinate 20°47'7.72"N, 96°23'59.13"E)	EMP cells members and hired technicians	semi-annually	Ks 80,000 (one sites)
6.	Soil	Moisture; pH; texture (sand%, silt%, clay%), total nitrogen; available nutrient (P, N); heavy metal	- At the village cultivated land (Coordinate 20°47'7.72"N, 96°23'59.13"E)	EMP cells members and hired technicians	semi-annually	Ks 40,000 (one sites)

With the aid of hired experts/technicians special environmental qualitites testing/monitoring will be conducted semi-annually and the findings/results will be submitted to ECD semi-annually.

8.6.7 Projected budgets and responsibilities

The overall budget for implementation of EMP has been already mentioned earlier (**Chapter-8.4**).

- One percent of the total project budget, that is, Ks 793,300,000 is set aside as EMP fund of which the breakdown for each EMP plan are as follow:

- 25% of this EMP fund, that is Ks 198,325,500, is allotted for the implementation and taking action for mitigation measures. Actually this is considered only for the Operation Phase as the Construction Phase is already completed. As mitigation measures here to be taken on a regular (almost a daily routine) basis throughout the Operation Phase most of the EMP fund is allotted for this programme.

- 20% of the EMP fund, that is Ks 158,660,000, is allotted for implementation of monitoring plan. It is expected that monitoring work needs less money than mitigation work. However, technicians have to be hired from time to time, e.g. every 6 months for testing and monitoring air, water and soil quality. Most of the allotted fund will be for hiring technicians which are expensive. It is roughly estimated that the specific fund for MP can cover at least 5 years. Depending on condition more money may have to be added to the EMP fund later.

- 25% of the EMP fund (Ks 198,325,500) is for procurement of equipment and materials required for execution of EMP. For example portable water testing kits, air quality testing kits, sound detector and chemicals. Their equipment are not very reliable and so technicians will have to be hired regularly for every six months for official monitoring of water, air quality and noise levels for regular semi-annually report.

- 10% of the EMP fund (Ks 79,330,000) will be set aside simply for use in emergency causes only. Unfortunately if major accidents happen more funds will have to be added to this emergency fund.

- 7% of the EMP fund (Ks 55,531,000) will be for execution of capacity building and training programme.

  Trainers from Fire-fighting Brigade and Red Cross Society will have to be hired for giving training.

  Educator and lectures from Environmental conservation Department, Occupational and Environmental Health Division and from Ministry of Labour's will be invited to give lectures. Honourarian fees and courtesy gifts will be provided.

- 5% of EMP fund (Ks 39,655,400) is be for operation of equipment by hired technicians.

- 5% of EMP fund (Ks 39,655,400) is for miscellanea on expenses – e.g. office equipment, papers, stationary and other minor expense.
- 3% of EMP fund (23,799,000) is set aside in the first place for organization works for instance – overhead changes; holding series of meeting; discussions and to be kept as seed funds for other casual expenses.

The EMP fund Ks 793,300,000 will not be adequate for the whole project life of 10 plus years. It is just the seed money for execution of EMP, estimated for 5 years. As time goes on more fund will be added as required.

As mentioned earlier price fluctuation and inflation are unavoidable. And this will be taken into consideration in the allotment of the fund.

There will be a separate fund for implementation of CSR programme for instance, from 5% of the net profit. Fund for decommissioning and rehabilitation will be from the main budget of the project.

All the EMP cell members are responsible for the execution of EMP and MP. 25 trained workers are also responsible for this task. Contractor will not be hired for doing EMP and MP. Of course there are no such contractors in Myanmar yet.

9. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

Public consultation is an integral part of EIA/IEE and EMP. Involving the public participation in the EIA/IEE/EMP work is fundamental to increasing the understanding and acceptance of the project.

Public consultation and participation should be started at early as possible in the preparation of EMP. And it has to be a continuous process, especially during the Operation Phase, carry out from time to time.

9.1 Purposes of the consultation during the preparation of the EIA/IEE/EMP report

- To enlighten the locals/stakeholders about the project
- To increase the understanding and acceptance of the project
- To give the locals/stakeholders the opportunity to present their views, opinions, perception of the project, express their concerns, complaints, grievances etc
- To identify impacts and issues those are not immediately obvious to project proponent and the EIA/EMP team
- To access social assistant and community development needs for the locals/stakeholders
- To gain community consent and to interact with the people to further strengthen existing cordial relationship
- To tap local knowledge and to negotiate for mutually beneficial future that is sustainable and locally relevant

Requirements for public consultations:

- Public consultation should be conducted in the early phase of project
- Must ensure the direct involvement of the locals/stakeholders
- Must ensure that all locals/stakeholders who are interested will have the chance to fully participate, especially the vulnerable and marginalized group,
- It should be a continuous process --- throughout the entire phase of the project, especially during the long Operation Phase, and
- There must be an action plan or response programme such as complaints and grievances mechanism (CGM) to tackle any issue

9.2 Methodology and approach

Standard methodology applied here includes:

(i) **Consensus building:** First of all a pre-sensitizing visits to the local authority (Village Administrator and party, elders) and briefing on the proposed project was carried out, and ask for their approval and assistant for holding the public consultation.

(ii) **Transect walk:** site visit (visit to the village) and conduct visual inspection.

(iii) **Actual public consultation meeting:** mainly involves disclosure of the proposed project and giving complete and accurate information; consultation mainly in the form of two-way conversation --- listening and talking; waiting for their response; further discussion.

(iv) **Interviews and discussions:**

- In the form of KII/SS, (Key Informant Interview/Secondary Source) for the gathering of secondary baseline socio-economical data and community profile with the aid of questionnaires.
- In the form of FGD (Focal Group Discussion); interview with few selected people (authority, knowledgeable persons) especially for ranking the pressing need of the locals for prioritizing the needs for community assistance and implementation of CSR.
- In the form of Household Interview (HHI) that involves 10% of the total household covering different main occupation/livelihood.

9.3 Summary of consultation activities (At South Pyi Nyaung Village, 2015, 2017)

(a) Previous meetings (before EIA and EMP surveys)

Previous meetings had been held and negotiation been carried out between the authority of the company and the village administrator, members and villagers, it was learnt. These were undertaken after permit for mining/quarrying limestone (and clay) was obtained from the Ministry of Mining and permit for mining/quarrying in the reserved forest was obtained from the Ministry of Environmental Conservation and Forestry.

Twenty three villagers then claimed that their lands about two acres each would be grabbed and asked for compensation. (There were no official papers or documents to verify their claims. There were also no fruit trees or cultivated plant, just forest. But the officials of the company recognized the customary law, practiced or applied in some remote areas of Myanmar. Another traditional law or custom was known as "dhar-mart-oo-chart" anyone who first cleared the land own it.) The authority of the company with a view to building trust and good relation did not argue but agreed to compensate for their claim of loss or damage.

Under the arrangement of the village administrators, members and elders those 23 villagers were compensated each at the rate of Ks 60,000/acre; a reasonable rate according to village elders. In addition some were given one acre each of available plot of land (fallow land) while some were given Ks 1,000,000 each instead of one acre plot of land.

That was the overall situation before EIA was conducted.

The following is the public consultation meeting held between the locals and the responsible officers of Blue Diamond Cement factory, that is, before the name of the company is changed to Highland Cement International Co., Ltd.

(b) Public consultation during EIA survey

Date : 11-7-2015

Venue : Village Administrator office, South Pyi Nyaunt Village

Attendance : 27 persons

Every household was invited; attendance rate was 25%. No community group exists in this village and vicinity.

Summary of main comments received from the stake holders/locals

There was no complaint or grievance concerning land grabbing, which was expected before the meeting. There was also no evidence of land grabbing, forced eviction and forced relocation. It seemed that the locals were quite satisfied with the compensation scheme for land acquisition.

The followings were 1 complaint, 2 concerns, 6 needs and 2 opinions expressed by the local participants during the public consultation meeting.

1) Complaint : that Myit Thar stream was already greatly polluted
2) Concern : for availability of fuel wood in the future
3) Concern : for smoke and dust entering the village
4) Need : for electrification of the village
5) Need : clinic/dispensary
6) Need : village library
7) Need : for more community assistance
8) Need : more villagers to be employed at the factory
9) Need : for upgrading primary school to post-primary school and thence Middle school

How comments were taken into account

All the comments (complaint, concern, need, opinion) were noted and documented and later kept in the file of consultant firm (MESC) office. Main points were included in EIA report.

The comments were reported back to cement factory authority for taking necessary action.

The responsible persons of the factory and EIA team members on their parts have also promptly tried to answer all the comments on the spot as far as possible.

Complaint: pollution of Myit Thar stream

The responsible person' of the factory said that since Highland Cement International Co., Ltd factory was not in operation yet it was quite clear that the pollution source was not from the factory. He also said that he was quite sure that Max Myanmar cement factory did not dump any waste into the stream.

The EIA team leader said that he had participated in EIA conducted last year on Max Myanmar cement factory. Pollution, as every villager already had known, was from illegal gold mining/panning taking places up stream. Last year he had tried to go up stream to see what was going on but was told not to risk his life. (Many illegal miners were Chinese and some were rumored to clandestinely carry small arms.)

The water was extremely turbid and reddish in colour; evident of application of powerful water jet pumps that severely eroded the bank and subsequent turbidity of water.

Concerns: for future availability of fuel wood

The concern was reasonable given the fact that the combined mining/quarry area of the two factories (Max Myanmar and Highland Cement International Co., Ltd) was 1873 acres; the two areas were contiguous. When the total area including factory compounds, residential areas and areas for storage of limestone etc. of both companies were taken into account the combined area was 2750.91 acres.

Although there were forests (secondary, partially degrade) elsewhere in this area villagers would have to go for longer distance for the collection of fuel wood in the future.

The EIA team simply answered that this would be reported back to the factory authority.

(EIA team had witnessed not only the cutting of trees for fuel wood but the illegal logging taking places in designated mining acres in other parts of Myanmar. Often the mining companies allowed the locals to cut trees for fuel wood in their areas (mostly reserved forests) out of humanitarian reason. Whether illegal loggings were done with or without their knowledge was unknown. Certain mining areas were up to 5,000 acres and so it was really hard to protect or to monitor.)

Probably the local who expressed his concern might be also involved in illegal logging. As already mentioned there were still moderate size trees having medium quality woods such as "inn" and "Ka-nyin" scattered in the areas. All large and graceful trees that still remained were, however, trees having bad quality wood or malodorous wood such as "nyaung" and "thit-poke".

As for villagers who collect edible wild vegetables, fruits, bamboo shoots and mushrooms they should be allowed to do so in the mining/quarry areas out of humanitarian reasons and out of kindness.

Concern: for smoke and dust entering the village

In answering to this comment the EIA team leader said that this would be reported back to factory authority, and that it would be included in the EIA report.

He then went on to explain to them the state-of-the-art technology nowadays applied in the production of cement. Highland Cement International Co., Ltd factory would applied such technology such as electrostatic precipitators, filter houses, dust collectors from clinker cooler, cement mill, coal mill etc. The technology applied after the year two thousand was very different from that was applied in the nine-teen seventies or nine-teen eighties.

He had had EIA experience with two modern cement factories earlier and had noticed that there were no longer billows of dark smokes coming out of the stack. The smokes were rather light brownish or even whitish in colour more like water vapour than smoke. And that during this EIA work which would last for 10-11 days he would monitor the stack of the existing Max Myanmar cement plant at a distance from time to time.

(During the three visual inspections conducted in the village there were no evident of smoke entering or dust falling into the village. The existing Max Myanmar cement plant was at an elevation much higher than the level of the village; the stack was of standard height and the chance of smoke going down ward was very remote. Viewed from Max Myanmar Plant or the proposed Highland Cement International Co., Ltd plant site the sprawling village with widely scattered houses was hidden from view by a variety of large trees, fruit trees, wild trees or bamboo thickets with good potential to sequestrate Green House Gas (GHG). The comment made by one local that it was sometimes hard to breathe was far-fetched or overblown.)

Need: for electricity

The need was very reasonable. Now that the two electricity grid lines (Max Myanmar and Highland Cement International Co., Ltd) has already reached South Pyi Nyaung village, it should be electrified and the people must have access to electricity.

But the electrification issue was tricky due to the topography and lay out plan of the village. The village was on a rugged terrain and the houses were not built systematically in rows by rows. The houses were widely scattered and far between and randomly distributed.

It was learnt that the existing cement plant, Max Myanmar authority had already agreed to shared their power line, that was, to source the electricity for the village from their power line (whether this additional work load would be within the work frame was calculated or not was unknown). But the company could not provide the cable lines and electrical devices, lamps bulbs etc. to all houses widely scattered. Of the 122 households only about 10 were near the power line; some houses were about one mile away. The village administrator and elders on their parts were not yet able to persuade the villagers to contribute money and set up a fund for electrification of the village. It was estimated then, in 2014 that it would cost from Ks 200,000 to Ks 600,000 per household depending on the distance from the power line.

Knowing the background history very well the EIA team leader simply replied that he would report this matter to Highland Cement International Co., Ltd Factory authority and would include this in the report. He however urged the administrator and village elders to make effort for self-reliance for village electrification at least for some houses not far from the power line.

(Actually the village administrator and elders were partly to blame for lack of self-reliance and lack of initiative. The Highland Cement International Co., Ltd Company already had donated Ks 70,000,000 at three occasions (6-2-2015, 17-3-2015 and 7-4-2015) for electrification of the village. This was known only later after public meeting. The donation was actually made to the Village Administer of North Pyi Nyaung Village Tract (also known as Karr–pyi-nyaung village) which is the chief village of the village tract. South Pyi Nyaung Village (also known as ya-htarr pyi-nyaung village) is under the jurisdiction of North Pyi Nyaung Village. It seemed there was also lack of cooperation and coordination between administration members of the two villages).

The authority of Highland Cement International Co., Ltd Company should take this matter into consideration. In consultation and collaboration with Max Myanmar Company, Highland Cement International Co., Ltd Company should consider for sharing of the cost for village electrification to a certain extent, while the village should also share portion of the expenditure, now that Ks 70 millions had already been obtained.

Needs: village dispensary

This was, of course, necessary for a relatively big village with 122 households. Actually the Ministry of Health was responsible for the establishment of a village dispensary and the provision of nurses, mid wives and health workers together with medical supply. And only the authority from the Ministry of Health could decide whether a dispensary was necessary or not for a village with 122 household.

Highland Cement International Co., Ltd Company on its part also should consider for collaboration cost sharing with Max Myanmar Company for the setting up of a village dispensary. The Corporate Social Responsibility (CSR) practiced in many countries nowadays usually included the provision of school and dispensary as the main CSR activities. As mentioned above consultation with the authority of the Ministry of Health should be undertaken first for the implementation of CSR action for health.

The EIA team leader on his part told the participant that the matter would be reported back and also included in the EIA report.

Needs: village library

This might not be very difficult and quite affordable if the two above-mentioned companies work in collaboration for the materialization of a small village library.

The villagers on their part should take the responsibility for the long term maintenance of the library. In many villages many libraries built and set up by big companies were no longer in operation. In many poor villages the people have no time to go to library as they have to struggle daily for existence and it would be really hard to maintain a library in such a poor village.

The EIA team leader on his part told the participants that this matter would be reported back and included in EIA report. (Actually the company had already donated Ks 300,000 for primary school library, not village library.)

Need: for more community assistance

As regards to this comment the EIA team leader said he would report this matter back and included it in the EIA report. He also assured them he would urge the company to provide more assistance. The company had pledged to carry out CSR but at the moment the business was not in operation yet.

(The villager who commented that the assistance provided by the company, so far, was small must be speaking out of ignorance or simply out of greed. In reality the donation and community, assistance provided by Highland Cement International Co., Ltd Company was not small indeed.) The community assistance so far included:-

I. For South Pyi Nyaung village

(i) Ks 70,000,000 for electrification

(ii) Ks 300,000 for primary school

(iii) Ks 500,000 to social welfare

(iv) Ks 140,700 for gilding pagoda

(v) Ks 550,000 for Ka-ti-na (Kahtein) festival

II. For North Pyi Nyaungvillage

- Ks 200,000 for Ka-ti-na

III. Yay Paung Sone village

- Ks 450,000

IV. Tharzi Town Social Welfare Association

- welfare association Ks 3,417,500
- Tharzi State High School Ks 450,000

V. Yin Mar Pin Hospital

- Ks 350,000

Total Ks 76,358,200 (For South Pyi Nyaung Ks 71,490,700) up to June 2015)

The EIA team leader went or explaining them that in this of era of environmental awareness a big company had the ethic duty to implement CSR and other community development, EMP and sometime also Payment for Ecosystem Services (PES) mostly in the form of rehabilitation. Usually almost up to 5% of the budget had to be used for the implementation of CSR, community development, community assistance, EMP and PES. Therefore, there should be mutual understanding between the local community and the company. The CSR, community development and community assistance should be affordable for the company to be economically feasible and viable. The local community should not ask too much.

On the other hand the CSR implemented by the company must not be a mere formality for name sake only. The CSR must be meaningful and effective and to achieve this, the philanthropic mindset of the company's authority was also necessary.

Need: for more villages to be employed at the factory

As for this comment the EIA team leader said that he would report this matter back and also would urge the authority to give priority to the villagers of South Pyi Nyaung when employing workers in the Operation Phase.

He also said that most EIA reports from various countries had highlighted this matter of prioritizing the locals for employment. (However a few villagers had said that they earned more money working odd jobs and would continue doing odd job rather than working in the proposed factory. They were probably referring to the temporary work (2 years) during the Construction Phase, not the permanent jobs during the long Operation Phase.)

A look at the list of workers employed showed that 79 workers from the local area including Tharzi Town and nearby towns were recruited and employed. The breakdown was as follow:

15 from neighbouring village Hlaing Tet

8 from Pyi Nyaung

12 from Meik-hti-la

11 from Tharzi

5 from Aung Pann

4 from Yinn-mar-pin

3 each from Ya-mei-thinn and Kyauk Pataung and the rest within Mandalay Region. As the total workers to be employed are 289 (including 10 foreign workers) during the Operation Phase the EIA team suggested for employing more villagers from Pyi Nyaung during that phase.

Need: for upgrading primary school to post-primary and thence middle school

The EIA team explained that, would be beyond the scope and capacity of the company. The authority of the Ministry of Education would decide that depending on the number of students and most of all on the education budget.

The following is the latest public consultation meeting between the locals and responsible officers from the two companies and also participated by the EMP team members.

(c) Public consultation during EMP survey (2017)

The EMP surveys by MESC for both Max Myanmar Cement Plant and Highland Cement International Cement Plant were conducted during the same period during the last week of February, 2017.

Therefore a public consultation meeting between the villagers of Taung Pyi Nyaung (Ya-htarr Pyi Nyaung) and the responsible officers of the two above-mentioned cement plants and members of EMP was held at the resident of a villager elder, U Aung Than.

Public consultation at Taung Pyi Nyaung village (During this latest public consultation meeting)

Date	: 20 February 2017
Time	: 10:30 hus
Venue	: at the resident of U Aung Than, the villager elder
Attendance	: 61 persons

Figure – 116: Public consultation

Figure – 117: KII interview

Figure – 118: FGD meeting

9.4 Summary of the last consultation meeting, Feb. 2017

9.4.1 Summary of main comments received from the stakeholders/locals

The following are complaint, and needs expressed by the villagers during the consultation meeting:

Complaints - Small crack, are happening in the school buildings due to blasting at quarry.

- There is dust on the clothing's when they are dried in the sun and vegetables have to be washed 5 times to get rid of dust.
- The pollution of water of the stream near the village; the occurrence of mosquitoes due to water pollution.

Needs - To employ more village youths at the two factories.

- To repair the damaged access road which is mainly due to illegal logging trucks using the road.
- to sink tube well for the provision of potable water for the villagers.

9.5 How comments are taken into account

All the comments (complaints and needs) are noted and documented and kept in the file of consultant firm (MESC). All these are recorded and incorporated into the EMP report.

Complaints (1): Cracks in school buildings due to blasting activities.

The responsible officer of the company replied that the he will look into this matter and do the repairing of the building promptly. (**Note:** This issue has been tackled; the crack, have been fixed.)

Complaints (2): generation of dust from the factory.

The responsible officer said that he will do his best to mitigate dust. (The factory has its dust mitigation programme. eg- The application of electro-static precipitator, the installation of series of filter bag houses, and the use of scrubber.)

(**Note:** The company has applied 44 bag filters and on ESP and the condition has improved. The dust that impacts the village is mostly from dust generated from heavy truck movement along the old dusty road built by YCDC, the original owner of Max Myanmar Cement Plant.). That road was used mainly by illegal logging trucks and also by illegal gold miners.

Highland (Blue Diamond) company has built its own access roads. Moreover all vehicles of Highland Cement company go to north (Meithtila-Kalaw Highway) and do not pass near the village which is in the South East.

Complaints (3): pollution of stream water.

