INITIAL ENVIRONMENTAL EXAMINATION

1000 TELECOMMUNICATION TOWERS AND 32,000 KM FIBER OPTIC CABLE BACKBONE NATIONAL NETWORK PROJECT MYANMAR

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Prepared for
Myanmar Fiber Optic Communication Network Co. Ltd

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List of Abbreviations

3G	Third Generation
BTS	Base Transceiver Station
CL	Central Lowland
CHS	Circular Hollow Section
CNC	Computer Numerical Control
CGI	Corrugated Galvanized Iron
DICA	Directorate of Investment and Company Administration
DA	Double Amour
EH	Eastern Highland
EMF	Electrical and Magnetic Fields
ECL	Environment Conservation Law
ESMP	Environmental and Social Management Plan
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FIL	Foreign Investment Law
FOC	Fiber Optic Cable
GPS	Global Positioning System
GSM	Global System for Mobile Communication
HSE	Health, Safety and Environment
HVAC	Heat, Ventilation and Air Conditioning
ICT	Information and Communication Technologies
ICAO	International Civil Aviation Organization
IEC	International Electro-technical Commission
IEE	Initial Environment Examination
IR LED	Infrared Light Emitting Diode
ISO	International Organization for Standardization
IFC	International Finance Corporation
LW	Light Weight
LWP	Light Weight Protected
M&E	Mechanical and Electrical
MCIT	Ministry of Communications and Information Technology
MICT	Myanmar Information Communication and Technology
MOECAF	Ministry of Environmental Conservation and Forestry
MoF	Ministry of Forestry
MFOCN	Myanmar Fiber Optic Communication Network
MIC	Myanmar Investment Commission
NCEA	National Commission for Environmental Affairs
OLS	Obstacle Limitation Surface
OP-AMP	Optical-Amplifier
PGA	Peak Ground Acceleration
PPE	Personal Protective Equipment
POP	Point-of-Presence
PVC	Poly Vinyl Chloride
PSHA	Probabilistic Seismic Hazard Assessment
RoW	Right of Way

SA	Single Amour
SIA	Social Impact Assessment
SARP	Standards and Recommended Practices
UNE	Unbundled Network Element
VOC	Volatile organic Compound
WFB	Western Fold Belt
WTO	World Trade Organization
YCDC	Yangon City Development Committee

Executive Summary

Introduction

Myanmar Fiber Optic Communication Network Company Ltd. ("MFOCN"), a privately-owned company and telecommunication infrastructure provider, proposes to significantly expand the existing wireless communication network and services for telecommunication service providers in Myanmar.

The project includes two components: the construction of 1000 communication towers or Base Transceiver Station (BTS) towers; and a 32,000 km Fiber Optic Cable (FOC) network across Myanmar. The activities envisaged by the project include land and right-of-way (RoW) acquisition, land clearing, arrangement of access roads to towers where required, construction of foundations and towers, tower erection and cable laying, and the installation of related appurtenances and equipment.

Environmental Approval

This Initial Environmental Examination (IEE) has been prepared in accordance with Myanmar's Environmental Conservation Law, 2012 and Draft EIA Procedure, 2014 as well as policy requirements from state and regional government. The IEE includes an Environmental Management Plan (EMP) as requested by the Ministry of Environmental Conservation and Forestry (MOECAF) and defines a mechanism for implementing mitigation measures for expected negative impacts and to monitor the efficiency of these mitigation measures based on relevant environmental indicators.

Project Description

Project site selection and routing (Right of Way) studies have been undertaken in 2012 to 2014 to identify preferred tower locations and the corridor for the construction of the proposed 32,000 km underground FOC connecting Base Transceiver Stations (BTSs) and substations. The main considerations during the selection were: the ease of access for construction and maintenance; and the constructability of the tower and cable route taking into account the topography, environmental constraints and ground conditions, including areas prone to landslides. Special attention was given to the social sphere in order to minimize impacts on the local population, agricultural land, visual significance, cultural heritage and traffic safety. Tower locations and the routing for the back bone FOC have been chosen based on community needs for additional projects, with specific sites then chosen based on geographic and topographic characteristics.

The area of land required for individual BTS and tower sites averages 300 m^2. Cable installation is executed using specialized trenching tractors which cut the trench to a depth of 1m and remove the soil in a single action. The trench will have a minimum 6-inch-wide opening, which can be used to accommodate multiple cables over long or short distances. Upon backfilling the trench surface will be restored to equal or better quality as compared to the original condition

A total of 1000 towers will be constructed by 2017, as will the 32,000 km length backbone FOC network.

Existing Environment

The project has the potential to impact on the existing environment at numerous locations throughout Myanmar. Consequently, an overview of the Myanmar environment is presented, as is a Hazard Profile of Myanmar.

Environmental Impact Assessment

Project impacts are addressed for the following project phases:

- Preconstruction
- Construction
- Operations and Maintenance

The identified potential impacts anticipated from the implementation of the Project and proposed mitigation measures are discussed in Chapter 5, and cover the following topics:

- Soil erosion
- Air pollution
- Noise and vibration
- Solid waste and hazardous waste generation
- Sanitary and Sullage wastewater generation
- Hazardous Materials
- Ecology including migratory birds
- Sites of Cultural and Historical Significant
- Vegetation loss
- Visual/ aesthetics
- Traffic
- Occupational health and safety including fiber optic and electromagnetic field (EMF) hazards

The Environmental Management Plan (EMP)

The EMP aims at defining a mechanism for implementing mitigation measures for expected negative impacts and to monitor the efficiency of these mitigation measures based on relevant environmental indicators. The EMP identifies certain roles and responsibilities for different stakeholders for implementing, supervising and monitoring the environmental performance of the project.

The EMP has distinguished between mitigation measures that should be implemented pre-construction and during the construction and operation of the project.

The objectives of the EMP are to:

- Provide practical and achievable plans for the management of the project specifically ensuring that environmental requirements are complied with, by providing for the monitoring and control of the predicted impacts.
- Provide MFOCN and the regulatory authorities with a framework to confirm compliance with environmental policies and requirements, and
- Provide the community with evidence of the management of the project in an environmentally and socially acceptable manner.

This EMP provides the delivery mechanism to address the adverse environmental impacts of the proposed project during its implementation, to enhance project benefits, and to introduce standards of good practices to be adopted during all project stages.

Information Disclosure and Stakeholder Engagement

Consultation with relevant stakeholders has been an integral part of the Project preparation. The Project Proponent, since the initiation of the project development in 2012, has carried out consultations with stakeholder groups including:

- Government agencies such as:
  - Yangon City Development Committee (YCDC),
  - Ministry of Environmental Conservation and Forestry (MOECAF),
  - Myanmar Investment Commission (MIC),
  - Ministry of Post and Telecommunication,
  - Ministry of Communications and Information Technology (MCIT),
  - Ministry for Construction, and
  - regional administrations;
- Regional Authorities from Myawaddy, Muse, Lashio, Yangon and Pathein, among others;
- NGOs active in Myanmar;
- Customers and corporate clients of the MFOCN;
- Communities in the vicinity of the sites; and
- Phone operators in Myanmar.

This IEE carried out for the project will be available for access and consultation. Specifically, the IEE with the EMP will also be available for consultation in English at MFOCN office at MICT Park; and the same on its corporate website. The final version of the EMP in English will be available to interested parties at the Project office on site.

Conclusion

The IEE of the project indicates that the predicted impacts arising from the construction and operational phases of the Project can be effectively mitigated and minimized to meet regulatory requirements with the implementation of appropriate mitigation measures. To ensure the effectiveness of the mitigation measures, the EMP for the Project which includes requirements for environmental monitoring, has been developed. The EMP, presented in Chapter 7, will be finalized upon receipt of feedback from the regulatory agencies.

1. INTRODUCTION

ENVIRON MYANMAR Company Ltd ("ENVIRON"), an independent environmental consultant, has been appointed by Myanmar Fiber Optic Communication Network Company Ltd ("MFOCN") to submit the Initial Environmental Examination (IEE) and Environmental Management Plan (EMP) in compliance with the requirements of Myanmar's Environmental Conservation Law, 2012 and Draft EIA Procedure of 2014 (6th revision).

MFOCN is a subsidiary of HyalRoute Communication Group Limited. The core business activities are to provide telecommunication infrastructure in Myanmar. The company has a portfolio of over 1,000 towers to be located across Myanmar with the objective to help bring in connectivity at affordable prices to the poorest of poor, and creating a positive impact on the Myanmar economy. A wholly foreign owned investment company, MFOCN is private limited company registered in Myanmar and has emerged at the forefront of telecommunication infrastructure companies through construction of telecommunication towers, base transmission/ transceiver stations, a Fiber Optic Cable (FOC) network and related facilities. It is registered with the Directorate of Investment and Company Administration ("DICA") of Myanmar and Ministry of Communication and Information Technology ("MCIT"), as an Infrastructure Provider. MFOCN has a portfolio of fiber serving all the major cellular operators and is associated with prestigious projects being promoted in the Information and Communication Technologies (ICT) Development Strategy of Myanmar. The company collaborates with local contractors in bringing network stations, a backbone FOC network, transmission towers, and related infrastructure, nationwide. The telecommunication infrastructure allows access for and cost sharing with service providers to cater to the high demand in telecommunication needs in Myanmar. The business model of infrastructure sharing is based on building, owning, operating and maintaining the passive telecom infrastructure sites capable of hosting multiple service providers. The model also enables the operator to convert their capital expenditure to a fixed and predictable operational expenditure allowing them to divert precious capital towards core activities. MFOCN aims to be the most efficient and environment friendly telecom Infrastructure Company.

In Myanmar, there has been a substantial growth in the use of mobile (wireless) communication services over the last few years and this growth is expected to continue for the near future with the introduction of the 3rd Generation (3G) mobile technologies. With this growth comes the inevitable increase in the number of Base Transceiver stations (BTSs) and towers, accompanied by public concern for possible impacts of these communication systems.

This, in line with Myanmar's Environmental Conservation Law, 2012 and Draft EIA Procedure, 2014, as well as policy requirements from both the state and regional governments, an Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) should be conducted for the construction of telecommunications infrastructure based on the MOECAF's Classification to the type and capacity of the industry, which states,:

'The erection or construction of communication networks including towers, telecommunication lines and Cable as well as structures associated therewith including roads;' requires an EIA or IEE to be conducted.' 6th Draft EIA Procedure (October 2014).

It is the intention of MFOCN to expand their mobile communications network and provide infrastructure across the country by providing additional BTS towers at a strategically selected sites. All proposed BTS sites have a dual purpose. The main purpose is not only to provide greater capacity for the operators in the telecommunication sector because of their increased subscriber growth, but also to improve both outdoor and indoor coverage for service providers in the applicable areas. Improving capacity and coverage, the quality of service to customers

are also improved which is very important for MFCON as a telecommunication infrastructure company for the telecommunication service providers.

The project was registered with the DICA, the Ministry of Environmental Conservation and Forestry ("MOECAF"), and Myanmar Investment Commission ("MIC") as the competent authority, on 24th March 2014. MOECAF has requested that an IEE and EMP be prepared for this project. The environmental assessment studies were conducted during March and April of 2015.

1.1 OBJECTIVES AND APPROACH

The purpose of this Initial Environmental Examination and Environmental Management Plan is to provide information on the nature and extent of potential environmental and social impacts arising from the concurrent construction of the proposed towers, Fiber Optic Cable (FOC) network and related activities. This information will contribute in making decisions by the state and regional authorities, MOECAF and MIC on:

(i) The overall acceptability of any adverse environmental consequences that is likely to arise because of the proposed Project.
(ii) The conditions and requirements for the detailed design, construction and operation of the proposed Project to mitigate against adverse environmental consequences, where practical.
(iii) The acceptability of residual impacts after the proposed mitigation measures are implemented.

Scoping is a critical, early step in the preparation of an IEE and consequently the EMP. The scoping process identifies the issues that are likely to be of most importance during the IEE.

This report comprises assessment and the potential impact/s of the proposed development on the environment. This Report highlights areas of potential concern and impacts on the environment and the surrounding community (socio-economic). Mitigations are presented on how these impacts can be minimized and addressed. These are summarized and presented in an Environmental Management Plan (EMP).

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Environmental Consultants for the IEE & EMP and Their Qualifications

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Mr. Neil Daetwyler	BSc Engineering Geology; Chartered Engineer.	Senior Quality Control and Environmental Expert
Ms. Juliana Ding	MSc Safety, Health and Environmental Technology	Principal Environmental Consultant and Reviewer
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2. POLICY, AND LEGAL FRAMEWORK

This section reviews the policy and legal framework of Myanmar and the structures set up to protect the environment, as well as ongoing activities that are intended to promote sustainable development and environmental protection in Myanmar.

National Commission for Environmental Affairs – (Also known as Environmental Conservation Committee) and MOECAF

The National Commission for Environmental Affairs ("NCEA") was formed in 1990 and it was chaired by the Minister of Foreign Affairs until 2005. In 2005, the NCEA was transferred under the Minister of Forestry (MoF), which assumed the role of the NCEA chairperson. The stated objectives of the now Ministry of Environmental Conservation and Forestry ("MOECAF") include setting environmental standards, creating environmental policies for using natural resources and laying down rules and regulations to control pollution, as well as to create short and long term environmental policies which balance environmental needs and development requirements. MOECAF has drafted the EIA rules and regulations which are pending approval by the government, to complement the Environmental Conservation Law of 2012.

2.1. MYANMAR ENVIRONMENTAL LEGISLATION

There are currently several laws and regulations relating to the environment in Myanmar. Most of these are old environmental laws with enforcement is spread over many ministries without a centralized environmental regulatory agency.

National Environmental Policy (1994)

The National Environmental Policy of December 1994 integrates environmental considerations into the development process and acknowledges that, while there is a sovereign right to use natural resources, environmental protection should be the primary objective at all times.

This policy states: "*To establish sound environmental policies, utilization of water, land, forests, mineral, marine resources and other natural resources in order to conserve the environment and prevent its degradation, the Government of the Union of Myanmar hereby adopts the following policy: The Wealth of a nation is its people, its cultural heritage, its environment and its natural resources. The objective of Myanmar's environment policy is aimed at achieving harmony and balance between these through the integration of environmental considerations into the development process to enhance the quality of the life of all its citizens. Every nation has a sovereign right to utilize its natural resources in accordance with its environmental policies, but great care must be taken not to exceed its jurisdiction or infringe upon the interests of other nations. It is the responsibility of the State and every citizen to preserve its natural resources in the interest of present and future generations. Environmental protection should always be the primary objective in seeking the development*."

Myanmar Constitution (2008)

Similarly to the National Environmental Policy, the 2008 Constitution affirms the Government's intention to conserve Myanmar's natural environment, and that the National Parliament can enact environmental and other protective laws.

Environmental Conservation Law (2012)

The Environmental Conservation Law was promulgated in 2012. It lists a set of broad principles and empowers MOECAF to enforce environmental standards (not currently available yet), The Environmental Conservation Law was enacted to implement the national environmental policy of 1994. It lays down basic principles and provide guidance to systematically integrate environmental conservation matters with the sustainable development works. Specifically, it emphasizes the need to reduce air pollution, water pollution and land pollution. It also requires public engagement to increase the awareness of the affected people with respect to environmental pollution and social issues and encourages public participation.

The responsibility to enforce these requirements has been given to the MOECAF. Chapter IV, section 7(m) requires the conduct of an Environmental and Social Impact Assessment. Under this chapter, the Law stipulates environmental quality standards on water quality, underground water quality, atmospheric quality, emissions, effluents, solid wastes and other environmental quality standards (not available yet). Chapter IX, section 19 of the Law requires the MOECAF to cooperate with the relevant Government departments and organizations for the conservation of cultural heritages sites, and cultural monuments for the benefit of current and future generations.

It enables promotion of international, regional and bilateral cooperation regarding environmental conservation as well as co-operation with the government departments and organizations, international organizations, non-governmental organizations and private individuals on environmental conservation matters.

The Environmental Conservation Law, paves the way for the preparation of EIAs and/or Social Impact Assessments (SIAs). At present there are no regulatory guidelines and rules specified to enable the Environmental Conservation Law to be operable in practice, as for example setting the environmental quality standards, emission standards and classes of hazardous substances and waste. It is expected that the Environmental Conservation Rules of the Environmental Conservation Law which are under development would provide regulatory guidelines to implement this Law.

The obligations of Business Owners and Occupiers under the Environmental Conservation Law is that the polluter must clean, discharge, dispose or keep pollutants in accordance with the prescribed standards. The owner or occupier of business activities, materials or places that are the source of the pollution must install or use an on-site facility or controlling equipment to monitor, control, manage, reduce or eliminate environmental pollution. If this is not possible it must be arranged to dispose the wastes in accordance with environmental sound methods.

No one shall violate any prohibition contained in the rules, notifications, orders, directives and procedures issued under the Environmental Conservation Law. The violation of this prohibition constitutes an offence punishable by imprisonment with a term not exceeding 1 year, a monetary fine, or both. Overall, the Environmental Conservation Law (ECL) of 30 of March 2012 has listed a set of broad principles and empowers MOECAF to enforce environmental standards (not currently available yet). The ECL addresses in its several chapters the: (i) environmental conservation, (ii) conservation of natural and cultural resources, (iii) process for businesses to apply for permissions to engage in an enterprise that has the potential to damage the environment, (iv) prohibitions and (v) describes the offences and their respective penalties.

Foreign Investment Law (2012) and Myanmar Investment Commission Notification (2013)

The Foreign Investment Law (FIL) Rules and Myanmar Investment Commission ("MIC") Notification (2013) clarify Myanmar's new foreign investment framework. Basic Principles of the FIL state that the investment shall be allowed based upon principles including "protection and conservation of the environment" and "developments that save energy consumption". The responsibilities of the investor requires the business to be carried out in a manner that does not cause environmental pollution or damage according to existing laws. Clause 37 of the Rules of the FIL states "In order to scrutinize accepted proposals sector by sector, a Proposal Review Group, composed of high ranking officers from several departments (including the Environmental Conservation Department), is to be formed to perform preliminary scrutiny".

Myanmar Investment Commission Notification No 1 of 2013

The Myanmar Investment Commission Notification 1 approved in 2013 includes a list of Economic Activities (No 3.3) which requires an Environmental Impact Assessment or Initial Environmental Examination. In the process of seeking approval for the network facilities services, the project proponent needs to request recommendation from the Ministry of Communication and Information Technology ("MCIT"). The decision will be made by MOECAF according to the project capacity once MIC seeks recommendation from MOECAF and MCIT. Of these activities listed that require an IEE or EIA and list of economic activities permitted with the recommendation of relevant Ministry are: Infrastructure and service development which includes fixed and wireless telecommunication infrastructure construction, installation and equipment.

Draft Environmental Impact Assessment Rules and Regulations

The Environmental Conservation Law, under Section 42 (n) gives the responsibility to MOECAF to issue necessary rules to implement the law. Under this provision, the Ministry has issued the Environmental Impact Assessment Rules and Regulations. The Environmental Impact Assessment Rules which are yet to be enforced defines the EIA as the process of studying the significant impact of a proposed project on the physical, biological and socioeconomic environment and includes an environmental management plan and a social impact assessment report. It also states that every project proponent is required to carry out an Environmental Impact Assessment of a proposed project and shall prepare an Environmental Impact Assessment Report detailing every stage of the assessment and its conclusion to MOECAF.

The legislation outlines screening and scoping criteria that defines which projects may be subject to the Regulation. According to the current draft Regulation (6th EIA Draft Procedure of October 2014), the Proposed Project is classified as a project requiring IEE as required for all sizes and EIA is necessary when all activities where the IEE process yields a recommendation to conduct an EIA.

Miscellaneous Regulations

Forest Law 1992

The Forest Law, 1992 mentions offences for extracting, moving, keeping in possession unlawfully any forest produce, including fauna and flora. These are liable to be punished with fine or imprisonment, or both. For offences relating to teak trees the punishment is heavier.

The Science and Technology Development Law (1994)

The Science and Technology Development Law provides the provisions relating to technology transfer for the promotion of production processes and the improvement of the quality of goods. The objectives of this Law are as follows:

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

The Computer Science Development Law (20th September, 1996)

The objectives of The Computer Science Development Law are to define and implement measures necessary for the development and dissemination of computer science and technology and to supervise the import and export of computer software or information.

The Electronic Transactions Law (30th April, 2004)

The provisions contained in this Law shall apply to any kind of electronic record and electronic data message used in the context of commercial and non-commercial activities including domestic and international dealings, transactions, arrangements, agreements, contracts and exchanges and storage of information. This Law shall apply to any person who commits any offence actionable under this Law within the country or from inside of the country to outside of the country, or from outside of the country to inside of the country by making use of the electronic transactions technology. The aims of this Law are as follows:-

(a) to support with electronic transactions technology in building a modern, developed nation;
(b) to obtain more opportunities for all-round development of sectors including human resources, economic, social and educational sector by electronic transactions technologies;
(c) to recognize the authenticity and integrity of electronic record and electronic data message and give legal protection thereof in matters of internal and external transactions, making use of computer network;
(d) to enable transmitting, receiving and storing local and foreign information simultaneously, making use of electronic transactions technologies;
(e) to enable communicating and co-operating effectively and speedily with international organizations, regional organizations, foreign countries, local and foreign government 3 departments and organizations, private organizations and persons, making use of computer network.

Telecommunication Law (8th October, 2013)

The Telecommunications Law stipulates, “Any person, department and organization from domestic and abroad desirous of establishing and providing any of the following Telecommunications Services shall apply to the Ministry of Information and Data

Communication Department to obtain permission and license in accord with the stipulations for Network Facilities Service, Network Service and Application Service".

Section 27 Chapter VIII "Technical Standards" highlights that the project proponent shall apply to the Department in order to get the technical standard approval of the Network Facility or Telecommunications Equipment to be manufactured, sold or distributed by him in accord with the stipulations. The department also have the right to issue and refuse a technical approval after scrutinizing application.

Construction Law

Myanmar has yet to enact laws specific to construction. In 2013, the parliament rectified the condominium law but it is not applicable to this proposed project. Generally, the city development committee administer the municipal and private construction. Therefore regulatory consideration are only made by City Development Committee who applies the Municipal Law, Building Rules, Municipal Rules, Committee's notifications and Environmental Law for building permits.

2.2 SOCIAL LEGISLATION

A synopsis is presented below of the social legislation and regulation that is considered relevant to the infrastructure and telecommunication. Myanmar has ratified numerous International Labour Organization Conventions. According to Section 24 of Myanmar's constitution, the government must provide the means to protect the labor workforce.

Land Law

Myanmar does not have a unitary land law but has several laws for different categories of land. All land belongs to the State under the current legal system, and land users receive certificates from the Settlement Land Records Department. The Land Acquisition Act (1894) gives the State the right to acquire land for public purposes, outlines procedures for valuing land and lodging objections to acquisition. It also contains a requirement for landowners to be provided compensation for such land, though historically this has been inconsistently applied. When private land is acquired or private assets such as trees and standing crops are lost under public or private projects, compensation is paid at market value. The Act also provides that affected people with complaints can bring the case to court.

A new Farmland Law was recently adopted which introduced various reforms such as the recognition that farmland owners are able to sell, mortgage, lease, exchange, inherit or donate all or part of their farmland. There is also the requirement that compensation be paid for both land and buildings attached to it. As for non-agricultural land in rural areas, the Village and Town Act is under revision. The Vacant, Fallow and Virgin Land Management Law, which was recently adopted, defines legal provisions on unused land.

Law on Health and Safety in the Workplace

The first law on safety and health in workplaces is being drafted by the Ministry of Labor, Employment and Social Security. The law will aim to prevent air and water pollution and improve safety at work sites, including fire prevention, ensuring construction workers use protective equipment, ensuring the safety of work site operators and taking precautions for natural disasters.

2.3 INTERNATIONAL AND REGIONAL TREATIES

Myanmar has signed several international treaties related to the environment. However, the contents of those treaties still need to be incorporated into domestic law. Table 2 presents a list of the conventions signed by Myanmar to date that are potentially relevant to the Project.

Table 2.1: **International and Regional Treaties to Which Myanmar is a Party**

	Name
1	Convention for the Safeguarding of the Intangible Cultural Heritage (August 7, 2014)
2	Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property (December 5, 2013)
3	Convention on the Rights of Persons with Disabilities (January 6, 2012)
4	International Plant Protection Convention (May 26, 2006)
5	Kyoto Protocol to the United Nations Framework Convention on Climate Change (February 16, 2005)
6	International Treaty on Plant Genetic Resources for Food and Agriculture (June 29, 2004)
7	United Nations Convention on the Law of the Sea (June 20, 1996)
8	Convention on Biological Diversity (February 23, 1995)
9	United Nations Framework Convention on Climate Change (February 23, 1995)
10	Agreement establishing the World Trade Organization (WTO) (January 1, 1995)
11	World Trade Organization (WTO) - Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) (1994) (January 1, 1995)
12	Protocol to the Convention for the Protection of Cultural Property in the Event of Armed Conflict (August 7, 1956)
13	Convention on International Civil Aviation (August 7, 1948)
14	ASEAN Framework Agreement on Intellectual Property Cooperation
15	Global System of Trade Preferences among Developing Countries
16	ASEAN Trade in Goods Agreement (May 17, 2010)
17	Framework Agreement on the BIMST-EC Free Trade Area and its Protocol and the Declaration establishing the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (February 8, 2004)
18	Agreement on the Common Effective Preferential Tariff Scheme for the ASEAN Free Trade Area (January 28, 1992)

2.4 INTERNATIONAL CIVIL AVIATION STANDARDS

The charter of International Civil Aviation Organization or ICAO is the Convention on International Civil Aviation, to which each ICAO Contracting State is a party. Creating and modernizing Standards and Recommended Practices, or SARPs on international aviation is the responsibility of the ICAO, the specialized agency of the United Nations whose mandate is to ensure the safe, efficient and orderly evolution of international civil aviation.

Myanmar is a Contracting State obliged to ensure civil aviation safety in accordance with the prescribed Standards and Recommended Practices. Under the terms of their license, as issued by the Myanmar Directorate Civil Aviation, airports are normally required to prevent new developments or extensions to existing structures from infringing the Obstacle Limitation Surface (OLS). The OLS completely surround an aerodrome, but those surfaces aligned with the runway(s) used to protect aircraft landing or taking-off can be more limiting than those surrounding the rest of the aerodrome, particularly closer to the aerodrome. Annex 14 of ICAO's SARPs elaborate the importance and high rise structures within the air navigation corridor must comply aviation law of the contracting nations.

The purpose of the Annex 14 Obstacle Limitation Surfaces is to define the volume of airspace that should be ideally kept free or safeguarded from obstacles, and to take the necessary measures to ensure the safety of aircraft, and thereby the passengers and crews aboard them, while taking-off or landing, or while flying in the vicinity of an airport. This is achieved by a process of evaluating proposed developments so as to:

- Protect the blocks of air through which aircraft fly, by preventing penetration of these surfaces' lower limits;
- Protect the integrity of radar and other electronic aids to air navigation, by preventing reflections and diffractions of the radio signals involved; and
- Protect visual aids, such as Approach and Runway lighting, by preventing them from being obscured, or preventing the installation of other lights, which could be confusing for them.

In accordance with the Myanmar Civil Aviation Regulations, as regulated by the Aviation Act, it is required that all intended telecommunication infrastructure undergo an Annex 14 Aeronautical Evaluation. The construction of towers to be sited in the vicinity of an airport requires the approval of the Director of Civil Aviation.

3. PROJECT DESCRIPTION

Myanmar Fiber Optic Communication Network Company Ltd, a privately owned company and telecommunication Infrastructure provider, proposes to expand wireless communication network and services for telecommunication service providers in Myanmar. The expansion of MFOCN's fiber optical network and services has the main purpose of improving the telecommunications sector and extend coverage across Myanmar by providing telecommunication infrastructure. By improving infrastructure capacity in term of quantity and quality, MFOCN intends to assist the quality provided by telecom service providers. The Project being assessed entails the construction of communication towers, or Base Transceiver Stations (BTS) and associated structures including a Fiber Optic Cable (FOC) network across Myanmar. The Project will help in the development of the Information and Communications Technologies (ICT) sector in Myanmar.

The project include two components, that is, the construction of 1,000 BTS towers (and associated structures) and a 32,000 km of backbone FOC network across Myanmar. The activities envisaged by the project include land and right-of-way (RoW) acquisition, land clearing, arrangement of access roads to towers where required, construction of foundations and towers, tower erection and cable landing – installation of related appurtenances, and other equipment. All activities related to pre-construction, construction and operation phases are described in detail in subsections below.

The main permitting authorities in Myanmar, issuing construction and project implementation permits, are the Myanmar Investment Commission ("MIC"), Ministry of Environmental Conservation and Forestry ("MOECAF"), and Ministry of Communication and Information Technology ("MCIT"). The MFOCN as project developer has applied the permit and had obtained MIC notification (DICA-6(A)/FI-906/2014 which highlighted mandatory measures, obtaining license and permit from MCIT and MOECAF by the project proponent. A special separate permit should be obtained for the Right-of Way (RoW) clearing and construction from relevant state and regional authorities. All the above procedures are described in details in Chapter 2 "Legal and Regulatory Framework" of this report.

The project will install towers and the FOC around the country. These towers will be primarily stationed according to the network coverage of the tower and market demand. The backbone FOC will be distributed nationwide connecting interstate provinces and regions. The final design and location will be based on the outcomes of the routing study, geotechnical and cadastral surveys, and towers spotting. The maps in Figures 3.1 and 3.2 illustrate the intended tower locations and FOC route across Myanmar.

Site selection and routing (Right of Way) studies have been undertaken in 2012-2014 to identify a preferred tower location and corridor for the construction of a proposed 32,000 km underground FOC line connecting BTSs and substations. The main considerations during the selection were: the ease of access for construction and maintenance; the constructability of the tower and backbone route taking into account the topography; environmental constraints; and ground conditions, including areas prone to landslides. Special attention was given to ecological habitats, and the social sphere in order to minimize the impacts on local population, agricultural land, visual significance, cultural heritage and traffic safety. Towers location and RoW for the backbone underground Fiber Optic Cable (FOC) has been chosen based on community needs for additional projects, with specific location chosen based on geographic and topographic characteristics. The site selection process will involve the following consideration:

- The site's urban, suburban, or rural characteristics;
- National, state, or municipal regulations affecting the proposed sites;
- Accessibility and distance from inhabited areas;

- Land ownership, including verification of absence of squatters and/or other potential legal problems with land acquisition;
- Determination of site vulnerability to natural hazards (i.e., intensity and frequency of floods, earthquakes, landslides, hurricanes, volcanic eruptions);
- Suitability of soils and subsoils for construction;
- Site contamination, risks and hazards by nearby property;
- Flora and fauna characteristics;
- Presence or absence of natural habitats and/or ecologically important habitats on site or in vicinity (e.g., forests, wetlands, coral reefs, rare or endangered species); and
- Physical Cultural Resources, and community characteristics.

The location of the towers practically follows where the most population and infrastructure are concentrated. The RoW crosses different landscape zones, from municipality, central business district, and downtown to the remote areas of different geographical settings. However, for the advantage of accessibility, the major RoW will be located in parallel to the major highways. Tower spotting work has been undertaken following the topography survey/walkover and in collaboration with the constraints mapping. The selected site largely avoids built up areas, thus minimizing the need for land acquisition and resettlement. The RoW route itself has been chosen to avoid settlements and their associated infrastructure as well as tourist areas. The detail specification of each component will be presented in Sections 3.1and 3.2 of this IEE.