The manager replied that, the pollution has nothing to do with the factory which is in downstream relative to the village. And that the pollution is only due to illegal gold mining/panning taking place up stream. The area is a malaria infested area and it is not a surprise that there are mosquitoes which are ubiquitous in virtually all parts of the country.

Needs (1): more employment for village youths.

The manager replied that he will give first priority to the village youths when there are vacancies. (Many youths are already employed; skill is also necessary to work in a cement factory.)

(**Note:** Of the existing 289 national employees at the cement plant 79 are from the local area, namely Pyi Nyaung, Hlaing Tet and Yin Mar Pin; and also from Meik-hti-la, Tharzi and Aung Pan.)

Needs (2): to repair the damage road.

The officer of the company replied he will report this back to his boss. At the moment at the factory is shut down for upgradation and not in operation yet we will have to wait for sometimes. (The company has already done the repair of the road once.)

(**Note:** This refer to the old access road built by YCDC about one decade ago; the villagers are using this old access road which in closer to the village. Actually the old road was damaged due to heavy trucks used by illegal loggers, mostly from Tharzi Town. The villagers actually use only motorcycles.)

Needs (3): to sink tube well (artesian well) for the provision of potable ground water.

The officer replied that he will report this to his boss and carry on the work for community assistance. The company does not sourced ground water as it is not feasible.

CSR programme

Highland Cement International Co., Ltd will set aside 5% of its profit for implementation of CSR program, So far, has spent Ks 101,573,301 for the implementation of CSR. Some of the community assistances, donations and charities among other are:- Ks 77,491,000 for South Pyi Nyaung village; Ks 200,000 for North Pyi Nyaung village; Ks 450,000 for Yay Paung Sone village; Ks 3,867,500 for Tharzi Town welfare

Association and State High School and Ks 350,000 for Yin Mar Pin hospital. Some were implemented before actual commencement of the project, in other word, before any profit from the cement factory was realized. These were done simply out of philanthropist mentality.

During both trip (2015, 2017) Key Informant Interview (KII), Focal Group Discussion (FGD) and Household Interview (HHI) were conducted. FGD was conducted a few selected knowledgeable villagers while HHI was conducted on 10% of the total households representing main different occupations/livelihoods of the villagers.

9.6 Summary of consultation and activities undertaken

Recent public consultation meeting held at five villages.

(1) At South Pyi Nyaung Village

Date : 7-8-2018

Time : 10:00 – 11:30 hrs

Venue : At the village school

Attendance : 30 persons

The company has already held many meetings with the villagers and these are already mentioned in previous EIA report. This is the latest meeting with locals of this village.

Figure – 119: Public consultation meeting

U Aung Zaw Myint, the responsible officer of the company: Explained to the villagers about the meeting and invited them to speak up frankly and express their opinion and what the company can do for the village.

U Myint Kyaw Thura, Team Leader (MESC): Explained to them about the purpose of the meeting and invited them to express their opinion and views frankly; and that all will be recorded and documented in the EIA report.

U Khin Maung Thaung, the village administrator: As for me I see only negligible impact of this factory on our village. Sometimes odour of coal can be felt at near the school and sometimes there are dust falling from the sky. What I want to ask for further help is to pave the road (450' x 12') to the school. The road is slippery when it rains.

U Aung Zaw Myint: The factory can provide cement bags for the village. As for paving road even our factory have to hire contractor for doing this. So if we have to provide cement this will materialize sooner but if you need man power it will take a longer time. As for control of odour we have a plan for planting fast growing trees around the school to mitigate the odour.

U Khin Maung Thaung: Another assistance I want to ask (I have asked for this once earlier) is to build a retaining wall at the back of the school.

U Aung Zaw Myint: We have certain difficulties regards heavy machinery. As we have many departments it is quite difficult to ask for the use of heavy machinery even among or between our separate department; not to mention asking the use of machinery for the village. (there is inadequate heavy machinery). But I will go see the spot you mentioned for building retaining wall and then discuss what we can do later.

U Aung Than, a village elder: I would like to ask for the construction of power transmission line for village electrification. The Ministry of Energy has already donated a transformer for our village (33KV, 400 voltages). We will source electricity from the Township Development Committee Grid Line (National Grid Line).

U Aung Zaw Myint: Our Company has a plan for giving more than 660 Lakhs Kyats (more than Ks 66,000,000) for village electrification. This has to be reported to the authority of the company for confirmation. Therefore there can be certain delay.

U Aung Than: Yes. I am glad that the company will provide assistance for our village.

U Myint Kyaw Thura: Any further comment to give? It there is no more I declare the meeting over. Thank you all.

(2) At North Pyi Nyaung village and Lei Sa Pin village

Date	: 7-8-2018
Time	: 15:30 – 17:30 hrs
Venue	: At North Pyi Nyaung Administrator Office
Attendance	: 18 persons, including U Hsann Win and U Htun Aung, village administrator of North Pyi Nyaung and Lei Sa Pin village, respectively.

Figure – 120: Public consultation meeting

U Aung Zaw Myint, the responsible officer of the company: The meeting today is about the consultation with the local community about the operation of the cement factory. I invite all of you to express your opinion and view frankly and the company on its part will do what it can for the benefit of the local community.

U Myint Kyaw Thura, team leader of MESC: Explained to them the purpose of EIA to be implemented by MESC. That this is the first time MESC to hold consultation meeting with the locals of North Pyi Nyaung village. As regards EIA our firm has conducted some consultation meetings with the other nearby villages. I therefore invite you to speak up frankly and express your opinion. We will have to document this and put it in the coming EIA report we are going to prepare.

U Htun Win Aung, village administrator, Lei Sa Pin village: I would like to ask for the electrification of our small village which is only about 1 mile away from the large North Pyi Nyaung village. If the company needs any help we will on our part try our best to lend hand.

U Aung Zaw Myint: So far our company has carried out the CSR programme and community development for South Pyi Nyaung village. We have yet to implement CSR programme for

North Pyi Nyaung. As the company is a joint venture company with a foreigner company when it comes to financial matter we have to summit it to the authority of the company. We can undertake CSR action only with the decision of the authority. Is it possible if the village is provided with solar panels for lighting?

U Htun Win Aung: That would be OK. I have asked for help from the Tharzi Township authority for this but as the township budget has not yet settled it cannot materialize yet.

U Thaung Tin, a village elder: For our village electrification Blue Diamond (High Land Cement) company and Shwe Taung Company have donated Ks 700 lakhs and Ks 500 lakhs, respectively. But as our village is a mountain village with houses widely scattered and far between it is not to easy to provide electricity to each and every household as the cost will be Ks 300,000 per household. Therefore, I would like to ask for more help if it is possible. Another thing I want to ask for help is for paving the bend of the access road branching off from the main road (the road use by the company and by lime powder producers). There is the issue of traffic risk.

U Aung Zaw Myint: We have plan for paving the road. As the motorcycles, cars and trucks involved in lime manufacturing use this road it would be good if the road is widen for 30 feet.

U Hsann Win, village administrator, North Pyi Nyaung: The establishment of the companies is good for the local area. But there is still a weakness in implementation for the development of the local area and community.

U Kyaw Soe, a village elder: I want to ask for upgrading the schools of the village. As the population grows and the grave yard area become limited I would like to ask the company for providing a crematory for our village. I would also like to ask for paving the road.

U Aung Zaw Myint: We will provide the crematory as this matter was discussed some time ago. As for paving the road we have first to pave inside the factory premise and outside. Other will be carried out later.

U Maung Cho, a village elder: When the factories emerged in 2006/2007 there were a few issues regarding land. Later most of the land issues were solved but there remain one or two issues. What I want to know is when the factories are shut down 50 years later what will happen. Will the area become a desert? I also want to know how many villagers are working in the factory. Did the factory provide jobs for the locals? Shwe Taung company which is in operation first have carried out CSR programme in the form of building of a village water purification plant, a village library, donation of Ks 500 lakhs for village electrification and construction of road. Blue Diamond Company has also carried out various donations, charities and community development actions. I hope for more help for the future when help is needed. Also help us regarding the air pollution issue for building good relation with the local community.

U Aung Zaw Myint: as regard a few remaining land issues we are in the process of tackling them. We have also provided jobs for the locals according to their qualifications. The locals who work in our factory should also be good workers following the rules and regulations of the factory. (There are certain issues regarding compliance with rules and regulations)

U Hsann Win, village administrator, North Pyi Nyaung: As our villagers are rural Yokels (working in Taung Yar farms) and who are care free there is a weakness when it comes to compliance with rules and regulation. But when compared with the situation 10 years ago there is quite a great improvement. Our student population is growing and the numbers of graduates has increased. As the local businesses structure support only 50% of them there will be an increase in workers at the factories. The village used to ask for help from the company. I would like to ask for assistance regarding village education.

U Aung Zaw Myint: It will take time for financial assistance but when it comes to rendering help for village with heavy machinery I can do that.

U Hsann Win: I would like to ask for flooring the room of kindergarten class and help from heay machinery for leveling the football/field/playing ground.

U Myint Kyaw Thura: I want to answer the question asked by U Maung Cho regarding what will happen in the next 50 years. When we are preparing EIA report we do not focus only on the existing situation. The EIA report covers the whole life of the project about 30 to 50 years. The area impacted by the operation of the project will have to be restored. There are plans for compensatory planting of trees and some are already in the process of implementation.

U Htun Win Aung, village administrator of Lei Sa Pin village: During the raining season it is not convenient for us to use water from the stream. As the roads are enlarged/widened it is no longer convenient for using stream water. We have to source spring water from the mountain. The spring water can be flowed to the village by pipes, but we encounter difficulty due to inadequate PVC pipes.

U Aung Zaw Myint: I will come and see and provide necessary help.

U Kyaw Soe, a village elder: When the car owned by our vilage's "Phyu Sin Youth Welfare Association" passes by your factory please let the car pass through the factory premise. (When the car is going to South Pyi Nyaung village it has to use the bumpy road that by-pass the factory compound.)

U Aung Zaw Myint: This will not be possible. As there are many heavy machinery and heavy trucks inside the compound there is the likelihood of traffic problem; and another issue is security. But we will repair the by-pass road that leads to South Pyi Nyaung.

U Myint Kyaw Thura (MESC): After this consultation meeting I think everything will be OK. If there is no more comment to give I declare the meeting close. Thank you all.

(3) At Oak-kyin Village and Mong-pin Village

Date : 8-8-2018

Time : 10:15 – 12:10 hrs

Venue : At the resident of the village Administrator of Oak-kyin village

Attendance : 62 persons, including U Win Tint and U Myint Lwin, administrator of Oak-kyin village and Mong-pin village, respectively.

Figure – 121: Public consultation meeting

U Aung Zaw Myint; the responsible officer of the company: The purpose of this consultation meeting is to hear from you about your opinion on the factory and to assist you in community development.

U Myint Kyaw Thura; team leader of EIA, (MESC): Explained to the locals briefly about the third party and then said that he and his team have been involved in consultation meeting previously with the locals of these two villages. He invited them to give comments and ask questions.

U Win Tin, village administrator, Oak-kyin: Because our village is quite far from the factory I have not much to say. Only 50% of the villages can use electricity. Our villagers have procured a transformer on a self-reliance basis and we are now Ks 230-240 lakhs in debt. Therefore I hope for the assistance from your company for village electrification. Another thing I want to ask for help our villagers employment at your factory. I want you to employ more people of our village.

U Aung Zaw Myint: Regarding electricity I have to report this matter to the authority and wait for their decision. This can take time for a certain period. As for employment at the factory we advertise full time for blue collar jobs and also other jobs according to qualifications.

U Win Tint, village administrator of Oak-kyin: This is our first meeting with officer of Blue Diamond (Highland Cement) Company. As we have good relation with Apache (another cement plant) it has provide assistance as far as possible. We have nothing against your company but we would like to ask only electricity for our village.

U Hpone Lwin, a village elder: I would ask for a village library, and it is not convenient to use the stream water I would also ask for a village tube well/artesian well.

U Aung Zaw Myint: Yes. We will render assistance as far as possible.

U Myint Lwin, administrator of Mong-pin village: As for Mong-pin village I do not have much to say as the factory is quite far away.

U Win Myint, a villager elder from Mong-pin: We have an understanding regarding the factory. The company is doing its work and we are doing ours. There is little negative impact.

U Myint Lwin: I want to ask for one assistance and that is electricity for the village. The government has provided us with transformer, cable lines and poles for power transmission. For electrification of the whole village we do not have enough money to do this. The cost is estimated at Ks 270 lakhs.

U Aung Zaw Myint: For village electrification I will report to the authority. It will take some time. We will implement community assistance and development programme (CSR programme) for villages within the two miles radius of our factory.

U Myint Kyaw Thura: Any more comment to give? Anything to say something against the project?

The villagers: No., nothing. Thank you for coming to our village and hold consultation meeting.

9.7 Results of public consultations

The following complaints and needs are expressed.

(1) Complaints

About dust generated from the factory. (South Pyi Nyaung village) Sometimes dust that cannot be seen easily fall onto the village, but not a severe issue. Sometimes odour of coal can be felt near the school.

(2) Needs

Needs were expressed by villagers from all five villages.

(a) Village electrification

Except North Pyi Nyaung Village which is 100% electrified and almost 50% of the household use electricity for cooking all the remaining 4 villages ask for village electrification. The cost is huge.

(b) Paving road

South Pyi Nyaung and North Pyi Nyaung ask for paving the village roads.

(c) School renovation and leveling playground

By north Pyi Nyaung (floor for kindergarten class room and for leveling football field/playing ground)

(d) For a village crematory

By North Pyi Nyaung (due to population growth and limited grave yard area)

(e) For a village library and a village tube well

By Oak-kyin village

(f) PVC pipes for sourcing water from a spring

By Lei Sa Pin village

At all public consultation meetings the villagers ask for assistance and donation. The company on its part has implemented CSR programme and has carried out community development and assistance for possible. CSR programme have been implemented even before any profit is realized. (The company has pledged to set aside 5% of tis annual profit for implementation of CSR).

The company has already spent so far Ks 164,730,100 for CSR programme, community assistance and development, donation and charity. See also ANNEX.

The company knows very well that the principle of implementing CSR programme should be an effective and meaningful CSR, not a mere formality and so has done its utmost for execution of meaningful CSR programme. On the other hand CSR should be an affordable CSR. The villagers should be considerate and should not ask too much. The company, has its limits.

Anyway the company will do its best, as practical as possible, to continue the CSR programme for the benefit of the local community.

9.8 Further ongoing consultation

As mentioned earlier public consultation must be a continuous process throughout the project period, from the Pre-construction Phase, through the Construction Phase and Operation Phase to the Decommissioning Phase. As regards the long Operation Phase (30 years) there shall be regular public consultations annually or bi-annually depending on the situation, or from time to time whenever there is a need for public consultation. This is very important for maintaining the long term cordial relationship with the locals and hence the long term benefit for quarry business.

The Grievance Redness Mechanism (GRM) or Complaints and Grievances Mechanism (CGM) programme for the local community will be implemented throughout the entire Operation Phase period. It shall be practical and applicable and effective. The public relation officer and EMP cell leader shall always give special attention to CGM.

The complaints handling and response shall be effective. A hotline for complaint will be set up. A log book will be kept; the date and time of complaints, detail of complaint, action taken and if no action is required the reason why will be all recorded and documented. There can be also follow up contact with complainant. Every issue will be tackled at the community level with good intention.

As regard workers grievance the company has no special plan for CGM for workers; only a log book will be kept. Workers can meet with their supervisions or meet with any factory officer or directly with factory manager and make complaints. Employer and employees will have direct contact, anytime, anywhere, if necessary. All workers (employee) are regarded as family members and work together as family member. The company also encourages its workers (employees) to express their opinions or view in a candid manner for the long term good relationship between in the employer and employees.

Future public consultation shall involve the continuation of CSR programme (affordable programme) and donation and charity works as far as possible.

9.9 Information disclosure

Part of the EIA report, for example, executive summary will be launched at the website www.bluediamondcement.com when this EIA report is approved by authority.

10. CONCLUSION AND RECOMMENDATION

This EIA study has been carried out and the original report has been prepared and submitted in accordance with the rules, regulations, guidelines and most of all, the format prescribed by Environmental Conservation Department (ECD) of Ministry of Natural Resources and Environmental Conservation (MONREC).

The potential impacts (both negative and positive) have been identified and assessed and the consultant firm, MESC, has put in place adequate measures, to eradicate or minimize or mitigate the potential negative impacts. The EMP and MP prescribed will also contribute to the long run effective and successful implementation and operation of the project, the cement business.

The project is considered viable because it is very clear that the benefits will outweigh the manageable negative impacts in many aspects. As already mentioned the cement factory had created temporary jobs, together with improved skills, for over 200 workers during the Construction Phase. It will also create 289 permanent jobs during the long Operation Phase. The project will foster the local economy and will eventually contribute to the development of the construction sector of the country, infrastructure of the country, and hence national development.

The company shall effectively implement all the mitigation/corrective measures prescribed in this EIA report; and also implement all the EMP and MP described in the report.

The company shall:

- comply with all the rules, regulations and statutory requirements
- study and heed to all the impacts/potential impacts addressed in the report and duly carry out all the mitigation/corrective measures prescribed in the report
- implement the EMP, especially all the management and monitoring sub-plans prescribed in the report
- duly undertake the rehabilitation task after the completion of the project

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ANNEX

ANNEX

Certificate of Exporter Importer Registeration	287
CSR ရံပုံငွေထားရှိမည်ဖြစ်ကြောင်း ဝန်ခံဂတိပြုခြင်း	288
ဝန်ထမ်းများသက်သာချောင်ချိရေးနှင့်သာယာပျော်ရွှင်ရေးအစီအမံများ	289
မီးဘေးကာကွယ်ရေးအစီအမံများ	290
လျှပ်စစ်ဓါတ်အားသုံးစွဲခြင်းဝန်ခံဂတိပြုခြင်း	291
ပတ်ဝန်းကျင်ညစ်ညမ်းမှုမရှိစေရန်ဆောင်ရွက်ထားရှိမှု	292
မူးယစ်ဆေးဝါးနှင်.စိတ်ကိုပြောင်းလဲစတတ်သောဆေးဝါးများ	293
Building & Structures List and Size	295
CSR	297
Water Quality Test Results	302
Attendee of Consultation Meeting	309
Declaration by Blue Diamond Cement Co., Ltd.	320
Declaration by MESC	321
Health, Safety and Environment Team	322
Aim of HSE	323
HSE plan	324
Signing Ceremony of HSE Policy and Internal Safety Regulation	326
Signing Ceremony for Safety (Accident Free 300 Days)	327
Health, Safety and Environment Team	328
Monthly HSE Meeting	329
Waste Disposal Plan	330
Ambient Air Quality Measurement	334
Ambient Air Quality	335

Stack Gas Analysis	336
Water Analysis	337
Noise and Light Measurement	340
Water Flow rate of Myitthar Stream &The Daily Water Consumption of Blue	343
Monthly Checking of Clinic and Canteen	344
Idntify unsafe places	345
Safety Patrol,Safety Training, Tool Box Meeting and Visitor Safety Precaution	346
Internal Security Team (Outsourcing)	347
Main Machine And Capacity	348
Kiln And Preheater	350
Electrostatic Precipitator	351
Water treatment Plant	352
Sewage Treatment	353
2 Explosive Magazines and Max Cement Plant	354
Explosive Magazine (50 ton)	355
Explosive Magazine (13 Ton)	356
Oil content of Inlet & Outlet of Sewage Treatment plant	357
Environmental Management System of Quarry	358
Noise Environment (Mine Explosion)	372

15580

The Government of the Republic of the Union of Myanmar
Ministry of Commerce
Department of Trade
CERTIFICATE OF EXPORTER/IMPORTER REGISTRATION

1. Enterprise Name (မြန်မာ/အင်္ဂလိပ်) HIGHLAND CEMENT INTERNATIONAL COMPANY LIMITED

2. Registration No: 40042(17-05-16)

3. Registration Term: FIVE YEAR

4. Start Date : 17-05-2016

5. End Date : 21-12-2020

6. Address : (မြန်မာ/အင်္ဂလိပ်) Kyaytinepyin Kwin, Pyi Nyaung Village Tract, Tharzi Township, Meikhtila District, Mandalay,Myanmar

7. Business Registration No : 72 FC /2015-2016(NPW)(22-12-2015)

8. Type of Business : (မြန်မာ/အင်္ဂလိပ်)
- ☐ Sole Proprietorship(တစ်ဦးတည်းပိုင်)
- ☒ Partnership(အစုစပ်)
- ☐ Limited Company(လီမိတက်ကုမ္ပဏီ)(Myanmar/Foreign)
- ☐ Co-operative Society(သမဝါယမအသင်း)
- ☐ Others(Please specify)[illegible]

9. Type of Service : • New ● Extension

10. Contact No :

(+951)655308,655309

Telephone No.	Fax No.	e-mail
(+951)655308,655309		

11. Remarks :

Form Of Permit No.72 FC/2015-2016(NPW)Date(22-12-2015)And MIC Permit No.1083/2016 Date(17-2-2016)

12. Terms and Conditions : စည်းကမ်းချက်များ

I hereby register the above mentioned enterprise as Exporter/Importer subject to the following terms and conditions: [illegible]

(a) Line of goods permitted - all items except prohibited and restricted items. [illegible]

(b) The enterprise must abide by the Export/Import rules and Regulations prescribed for the registered Exporters/Importers.[illegible]

17/5/2016

Stamp

For Director General

(ခင်သန်းနွဲ့)

ဦးစီးအရာရှိ

318

17.5.2016.

EIREG051611EIREGEX12130012

YANGON (BRANCH OFFICE)
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CSR ရံပုံငွေ ထားရှိမည်ဖြစ်ကြောင်း ဝန်ခံကတိပြုခြင်း

ကျွန်တော်တို့၏ Highland Cement International Co.,Ltd သည် မန္တလေးတိုင်းဒေသကြီး၊ သာစည်မြို့နယ်၊ ပြည်ညောင်ဒေသ၊ လုပ်ကွက်(၁) ညောင်ပင်တောင်လုပ်ကွက်နှင့် လုပ်ကွက်(၂) သရက်ရေချောင်းလုပ်ကွက်ရှိ မြေဧရိယာ ၉၅၀-ဧက (၃.၈၄၄၅ စတုရန်းကီလိုမီတာ) အကျယ်တွင် စက်ရုံတည်ဆောက်ပြီး ကနဦး နှစ်(၂၅)နှစ် ငှားရမ်း၍ လုပ်ငန်းဆောင်ရွက်မည်ဖြစ်ပြီး အဆိုပြုလုပ်ငန်းကို မြန်မာနိုင်ငံသားများ ရင်းနှီးမြှုပ်နှံမှုဥပဒေနှင့်အညီ မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှုကော်မရှင်၏ ခွင့်ပြုမိန့်ဖြင့် လုပ်ငန်းဆောင်ရွက်မည် ဖြစ်ပါသည်။

အဆိုပါလုပ်ငန်းမှ နှစ်စဉ် အသားတင်အမြတ်ငွေ၏ ၅%အား CSR ရန်ပုံငွေအဖြစ် အောက်ပါအတိုင်း ထားရှိသုံးစွဲမည် ဖြစ်ကြောင်း ဝန်ခံကတိပြုပါသည်-

ပညာရေး	-	၃၀ %
ကျန်းမာရေး	-	၃၀ %
လူမှုရေး၊ ဘာသာရေး	-	၄၀ %

လေး စား စွာ ဖြင့်

Kyaw Soe Win

Director

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ဝန်ထမ်းများ သက်သာချောင်ချိရေးနှင့် သာယာပျော်ရွှင်ရေး အစီအမံများ

ကျွန်တော်တို့၏ Highland Cement International Co.,Ltd သည် ဝန်ထမ်းများအား ရက်သတ္တပတ် (၁)ပတ်လျှင် (၁)ရက်ပိတ်ပေးခြင်း၊ (၁)ရက်လျှင် အလုပ်ချိန် (၈)နာရီသာ ခိုင်းစေခြင်း၊ နိုင်ငံတော်အစိုးရမှ အများပြည်သူရုံးပိတ်ရက်အဖြစ် သတ်မှတ်ထားသော နေ့ထူး၊ နေ့မြတ်များတွင်လည်း အလုပ်ပိတ်ပေးခြင်း၊ အချိန်ပိုအလုပ်ဆင်းရပါက အချိန်ပိုကြေးများပေးခြင်း၊ ဝန်ထမ်းများ၏ လုပ်ရည် ကိုင်ရည်ပေါ်မူတည်ပြီး လစဉ်လတိုင်း စံပြဆုရဝန်ထမ်း အနည်းဆုံး(၂)ဦး ရွေးချယ်ဆုချီးမြှင့်ပေးသွား ပါမည်။

ဝန်ထမ်းများ ကျန်းမာရေးအတွက် အလုပ်ရုံတွင် ကျန်းမာရေးဝန်ထမ်း ထားရှိသွားမည်ဖြစ်ပြီး အရေးပေါ်ဆေးကုသရေးနှင့် လိုအပ်သော ဆေးဝါးများထားရှိပေးသွားမည်ဖြစ်ပါသည်။ မြို့နယ်လူမှုဖူလုံရေး အသင်း၏ အသင်းဝင်ရောက်စေမည်ဖြစ်ပြီး နာမကျန်းပါက ရသင့်သည့် ဝန်ထမ်းအခွင့်အရေးများ အပြည့်အဝ ခံစားခွင့်ပေးပြီး ဆေးကုသမှုခံယူစေမည်ဖြစ်ပါသည်။

လုပ်ငန်းခွင် စိတ်လက်ပေါ့ပါးစွာနှင့် စိတ်ကြည်လင်ချမ်းမြေ့စွာ လုပ်ကိုင်နိုင်ရေး သန့်စင်ခန်းများ လုံလောက်စွာထားရှိပေးမည်ဖြစ်ပါသည်။ စက်ရုံအတွင်းအပြင် သန့်ရှင်းရေးအား အချိန်ပြည့်ဆောင်ရွက်ထားရှိမည်ဖြစ်ပါသည်။ တစ်ကိုယ်ရည်သန့်ရှင်းရေးများအတွက် ရေလုံလောက်စွာရရှိရေး စီစဥ်ဆောင်ရွက် ပေးသွားမည်ဖြစ်ပါသည်။ စက်ရုံအတွင်းအပြင် ရေနုတ်မြောင်းများ ရေစီးရေလာကောင်းမွန်စေရေးကို အမြဲ ဂရုစိုက်ဆောင်ရွက်သွားမည်ဖြစ်ပါည်။ စက်ရုံမှ ထွက်ရှိလာသော အမှိုက်သရိုက်များအား မြို့နယ် စည်ပင်သာယာရေးကော်မတီနှင့် တိုင်ပင်၍ ၎င်းတို့၏ အစီအမံများအတိုင်း စွန့်ပစ်သွားမည်ဖြစ်ပါကြောင်း တင်ပြအပ်ပါသည်။

လေး စား စွာ ဖြင့်

Kyaw Soe Win

Director

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မီးဘေးကာကွယ်ရေး အစီအမံများ

၁။ အလုပ်ရုံပတ်လည်တွင် မီးသတ်ရေပိုက်လိုင်းများ တပ်ဆင်သွားမည်ဖြစ်ပြီး ပေ(၅၀)အကွာအဝေး တိုင်းတွင် ရေပိုက်ခေါင်းများထားရှိသွားမည် ဖြစ်ပါသည်။ ရေပိုက်ပျော့များလည်း ထားရှိသွားမည် ဖြစ်ပါသည်။

၂။ အလုပ်ရုံအတွင်း၊ စက်ရုံအပြင်နှင့် ဂင်ပေါက်ထွက်ပေါက်များတွင် မီးသတ်ဦးစီးဌာန၏ လမ်းညွှန်သည့်အတိုင်း မီးသတ်ဆေးဗူးများ အလုံအလောက် ထားရှိချိတ်ဆွဲသွားမည်ဖြစ်ပါသည်။

၃။ Over Head Tank များလည်း တည်ဆောက်သွားမည် ဖြစ်ပါသည်။

၄။ လောင်စာဆီများအား လေဂင်လေထွက်ကောင်းမွန်သည့် နေရာတွင် မြေအောက်လှောင်ကန် တည်ဆောက်သိုလှောင်သွားမည်ဖြစ်ပါသည်။

၅။ စက်ရုံနှင့် စက်ရုံဂန်းအတွင်း အရေးပေါ်ထွက်ပေါက်များ အပြည့်အဂထားရှိမည်ဖြစ်ပြီး ဂန်ထမ်းများအား အရန်မီးသတ်သင်တန်းများ တက်ရောက်စေပြီး မီးလောင်လျှင် မီးငြိမ်းသတ်ခြင်းနှင့် အရေးပေါ် အသက်ကယ်သင်တန်း (ရှေးဦးသူနာပြုသင်တန်း)များ တက်ရောက်စေမည်ဖြစ်ပါသည်။

၆။ လုပ်ငန်းခွင်အတွင်း ဆေးလိပ်သောက်ခြင်းအား တားမြစ်ထားမည်ဖြစ်ပြီး စက်ရုံ၏ လျှပ်စစ် အင်ဂျင်နီယာ၏ ကြီးကြပ်မှုဖြင့် စက်ရုံအတွင်း လျှပ်စစ်ကြိုးများအား အစဉ်စစ်ဆေးဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ ဂါယာရှော့များမဖြစ်ပေါ်စေရေး၊ လျှပ်စစ်ဓါတ်အားကို အရေးပေါ်အချိန်တွင် ဖြတ်တောက် ပေးမည့် Breaker များလည်း တပ်ဆင်ထားမည်ဖြစ်ပါကြောင်း တင်ပြအပ်ပါသည်။

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လျှပ်စစ်ဓါတ်အားသုံးစွဲခြင်းနှင့်စပ်လျဉ်း၍ ဝန်ခံကတိပြုခြင်း

ကျွန်တော်တို့၏ Highland Cement International Co.,Ltd သည် မန္တလေးတိုင်းဒေသကြီး၊ သာစည်မြို့နယ်၊ ပြည်ညောင်ဒေသ၊ လုပ်ကွက်(၁) ညောင်ပင်တောင်လုပ်ကွက်နှင့် လုပ်ကွက်(၂) သရက်ရေချောင်းလုပ်ကွက်ရှိ မြေဧရိယာ ၉၅၀-ဧက (၃.၈၄၄၅ စတုရန်းကီလိုမီတာ) အကျယ်တွင် စက်ရုံတည်ဆောက်ပြီး ကနဦး နှစ်(၂၅)နှစ် ငှားရမ်း၍ လုပ်ငန်းဆောင်ရွက်မည်ဖြစ်ပြီး အဆိုပြုလုပ်ငန်းကို မြန်မာနိုင်ငံသားများ ရင်းနှီးမြှုပ်နှံမှုဥပဒေနှင့်အညီ မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှုကော်မရှင်၏ ခွင့်ပြုမိန့်ဖြင့် လုပ်ငန်းဆောင်ရွက်မည် ဖြစ်ပါသည်။

အဆိုပြုလုပ်ငန်းအတွက် လိုအပ်သောလျှပ်စစ်ဓါတ်အားကို စီမံကိန်းနေရာမှ (၇)မိုင်ဝေးသော ရေပေါင်းဆုံကျေးရွာ မဟာဓါတ်အားလိုင်းမှ ရယူဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ မီးပြတ်တောက်မှု ဖြစ်ပေါ်ခဲ့လျှင် သုံးစွဲရန် ၅၀၀ ကေဗွီအေ၊ ၁၁၀ ကေဗွီအေ၊ ၆၆ ကေဗွီအေ၊ ၃၀ ကေဗွီအေ မီးစက်များ ထားရှိသုံးစွဲပါသည်။

လေး စား စွာ ဖြင့်

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ပတ်ဝန်းကျင်ညစ်ညမ်းမှုမရှိစေရန် ဆောင်ရွက်ထားရှိမှု အခြေအနေတင်ပြခြင်း

ကျွန်တော်တို့၏ Highland Cement International Co.,Ltd သည် မန္တလေးတိုင်းဒေသကြီး၊ သာစည်မြို့နယ်၊ ပြည်ညောင်ဒေသ၊ လုပ်ကွက်(၁) ညောင်ပင်တောင်လုပ်ကွက်နှင့် လုပ်ကွက်(၂) သရက်ရေချောင်းလုပ်ကွက်ရှိ မြေဧရိယာ ၉၅၀-ဧက (၃.၈၄၄၅ စတုရန်းကီလိုမီတာ) အကျယ်တွင် စက်ရုံတည်ဆောက်ပြီး ကနဦး နှစ်(၂၅)နှစ် ငှားရမ်း၍ လုပ်ငန်းဆောင်ရွက်မည်ဖြစ်ပြီး အဆိုပြုလုပ်ငန်းကို မြန်မာနိုင်ငံသားများ ရင်းနှီးမြှုပ်နှံမှုဥပဒေနှင့်အညီ မြန်မာနိုင်ငံ ရင်းနှီးမြှုပ်နှံမှုကော်မရှင်၏ ခွင့်ပြုမိန့်ဖြင့် လုပ်ငန်းဆောင်ရွက်မည် ဖြစ်ပါသည်။

ထိုသို့ ဆောင်ရွက်ရာတွင် ပတ်ဝန်းကျင်ညစ်ညမ်းမှုမရှိစေရေး၊ အလုပ်ရုံအတွင်း စနစ်တကျ အမှိုက်စွန့်ပစ်ရန် စီစဉ်ထားရှိခြင်း၊ ရေမြောင်းများအား ရေစီးရေလာကောင်းမွန်အောင် စနစ်တကျ ဖောက်လုပ်ထားရှိခြင်း၊ အလုပ်ရုံအတွင်း လေဝင်လေထွက်ကောင်းမွန်စေရန် စီမံဆောက်လုပ်မည်ဖြစ်ခြင်းနှင့် အလုပ်သမားနှင့် ရေအိမ်ညီညွတ်မျှတစေရန် စီမံဆောက်လုပ်ထားမည် ဖြစ်ပါသည်။

စက်ရုံ၏ စားသောက်ဆောင်နှင့် ၄င်းစက်ရုံ၏ လုပ်ငန်းခွင်မှလည်းကောင်း၊ ထွက်ရှိလာသော အမှိုက်မျိုးစုံအား အမျိုးအစားခွဲခြားစွန့်ပစ်ပြီး စက်မှုဇုန်နှင့် မြို့နယ်စည်ပင်သာသာရေးကော်မတီတို့၏ စီမံမှုဖြင့် စနစ်တကျ ရေစီးရေလာကောင်းမွန်စေရေးနှင့် ပတ်ဝန်းကျင်သန့်ရှင်းစေရေးကိုလည်း စက်ရုံမှ ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

လုပ်ငန်းခွင်ဘေးအန္တရာယ်ကင်းရှင်းရေးနှင့် ပတ်ဝန်းကျင်ဆူညံမှုနှင့် ညစ်ညမ်းမှုမဖြစ်ပေါ်စေရေး၊ ရေစီးရေလာပိတ်ဆို့မသွားရေးနှင့် လမ်းပိတ်ဆို့မှုနှင့် ဝန်းကျင်ညစ်ညမ်းမှုမဖြစ်ပေါ်စေရေးကို အစွမ်းကုန် ကြိုးစားဆောင်ရွက်သွားမည်ဖြစ်ကြောင်း တင်ပြအပ်ပါသည်။

လေး စား စွာ ဖြင့်

Kyaw Soe Win
Director

ပုံစံ (၂၈)

ပြည်ထောင်စုမြန်မာနိုင်ငံတော်အစိုးရ

ပြည်ထဲရေးဝန်ကြီးဌာန

မူးယစ်ဆေးဝါးနှင့် စိတ်ကိုပြောင်းလဲစေသောဆေးဝါးများအန္တရာယ်

တားဆီးကာကွယ်ရေးဗဟိုအဖွဲ့

မူးယစ်ဆေးဝါးနှင့် စိတ်ကိုပြောင်းလဲစေသော ဆေးဝါးများအန္တရာယ်

တားဆီးကာကွယ်ရေး ဗဟိုအဖွဲ့

[illegible] တိုင်း

ထိန်းချုပ်ဓာတုပစ္စည်းကို လက်ဝယ်ထားပြီး အသုံးပြုခြင်းအတွက်

ခွင့်ပြုချက်

(နည်းဥပဒေ ၄၆)

ခွင့်ပြုချက်အမှတ် ...၃/၂၀၁၈............ ရက်စွဲ ...၁၆. ၂. ၂၀၁၈.........

[illegible] မူးယစ်ဆေးဝါးနှင့် စိတ်ကိုပြောင်းလဲစေသော ဆေးဝါးများ အန္တရာယ်တားဆီးကာကွယ်ရေး အဖွဲ့သည် ခွင့်ပြုချက် ရယူရန် လိုအပ်သော ထိန်းချုပ်ဓာတုပစ္စည်းကို လက်ဝယ်ထားပြီး [illegible] အတွက် ထိန်းချုပ်ဓာတုပစ္စည်း [illegible] နည်းဥပဒေများ [illegible] နည်းဥပဒေ [illegible] လုပ်ငန်း၊ ဌာန၊ ကုမ္ပဏီ၊ အဖွဲ့အစည်း၊ ပုဂ္ဂိုလ်အား ဤခွင့်ပြုချက်ကို ထုတ်ပေးလိုက်သည် -

၁။ ခွင့်ပြုချက်ရရှိသည့် လုပ်ငန်း၊ ဌာန၊ ကုမ္ပဏီ၊ အဖွဲ့အစည်း၊ ပုဂ္ဂိုလ်၏ အမည်၊ လိပ်စာနှင့် ဆက်သွယ်ရန် ဖုန်း၊ ဖက်စ်၊ အီးမေးလ်အမှတ် .Mr. Hoon Joo Lee (M-1784654)

၂။ လက်ဝယ်ထားပြီး အသုံးပြုခွင့်ရသော ထိန်းချုပ်ဓာတုပစ္စည်းများ

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	မှတ်ချက်
၁။	Potassium		Solid	500gm	500gm x 2	[illegible]	
၂။	Hydrochloric acid		Liquid	2.5L	2.5L x 60		
၃။	Sulphuric acid		Liquid	250ml	250ml x 10		

၈၆

လက်ဝယ်ထားပြီး အသုံးပြုခွင့်ရရှိသူက လိုက်နာရမည့် စည်းကမ်းချက်များ

(က) ခွင့်ပြုချက်ကိုလက်ဝယ်ထားသည့် နေရာတွင် ချိတ်ဆွဲထားရမည်။

(ခ) လက်ဝယ်ထားပြီး အသုံးပြုခြင်းနှင့်စပ်လျဉ်း၍ လစဉ်မှတ်တမ်းများကို ပုံစံ (၃၀) ဖြင့် ပြုစုရမည်။

(ဂ) လစဉ်မှတ်တမ်းများကို ၃ လတစ်ကြိမ်စုစည်း၍ ထိန်းချုပ်ဓာတုပစ္စည်းကြီးကြပ်ရေး ကော်မတီသို့ ပုံစံ (၅) ဖြင့် တစ်ပြအစီရင်ခံပြီး မိတ္တူကို သက်ဆိုင်ရာ ခရိုင်၊ မြို့နယ် မူးယစ်ဆေးဝါးနှင့် စိတ်ကိုပြောင်းလဲစေသော ဆေးဝါးများအန္တရာယ် တားဆီးကာကွယ်ရေးအဖွဲ့သို့ပေးပို့ ရမည်။

(ဃ) ထိန်းချုပ်ဓာတုပစ္စည်းကို တရားမဝင်သောလမ်းကြောင်းသို့ ပြောင်းလဲ၍ အသုံးပြုခြင်း မရှိစေရန် အထူးကရုပြု၍ လက်ဝယ်ထား အသုံးပြုရမည်။

(င) မူးယစ်ဗဟိုအဖွဲ့ကဖြစ်စေ၊ ထိန်းချုပ်ဓာတုပစ္စည်းကြီးကြပ်ရေးကော်မတီကဖြစ်စေ ခါအားလျော်စွာ သတ်မှတ်သည့် စည်းကမ်းချက်များကို လိုက်နာရမည်။

ခရိုင် မူးယစ်ဆေးဝါးနှင့် စိတ်ကိုပြောင်းလဲစေသော
ဆေးဝါးများအန္တရာယ် တားဆီးကာကွယ်ရေးအဖွဲ့၊
....မိတ္ထီလာ..........ခရိုင်