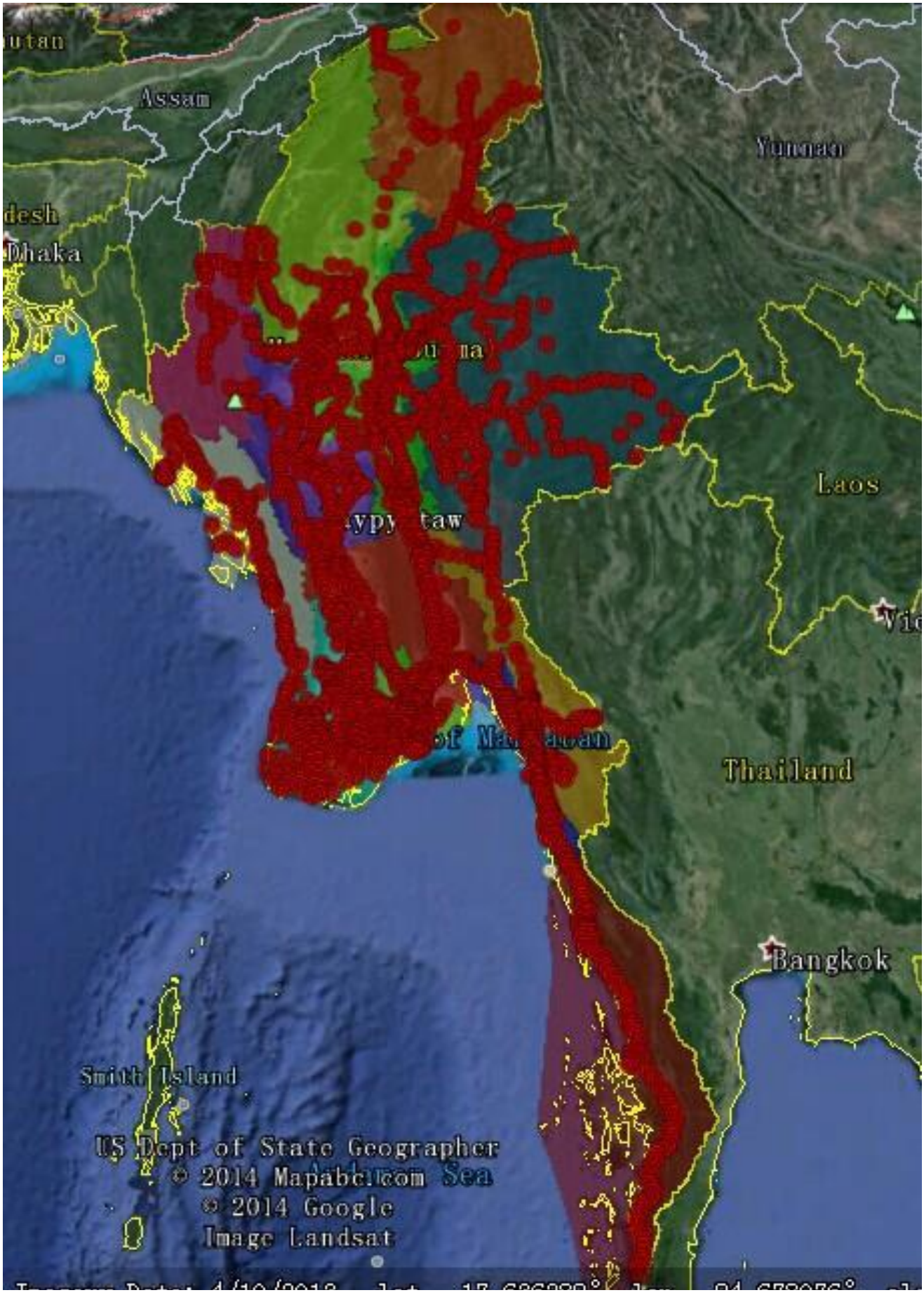

Figure 3.1: Location of MFOCN's Proposed 1000 Telecommunication Towers

ENVIRON

Date: April 2015

Figure 3.2: Map of 32,000 Km Backbone Nationwide Fiber Optic Network Route

ENVIRON

Date: April 2015

3.1. COMPONENT 1: CONSTRUCTION OF 1,000 TOWERS

MFOCN intends to invest in the telecommunication sector in Myanmar by providing infrastructure needed by telecom operators while telecommunications and internet services growth in Myanmar is accelerating. The 1000 towers will be constructed by 2017. The proposed implementation of tower construction across the country by area and year is presented below Table 3.1. Based on the land acquisition, tenure, and availability MFOCN has preliminarily selected 2,000 locations. Only 1,000 locations will be chosen for tower construction. Figures 3.3 to 3.5 show proposed tower locations which the project will be implemented on a projected yearly basis. Detailed addresses of tower locations are presented on Annex 1.

Table 3.1: MFOCN's planning for 1000 Towers

SN	Area	Sites Planning 2015	Sites Planning 2016	Sites Planning 2017	Total Target
1	Bago	35	29	13	77
2	Mandalay	20	159	19	198
3	Yangon	2	81	8	91
4	Magway	19	68	52	139
5	Sagaing	17	19	31	67
6	Tanintharyi	12	0	21	33
7	Ayeyarwady	15	12	69	96
8	Shan	23	14	72	109
9	Mon	11	13	11	35
10	Kachin	8	7	14	29
11	Chin	1	0	14	15
12	Rakhine	18	0	50	68
13	Kayin	4	8	15	27
14	Kayah	5	0	11	16
Total		**190**	**410**	**400**	**1000**

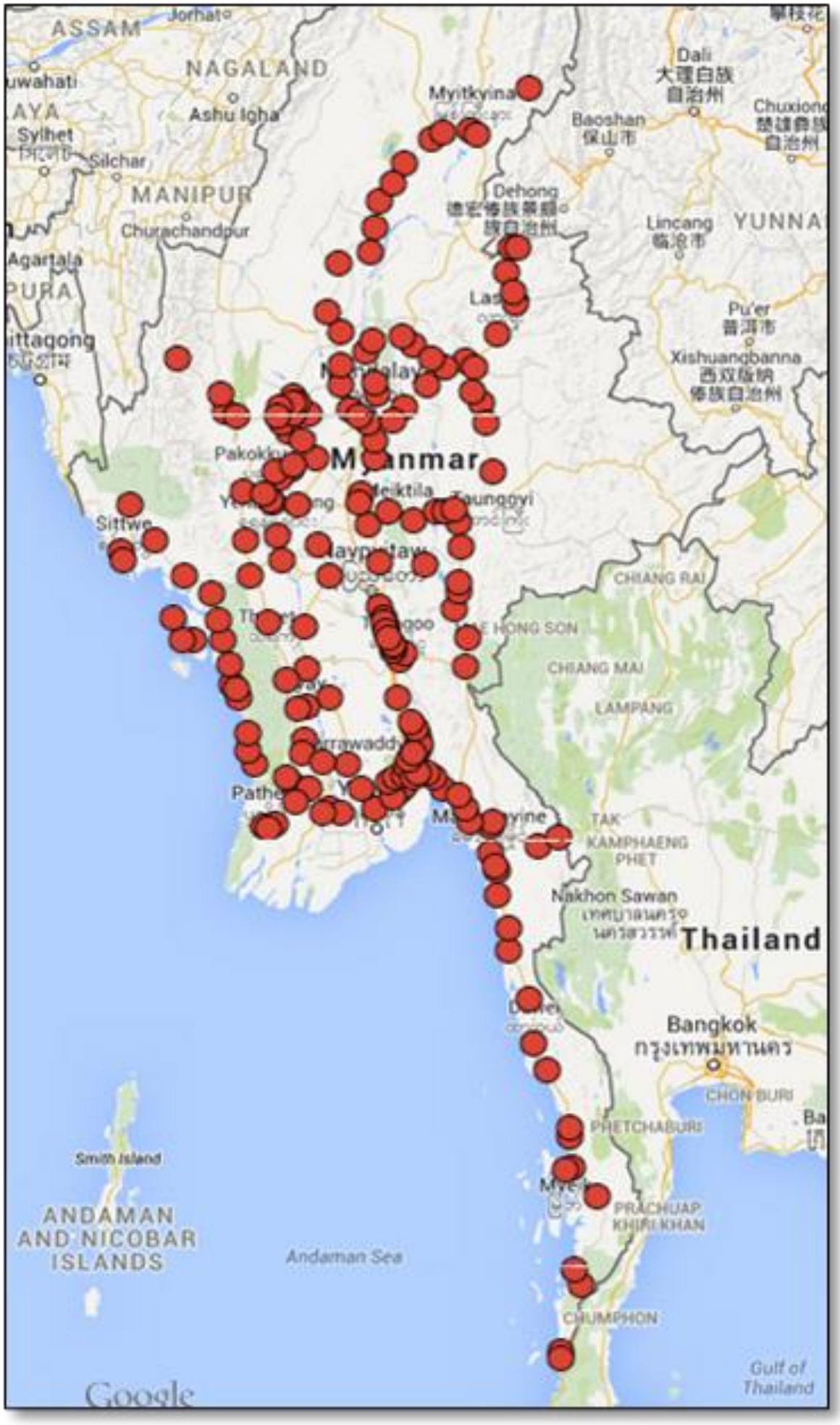

Figure 3.3: Location Map of Proposed Tower Implementation for 2015 (190 Towers)

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Date: April 2015

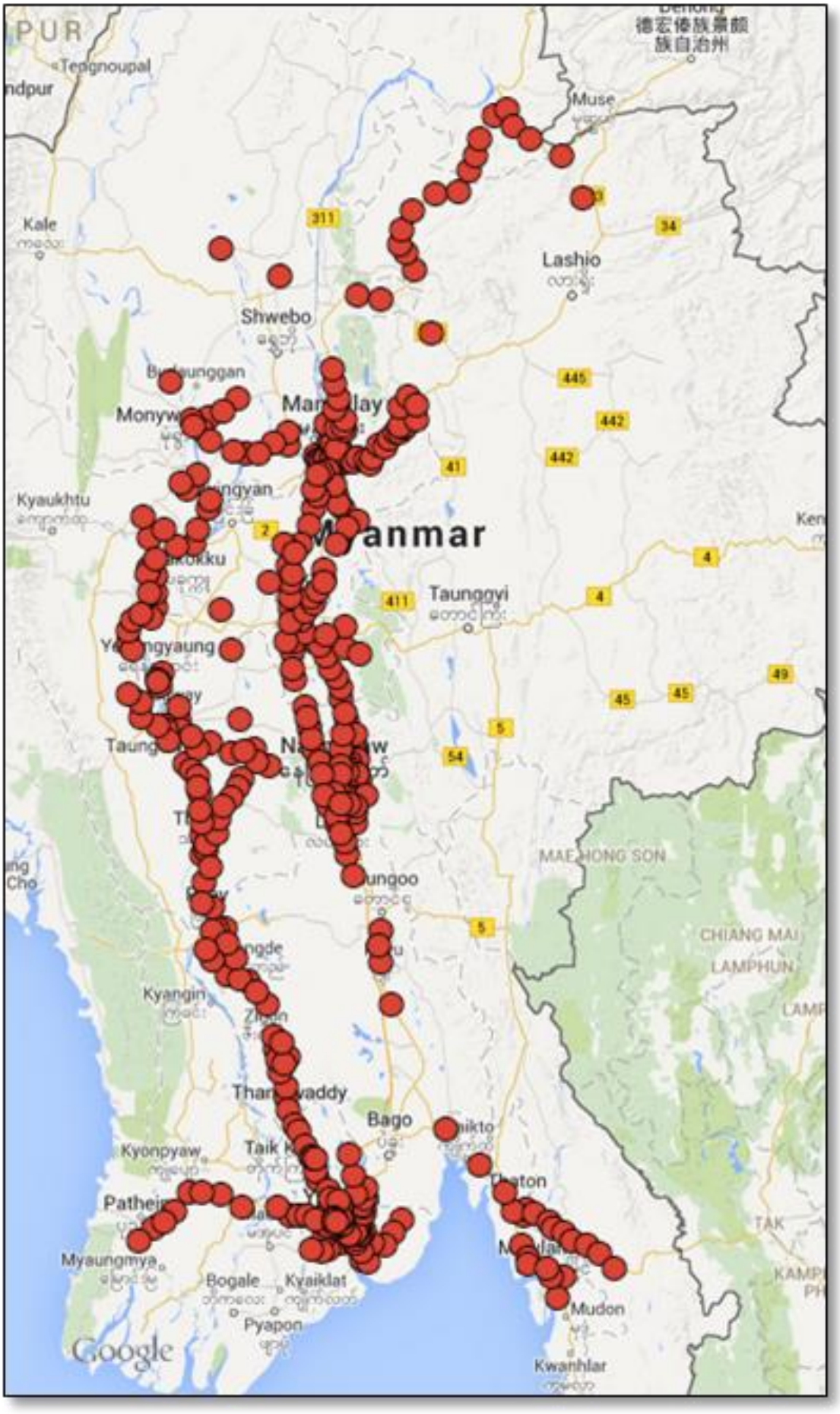

Figure 3.4: Location Map of Proposed Tower Implementation for 2016 (410 Towers)

ENVIRON

Date: April 2015

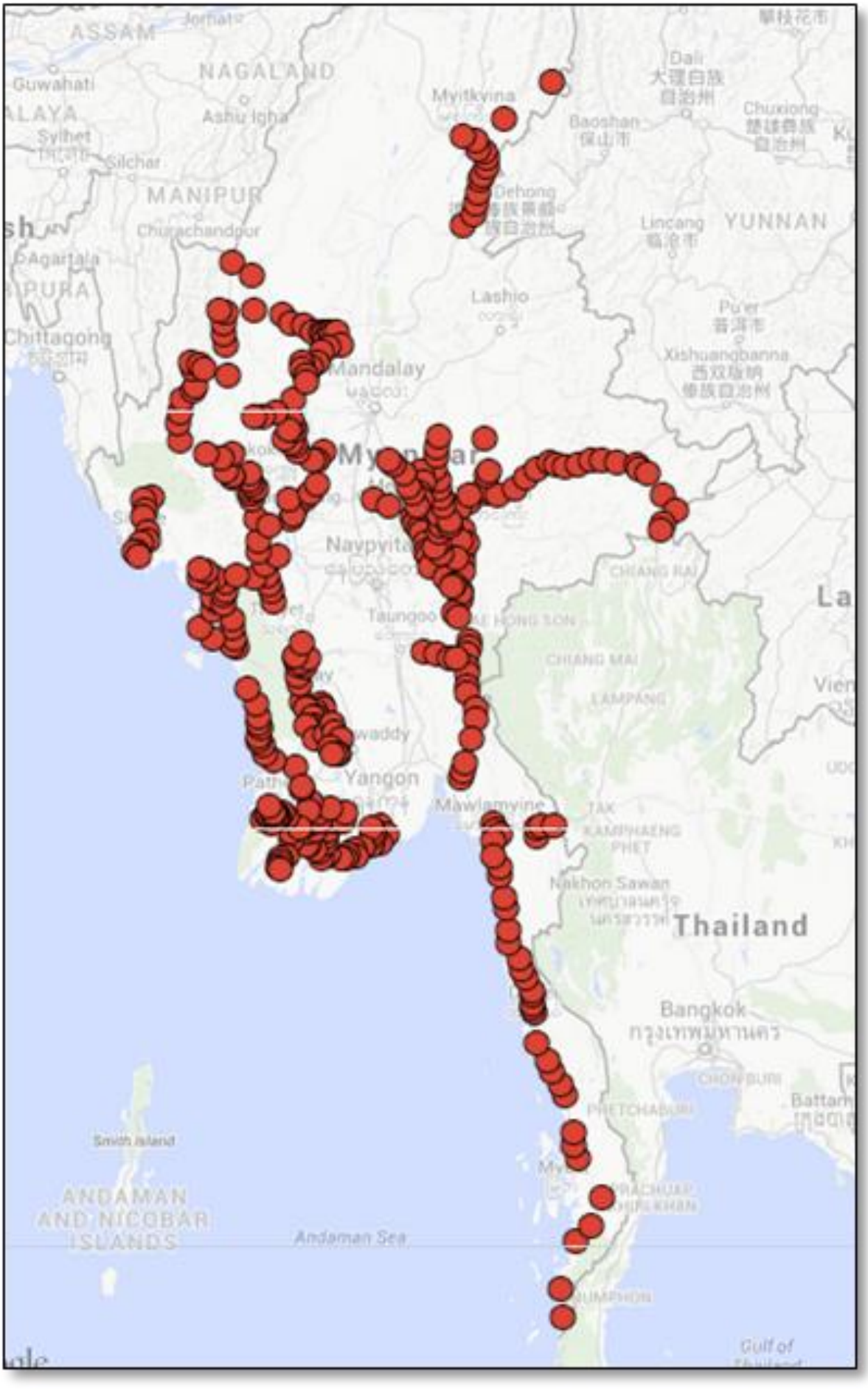

Figure 3.5: Location Map of Proposed Tower Implementation for 2017 (400 Towers)

ENVIRON

Date: April 2015

Tower Specification

The intended structure to be evaluated are of 35m, 40m, 45m 50m and 60m heights, 3 lagged Circular Hollow Section (CHS) Tower which is to be painted red and white as per the requirements of the Directorate of Civil Aviation. The tower structure will be mounted onto a concrete foundation without any supporting cable and be earthed to ensure safety during lightning occurrences. Access ladder will be incorporated to the tower structure. The design specifications and standards are in accordance with SABS 1200DA (excavation standards), SABS 0225-1991, SABS 0162-1993, BS 8100-1986 (tower standards). The design specifications of the base station tower are available on request. The engineering drawing of typical tower is shown in Annex 2. The general arrangement is further described below.

The tower is designed to carry the following equipment. For purposes of wind loading and deflection calculations, it shall be assumed that all loads are exercised at the top of the tower. Main components are;

- 12 GSM dual-polarised, single-band panel antennas
- 6 pole-mounted 1,800mm solid microwave dishes
- Twelve $^{7}/_{8}$" or $1^{5}/_{8}$" feeder Cable, clamped three-high, together with steel support structure
- Climbing ladder, and
- Circular Hollow Section (CHS) Steel channels

The deflection of the tower has been designed under normal operating conditions shall not exceed 1º. This shall be measured as the difference between the angle of the tower at the designed load and the vertical. Similarly the amount of twist under normal operating conditions shall be limited to 1º. For all towers, one leg shall be oriented in the direction of True North unless otherwise specified for the particular tower.

SPECIFIC CONSIDERATIONS FOR TOWER DESIGN

The proposed 3 legged CHS BTS tower design includes all aspects of the tower system design criteria and following key considerations:

- Selection of appropriate parameters for wind, seismic and other loading at each specific site. In interpreting the codes and specifications, and full consideration to the following:
- Location, terrain type and category
- Topographical effects and vortex shedding
- Potential seismic loading
- Fatigue effects on the tower, including the base flange and the connection between the spine and the tower in the case of monopole towers.
- Return period to be used (50 years minimum)
- Tower structural design.
- Foundation design allowing for soil conditions.
- Certification that the construction of all aspects of the tower and foundation has been erected in accordance with the design and specifications.

Note: There may be a choice of standard foundation designs depending on soil conditions.

The tower and foundation to be used for each application, contractors, designers and resources supplier are chosen based on MFOCN's technical teams and make required them to be certified by recognized and relevant national and international institution. Similarly, an Engineer's certificate is necessary for the finished installation, to ensure that the entire installation is of adequate design, safety provision and execution. MFOCN requires the maximum degree of standardisation consistent with cost savings and good engineering practice. The follow table describes general parameters of typical BTS tower which are

provided as a guide for the contractor tender process. The selected Contractor shall be responsible for determining the appropriate tower and foundation requirements for any site, taking into consideration wind speeds, applicable codes, actual terrain category, topographical effects, etc.

Table 3.2 General Parameters Specified for MFOCN's Towers

PARAMETER	DETAILS
Height	Varying (35m, 40m,, 45m 50m and 60m)
Provision for Antenna Loading	Load of Tower to handle 6 x 900MHz Panel antennas, 6 x 1800MHz Panel antennas and 6 x 1.2m (Microwave) Solid type antennas. All ancillary items, including Cable, ladders, etc. to be taken into account to ensure safety. All above items are, for the purpose of load calculations, to be considered as installed at the top of the tower.
Wind Speed	Unless otherwise specified, 40m/s is to be used as the design wind speed. However, towers are to be designed in accordance with the applicable conditions for any location.
Altitude	Sea Level
Mean Return Period	50 Years
Terrain Category	Varying
Structure Class	B
Treatment	All Supplied items are to be Hot Dipped Galvanized
Construction	Lattice type, angle iron members. Monopoles will be considered if design and fatigue strength is maintained.
Climbing Ladder	Internal Climbing Ladder with 300mm Ladder Width and hoops of min 750mm opening and spaced at 600mm intervals
Platforms	Working platforms including handrails at 23m and at microwave dish heights.
Rest Platform	Rest platform at 15m intervals between working platforms.
Lightning Spike	2m lighting spike placed above tower top
Down Conductor	70mm² down conductor connecting lighting spike to earth mat tails at the base of the Tower, at the leg position
Antenna Earthing	Earth bars of 300mm wide with 8 holes per bar, to be placed at Antenna levels and interconnected via 70mm² conductor and linked to earth mat at base of climbing ladder
Navigational Light	To meet ICAO requirements, with PL13 fittings and circuit breaker facility at the navigational light level/s, Placed at the top of Tower
Bolting	All bolt assembly points to be fitted with flat washers both side of clamped materials with locking nuts for each connection point. Deviations if required to be specified and approved by MFOCN.
Painting	Approved Industrial type paint and primers to be applied as per manufacturer's specification in accordance with ICAO requirements. Painting excludes all climbing ladders, platforms, Antenna mounting poles, and handrails, as well as matching flanges or lap joints on legs
Antenna Poles	76mm diameter poles, 4.5m long, mounted at 25m, centre height on each leg of the tower. 2 stabilizer arms, back to the tower at both top and bottom of the mounting pole. Standard offset 200mm.
M/W Poles	100mm diameter poles, 2m long, mounted at 40m, centre height on each leg of the tower. 2 stabilizer arms, back to the tower at both top and bottom of the mounting pole. Standard offset 200mm.
Certification	Tower design and erection of structures and foundation to be certified by Engineer

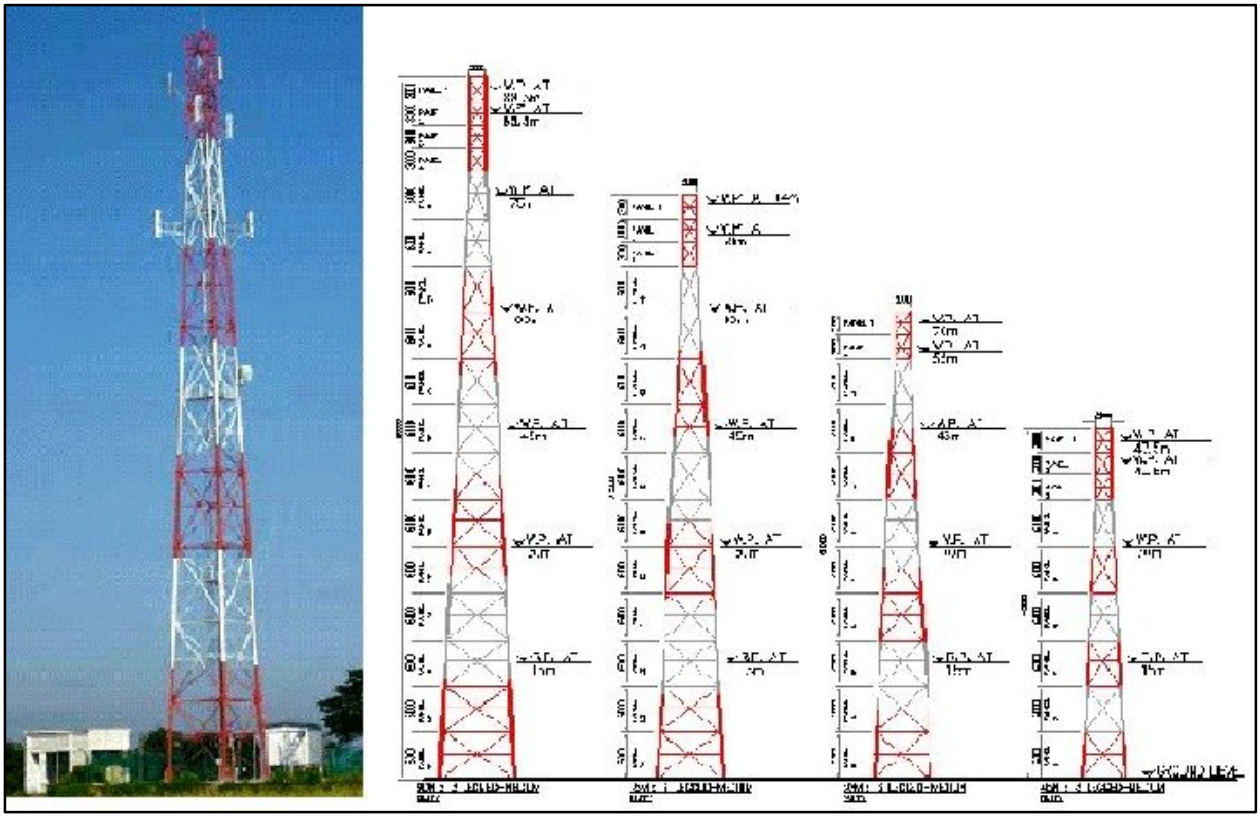

Figure 3.6: Towers in Varying Heights

FOUNDATION REQUIREMENTS

Foundations are designed and constructed according to the codes of practice (refer to Tables 3.3 and 3.4). Prior to construction of the foundations, the contractor will ensure the soil strength meets the requirements of the specification and shall propose measures to be taken if the soil strength is insufficient. All tests are formally documented. MFOCN make ensure that the contractor sets out and orientates the holding down bolts in such a way that the tower is erected correctly as regards to both position and orientation, as shown on the site drawings. All surfaces shall be level/vertical to the satisfaction of MFOCN and suitable falls shall be provided to ensure that rainwater does not stand on the foundation surfaces.

Foundations will be constructed generally below ground, with 100 mm maximum protruding above natural ground level. Above-ground foundations must be specifically designed for the specific application and must bear the written approval of MFOCN's engineering team. Surfaces will be to a wood float finish unless otherwise stated. No patching or plastering of concrete is permitted. Corners will be constructed with a 20mm, 45º chamfer. During excavation of the foundations, access shall be provided for the earthing to install and test the portion of the earthing system that is underneath and directly adjacent to the foundations. 25 Mpa concrete strength shall be the minimum used in the design and construction of the foundations. Concrete samples shall be taken and tested by the tower supplier in accordance with the standards contained herein and the certified results shall be made available for inclusion in the site folder.

MFOCN reserves and supervises the right to confirm concrete strength by using for example a Schmidt Hammer and /or core sampling. Should the concrete fail the tests, the contractor shall be responsible for all costs involved in both testing and rectification. Annex 3 represent the detail Drawing of Tower Foundation. The foundation specification to conform to Engineers Approved design is as follows:

Table 3.3 Foundation Specification of MFOCN's Towers

PARAMETER	DETAILS
Design	Foundation pricing to be based on 100 kPa soil bearing pressure. The successful bidder will be required to price foundations for different bearing pressures (50, 150 kPa).
Angle of repose	0 °
Soils Verification	Soils test by DCP and/or Soils Laboratory required and results to be certified by the Design Engineer
Construction	To be in accordance with Engineers Approved design
Backfill	To be in accordance with Engineers Approved design in 150mm layers and a 93% MOD ASHTO achieved as per Soil compaction tests

PROVISION FOR ENGINEERING DESIGN AND SAFETY

Irrespective of the actual radio frequency specifications for the BTS, there is provision for the tower of the necessary pole-mounts for mounting six 1800 MHz GSM panel antennas and six 900 MHz GSM panel antennas. The antennas shall be mounted on poles provided as part of the tower supply/installation and shall be provided with the appropriate tilt brackets. The poles shall be the "bolt-on" type that can be repositioned at a different height on the tower.

Actual antenna heights required for the tower as well as antenna centre heights will be specified on a case-by-case basis. Similarly, six pole-mounts for solid microwave dishes are to be provided and these dishes shall be allowed for in the structural design of the tower.

A lightning spike as required in the earthing specification (TS 2005) shall be incorporated into the design. Full earth continuity shall be provided from this spike through into the earthing system with a separate down conductor. In addition, no painting of the mating faces of galvanised tower flanges or lap joints shall be done.

Provision shall be made for feeder Cable to be brought up to the antennas using Cable ladders or purpose-built mounts for the Cable clamps. The Cable clamping and mounting shall be subject to MFOCN approval. These feeders will be connected to jumper Cable feeding the antennas directly. The design shall provide for this installation to be as neat as possible.

Tapered washers shall be used as applicable on tapered surfaces. For other joints, steel washers (minimum thickness 2mm.) shall be used on the nut side. Spring washers shall not be used. All nuts, bolts and washers above 10 mm shall be hot dip spun galvanised in accordance with SABS/ISO 1461 type C.

Bolts other than grade 8.8 (High strength friction grip) shall only be used with the written authority of MFOCN.

Only in cases where normal caged ladders cannot be provided, a fall-arrest system shall be specified by MFOCN and this shall become part of the tower supplier's scope of work and shall be subject to all safety, quality and certification requirements applicable to the complete tower.

Navigation lights shall be provided in accordance with the requirements of the International Civil Aviation Organisation (ICAO). These lights and the cabling shall be the responsibility of the tower supplier.

LIGHTNING PROTECTION

A long galvanised M16 steel rod, with a sharpened point, shall be securely attached to the top of the tower with an insulated copper down conductor providing a secure earth path from the spike to the tower earth. An earth bar or bars, firmly and continuously fixed to the tower, shall be provided for earthing the feeder Cable below all antennas (up to 12 GSM feeders, plus microwave units) as well as any intermediate earths. Similarly, an earth bar shall be provided at the base of the tower for earthing all feeders prior to the bend. This lower earth bar shall be firmly connected to the tower and linked to the tower earthing system. The following figure shows a junction box housing the lightning protection gear at the foot of the tower.

Figure 3.7 Lighting Protection Gear

FINISHES, PAINTING AND OBSTRUCTION LIGHT

Any bolts 10mm or less in diameter, together with their nuts and washers, shall be Grade 304 stainless steel. All non-stainless steel items shall be hot dipped galvanised in accordance with the specifications. Full hot dip galvanising is required for holding down bolts. All nuts shall be provided with full thickness lock nuts, to the same specification. Self-locking nuts shall not be used.

All towers shall be painted in accordance with local Civil Aviation Authority regulations irrespective of the height and location. The paint system shall preferably be factory applied and shall be subject to MFOCN approval. For night time navigational safety, Infrared (IR) LED Obstruction Lights will be installed top and midpoint of the tower. Power supply is provided for visual and obstruction signalling. Figure show the painting of the tower and IR LED mounted at the tower.

Figure 3.8 Painting and IR LED

DESIGN AND CONSTRUCTION RESPONSIBILITY

Prospective suppliers of towers shall undertake total responsibility to ensure that the tower, complete with foundation, is suitable for the specific application and has been constructed in accordance with its specification. To this end, both the tower and the foundation design shall be certified by a registered professional engineer with appropriate qualifications. On request, MFOCN may request an independent confidential design audit and the tower design engineer is required to comply fully with such an audit.

Only suitably certified welders shall be used for work on the tower and copies of those certificates shall be available on request. Critical welds shall be non-destructively tested and copies of the test results shall form part of the documentation provided with each tower. The structure shall be hot dipped galvanised in accordance with the referenced specification. No welding or machining shall be carried out on the tower after galvanising.

Suitable care shall be taken in handling, transport and erection that no damage is done to any components or finishing of the tower, and to the surrounding. Each tower shall have an individual drawing, which shall fully define the tower as well as its location. This shall carry the following information as a minimum:

- Tower serial number and model number
- Design requirements (Terrain category, wind specifications, etc.)
- Design Loading (Antenna details, etc.)
- Spare area, referenced to the top of the tower.
- Relevant dimensions
- GPS Co-ordinates
- Founding requirements
- Certification by registered engineer

Certified copies of this drawing shall be retained on the site and shall also be provided to MFOCN by way of the site folder.

DOCUMENTATION

The following information are documented by MFOCN. They are of contractor's qualification, quality of resources and practice materials of MFOCN and its contractors. MFOCN check the documentation from time to time. They are:

- Galvanising certification
- Certification of Steel Grade used
- Non-destructive test results
- Certificate of Compliance – foundation. This should be provided with photographs taken at hold points, e.g. Excavation, Steelfixing, etc.

- Soil Test Results
- Concrete test certificates.
- Complete As-built drawings.
- Design Calculations. (These shall be provided only on request to an independent structural engineer for design audit purposes).

APPLICABLE STANDARDS

The following Standards, Guidelines and Codes of Practice are applied, for tower and related infrastructure for the proposed project.

Table 3.4 Standards, Guidelines and Codes of Practice for Tower and related Infrastructure

STANDARD	DETAILS
BS6399-2 1997	Code of practice for wind loading on buildings
BS8100	Code of practice for loading lattice towers and masts
BS8100-1:1986	Code of Practice for Tower loading. Procedures for the determination of loading for free standing towers. Primarily applies to bolted, riveted and welded metallic towers up to 300m height.
BS8100-2:1986.	Guide to the background and use of Part 1 – code of practice for loading.
BS8100-3:1999	Code of Practice for strength assessment of members of lattice towers and masts. This part provides the basis for assessing the strength of members and connections for masts and towers of lattice construction consisting mainly of bolted, riveted or welded steel angle or tubular or solid round sections.
ISO 1461:1999	Hot dip galvanised coating on fabricated iron and steel articles – specifications and test methods
ASTM2092-61	Standard guide for preparation of zinc coated (galvanised) steel surfaces for painting.
ASTM A394	Standard specification for steel transmission tower bolts, zinc-coated and bare.
TIA222	Structural Standards for Steel Antenna Towers and Antenna Supporting Structures (ANSI/TIA 222-F-1996 (R2003))
ISO 1106-1:1984 ISO 1106-2:1985 ISO 1106-3:1984	Non-destructive testing. Radiographic examination of fusion welds in steel
ISO 2400:1972	Ultra-sonic examination of welds in steel
BS 1977 series	Methods of tests for soil for civil engineering purposes
BSDDENV 1998-3	Earthquake resistance design provision
BS8800	Guide to occupational health and safety management systems.
BS OHSAS 18001	UK Occupational health and safety management systems – specifications
BS OHSAS 18002	Guidelines for implementation of BS OHSAS 18001
BSEN 358:2000 BSEN 360:2002 BSEN 361:2002	Personal protection equipment against falls from a height.
TS 2005	MFOCN Earthing specification
TS 2003	MFOCN Civil Works specification

Note: Equivalent local specifications may be used instead of International specifications

OTHER RELATED INFRASTRUCTURE

The land area needed for typical Base Transceiver Station (BTS) is a minimum of about 250 square meters. This area is to house the tower, equipment room, and equipment plant form, space for fuel tank, transformer and generator. The site will be fenced off with a 3-meter high palisade fence with electric fence on top and access will be for authorized personnel only.