Buildings and structures list and size

Sr. No.	Particulars	L (m)	B (m)	H (m)	Area (Square meter)	Remarks
1	**Industrial Buildings**					
	Quarry Office & Equipment Shed	200	40			
	Limestone Crushing & Conveying					
	Limestone Crusher (Primary)	24	13	19.3	312	C/C (Lean Top)
	Limestone Crusher (Secondary)	17	13	7.7	221	C/C (Lean Top)
	Conveyor Line	60	3.4			
2	**Conveyor Support (2) Nos;**					
	Conveyor Support	6	6	6		
	Conveyor Support	5	6.973	8		
	Limestone Prehomogenization	126	44	22	5,544	C/C (Roof Top)
3	**Corrective Materials Crushing and Storage Hall**					
	Storage Hall	4	54	10.6	2,916	C/C (Roof Top)
	Crusher	10	36			
	Conveyor Line	45	3.4			
4	**Conveyor Support (2) Nos**					
	Conveyor Support	6	6			
	Conveyor Support	5	5			
5	**Raw Proportioning Silos**					
	Clay Silo	Φ 6 (id)	0.2(thk)	17		
	Ironstone Silo	Φ 6 (id)	0.2(thk)	17		
	Sand Silo	Φ 6 (id)	0.2(thk)	17		
	Limestone Silo	Φ 8 (id)	0.2(thk)	21		
6	**Conveying System**	Steel Structure				
	Pre Grinder	5.7	5.7	7		
	Raw Grinding Plant					
	Raw Grinding Mill	24	12	20.9	288	Roof Slab
	Conditioning Tower	7.5	7.5	11	56.25	Roof Slab
	Dust Collector	7.65	12.84	10	226.63	Roof Slab
	Raw Mill Silo	Φ 15 (id)		6.25		
	Kiln Inlet	4.5	13	83	188.5	
7	**Kiln**					
	1 # pillar of Kiln	9.2	4.3	7	39.56	Foun; Outer
	2 # pillar of Kiln	7.9	6	8	47.4	Foun; Outer
	3 # pillar of Kiln	11	8	8.476	88	Foun; Outer
8	**Clinker Cooling and E.P**					
	Gas Treatment					
	Grate Cooler	22	17.5	8	385	C/C
	Dust Collector	17.52	8.42	8.14	147.35	C/C
	Clinker Transport	14.646	4.5			
	Clinker Storage	Φ 22 (id)		45		
9	**Coal Storage Shed and Crushing**					
	Coal Storage Shed	90	27	8	2,430	C/C (Roof Top)
	Crusher	7	6	5		
10	**Coal Drying & Conveying**					
	Coal Drying	49	12	13	588	C/C (Roof Top) (Roof Slab)
	Conveyor Support	6	5	8.5		
	Conveyor Line	18.32	3.15	2.2		
	Coal Pre-blending	90	30	10.5	2,700	Steel Column top
11	**Conveyor Support (2) Nos**					

	Conveyor Support (1)	9.5	6.9	10.5		
	Conveyor Support (2)	7.75	8.05	4		
	Coal Grinding Plant	31.5	12	22.1	378	C/C
12	**Gypsum and Additive Crushing**					
	and Storage					
	Storage Hall	90	18	73	1,620	C/C RC Top
	Crusher	8.5	7	5.5		
	Conveyor Line	45.5	3.4			
	Conveyor Support	6.35	5	6.5		
	Clinker, Gypsum & Additive				1748.5	
	Proportioning Station					
	Gypsum Silo	Φ 6 (id)		17		
	Additive Silo	Φ 6 (id)		17		
	Cement Mill	29		13.2	725	C/C
	Cement Silos (4) Nos;	Φ 12 (id)		35		C/C
13	**Packing & Loading Plant**					
	Packing I	30.3	40	19.5	1212	C/C
	Packing II	49.5		8.3	1534.5	Outer
	Compressors House	14.5	13	7	2,028	
	Electrical Main & Sub-station	30	14.5	7	435	C/C
14	**(Inc.Emergency Generator)**					
	Central Control Room & Laboratory	38.4	2.3	13.7	472.32	C/C
15	**Water Storage & Treatment Plant**					
	Pump House	29.4	6.6	4.6		
16	**Circulating Water Tank (3) Nos**					
	Circulating Water Tank (1) Nos	16.4	8.2	4		
	Circulating Water Tank (2) Nos	16.4	8.2	4		
17	**Circulating Water Tank (3) Nos**					
	Mechanical and Electrical Workshop	78	15	9	1,170	C/C
	Weigh Bridges Platforms	15.8	3.3	0.6		
	Roads (Inside Factory)				6.17km	
18	**Bore Pile Costs**					
	Proportioning Station & Conveying	13	12.5	24.5	162.5	C/C Steel
	for Cement Grinding					Structure
	Limestone Crushing Electrical	12.2	10.7	5.2	130.54	C/C
	Raw Electrical Room	16.5	4.2	5.2	69.3	C/C
	Cement Mill Electrical Room	17	12	5.2	204	C/C
	Packing Electrical Room	18.9	4.2	5.2	79.38	C/C
	Rotation Domitory	34.5	12	18.53	414	C/C
	Dormitory	34.5	12	14.9	414	C/C Roof Top
19	**Retaining Wall**					
	Retaining Wall (I)	77	3.75	6		
	Retaining Wall (II)	77	4.25	7.5		
	Retaining Wall (III)	100	0.46	9		
20	**Stone Pitching**					
	Fencing				6300m	
	Pipe Cable Trenches and Drain	782.12m				
21	**Administrative Buildings**					
	Main Gate and Office Building					
	Infirmary Building					
	Canteen	47.4	18.3	63		
	Commercial Buildings					
	Store Godowns		36	12	23,242	
	POL Shed					
	Explosive Bunker	40ft	15ft			
22	**Residential Buildings**					
	Briefing Hall and Guests House	120ft	40ft			

	Residential House (GM)	88ft	44ft	21ft		
	2 Residential Houses (DGM	41ft	60ft	21ft		
	2 Hostel	148ft	49ft	19ft		
23	**Fencing**					
	Sanitary and Electrification Work					
	Roads & Bridges Outside Factory and Residential Area					

Blue Diamond Cement မှ ၂၀၁၅ မှ ၂၀၁၈ ခုနှစ်၊ ဇွန်အထိ ဒေသဖွံ့ဖြိုးတိုးတက်ရေး ကူညီဆောင်ရွက်ခဲ့မှု အခြေအနေများ

စဉ်	ရက်စွဲ	အကြောင်းအရာ	လှူဒါန်းငွေ
၁	၂၀၁၅	တောင်ပြည်ညောင် မီးလင်းရေးအတွက်	၇၀,၀၀၀,၀၀၀
၂		တောင်ပြည်ညောင် မူလတန်းကျောင်းအတွက်	၃၀၀,၀၀၀
၃		တောင်ပြည်ညောင် လူမှုရေးအသင်းအတွက်	၅၀၀,၀၀၀
၄		ဘုရားရွှေချခြင်းအတွက်	၁၄၀,၇၀၀
၅		ကထိန်အတွက်	၅၅၀,၀၀၀
၆		မြောက်ပြည်ညောင် ကထိန်အတွက်	၂၀၀,၀၀၀
၇		ရေပေါင်းစုံကျေးရွာအတွက်	၄၅၀,၀၀၀
၈		သာစည်မြို့ လူမှုရေးအသင်းအတွက်	၃,၄၁၇,၅၀၀
၉		သာစည်အထက်တန်းကျောင်းအတွက်	၄၅၀,၀၀၀
၁၀		ယင်းမာပင်ဆေးရုံအတွက်	၃၅၀,၀၀၀
၁၁	၈.၄.၂၀၁၆	သာစည်မြို့နယ် အုပ်ချုပ်ရေးမှူးရုံးသို့ အလှူငွေ လှူဒါန်းခြင်း	၂၀၀,၀၀၀
၁၂	၈.၄.၂၀၁၆	ယင်းမာပင် ရဲစခန်း သင်္ကြန်အတွက် အလှူငွေ လှူဒါန်းခြင်း	၁၀၀,၀၀၀
၁၃	၆.၅.၂၀၁၆	သာစည်မြို့နယ် လေဘာတီဂေါက်ကလပ်တွင် Submersible Pump နှင့် ရေပိုက်များပြုပြင်သွယ်တန်းခြင်းလုပ်ငန်းအတွက် အလှူငွေ လှူဒါန်းခြင်း	၁၃၀,၀၀၀
၁၄	၁၅.၅.၂၀၁၆	သာစည်မြို့နယ်၊ ရေပေါင်းစုံကျေးရွာ လျှပ်စစ်ဓါတ်အားခွဲရုံရှိ အမိုးများပြန်လည် ပြုပြင်နိုင်ရန်အတွက် လှူဒါန်းခြင်း	၅၀၀,၀၀၀
၁၅	၁၅.၇.၂၀၁၆	အာဇာနည်နေ့အတွက် အလှူငွေထည့်ဝင်ခြင်း	၁၀၀,၀၀၀
၁၆	၁၁.၈.၂၀၁၆	ပြည်ညောင်ကျေးရွာ၊ မုဒိတာ ပရိဟိတအဖွဲ့သို့ ရေးဘေး ကယ်ဆယ်ရေးအတွက် အလှူငွေထည့်ဝင်ခြင်း	၃၅၃,၀၀၀
၁၇	၁၆.၈၂၀၁၆	သာစည်မြို့နယ်အတွင်း လေပြင်းမုန်တိုင်းတိုက်ခတ်မှုကြောင့် ပျက်စီးသွားသော အဆောက်အအုံများ၊ အမိုးများပြန်လည် ပြုပြင်နိုင်ရန်အတွက် အလှူငွေထည့်ဝင်ခြင်း	၅၃၃,၀၀၀
၁၈	၂.၉.၂၀၁၆	မိတ္ထီလာမြို့နယ်၊ အလုပ်သမားရုံးမှပြုလုပ်သော တန်ဆောင်တိုင် ဘုံကထိန်အတွက် အလှူငွေထည့်ဝင်ခြင်း	၅၀,၀၀၀
၁၉	၁၄.၁၀.၂၀၁၆	ပြည်ညောင်ကျေးရွာ၊ အလယ်တန်းကျောင်းတွင်လုပ်အားပေး တာဝန်ထမ်းဆောင်နေသော ဆရာမ(၃)ဦး၏ ဒီဇင်ဘာလ အတွက် လစာငွေလှူဒါန်းခြင်း	၂၁၀,၀၀၀

၂၀	၉.၁.၂၀၁၇	ပြည်သောင်ကျေးရွာ အလယ်တန်းကျောင်းတွင်လုပ်အားပေး တာဝန်ထမ်းဆောင်နေသော ဆရာမ(၃)ဦး၏ ဇန်နဝါရီလ အတွက်လစာငွေလှူဒါန်းခြင်း	၂၁၀,၀၀၀
၂၁	၁၅.၂.၂၀၁၇	ပြည်သောင်ကျေးရွာ အလယ်တန်းကျောင်းတွင်လုပ်အားပေး တာဝန်ထမ်းဆောင်နေသော ဆရာမ(၃)ဦး၏ ဖေဖော်ဝါရီလ အတွက်လစာငွေလှူဒါန်းခြင်း	၂၁၀,၀၀၀
၂၂	၁၆.၂.၂၀၁၇	သာစည်မြို့နယ် လေဘာတီဂေါက်ကလပ်၏ (၇၀)နှစ်မြောက် ပြည်ထောင်စုနေ့ အထိမ်းအမှတ်ဂေါက်ရိုက်ပြိုင်ပွဲတွင် ဆုရရှိသူများအား ဆုကြေးငွေပေးအပ်ခြင်း	၃၀၀,၀၀၀
၂၃	၁.၃.၂၀၁၇	သာစည်မြို့နယ်၊ စာပြန်ပွဲတွင် စာအောင်သံဃာတော်များအား ပေးအပ်ချီးမြှင့်သောဆုငွေအတွက် အလှူငွေထည့်ဝင်ခြင်း	၅၀,၀၀၀
၂၄	၁၃.၃.၂၀၁၇	ပြည်သောင်ကျေးရွာ အလယ်တန်းကျောင်းတွင်လုပ်အားပေး တာဝန်ထမ်းဆောင်နေသော ဆရာမ(၃)ဦး၏ မတ်လအတွက် လစာငွေလှူဒါန်းခြင်း	၂၁၀,၀၀၀
၂၅	၁၁.၄.၂၀၁၇	သာစည်မြို့နယ်၊ လ.ဝ.က ဦးစီးဌာနရုံး၏ မိသားစုသကြ်ာန်ပွဲ ကျင်းပရေးအတွက် အလှူငွေထည့်ဝင်ခြင်း	၂၁၀,၀၀၀
၂၆	၁၂.၄.၂၀၁၇	သာစည်မြို့နယ်၊ အထွေထွေအုပ်ချုပ်ရေးဦးစီးဌာန၏ မိသားစု သကြ်ာန်ပွဲကျင်းပရေးအတွက် အလှူငွေထည့်ဝင်ခြင်း	၂၀၀,၀၀၀
၂၇	၁၅.၅.၂၀၁၇	သာစည်မြို့နယ်၊ ပြည်တွင်းအခွန်ဦးစီးဌာနရုံးသို့ ပန်ကာ (၂)လုံးအတွက် လှူဒါန်းငွေ	၅၂,၀၀၀
၂၈	၁၅.၅.၂၀၁၇	ပြည်သောင်ကျေးရွာ၊ အထွေထွေအုပ်ချုပ်ရေးမှူးရုံးအတွက် ရေခဲသေတ္တာ (၁)လုံးအတွက် လှူဒါန်းငွေ	၁၄၀,၀၀၀
၂၉	၂၀.၅.၂၀၁၇	ပြည်သောင်ကျေးရွာ၊ အထက်တန်းကျောင်းတိုးချဲ့ ကျောင်းဆောင်ဆောက်လုပ်ရန်အတွက် ဘိလပ်မြေအိတ် (50kg) ၁၀၀ အိတ် လှူဒါန်းခြင်း	၃၄၅,၀၀၀
၃၀	၁၉.၆.၂၀၁၇	ယင်းမာပင်ရဲစခန်းအတွက် ဘိလပ်မြေအိတ်(50kg) ၁၀၀အိတ်လှူဒါန်းခြင်း	၃၄၅,၀၀၀
၃၁	၂၈.၆.၂၀၁၇	ပြည်သောင်ကျေးရွာ၊ အခြေခံပညာအထက်တန်းကျောင်း ဖွင့်ပွဲအခမ်းအနားအတွက် အလှူငွေလှူဒါန်းခြင်း	၆၀၀,၀၀၀
၃၂	၂၇.၇.၂၀၁၇	ပြည်သောင်ကျေးရွာ၊ အထက်တန်းကျောင်းလုပ်အားပေး တာဝန်ထမ်းဆောင်နေသော ဆရာမ(၃)ဦး၏ ဇွန်လနှင့် ဇူလိုင်လအတွက် လစာငွေလှူဒါန်းခြင်း	၆၀၀,၀၀၀
၃၃	၁၅.၈.၂၀၁၇	ပြည်သောင်ကျေးရွာ(ရထား) ရွာဦးကျောင်းဆရာတော်အား နာဂကမ္မဆက်ကပ်လှူဒါန်းခြင်း	၁၀၀,၀၀၀
၃၄	၂၅.၈.၂၀၁၇	သာစည်မြို့နယ်၊ ကြက်ခြေနီအသင်းရုံးဆောက်လုပ်ရန် အတွက် ဘိလပ်မြေအိတ်(50kg) ၁၀၀-အိတ်လှူဒါန်းခြင်း	၃၄၅,၀၀၀
၃၅	၂၇.၈.၂၀၁၇	ပြည်သောင်ကျေးရွာ၊ ရေဘေးသင့်ပြည်သူများအတွက် အလှူငွေများလှူဒါန်းခြင်း	၁,၅၀၀,၀၀၀

၃၆	၂၈.၈.၂၀၁၇	ပြည်ညောင်ကျေးရွာ၊ အထက်တန်းကျောင်းလုပ်အားပေး တာဝန်ထမ်းဆောင်နေသော ဆရာမ(၃)ဦး၏ဩဂုတ်လ အတွက် လစာငွေလှူဒါန်းခြင်း	၃၀၀,၀၀၀
၃၇	၁.၉.၂၀၁၇	ပြည်ညောင်ကျေးရွာအုပ်စု၊ အုပ်ချုပ်ရေးမှူးရုံးအတွက် Air Con(2Hp-Mitsubishi) ၁ လုံး လှူဒါန်းခြင်း	၆၀၀,၀၀၀
၃၈	၁၂.၉.၂၀၁၇	သာစည်မြို့နယ်၊ မူးယစ်ရဲတပ်ဖွဲ့ ရုံးခန်းဆောက်လုပ်ရန် အတွက်ဘိလပ်မြေအိတ်(50kg)၇၀ အိတ် လှူဒါန်းခြင်း	၂၄၁,၅၀၀
၃၉	၃၀.၉.၂၀၁၇	ပြည်ညောင်ကျေးရွာ၊ အထက်တန်းကျောင်းလုပ်အားပေး တာဝန်ထမ်းဆောင်နေသော ဆရာမ(၃)ဦး၏ စက်တင်ဘာလ အတွက် လစာငွေလှူဒါန်းခြင်း	၃၀၀,၀၀၀
၄၀	၂၀.၁၀.၂၀၁၇	ပြည်ညောင်ကျေးရွာ(ရထား)ရွာဦးဘုန်းတော်ကြီးကျောင်းတွင် အသုံးပြုရန်နှင့် ကျေးရွာစာသင်ကျောင်းတွင် အသုံးပြုရန် ဘိလပ်မြေအိတ်-၅၀၀အိတ်လှူဒါန်းခြင်း	၁,၇၇၅,၀၀၀
၄၁	၂၄.၁၀.၂၀၁၇	ပြည်ညောင်ကျေးရွာ(ရထား)၏ စုပေါင်းမဟာဘုံကထိန် အတွက် အလှူငွေလှူဒါန်းခြင်း	၆၀၀,၀၀၀
၄၂	၂၈.၁၀.၂၀၁၇	သာစည်မြို့နယ်၊ လွှတ်တော်ကိုယ်စားလှယ်ရုံးမိသားစု မဟာဘုံကထိန်အတွက် အလှူငွေထည့်ဝင်ခြင်း	၂၀၀,၀၀၀
၄၃	၁၄.၁၁.၂၀၁၇	ပြည်ညောင်ကျေးရွာ၊ အထက်တန်းကျောင်း လုပ်အားပေး တာဝန်ထမ်းဆောင်နေသာ ဆရာမ(၃)ဦး၏ အောက်တိုဘာ လအတွက် လစာငွေလှူဒါန်းခြင်း	၃၀၀,၀၀၀
၄၄	၇.၁၂.၂၀၁၇	သာစည်မြို့နယ်၊ ရွာကြီးကျေးရွာရှိ ရွှေယင်မျှော်ဘုရား သာသနာ့ဗိမ္မာန်တော် ဆောင်လုပ်နေခြင်းအတွက် ဘိလပ်မြေ (၃၀၀)အိတ် လှူဒါန်းခြင်း	၁,၀၆၅,၀၀၀
၄၅	၁၃.၁၂.၂၀၁၇	ရခိုင်ပြည်နယ်၊ ပြန်လည်ထူထောင်ရေးနှင့် လူသားချင်းစာနာမှု အထောက်အကူပြုရေးအတွက် အလှူငွေပါဝင်လှူဒါန်းခြင်း	၁၀၀,၀၀၀
၄၆	၂၀.၁၂.၂၀၁၇	ပြည်ညောင်ကျေးရွာ၊ အထက်တန်းကျောင်း လုပ်အားပေး တာဝန်ထမ်းဆောင်နေသော ဆရာမ(၂)ဦး၏ နိုဝင်ဘာလ လစာနှင့် ဒီဇင်ဘာလအတွက် ဆရာမ(၁)ဦးအတွက် လစာငွေ လှူဒါန်းခြင်း	၃၀၀,၀၀၀
၄၇	၂၀.၁၂.၂၀၁၇	မိတ္ထီလာခရိုင်ရဲတပ်ဖွဲ့ရုံးရှိ ဓမ္မာရုံပြုပြင်ရန်အတွက် ဘိလပ်မြေ (50kg) ၅၀ အိတ် လှူဒါန်းခြင်း	၁၇၂,၅၀၀
၄၈	၅.၁.၂၀၁၈	သာစည်မြို့နယ်၊ မီးသတ်တပ်ဖွဲ့မှူးရုံးရှေ့ စကြံန်ခင်းရန် အတွက် ဘိလပ်မြေ(50kg) ၆၀ အိတ်လှူဒါန်းခြင်း	၂၀၇,၀၀၀

၄၉	၈.၁.၂၀၁၈	သာစည်မြို့နယ်၊ လေဘာတီဂေါက်ကလပ် ဂေါက်ကွင်း ခြံစည်းရိုးအုတ်တံတိုင်း ကာရန်အတွက် ဘိလပ်မြေအိတ် ၃၀၀ အိတ် လှူဒါန်းခြင်း	၁,၀၃၅,၀၀၀
၅၀	၁၅.၁.၂၀၁၈	သာစည်မြို့နယ်၊ ရွာကြီးကျေးရွာရှိ ရွှေယင်မှျော်ဘုရား သာသနာ့ဗိမ္မာန်တော် ဆောက်လုပ်နေခြင်းအတွက် ဒုတိယ အကြိမ်မြောက် ဘိလပ်မြေ ၃၀၀ အိတ်လှူဒါန်းခြင်း	၁,၀၃၅,၀၀၀
၅၁	၁၈.၁.၂၀၁၈	ပြည်ညောင်ကျေးရွာ(ကား) အထက်တန်းကျောင်း ၂၀၁၇-၂၀၁၈ ပညာသင်နှစ် စုံညီပွဲတော်ကျင်းပနိုင်ရေးအတွက် အလှူငွေ ၁၀၀၀၀၀ ကျပ်နှင့် လုပ်အားပေးဆရာမ(၁)ဦးအား ဇန်နဂါရီလနှင့်ဖေဖော်ဂါရီလတို့အတွက် လစာငွေ ၂၀၀၀၀၀ ကျပ်တို့အား ပါဝင်လှူဒါန်းခြင်း	၃၀၀,၀၀၀
၅၂	၁၇.၁.၂၀၁၈	မိတ္ထီလာမြို့နယ်၊ မြင်းကန်ကျေးရွာအုပ်စု၊ အိုင့်ကျေးရွာ ဘုန်းကြီးကျောင်းရှိ ဆွမ်းစားဆောင် ဆောက်လုပ်ရန်အတွက် ဘိလပ်မြေ ၁၅၀ အိတ် လှူဒါန်းခြင်း	၅၁၇,၅၀၀
၅၃	၂၇.၂.၂၀၁၈	သာစည်မြို့နယ်၊ ဇဝင်းကျေးရွာအုပ်စု မြောက်ဦးကျေးရွာ(ခ) ပေါက်ချောင်းကျေးရွာ တံတားခင်းနိုင်ရန်အတွက် ဘိလပ်မြေ (၁.၅ တန် အိတ်) ၁၀ အိတ် လှူဒါန်းခြင်း	၁,၀၃၅,၀၀၀
၅၄	၈.၃.၂၀၁၈	ပြည်ညောင်ကျေးရွာ(ရထား)၏ စေတနာရှင် ပရဟိတ လူငယ်အသင်းမှဦးဆောင်သော နွေရာသီကျောင်းပိတ်ရက် ယဉ်ကျေးလိမ္မာသင်တန်းဖွင့်လှစ်သင်ကြားရေးအတွက် အလှူငွေပါဝင် လှူဒါန်းခြင်း	၅၀,၀၀၀
၅၅	၁၄.၃.၂၀၁၈	သာစည်မြို့နယ်၊ လေဘာတီဂေါက်ကလပ်၏ ဂေါက်သီးရိုက် ပြိုင်ပွဲကျင်းပရေးအတွက် အလှူငွေထည့်ဝင်ခြင်း	၁၀၀,၀၀၀
၅၆	၂၁.၃.၂၀၁၈	စစ်ကိုင်းတိုင်းဒေသကြီး၊ ဘုတလင်မြို့နယ်၊ မြောက်တောကြီး (ခ)ညောင်ပင်ကြီးကျေးရွာ ကိုယ်ထူကိုယ်ထ မူလတန်းကျောင်း ဆောင်လုပ်ခြင်းအတွက် ဘိလပ်မြေ(၁.၅ တန်အိတ်) ၁၀အိတ် လှူဒါန်းခြင်း	၁,၀၃၅,၀၀၀
၅၇	၂၃.၃.၂၀၁၈	မန္တလေးတိုင်းဒေသကြီး၊ ရမည်းသင်းမြို့နယ်၊ သစ်စုံကြီးအုပ်စု၊ မြင်းခြံကျေးရွာ ကိုယ်ထူကိုယ်ထ ကွန်ကရစ်လမ်းခင်းနေခြင်း အတွက် ဘိလပ်မြေ(၁.၅တန်) ၁၀အိတ် လှူဒါန်းခြင်း	၁,၀၃၅,၀၀၀
၅၈	၂၆.၃.၂၀၁၈	ပြည်ညောင်ကျေးရွာ အထက်တန်းကျောင်း လုပ်အားပေး တာဝန်ထမ်းဆောင်နေသော ဆရာမ(၁)ဦး၏ မတ်လအတွက် လစာငွေ ၁၀၀၀၀၀ လှူဒါန်းခြင်း	၁၀၀,၀၀၀

၅၉	၅.၄.၂၀၁၈	မိတ္ထီလာမြို့နယ်၊ ညောင်ပင်လျှိုအုပ်စု၊ သရက်တန်းကျေးရွာ၊ သရက်တန်းကျောင်းတိုက် တည်ဆောက်ဆဲ ဓမ္မာရုံတော် အတွက် ဘိလပ်မြေ(၁.၅တန်) ၅ အိတ် လှူဒါန်းခြင်း	၅၁,၇၀၀
၆၀	၇.၄.၂၀၁၈	သာစည်မြို့နယ်၊ သစ်တောဦးစီးဌာန၊ ယင်းမာပင်ဘိနယ် သစ်တောရုံးဝန်းရှိ ခြံစည်းရိုးကာရံခြင်းနှင့် အုတ်ရေကန် ဆောက်လုပ်ခြင်းလုပ်ငန်းအတွက် ဘိလပ်မြေ(၁.၅တန်အိတ်) ၅ အိတ် လှူဒါန်းခြင်း	၅၁,၇၀၀
၆၁	၉.၄.၂၀၁၈	သာစည်မြို့နယ်၊ လေဘာတီဂေါက်ကလပ်တွင် ခြံစည်းရိုး ကာရံခြင်းလုပ်ငန်းအတွက် ဘိလပ်မြေ(၁.၅တန်အိတ်) ၇အိတ် လှူဒါန်းခြင်း	၇၂၄,၅၀၀
၆၂	၂၄.၄.၂၀၁၈	မကွေးတိုင်းဒေသကြီး၊ နတ်မောက်မြို့ရှိ ရွှေနတ်ကယ်တောင် ဘုရားတွင် ဘုရားတည်ရန်အတွက် ဘိလပ်မြေ(၁.၅တန်အိတ်) ၃၀ အိတ် လှူဒါန်းခြင်း	၃၁၀,၅၀၀
၆၃	၂၄.၅.၂၀၁၈	သာစည်မြို့နယ်၊ ပြည်ညောင်(ရထား)ကျေးရွာရှိ ဓမ္မာရုံအား ခြံစည်းရိုးကာရံခြင်းအတွက် အသုံးပြုနိုင်ရန်အတွက် ဘိလပ်မြေ(၁.၅တန်အိတ်) ၂ အိတ် လှူဒါန်းခြင်း	၂၀၇,၀၀၀
၆၄	၁၄.၆.၂၀၁၈	"မြန်မာအမျိုးသမီးများနေ့ (ဖွန်လ၁၉) အထိမ်းအမှတ်" သစ်ပင်စိုက်ပွဲ အခမ်းအနားအောင်မြင်စွာကျင်းပနိုင်ရေး အတွက် သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဝန်ကြီးဌာန၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနသို့ အလှူငွေ ၂၀၀,၀၀၀ ကျပ် လှူဒါန်းခြင်း	၂၀၀,၀၀၀
၆၅	၁၅.၆.၂၀၁၈	သာစည်မြို့နယ်၊ ပြည်ညောင်ကျေးရွာ(ရထား)ရှိ အခြေခံ ပညာမူလွန်ကျောင်းရှိလုပ်အားပေးတာဝန်ထမ်းဆောင်နေသော ဆရာမတစ်ဦးအတွက် ဇူလိုင်လနှင့်ဩဂုတ်လအတွက် ထောက်ပံ့ကြေးငွေ ၂၆၀,၀၀၀ ကျပ်လှူဒါန်းခြင်း	၂၆၀,၀၀၀
၆၆	၁၈.၆.၂၀၁၈	သာစည်မြို့နယ်၊ မြို့သာယာလှပရေးအတွက် သာစည်ပန်းခြံ တွင်ထားရှိမည့် ထိုင်ခုံ ၂ ခုံစာအတွက် မြို့နယ်စည်ပင် သာယာရေးအဖွဲ့သို့ အလှူငွေ ၇၀၀၀၀ ကျပ်လှူဒါန်းခြင်း	၇၀,၀၀၀
၆၇	၂၅.၆.၂၀၁၈	မိတ္ထီလာခရိုင် ရဲတပ်ဖွဲ့၏ ယာဉ်/လမ်းစည်းကမ်း၊ မူးယစ် ဆေးဝါးအန္တရာယ်အသိပညာပေးလက်ကမ်းစာစောင်များ ဝေငှခြင်းလုပ်ငန်းအတွက် ကူညီထောက်ပံ့ငွေလှူဒါန်းခြင်း	၂၅၀,၀၀၀
၆၈	၂၂.၁၀.၂၀၁၈	တောင်ပြည်ညောင်မီးလင်းရေးအတွက် အလှူငွေလှူဒါန်းခြင်း	၆၆,၂၅၀,၀၀၀
စု စု ပေါင်း			**၁၆၄,၇၃၀,၁၀၀**

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
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WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 1 of 2

WW0918 022

WATER QUALITY TEST RESULTS FORM

Client: Highland Cement International Co.,Ltd.
Nature of Water: Industrial Wastewater
Location: Pyinyaung Village
Date and Time of collection: 4.9.2018
Date and Time of arrival at Laboratory: 5.9.2018
Date and Time of commencing examination: 6.9.2018
Date and Time of completing: 11.9.2018

Results of Water Analysis

WHO Drinking Water Guideline (Geneva - 1993)

pH	6.9		6.5 - 8.5
Colour (True)	10	TCU	15 TCU
Turbidity	36	NTU	5 NTU
Conductivity		micro S/cm	
Total Hardness	196	mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness	132	mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity	168	mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)	Nil	mg/l as $CaCO_3$	
Bicarbonate (HCO_3)	168	mg/l as $CaCO_3$	
Iron		mg/l	0.3 mg/l
Chloride (as CL)	7	mg/l	250 mg/l
Sodium Chloride (as NaCL)		mg/l	
Sulphate (as SO_4)	30	mg/l	500 mg/l
Total Solids	281	mg/l	1500 mg/l
Suspended Solids		mg/l	
Dissolved Solids		mg/l	1000 mg/l
Manganese		mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

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Issue No - 1.0/Page 2 of 2

WW0918 022

WATER QUALITY TEST RESULTS FORM

Client: Highland Cement International Co.,Ltd.
Nature of Water: Industrial Wastewater
Location: Pyinyaung Village
Date and Time of collection: 4.9.2018
Date and Time of arrival at Laboratory: 5.9.2018
Date and Time of commencing examination: 6.9.2018
Date and Time of completing: 11.9.2018

Results of Water Analysis

WHO Drinking Water Guideline (Geneva - 1993)

Temperature (°C)	°C	
Fluoride (F)	mg/l	1.5 mg/l
Lead (as Pb)	mg/l	0.01 mg/l
Arsenic (As)	mg/l	0.01 mg/l
Nitrate ($N.NO_3$)	mg/l	50 mg/l
Chlorine (Residual)	mg/l	
Ammonia (NH_3)	mg/l	
Ammonium (NH_4)	mg/l	
Dissolved Oxygen (DO)	mg/l	
Chemical Oxygen Demand (COD)	64 mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)	18 mg/l	
Cyanide (CN)	mg/l	0.07 mg/l
Zinc (Zn)	mg/l	3 mg/l
Copper (Cu)	mg/l	2 mg/l
Silica (Si)	mg/l	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by

Signature:

Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:

Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
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WW0918 020

WATER QUALITY TEST RESULTS FORM

Client	Highland Cement International Co.,Ltd.
Nature of Water	Industrial Wastewater (Output)
Location	Pyinyaung Village
Date and Time of collection	4.9.2018
Date and Time of arrival at Laboratory	5.9.2018
Date and Time of commencing examination	6.9.2018
Date and Time of completing	11.9.2018

Results of Water Analysis — **WHO Drinking Water Guideline (Geneva - 1993)**

pH	7.2		6.5 - 8.5
Colour (True)	Nil	TCU	15 TCU
Turbidity	2	NTU	5 NTU
Conductivity		micro S/cm	
Total Hardness	248	mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness	166	mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity	276	mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)	Nil	mg/l as $CaCO_3$	
Bicarbonate (HCO_3)	276	mg/l as $CaCO_3$	
Iron		mg/l	0.3 mg/l
Chloride (as CL)	5	mg/l	250 mg/l
Sodium Chloride (as NaCL)		mg/l	
Sulphate (as SO_4)	40	mg/l	500 mg/l
Total Solids	268	mg/l	1500 mg/l
Suspended Solids		mg/l	
Dissolved Solids		mg/l	1000 mg/l
Manganese		mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature: [signature]
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature: [signature]
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

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No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001.
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 2 of 2

WW0918 020

WATER QUALITY TEST RESULTS FORM

Client	Highland Cement International Co.,Ltd.
Nature of Water	Industrial Wastewater (Output)
Location	Pyinyaung Village
Date and Time of collection	4.9.2018
Date and Time of arrival at Laboratory	5.9.2018
Date and Time of commencing examination	6.9.2018
Date and Time of completing	11.9.2018

Results of Water Analysis | **WHO Drinking Water Guideline (Geneva - 1993)**

Temperature (°C)	°C	
Fluoride (F)	mg/l	1.5 mg/l
Lead (as Pb)	mg/l	0.01 mg/l
Arsenic (As)	mg/l	0.01 mg/l
Nitrate (N.NO_3)	mg/l	50 mg/l
Chlorine (Residual)	mg/l	
Ammonia (NH_3)	mg/l	
Ammonium (NH_4)	mg/l	
Dissolved Oxygen (DO)	mg/l	
Chemical Oxygen Demand (COD)	32 mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)	6 mg/l	
Cyanide (CN)	mg/l	0.07 mg/l
Zinc (Zn)	mg/l	3 mg/l
Copper (Cu)	mg/l	2 mg/l
Silica (Si)	mg/l	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by		Approved by	
Signature:	[signature]	Signature:	[signature]
Name:	Zaw Hein Oo B.Sc (Chemistry) Sr. Chemist ISO TECH Laboratory	Name:	Soe Thit B.E (Civil) 1980, Technical Officer ISO TECH Laboratory

(a division of WEG Co.,Ltd.)
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Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 1 of 2

WW0918 021

WATER QUALITY TEST RESULTS FORM

Client: Highland Cement International Co.,Ltd.
Nature of Water: Industrial Wastewater (Input)
Location: Pyinyaung Village
Date and Time of collection: 4.9.2018
Date and Time of arrival at Laboratory: 5.9.2018
Date and Time of commencing examination: 6.9.2018
Date and Time of completing: 11.9.2018

Results of Water Analysis

WHO Drinking Water Guideline (Geneva - 1993)

pH	6.9		6.5 - 8.5
Colour (True)	Nil	TCU	15 TCU
Turbidity	3	NTU	5 NTU
Conductivity		micro S/cm	
Total Hardness	150	mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness	102	mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity	276	mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)	Nil	mg/l as $CaCO_3$	
Bicarbonate (HCO_3)	276	mg/l as $CaCO_3$	
Iron		mg/l	0.3 mg/l
Chloride (as CL)	6	mg/l	250 mg/l
Sodium Chloride (as NaCL)		mg/l	
Sulphate (as SO_4)	43	mg/l	500 mg/l
Total Solids	251	mg/l	1500 mg/l
Suspended Solids		mg/l	
Dissolved Solids		mg/l	1000 mg/l
Manganese		mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
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WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 2 of 2

WW0918 021

WATER QUALITY TEST RESULTS FORM

Client: Highland Cement International Co.,Ltd.
Nature of Water: Industrial Wastewater (Input)
Location: Pyinyaung Village
Date and Time of collection: 4.9.2018
Date and Time of arrival at Laboratory: 5.9.2018
Date and Time of commencing examination: 6.9.2018
Date and Time of completing: 11.9.2018

Results of Water Analysis | **WHO Drinking Water Guideline (Geneva - 1993)**

Temperature (°C)	°C	
Fluoride (F)	mg/l	1.5 mg/l
Lead (as Pb)	mg/l	0.01 mg/l
Arsenic (As)	mg/l	0.01 mg/l
Nitrate (N.NO_3)	mg/l	50 mg/l
Chlorine (Residual)	mg/l	
Ammonia (NH_3)	mg/l	
Ammonium (NH_4)	mg/l	
Dissolved Oxygen (DO)	mg/l	
Chemical Oxygen Demand (COD)	32 mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)	8 mg/l	
Cyanide (CN)	mg/l	0.07 mg/l
Zinc (Zn)	mg/l	3 mg/l
Copper (Cu)	mg/l	2 mg/l
Silica (Si)	mg/l	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by

Signature:

Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by

Signature:

Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

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W0918 092

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 1 of 1

WATER QUALITY TEST RESULTS FORM

Client: Highland Cement International Co.,Ltd.
Nature of Water: Drinking Water
Location: Pyi Nyaung Village
Date and Time of collection: 4.9.2018
Date and Time of arrival at Laboratory: 5.9.2018
Date and Time of commencing examination: 6.9.2018
Date and Time of completing: 8.9.2018

Results of Water Analysis — **WHO Drinking Water Guideline (Geneva - 1993)**

pH	7.5		6.5 - 8.5
Colour (True)	Nil	TCU	15 TCU
Turbidity	1	NTU	5 NTU
Conductivity		micro S/cm	
Total Hardness	178	mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness	120	mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity	388	mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)	Nil	mg/l as $CaCO_3$	
Bicarbonate (HCO_3)	388	mg/l as $CaCO_3$	
Iron		mg/l	0.3 mg/l
Chloride (as CL)	4	mg/l	250 mg/l
Sodium Chloride (as NaCL)		mg/l	
Sulphate (as SO_4)	18	mg/l	500 mg/l
Total Solids	350	mg/l	1500 mg/l
Suspended Solids		mg/l	
Dissolved Solids		mg/l	1000 mg/l
Manganese		mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr. Chemist
ISO TECH Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980
Technical Officer
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ကျေးရွာအမည်-ကောင်းပြည့်ရှောင်--- နေ့စွဲ- 20.2.2017
10:30 AM

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁.	ဦးခင်မောင်သောင်း		ရွာခွဲခေါင်း
၂.	ဦးအောင်သန်း		ရပ်မိ/ဖ
၃.	ဦးဝင်းတင်		
၄.	ဦးညွန့်တင်		
၅.	ဦးလှမြင့်		
၆.	ဦးကိုဦး		
၇.	ဦးမောင်ရှိ		
၈.	ဦးဝင်းနိုင်		
၉.	ဦးထွန်းထွန်း		
၁၀.	ဦးတင်စိုး		
၁၁.	ဦးသန်းမြင့်		
၁၂.	ဦးဇော်လွင်ဦး		
၁၃.	ဒေါ်ဆန်း		
၁၄.	ဒေါ်ဝင်းအေး	X	
၁၅.	ဒေါ်ဘိဆွေ		

ကျေးရွာအမည်-ကောင်းပြည့်ဆောင်--

နေ့စွဲ-၂၀-၂-၂၀၁၇--

10:30 AM

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁၆.	ဒေါ်ကြည်ဝင်း		
၁၇.	ဒေါ်ကြူကြူ		
၁၈.	ဒေါ်သန်းတင်	X	
၁၉.	ဦးခိုတင်		
၂၀.	ဦးစိုးမြင့်		
၂၁.	ဦးရို		
၂၂.	ဦးတင်ဝင်း		
၂၃.	ဦးသန်းဝင်း	သန်းဝင်း	
၂၄.	ဦးဖိုးဝင် (ထွန်း)		
၂၅.	ဦးဝင်းတင် (မဝင်း)		
၂၆.	ဦးညိုတင်		
၂၇.	ဦးဝင်းရွှေ		
၂၈.	ဦးကျော်အေး		
၂၉.	ဦးဝင်းမြင့် (မူ)		
၃၀.	ဒေါ်ခင်ဝင်းဌေး	X	

ကျေးရွာ - အောင်ပြည့်ရှေသာင် -

ရက်စွဲ - ၂၀-၂-၂၀၁၇ -
10:30 AM

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၃၁.	ဒေါ်လှလှအေး		
၃၂.	ဒေါ်သန်းသန်းဆင့် (ကုလား)		
၃၃.	ဦးမျိုး (မဲ)		
၃၄.	ဦးမောင်ပို		
၃၅.	ဦးမြထွန်း		
၃၆.	ဒေါ်သင်းသင်းမာ		
၃၇.	ဒေါ်ခင်ညို		
၃၈.	ဒေါ်စန်းရီ		
၃၉.	ဦးတင်ထွန်း		
၄၀.	ဦးစိုးဦး		
၄၁.	ဒေါ်ပု		
၄၂.	ဦးကျော်စွာ		
၄၃.	ဒေါ်မြမြသင်း		
၄၄.	မလှမျိုးချို		
၄၅.	မမန်း [illegible]		

ကျေးရွာ ထောင်ပြည့်ဇောင်း

ရက်စွဲ 20.2.2017
10:30 AM

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၄၆.	ဒေါ်ခိုင်	ခိုင်	
၄၇.	ဦးစလင်းထွန်း	[illegible]	
၄၈.	ဦးဝင်းမြင့် (ငယ်)	ဝင်းမြင့်	
၄၉.	ဦးဇော်မျိုး	[illegible]	
၅၀.	ဦးထွေး	[illegible]	
၅၁.	ဦးကုလား (ထားထားဦး)	ကု	
၅၂.	ဒေါ်ပြည့်	ဒေါ်ပြည့်	
၅၃.	ကိုငွေသင်းအောင်	[illegible]	
၅၄.	ကိုစိုးပိုင်	[illegible]	
၅၅.	ကိုရဲကျော်	ကျော်	
၅၆.	ကိုဦး	ကို	
၅၇.	ဦးအောင်အောင် (ဝင်း)	[illegible]	
၅၈.	ဦးတော	[illegible]	
၅၉.	မယဉ်မြင့်	[illegible]	
၆၀.	မရီရီဦး	ဦး	