The Equipment Room will be housed in a one storey control building of reinforced concrete and brick structure. The dimension of the building is 10 m height, 5 meter width and 3.5 meter height with corrugated galvanized iron (CGI) sheet roofing. The building will accommodate network and telecommunication devices and all the equipment are to be operated under Computer Numerical Control (CNC) system. Standardized Mechanical and Electrical (M&E) system will be installed for controlling room temperature, smoke detector, fighter fighting, temporary office and emergency response. Only authorized persons will be admitted for entry. The following Figures illustrate a typical equipment room inside a BTS station.

Figure 3.9: Equipment Room inside BTS Station

The purpose of equipment platform (figure: center above) is to bear incoming Fiber Optic Cable (FOC) from national backbone and transmission tower. It will also support network switches, coated FOC and telecommunication accessories (Optical-amplifier [OP-AMP] stations). It is constructed with steel frame skeleton structure (with 2m x 3m x 3m) to the front of equipment room.

The utility system will use about (2m x 9 m) area in which fuel tank, generator and transformer will be stationed. The project will use electricity from national grid line (440 V, 33KVA) linked with transformer installed for the project. For power back-up, standby generator of 30 KVA capacity with be set up and 2000L fuel tank. They will be installed under CGI sheet roofing and fenced with iron squared mesh to avoid exposure and fire safety. PVC pipes and PVC coated high quality Cable will only be used and all power line will be buried underground to prevent electrocution for servicing personnel and hazards to the nearby residents. Annex 4 represents the detailed Drawing of Tower and BTS.

CONSTRUCTION AND MAINTENANCE OF THE TOWER

The tower will be constructed by subcontractors under supervision of MFOCN Technical Services in accordance with set specifications and standards. Physical construction of the tower structure with foundation and fencing will take place on site. The various components of the BTS or Tower Segments will be transported to the site and offloaded either manually or by using small on board cranes.

Excavations for the foundation and digging of trenches for the electricity Cable will be conducted manually. The foundation to be provided is 2 meters deep, while the trenches to accommodate electricity Cable are 1 meter below the surface. It is only in cases where the

site is underlain with extreme hard rock foundations that excavation equipment is to be used. It is not expected that the site would have such underground rock formations for the overall tower and related structure requires only shallow spread footing according to building codes and designs.

Apart from the Sectional Pole structure, which will be lifted in place by making use of cranes, the other tower structure will be assembled manually and does not require any machinery such as cranes. The palisade fence is manufactured off-site and assembled on site.

The area or footprint affected during construction is the excavation site of approximately 10m x 15m inclusive of the area to accommodate the tower (7m x 7m) x 35m – 60m height. The construction period for each BTS tower is on average 10 days. The physical construction (construction site clearance, trenches and access roads) will be guided by this IEE and EMP and overseen by the Environmental Assessment Practitioner (EAP). Rehabilitation of the affected environment is a requirement and will be conducted in accordance with the EMP.

3.2 COMPONENT 2: CONSTRUCTION OF 32,000 KM BACKBONE FIBER OPTIC CABLE NETWORK

MFOCN proposes to offer telecommunication service for telecom operators in Myanmar to various entities (their clients) by constructing new Fiber Optic Cable (FOC) facilities and ancillary equipment between infrastructure to which the telecommunication services would be provided. A total of 26,820 Km of Fiber Optic Cable (FOC) network construction has been completed in 2014and now the company plans to complete the next 3,256 Km of FOC network by the second half of 2015. The completion of the remaining FOC network length of 1914 Km is to be done by 2017. The detail Right of Way (RoW) of national backbone FOC network and project status is presented in Figure 3.10.

A complete list of cities and counties in which MFOCN intends to provide service is provided under annex 8. MFOCN proposes to offer it services by utilizing new Fiber Optic Cable (FOC) facilities unless existing facilities are compatible with the system MFOCN intend to exercise, such as for conduit, duct, and pole systems, or by constructing new connections. Upon obtaining to execute to project, the overall 32,000 Km length backbone Fiber Optic Cable (FOC) network will be completed by 2017 by implementing concurrently the project nationwide.

MFOCN will seek agreements with state and regional administration and relevant authorities to use the existing (utility duct) system. MFOCN will execute the implementation for construction with local infrastructure providers, contractors, and other municipalities and service providers to construct new systems (underground Cable line). MFOCN will also construct facilities (e.g., regenerator and Optical-amplifier [OP-AMP] stations) on MFOCN's tower sites and on other utility sites. The installation locations and methods are described below:

- Use existing dark Fiber Unbundled Network Element (UNE).
- Use existing conduits, ducts, and rights-of-way of existing utilities and other companies for installation of new Fiber Optic Cable.
- Obtain pole attachment rights to authorize installation of Fiber Optic Cable on existing utility structures, using either existing or new brackets.
- Construct new underground conduit in existing public, utility network and highway alignment or rights-of-way (RoW).

Conduit would be installed adjacent to or in close proximity with other existing utility facilities. In limited circumstances, construction of the new conduit would involve digging into the street surface and the area immediately below to permit the placement of conduit in a trench

approximately 12 inches wide and 4 feet deep. Upon completion of the construction, the street surface would be returned to condition of equal or better quality than the original condition. The conduit would be accessible via manholes that would be placed along the right-of-way at equal interval, approximately one per block in downtown areas or one very several hundred feet in suburban areas. Ground disturbance will be required for the placement of a manhole and the extent would not typically exceed 10 by 10 feet surface area.

Central offices (BTS station) would typically consist of average one 300-square-meter-large built with prefabricated structures within a fenced area and located on private property. It would be outfitted with heat, ventilation, and air conditioning (HVAC), a backup power supply, and security lighting. Diesel generator would be used. The central offices, BTSs would be expanded to meet demand and, located at intervals of up to 40 miles. In order to identify areas where most construction could occur, MFOCN has identified point-of-presence (POP) zones, extending from a center point(s) within most of the targeted areas (i.e., cities). However, the exact locations of each customer, and therefore specific FOC installation projects, are not known at this time.

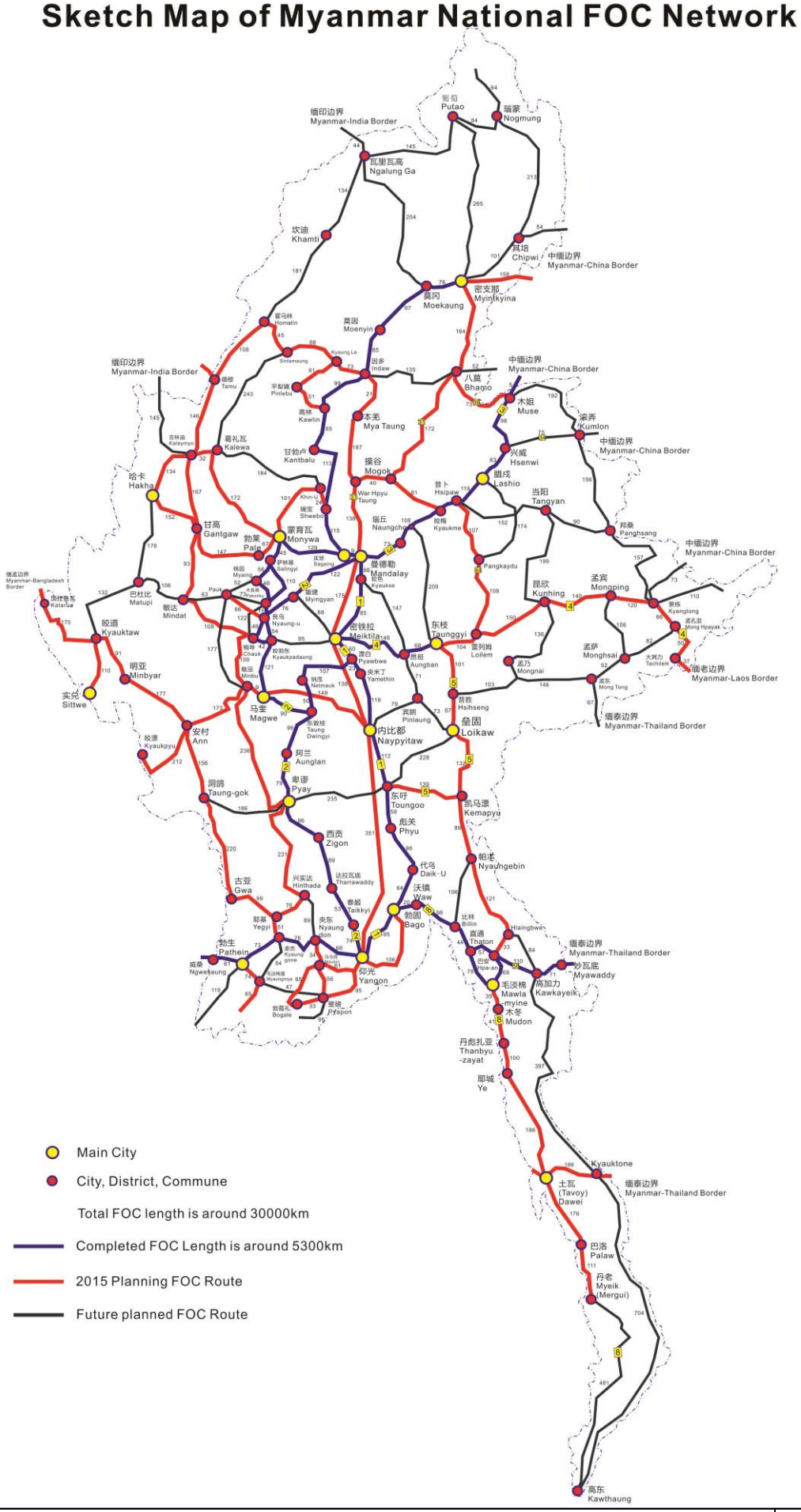

Figure 3.10: COUTRYWIDE FIRBER OPTIC NETWORK MAP

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CABLE CHARACTERISTICS & INSTALLATION METHOD

The installation method will probably be by direct landing and it is expected that the installation vehicle will be able to land the Cable upon completion of trenching. Soil rehabilitation will be followed up by km by km basis after connectivity is tested.

THE FIBRE OPTIC CABLE

FOCs are thin strands of glass that carry pulses of light (frequently infrared light) across long distances. Fiber Optic channels are usually immune to common RF interference, and can transmit incredibly high amounts of data very quickly. There are 2 general types of FOC: single frequency Cable, and multi-frequency Cable. Single frequency Cable carries only a single frequency of laser light, and because of this there is no self-interference on the line. Single-frequency FOC can attain incredible bandwidths of many gigahertz. Multi-Frequency FOC allows a Frequency-Division Multiplexed series of signals to each inhabit a given frequency range. However, interference between the different signals can decrease the range over which reliable data can be transmitted.

The Cable will be of repeated type OAL-C5 and unrepeated type URC-2; both Cable types have the following Cable options:

- Light Weight (LW)
- Light Weight Protected (LWP)
- Single Armour (SA)
- Double Armour (DA)

Fibre pairs are coated within a PVC layer which is filled with a non-deteriorating compound to protect the Optical fibres. The aluminum tube is protected by steel wires that are wrapped around the tube, which is then housed in a copper tube and covered by an insulating, polyethylene cover. This Cable has a diameter of 14 mm and is called lightweight (LW) Cable. LW 19.6mm Lightweight Cable is installed in deeper soil layer, where the risk of damage to the Cable is low. LW Cable is then covered with an additional metal tape to form Lightweight Protected (LWP) Cable that is deployed in deep soil, but where soil conditions are unfavourable further protection is required. Armoured Cable uses LW Cable as its central core with additional external protection where external risks are considered a threat to the Cable. Single Armour. (SA) Cable has a single layer of high strength galvanized steel wound around LW Cable. Double Armour (DA) is constructed by winding a second layer of galvanized steel wires around the SA Cable. The SA or DA Cable is then coated with a bituminous compound and covered by polypropylene yarns. SA Cable has a diameter of 26 mm and DA has a diameter of 35 mm. The following figure 3.11 shows the Fiber Optic Cable to be installed for the National Backbone Network.

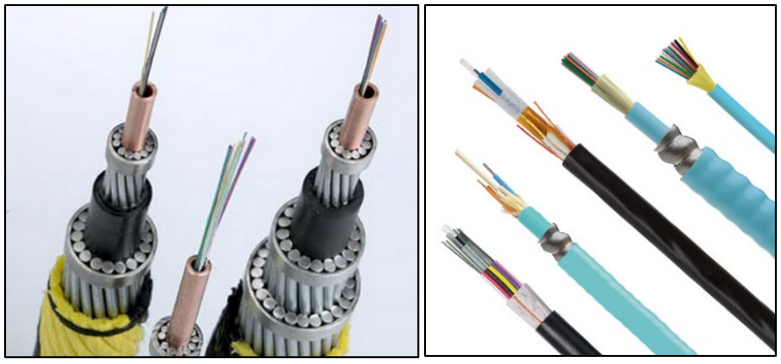

Figure 3.11: Fiber Optic Cables

The construction is designed for a minimum 25-year operational life. All Cable for telecommunications use in current production by MFOCN and others use Polyethylene for insulation. This material is exceptionally stable and have high resilience to chemical attack. It is typically used in the transportation of water for human consumption in construction and domestic installations. It has no components that leach or impart to soil and water. The Armour wires typically used are carbon steel with a zinc coating to minimize the corrosion of the steel. The outer layers of the Cable are designed to keep the galvanized wires protected from the acidity, salinity and consist of several layers of polypropylene yarn impregnated with bitumen. Polypropylene (like polyethylene) is a very common material used for the storage of potable water and similarly does not leach any material.

CABLE INSTALLATIONS

Cable installation is executed upon trenching is accomplished with specialized trenching tractors which cut the trench and remove the soil in a single action. A trench can be used to place multiple Cable over long or short distances. Detailed equipment operation and excavation procedures are specified by the construction equipment manufacturer. Cable trailers or Cable reels are then placed in line with the trench to prevent any unnecessary bending of the Cable. It is important to lay the Cable off the bottom of the reel. When routing Cable to enclosure locations, it needs to leave adequate cable lengths for splicing and storage. It is required to distribute 5% of the total length of the cable at these locations throughout the installation.

The bending radius of the Cable when going around corners and upward at enclosure locations need to be monitored. The Cable needs to cap as needed to prevent contamination from dirt and moisture. Warning tape above the Cable must be placed during the back-fill process. Finally, the trenched must be filled with sand/loose dirt and compact it as required. Damping or flooding the trench to provide compaction is required to prevent the trench from receding. Annex 5 shows the spools of Fiber Optic Cable.

3.3. PROJECT ACTIVITIES

MOBILIZATION PHASE

Mobilization of equipment, materials, and construction personnel, together with final design will commence when all necessary permits and approvals have been obtained. The Mobilization Phase will include establishing temporary offices and material storage areas in the project area, assembling equipment; and procuring construction workforce and materials. The Mobilization Phase is anticipated to last approximately one week for individual tower and constant procuring to the end for underground (FOC laying project. It is anticipated that materials and equipment will be imported for the construction phase, through the MFOCN's logistic headquarters and delivered to the storage areas by container trucks.

Location for the construction camps will be identified by selected Contractor in conjunction with MFOCN, at the mobilization stage. Number of camps could be 2 or 3. In reality these are more equipment yards, used for storage of equipment and vehicles, fuelling, fiber yarn and rolls etc. rather than camps. It is expected, that workers involved in construction activities will be accommodated through renting of houses with sanitation, however as an option they can be placed in rented or constructed construction camps. The selection of alternatives is up to the contractor, however the accommodation facilities should consider Health, Safety and Environment (HSE) requirements applicable for construction and recommendations given. The camp facilities if constructed will be constructed using mobile living units in standard containers, will have power and sanitary facilities, warehouses, car parking and repair facilities, etc. The camp will be securely fenced and guarded to avoid unauthorized entry.

ACCESS ROADS

Access roads will be needed to obtain access to the new tower locations and inaccessible RoW in the remote areas or at the off-road locations. During construction, all the access roads will be used to bring workers and materials to the tower sites to conduct tree-cutting operations (where needed), construct foundations, and assemble and raise the towers. Some local roads used by the local population and quite well-established will be partially used as access roads for the proposed Cable line. Where needed, clearing for new access roads will be 3 meters wide; in general, vehicles and equipment will travel across unprepared ground, with no preparation or road construction unless efforts are needed to control erosion or excess land disturbance. If expansion or construction of access roads require any land acquisition, it will be conducted in accordance with the applicable regulation in the region and upon authorization of the local administration. Access to tower locations will be made by driving on unimproved access "roads" from existing road crossings over the ground to the right-of-way. Neither permanent nor temporary paved/gravel access roads are proposed in the right-of-way.

CONSTRUCTION PHASE

The construction of the BTSs towers and Backbone Fiber Optic Cable Duct will require the creation of some temporary access roads to the construction sites. The construction of the Cable duct themselves will require some localised vegetation clearance. Materials arising from the excavation for the tower foundations (soil, rock etc.) and Cable duct would either be spread in appropriate areas surrounding site or removed to another site as agreed and rehabilitated on construction completed.

The foundations of the tower will be ready mixed or cast-in-situ according contractors' implementation method. And tower segments will be prefabricated and installed in the tower locations. Following tower erection, conductor stringing, which may involve the use of a mobile crane. Excavation for Cable duct may result in the need for removing vegetation along the RoW.

The works will be sequenced as follows: removal of the upper layer of soil (topsoil), construction of access roads (as needed), installation of tower foundations, arrangement of gravel lining around tower installation, installation of concrete foundations with ground refilling, arrangement of grounding contour, preparation of installation areas of towers, transportation of towers, installation of towers, installation of lines and Optical-fibre Cable, cleaning of construction area from construction debris and other waste, laying of stored topsoil.

Construction of the BTSs and Fiber Optic Cable Duct, related structures, and temporary facilities, will require the use of various types of equipment and manual labour. Activities can be described as follows:

- Tower Spotting;
- Clearing of Right-of-Way ;
- Clearing and Excavation of Tower Base and Foundation;
- Clearing of Tower Track;
- Trenching top soil
- Soil rehabilitation
- Storage and Transportation of Equipment and Material;
- Erection of Towers and construction of related structures (equipment rooms, junctions, manholes, switches, etc. ;

Construction of the proposed project line will utilize skilled, semi-skilled, and unskilled labour. A temporary workforce of approximately 100 workers is anticipated. The majority of the labour force will be recruited from within the country and will include the maximum use of qualified

personnel from the local communities as per Local Recruitment Plan to be prepared by the contractor. It is anticipated that the construction phase will last approximately 36 months.

INSTALLING NEW IN-GROUND CONDUITS

If no existing conduits, or conduits secured from another provider, were available on economic terms agreeable by the parties, MFOCN would construct a new conduit structure. Construction would occur primarily in existing utility rights-of-way and conduits would typically be installed adjacent to or in close proximity of other existing utility facilities. The route would be developed based on the nearest existing manhole of the leased third-party Fiber provider and the existing entrance structure provided by the building owner/developer. Construction activities involved in the installation of new in-ground conduits include trenching and directional drilling.

TRENCHING

The typical construction process would consist of using trenching/excavating equipment to cut a minimum 6-inch-wide opening, preferably immediately off the concrete curb and gutter line in the asphalt area. The trench would be to a depth of approximately 48 inches, depending upon the location of other utilities, with a 2-inch gravel base. Conduits would be placed at the bottom of the trench. The trench would then be backfilled and compacted, and the surface restored to a condition of equal or better quality as the original condition. Figure shows trenching operation during construction phase.

DIRECTIONAL DRILLING

Directional drilling equipment may be used in order to construct around complicated utility systems or other areas needing to be avoided without causing damage. Larger work areas are required for drilling. Pilot and receiving holes are dug to begin and end the drill tunnel. These holes vary in size depending upon the length of the proposed drill. Directional drilling often requires a lubricating slurry to help lubricate the drill bit, prevent the bore tunnel from collapsing, and carry drill cuttings to the surface. The viscosity of the slurry used will vary depending upon existing subsurface conditions.

ESTABLISHING STAGING AND PARKING AREAS

Staging areas for construction equipment, materials, fuels, lubricants, and solvents would be established along each project route during construction to allow more efficient use and distribution of materials and equipment. No new staging areas would be established in undisturbed areas. All staging areas would be located on private lands in existing contractor yards or public lands if authority is granted by local municipalities; existing commercial areas used for storing and maintaining equipment; previously cleared, graded, or paved areas; or level areas where grading and vegetation-clearing are not required.

MANHOLES

The conduits would be accessible via manholes that would be placed along the right-of-way approximately one per block in downtown areas or one every several hundred feet in suburban areas. Manholes typically measure 1m x 1m x 2m with only the manhole lid visible at the surface. Manholes, used to assist the installation of Fiber Optic Cable (FOC) inside the conduit, are smaller in size than manholes and typically require less ground disturbance. Manholes will be provided with iron covers and paved monolithically to the ground surface with concrete or bitumen according to the existing condition.

OPERATION PHASE

Once constructed, both component will require minimal maintenance. Periodical visual inspection of the towers and connectivity is expected. After a period of many years, the entire system would need a detailed survey and overhaul. There may be a requirement for occasional examination to check the stability, risk and hazards. Access rights may need to be retained to allow for maintenance works in the future.

The operational phase of the project will involve the commissioning of the equipment room and maintenance of the ROW, the Fiber Cable lines and the towers. The operation and maintenance will be based on accepted international standards, such as those of the International Electrotechnical Commission (IEC). The MFOCN has its own specific procedures for the operation and maintenance of its property as set out in the 'MFOCN Rules and Regulations'. The main activities to be carried out during the operating life of the towers and Fiber Cable network include surveillance of the condition of the connectivity, towers and ROW; routine and emergency maintenance and repairs; and vegetation control. Vegetation control measures will be done manually. All operations will be managed in accordance with the EMP prepared in accordance to the requirements and recommendations set in the present report fully compliant with local legislation and MOECAF requirements.

The MFOCN maintains a department that is responsible for the operation and maintenance of its towers and FOC network. The department carries out its duties through the activities described below:

This consists of routine maintenance carried out by the maintenance department to ensure the integrity, efficiency and safety of the towers and Cable network. The maintenance activities carried out here include: Foot patrol, Security patrol, and Tower auditing and repairs.

Scheduled maintenance programs are carried out throughout the project life to counteract the effects of the ageing of towers, Cable lines and other accessories. The repairs may also arise out of the running maintenance activities. These maintenance programs usually become necessary as a result of the dis-connectivity, mechanical wear and tear through harsh environments and natural disaster. Some of the activities carried out under the major maintenance program include:

- Replacement of appliances and sections of the Fiber Cable line.
- Treatment of rust and re-painting of tower components.
- Replacement of corroded towers and fixtures components.
- Replacement of conventional bolts and nuts with anti-theft fasteners where necessary, and
- Rehabilitation of access roads and tracks.

In forested areas, the right-of-way will require vegetation control and to maintain access to the towers. Vegetation control will be conducted mechanically, with cutting activities occurring every year. Herbicides will not be used. Access to towers locations will be achieved by driving to existing road crossings and entering the right-of-way by driving over the ground or by driving along dirt access roads (where they exist along the existing sections of the line). Neither permanent nor temporary paved/gravel access roads will be established and maintained in the right-of-way. In all cases, access through private properties will be arranged with prior information to the land user/owner and after accomplishment of all procedures.

Some of the activities carried out under construction phase include the construction of temporary by-pass Cable line for underground utility, compensation for disturbed utility networks line, reconstruction of the interrupted utility setting. These activities will be done in closer collaboration with local administration and only executed after the agreement and permit has been achieved.

DECOMMISSIONING

The project line is likely to remain in place for many years and therefore any decommissioning works would be a long time in the future. Operation of the telecommunication is not limited and expected to continue. Decommissioning of the infrastructure is not very likely for at least 25 years, and rather a long-ranging repair or exchange of components is expected to occur. Decommissioning of technical installations comprises dismantling, decontamination of materials and site, shipment and final disposal of materials as well as site rehabilitation.

Towers should be dismantled and removed and materials recycled/re-used as far as possible. Disposal of materials can take place either by selling, re-use or depositing. Any areas disturbed would be restored to pre-project conditions and/or to conditions acceptable to the MOECAF.

If required, MFOCN would develop a Closure Plan prior to decommissioning for submittal to the MOECAF for review and approval. All environmental impacts associated with the decommissioning process would be minimized through the implementation of an environmental management plan as part of the Closure Plan. The Closure Plan would demonstrate that MFOCN is fully committed to its responsibilities and the degree of planning and input required to protect the local and regional environment of the project area.

4. DESCRIPTION OF THE ENVIRONMENT

This Chapter describes the general environmental conditions of Myanmar and provides an understanding of the current conditions from the perspective relevant to the proposed telecommunication infrastructure Project. The planning and implementation of the proposed infrastructure from site selection, land preparation, construction and operational aspects should take into account the baseline physical, biological and social aspects of the existing conditions. For example knowledge of where environmentally and or culturally sensitive areas are located will help in the planning of the FOC route, sites for the BTSs, towers, construction camps and equipment yards. The land area required for individual BTS and tower can be considered to be small (i.e. 300 square meters at most), although construction camps and equipment yards could have a larger footprint. However, these camps and yards are expected to be located within urbanized areas or near main roads and not on virgin land, thus limiting impacts on the environment.
In addition, a Hazard Profile of Myanmar, based on available literature, is presented at a latter section in this Chapter. These identified hazards should be considered in the site selection, design, material selection, and construction methodology of the infrastructure.

All information in this Chapter is from secondary sources and should not be considered to be comprehensive in nature to describe all site locations under this project. This is because the project is scattered across Myanmar and specific locations are localized and yet to be finalized.

4.1. PHYSICAL ENVIRONMENT OF MYANMAR

The existing Environmental condition (i.e. baseline) of Myanmar is discussed below. The discussion highlights on biodiversity, habitat, protected areas and hazards.. The description in these sections are almost entirely based upon secondary resources, including various studies conducted earlier specifically for the proposed project.

4.1.1. Country Overview

Myanmar, the largest country in South East Asia, is part of the Sundaic subregion of the Indo-Malayan Realm. Due to the combination and interaction of geography, topography, climate, pattern of seasonal rainfall, presence of high mountains and major rivers, Myanmar presents a great variety of different habitats and ecosystems supporting a rich biodiversity. With about half (48%) of mainland covered by forests (FAO 2010), Myanmar ranks 6 out of 11 among the Southeast Asian countries in terms of percentage of land area covered by forest (FAO 2009).

Northern Myanmar presents the highest mountains with permanent snow and glaciers, with Mount Khakaborazi (6,000 m) being the highest in Myanmar and in South East Asia. The country includes extensive lowland plains, major rivers running parallel to each other, one of the largest river deltas in Asia (Ayeyarwaddy Delta) and plateau around 1,000 m above sea level like the Shan Plateau. Myanmar, with its 2,280 km long coast and more than 800 small islands, has important coast and marine habitats supporting an abundance of species. The climate is a tropical monsoon climate with three distinctive seasons: hot season from March to May, rainy season from June to October, cold season from November to February, with high rainfall variability, from 500 mm in the Dry Zone up to over 6,000 mm in Tanintharyi Region and northern Rakhine State.

Myanmar has a wide range of terrain and ecological and climatic zones. Its rich natural endowment includes evergreen forests in the southern part of the country, deciduous dipterocarp forests and thorn scrub in the central part, and subalpine forests in the north. Large, slow-flowing rivers and large lakes support extensive freshwater ecosystems, while expansive seacoasts with tidal mangroves sustain vital marine ecosystems. Areas of

particularly rich biodiversity are the Malaysian rain forests present in the southern part of Myanmar (in the Tanintharyi Division) and the mountainous area of Kachin State in the upper north, home to Himalayan fauna. With a large part of the country still forested, Myanmar's flora and fauna are extensive and include a number of endangered species, such as the tiger and the Irrawaddy dolphin.

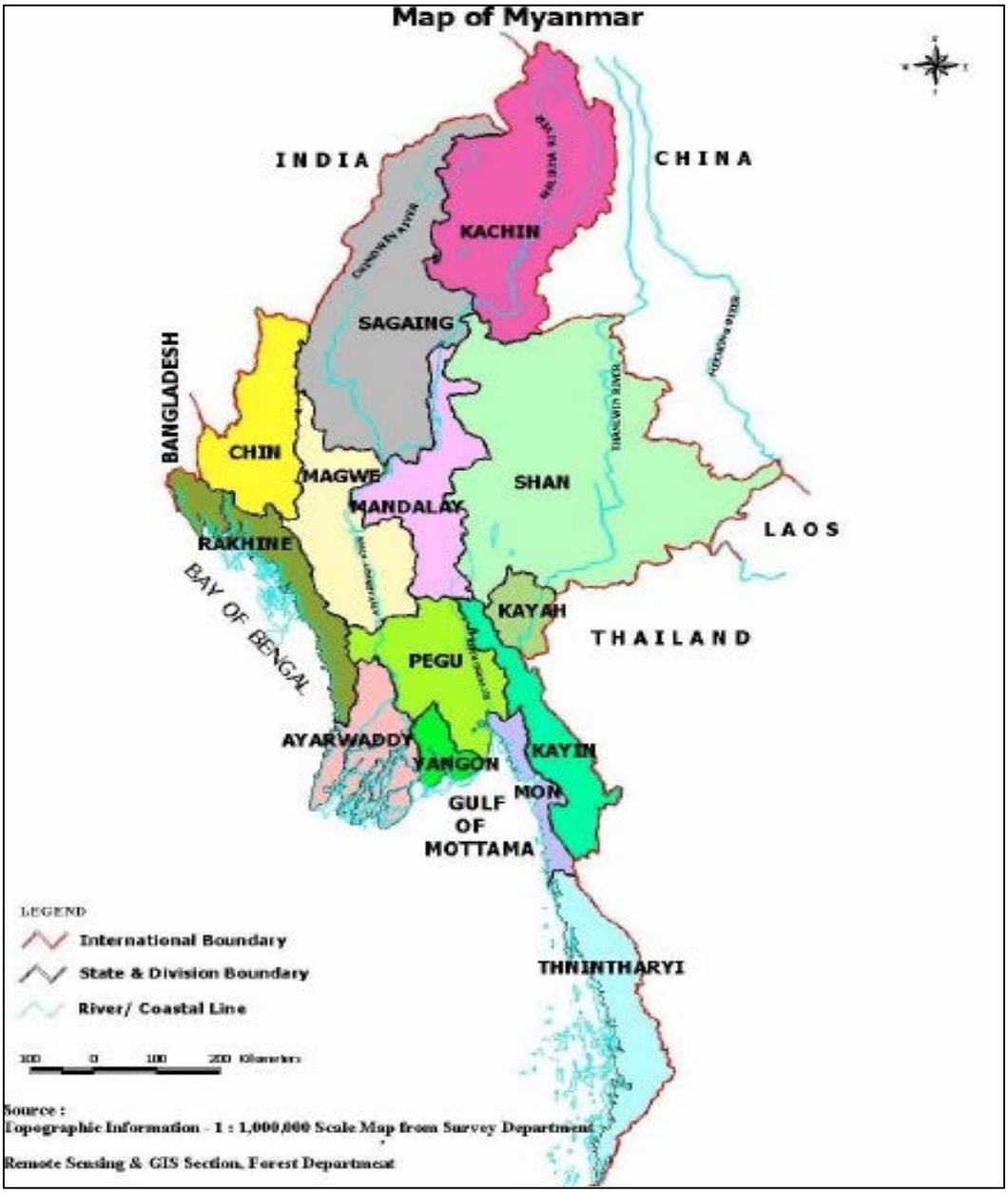

Figure 4.1: Administration Map of Myanmar Source (*source: Forest Department)*

4.1.2. Biodiversity

About 250 mammal species, more than 1,000 birds, 370 reptiles and 7,000 plants are recorded in Myanmar, including 39 species of mammals, 45 of birds, 21 of reptiles and 38 of plants which are globally threatened (NCEA, 2009a). More species could be added since new discoveries continue to be made every year, including the exceptional discovery, during a survey of FFI and BANCA in Kachin state, of a new species of primate in 2010, the Burmese snub-nosed monkey *Rhinopithecus strykeri,* immediately classified as critically endangered by IUCN. 76 Key Biodiversity Areas (KBAs) have been identified, out of which 54 are

recognized as Important Birds Areas (IBAs) (BLI 2005). Endemism is relatively low compared to other countries in South East Asia. There are seven Endemic Birds Areas EBAs and secondary endemic areas (BLI 2005 and IUCN-WCPA 2007), three exclusively located in Myanmar (Eastern Himalayas, Irrawaddy plains and North Myanmar Lowlands), two stretching across Myanmar and Thailand (Myanmar-Thailand Mountains and Peninsular Thailand lowland forests) and two others centered mainly in other countries but extending in Myanmar (Andaman Islands and Yunnan mountains). Natma Taung National Park is a particular area of local endemism.