ရပ်ကွက်အမည် ကောင်းပြည့်ချောင်း ရက်စွဲ 20.2.2017

10:30 AM

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၆1.	ကိုဇော်မြင့်	ကိုဇော်မြင့်	

ကျေးရွာအမည် မြောက်ပြန့်ချောင်(ကား) + လယ်ပေါင် နေ့စွဲ ၇.၈.၂၀၁၈

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁.	ဦးဆန်းဝင်း		အုပ်ချုပ်ရေးမှူး
၂.	ဦးဝင်းဆွေဦး		
၃.	ဦးသောင်းတင်		
၄.	ဦးစိန်မြိုင်		
၅.	ဦး[illegible]မြား		
၆.	ဦးကျော်လင်း		
၇.	ဦးသက်နိုင်ဦး		
၈.	ဦးထွန်းဝင်းအောင်		
၉.	ဦးစိုးနိုင်ဦး		
၁၀.	ဦးသန်းဆွေ		
၁၁.	ဦးမြင့်စိုး		
၁၂.	ဦးကျော်စိုး (၁)		
၁၃.	ဦးမြင့်လင်း		
၁၄.	ဦးဆွေလွင်		
၁၅.	ဦးကျော်စိုး (၂)		

ကျေးရွာအမည် မြောက်ပြည်ရှောင် (ကား) + ကယ်စဉ်   နေ့စွဲ ၇.၈.၂၀၁၈

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁၆။	ဦးအောင်ခိုင်		
၁၇။	ဦးပေါ်ချို		
၁၈။	ဦးမှန်ကျား		

ကျေးရွာအမည် - အုတ်ဖိုကျောင်း + နံ့ပင်　　　　　　　　　　　　နေ့စွဲ - ၈-၈-၂၀၁၈

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁	ဦးဝင်းဇော်		ဥက္ကဋ္ဌ
၂	ဦးကြည်ဝင်း		
၃	" တင်ရွှေ (1)		
၄	" အေးဇော်		
၅	" ကျော်ကျော်		
၆	" မြင့်ဆွေ		
၇	" မောင်ကြီး		
၈	" သန်းဝင်း		
၁၀	" ချစ်ဝင်း		
၁၁	" ကျော်ဇော်မိုး		
၁၂	" ချစ်ဆွေ		
၁၃	" ဝင်းမြင့်		
၁၄	" ဦးမိုးနိုင်		
၁၅	ဦးကျော်ဟိန်		
၁၆	ထွန်းထွန်းဝင်း		

ကျေးရွာအမည်- ဘုံကျောင်း + ရုံပင်

နေ့စွဲ- ၈.၈.၂၀၁၈

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၁၇	ဦးတင်ချော	ချော်	
၁၈	ဦးစည်သူဒိုရ်	[illegible]	
၁၉	ဦးမောင်ဒေါ	[illegible]	
၂၀	ဦးစိုးသိန်းအား	[illegible]	
၂၁	မောင်ကျော်မြင့်	[illegible]	
၂၂	မြနိုင်	[illegible]	
၂၃	ကောင်း	[illegible]	
၂၄	ခင်မြင့်	[illegible]	
၂၅	မောင်ကျွင်	ကျွင်	
၂၆	မော်ကျွန်	ကျွန်	
၂၇	လွင်ထိုက်	[illegible]	
၂၈	မောင်းဝင်း	ဝင်း	
၂၉	ဝင်းနိုင်	ဝင်း	
၃၀	ဒေါ်စန်းမြင့်	[illegible]	
၃၁	ဒေါ်မမဝင်း	ဝင်း	

ကျေးရွာအမည် - [illegible] ၊ [illegible]   နေ့စွဲ - ၈.၈.၂၀၁၈

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၃၂	ဦး၊ [illegible]	[illegible]	
၃၃	[illegible]	[illegible]	
၃၄	ဒေါ်ခင်ရီငွေ၊	[illegible]	
၃၅	ကိုဝင်း၊	ဝင်း	
၃၆	ဖြိုးဝင်း၊	ဖြိုး	
၃၇	[illegible]	[illegible]	
၃၈	သန်းငွေအောင်	အောင်	
၃၉	[illegible]	[illegible]	
၄၀	ဒေါ်[illegible]	[illegible]	
၄၁	~~ဒေါ်[illegible]~~၊ [illegible]	[illegible]	
၄၂	[illegible]	[illegible]	
၄၃	ကိုငွေ၊ဝင်း၊	ဝင်း	
၄၄	[illegible]	[illegible]	
၄၅	[illegible]	[illegible]	
၄၆	[illegible]	[illegible]	
၄၇	ငွေ၊နိုင်ဦး၊	[illegible]	

ကျေးရွာအမည်-ဘုရားကျွန်း+ယုံပင် နေ့စွဲ-၈.၈.၂၀၁၅

အစည်းအဝေးတက်ရောက်သူများစာရင်း

စဉ်	အမည်	လက်မှတ်	မှတ်ချက်
၄၈	ဦးစောဒီစေတော်ဖော	[signature]	
၄၉	" ဝေဝင်းရွှေရုံး	[signature]	
၅၀	" ကော်ဦး	[signature]	
၅၁	" ရှိုဏ်ကံဖော	[signature]	
၅၂	" သာအောင်	[signature]	
၅၃	" စံသာဘဲနှံ	[signature]	
၅၄	ဒေါ်ဂျူလိုက်ခမေ	[signature]	
၅၅	ဦးမောင်ဝဇီ	[signature]	
၅၆	" မောင်ရွှေ	[signature]	
၅၇	မြင့်ကြီး	[signature]	
၅၈	" သန်းအောင်	[signature]	
၅၉	" မောင်ဝင်း	[signature]	
၆၀	" ဆိုင်းလင်း	[signature]	
၆၁	ဦးမြင့်ကျွန်	[signature]	ကျေးရွာအုပ်ချုပ်ရေးမှူး (ယုံပင်)
၆၂	ဦးဝင်းမြင့်		

List of attendees at the public consultation meeting

အမှတ် (၃) ဘိလပ်မြေစက်ရုံ၊ တန်-၁၂၀၀၊ ပြည်ညောင်

ကျောက်မီးသွေးအရည်အသွေးစမ်းသပ်မှု မှတ်တမ်း

Date	Location	Sample Name	Moisture			Mad	Aad	Vad	F/C	S	Cal/g	Hy	Hh	Lh	ARB
			Mf	Minh	Mt/Mar										
Standard					10~15		< 12%	:35~40	: > 40 %	2%					5500
8.3.2022	Kalaywa	Power 95	0.4	5.1	5.5	2.27	18.96	34.36	44.41	1.12	5876	6.11	5746	5382	5685

ဒေါ်မူစိန်ပြူး
စမ်းသပ်တာဝန်ခံ

ဒုတိယစက်ရုံမှူး (အရည်အသွေး)

Health Safety and Environment team

Health, Safety and Environment team has been formed with 6 members and headed by GM. There's also a safety committee, members of the committee are heads of departments, heads of sections and representatives of employee. With the cooperation of safety committee, HSE team is implementing a 3 years HSE plan. The aim of HSE is

- Improving site insecurity and 3 S (Organization and cleaning)
- Wearing PPE and establishing safety rules
- Safety mindset by teaching and education
- Emergency evacuation plan and fire power management
- EIA and EMP implementation
- Monitoring of ambient air, water and waste treatment
- Management of mine plan
- Clinic management and first aid treatment
- Strengthening sanitation of canteen
- Establishment and operation of other sanitary plans

In May 2018, Blue Diamond Cement laid down the Health and Security Policy and started accident free 300 days.

Regarding to the Health, Safety and Environment, Blue Diamond Cement is implementing

- Monthly measurement of ambient air quality, stack gas analysis, Noise level test. Lighting intensity, Dust content of emission from bag filter, oil content of outlet water.
- Monthly checking of clinic, canteen, quarry, fire stand, fire extinguisher, hydrant, water bowser and pump
- Regular meeting of HSE team, HSE committee, CSR consultant
- Training and drill for fire fighting, Safety training for new employee and OHS training from Labor Office and ISO awareness training.
- Reporting of incidents: Lost time injury, Fatal accident, First aid incident and near miss incident
- Reporting to Government sectors like labor office and ECD.
- Other activities like that Demarcation of Safety Zone, Practicing of night time safety patrol, distribution of safety manual booklet to every employee.

AIM of HSE

SAFETY

- Improving site insecurity and 3S (Organization & Cleaning)
- Wearing safety clothing and establishing safety rules
- Safety Mind through the production of teaching materials and education
- Emergency plan including emergency evacuation system and firepower management

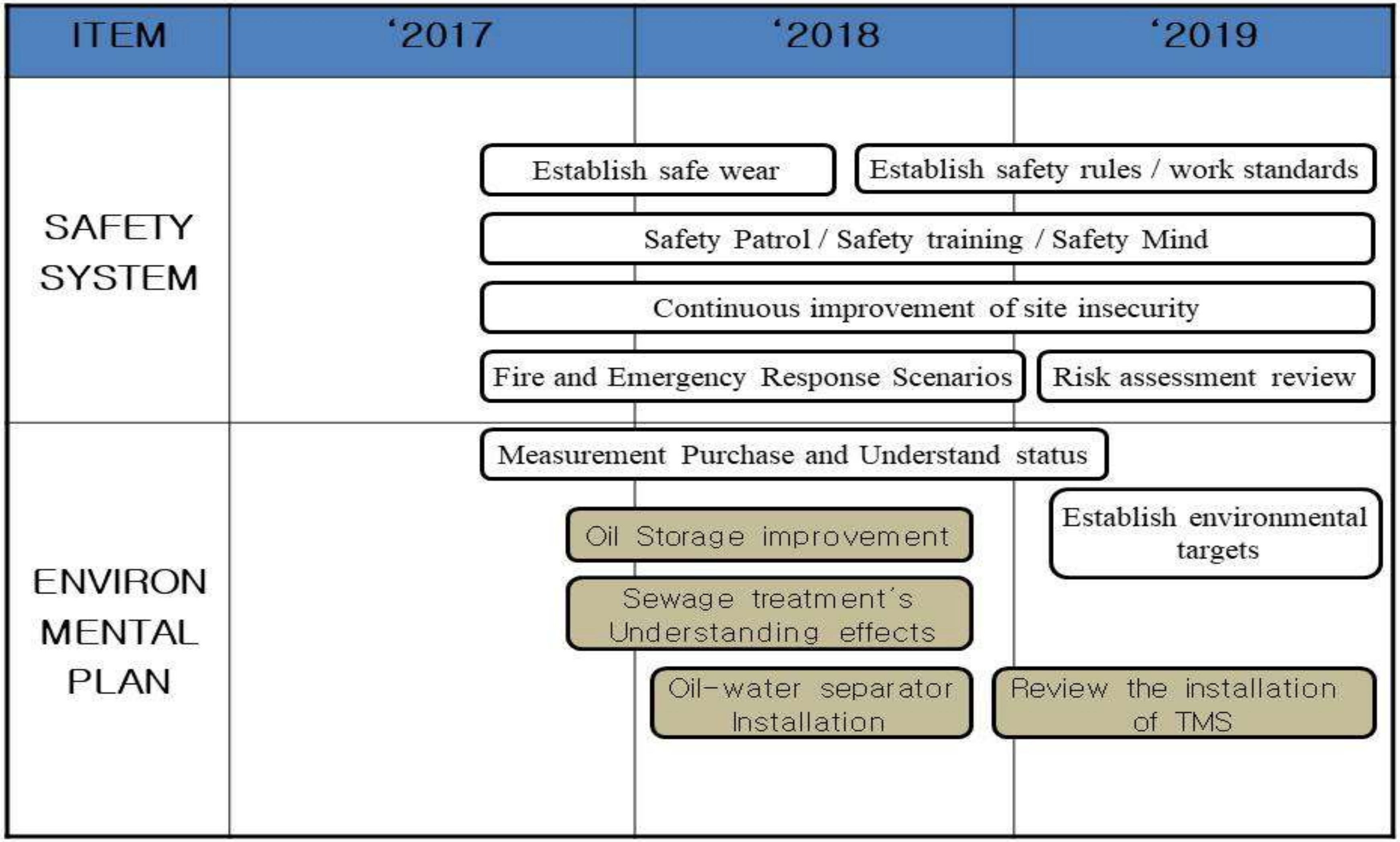
ENVIRONMENT

- EIA & EMP establishment (Purchasing meter)
- Master plan for environmental management including air, water quality and waste treatment
- Management of planting according to mining

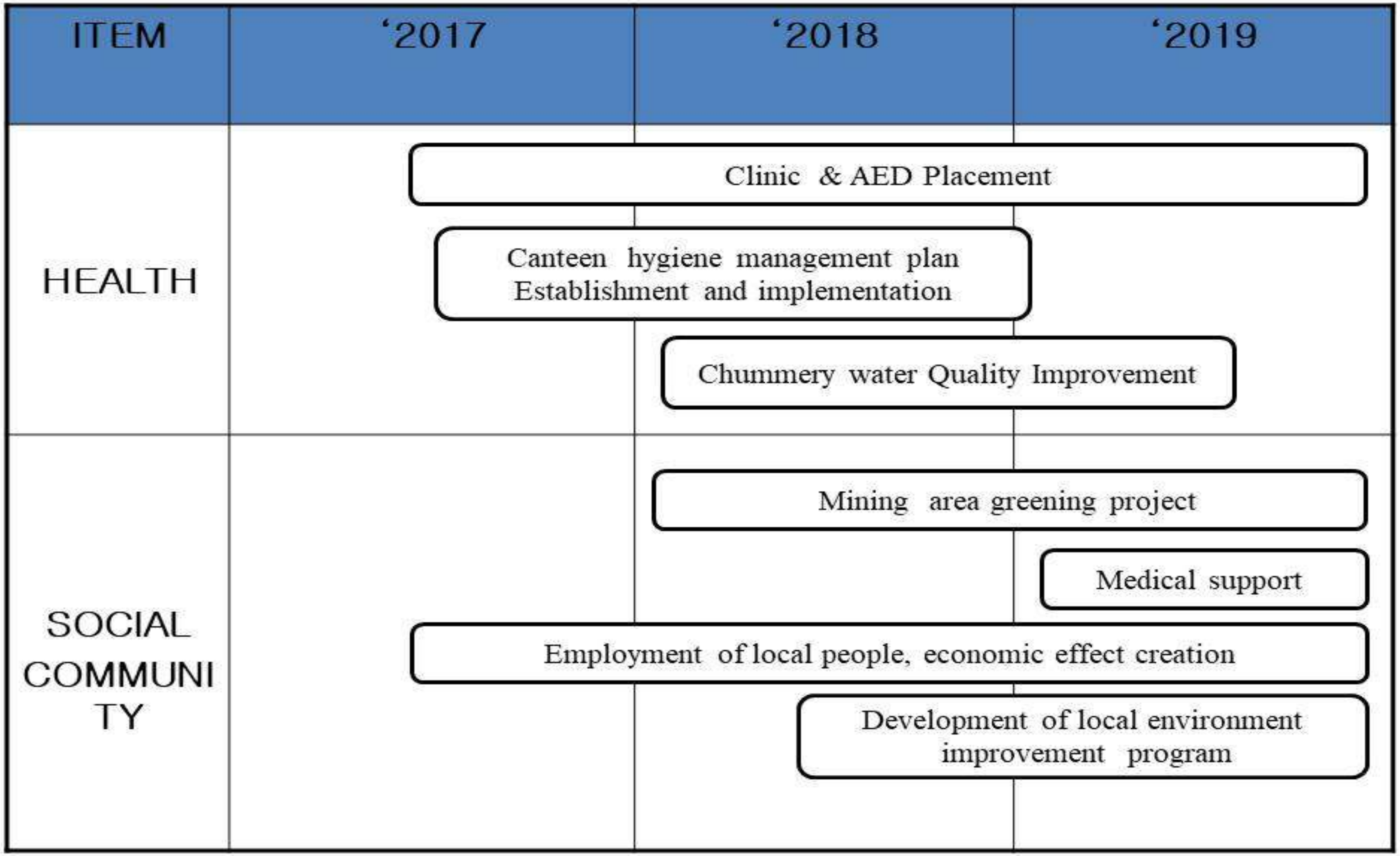
HEALTH

- Clinic management & first-aid treatment placement for employee health care
- Strengthening sanitation of Canteen
- Establishment and operation of other sanitary plans like chummery water quality

HSE PLAN


ITEM
'2017
'2018
'2019
SAFETY SYSTEM
Establish safe wear
Establish safety rules / work standards
Safety Patrol / Safety training / Safety Mind
Continuous improvement of site insecurity
Fire and Emergency Response Scenarios
Risk assessment review
ENVIRON MENTAL PLAN
Measurement Purchase and Understand status
Oil Storage improvement
Establish environmental targets
Sewage treatment's Understanding effects
Oil-water separator Installation
Review the installation of TMS

HSE PLAN


ITEM
'2017
'2018
'2019
HEALTH
Clinic & AED Placement
Canteen hygiene management plan Establishment and implementation
Chummery water Quality Improvement
SOCIAL COMMUNITY
Mining area greening project
Medical support
Employment of local people, economic effect creation
Development of local environment improvement program

Signing Ceremony of HSE policy and Internal Safety Regulation

Signing Ceremony for Safety

Health Safety Environment Team

❑ Organization

❑ Work

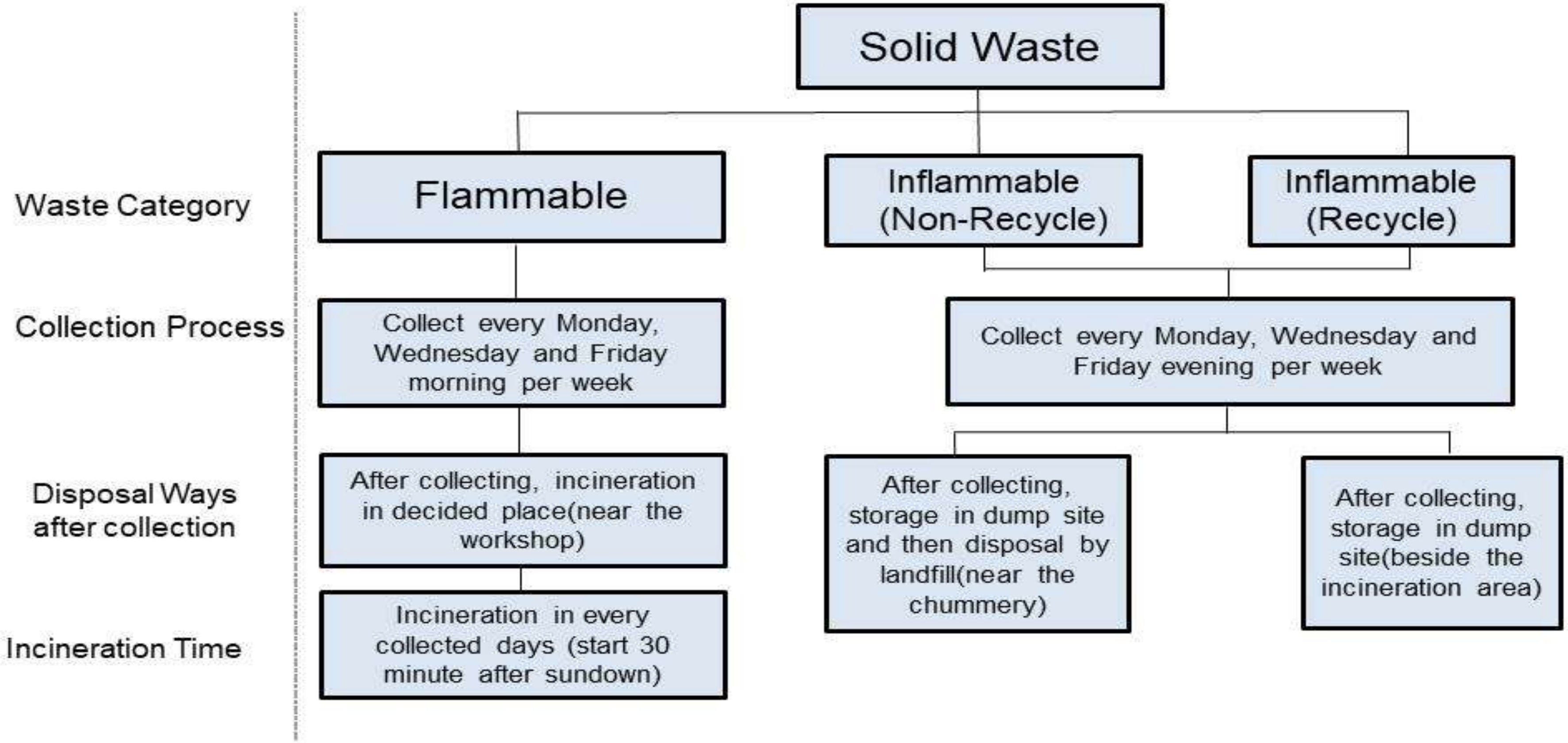
Item	Contents	
	System establishment	Detailed planning
Safety	▪ HCI & Contractor employee safety system Establish ment ▪ Emergency Planning	▪ Management of gas dangerous goods ▪ Fire Safety Management ▪ Operate safety management system
Environment / Health	▪ EMP(Environment Management Plan) Establisment & Implementation ▪ Establishment of Waste Management System in Factory	▪ Operation / management of mine plantation ▪ Atmospheric Environment Management ▪ Water Environment Management ▪ Clinic management(First Aid Kit & AED)
Quarry	▪ Establishment of mine development and production operation system	▪ Operation and management of heavy equipment ▪ Gunpowder safety management ▪ Security Management