4.1.3. Habitats

Important habitat types represented in Myanmar are forests, wetlands and the marine habitat. Eight different forest types are found in Myanmar: tropical evergreen forest, mixed deciduous forest, dry forest, deciduous dipterocarp forest, hill and temperate evergreen forest, tidal forest or mangrove forest, beach and dune forest, swamp forest (Tint, 1995).

The tropical evergreen forest is mainly represented in Myanmar by the lowland wet evergreen forest, a lush vegetation forest dominated by high value commercial species like the evergreen *Dipterocarpus* species. This forest is found quite well conserved along the coast of the Tanintharyi Region.

The mixed deciduous forest is the major forest type of Myanmar and is characterized by the high-value timber species of *Tectona grandis*, commonly known as teak, often found in association with *Xylia dolabriformis* and different species of *Terminalia*. The presence of *Tectona grandis* makes this forest also the most economically important forest of the country. The mixed deciduous forest is strictly associated with bamboo species, which represent an important source of food for many wildlife species, and supports endangered species like the Hoolock Gibbon.

The dry forest, represented by thorn scrub and forest, it is found in the Central alpine meadows are found at the highest elevations on the mountains, before the level of permanent snow and ice.

Mangrove forests (or tidal forests), found along alluvial flats of river deltas and on muddy coastal areas, are salt tolerant and are flooded by seawater during high tide. This type of forest has a very important ecological function since it stabilises the shoreline, protects the coast from erosion and is a particularly important habitat for migratory waterbirds. Mangroves offer a variety of forest and aquatic products to many coastal people and largely support fish production. Myanmar hosts 8.8% of the total mangrove forests area of South East Asia, being the third richest country after Indonesia and Malaysia. Of the total mangroves area in Myanmar, 46% is located in Ayeyawaddy Region, 37% in the Tanintharyi Region and 17% in the Rakhine State (Giesen et al. 2006). They are all considered under threat, although many areas are nominally protected.

Beach and dune forest represents a minority of total forest area in Myanmar, and it is found in narrow strips on beaches and dunes along the coasts, usually dominated by *Casuarina equisetifolia*.

The swamp forest, found in the Ayeyarwaddy Delta and in the floodplains of other rivers and lakes, and wetlands are of high ecological importance for many bird species which have suffered dramatic population declines across their global distributions. Many of these wetland sites have been recognized as Important Bird Areas and some proposed as Ramsar sites.

The marine habitat, supporting a high biomass of fish and other aquatic organism, represents an important source of income for the country, with the fishery sector as the fourth largest

sector in Myanmar, and shrimp export accounting for nearly 50% of the total value of fishery export. Coral reefs are extensive on the south east coast of Myanmar (fringing reefs and patch) and around the islands, extending further south into Thailand, covering 1,870 km², with the majority of coral reefs found in the Myeik Archipelago of the Tanintharyi Region.

Coral reefs in Myanmar need to be more fully surveyed and better protected since they provide many functions, services and goods in terms of coastal protection and sediment retention, nurseries and habitats for aquatic organism, feeding grounds for economically important species of fish and other seafood products, potential revenues from tourism. Seagrasses are mainly found in Rakhine and Tanintharyi marine areas, while they are absent in the Ayeyawaddy Delta because of high turbidity. Seagrass beds represent a food source and shelter habitat for many economically important species of marine invertebrates and fishes, and globally threatened species like the Dugong (*Dugong dugon*). Seagrass habitat has an important role in stabilizing the coast, reducing waves and the effects of currents and trapping the sediments, thus protecting coral reefs from sedimentation.

Dry Zone, characterized by dry and seasonal climate, where the rainfall is usually under 1,000 mm. The dominant species are *Terminalia oliveri* and *Tectona hamiltoniana*, with a number of thorny *Acacia* species.

The deciduous dipterocarp forest is found only in five countries in the world, namely Myanmar, Laos, Cambodia, Vietnam and Thailand. Also known as Indaing forest in Myanmar, is commonly found at higher altitudes in the northern part of the country. It is characterized by open canopy of deciduous species of Dipterocarpaceae. This forest type has remained isolated from other similar forests of South East Asia, making it one of the centres of endemism in Myanmar. It hosts endemic species like the critically endangered Burmese Star Tortoise and many threatened species like the vulnerable Eld's Deer.

The hill and temperate evergreen forest is found in high rainfall areas, on slopes between 900 m and 1,800 m (hill forests) and over 1,800 m (montane forest). Dominated by tree species of *Quercus, Castanopsis, Schima*, Fagaceae, Magnoliaceae, Lauraceae and Ericaceae, this forest type is characterized by many climber species and rich and lush undergrowth.

Beyond the coniferous forests, sub-alpine forest and alpine meadows are found at the highest elevations on the mountains, before the level of permanent snow and ice. Mangrove forests (or tidal forests), found along alluvial flats of river deltas and on muddy coastal areas, are salt tolerant and are flooded by seawater during high tide. This type of forest has a very important ecological function since it stabilises the shoreline, protects the coast from erosion and is a particularly important habitat for migratory waterbirds.

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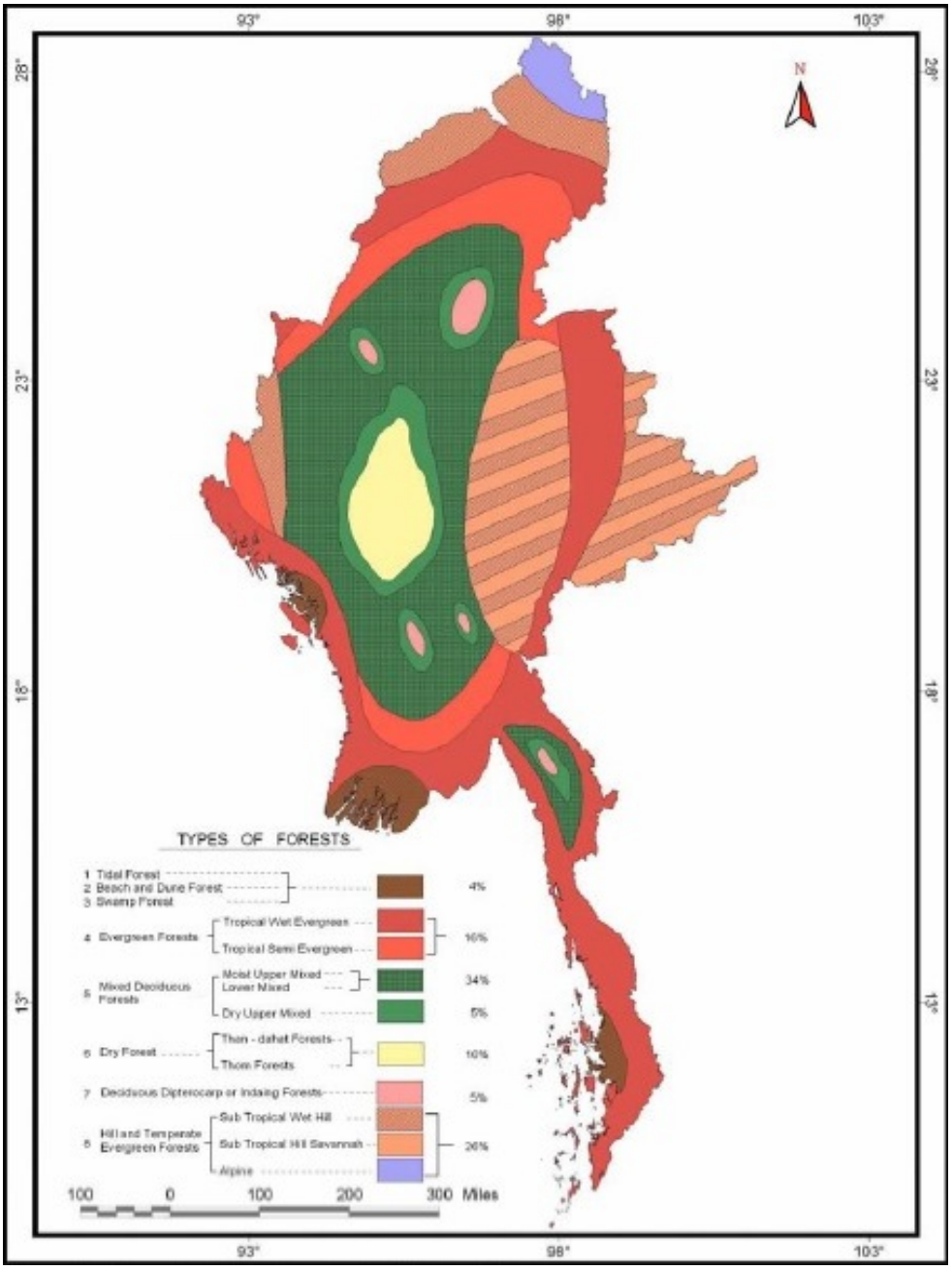


Figure 4.2: Dominant Types of Forests in Myanmar (Source: Department of Forestry)

4.1.4. Myanmar Protected Areas (PAs)

According to Forest Department (2009), 43 protected areas exist in Myanmar. Thirty-five sites were designated in the period 1918-2010. Eight additional sites have been proposed in the period 1997-2008, also thanks to the efforts of international organizations and conventions, and are still at the proposal stage. There is no available information on the status of designation process of the remaining 7 proposed sites. The 35 designated protected areas cover approximately 42,000 km² of land, representing 6.2% of the total country area. With the establishment of 8 additional protected areas, proposed from 2001 to 2008, Myanmar would increase by 7,400 km² (1.1%) the total protected land, reaching 49,500 km² and representing 7.3% of the total land area, surpassing the 5% target set by the Myanmar's Forest Policy (1995), but still under the 10% set by the National Forest Master Plan (2001).

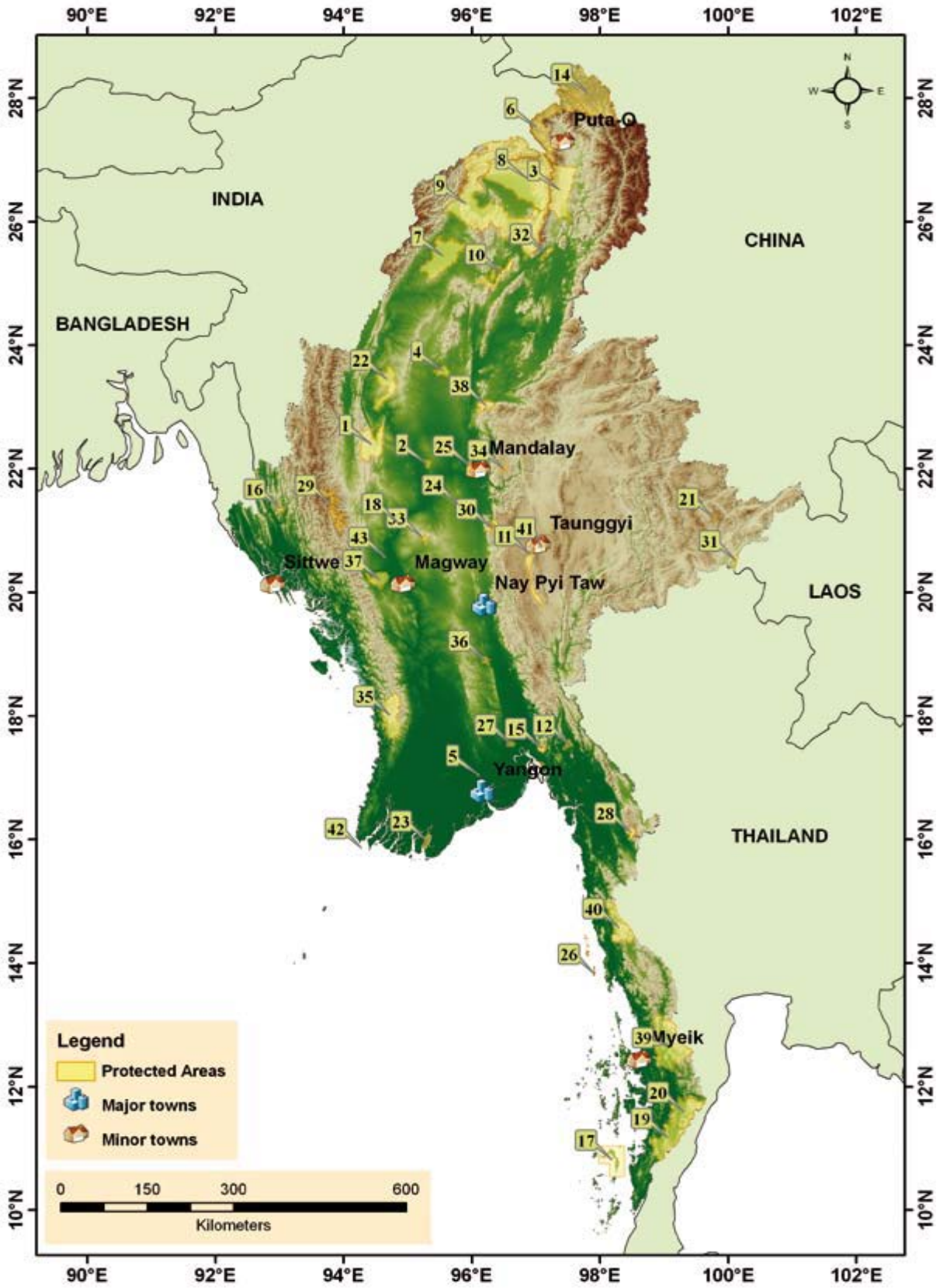
PAs range in size from 0.5 km² to 22,000 km². The majority of PAs are included in the category wildlife sanctuary. Wildlife Park and Mountain Park were established with the main objective of education and recreation. In addition, Wildlife Reserve aims to combine conservation and controlled timber extraction to meet the needs of wildlife and local communities. There are only 4 marine protected areas (MPA) 10 including 1 marine national park and 3 wildlife sanctuaries. Currently, only Thamihla Kyun Wildlife Sanctuary is classified as MPA while the remaining three are considered as both terrestrial and marine. Conservation efforts in all sites seem more focused on forest resources and terrestrial wildlife protection than on marine ecosystems.

Thirty-one of the PAs are totally protected and 12 are partially protected, whereas permanent settlements and activities like tourism, fishing, agriculture, logging and industry are explicitly allowed in the notification. All the designated and proposed protected areas support threatened species of mammal, bird and reptile. Six PAs were designated/proposed to protect not only threatened species but their habitats. The table shows list of Myanmar Protected Areas (PAs) and their general information.

Table 4.1. List of Myanmar Protected Areas (PAS) and Their General Information

ID	Site name	National Designation	Status	Establishment Year	Area (km2)
1	Alaungdaw Kathapa	National Park	Designated	1989	1597.62
2	Bawditataung	Nature Reserve	Proposed	2008	72.52
3	Bumhpabum	Wildlife Sanctuary	Designated	2004	1854.43
4	Chatthin	Wildlife Sanctuary	Designated	1941	269.36
5	Hlawga	Wildlife Park	Designated	1989	6.24
6	Hponkanrazi	Wildlife Sanctuary	Designated	2003	2703.95
7	Htamanthi	Wildlife Sanctuary	Designated	1974	2150.73
8	Hukaung Valley	Wildlife Sanctuary	Designated	2004	6371.37
9	Hukaung Valley (Extension)	Wildlife Sanctuary	Designated	2004	15431.16
10	Indawgyi Lake	Wildlife Sanctuary	Designated	2004	814.99
11	Inlay Lake	Wildlife Sanctuary	Designated	1985	641.90
12	Kahilu	Wildlife Sanctuary	Designated	1928	160.56
13	Kelatha	Wildlife Sanctuary	Designated	1942	23.93
14	Khakaborazi	National Park	Designated	1998	3812.46
15	Kyaikhtiyoe	Wildlife Sanctuary	Designated	2001	156.23
16	Kyauk-Pan-Taung	Wildlife Sanctuary	Proposed	2001	132.61
17	Lampi Island	Marine National Park	Designated	1996	204.84
18	Lawkananda	Wildlife Sanctuary	Designated	1995	0.47
19	Lenya	National Park	Proposed	2002	1761.19
20	Lenya (Extension)	National Park	Proposed	2004	1398.59
21	Loimwe	Protected Area	Designated	1996	204.84
22	Maharmyaing	Wildlife Sanctuary	Proposed	2002	1180.39
23	Mainmahla Kyun	Wildlife Sanctuary	Designated	1993	136.69
24	Minsontaung	Wildlife Sanctuary	Designated	2001	22.60

ID	Site name	National Designation	Status	Establishment Year	Area (km2)
25	Minwuntaung	Wildlife Sanctuary	Designated	1972	205.88
26	Moscos Island	Wildlife Sanctuary	Designated	1927	49.19
27	Moyingyi Wetland	Bird Sanctuary	Designated	1988	103.60
28	Mulayit	Wildlife Sanctuary	Designated	1936	138.54
29	Natma Taung	National Park	Proposed	1997	722.61
30	Panlaung-Pyadalin Cave	Wildlife Sanctuary	Designated	2002	333.80
31	Parasar (Par Sar)	Protected Area	Designated	1996	77.02
32	Pidaung	Wildlife Sanctuary	Designated	1918	122.08
33	Popa	Mountain Park	Designated	1989	128.54
34	Pyin-O-Lwin	Bird Sanctuary	Designated	1918	127.25
35	Rakhine Yoma Elephant Range	Wildlife Reserve	Designated	2002	1755.70
36	Shinpinkyetthauk	Wildlife Sanctuary	Proposed	2006	71.90
37	Shwesettaw	Wildlife Sanctuary	Designated	1940	552.70
38	Shwe-U-Daung	Wildlife Sanctuary	Designated	1918	325.95
39	Tanintharyi	National Park	Proposed	2002	2071.81
40	Tanintharyi	Nature Reserve	Designated	2005	1699.99
41	Taunggyi	Bird Sanctuary	Designated	1930	16.06
42	Thamihla Kyun	Wildlife Sanctuary	Designated	1970	0.88
43	Wenthtikan	Bird Sanctuary	Designated	1939	4.40



Figures 4.3: Locations of Protected Areas (PAs) across Myanmar

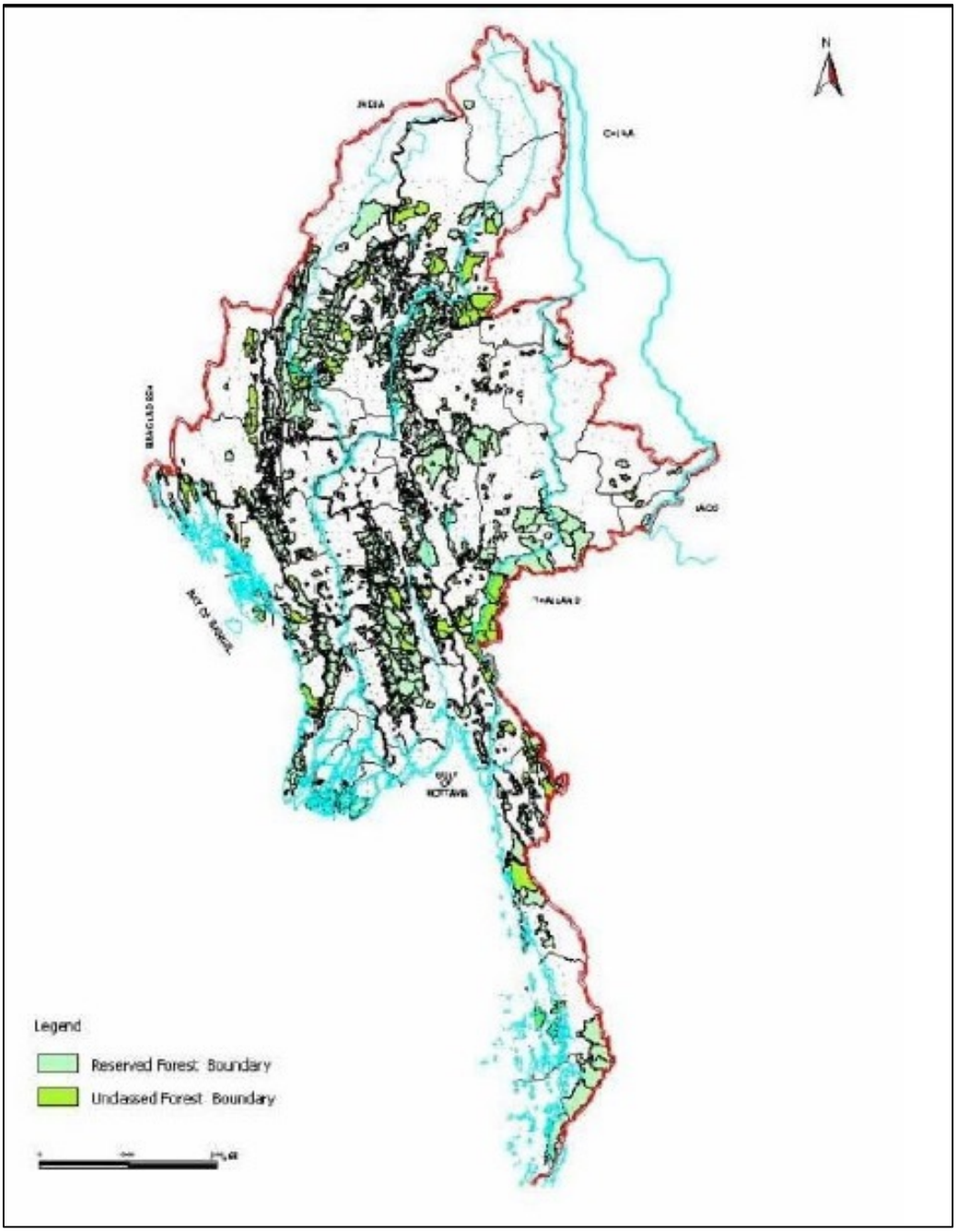


Figure 4.4.: Locations of Reserved Forests in Myanmar (*Source: Forest Department)*

4.2 HAZARD PROFILE OF MYANMAR

According to the Hazard Profile of Myanmar prepared by Myanmar Information Management Union (MIMU), totally 10 hazards have been identified. However among them, potential hazards that the proposed project could confront are the following:

- Cyclone
- Earthquake
- Floods, and
- Landslide

4.2.1 Cyclone

Myanmar is exposed to the threat of cyclones and associated sea waves. Previous frequency of cyclones that made landfall on Myanmar coast was just once in about three years, but since the year 2000, cyclones crossed Myanmar coast every year. The cyclone tracks are unprecedented with respect to the Latitude and pattern of recurvature. Latitude of recurvature becomes lower year after year and drastic change of direction of the course took place within a few hours. In the case of Cyclone Nargis, the impact was extremely severe. It is due to very high vulnerability of the area. Enhancement of strong coordination among the responsible agencies, community participation and capacity building need to be expanded in the context of disaster risk reduction in Myanmar.

Causes and Characteristics of Cyclones in the Bay of Bengal

Myanmar is situated in the western part of the South-East Asia, bordering the Bay of Bengal and the Andaman Sea with its 2400 km long coast line. It is potentially rich with marine natural resources and also potentially threatened by the waves, cyclones and associated weather. As a tropical agricultural country, the majority of the people live in the fertile plain land which is often inundated by river floods and coastal areas exposed to stormy weather.

The Bay of Bengal of the North Indian Ocean stretches northward from the equator to the river mouths of Bramaputra, Ganges and Magna and eastward from Madras coast of India to Myanmar coast, in the tropical region. Though the area is not so vast, but it is a typical place for the tropical cyclone generation. The life span of cyclone is rather short, less than a week. Cyclones, once generated, move generally westward heading to India and if there is slight re-curvature, it heads towards Bangladesh. If the re-curvature is sudden, then it moves towards the Myanmar coast. The more the degree of re-curvature is drastic, the higher probability of its crossing the Myanmar coast at lower Latitudes. Hence, once there is cyclone formation in Bay of Bengal, at least one country is likely to suffer unless the cyclone filled up in the open sea, which is not often. The cyclone is accompanied by three destructive forces: strong winds (as high as 120 mph), heavy rains (more than 5 inches in 24 hours) and storm surges (higher than 10 feet). Storm surge is the main cause of damage, which depends on the vulnerability of the place of landfall. Annually, there are approximately 10 tropical storms in the Bay of Bengal from April to December. Severe cyclones occurred during the pre-monsoon period of April to May and post-monsoon period of October to December. The tropical storms that form during the monsoon period June to September are weak and have a short life span. In the post-monsoon period, remnants of typhoons in the South China Sea regenerate into storms in the Bay of Bengal. Hence, the Bay of Bengal has two cyclone seasons annually about a month before and three months after the South-West monsoon.

Frequency and Impact

During the period 1887 to 2005, 1248 tropical storms were formed in the Bay of Bengal, of which 80 storms (6.4 percent of total) hit the Myanmar coast. May and April account for 30 and 18 percent of the cyclones, respectively, while October and November each accounts for 18 percent cyclones that hit Myanmar. The month-wise break-up of cyclone formed in Bay of Bengal from 1887 to 2005 is summarized below:

Month	No. of Cyclone formed in Bay of Bengal along with % of total	No. of Cyclone which hit Myanmar along with % of total
JAN	16(1%)	2(2%)
FEB	3(0%)	1(1%)
MAR	8(1%)	-
APR	32(3%)	15(19%)
MAY	89(7%)	24(30%)
JUN	111((9%)	1(1%)
JUL	180(15%)	-
AUG	192(15%)	-
SEP	209(17%)	-
OCT	190(15%)	14(18%)
NOV	141(11%)	14(18%)
DEC	77(6%)	9(11%)
Total	**1248(100%)**	**80(100%)**

As 24 out of 89 cyclones crossed Myanmar coast, the Department of Meteorology and Hydrology assumes the month of May as the highest possible period for the cyclone to cross the Myanmar coast.

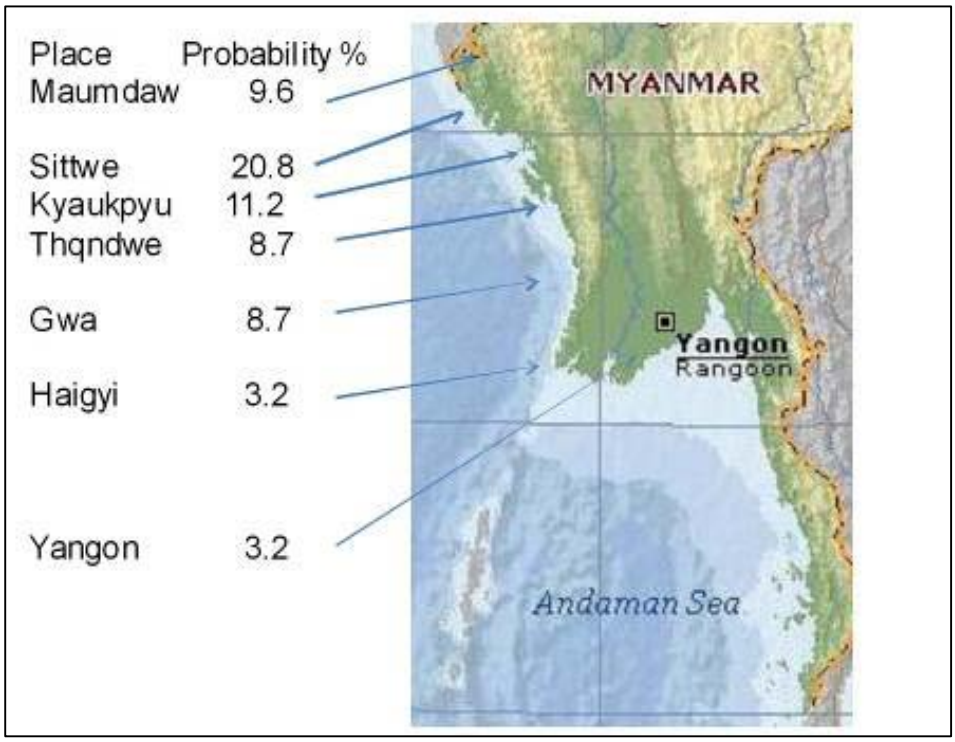


Figure 4.5: Cyclone landfall probability along Myanmar Coast (1947-2008)

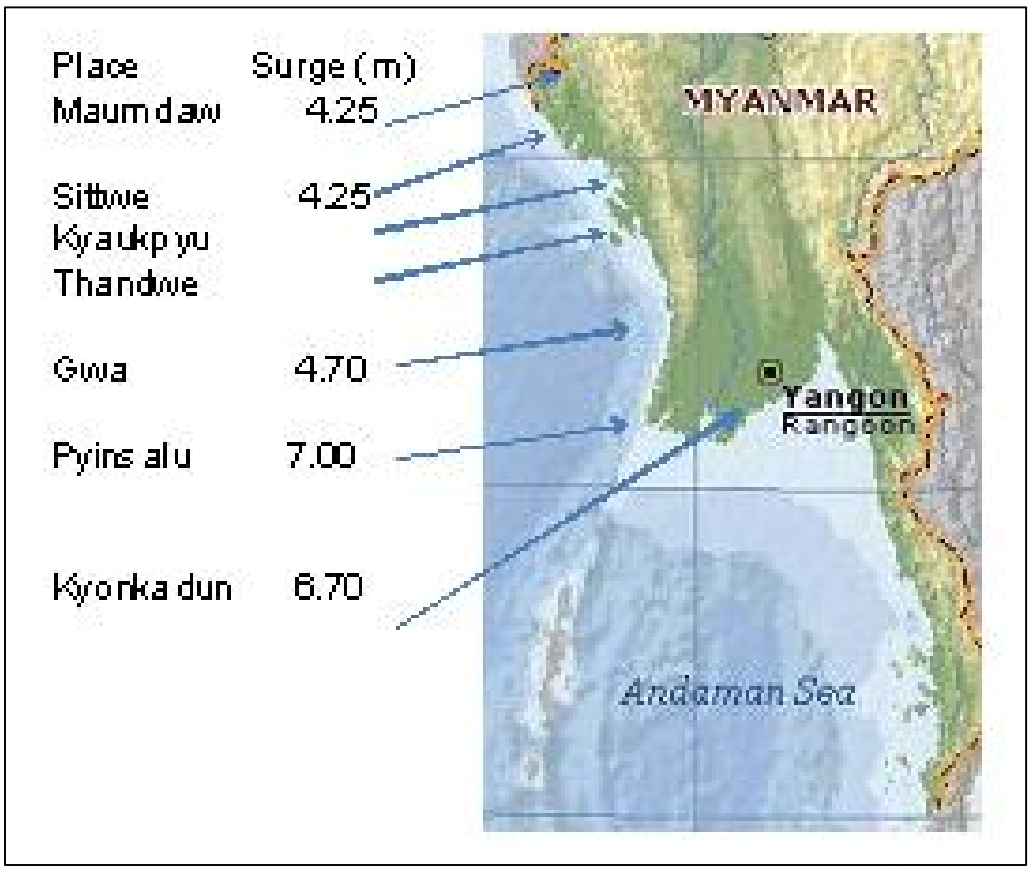


Figure 4.6: Storm surge observed along Myanmar Coast

4.2.2 Earthquake

Causes and Characteristics

Geographically, a larger part of Myanmar lies in the southern part of the Himalaya and the eastern margin of the Indian Ocean, hence exposed to bigger earthquakes. Myanmar is earthquake-prone as it lies in one of the two main earthquake belts of the world, known as the Alpide Belt that starts from the northern Mediterranean in the west, and then extends eastwards through Turkey, Iran, Afghanistan, the Himalayas, and Myanmar to finally Indonesia. The seismotectonics of Myanmar is at Figure (4.7). Earthquakes in Myanmar have resulted from two main sources namely:

- continued subduction (with collision only in the north) of the northward-moving Indian Plate underneath the Burma Platelet (which is a part of the Eurasian Plate) at an average rate of 3.5 cm/yr; and
- The northward movement of the Burma Plate from a spreading centre in the Andaman Sea at an average rate of 2.5–3.0 cm/yr (Bertrand et al., 1998; Curray, 2005).

Very large over thrusts along the Western Fold Belt have resulted from the former movement, and the Sagaing and related faults from the latter movement. Intermittent jerks along these major active faults have caused the majority of earthquakes in Myanmar. These seismotectonic processes are still going on. The occurrence of intermediate-focus earthquakes (focal depth 70 – 300 km) along the Western Fold Belt is due to the subduction, and that of shallow-focus earthquakes (focal depth 0 – 70 km) along the Central Lowlands and Eastern Highlands is mainly due to shallow-depth strike-slip (e. g., Sagaing Fault) and other faulting. Generally, the shallow earthquakes tend to be more destructive than intermediate ones for the same magnitude.

The major seismotectonically important faults in Myanmar are some unnamed major thrust faults in north-western Myanmar, Kabaw Fault along the Kabaw Valley in western Myanmar, the well-known Sagaing Fault, and the Kyaukkyan Fault situated west of Naungcho. The well-known and seismologically very active Sagaing Fault (Win Swe, 1972 & 1981; Vigny et al., 2003; Soe Thura Tun, 2006) is the most prominent active fault in Myanmar, trending roughly north – south. It has been an originator of a large proportion of destructive earthquakes in Myanmar. This is due to the fact that many large urban centres lie on or near this fault. In fact, of the five major source zones in Myanmar, three lie around this large and dangerous fault. As shown at Figure 4.7, it is a right lateral strike-slip fault extending from south of Putao, west of Katha, through Sagaing, along the eastern flank of Bago Yomas, then through Bago, and finally into the Gulf of Mottama for a total distance of about 1500 km. The earthquakes generated by sea-floor spreading in the Andaman Sea, however, are mostly small to moderate and shallow-focus.

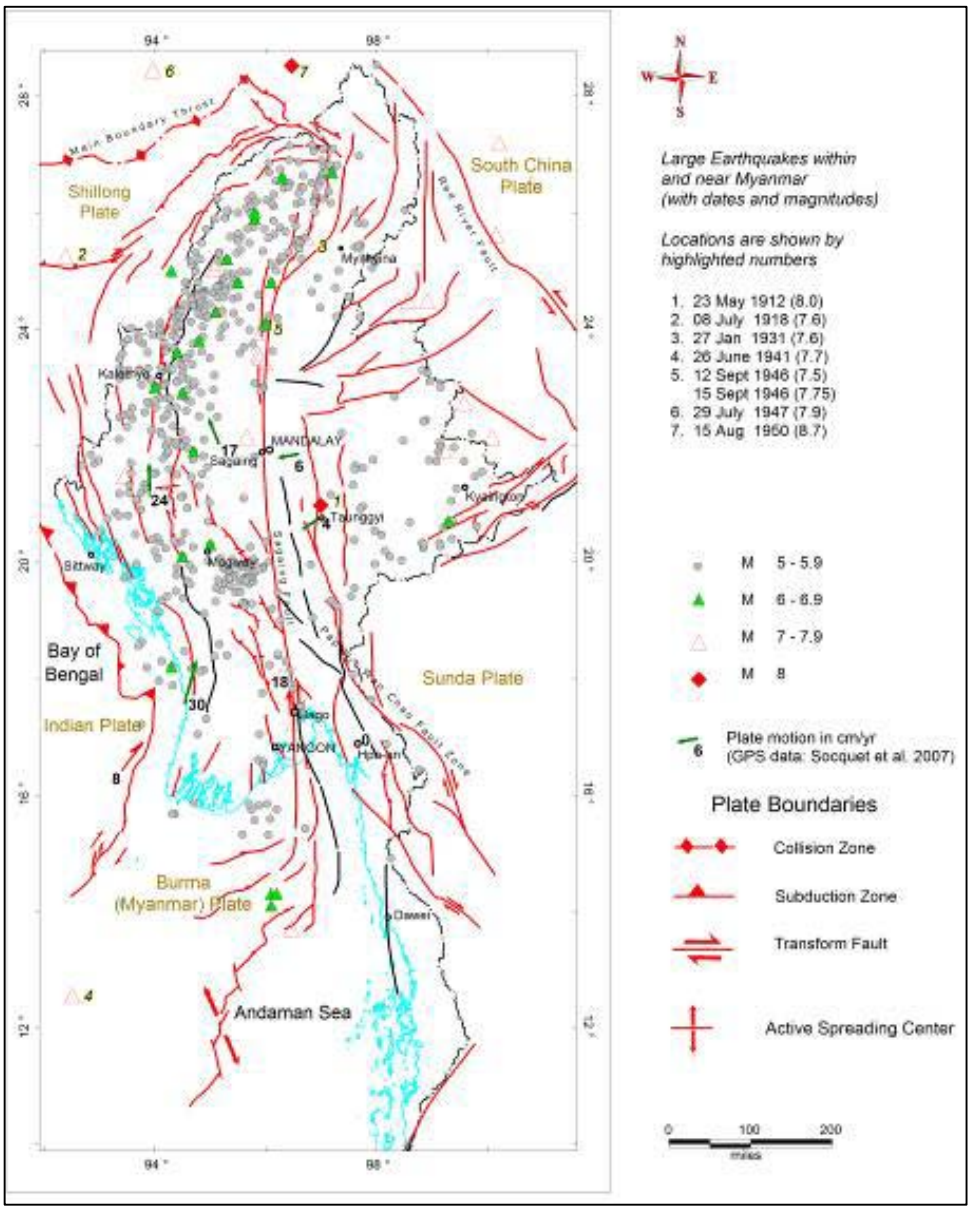


Figure 4.7: Seismotectonic map of Myanmar and surrounding regions

The zones are as follows:

1. The zone along the western fold belt of Myanmar with mostly intermediate-focus earthquakes; earthquake frequency is much higher in the northern part.
2. The zone along the Sagaing Fault, including the offshore part with shallow-focus earthquakes; the earthquake frequency is higher in three segments, namely (from south to north), Bago-Taungoo, Sagaing-Tagaung, and Myitkyina-Putao Segments.
3. The zone in the north-eastern part of Myanmar, which is continuous with the earthquakes in southern Yunnan.

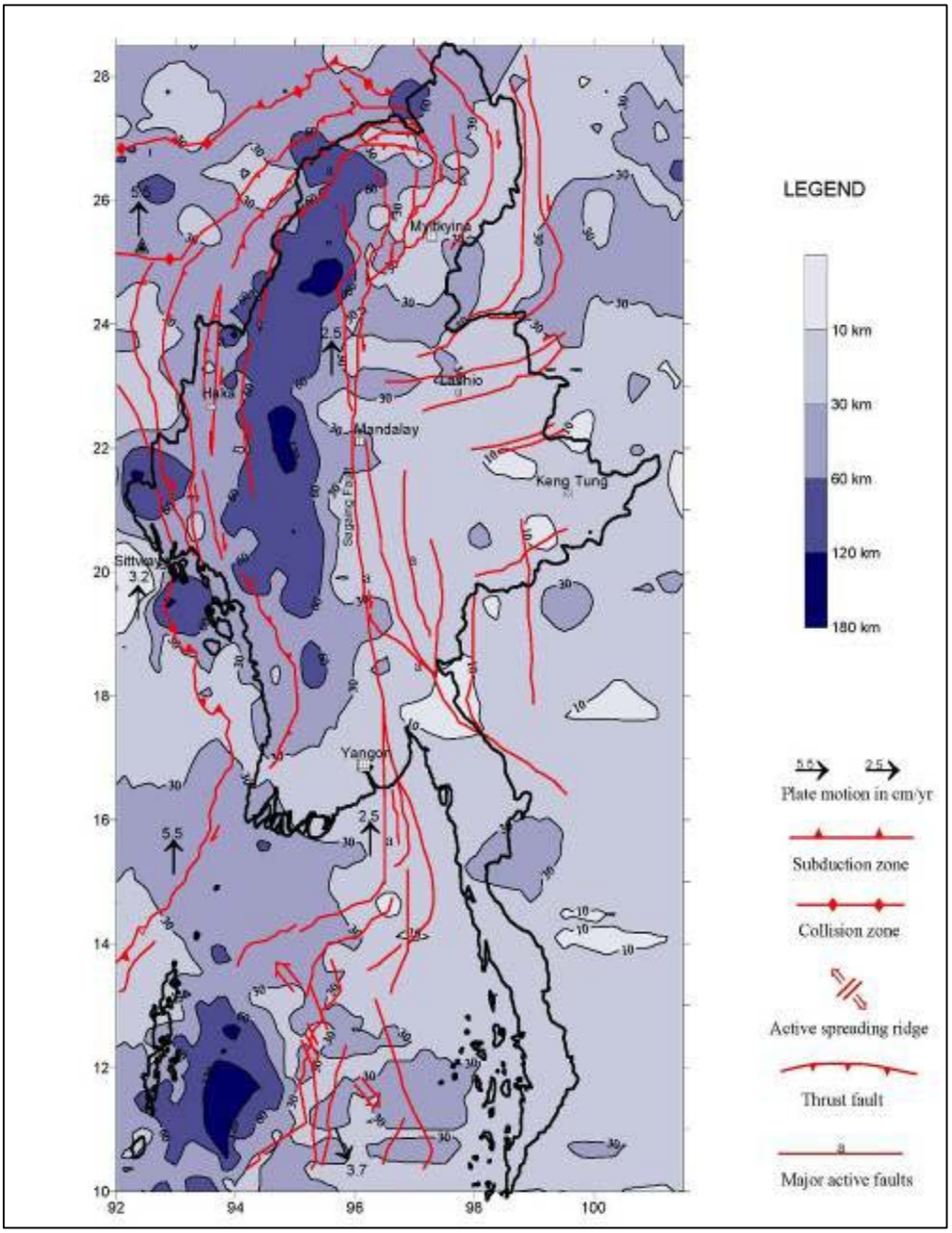


Figure 4.8: Earthquake focal depth contour of Myanmar for the period 1964- 2004

Seismic Zoning Map

The seismic zone map of Myanmar (2005) was prepared by a team led by Dr Maung Thein during 2003 to 2005 with several detail observations and brainstorming. Tectonic activities in connection with earthquake information from external sources are applied in the development of the map (Maung Thein and Tint Lwin Swe, 2006), deterministically and some intuitively.

As shown in the map (Figure), five seismic zones are demarcated and named (from low to high) Zone I (Low Zone), Zone II (Moderate Zone), Zone III (Strong Zone), Zone IV (Severe Zone), and Zone V (Destructive Zone), mainly following the nomenclature of the European Macroseismic Scale 1992. (It should be mentioned that in some countries, there are zones higher than **Zone V** as used here). For each zone, a probable maximum range of ground acceleration in g values and equivalent Modified Mercalli (MM) Scale classes are given. In near future, the Probabilistic Seismic Hazard Assessment (PSHA) map, indicating the level of

earthquake loading of 10% in 50 years is going to be developed. During the years of 2005 to 2007, the Myanmar Geosciences Society, in collaboration with the MEC, sponsored some graduate students of the University of Yangon, for the preparation of preliminary seismic micro zoning maps for four seismically hazardous cities.

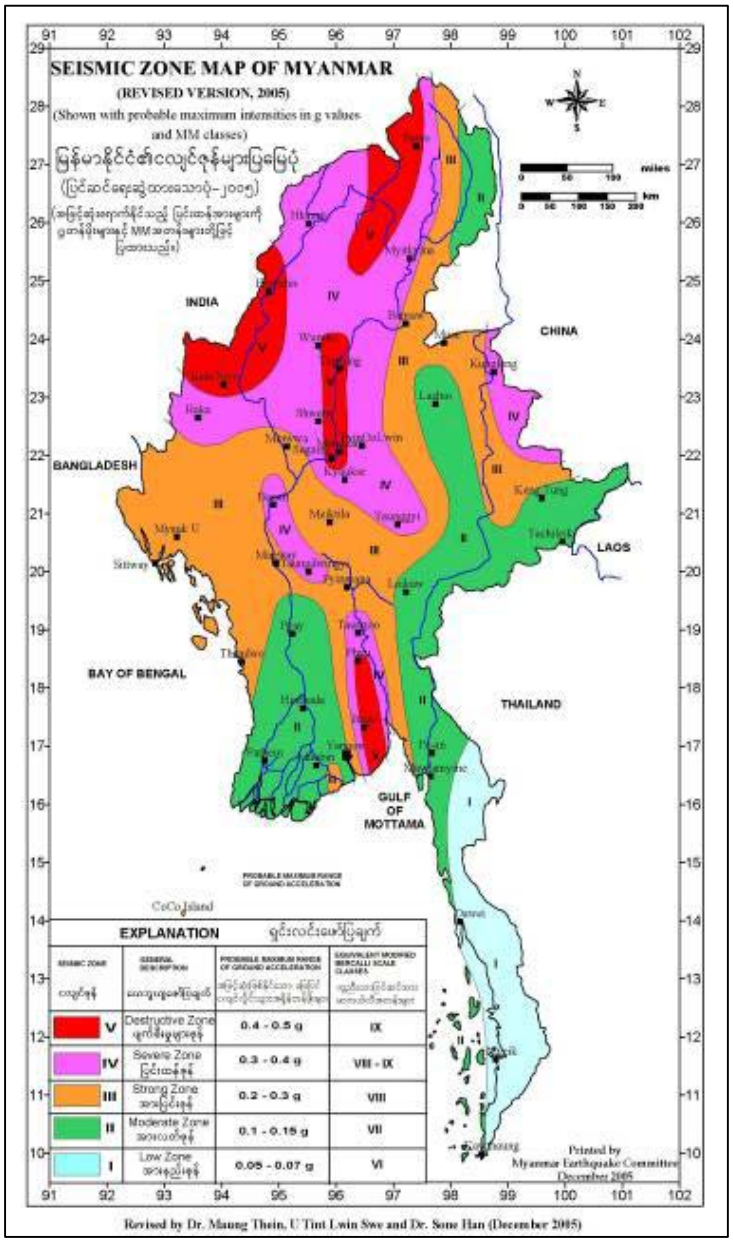


Figure 4.9: Seismic zone map of Myanmar

Frequency and Extent of Earthquakes

As shown in epicentral map (Figure 4.10) and with reference to the seismotectonic map (Figure 4.9), the majority of the earthquakes in Myanmar are mainly confined to three zones.

Earthquake Prone Locations

The seismic zone map of Myanmar is a probable intensity zoning map. It is partly a deterministic map as past earthquake data and spatially correlated peak ground acceleration (PGA) values for some earthquakes are used.

The highest intensity zone designated for Myanmar is the Destructive Zone V (with probable maximum range of ground acceleration 0.4 – 0.5 g), which is equivalent to Modified Mercalli (MM) class IX. There are four areas in that very vulnerable zone; namely, Bago-Phyu, Mandalay-Sagaing-Tagaung, Putao-Tanaing, and Kale-Homalin areas. Although the latter two have major earthquake hazards, they may be less vulnerable as are sparsely populated.

Important cities and towns that lie in Zone IV (Severe Zone, with probable maximum range of ground acceleration 0.3 – 0.4 g) are Taungoo, Taungdwingyi, Bagan-Nyaung-U, Kyaukse, Pyin Oo Lwin, Shwebo, Wuntho, Hkamti, Haka, Myitkyina, Taunggyi, and Kunglong. Yangon straddles the boundary between Zone II and Zone III, with the old and new satellite towns in the eastern part in Zone III, and the original City in Zone II. About 75 percent of the Myanmar people are living in the rural areas. Most of their dwellings are still non-engineered structures, which are vulnerable to moderate to high intensity earthquakes. The rate of urban growth increases in some large cities like Yangon and Mandalay. Due to urbanization the vulnerability increases in cities and the level of disaster from earthquake would increase in major cities. On the other hand, some large segments of the active faults have not exhibited any significant seismic activity in the past 50 to 75 years, indicating that the faults are apparently locked and stress is accumulating in those segments (e.g., the southern segment of the Sagaing Fault that is close to Yangon and Bago cities, and the central segment that is close to Mandalay and Sagaing cities). This suggests that a national emergency plan for earthquakes and related disasters is in need, which should also include operating procedure for disaster preparedness and mitigation with strong support of scientific foresight. Vulnerable locations of the country can be studied also on seismotectonic map in which seismically active faults are shown in red lines in comparison with earthquake records (Figure 4.10).

The seismic records show that there have been at least 16 major earthquakes with Richter Scale (RS) ≥ 7.0 within the territory of Myanmar in the past 170 years.

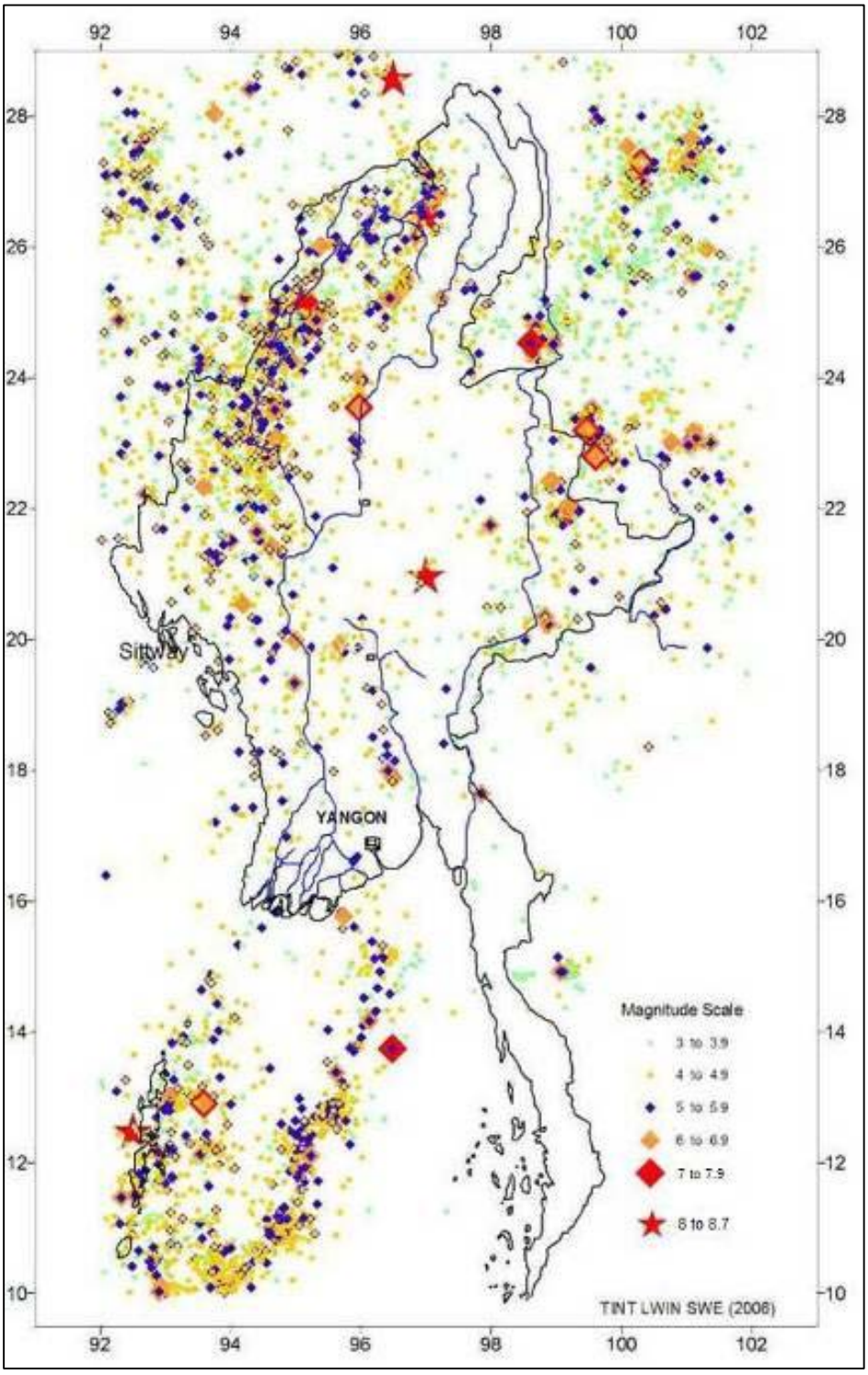


Figure 4.10: Earthquake occurrences in the Myanmar region

4.2.3 Floods

In Myanmar, majority of big cities and towns, economically strategic places in the country, usually situate along four major rivers, namely Ayeyarwady, Chindwin, Sittaung and Thanlwin. The topography of the country varies from hilly and mountainous areas in the north and east, semi-arid dry zone in the central region, coastal area in the western parts and alluvial plains in the southern delta where Ayeyarwady flows into the Andaman Sea. While the existing intricate river systems provide easy access of water transportation, creating prosperous urban centers along the waterways, the flooding in these rivers devastate the lives of the inhabitants. Though water retaining and flood control structures are being built in areas considered vulnerable to floods, with the increased population in the big cities, development of living quarters and settlement lands has been encroaching upon natural catchment areas.

Flooding in Myanmar

Flooding has always been one of the major hazards in Myanmar, accounting for 11% of all disasters, second only to fire. Between 1910 and 2000, there were 12 major floods. The Ayeyarwady River basin alone, the largest in the country, covers 404,200 square kilometer of the country. Over 2 million people are exposed to flood hazard in Myanmar every year.

Flooding leads to loss of lives and properties, damage to critical infrastructure, economic loss and health related problems such as outbreak of water borne diseases when the lakes, ponds and reservoirs get contaminated. The country receives practically all its rainfall between mid-May and October, the rainy season, during which flooding and landslides are common.

In Myanmar, the threat of flooding usually occurred in three waves each year: June, August and late September to October with biggest danger arriving in August as peak monsoon rains occurr around that time. Different types of floods can be seen in different areas of Myanmar:

- ***Riverine floods*** in the river delta;
- ***Flash floods*** in the upper reaches of the river systems, normally the mountainous areas, caused by the heavy rainfall striking at head water region for considerable period of 1-3 days.
- ***Localized floods*** in urban area due to a combination of factors such as cloudburst, saturated soil, poor infiltration rates and inadequate or poorly built infrastructure (such as blocked drains) and in rural areas due to the breakage of water resistance structures as dams, dykes and levees
- ***Flooding due to cyclone and storm surge*** in the coastal areas.

Riverine floods are most common among all and they happen when the monsoon troughs or low pressure waves superimpose on the general monsoon pattern resulting in intense rainfall over strategic areas of the river catchments. However, annual riverine floods are considered natural phenomenon in the river basins that help clean the farm lands and replenish the ground with nutrients carried from upriver. For those working in fishing industry, the overflowing rivers are welcoming events as they facilitate the fish spawning process.

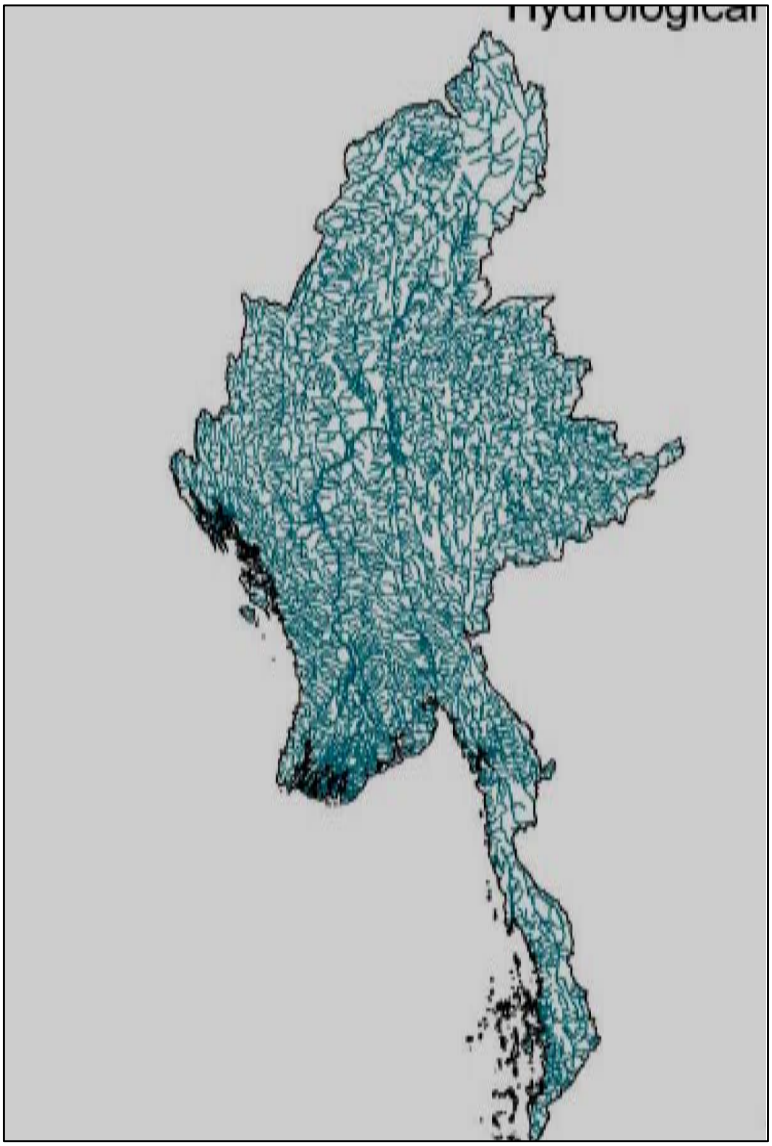


Figure 4.11: Distribution of rivers and Streams in Myanmar

Flood Vulnerable Locations

In general, the catchment areas of major rivers in the north and central zone are prone to riverine floods. The Southern Delta faces riverine floods when there is flood tide and high river water flow at the same period. In these areas, the lands are protected from floods by earthen dykes, but there were times when flood overpower the dykes and cause losses of lives and properties. The mountainous and hilly in Kayin, Kachin, Shan, Mon and Chin States areas are threatened by flash floods. In Kachin State, at the confluences of the Ayeyarwady River, the snow in the higher altitude melt and flash floods occur quite frequently at the beginning of summer. Along the coastal region in Rakhine State, floods are secondary hazard generated by cyclones. Furthermore, the Ayeyarwady River basin and the catchment occupy 60% of the country area traversing Chin, Kachin, Shan States and Mandalay, Magwe, Bago, Yangon and Ayeyarwady Divisions. Floods, in consequence, can occur over a wide range of region.

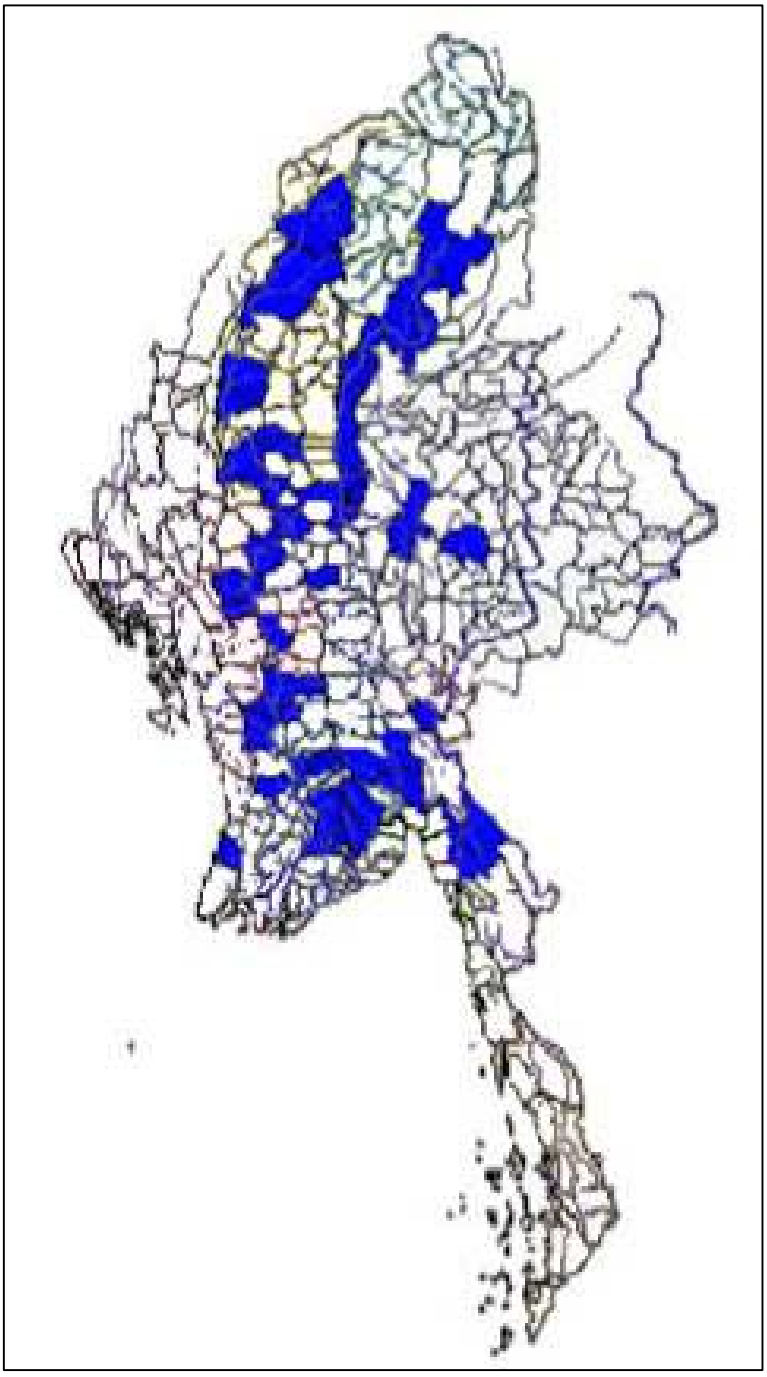


Figure 4.12: Flood prone areas in Myanmar

4.2.4 Landslide

Myanmar has experienced many types of geologic hazards including earthquakes, landslides and subsidence in karst area. Among these, earthquakes and landslides are major hazards affecting the country. Geomorphologically, Myanmar has two mountainous provinces: namely the Western Ranges and the Eastern Highland. These provinces are inherently unstable regions of the country. The steep slopes, unstable geologic conditions, and heavy monsoon rains combine to make the mountainous areas one of the most hazard-prone areas in Myanmar. More recently there has been an increase in human settlement in hazard-prone areas as a result of rapid population growth, as well as improvement in accessibility by road

and the onset of other infrastructure developments. Consequently, natural and man-made disasters are on the increase and each event affects people more than before.

Earth materials on slopes may fail and move or deform in several ways, including flowage, sliding, falling and subsidence. The important variables in classifying down-slope movements are type of movement, slope material type, amount of water present and rate of movement. The causes of many landsides and related types of down-slope movement can be examined by studying the safety factor (the ratio of resisting forces to the driving forces).

The controlling factors for the effect of landslides are the role of earth material type, slope, topography, climate, vegetation, water, and time. Nowadays, several new techniques related to landslide investigations such as aerial-photographic investigation, field investigation, geophysical investigation etc., are widely applied. The principal methods in use for landslides mitigation systems are drainage system, construction of retaining wall, and well-designed civil engineering infrastructure. At present, Bio-engineering measures are the most popular and very interesting methods among them. Although the landslides are natural hazards, preventing systems and controlling techniques can be used to mitigate the loss of life and cause of damages.
Technical and scientific supports on the basis of area-wise research projects are needed for effective planning and implementation of hazard mitigation scheme.

Causes of Landslide

Cause of many landslides and related types of down-slope movement can be examined by studying relations between driving forces, which tend to move earth materials down a slope and resisting forces, which tend to oppose such movement. The main cause of landslides is the event that is decreasing the resisting forces or decreasing in slope stability. The main factors that influence slope stability are:

1. Gravity and slope gradient
2. Hydrogeologic characteristic of the slope
3. Presence of troublesome earth materials
4. Processes of erosion
5. Man-made causes
6. Geological conditions
7. Occurrence of a triggering event

Landslide Prone Areas in Myanmar

Tectonically and geomorphologically, the physiographic unit of Myanmar can be divided into three provinces: the Western Fold Belt (WFB), the Central Lowland (CL), and the Eastern Highland (EH). Structurally and lithologically, potential landslide hazards can be found in parts of Eastern Highland and Western Fold Belt. One of the major rivers of Myanmar, River Ayeyarwady flows from north to south in the Central Lowland. Because of erosion and flooding of this river, landslide hazards occur along the bank of this river and its distributaries. These hazard areas are shown in Figure 4.13.