Monthly HSE Meeting

WASTE DISPOSAL PLAN

All Kind of Waste (Plant Site)				
Waste Types	Waste Material	Effect	Places	Danger
Toxic Waste	Chemical waste/ Chemical Solution	Air Pollution Water Pollution Land Pollution	QC	Flammable Healthy Environmental
Toxic Waste	Clinic Waste Clothes with blood & other body tissue	Health Hazard	Clinic	Health, Environmental
Recycle Waste	Paper/ Plastic bottles	Land Pollution	All of department	Health, Environment
Recycle Waste	Oil/Grease Diesel	Water Pollution Land Pollution	Mechanical Operation Electrical	Flammable, Health, Environment
Recycle Waste	Iron Scrap PVC Pipe Wood	Work Place Hazard	Mechanical Electrical Utility	Work places messy and can cause accident
Recycle Waste	Tyre	Work Place Hazard	Quarry Vehicle Maintenance	Work places messy and can cause accident
Organic Waste	Kitchen Waste Vegetables Flower Food Material	Work Place Pollution Land Pollution Water Pollution Ozone Pollution	All of the Department Canteen Living House	Health, Environment

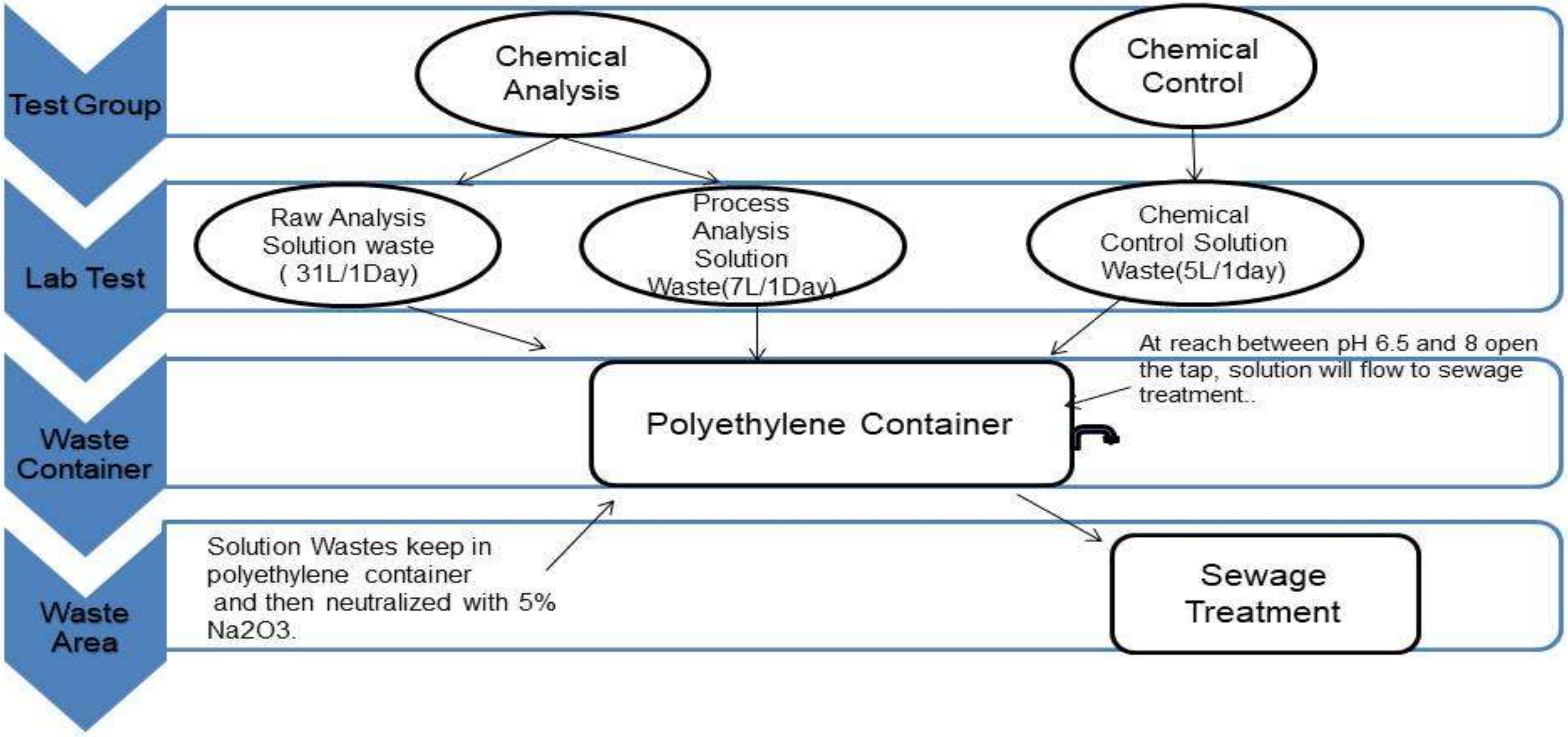
WASTE DISPOSAL PLAN



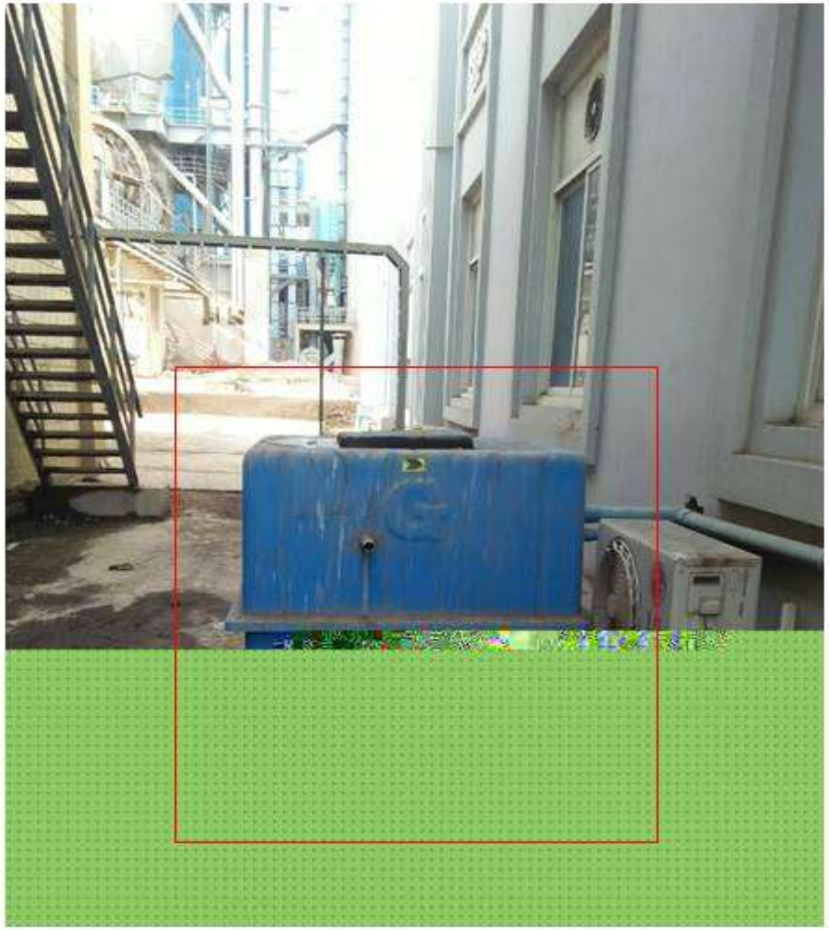
Note) Collect the recycle waste (used-oil, used-grease, used-paper and used-bottles) and sell to third party.

WASTE DISPOSAL PLAN

Standard Operating Procedure
Laboratory Solution Disposal Waste Procedure
Quality Control Department



WASTE DISPOSAL PLAN



- Collect the hazard chemical solution from QC and treatment to get pH 6-9 by chemical.
- And then the purified solution was sent to sewage treatment.
- Other chemical waste such kind of used chemical bottles dispose by landfill after cleaning.

Ambient Air Quality Measurement

Ambient Air Quality Summary

No	Parameter	NEQEG Guideline	Plan Site							Remark
			First Time (20.11.17)	Second Time (16.1.18)	Third Time (16.3.18)	Fourth Time (13.5.18)	Fifth Time (30.6.18)	Sixth Time (30.8.18)	Seventh Time (2.10.18)	
1	PM_{10} (Particular Matter 10 Micrometer	50µg/m^3	36.5µg/m^3	95.1µg/m^3	252.5µg/m^3	43µg/m^3	18.2µg/m^3	23µg/m^3	33.1µg/m^3	
2	PM 2.5(Particular Matter 2.5)	25µg/m^3	22.5µg/m^3	58.7µg/m^3	146.6µg/m^3	28.6µg/m^3	10.9µg/m^3	-	-	
3	So_2(Sulphure Dioxide)	400µg/m^3	33.7µg/m^3	32.7µg/m^3	110.9µg/m^3	122µg/m^3	222µg/m^3	120.9µg/m^3	116.8µg/m^3	
4	No_2 (Nitrogen Dioxide)	200µg/m^3	55.2µg/m^3	62.2µg/m^3	68.8µg/m^3	98.1µg/m^3	91.5µg/m^3	52µg/m^3	20.3µg/m^3	
5	Co(Carbon Monoxide)	30000µg/m^3	66.4µg/m^3	445µg/m^3	527µg/m^3	206µg/m^3	79.1µg/m^3	0.1µg/m^3	0.1µg/m^3	
6	O_3 (Ozone)	100µg/m^3	17.2µg/m^3	22.6µg/m^3	23.7µg/m^3	54.7µg/m^3	43.5µg/m^3	93.3µg/m^3	49.5µg/m^3	
7	VOC(Volatile Organic Compound)	400µg/m^3	25.2µg/m^3	205µg/m^3	24.1µg/m^3	0.6µg/m^3	25µg/m^3	-	-	
8	Co_2 (Carbon Dioxide)	Nill	-	-	-	-	-	610.9µg/m^3	593µg/m^3	
9	NO (Nitrogen Monoxide)	600µg/m^3	-	-	-	-	-	6.1µg/m^3	7.5µg/m^3	
10	HC(Hydro Carbon)	Nill	447 ppm	423 ppm	378 ppm	30435ppm	698 ppm	-	-	
11	CH_4	Nill	5489 ppm	5295 ppm	4367 ppm	4976 ppm	4153 ppm	-	-	

Amigos
International Co., Ltd.

Branch Office - No 33, 33 Street, Between 18 x 19, Aung Myae Thar Zan Township, Mandalay

Date : 15/6/2018

Service Certificate

We here by certified that Sound Level Meter, GM 1356, S/N- CX:1294185 is servicing by Amigos Service and Technical Support Department(Amigos International Co.,Ltd).

Calibration Date - 15/6/2018

Next Calibration - 15/12/2018

15/6/2018

Ywet Nu Nge
Assistant Service Engineer
Amigos International Co., Ltd

Calibration record for air sample

Kiln   Stack Emission Gas Result Measured by Apache

No	Parameter	Guide Line	First Time (23.6.17)	Second Time (9.10.17)	Third Time (2.12.17)	Fourth Time (12.1.18)	Remark
1	NO x	600mg/Nm^3	658.71mg/Nm^3	623.08mg/Nm^3	322.57mg/Nm^3	472.9mg/Nm^3	
2	So_2	400mg/Nm^3	50.11mg/Nm^3	24.56mg/Nm^3	19.07mg/Nm^3	11.1mg/Nm^3	
3	Co	625mg/Nm^3	758.13mg/Nm^3	93.64mg/Nm^3	214.93mg/Nm^3	211.55mg/Nm^3	
4	Co_2	-	6.79%	6.50%	6.66%	5.28%	
5	O_2	-	13.23%	13.58%	13.60%	14.97%	

Kiln   Stack Emission Gas Result Measured by ECD

No	Parameter	Guide Line	First Time (23.6.17)	Second Time (23.10.17)	Third Time (25.1.18)	Fourth Time (6.3.18)	Fifth Time (24.5.18)	Sixth Time (28.6.18)	Remark
1	NO x	600mg/Nm^3	658.72mg/Nm^3	356.78mg/Nm^3	267.75mg/Nm^3	-	0.151mg/Nm^3	136.22mg/Nm^3	
2	So_2	400mg/Nm^3	19.67mg/Nm^3	8.2mg/Nm^3	0.63mg/Nm^3	3.68mg/Nm^3	5.797mg/Nm^3	20.55mg/Nm^3	
3	Co	625mg/Nm^3	758.13mg/Nm^3	424.35mg/Nm^3	152.31mg/Nm^3	53.181mg/Nm^3	0.217mg/Nm^3	194.88mg/Nm^3	
4	Co_2	-	6.74%	11.59%	16.45%	8.89%	0.02%	6.73%	
5	O_2	-	13.23%	13.63%	11.21%	15.44%	20.51%	16.13%	

Note – The hired technicians have measured those (parameters that are practical and workable. Later the company will plan for the measurement of cadminium + thalium, dioxide/furans, hydrogen, chloride, hydrogen fluoride,, mercury, total metals and total organic carbon and report this in official semi-annual monitoring report.

Drinking Water Result from ISO

No.	Test Items	WHO Drinking Water	EMP Factory Law	First 17.6.17		Second 16.7.17		Third 12.1.18					Fourth 21.5.18	Fifth 4.9.18
				GM House	Chummery	Canteen	Briefing Hall	Chummery	GM House	CCR	Briefing Hall	Canteen	GM House	GM House
1	PH	6.5-8.5	6-9	7.1	7.2	8	7.9	7.6	7.5	7.9	7.6	7.9	7.5	7.5
2	Colour	15TCU (True Color Unit)	-	Nill	30	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill
3	Turbidity	5 NTU (Nephelometric Tubidity Unit)	-	7	58	Nill	1	2	2	1	1	2	Nill	1
4	Conductivity	-	-	-	-	-	-	-	-	-	-	-	-	-
5	Total Hardness	500 mg/l as $CaCo_3$	-	232	256	174	198	178	180	108	190	172	176	178
6	Calcium Hardness	-	-	-	-	-	-	-	-	-	-	-	-	120
7	Magnesium Hardness	-	-	-	-	-	-	-	-	-	-	-	-	-
8	Total Alkalinity	-	-	-	-	-	-	-	-	-	-	-	-	388
9	Phenolphthalein Alkalinity	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Carbonate($CaCo_3$)	-	-	-	-	-	-	Nill	Nill	Nill	Nill	Nill	-	Nill
11	Bicarbonate(HCo_3)	-	-	-	-	-	-	-	-	-	--	-	-	388
12	Iron	0.3 mg/l	-	0.84	1.38	0.06	0.1	0.2	0.18	0.16	0.16	0.18	0.08	-
13	Chloride(Cl)	250 mg/l	-	8	6	6	6	11	10	12	10	8	6	4
14	Sodium Chloride (NaCl)	-	-	-	-	-	-	-	-	-	-	-	-	-
15	Sulphate (SO_4)	200 mg/l	-	48	50	Nill	10	30	28	22	18	20	18	18
16	Total Solids	1500 mg/l	-	425	544	329	401	363	311	288	319	293	295	350
17	Suspended Solids	-	50 mg/l	-	-	-	-	-	-	-	-	-	-	-
18	Dissolved Solids	1000 mg/l	-	413	472	328	399	360	308	286	317	290	294	-
19	Maganese	0.05 mg/l	-	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	-
20	Phosphate	-	≤ 2 mg/l	-	-	-	-	-	-	-	-	-	-	-
21	Phenolphthalein Acidity	-	-	-	-	-	-	-	-	-	-	-	-	-

22	Methyl Orange Acidity	-	-	-	-	-	-	-	-	-	-	-	-	-
23	Salinity	-	-	-	-	-	-	-	-	-	-	-	-	-
24	Temperature	-	< 3 °C	25	25	25	25	25	25	25	25	25	-	-
25	Fluoride(F)	1.5 mg/l	-	1.1	0.8	0.2	0.5	Nill	Nill	Nill	Nill	Nill	Nill	-
26	Lead(Pb)	0.01 mg/l	-	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	-	-
27	Arsenic(AS)	0.01 mg/l	-	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	-
28	Nitrate($N.No_3$)	50 mg/l	≤ 10 mg/l	0.8	1.5	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	-
29	Chlorine	-	-	-	-	-	-	-	-	-	-	-	-	-
30	Ammonia(NH_3)	-	-	-	-	-	-	-	-	-	-	-	-	-
31	Ammonium(NH_4)	-	-	-	-	-	-	-	-	-	-	-	-	-
32	Dissolved Oxygen Demand(COD)	-	≤ 125 mg/l	-	-	-	-	-	-	-	-	-	-	-
33	Biochemical Oxygen Demand(BOD)	-	≤ 30 mg/l	-	-	-	-	-	-	-	-	-	-	-
34	Total Coliform & Fecal Coliform	-	400 mg	-	-	-	-	-	-	-	-	-	-	-
35	Cyanide(CN)	0.07 mg/l	-	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill
36	Zinc(Zn)	3 mg/l	-	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	-	-
37	Copper(Cu)	2 mg/l	-	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	-	-
38	Silica(Si)	-	-	-	-	-	-	2.8	2.6	2.6	2.2	2.8	-	-

Waste Water Result from ISO

No.	Test Items	WHO Drinking Water	EMP Factory Law	First 20.6.17	Second 14.7.17		Third 29.9.17		Fourth 25.10.17		Fifth 25.4.18		Sixth 21.5.18		Seven 26.6.18		Eight 4.9.18		Nine 11.10.18	
				Exit of factory	Exit of factory	Stream	Sewage (input)	Sewage (output)	Sewage (input)	Sewage (output)	Sewage (input)	Sewage (output)	Sewage (input)	Sewage (output)	Sewage (input)	Sewage (output)	Sewage (input)	Sewage (output)	Sewage (input)	Sewage (output)
1	PH	6.5-8.5	6-9	8.1	7.6	7.7	8	8.1	8.6	8.2	7.5	6.9	8.5	7.7	8	7.8	6.9	7.2	7.7	7.9
2	Colour	15TCU (True Color Unit)	-	-	10	80	Nill	Nill	Nill	Nill	Nill	Nill	10	5	15	Nill	Nill	Nill	Nill	Nill
3	Turbidity	5 NTU (Nephelometric Tubidity Unit)	-	-	2.3	172	10	19	7	3	18	5	16	10	22	7	3	2	14	8
4	Conductivity	-	-	-	-	-	-	-	--	-	-	-	-	-	-	-	-	-	-	-
5	Total Hardness	500 mg/l as $CaCo_3$	-	-	-	-	188	126	184	214	228	224	238	246	246	234	150	248	242	264
6	Calcium Hardness	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	102	166	162	178
7	Magnesium Hardness	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	Total Alkalinity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	276	276	276	280
9	Phenolphthalein Alkalinity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Carbonate($CaCo_3$)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Nill	Nill	Nill	Nill
11	Bicarbonate(HCo_3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	276	276	276	280
12	Iron	0.3 mg/l	-	-	-	-	0.48	0.62	0.36	0.18	0.29	0.17	0.48	0.35	0.66	0.28	-	-	-	-
13	Chloride(Cl)	250 mg/l	-	-	-	-	8	7	6	16	17	9	15	49	11	7	6	5	7	7
14	Sodium Chloride (NaCl)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	Sulphate (SO_4)	200 mg/l	-	-	-	-	30	28	52	46	30	28	35	38	62	56	43	40	40	38
16	Total Solids	1500 mg/l	-	-	-	-	251	267	238	272	418	368	428	450	455	380	251	268	310	300
17	Suspended Solids	-	50 mg/l	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	Dissolved Solids	1000 mg/l	-	-	-	-	231	238	222	260	388	358	394	430	420	360	-	-	-	-
19	Maganese	0.05 mg/l	-	-	-	-	Nill	Nill	Nill	Nill	-	-	-	-	-	-	-	-	-	-
20	Phosphate	-	$\leq$ 2 mg/l	0.88	-	-	-	-	-	-	7.9	3.2	0.6	0.08	0.96	0.08	-	-	-	-