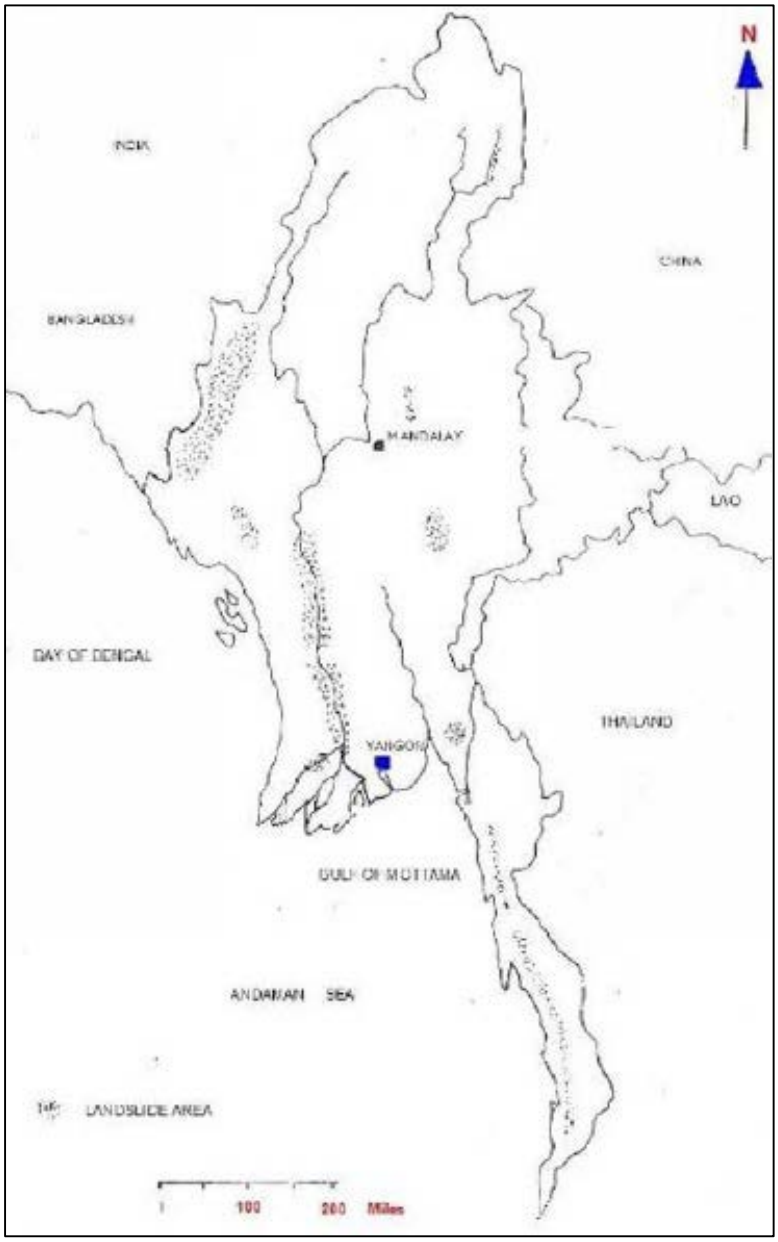


Figure 4.13: Location of Past Landslide, Myanmar

Landslide Hazard Map

There are three geologically and tectonically active landslide prone areas in Myanmar; the western region (part of the WFB) along the lower Ayeyarwady River and its distributaries and western flank of the Eastern High Land. The gradient of the slope, hydrologic characteristics of the slope, presence of troublesome earth materials, process of erosion, geological condition and triggering event cause many small and large landslides in Myanmar. Taking consideration upon these facts, the landslide hazard map is illustrated in Figure 4.14. This is only a draft proposed map and not a detailed landslide zonation map. Further work is required on developing a landslide zonation map.

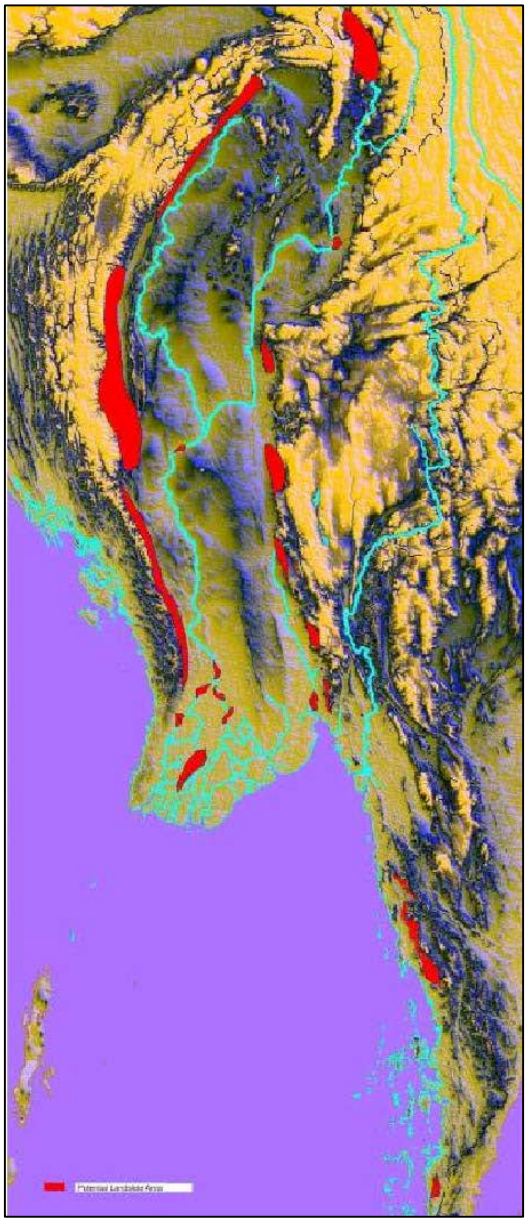


Figure 4.14: Proposed landslide hazard map

Frequency and Impact

Various sizes of landslides had frequently occurred in mountainous regions of Myanmar especially in the Western Ranges and some localities in the Eastern Highland, in particular along the western flank of the Tanintharyi Ranges. The collapses of river banks are found along the Ayeyarwaddy River and its distributaries. The western Ranges has experienced many types of landslides and earth, movement, i.e. rock falls, rock slides, soil avalanche and mud flows of various scales due to the wedge failure, plane failure, toppling, and circular failure. The direct impact of landslide in this region is the damage of the infrastructure rather than human settlement because these areas are sparsely populated.

In Eastern High Ranges, landslides of all types were occurred along the western flank of the Kachin, Shan and Tanintharyi Ranges. In Tanintharyi area, some rural houses and primary school were buried in the debris materials during the rainy season in 1999. The landslide hazards, which frequently occur in Shan State is along the railroad in hilly terrain, lying

between the Yinmabin Plain and the Kywedatson Plain. Both plains are in metamorphic and igneous terrain, which were weathered deeply. They are more exposed in the East of Kyauk Pan Oo Stream. In 2001, subsidence events were occurred in Nansang area due to the ***karst*** formation. There were no any impacts due to those events. However, landslides in Mogok have observed as some types of mass movements and caused the loss of lives and properties in June, 2008.

5. ANTICIPATED ENVIRONMENTALSOCIO-ECONOMIC IMPACTS AND MITIGATION MEASURES

The assessment of potential impacts was undertaken through the analysis of the different project activities and envisaging potential impacts to the environment. The first step is the identification of the potential impacts at pre-construction, construction and during operation phase. Then, each potential impact was qualitatively analysed. Based on the findings of the assessment, mitigation measures have been recommended to minimize and manage these impacts to meet prevailing regulatory requirements and good international industry practice for such projects.

The project will assist in the national telecommunication development agenda to improve communications for the population and thereby create immense benefits to the socio-economy of the country. The project would also create jobs throughout the country in the construction, info-communication and information technology fields. This socio-economic assessment did not identify any significant adverse social impacts arising from the proposed project.

5.1. GENERAL ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS BY PROJECT IMPLEMENTATION PHASE

The assessment is divided into three phases, with each phase representing a stage in the life-cycle of the project, i.e. pre-construction phase when important decisions such as route and site selection are made but not finalized, construction phase and post-construction phase (operations and maintenance). The analysis of the potential impacts at each of the phases is activity-based.

5.1.1 Preconstruction Phase

Site and Cable Route Selection

Selection of infrastructure locations may have potential socioeconomic impacts on the community. Depending on the land acquisition contract, the local property value could unnecessarily increase at key sites such as the BTS sites. On the other hand, land value surrounding certain sites may subsequently decrease due to impaired visual aesthetics from the erection of the towers. Land values are not expected to be impacted at temporary construction camps and equipment yard sites.

The target sites for the infrastructure could potentially be located in an environmentally or culturally sensitive area.

Stripping of Topsoil

Site preparation and clearance operations, grading, filling, excavation, earthwork, and movement of vehicles and heavy construction equipment for the construction of the infrastructure including access roads will disturb soil, vegetation, natural habitats, nearby residents (if any), and increase fugitive emissions from dust generation and equipment usage Generally, these localized activities will adversely affect air quality for a relatively short period. Noise and some vibration would also be generated but is anticipated to be localized and of short duration.

The loss of top soil will increase the erosion potential which will result in the suspension of soil and particulate matter in surface runoff from the exposed areas. Additionally, exposed areas will be susceptible to wind driven erosion. The degree and susceptibility to erosion will arise from a combination of factors such as rainfall intensity, duration, soil type, slope, surface condition; and in dry weather, wind intensity, direction and duration. Water quality in surface drainage and water bodies could therefore be adversely impacted by the sedimentation and

wind deposition of soil and particulate matter. Dust generation can also lead to respiratory health risks associated with fine airborne dust.

It is anticipated that sites and routes would be selected with due consideration to avoid significant impacts on sensitive natural habitats. However, once the sites and routes are selected, a field survey should be conducted at the local level to ensure that there no important habitats and endangered species (flora and fauna) are present.

Transport and Stock Piling of Materials

Prior to construction, construction materials and tower segments may be stockpiled at sites, primarily at staging areas at a construction camp or more likely in designated equipment yards. The transport of materials to the sites will generate increased heavy vehicular traffic which would generate increased air and noise pollution along the transport routes and in the vicinity of the staging areas. These impacts are expected to be transient and temporary. No significant noise and vibration impacts are anticipated.

Fuels and other hazardous materials brought to the sites could accidentally be released causing adverse impacts on soil, surface water and groundwater resources.

The stockpiling of materials at the staging areas may also impact the visual aesthetics of the surrounding area depending on the height and volume of material to be stockpiled. However, no new staging areas would be established in undisturbed areas. All staging areas would be located on private lands in existing contractor yards or public lands if authority is granted by local municipalities; existing commercial areas used for storing and maintaining equipment; previously cleared, graded, or paved areas; or level areas where grading and vegetation-clearing are not required or anticipated.

5.1.2. Construction Phase

The following potential impacts may result from activities during the construction phase of a project.

Socio-Economic Aspects

The construction workforce comprising skilled and unskilled labor will be sourced primarily from the local population, and foreign workers would mostly be hired if a post cannot be filled by a local.

Waste Management

During the construction phase, non-hazardous and hazardous waste are expected to be generated. Waste management shall be adequately addressed to avoid, minimize and mitigate the impacts.

Potential non-hazardous wastes generated during the construction phase commonly include scrap steel and other metal scrap, glass, paper, plastic, and insulations. At the construction camps, other non-hazardous waste could include food waste from temporary workers' canteen and office waste from the temporary site office.

Hazardous waste are empty hazardous waste containers, spent welding materials, solvents, paints or adhesive, and other hazardous waste resulting from operation and maintenance of the equipment and vehicles, i.e. spent oils, spent lube, waste oil filters, batteries, etc.

Non-hazardous sanitary waste which include sewage effluent and sullage (also known as grey water; e.g. wastewater from on-site canteen, sinks and baths) will be generated from

construction camp sites. Aside from having high counts of faecal coliform and other disease carrying bacteria, these effluents create odour nuisance and has the potential to increase the Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and Ammoniacal Nitrogen (AN) concentration on receiving waters.

Generally, construction of the underground cable and towers will involve very limited amount of excavation waste. Most of the excavated soil (if any) will be used as back fill for rehabilitation as the nature of construction is shallow foundations without any need for localized dewatering of the subsurface formation.

The potential impacts arising from improper management of wastes, both non-hazardous and hazardous wastes, include the following:

- Improperly managed wastes may enter public drainage systems potentially obstructing the proper flow of drains;
- Grouting materials, oils and grease, paints, solvents etc may potentially contaminate land through accidental release, and to surface water through rainwater runoff originating from the construction site;
- Improper handling and disposal of putrescible food wastes would attract disease carrying rodents and pests which are possible health risks to workers within the construction camps as well as create an odor nuisance within and adjacent to the camps; and
- Inadequate provision of sanitary containment which could overflow and be released to land and surface water.

Overall, the impacts from wastes are predicted to be short-term and localized and can be readily mitigated with the implementation of good housekeeping measures and appropriate construction management practices.

Air Quality

Emissions generated during the construction phase include vehicle exhaust and machinery engine emissions containing NOx, SOx, CO volatile organic compounds (VOCs), particulates and smoke. Most of the construction equipment, power generators, and cable trencher will be fuelled with diesel. Fugitive VOC emissions from storage and transfer of fuels for construction equipment and dust from earthworks, concrete mixing and exposed earth stockpiles are also anticipated to be generated. Air quality impacts could also occur during welding process for tower erection and laying cast iron caisson duct and joint.

The excavation area for the BTS sites are typically 10m x 15m to accommodate a tower base of 7m x 7m. The construction of the tower is expected to take on average of 10 days. Air quality impacts from the construction of the BTS sites are therefore localized and of short duration. Air emission impacts can be mitigated by proper and regular maintenance of vehicles and machinery used for the Project, implementing dust suppression as necessary, and covering fuel receptacles during storage.

Noise and Vibration

Sources of noise and vibration during construction would primarily occur from heavy equipment such as excavator, bull dozer, jackhammer, cement trucks, cranes, paver, vibratory roller, and construction vehicular traffic. Construction works in metropolitan areas will be limited to during daytime hours. Noise and vibration sensitive receptors include nearby residents and sensitive facilities (e.g. hospitals, schools), fauna (terrestrial animals and birds) in natural habitats, and heritage structures that may be vulnerable to vibration.

Sites of Cultural/Historical Significance

Potential impacts to cultural resources include visual impacts arising from areas of exposed surface, increase in dust, and the presence of large-scale equipment, machinery, and vehicles.

MFOCN plans to construct through specialized construction companies working in the field of construction and municipal work. Therefore, local communities will be exposed to interaction with outsiders from the project crew and workers during the construction phase. This is not a significant concern in urban areas. However, in the conservative rural and environmentally sensitive areas, this may affect the local communities' way of life, privacy, cultural and religious values.

Ecology

Site clearing and grading, coupled with construction of Cable duct, towers, access roads and support facilities, could reduce, fragment, or dramatically alter existing habitat in the disturbed portions of the project area. Wildlife in surrounding habitats may also be affected if construction activities (and associated noise, vibration and lighting) disturb normal behaviours, such as feeding and reproduction.

Where the cable route intersects waterways such as rivers, streams and floodplains, there is a potential for aquatic habitats to be impacted by the construction activities during land clearing and laying of the cable. Potential impacts include alteration in aquatic habitats caused by damage to river banks, decreased water quality from sediment laden runoff and disturbance to riverbeds.

Vegetation

Each tower will use an area of approximately 300 square meter of land and these will be sited mostly in developed areas.

In the case of Fiber Cable, the impacts to vegetation would be temporary due to restriction of activities to the 3.5m wide utility easement along its Right of Way (RoW). The impact of construction disturbance on vegetation would be significantly low as the trench would be only 50 centimetre (approx. 1.65 feet) wide. The trench would be compacted and the easement re-vegetated according to stipulations after installation of the Cable.

No significant land clearing is expected for the construction camps and equipment yards as existing disturbed sites are proposed to be utilized.

Migratory Birds

Construction of tower may have potential impacts into the migratory birds. Terrestrial habitat pattern could be changed or disturbed depending to the type of towers to be stationed. Potential impact will be more significant if the new towers are placed along the corridor of bird migration.

The Fiber Cable project has no potential impacts to the migration of bird as the Cable is buried underground.

Visual Resources

Potential sources of visual impacts during construction include: visual contrasts in the landscape from access roads and staging areas; and conspicuous and frequent small-vehicle traffic for worker access and frequent large-equipment traffic for project and access road

construction. Project component installation would produce visible activity and dust in dry soils. Project construction may be progressive, persisting over a significant period of time. Ground disturbance (e.g., trenching and grading) would result in visual impacts that produce contrasts of color, form, texture, and line. Soil scars and exposed slope faces could result from excavation, levelling, and equipment movement.

Traffic and Underground Utilities

Short-term increases in the use of local roadways would occur during the construction period. Heavy equipment would need to be continuously moved as construction progresses along the linear project. Overweight and oversized loads could cause temporary disruptions and could require some modifications to roads. Construction of Cable duct and tower could cause two main impacts to traffic: the first is by narrowing of roads or occupation of one or more traffic lanes by stored construction materials or construction waste. The second is by increasing traffic volumes on rural access roads by construction vehicles and machinery that are expected to pass through. Narrowing of roads and increasing traffic volume impact the efficiency and the average speed of these roads, this impacts are proportional to the degree roads are narrowed and to the amount of extra traffic volume.

Trenching and excavation work has potential to engage or disturb underground utilities such as water, electricity, telecommunication and gas lines especially in the metropolitan areas. Municipal water and waste water drain will intersect the Right of Way (RoW) of the Fiber Optic Cable (FOC). Systematic demarcation and examination is required when trenching along the Right of Way (RoW) of the backbone Cable network. Underground Cable network related facilities can sometime need to be stationed near other similar operators in the same location.

Occupational Health and Safety

During the construction phase, issues relating to health and safety include:

- Increased dust in the ambient air in working zones;
- Heat stress;
- Increased temperature of equipment surfaces;
- Increased noise and vibration levels;
- Use of Mobile equipment and machinery and associated moving parts;
- Common injuries including severe injuries including death arising from slip and falls, ergonomic injuries, working at height, cuts and bruises, lifting works;
- Communicable diseases and vector-borne diseases;
- Handling of hazardous materials and waste;
- Traffic movement;
- Installation and testing of Fiber Optics;
- Electromagnetic fields.

Specific to this project is fiber optic and EMF hazards. These are further discussed below to provide a better understanding of these hazards.

Optic Fiber Safety

The installation of Fiber Optic call and testing may pose risks associated to eye and electrical safety to workers involved in Fiber Optic project. Common risk that comes to mind is eye damage from laser light in the Fiber.

Optical sources used in Fiber Optics, especially LEDs used in premises networks, are of much lower power levels than used for laser surgery or cutting materials. The light that exits an Optical Fiber spreads out in a cone, and thus the farther away from the eye is from the source,

the lower the intensity that eye receives. The infrared light in Fiber Optic links is at a wavelength that cannot penetrate to the eye easily while light in the 1300-1550 nm range is unlikely to damage eye retina, but might harm the cornea or lens. Workers are required to check the Fiber with a power meter before examining it.

The real issue of eye safety is getting Fiber scraps into the eye. As part of the termination and splicing process, workers will be continually exposed to small scraps of bare Fiber, cleaved off the ends of the Fibers being terminated or spliced. These scraps are very dangerous. If they get into eyes, they are very hard to flush out and will likely require emergency treatment at the hospital. Whenever working with Fiber, it is mandatory to wear safety glasses.

5.1.3. Post Construction Phase (Operation and Maintenance)

Potential Impact during Operation and Maintenance of Tower and Fiber Cable Network

Typical activities during the operation and maintenance phase include: Right of Way (RoW) inspections, stability checks, vegetation clearing, and maintenance and replacement of facility components, and security patrol. Environmental impacts that could occur during the operation and maintenance phase would mostly occur from long-term habitat change within the Right of Way (RoW) for the network and Towers, and maintenance activities. The following potential impacts may result from the operation and maintenance of a tower and Fiber Optic Cable (FOC) network project.

Socio-Economic Aspects

Only significant long-term positive socio-economic impacts are predicted as a result of the project. The benefits of the project include inflow of foreign direct investments for the operation of the communication network and its multiplier effects as communications are improved, transfer of technology and opportunities for professional development of local info-communications employees, growth in local businesses that support the info-comm industry and overall increased employment to the local population.

Noise and Vibration

Sources of noise during the operation and maintenance phase would include vehicles and machinery for inspection. The primary impacts from noise would be localized disturbance to wildlife and nearby residents, if any. No significant noise and vibration sources are anticipated.

Air Quality

Similarly for noise, vehicular traffic and machinery would continue to produce small amounts of fugitive dust and exhaust emissions during the operation and maintenance phase. These emissions would not likely cause an exceedance of air quality standards.

Cultural Resources

Impacts during the operation and maintenance phase could include damage to cultural resources during vegetation management and other maintenance activities, unauthorized collection of artefacts, and visual impacts. This threat is present once the access roads are constructed and the Right of Way (RoW) is established, making remote areas more accessible to the public. Visual impacts resulting from the presence of the aboveground portion of Cable lines, tower structure and associated facilities could impact cultural resources that have an associated landscape component that contributes to their significance.

Ecological Resources

During operations and maintenance, adverse impacts to ecological resources could occur from disturbance to migratory birds due to the presence of the tower structures, and to wildlife in general during tower maintenance works.

Hazardous Materials and Waste Management

No significant industrial hazardous wastes are generated during operations. In the maintenance of the tower and related facilities some hazardous materials (e.g., lubricating oils, hydraulic fluids, coolants, solvents, cleaning agents, batteries and diesel fuel) will be used in small or limited quantity. Adverse impacts could result if wastes are not properly handled and are released to the environment. Environmental contamination could occur from accidental spills of such chemicals and fuel.

Human Health and Safety

Key safety risks associated during the operation phase are those related to electrical, fiber optic, work at height and fire.

Electrocution could happen for maintenance operators during repairs or to the general public because of unforeseen accidents. However with the normal safety precautions adhered to in the design and construction of the Cable lines, telecommunication devices, towers, etc. should minimize such risks both to the general public and to the maintenance workers.

Workers' training and provision of appropriate personal protective equipment and emergency response equipment will be provided.

Visual Resources

The aboveground portions of tower projects would be highly visible in natural landscapes, many of which have few other comparable structures. The appearance of a tower may have visually incongruous "industrial" associations for some, particularly in a predominantly natural landscape. Visual evidence of these projects cannot be completely avoided, reduced, or concealed.

For the FOC project, in the general vicinity of the proposed route, the natural and undisturbed visual environment is dominant, but utility lines, fence lines, and dirt roads are also highly visible elements of the landscape. Once completed, the Fiber-Optic line would be underground and re-vegetation efforts would ensure that this feature does not impact visual resources in the area.

Optic Fiber Safety

As discussed previously and similar to during the installation and testing phase, maintenance works on fiber optics may pose eye injury and electrical risks. Workers are required to check the Fiber with a power meter before examining it and to wear safety glasses.

Electromagnetic Fields (EMF)

Whilst there is public and scientific concern over the potential health impacts associated with exposure to EMF (not only high voltage power lines and substations and radio frequency transmissions systems, but also from everyday household uses of electricity), the positive aspect of fiber optics is that it uses light (IR) and not current to transmit data. Thus, there is no EMF issue with fiber optic transmission as compared to typical data cable wires.

Associated with the towers, there are provisions to install GSM antennae for wireless telecommunications. These will emit radiofrequency EMF. Whilst there is evidence that EMF

exposure poses a human health risk and has potential biological impacts on plants, animals and even insects, the EMF from GSM technology is generally much lower than those emitted from radio and television stations. While the principle of ALARA or "as low as reasonably achievable" threshold values for EMF emissions is preferred, industry standards such as the Institute of Electrical and Electronics Engineers and American National Standards Institute (ANSI/IEEE), are more likely the applied standards. The installation of the transmission antennae is outside the scope of the project proponent. MFOCN will only provide the infrastructure to the client and telecom operators. The installation and operation of EMF transmitting devices will be administered by the operators and they must abide the applicable laws, requirements and guidelines pertaining to electrical and magnetic fields during operation.

5.2. MITIGATION MEASURES FOR PRE-CONSTRUCTION, CONSTRUCTION AND POST CONSTRUCTION PHASES

Acknowledging the environmental and socio-economic impacts identified above, the project will develop and implement sound policies and the best management practices to safeguard the environment and to manage potential causes of pollution. Based on the findings of the assessment, mitigation measures have been recommended to minimize and manage these impacts to meet prevailing regulatory requirements and in accordance with good industry practice. The mitigation measures presented below are consolidated based on the common identified impacts for similar activities at the different phases of the project.

Mitigation Measures for Site and Cable Route Selection (Pre-Construction)

Fair market value should be employed in the compensation to landowners for land acquired for the project.

The site selection for every tower, BTS, and construction camp should be reviewed on the ground for potential ecological and heritage impacts. Appropriate mitigation measures should be developed where required before construction begins.

Similarly, the access routes to each site and the route of the FOC should also be reviewed at a localized level to identify such and other sensitive receptors, and appropriate mitigation measures developed prior to construction.

Consultation with local rural communities should be conducted prior to mobilizing equipment and workers.

MFOCN should communicate with the local authorities to officially assign a location for the disposal of construction waste. Agreement on these disposal sites should be reached prior to commencing construction works.

Mitigation Measures for Soil Erosion and Land Contamination (Pre and Construction phases)

The project will implement the following mitigation measures to minimize soil erosion:

- All excavations shall be made in accordance with the approved drawings.
- Careful planning to establish work zones, defining phases of construction, and active management of daily activities will be employed to minimize soil disturbance during the construction phase. Construction management procedures involving scheduling of earthworks and developing the sequence and methods as part of soil protection plans.
- The project area will be divided into smaller sectors and vegetation from the smaller sectors will be cleared sequentially to minimize soil exposure during construction.
- When required, top soil will be carefully removed and saved for rehabilitation

- Placing silt fences or screens, placing compost blanket, creating temporary soil stabilization, and setting vegetated buffer zones and swales along the construction areas will be carried out in the construction phase.
- Frequent water sprinkling and appropriate scheduling for truck and heavy equipment movements will also be arranged throughout the construction period.
- Traffic and pedestrian walk ways will not be covered in or obstructed by construction vehicles and crew.
- Re-greening of the project area will be carried out to compensate the vegetation loss in the construction.
- The sides of all excavations, which might expose personnel or facilities to danger resulting from shifting earth shall be protected by providing slope to the appropriate angle of repose or benching in the sides and ends of the excavation or ladders must be used and secured, enough to withstand at least 1 meter above the top of the excavation.
- Prior to the construction activities, the soil analysis shall be done to identify the soil characteristics, soil stability and the depth of the groundwater
- All excavation deeper than 1.5 meters must have barriers and toe boards around the outside to-prevent persons and material failing into the excavation. Barriers must be of a strength that is capable of withstanding the weight of a person falling against the barrier. Barriers shall be readily visible by day or night.
- Regular inspection for leakage to the soil to avoid soil contamination from spills.
- Training of staff should be done for application of contaminate materials from construction, operation and maintenance.
- In case a leakage occurred, the soil should be removed and disposed in the appointed disposal site for special waste or hazardous waste, according to best practices for waste management.
- Any spills observed will be contained and removed with use of sand, sawdust or other absorbents.
- Appropriate sanitary facilities will be provided and properly maintained.
- Direct discharge of sanitary and sullage wastewater will be prohibited.
- Portable toilets or temporary septic systems will be installed at construction sites where there are no established / existing sanitary and sewerage facilities.

Mitigation Measures for Air Pollution (All phases)

The project will implement the following mitigation measures to minimize air pollution:

- Soil erosion and dust control management measures also assist in the management of air pollution from construction operations.
- Carry out regular surface damping or wetting on exposed site areas, unpaved access roads, and stockpiled top soil especially during the dry season.
- Provide enclosure and covering of soil and aggregate stockpiles.
- Provide wheel and undercarriage washing facilities or trough at the ingress/ egress points of construction sites.
- Vehicles operating in unpaved access roads will adhere to speed limits that will minimize excessive generation of dust.
- Air pollution from vehicles will be minimized by using low emission equipment and vehicles, operating all equipment and vehicles on an appropriate maintenance and inspection scheme, and enforcing the policy of no idling engines.
- All construction vehicles transporting dusty materials will be secured with covers to prevent escape of fugitive dust.
- Vegetation and trees planted around the project area and along the routes will also help to offset emission from operations.
- In areas of loose sandy soils the contractor should provide source of water for spraying soil before excavation, filling, loading and unloading. If noticed visual increase of dust emissions, perform additional spraying of water in the spot generating high emissions.

- Onsite fuel burning equipment such as generators will be serviced and maintained in good working order.
- Open burning is strictly prohibited at all times.

Mitigation Measures for Solid and Hazardous Waste Generation (Construction and Post-construction phases)

The construction phase could generate significant amounts of solid wastes. While achieving optimum solid waste elimination is not practical in the construction industry, waste minimization, recycling and reuse, and appropriate disposal methodologies will be implemented in this project.

The project will implement the following measures to minimize solid waste generation and mitigate environmental impacts:

- Carefully select less hazardous materials and use the necessary amount only.
- Establish a designated hazardous waste collection site and make it secure.
- Use items completely before disposing of the containers.
- Do not clean the containers and mix wastes.
- Arrange regular collection before containers overflow.
- Prevent spills and leaks and set appropriate clean-up procedures.
- Dispose of hazardous wastes in accordance with the regulations and best practices.
- Provide regular training to the workforce and set a monitoring scheme for hazardous materials.
- MFOCN should communicate with the local authorities to officially assign a location for the disposal of construction waste. Agreement on these disposal sites should be reached prior to commencing construction works.
- A certain location in the construction site should be assigned for temporary storage of construction waste; this location will be within the construction area of the tower site and Right of Way (RoW) of Cable network. This location should be agreed between the contractor and MFOCN prior to starting the project.
- Construction waste should be hauled at the end of each business day to the officially approved disposal sites. Adequately equipped trucks should undertake waste transportation. Contractor shall ensure that the trucks are not overloaded and that the waste is adequately contained inside the rear box or covered to prevent dust generation during transportation. The contractor shall put in place a system to monitor that wastes transported by any third party transportation contractors / truck drivers are disposed to the approved disposal location.
- The waste storage area shall be provided with appropriate flooring for possible access of forklifts and small trucks. A storekeeper will be assigned to manage the waste store; he should keep separate areas for each type of waste, keep internal passages inside the store for facilitating access and ensure good housekeeping. The storekeeper should keep records of the admitted waste in the store, and before the store is full he should organize to sell or dump the scrap at the authorized landfill. The responsible person for environment should make sure the store has sufficient area and facilities during the design/construction phase.
- For the hazardous waste, a separate section has been developed to mitigate and monitor the activities related to the hazardous waste and to ensure the management and monitoring plan is in accordance with MOECAF's requirements for hazardous waste handling, disposing and transporting.
- For scrap (non-hazardous wastes) generated from the construction shall be transported and sold for recycling or reuse where possible.
- For hazardous or special wastes generated from construction, special waste which could not be recycled, should be disposed of in controlled areas within approved disposal sites.

- Secured storage areas shall be provided for the collected hazardous wastes with records being kept of the type, amount and date of collection.
- Transportation of accumulated waste items will be done quarterly by certified contractors.
- Project's stakeholders should be informed of the disposal procedure of hazardous wastes generated from Cable lines, towers and the possible environmental risks associated with them.
- Avoid, as much as possible, the use of PVC insulated Cable. This could be done through specifying such preference measure in the tender documents for materials. It may be unfeasible to use other type of insulators; however, PVC free insulators should have more technical score than PVC insulators.
- Waste minimization procedures should be adopted during the operation of network backbone and towers. MFOCN should make sure that the procedures are implemented according to the design measures.

Mitigation Measures for Noise and Vibration (Pre and Construction phases)

The project will implement the following mitigation measures to minimize noise and vibration issues:

- Careful handling of material loading and unloading.
- Employment of low impact technologies.
- Using modern quiet power tools, and equipment.
- Erecting sound shields or wall structures.
- Giving consideration to careful sequencing and scheduling times.
- Rerouting traffic through less populated areas.
- Combine noisy operations at the same time but avoid combination of vibration
- Working hours for workers exposed to noise equipment should be designed so that noise exposure periods do not exceed the safe limits.
- Inform the nearby receptors about the peak time and hours for construction activities.

Mitigation Measures for Sites of Cultural and Historical Significance (Pre and Construction phases)

The site selection for every BTS, construction camp and equipment yard should be reviewed on the ground for the presence of cultural and historical significant sites. The site selection should avoid these sensitive areas. Similarly, the access routes to each site and the route of the FOC should also be reviewed at a localized level to identify heritage sites and the route aligned away from these sensitive areas.

If heritage areas are avoided, the monitoring and measurement of impacts would not be required.

Mitigation Measures for Ecological Impacts (Pre and Construction phases)

The site selection for every BTS, construction camp and equipment yard should be reviewed on the ground for potential ecological impacts. This include a field survey of flora, fauna habitats including aquatic habitats, if any. Appropriate mitigation measures should be developed where required before construction begins.

Similarly, the access routes to each site and the route of the FOC should also be reviewed at a localized level to identify such and other sensitive receptors, and appropriate mitigation measures developed prior to construction.

If ecological sensitive areas are avoided, the monitoring and measurement of impacts during and post construction could be minimized.

Mitigation Measures for Visual/ Aesthetics Impact (Pre and Construction phases)

Where possible, the location of towers and the BTS should be constructed in disturbed areas (e.g. near existing roads, rail lines, etc) to minimize visual contrasts in landscape. The infrastructure, through proper alignment review at the planning stage, should not visually impact areas of cultural, historical and areas of high scenic value, and significant national landscapes.

Infrastructure supporting the construction such as construction camps and equipment yards are temporary and their impacts could be minimized by use of appropriately designed hoarding fencing (e.g. color of hoarding could blend with the surroundings) around the boundaries of the site. Good housekeeping should also be practiced. Following completion of construction, the sites should be reinstated and tidied up.

Mitigation Measures for Traffic and Underground Utilities (Construction phase)

The project will implement the following mitigation measures to minimize traffic and underground utilities.

- An agreement between contractors and supervisor consultants should be reached about the suitable location for temporary storage of construction materials along the Right of Way (RoW) of backbone Fiber Cable network, equipment, tools and machinery prior to starting construction of each reach of tower locations. No storage of construction materials or electric tools should be allowed in traffic lanes.
- Find suitable locations for temporary storage of conventional construction wastes.
- In case a narrow access road needs to be occupied for limited period (for example by loading/unloading trucks or loaders) the occupation time should be minimized. The additional measure is to have a careful turn (if needed) for the heavy trucks or loaders due to the high-speed vehicles passing by the highway.
- In densely populated areas such as downtown, central business districts, and road junction, non-noisy construction operation is done by night time
- Systematic demarcation and subsurface clearance in conjunction with municipal authorities and relevant administration should be completed prior to trenching the Cable duct or any other subsurface works.

Mitigation measures for Occupational Health and Safety (All phases)

Health and safety personnel will be employed to implement a health and safety program for the Project.

The project will implement the following mitigation measures for Occupational Health and Safety:

- Health and safety training relevant to the assignments should be conducted for all workers;
- All workers will be provided with personal protection equipment (PPE) and will be obliged to wear them in work zones; and
- A work permit system will be implemented for all hazardous work which must be strictly adhered to.
- All persons at the construction site, at a minimum must wear safety helmets, safety boots, eye protection, and if required, ear protection. All other personal protection equipment required must be assessed on task by task basis by a qualified health and safety professional.
- Vehicles and other machineries or construction equipment must not be allowed to come within 2 meters of an excavation unless working in connection with the excavation.

- Workers that operate noisy machines or worker near them should be supplied with earmuffs and should be instructed to put them on when they get into noisy zones.
- All mobile mechanical equipment shall be operated by authorized personnel and have a valid license.
- All equipment shall be checked prior to use by qualified personnel.
- Brakes, lights, tire pressure and battery shall be inspected before using the equipment. Revolving lights must be used for heavy duty vehicles.
- The design capacity of any equipment shall never be exceeded. The equipment shall not be modified to alter its capacity.
- Equipment that could present a hazard to personnel, if accidentally activated during the performance of installation, repair, alteration, cleaning or inspection, work shall be made inoperative prior to state of work.
- Equipment, which is subject to unexpected external physical movement such as rotating, turning, dropping, sliding etc., mechanical and/or structural constraint, shall be applied to prevent such movement.
- All equipment, which is locked or taken out of service, because of potentially hazardous condition, shall be appropriately tagged indicating the reason for taken out of service.

Mitigation Measures for Optic Fiber Safety (Construction and Post Construction phases)

For Optic Fiber Safety work, the following safety practices will be implemented:

- Always wear safety glasses with side shields and protective gloves. Treat Fiber Optic splinters the same as use in glass splinters.
- Employees wearing non-safety prescription glasses will wear safety goggles while exposed to Fiber Optic Cable (FOC) splicing or termination activities.
- Never look directly into the end of Fiber Cable until you are positive that there is no light source at the other end.
- Use a Fiber Optic power meter to make certain the Fiber is dark. When using an Optical tracer or continuity checker, look at the Fiber from an angle at least 6 inches away from your eye to determine if the visible light is present.
- Contact wearers must not handle their lenses until they have thoroughly washed their hands.
- Workers should not touch their eyes while working with Fiber Optic systems until they have been thoroughly washed.
- Company employees and other site personnel entering into work areas, where Fiber Optic Cable (FOC) is being spliced or terminated, will wear appropriate safety glasses with side shields.
- Keep all combustible materials safely away from the curing ovens.
- Put all cut Fiber pieces in a safe place.
- Thoroughly clean work area when work is finished.
- Wear disposable aprons and gloves to minimize punctures and ingestion of Fiber particles on the clothing that could later get into food, drinks, and/or be ingested by other means.
- Supervisor and employees will not inspect live Fiber Optic Cable (FOC) ends. Fibers will be dark (no signals being sent through them) when inspected. The supervisor or employee will use a Fiber Optic power meter to make certain the Fiber is dark.
- When the supervisor determines that there is a risk of employees inspecting live Fiber Optic Cable (FOC), especially when the Fiber light source is a laser, the eye protection worn by employees, safety glasses or goggles, will be specified for infrared filtering.
- The supervisor will have employees post warning signs stating “Fiber Optic Work Area –Safety Glasses with Side Shields Must Be Worn” prior to employees performing any splicing or termination activities.

6. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

Consultation with relevant stakeholders has been an integral part of the Project preparation. The Project Proponent, since the initiation of the project development in 2012, has carried out consultations with stakeholder groups including:

- Government agencies such as the Yangon City Development Commission, MOECAF, Myanmar Investment Commission, Ministry of Post and Telecommunication, Ministry of Communications and Information Technology (MCIT), Ministry for Construction and regional administrations;
- Regional Authorities from Myawaddy, Muse, Lashio, Yangon and Pathein, among others;
- NGOs active in Myanmar;
- Customers and corporate clients of the MFOCN;
- Communities in the vicinity of the sites; and
- Phone operators in Myanmar.

A Burmese language article has been placed in a major local newspaper in Yangon to inform the public about the Project. The newspaper article informing the public that the company, Myanmar Fiber Optic Communication Network, initiated the Cable landing projected in Myawaddy on August 30th, 2014.

ပြည်တွင်းဆက်သွယ်ရေးစနစ်များ ကောင်းမွန်လာစေရန် Fiber Optic Cable
တည်ဆောက်ရေးလုပ်ငန်းများ မြဝတီမြို့တွင် စတင်လုပ်ဆောင်

Figure 6.1 News Article about the Project

The article described that by applying permit and closer collaboration for legal framework with the Ministry of Post and Telecommunication and regional administration, the company is implementing the national backbone Fiber project for the route of Bago-Myawady. Central Backbone Fiber network route project for Muse, Lashio, Yangon and Pathen are to be implemented after the permission has been granted from the authorities. "Myawaddy-Bago Fiber network project is being initiated and yet we are discussing with ministers and local authorities for the project in Muse, Lashio, Yangon, Pathein and Bago region could be implemented" said U Thaung Min Htut, project coordinator at MFOCN. He added once the national backbone project is completed, the telecommunication condition will be faster and reliable than before by adding more bandwidth and infrastructure. It was also noted that the company will compensate for the disturbance to pavements and municipal platforms caused

by the project construction. The company will also rehabilitate the affected areas. The article finished by describing the ongoing implementation phase starting from Myawaddy, the border area of Kayin State, and the network route that will link Kawkareit, Pha-an, Thathon and Bago.

Another article published in the Global New Light of Myanmar newspaper on January 18th, 2015 (Figure 6.2) highlighted MFOCN's Corporate Social Responsibility program. The Managing Director of MFOCN presented heavy machinery to the Union Minister for Construction of the Public Works during a ceremony held at Sedona hotel in Yangon on January 17th.

Wellwisher donates heavy machinery to Public Works

Union Minister U Kyaw Lwin poses for documentary photo with Managing Director Ms Dana Dong of Myanmar Fiber Optic Communication Network Co., Ltd.—MNA

NAY PYI TAW, 18 Jan — Myanmar Fiber Optic Communication Network Co., Ltd donated construction heavy machinery at Sedona Hotel, here, on 17 January.

Managing director Ms Dana Dong of Myanmar Fiber Optic Communication Network Co., Ltd handed over documents related to the heavy machinery to Union Minister for Construction U Kyaw Lwin.

At the ceremony, the company presented eight kinds of heavy machinery to Public Works.

On Sunday, the union minister inspected progress of Yaygyawkale Bridge on Twantay-Maubin road and Maubin-Kyaiklat road. He also viewed implementation of a 600-foot-long Wunkawet bridge being built by Bridge Construction Project Group (12) of Public Works on the road.—*MNA*

Figure 6.2 MFOCN's CSR News on The Global New Light of Myanmar Newspaper

This IEE will also be available for consultation in English at MFOCN office at MICT Park; and the same on its corporate website. The final version of the EMP in English will be available to interested parties at the Project office on site. Information on the contact and location of the Project Office may be obtained from MFOCN's office at MICT Park.

7. ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) aims at defining a mechanism for implementing mitigation measures for expected negative impacts and to monitor the efficiency of these mitigation measures based on relevant environmental indicators. The EMP identifies certain roles and responsibilities for different stakeholders for implementing, supervising and monitoring the environmental performance of the project.

The EMP has distinguished between mitigation measures that should be implemented pre-construction and during the construction and operation of the project. MFOCN is the responsible entity for construction of Towers and Backbone Fiber Optic channel in Myanmar. Furthermore, MFOCN is the infrastructure provider for telecommunication service operators and has been permitted for a duration of 15 years for the project commencing from the date of issuance of the license by Ministry of Communications and Information Technology ("MCIT"). The license is extendable for another period with the approval of MCIT and MIC. MIC notified MFOCN shall be responsible for the preservation of the environment at and around the area of the project. In addition, the company shall carry out measures to be taken for safety work-site plan, health care plan and waste management plan for the implementation and operation of the proposed project as directed by MOECAF.

In this study, the main roles for implementing the project component is under the responsibility of MFOCN. However, the engagement play vital roles especially for the supervision and monitoring activities to ensure the project components and implementation comply with the MOECAF's guidelines. The section below describe the institutional arrangement for the project activities during the Construction and operation of the backbone Fiber Optic line and BTS towers. The objectives of the EMP are to:

- Provide practical and achievable plans for the management of the project specifically ensuring that environmental requirements are complied with, by providing for the monitoring and control of the predicted impacts.
- Provide MFOCN and the regulatory authorities with a framework to confirm compliance with environmental policies and requirements, and
- Provide the community with evidence of the management of the project in an environmentally and socially acceptable manner.

This EMP provides the delivery mechanism to address the adverse environmental impacts of the proposed project during its implementation, to enhance project benefits, and to introduce standards of good practices to be adopted during all project stages.

Environmental Management Plan Measures

Following the IEE assessment environmental impacts are addressed and expected. The project has come up with a set of environmental mitigation measures to avoid or minimize adverse impacts throughout the Project's life cycle. These measures are set as requirements for every activity of the Project, either implemented by its own staff or by contractors. The project's EMP is presented in **Tables** 7.1, 7.2 and 7.3 for the pre-construction, construction and post construction (operation and maintenance) phases, respectively.

Table 7.1: Environmental Management Plan for the Pre-Construction Phase

Impacts	Proposed Mitigation	Monitoring and Frequency	Budget	Institutional Responsibility	
				Implementation	Supervision
Land Valuation	Fair market value should be employed in the compensation to landowners for land acquired for the project.	Assess market value of land through recognized official valuer prior to offering compensation.	Included in the project budget	MFOCN	MFOCN
Ecological and Heritage Sites	- The site selection for each tower, BTS, and construction camp should be reviewed on the ground for potential ecological and heritage impacts. Appropriate mitigation measures for any identified ecological or heritage sites should be developed before construction works begins. - Similarly, the access routes to each site and the route of the FOC should also be reviewed at a localized level to identify such and other sensitive receptors, and appropriate mitigation measures developed prior to construction.	Baseline survey of tower, BTS and construction camp sites and FOC route for ecological and heritage significance.	To be included in project budget	MFOCN	MFOCN
Local Communities	Consultation with local rural communities should be conducted prior to mobilizing equipment and workers.	Prior to mobilization and follow up during the course of construction.	To be included in project budget	MFOCN	MFOCN
Waste Management	Consult with the local authorities to officially assign a location for the disposal of construction waste. Agreement on these disposal sites should be reached prior to commencing construction works.	Would be carried out during the project implementation	To be included in project budget	MFOCN	MFOCN
Soil Erosion	- Develop construction management procedures involving scheduling of earthworks and developing the sequence and methods as part of soil protection plans.	Evidence of soil erosion management plans and resources in place prior to mobilization to site.	To be included in the project budget	MFOCN & contractors	MFOCN

	- The project area will be divided into smaller sectors and vegetation from the smaller sectors will be cleared sequentially to minimize soil exposure during construction. - When required, top soil will be carefully removed and saved for rehabilitation. - Placing silt fences or screens, placing compost blanket, creating temporary soil stabilization, and setting vegetated buffer zones and swales along the planned construction areas. - Water sprinkling and appropriate scheduling for truck and heavy equipment movements will also be arranged for the site surveys and mobilization. - Traffic and pedestrian walk ways will not be covered in or obstructed by construction vehicles and crew. - The soil analysis shall be done to identify the soil characteristics, soil stability and the depth of the groundwater				
Air Pollution	- Carry out regular surface damping or wetting on exposed site areas, unpaved access roads, and stockpiled top soil especially during the dry season. - Provide enclosure and covering of soil and aggregate stockpiles. - Provide wheel and undercarriage washing facilities or trough at the ingress/ egress points of construction sites. - Vehicles operating in unpaved access roads will adhere to speed limits that will minimize excessive generation of dust. - Air pollution from vehicles will be minimized by using low emission equipment and vehicles, operating all equipment and vehicles on an appropriate maintenance	In the absence of air quality monitoring resources in the country, visual inspection will be carried out during construction	To be included in the construction contract	MFOCN & contractors	MFOCN

	and inspection scheme, and enforcing the policy of no idling engines. - All construction vehicles transporting dusty materials will be secured with covers to prevent escape of fugitive dust. - Vegetation and trees planted around the project area and along the routes will also help to offset emission from operations. - In areas of loose sandy soils the contractor should provide source of water for spraying soil before excavation, filling, loading and unloading. If noticed visual/sensible increase of dust emissions, perform additional spraying of water in the spot generating high emissions. - Onsite fuel burning equipment such as generators will be serviced and maintained in good working order. - Open burning is strictly prohibited at all times.				
Occupational Health and Safety	- Carry out training and awareness raising campaign to educate workers on hazards. - Develop standard safety procedures for transportation, staging and stockpiling of materials, tower erection and cable works - employ health and safety manager	Review training records and evidence of appropriate health and safety procedures and resources.	To be included in the project budget	MFOCN & contractors	MFOCN

Table 7.2: Environmental Management Plan Measures for the Construction Phase

Impacts	Proposed Mitigation Measures	Monitoring and Frequency	Budget	Institutional Responsibility	
				Implementation	Supervision
Soil erosion and potential land contamination	- All excavations shall be made in accordance with the approved drawings. - Careful planning to establish work zones, defining phases of construction, and active management of daily activities will be employed to minimize soil disturbance during the construction phase. Construction management procedures involving scheduling of earthworks and developing the sequence and methods as part of soil protection plans. - The project area will be divided into smaller sectors and vegetation from the smaller sectors will be cleared sequentially to minimize soil exposure during construction. - When required, top soil will be carefully removed and saved for rehabilitation - Placing silt fences or screens, placing compost blanket, creating temporary soil stabilization, and setting vegetated buffer zones and swales along the construction areas will be carried out in the construction phase. - Frequent water sprinkling and appropriate scheduling for truck and heavy equipment movements will also be arranged throughout the construction period. - Traffic and pedestrian walk ways will not be covered in or obstructed by construction vehicles and crew. - Re-greening of the project area will be carried out to compensate the vegetation loss in the construction.	- Inspection of silt traps will be carried out by the Contractor as required. - Based on the inspection, as required, silt traps/catch pits will be desludged to maximize silt removal efficiencies. - The overflow from the silt traps will be monitored on a weekly basis to ensure the Total Suspended Solids (TSS) concentration is below 50 mg/l. - Top soil stockpiles will be inspected daily. - An inspection must be conducted at the end of the works to ensure that the excavation has been left in a safe manner. - Daily inspection of the areas designated for refuelling - Sanitary facilities (eg portable toilets) to be cleaned twice daily. If temporary septic systems are used, periodic inspection and desludging will be carried out.	To be included in the construction contract	MFOCN & contractors	MFOCN

Impacts	Proposed Mitigation Measures	Monitoring and Frequency	Budget	Institutional Responsibility	
				Implementation	Supervision
	- The sides of all excavations, which might expose personnel or facilities to danger resulting from shifting earth shall be protected by providing slope to the appropriate angle of repose or benching in the sides and ends of the excavation or ladders must be used and secured, enough to withstand at least 1 meter above the top of the excavation. - Prior to the construction activities, the soil analysis shall be done to identify the soil characteristics, soil stability and the depth of the groundwater - All excavation deeper than 1.5 meters must have barriers and toe boards around the outside to-prevent persons and material failing into the excavation. Barriers must be of a strength that is capable of withstanding the weight of a person falling against the barrier. Barriers shall be readily visible by day or night. - Regular detection for leakage to the soil to avoid soil contamination from spills. - Training of staff should be done for application of contaminate materials from construction, operation and maintenance. - In case a leakage occurred the soil should be removed and disposed in the appointed disposal site for special waste or hazardous waste, according to the environmental conservation procedures and practices. - Any spills observed will be contained and removed with use of sand, sawdust or other absorbents. - Appropriate sanitary facilities will be provided and properly maintained.				

Impacts	Proposed Mitigation Measures	Monitoring and Frequency	Budget	Institutional Responsibility	
				Implementation	Supervision
	- Direct discharge of sanitary and sullage wastewater will be prohibited. - Portable toilets or temporary septic systems will be installed at construction sites where there are no established / existing sanitary and sewerage facilities.				
Air Pollution	- Soil erosion and dust control management measures also assist in the management of air pollution from construction operations. - As appropriate; potential causes of air pollution from unloading and vehicles will be minimized. - Air pollution from vehicles will be minimized by using low emission equipment and vehicles, operating all equipment and vehicles on an appropriate maintenance and inspection scheme, and enforcing the policy of no idling engines. - Vegetation and trees planted around the project area and along the routes will also help to offset emission from operations. - In areas of loose sandy soils the contractor should provide source of water for spraying soil before excavation, filling, loading and unloading. If noticed visual/sensible increase of dust emissions, perform additional spraying of water in the spot generating high emissions	In the absence of air quality monitoring resources in the country, visual inspection will be carried out during construction	To be included in the construction contract	MFOCN & contractors	MFOCN
Solid and Hazardous Waste Generation	- Carefully select less hazardous materials and use the necessary amount only. - Establish a designated hazardous waste collection site and make it secure.	- Daily inspection on housekeeping, storage and disposal of non-hazardous waste generation from the construction sites will be carried out.	To be included in the construction contract	MFOCN & contractors	MFOCN

Impacts	Proposed Mitigation Measures	Monitoring and Frequency	Budget	Institutional Responsibility	
				Implementation	Supervision
	- Use items completely before disposing of the containers. - Do not clean the containers and mix wastes. - Arrange regular collection before containers overflow. - Prevent spills and leaks and set appropriate clean-up procedures. - Dispose of hazardous wastes in accordance with the regulations. - Provide regular training to the workforce and set a monitoring scheme for hazardous materials. - Communicate with the local authorities for officially assigning location for the disposal of construction waste. - Designate temporary storage of construction waste - Haul construction waste at the end of each business day to the officially approved disposal sites - store of the equipment should be a covered area provided with adequate flooring for possible access of forklifts and small trucks - The responsible person for environment should make sure the store has sufficient area and facilities during the design/construction phase. - non-hazardous wastes shall be transported and disposed the permitted dump site - Hazardous or special wastes should be disposed of in controlled areas within certified disposal sites.	- Occasional audit of any third party waste transporter to ensure proper disposal of wastes to designated disposal sites will be conducted.			

Impacts	Proposed Mitigation Measures	Monitoring and Frequency	Budget	Institutional Responsibility	
				Implementation	Supervision
	- Secured storage areas for the collected hazardous wastes with records being kept of the type, amount and date of collection. - Transportation of accumulated wasted items will be done quarterly by certified contractors. - Project's stakeholders should be informed awareness of the disposal procedure of hazardous - Avoid, the use of PVC insulated Cable - Adopt Waste minimization procedures during the operation of network backbone and towers.				
Noise and Vibration	- Careful handling of material loading and unloading. - Employment of low impact technologies. - Using modern quiet power tools, and equipment. - Erecting sound shields or wall structures. - Giving consideration to careful sequencing and scheduling times. - Rerouting traffic through less populated areas. - Combine noisy operations at the same time but avoid combination of vibration - Working hours for workers exposed to noise equipment should be designed so that noise exposure periods do not exceed the safe limits. - Inform the nearby receptors about the peak time and hours for construction activities.	No regular monitoring programme required but frequent and daily inspection will be carried out.	To be included in the construction contract	MFOCN & contractors	MFOCN

Impacts	Proposed Mitigation Measures	Monitoring and Frequency	Budget	Institutional Responsibility	
				Implementation	Supervision
Traffic and Underground Utilities	- An agreement between contractors and supervisor consultants should be reached about the suitable location for temporary storage of construction materials along the Right of Way (RoW) of backbone Fiber Cable network, equipment, tools and machinery prior to starting construction of each reach of tower locations. No storage of construction materials or electric tools should be allowed in traffic lanes. - Find suitable locations for temporary storage of conventional construction wastes. - In case a narrow access road needs to be occupied for limited period (for example by loading/unloading trucks or loaders) the occupation time should be minimize. The additional measure is to have a careful turn (if needed) for the heavy trucks or loaders due to the high-speed vehicles passing by the highway. - In densely populated areas such as downtown, central business districts, and road junction, construction operation is done by night time - Systematic demarcation and necessary examination is done prior to trenching the Cable duct incorporation with municipal authorities and relevant administration.	Regular monitoring programme required as the work progress proceed but inspection will be carried out prior to the construction take place	To be Included in the construction contract	MFOCN & contractors	MFOCN
Occupational Health and Safety	- Initial job trainings relevant to the assignments should be offered for staffs; - All workers will be provided with personal protective equipment (PPE) and will be obliged to wear them in work zones; and - Particular works shall strictly follow work permit scheme.	Provisions for the appointment of health and safety personnel for the project will be made. Personnel will be tasked to implement the health and safety program for the project, conduct appropriate training, inspections and	To be Included in the construction contract	MFOCN & contractors	MFOCN

Impacts	Proposed Mitigation Measures	Monitoring and Frequency	Budget	Institutional Responsibility	
				Implementation	Supervision
	- All persons in excavation must wear safety helmets and safety boots - Vehicles and other machineries or construction equipment must not be allowed to come within 2 meters of an excavation unless working in connection with the excavation. - Workers that operate noisy machines or worker near them should be supplied with earmuffs and should be instructed to put them on when they get into noisy zones. - All mobile mechanical equipment shall be operated by authorized personnel and ha a valid license. - All equipment shall be checked prior to use by qualified personnel. - Brakes, lights, tire pressure and battery shall be inspected before using the equipment. Revolving lights must be used for heavy duty vehicles. - The design capacity of any equipment shall never be exceeded. The equipment shall not be modified to alter its capacity. - Equipment that could present a hazard to personnel, if accidentally activated during the performance of installation, repair, alteration, cleaning or inspection, work shall be made inoperative prior to state of work. - Equipment, which is subject to unexpected external physical movement such as rotating, turning, dropping, sliding etc., mechanical and/or structural constraint, shall be applied to prevent such movement.	provide technical assistance and guidance for the project.			

Impacts	Proposed Mitigation Measures	Monitoring and Frequency	Budget	Institutional Responsibility	
				Implementation	Supervision
	- All equipment, which is locked or taken out of service, because of potentially hazardous condition, shall be appropriately tagged indicating the reason for taken out of service.				
Optic Fiber Safety	- Always wear safety glasses with side shields and protective gloves. Treat Fiber Optic splinters the same as use in glass splinters. - Employees wearing non-safety prescription glasses will wear safety goggles while exposed to Fiber Optic Cable (FOC) splicing or termination activities. - Never look directly into the end of Fiber Cable until you are positive that there is no light source at the other end. - Use a Fiber Optic power meter to make certain the Fiber is dark. When using an Optical tracer or continuity checker, look at the Fiber from an angle at least 6 inches away from your eye to determine if the visible light is present. - Contact wearers must not handle their lenses until they have thoroughly washed their hands. - Do not touch your eyes while working with Fiber Optic systems until they have been thoroughly washed. - Company employees and other site personnel entering into work areas, where Fiber Optic Cable (FOC) is being spliced or terminated, will wear appropriate safety glasses with side shields. - Keep all combustible materials safely away from the curing ovens.	Provisions for the appointment of health and safety personnel for the project will be made. Personnel will be tasked to implement the health and safety plan for the project, conduct appropriate training, inspections and provide technical assistance and guidance for the project.	To be Included in the construction contract	MFOCN & contractors	MFOCN

Impacts	Proposed Mitigation Measures	Monitoring and Frequency	Budget	Institutional Responsibility	
				Implementation	Supervision
	- Put all cut Fiber pieces in a safe place. - Thoroughly clean your work area when you are done. - Wear disposable aprons and gloves to minimize punctures and ingestion of Fiber particles on your clothing can later get into food, drinks, and/or be ingested by other means. - Supervisor and employees will not inspect live Fiber Optic Cable (FOC) ends. Fibers will be dark (no signals being sent through them) when inspected. The supervisor or employee will use a Fiber Optic power meter to make certain the Fiber is dark. - When the supervisor determines that there is a risk of employees inspecting live Fiber Optic Cable (FOC), especially when the Fiber light source is a laser, the eye protection worn by employees, safety glasses or goggles, will be specified for infrared filtering. - The supervisor will have employees post warning signs stating “Fiber Optic Work Area –Safety Glasses with Side Shields Must Be Worn” prior to employees performing any splicing or termination activities.				

Table 7.3: Environmental Management Plan for the Operations and Maintenance Phase

Impacts	Proposed Mitigation	Monitoring and Frequency	Budget	Institutional Responsibility	
				Implementation	Supervision
Air Pollution	- Soil erosion and dust control management measures also assist in the management of air pollution from maintenance operations. - As appropriate; potential causes of air pollution from unloading and vehicles will be minimized. - Air pollution from vehicles will be minimized by using low emission equipment and vehicles, operating all equipment and vehicles on an appropriate maintenance and inspection scheme, and enforcing the policy of no idling engines. - Re-vegetation around the project areas and along access routes will also help to offset emission from operations.	In the absence of air quality monitoring resources in the country, visual inspection will be carried out during maintenance works	To be included in the maintenance contract	MFOCN & operation & maintenance (O&M) contractor	MFOCN
Solid and Hazardous Waste Generation	- Keep the BTS and tower areas clean and tidy - Appropriate storage, transport and disposal measures for hazardous and special waste will be implemented - Implement waste minimization measure	Monthly records of quantities, types of waste generated, the location, and interval of replacement	To be included in the maintenance contract	MFOCN & operation & maintenance (O&M) contractor	MFOCN
Human Health and Safety	- Maintaining standard safety procedures for tower and network stations. - Provide work at height and electrical hazards training and safety	Provisions for the appointment of a health and safety manager for the operation phase will be made. The personnel will be tasked to implement the health and safety program such as providing training, conduct	To be included in the maintenance contract	MFOCN & operation & maintenance (O&M) contractor	MFOCN

	equipment to linemen working on the elevated energized structures. - Provide health and safety training to all maintenance workers on the hazards associated with the BTS and towers.	inspections, record and document incidents, etc.			
Optic Fiber Safety	The following protocols will be implemented and training provided: - Always wear safety glasses with side shields and protective gloves. Treat Fiber Optic splinters the same as use in glass splinters. - Employees wearing non-safety prescription glasses will wear safety goggles while exposed to Fiber Optic Cable (FOC) splicing or termination activities. - Never look directly into the end of Fiber Cable until you are positive that there is no light source at the other end. - Use a Fiber Optic power meter to make certain the Fiber is dark. When using an Optical tracer or continuity checker, look at the Fiber from an angle at least 6 inches away from your eye to determine if the visible light is present. - Contact wearers must not handle their lenses until they have thoroughly washed their hands. - Do not touch your eyes while working with Fiber Optic systems until they have been thoroughly washed. - Company employees and other site personnel entering into work areas, where Fiber Optic Cable (FOC) is being spliced or terminated, will wear	Provisions for the appointment of a health and safety manager for the operation phase will be made. The personnel will be tasked to implement the health and safety program such as providing training, conduct inspections, record and document incidents, etc.	To be Included in the maintenanace contract	MFOCN & operation & maintenance (O&M) contractor	MFOCN

	appropriate safety glasses with side shields. - Keep all combustible materials safely away from the curing ovens. - Put all cut Fiber pieces in a safe place. - Thoroughly clean work area when done. - Wear disposable aprons and gloves to minimize punctures and ingestion of Fiber particles on clothing which can later get into food, drinks, and/or be ingested by other means. - Supervisor and employees will not inspect live Fiber Optic Cable (FOC) ends. Fibers will be dark (no signals being sent through them) when inspected. - The supervisor or employee will use a Fiber Optic power meter to make certain the Fiber is dark. - When the supervisor determines that there is a risk of employees inspecting live Fiber Optic Cable (FOC), especially when the Fiber light source is a laser, the eye protection worn by employees, safety glasses or goggles, will be specified for infrared filtering. - The supervisor will have employees post warning signs stating “Fiber Optic Work Area –Safety Glasses with Side Shields Must Be Worn” prior to employees performing any splicing or termination activities.				

8. CONCLUSIONS AND RECOMMENDATIONS

This Initial Environmental Examination (IEE) has been prepared in accordance with Myanmar's Environmental Conservation Law, 2012 and Draft EIA Procedure, 2014 as well as policy requirements from state and regional government. The IEE includes an Environmental Management Plan (EMP) as requested by the Ministry of Environmental Conservation and Forestry (MOECAF) and defines a mechanism for implementing mitigation measures for expected negative impacts and to monitor the efficiency of these mitigation measures based on relevant environmental indicators.

Project site selection and routing (Right of Way) studies have been undertaken in 2012 to 2014 to identify preferred tower locations and the corridor for the construction of the proposed 32,000 km underground FOC connecting Base Transceiver Stations (BTSs) and substations. The main considerations during the selection were: the ease of access for construction and maintenance; and the constructability of the tower and cable route taking into account the topography, environmental constraints and ground conditions, including areas prone to landslides. Special attention was given to the social sphere in order to minimize impacts on the local population, agricultural land, visual significance, cultural heritage and traffic safety. Tower locations and the routing for the back bone FOC have been chosen based on community needs for additional projects, with specific sites then chosen based on geographic and topographic characteristics.

The area of land required for individual BTS and tower sites averages 300 m^2. Cable installation is executed using specialized trenching tractors which cut the trench to a depth of 1m and remove the soil in a single action. The trench will have a minimum 6-inch-wide opening, which can be used to accommodate multiple cables over long or short distances. Upon backfilling the trench surface will be restored to equal or better quality as compared to the original condition

A total of 1000 towers will be constructed by 2017, as will the 32,000 km length backbone FOC network.

The project has the potential to impact on the existing environment at numerous locations throughout Myanmar. Consequently, an overview of the Myanmar environment is presented, as is a Hazard Profile of Myanmar.

Project impacts are addressed for the following project phases:

- Preconstruction
- Construction
- Operations and Maintenance

The identified potential impacts anticipated from the implementation of the Project cover the following topics:

- Land Valuation
- Soil erosion
- Air pollution
- Noise and vibration
- Solid waste and hazardous waste generation
- Sanitary and Sullage wastewater generation
- Hazardous Materials
- Ecology including migratory birds

- Sites of Cultural and Historical Significant
- Vegetation loss
- Visual/ aesthetics
- Traffic
- Occupational health and safety including fiber optic and electromagnetic field (EMF) hazards

Recommended mitigation measures are proposed and summarized in the Environmental Management Plan (EMP). The EMP has distinguished between mitigation measures that should be implemented pre-construction, and during the construction and operation of the project.

The objectives of the EMP are to:

- Provide practical and achievable plans for the management of the project specifically ensuring that environmental requirements are complied with, by providing for the monitoring and control of the predicted impacts.
- Provide MFOCN and the regulatory authorities with a framework to confirm compliance with environmental policies and requirements, and
- Provide the community with evidence of the management of the project in an environmentally and socially acceptable manner.

This EMP provides the delivery mechanism to address the adverse environmental impacts of the proposed project during its implementation, to enhance project benefits, and to introduce standards of good practices to be adopted during all project stages. The costs for implementing the mitigation measures should be included in the Project budget.

It will be the MFOCN's responsibility to ensure that project parameters are compliance to permit and license endorsed by MIC, MOECAF and MCIT, and environmental conservation actions are exercised according to the final EMP that include provision for basic worker facility requirements, structural stability, safety and health requirements, etc., as outlined in the EMP. It provides realizable mitigation measures that are compatible with Best Construction and Worker Health and Safety Practices. Compliance monitoring of the mitigation measures will be the responsibility of the MFOCN and its contractors. The cost of mitigation measures are expected to be included in the MFOCN's project budget and its contractors bid values.