21	Phenolphthalein Acidity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
22	Methyl Orange Acidity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	Salinity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	Temperature	-	< 3 °C	25	-	-	25	25	25	25	25	25	25	25	25	25	-	-	-	-
25	Fluoride(F)	1.5 mg/l	-	-	-	-	0.2	0.1	0.3	0.1	1.2	0.3	1.1	0.3	1.2	0.8	-	-	-	-
26	Lead(Pb)	0.01 mg/l	-	-	-	-	Nill	Nill	Nill	Nill	-	-	-	-	-	-	-	-	-	-
27	Arsenic(AS)	0.01 mg/l	-	-	-	-	Nill	Nill	Nill	Nill	-	-	-	-	-	-	-	-	-	-
28	Nitrate(N.No_3)	50 mg/l	≤ 10 mg/l	3.1	-	-	0.3	0.1	0.7	0.2	8	2.1	9.7	3.9	3.2	1.3	-	-	-	-
29	Chlorine	-	-	-	Nill	Nill	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	Ammonia(NH_3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	Ammonium(NH_4)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	Dissolved Oxygen Demand(COD)	-	≤ 125 mg/l	64	-	-	-	-	64	32	96	32	64	32	96	32	32	32	64	32
33	Biochemical Oxygen Demand(BOD)	-	≤ 30 mg/l	22	-	-	-	-	20	9	28	12	27	12	28	12	8	6	20	12
34	Total Coliform & Fecal Coliform	-	400 mg	-	20/12	48/20	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	Cyanide(CN)	0.07 mg/l	-	-	-	-	Nill	Nill	Nill	Nill	-	-	-	-	-	-	-	-	-	-
36	Zinc(Zn)	3 mg/l	-	-	-	-	Nill	Nill	Nill	Nill	-	-	-	-	-	-	-	-	-	-
37	Copper(Cu)	2 mg/l	-	-	-	-	Nill	Nill	Nill	Nill	-	-	-	-	-	-	-	-	-	-
38	Silica(Si)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Industrial Water Result from ISO

No.	Test Items	WHO Drinking Water	EMP Factory Law	First 20.6.17	Second 20.6.17		Third 28.7.17					Fourth 18.9.17			Fifth 3.12.17			Sixth 18.2.18			Seven 21.5.18	Eight 26.6.18	Nine 4.9.18
				Stream	Exit of factory	Stream	Stream	Purifier	Cooling Water Tank	Cooling Water Tank Return	Spray Water	Stream	Cooling Water Tank	Cooling Water Tank Return	Stream	Cooling Water Tank	Cooling Water Tank Return	Stream	Cooling Water Tank	Cooling Water Tank Return	Stream (Tank)	Exit of factory	Exit of factory
1	PH	6.5-8.5	6-9	8.5	8.1	8.8	7.4	7.3	7.9	8	7.8	7.7	8.2	8.3	-	-	-	7.5	8.4	8.5	7.5	8.2	6.9
2	Colour	15TCU (True Color Unit)	-	180	-	-	Nill	Nill	Nill	Nill	Nill	10	Nill	Nill	-	-	-	Nill	Nill	Nill	Nill	50	10
3	Turbidity	5 NTU (Nephelometric Tubidity Unit)	-	310	-	-	2	1	2	2	2	22	2	3	-	-	-	2	2	2	1	82	36
4	Conductivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	Total Hardness	500 mg/l as $CaCo_3$	-	260	-	-	188	186	186	190	204	200	216	204	324	228	224	216	266	268	132	188	196
6	Calcium Hardness	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	132
7	Magnesium Hardness	-	-	-	-	-	-	-	-	-	-	-	-	-	52	58	60	-	-	-	-	-	-
8	Total Alkalinity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	168
9	Phenolphthalein Alkalinity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Carbonate($CaCo_3$)	-	-	-	-	-	-	-	-	-	-	-	-	-	Nill	Nill	Nill	-	-	-	-	-	Nill
11	Bicarbonate(HCo_3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	168
12	Iron	0.3 mg/l	-	2.88	-	-	0.15	0.12	0.22	0.21	0.16	0.68	0.2	0.25	-	-	-	0.25	0.21	0.22	0.1	1.88	-
13	Chloride(Cl)	250 mg/l	-	10	-	-	7	6	7	11	6	6	6	7	-	-	-	6	7	6	8	5	7
14	Sodium Chloride (NaCl)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	Sulphate (SO_4)	200 mg/l	-	64	-	-	45	40	20	20	25	18	32	33	-	-	-	28	22	25	22	38	30
16	Total Solids	1500 mg/l	-	-	-	-	403	402	284	283	313	400	226	233	-	-	-	280	265	272	253	353	281
17	Suspended Solids	-	50 mg/l	-	52	288	-	-	-	-	-	-	-	15	8	5	-	-	-	-	-	-	-
18	Dissolved Solids	1000 mg/l	-	180	-	-	-	-	-	-	-	370	221	226	-	-	-	-	-	-	250	243	-
19	Maganese	0.05 mg/l	-	-	-	-	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	-	-	-	-	-	-	Nill	Nill	-
20	Phosphate	-	≤ 2 mg/l	-	0.88	0.92	-	-	-	-	-	-	-	-	-								

21	Phenolphthalein Acidity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	Methyl Orange Acidity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	Salinity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	Temperature	-	< 3°C	25	25	25	25	25	25	25	25	25	25	25	-	-	-	25	25	25	-	-	-
25	Fluoride(F)	1.5 mg/l	-	-	-	-	-	-	-	-	-	0.8	1	1	-	-	-	-	-	-	Nill	0.8	-
26	Lead(Pb)	0.01 mg/l	-	-	-	-	-	-	-	-	-	Nill	Nill	Nill	-	-	-	-	-	-	-	-	-
27	Arsenic(AS)	0.01 mg/l	-	-	-	-	-	-	-	-	-	Nill	Nill	Nill	-	-	-	-	-	-	Nill	Nill	-
28	Nitrate(N.No_3)	50 mg/l	≤ 10 mg/l		3.1	1.8	0.6	0.8	0.6	0.5	0.6	0.3	0.1	0.2	-	-	-	Nill	Nill	Nill	Nill	0.5	-
29	Chlorine	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	Ammonia(NH_3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	Ammonium(NH_4)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	Dissolved Oxygen Demand(COD)	-	≤ 125 mg/l	-	64	96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	64
33	Biochemical Oxygen Demand(BOD)	-	≤ 30 mg/l	-	22	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
34	Total Coliform & Fecal Coliform	-	400 mg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
35	Cyanide(CN)	0.07 mg/l	-	-	-	-	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	-	-	-	-	-	-	Nill	Nill	-
36	Zinc(Zn)	3 mg/l	-	-	-	-	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	-	-	-	-	-	-	-	-	-
37	Copper(Cu)	2 mg/l	-	-	-	-	Nill	Nill	Nill	Nill	Nill	Nill	Nill	Nill	-	-	-	-	-	-	-	-	-
38	Silica(Si)	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2	3.8	3.7	-	-	-	-	-	-

Noise (Sound) and Light Measurement

LIGHTING TEST

Lighting Result													
Department :	H.S.E					Edit :	Yan Shin			Date :	10.1.18		
Ware House - Lighting Result													
Location	NO.	1	2	3	4	5	6	7	8	9	10	Average LUX	Total Average
Ware House	A1	124.2	115.3	118.2	108.1	105.4	115.2	107.3	118.3	108.5	115.8	113.63	83.528
	A2	133.4	129.1	120.2	121.5	116.4	121.5	129.3	124.6	116.2	120.5	123.27	
	A3	78	30.9	28.9	29.7	28.1	29.9	24.6	30.5	70.4	29.9	38.09	
	A4	44.5	45.8	44.9	43.9	45.3	43.7	32.9	36.9	31.9	44.9	41.47	
	A5	101.4	98.4	101.6	98.3	101.4	102.1	105.2	103.4	98.4	101.6	101.18	
Coal Pre-Blending - Lighting Result													
Location	NO.	1	2	3	4	5	6	7	8	9	10	Average LUX	Total Average
Coal Pre-blending	A1	83.3	94.2	75	77.8	84.6	84.2	88.4	77.3	93.2	80.5	83.85	
	A2	127.3	29.3	30.7	31.2	30.4	30.4	33.4	33.5	34.5	31.5	41.22	
	A3	127.3	29.3	30.7	31.2	30.4	30.4	33.4	33.5	34.5	31.5	41.22	
	A4	19.6	19.2	19.3	18.8	18.4	17.3	17.8	18.5	19.3	18.7	18.69	
	A5	101.9	102.2	119.3	127.1	133.1	131.8	129	125.7	119.8	102.5	119.24	
	A6	121.2	173.7	163.2	159.2	162.5	195.4	197.2	161.5	163.7	123.6	162.12	

SOUND TEST

Highland Cement International Co., Ltd
Blue Diamond Cement Factory

Sound Test (Noise) For Environmental 19.3.18

Location	State		Day	Time	1 mins (dBA) 1	2	3	4	5	Average 5 mins	Average dBA
Cement Mill	Running	Infront		8:00 AM - 10:AM	94.20	94.80	95.70	95.30	94.80	94.96	93.17
		Behind			96.40	95.30	96.60	95.20	96.40	95.98	
		Left Side			88.60	88.50	88.80	88.50	88.40	88.56	
		Right Side			94.50	93.90	92.20	94.50	90.70	93.16	
Coal Mill	Running	Infront			94.10	95.70	95.10	94.90	92.70	94.50	90.91
		Behind			94.20	94.30	95.70	94.80	96.10	95.02	
		Left Side			83.30	83.50	83.40	82.80	83.90	83.38	
		Right Side			93.50	89.80	91.20	89.40	89.80	90.74	
Kiln	Running	Infront			97.20	96.20	96.50	96.70	97.40	96.80	94.34
		Behind			94.20	94.30	95.70	94.80	96.10	95.02	
		Left Side			93.50	89.80	91.20	89.40	89.80	90.74	
		Right Side			93.20	94.50	95.20	94.90	96.20	94.80	
Raw Mill	Running	Infront			96.10	96.40	96.90	96.60	96.80	96.56	96.39
		Behind			98.20	98.30	97.60	98.70	98.50	98.26	
		Left Side			95.30	96.60	95.90	96.50	96.40	96.14	
		Right Side			93.20	94.20	94.40	95.50	95.70	94.60	
Road (infrond of the CCR)					72.10	74.10	72.30	72.90	76.10	73.50	73.50
Security Gate -1					56.60	57.20	58.40	58.70	57.60	57.70	57.70
Security Gate -2					60.40	64.70	69.40	65.50	64.20	64.84	64.84
Security Gate -3 & Jaw Crusher					85.10	83.20	79.20	79.10	85.30	82.38	82.38

Remark =All of the machine is running during the noise test

WATER FLOW RATE OF MYITTHAR STREAM

Water flow rate of Myit Thar stream in gallon per hour is measured every month since 2013, construction period.

Sr	Month	2013	2014	2015	2016	Remak
1	January		427500	399735	366174	
2	February		369830	389074	311385	
3	March	429300	237325	298970	247320	
4	April	469350	220050	310770	375144	
5	May	665325	327539	392708	543240	
6	June	427275	497448	497568	581338	
7	July	573012	462369	549724	718216	
8	August	728022	3668895	561420	1942200	
9	September	639900	1131206	588315	2035530	
10	October	1141875	1080246	872380	3640037	
11	November	1715175	956868	692065		
12	December	803655	516375	650947		
	Average	**759288.9**	**824637.6**	**516973**	**1076058**	

Unit gallons /hour

The daily water consumption is as follows; it is about 1% of stream.

Unit Gallons/day

Sr	Month	Domestic use	Cooling Water	Daily water consumption (gallon/day)
1	2018 January	59797	81677	141474
2	February	101624	58779	160403
3	March	131120	38954	170074
4	April	113887	52044	165931
5	May	115088	46974	162062
6	June	108401	44044	152445
7	July	89646	26648	116294
8	August	137287	42878	180165
9	September	137353	51561	188914
10	October	112980	44220	157200

Monthly Checking of Clinic & Canteen

Identify Unsafety Places

Safety Patrol, Training, Toolbox Meeting &Visitor Safety Precaution

Internal Security Team

Main Machinery and Capacity

Sr	Item	Manufact;	Unit	Capacity	Power (KW)	Remark
1	limestone Crushing and Conveying					
	Apron Feeder		m3/hr	100~350	37	
	Primary Crusher	NHI	Ton/hr	250~400	185	PE 1200-1500
	Secondary Crusher	NHI	Ton/hr	250~350	560	PCD 1818
2	Limestone Preblending and Conveying					
	Stacker		Ton/hr	250	48	
	Scraping Reclaimer		Ton/hr	150	95	
3	Combined Storage Shed Additive					
	Materials Crushing and Conveying					
	Heavy Load Apron Feeder		Ton/hr	30~120	11	
	Hammer Crusher		Ton/hr	60~90	75/55	
	Jaw Crusher		Ton/hr	20~52	55	
4	Coal Shed,Coal Crushing and Conveying					
	Vibrating Feeder		Ton/hr	80	3	
	Hammer Crusher		Ton/hr	80	45	
5	Raw Coal Drying and Conveying					
	Horizontal Crusher		Ton/hr	9~12	7.5	
	Blower		m3/hr	40000	110	
6	Raw Material Proportioning and Conveying Dryer		Ton/hr	30	110	
	Hammer Crusher			110~150		

Main Machinery and Capacity

7	Raw Material Grinding, Kiln Mill Dust Handling					
	Raw Mill (ø 3.8*8.6m)	NHI	Ton/hr	100~120	1600	
	Fan (ID)		m3/hr	360000	1120	
	Air Separator		Ton/hr	120~140	110	
	Fan (Air Separator)		m3/hr	205000	560	
	Exhaust Fan		m3/hr	360000	1120	
8	kiln					
	Rotary kiln (ø 3.5*54m)		Ton/day	1800	250	
9	Clinker Colling & Exhaust Gasd Trement					
	Clinker Cooler		Ton/day	1500	2*37	
	Clinker Crusher Motor				45	
	Exhaust Fan		m3/hr	240000	185	
10	Coal Grinding System					
	Coal Ball Mill (ø 3.0*6+3m)		Ton/hr	14~16	630	
	Dynamic Separator		Ton/hr	16~18	22	
11	Gypsum Admixture Storage Shed, Crushing & Conveying					
	Jaw Crusher		Ton/hr	15~32	37	
12	Cement Mill					
	Mill#1 (ø 3.2*13m)		Ton/hr	40~ 45	1600	
	Mill#2 (ø 3.2*13m)		Ton/hr	40~45	1600	
13	Cement Packing					
	Bagged Cement Loading Machine(1)		Ton/hr	120		
	Bagged Cement Loading Machine(2)		Ton/hr	120		

Kiln

Electro static precipitator

Satellite image of Project Site and Explosive Magazines

Explosive Magazines(50 ton)

Explosive Magazines(13 ton)

Highland Cement International Co.,Ltd

Blue Diamond Cement Factory

Oil Result (Exit of Industrial & Sewage Treatment)

Department : H.S.E **Date : 2. 4 . 2018**

Name : Yan Shin

Instrument : Oil Contact Analyzer

OCMA-500 / HORRIBA

Location : Sewage Treatment and Exit of Industrial

Parameter	Result	Guideline	Location
Oil	49.9 mg/l	10 mg/l	Sewage Treatment
Oil	45.7 mg/l	10 mg/l	Exit of Industrial

Environmental Management System of Quarry

-The environment management plan has been prepared for subject opencast or fully mechanized mining operation for limestone production with capacity of 269,000 m^3per year.

-The EMP list out all these measures for the mining activities .

-The EMP is prepared keeping in view of all possible strategies oriented towards impact minimization.

-It is observed that quarry area is recorded as decreased forest land .

-Two quarry work site area(No.1 Nyaungbintaung work site and No.2 Thayetyaechaung work site) are adjacent and one another quarry (Max Myanmar Quarry Area) is located in the 6 km radius .

-One village and one creek are located near to quarry area .

-The management as a part of environment policy declared its responsibility and commitment to protect the environment and to ensure the public safety.

-To realize the implementation of its environmental policy , project management should give proper structure to environmental management system .

Environmental Management System of Quarry

The Environmental Management System for Quarry Site are as follow.

1. Air Environment
   1) Dust Control
      (i) Haul Road and Dumping
2. Noise Environment
   1) Drilling
   2) Blasting
   3) Mitigation Measure to Reduce Ambient Noise Levels
   4) Measure to Protect Workers From High Noise Levels
3. Land Environment and Waste Management

Air Environment

-The potential sources of air pollution arising from the existing is observed from excavation of limestone, waste dumping, haul roads and transportation of limestone in the vicinity .

-Air pollution caused by mining and associated activities can be classified into the following ,

- Gaseous pollutants (Nitrogen Oxides , Carbon Monoxides) and
- Particulate Matter .

Air Environment

1) Dust Control

-Dust is the major pollutant generated from the mining operations.

-Dust is also generated during handling and transportation of the limestone and waste rock.

-Because of the test result is out of guideline, controlled by Water spraying in Haul Roads and Dumping Site.

Air Environment

1) Dust Control (Haul Road and Dumping Site)

-Following measures has been taken to mitigate the effect of limestone mining operation over ambient air environment :

- Frequent Water spraying has already been carried out on the haulage roads, access roads (service roads) & dump area and same practice will continue in future also .
- Considering the location of village (south west direction) , dumping has been done in south east and north direction .
- Less amount of over burden and top soil are covered on limestone quarry area and dumping will not be left active for longer period and will be used for reclamation purposes.
- Over burden and waste dumping has been collected and some are used in main roads earth shoulder filling , other access roads laying and filling for limestone stock pile area . By this way, maintained and prevented the erosion of soil .

Air Environment

2) Dust Control (Haul Road and Dumping Site)

-Following measures has been taken to mitigate the effect of limestone mining operation over ambient air environment :

- Water has already been sprayed over the muck pile and dumping site to reduce the dust generation .
- Dust mask has already been provided to all workers .
- Regular maintenance of vehicles and machines has been carried out in order to control emissions .

Emission Sources and Control Options

Operation or Sources	Control Options
Mining Operations	
Loading	Water wetting
Hauling (emissions from roads)	Water wetting , soil stabilization , Traffic control .

All above measures is expected to be continue in future .

Air Environment

1) Dust Control (Water Spraying Condition in Haul Road and Dumping Site)

Air Environment

1) Dust Control (Water Spraying Condition in Haul Road and Dumping Site)

Noise Environment

-The following measures are practically operating ways in order to further control the noise levels in the work zone.

1)Drilling

1. Hydraulic Crawler Drill has been used for drilling;
2. All moving parts are properly lubricated ; and
3. Non-moving parts are properly fastened .

Mitigation Measurement to reduce Ambient Noise Levels

The following control measures are being adopted to keep the ambient noise levels well below the limits :

- Trees shall be planted on both sides of main roads .
- Proper maintenance has been done of noise generating machinery including the transport vehicles ;
- Regular maintenance of machines and vehicles have been properly lubricated , Non-moving parts of machine have been properly fastened .

Measure To Protect Workers from High Noise Levels

The following measures have been taken to protect the workers from exposure to higher noise levels :

1. Noise is considered as an occupational hazard . Blasting is an occasional and impulsive event , which needs to be carried out in an isolated manner .

2. The working at the mining face , where high noise level is expected , has been provided with protective device for occupational safety .

3. Compulsory use of personal protective equipment (PPE) such as ear plugs for the workers .

Noise Environment (Mixe Explosion)

-The main source of noise in mining activity is drilling , blasting , excavation & transportation of limestone .

-There are one village observed within 850 m ranges from limestone quarry.

-Therefore , noise level is insignificant as the operations and is an intermittent nature.

-The prevailing evening noise level at village reported are between 49.3-54.3 dBA.

Near Yahtar Pyin Nyaung Village

No	Sample Point	Average (dBA)	Total Average (dBA)
1	Location 1	53.4	52.35
2	Location 2	52.4	
3	Location 3	49.3	
4	Location 4	54.3	

Noise Environment

Noise Environment (Locations of Noise Measurement)

Land Environment and Waste Management

-Total area of quarry is 950 acres and about 50 acres has already been developed at work site No.2 for production.

-During the life of mine total 100 acres will be excavated and 147 acres will be reclaimed using mine waste, overburden and soil.

-Some of waste rock and overburden used for backfilling the stock pile areas and roads construction works. By this way, maintained the surface soil erosion and controlled the waste disposal.

Land Environment and Waste Management

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