All project activities prior to construction, during construction and during operation will be monitored and a monitoring mechanism for which is provided in this IEE Report. Moreover, the members of the MOECAF, State and Regional Authorities, and all stakeholders have an important role in project construction and operation so that they can intervene when necessary or when complaints arise. It is recommended that the project proceeds as planned and that the mitigating and monitoring measures that have been identified within the EMP are implemented during the pre-construction, operation and maintenance phases of the project's implementation. Therefore, the bidding document should include the IEE as attachment, and the contractor will be able to include all mitigation costs during the construction period. Bidding evaluation should take into the contractor proposal to cover works and budget to implement mitigation measures as stated in the EMP. The supervision consultant /the engineer, has also to strictly implement the EMP when clear any contractor claim.

Based on the IEE findings it is concluded that there are no outstanding environmental issues remaining and as all impacts can be effectively mitigated no further environmental assessment is required for the subproject. From the foregoing discussions, it is recommended that:

- The main client of MFOCN's, here, mobile communication providers or operators, who own or lease the infrastructure should be required within specific time-frame to

undertake initial environmental audits for their projects and obtain respective clearance from the regulatory bodies.

- For ongoing projects, developers should be required undertake initial environmental audit within two years after commissioning the projects.
- All new projects should be subjected to environmental assessment as per law
- The project proponent, in collaboration with the MOECAF and MCIT should develop a checklist for environmental assessment for communication towers, as well as forms for respective EMPs and MPs.
- The Ministry of Infrastructure, Communication and Information Technology should urgently develop guidelines for mobile communication networks development. In this regard, the Minister responsible for environment needs to ask the Lead Sector Ministry to initiate the guidelines formulation process as early as possible.

9. REFRENCES & SOURCE OF INFORMATION

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ANNEXES

ANNEX

1 DETAIL TOWERS LOCATION, THEIR ADDRESS AND THE ROUTE

Detailed Tower Locations and Their Addresses

Tower Planning for the Year 2015

Site	Tower Invester	Site Name (MFOCN)	Site Type	Latitude (MFOCN proposed)	Longtitude (MFOCN proposed)	Areas(㎡)	Site Address
MF0001	MFOCN	Muse	B	23.992804	97.905145	300	Keep side Lashio-Muse Road,Muse Town
MF0002	MFOCN	105-Mile	A	23.982650	97.974550	586	No.(221), Zawthiga street, (5) block, 105 miles
MF0003	MFOCN	Banjerout	B	23.693940	97.829341	325	Thar tha na yaung chi street, Banjerout village, Kuitkaing Town
MF0004	MFOCN	Hsenwi	B	23.306760	97.964770	330	Theinni Town
MF0005	MFOCN	Lashio	A	22.928993	97.726139	446	No.1,(1)block,Lashio Town
MF0006	MFOCN	Hsipaw	B	22.614030	97.295770	325	No.(75), Myetlay street, Taungmyo block, Thipaw Town
MF0007	MFOCN	Kyaukme	B	22.525790	97.040470	325	No.(54) Thitdaw street, (2) block, Kyaukme Town
MF0008	MFOCN	Naungcho	A	22.327575	96.803304	446	Thepay street, Panhet block, Naungcho Town
MF0009	MFOCN	Pyinoolwin	B	22.056097	96.514616	247	(11) block, Yuzana street, Yena villlage, Pyinoolwin Town
MF0010	MFOCN	Maw Pyi	A	17.052280	96.134818	4015	Htauk Kyant
MF0011	MFOCN	Phyu	B	18.455850	96.438620	267	Naung Kar Yar Village, Phyu Town
MF0012	MFOCN	TaungOo	A	18.911100	96.450000	773	kapoke su village,Taungoo Town
MF0013	MFOCN	Bago Payargyi	A	17.434594	96.528651	278	Payargyi Town,Bago Province
MF0014	MFOCN	Daik-U	B	17.773540	96.686980	223	Daike Oo Town
MF0015	MFOCN	Nyaunglaypin	B	17.970470	96.703520	279	Nyaunglaypin Town
MF0016	MFOCN	Thar Ga Ya	B	19.303990	96.290340	279	Thar Ga Ya Town,Bago Province
MF0017	MFOCN	Naypyitaw	A	19.589310	96.199700	928	lae way township,Naypyitaw Province
MF0018	MFOCN	Tatkon	B	20.128710	96.205980	223	That gone township, Naypyitaw Province
MF0019	MFOCN	Pyawbwe	B	20.596841	96.042908	378	Shwepyi yannaing Village, Pyaw bwe Town
MF0020	MFOCN	Thepyawa Meiktila	A	20.970040	95.973720	510	Thepyawa village,Tarsi Town
MF0021	MFOCN	aung kan Meiktila	B	20.866350	95.945530	336	Naung gaing village,Meiktila Town
MF0022	MFOCN	Myittha	B	21.413170	96.134670	335	Myitta Town
MF0023	MFOCN	Kyauksae	B	21.624430	96.139370	220	Inntine village,Kyaukse Town
MF0024	MFOCN	Mandalay	A	21.851130	96.049190	2844	Kanbae village,Amarabura Township,Mandalay Province
MF0025	MFOCN	Myingyan	A	21.432550	95.372890	653	Ywarsi village,Myinchan Town
MF0026	MFOCN	Ywar thi kone	B	21.260121	95.956118	725	Ywar thit gone village,Naung Oo

Tower Planning for the Year 2016

Site	Tower Invester	Site Name (MFOCN)	Site Type	Latitude (MFOCN proposed)	Longtitude (MFOCN proposed)	Areas(㎡)	Site Address
MF0191	MFOCN	thar ga ya	B	19.32379	96.19498	300	suburbs of thar ga ya
MF0192	MFOCN	myo hla	B	19.400555	96.171242	300	suburbs of myo chaung hla
MF0193	MFOCN	baungdok	B	19.190125	96.227989	300	suburbs of baungdok
MF0194	MFOCN	ka nyut kwin	B	18.339111	96.490632	300	urban area of ka nyut kwin
MF0195	MFOCN	oke twin	B	18.82324	96.41888	300	urban area of oke twin
MF0196	MFOCN	nyaung chay htauk	B	18.61123	96.41897	300	urban area of nyaung chay htauk
MF0197	MFOCN	kywebwe	B	18.722787	96.408222	300	urban area of kywebwe
MF0198	MFOCN	ywar thit gyi	B	21.974444	95.784999	300	urban area of ywarthit gyi
MF0199	MFOCN	okhnebin	B	22.06122	95.77889	300	urban area of okhnebin
MF0200	MFOCN	sagaing	B	21.906121	95.965557	300	urban area of sagaing
MF0201	MFOCN	mzhar nander kan	B	21.878821	95.976668	300	urban area of mahar nandar kan
MF0202	MFOCN	urban area of sagaing	B	21.890901	95.995202	300	urban area of sagaing
MF0203	MFOCN	pao ja	B	21.99999	95.68213	300	suburbs of bao ja
MF0204	MFOCN	allagappa	B	21.931909	95.490101	300	urban area of allgappa
MF0205	MFOCN	myin oo	B	21.928877	95.578877	300	suburbs of myin oo
MF0206	MFOCN	ka-onda	B	23.066667	95.719898	300	suburbs of ka-onda
MF0207	MFOCN	kan blu	B	23.241123	95.307777	300	urban area of kan blu
MF0208	MFOCN	budaungkan	B	22.161334	95.22901	300	urban area of budaungkan
MF0209	MFOCN	myin oo	B	22.079879	95.177887	300	urban area of myin oo
MF0210	MFOCN	moneywa	B	22.149543	95.108998	300	urban area of moneywa
MF0211	MFOCN	ayadaw	B	22.276198	95.434267	300	urban area of ayadaw
MF0212	MFOCN	kyunbobing	B	22.19455	95.322123	300	suburbs of kyunbobing
MF0213	MFOCN	khin mun	B	22.002887	95.241787	300	urban area of khin mun
MF0214	MFOCN	balwe	B	21.932986	95.398876	300	sububs of balwe
MF0215	MFOCN	chaing	B	22.383542	94.96211	300	sububs of chaing
MF0216	MFOCN	monrywa	B	22.100877	95.118765	300	urban area of moneywa
MF0217	MFOCN	Myitnge	B	21.857887	96.029665	300	urban area of myitinge
MF0218	MFOCN	Inn wa	B	21.876871	96.006111	300	urban area of inn wa
MF0219	MFOCN	Mandalay	B	21.982987	96.066234	300	urban area of mandaylay
MF0220	MFOCN	Amarapura	B	21.893001	96.036778	300	urban area of Amarapura
MF0221	MFOCN	Myitnge	B	21.874998	96.0605001	300	urban area of myitinge
MF0222	MFOCN	Amarapura	B	21.893889	96.066112	300	urban area of Amarapura

MF0223	MFOCN	Chanmyathazi	B	21.936788	96.10624	300	urban area of chanmyathazi
MF0224	MFOCN	Pyigyitagon	B	21.906793	96.099091	300	urban area of pyigyitagon
MF0225	MFOCN	Amarapura	B	21.912889	96.060231	300	urban area of Amarapura
MF0226	MFOCN	Myitnge	B	21.855881	96.138889	300	sububs of myitnge
MF0227	MFOCN	ohn chaw	B	21.874121	96.182789	300	sububs of ohn chaw
MF0228	MFOCN	aungthasanmyay	B	22.020778	96.102778	300	urban area of aungthasanmyay
MF0229	MFOCN	chanayethazan	B	22.035554	96.100112	300	urban area of changayethazan
MF0230	MFOCN	yaungpyon	B	22.060778	96.090789	300	sububs of toungpyon
MF0231	MFOCN	Mandalay	B	21.965667	96.08567	300	urban area of mandaylay
MF0232	MFOCN	Myitnge	B	21.873119	96.096791	300	sububs of myitnge
MF0233	MFOCN	patheingyi	B	21.987112	96.126787	300	urban area of pateingyih
MF0234	MFOCN	ongyaw	B	21.879766	96.236546	300	urban area of ongyaw
MF0235	MFOCN	Amarapura	B	21.901998	96.042778	300	urban area of Amarapura
MF0236	MFOCN	Chanmyathazi	B	21.92787	96.089787	300	urban area of chanmyathazi
MF0237	MFOCN	Pyigyitagon	B	21.892897	96.123797	300	urban area of pyigyitagon
MF0238	MFOCN	kyauk Mee	B	21.902456	96.185789	300	urban area of Kyauk Mee
MF0239	MFOCN	aungnaythazany	B	22.007462	96.073415	300	urban area of aungmyaythazan
MF0240	MFOCN	Pyigyitagon	B	21.902954	96.083597	300	urban area of pyigyitagon
MF0241	MFOCN	aungnaythazany	B	21.993017	96.084372	300	urban area of aungmyaythazan
MF0242	MFOCN	Chanmyathazi	B	21.935134	96.151253	300	urban area of chanmyathazi
MF0243	MFOCN	Pyigyitagon	B	21.919927	96.109638	300	urban area of pyigyitagon
MF0244	MFOCN	mahaaungmyay	B	21.958731	96.113521	300	urban area of mahar nandar kanaaungmyay
MF0245	MFOCN	tha pdaukhan	B	22.109863	96.044029	300	sububs of th pdaukhan
MF0246	MFOCN	myithnge	B	21.818494	96.061878	300	sububs of th myitnge
MF0247	MFOCN	kalagon	B	16.541269	97.698017	300	sububs of kalagon
MF0248	MFOCN	okhpo	B	16.391392	97.656872	300	sububs of okhpo
MF0249	MFOCN	thaton	B	16.937435	97.413297	300	urban area of thadon
MF0250	MFOCN	du yin seik	B	16.979769	97.438773	300	urban area of duzeikyin
MF0251	MFOCN	naunggala	B	16.973939	97.343262	300	sububs of naunggala
MF0252	MFOCN	minlwin	B	17.100572	97.292559	300	sububs of minlwin
MF0253	MFOCN	yinnyein	B	16.739895	97.410163	300	sububs of yinnyein
MF0254	MFOCN	zin kyaik	B	16.655819	97.447401	300	urban area of zin kyzik
MF0255	MFOCN	pzung	B	16.614635	97.451282	300	sububs of paung
MF0256	MFOCN	moke ta ma	B	16.539073	97.611693	300	urban area of moke ta ma
MF0257	MFOCN	kawpamagon	B	16.587247	97.587539	300	sububs of kawpamagon

MF0258	MFOCN	thein za yat	B	17.511384	96.880088	300	urban area of thei za yat
MF0259	MFOCN	alugyi	B	17.280853	97.118035	300	sububs of alugyi
MF0260	MFOCN	kyaukse	B	21.572234	96.159953	300	urban area of kyaukse
MF0261	MFOCN	bellin	B	21.658392	96.115359	300	urban area of bellin
MF0262	MFOCN	kyaukse	B	21.597809	96.133844	300	urban area of kyaukse
MF0263	MFOCN	thanywa	B	21.485757	96.258411	300	urban area of thanywa
MF0264	MFOCN	Sintgaing	B	21.728749	96.103265	300	urban area of sintgaing
MF0265	MFOCN	Hanthaddyw	B	21.804268	96.006765	300	urban area of Hanthaddyw
MF0266	MFOCN	Tada-u	B	21.451527	96.189577	300	urban area of Tada-u
MF0267	MFOCN	Thein ni kan	B	21.566712	95.955937	300	suburbs of Thein ni kan
MF0268	MFOCN	Onhmin	B	21.657675	95.978742	300	urban area of Onhmin
MF0269	MFOCN	Chaunggwa	B	21.699837	95.960765	300	suburbs of Chaunggwa
MF0270	MFOCN	Tada-u	B	21.783392	95.980185	300	urban area of Tada-u
MF0271	MFOCN	kanna	B	21.467651	95.921536	300	suburbs of kanna
MF0272	MFOCN	kokkosu	B	21.342238	95.865617	300	suburbs of kokkosu
MF0273	MFOCN	Popa	B	20.915846	95.305351	300	suburbs of Popa
MF0274	MFOCN	Singu	B	20.937186	94.860192	300	urban area of Singu
MF0275	MFOCN	Kannibauk	B	21.033181	94.861051	300	suburbs of Kannibauk
MF0276	MFOCN	New bagan	B	21.129948	94.861692	300	urban area of New bagan
MF0277	MFOCN	Inbingyi	B	20.339264	96.152316	300	suburbs of Inbingyi
MF0278	MFOCN	Yamethin	B	20.416539	96.143825	300	urban area of Yamethin
MF0279	MFOCN	Inginekan	B	20.472392	96.110476	300	urban area of Inginekan
MF0280	MFOCN	Thit sone gyi	B	20.464825	95.826939	300	suburbs of Thit sone gyi
MF0281	MFOCN	Taunggyi	B	20.287892	95.890239	300	suburbs of Taunggyi
MF0282	MFOCN	Kan-auk	B	20.536323	96.065969	300	suburbs of Kan-auk
MF0283	MFOCN	Pyawbwe	B	20.614472	96.040068	300	urban area of Pyawbwe
MF0284	MFOCN	Yindaw	B	20.711982	95.949943	300	urban area of Yindaw
MF0285	MFOCN	Shanzu	B	20.684616	95.993186	300	suburbs of Shanzu
MF0286	MFOCN	Kokkogan	B	20.675932	96.174384	300	urban area of Kokkogan
MF0287	MFOCN	Hngetmi	B	20.634582	96.277329	300	suburbs of Hngetmi
MF0288	MFOCN	Shanzu	B	20.638074	95.811786	300	suburbs of Shanzu
MF0289	MFOCN	Ah le ywa	B	20.705538	95.82695	300	suburbs of Ah le ywa
MF0290	MFOCN	Kande	B	20.534415	95.810942	300	suburbs of Kande
MF0291	MFOCN	Net kyee kone	B	20.772263	95.897823	300	suburbs of Net kyee kone
MF0292	MFOCN	Tatkon	B	20.122189	96.207632	300	urban area of Tatkon
MF0293	MFOCN	Okshitkon	B	20.194216	96.183862	300	suburbs of Okshitkon

MF0294	MFOCN	Wumbyangon	B	19.989676	96.248708	300	suburbs of Wumbyangon
MF0295	MFOCN	Shwemyo	B	20.043715	96.237451	300	urban area of Shwemyo
MF0296	MFOCN	Kyathe-aing	B	20.103382	96.240902	300	suburbs of Kyathe-aing
MF0297	MFOCN	Bodetywa	B	20.010854	95.957682	300	suburbs of Bodetywa
MF0298	MFOCN	Thechaung	B	20.148857	95.922742	300	suburbs of Thechaung
MF0299	MFOCN	Payadaungywa	B	20.074768	95.933518	300	suburbs of Payadaungywa
MF0300	MFOCN	Sattobauk	B	20.216442	95.907293	300	suburbs of Sattobauk
MF0301	MFOCN	Dobinkhon	B	19.919648	96.247915	300	urban area of Dobinkhon
MF0302	MFOCN	Nanaw	B	19.943501	96.259594	300	suburbs of Nanaw
MF0303	MFOCN	Letha	B	19.926928	96.208837	300	urban area of Letha
MF0304	MFOCN	Nyaunglu	B	19.939778	96.158356	300	suburbs of Nyaunglu
MF0305	MFOCN	Thangedaung	B	20.007687	96.150357	300	suburbs of Thangedaung
MF0306	MFOCN	Kyatchaung	B	20.108785	96.152576	300	urban area of Kyatchaung
MF0307	MFOCN	Nyaung lunt	B	20.239235	96.179156	300	urban area of Nyaung lunt
MF0308	MFOCN	Thitseinbin	B	19.742664	96.231743	300	urban area of Thitseinbin
MF0309	MFOCN	shabingone	B	19.767364	96.143643	300	suburbs of shabingone
MF0310	MFOCN	Zegon	B	19.871028	96.222245	300	suburbs of Zegon
MF0311	MFOCN	Ywadaw	B	19.814346	96.192733	300	urban area of Ywadaw
MF0312	MFOCN	Oattara thiri hotel zone	B	19.863367	96.154733	300	urban area of Oattara thiri hotel zone
MF0313	MFOCN	New village	B	19.927563	95.991453	300	suburbs of New village
MF0314	MFOCN	Thayetkon	B	19.809879	96.276134	300	suburbs of New Thayetkon
MF0315	MFOCN	kyarpin	B	19.720443	96.139535	300	urban area of kyarpin
MF0316	MFOCN	Pyangabye	B	19.737535	96.172533	300	urban area of Pyangabye
MF0317	MFOCN	Okshitkon	B	19.765345	96.207235	300	urban area of Okshitkon
MF0318	MFOCN	Ywathit	B	19.768224	96.174543	300	urban area of Ywathit
MF0319	MFOCN	Aycmyintthayar	B	19.784656	96.218452	300	urban area of Aycmyintthayar
MF0320	MFOCN	yezin	B	19.849455	96.261785	300	urban area of yezin
MF0321	MFOCN	Pyinmana	B	19.741337	96.200154	300	urban area of Pyinmana
MF0322	MFOCN	Pobeu	B	19.692389	96.244011	300	suburbs of New Pobeu
MF0323	MFOCN	Kan-u	B	19.702375	96.314832	300	suburbs of New Kan-u
MF0324	MFOCN	Alyinlo	B	19.713608	96.171147	300	urban area of Alyinlo
MF0325	MFOCN	Thagala	B	19.865546	96.182219	300	urban area of Thagala
MF0326	MFOCN	Bala theiddhi ward	B	19.775131	96.065453	300	urban area of Bala theiddhi ward
MF0327	MFOCN	Thayetkyun	B	19.828476	96.051987	300	urban area of Thayetkyun
MF0328	MFOCN	kyetpyay	B	19.742356	96.123246	300	urban area of kyetpyay
MF0329	MFOCN	Pobba thiri	B	19.899457	96.147143	300	suburbs of Pobba thiri

MF0330	MFOCN	Thinwindaing	B	19.844356	96.151187	300	urban area of Thinwindaing
MF0331	MFOCN	Kyweshin	B	19.851834	96.017343	300	suburbs of Pobba Kyweshin
MF0332	MFOCN	Lewe	B	19.637986	96.109348	300	urban area of Lewe
MF0333	MFOCN	Kuthabeik	B	19.609453	96.159765	300	suburbs of Kuthabeik
MF0334	MFOCN	Thar wut hti	B	19.530355	96.250445	300	urban area of Thar wut hti
MF0335	MFOCN	Kanbe	B	19.593786	96.243469	300	urban area of Kanbe
MF0336	MFOCN	Aye lar	B	19.634734	96.244756	300	urban area of Aye lar
MF0337	MFOCN	Nalkan	B	19.528583	96.119156	300	suburbs of Nalkan
MF0338	MFOCN	Hotel zone	B	19.703316	96.104986	300	urban area of Hotel zone
MF0339	MFOCN	Taungbi	B	19.721967	96.105546	300	urban area of Taungbi
MF0340	MFOCN	Kanhla	B	19.638963	96.055471	300	suburbs of Kanhla
MF0341	MFOCN	Inbintha	B	19.575366	96.114243	300	urban area of Inbintha
MF0342	MFOCN	Aungtha	B	19.460188	96.149884	300	suburbs of Aungtha
MF0343	MFOCN	Sizu	B	19.714592	96.031873	300	suburbs of Sizu
MF0344	MFOCN	Wetkamu	B	19.659664	96.209678	300	urban area of Wetkamu
MF0345	MFOCN	Bawtigon	B	19.649749	96.139477	300	urban area of Bawtigon
MF0346	MFOCN	Kyaukpon	B	20.931684	95.787142	300	suburbs of Kyaukpon
MF0347	MFOCN	Kyewgan	B	20.705195	95.763167	300	suburbs of Kyewgan
MF0348	MFOCN	Mondaing	B	20.848374	95.860875	300	urban area of Mondaing
MF0349	MFOCN	Chaungna	B	20.839184	95.795644	300	suburbs of Chaungna
MF0350	MFOCN	Meiktila	B	20.903785	95.890386	300	urban area of Meiktila
MF0351	MFOCN	Thabyewa	B	20.964734	95.958794	300	urban area of Thabyewa
MF0352	MFOCN	Wundwin	B	20.996466	95.944223	300	suburbs of Wundwin
MF0353	MFOCN	Badazo	B	21.200665	95.776776	300	suburbs of Badazo
MF0354	MFOCN	Yae cho	B	21.005336	95.787654	300	suburbs of Yae cho
MF0355	MFOCN	Kanthit	B	21.099177	95.792245	300	suburbs of Kanthit
MF0356	MFOCN	Mahlaing	B	21.097586	95.650446	300	urban area of Mahlaing
MF0357	MFOCN	Bingyidaw	B	21.335876	95.752966	300	suburbs of Bingyidaw
MF0358	MFOCN	Hlaingdet	B	20.808121	96.176533	300	urban area of Hlaingdet
MF0359	MFOCN	Nyaungyan	B	20.751354	96.044985	300	urban area of Nyaungyan
MF0360	MFOCN	Badazo	B	21.151988	95.804243	300	suburbs of Badazo
MF0361	MFOCN	Wundwin	B	21.046524	95.981538	300	suburbs of Wundwin
MF0362	MFOCN	Paukpingyaut	B	21.288677	95.829786	300	urban area of Paukpingyaut
MF0363	MFOCN	Dainggaungkon	B	21.178674	96.024566	300	urban area of Dainggaungkon
MF0364	MFOCN	Wundwin	B	21.092615	96.021095	300	urban area of Wundwin
MF0365	MFOCN	Kame	B	21.344719	96.112284	300	urban area of Kame

MF0366	MFOCN	Paungdale	B	18.836203	95.333729	300	suburbs of Paungdale
MF0367	MFOCN	Tharay khit taya	B	18.842874	95.273768	300	urban area of Tharay khit taya
MF0368	MFOCN	Inawgon	B	18.976546	95.244467	300	urban area of Inawgon
MF0369	MFOCN	Pyay	B	18.826678	95.255519	300	urban area of Pyay
MF0370	MFOCN	Paungde	B	18.492226	95.503865	300	urban area of Paungde
MF0371	MFOCN	Inma	B	18.528657	95.351233	300	urban area of Inma
MF0372	MFOCN	Padigon	B	18.507547	95.436671	300	urban area of Padigon
MF0373	MFOCN	Thegon	B	18.648236	95.416217	300	urban area of Thegon
MF0374	MFOCN	Sinmizwe	B	18.733755	95.357428	300	suburbs of Sinmizwe
MF0375	MFOCN	Wadauth	B	18.629356	95.249357	300	suburbs of Wadauth
MF0376	MFOCN	Shwedaung	B	18.701685	95.211643	300	urban area of Shwedaung
MF0377	MFOCN	Phashwekyaw	B	17.720519	95.770319	300	urban area of Phashwekyaw
MF0378	MFOCN	Thonse	B	17.638853	95.781153	300	urban area of Thonse
MF0379	MFOCN	Letpadan	B	17.789753	95.760412	300	urban area of Letpadan
MF0380	MFOCN	Othegon	B	18.042424	95.695544	300	urban area of Othegon
MF0381	MFOCN	Sit kwin	B	17.896753	95.723416	300	urban area of Sit kwin
MF0382	MFOCN	Minhla	B	17.977235	95.712613	300	urban area of Minhla
MF0383	MFOCN	Payagwin	B	17.992865	95.775113	300	urban area of Payagwin
MF0384	MFOCN	Minhla	B	17.943981	95.744693	300	urban area of Minhla
MF0385	MFOCN	Okpho	B	18.127511	95.670366	300	urban area of Okpho
MF0386	MFOCN	Ayemyathayar	B	18.079972	95.732445	300	urban area of Ayemyathayar
MF0387	MFOCN	Zigon	B	18.343855	95.626283	300	suburbs of Zigon
MF0388	MFOCN	Nattalin	B	18.425899	95.552975	300	urban area of Nattalin
MF0389	MFOCN	Magway	B	20.160731	94.955833	300	urban area of Magway
MF0390	MFOCN	Kanbya	B	20.197316	95.009852	300	urban area of Kanbya
MF0391	MFOCN	Myinthar	B	20.151055	94.936335	300	urban area of Myinthar
MF0392	MFOCN	Ywarthit	B	20.159066	94.922556	300	urban area of Ywarthit
MF0393	MFOCN	Tha pyay san	B	20.129975	95.029063	300	suburbs of Tha pyay san
MF0394	MFOCN	Puteekone	B	20.290533	95.010443	300	suburbs of Puteekone
MF0395	MFOCN	Kwingyi	B	20.057722	95.243755	300	urban area of Kwingyi
MF0396	MFOCN	Malun	B	19.919886	95.054944	300	suburbs of Malun
MF0397	MFOCN	Sainggya	B	20.005567	95.153467	300	suburbs of Sainggya
MF0398	MFOCN	Ondwe	B	20.093456	95.110854	300	suburbs of Ondwe
MF0399	MFOCN	Ywarthit	B	20.139446	94.922785	300	suburbs of Ywarthit
MF0400	MFOCN	Kyemyin	B	20.511953	94.906668	300	suburbs of Kyemyin
MF0401	MFOCN	Yenangyaung	B	20.461156	94.868864	300	urban area of Yenangyaung

MF0402	MFOCN	SarTaing village	B	20.419356	94.887275	300	urban area of SarTaing village
MF0403	MFOCN	Yenangyaung	B	20.445532	94.877314	300	urban area of Yenangyaung
MF0404	MFOCN	Chauk	B	20.860776	94.828245	300	suburbs of Chauk
MF0405	MFOCN	Thadodan	B	19.981319	95.382409	300	suburbs of Thadodan
MF0406	MFOCN	taungdwingyi	B	20.006745	95.544783	300	urban area of taungdwingyi
MF0407	MFOCN	Gonnyindan	B	19.907436	95.653556	300	urban area of Gonnyindan
MF0408	MFOCN	Sar thwar	B	19.927754	95.561126	300	suburbs of Sar thwar
MF0409	MFOCN	Ingon	B	19.991179	95.469257	300	suburbs of Ingon
MF0410	MFOCN	Lettet	B	19.824534	95.461874	300	suburbs of Lettet
MF0411	MFOCN	Leetet	B	19.76253	95.42135	300	suburbs of Lettet
MF0412	MFOCN	Myothit	B	20.198774	95.446685	300	urban area of Myothit
MF0413	MFOCN	Sinthegon	B	20.656126	95.376445	300	suburbs of Sinthegon
MF0414	MFOCN	Ywa tha yar	B	20.069679	94.947346	300	urban area of Ywa tha yar
MF0415	MFOCN	Minbu	B	20.157665	94.871293	300	urban area of Minbu
MF0416	MFOCN	Saku	B	20.223738	94.757293	300	urban area of Saku
MF0417	MFOCN	Hlegyi	B	20.307295	94.750759	300	urban area of Hlegyi
MF0418	MFOCN	Pwintbyu	B	20.366586	94.668861	300	urban area of Pwintbyu
MF0419	MFOCN	kandaw	B	20.691859	94.665858	300	suburbs of kandaw
MF0420	MFOCN	Sin hpyu kyun	B	20.662635	94.694885	300	urban area of Sin hpyu kyun
MF0421	MFOCN	Ta nyaung	B	20.785849	94.662489	300	urban area of Ta nyaung
MF0422	MFOCN	Sulaykon	B	20.847592	94.701587	300	urban area of Sulaykon
MF0423	MFOCN	Thayet	B	19.319158	95.172943	300	urban area of Thayet
MF0424	MFOCN	Lingyaung	B	19.445488	95.173821	300	suburbs of Lingyaung
MF0425	MFOCN	Migyaungye	B	19.872647	95.111368	300	suburbs of Migyaungye
MF0426	MFOCN	Pyalo	B	19.147573	95.188672	300	urban area of Pyalo
MF0427	MFOCN	Nyaungbinzeik	B	19.008177	95.182842	300	suburbs of Nyaungbinzeik
MF0428	MFOCN	Aunglan	B	19.34821	95.213514	300	urban area of Aunglan
MF0429	MFOCN	Bwetgyi	B	19.239691	95.238478	300	urban area of Bwetgyi
MF0430	MFOCN	Myede	B	19.385515	95.21361	300	urban area of Myede
MF0431	MFOCN	Mauktin	B	19.460366	95.275346	300	suburbs of Mauktin
MF0432	MFOCN	Migyaungye	B	19.828931	95.150614	300	suburbs of Migyaungye
MF0433	MFOCN	Koebin	B	19.700488	95.381848	300	urban area of Koebin
MF0434	MFOCN	Egayit	B	19.556582	95.292348	300	urban area of Egayit
MF0435	MFOCN	Koebin	B	19.645793	95.329148	300	suburbs of Koebin
MF0436	MFOCN	Lingyaung	B	19.522832	95.185121	300	suburbs of Lingyaung
MF0437	MFOCN	Sinbaungwe	B	19.718134	95.162643	300	urban area of Sinbaungwe

MF0438	MFOCN	Thazi	B	19.615561	95.167673	300	suburbs of Thazi
MF0439	MFOCN	Tha man gyi	B	19.767257	95.147146	300	suburbs of Tha man gyi
MF0440	MFOCN	Kamma	B	21.385833	94.809825	300	urban area of Kamma
MF0441	MFOCN	Old bagan	B	21.196256	94.818783	300	urban area of Old bagan
MF0442	MFOCN	Myin ka bar	B	21.153832	94.802257	300	urban area of Myin ka bar
MF0443	MFOCN	Sin-in-taung	B	21.025783	94.814732	300	suburbs of Sin-in-taung
MF0444	MFOCN	Pakokku	B	21.340784	95.113378	300	urban area of Pakokku
MF0445	MFOCN	Myit chay	B	21.245883	94.849335	300	urban area of Myit chay
MF0446	MFOCN	Balgyi village	B	21.328112	94.997663	300	urban area of Balgyi village
MF0447	MFOCN	Myaukluu kan	B	21.438442	95.142577	300	suburbs of Balgyi Myaukluu kan
MF0448	MFOCN	Anyadaw	B	21.690247	95.081683	300	suburbs of Anyadaw
MF0449	MFOCN	Pa khan gyi	B	21.571466	95.215362	300	suburbs of Pa khan gyi
MF0450	MFOCN	Dan bin gan	B	21.784127	95.141633	300	suburbs of Dan bin gan
MF0451	MFOCN	Yesagyo	B	21.624137	95.237842	300	urban area of Yesagyo
MF0452	MFOCN	lingadaw	B	21.729683	95.038147	300	suburbs of lingadaw
MF0453	MFOCN	Aingma(west)	B	21.442732	94.910784	300	suburbs of Aingma(west)
MF0454	MFOCN	Hnanzigan	B	21.514783	94.761173	300	suburbs of Hnanzigan
MF0455	MFOCN	Taungngelon	B	20.890843	94.753127	300	suburbs of Taungngelon
MF0456	MFOCN	Dala	B	16.758944	96.14919	300	urban area of Dala
MF0457	MFOCN	Kyeemyindaing	B	16.808943	96.114844	300	urban area of Kyeemyindaing
MF0458	MFOCN	Kanungto	B	16.714833	96.057478	300	suburbs of Kanungto
MF0459	MFOCN	Hkayangyi	B	16.803157	96.028733	300	suburbs of Hkayangyi
MF0460	MFOCN	Payagi	B	16.697743	96.012783	300	suburbs of Payagi
MF0461	MFOCN	Twantay	B	16.713136	95.933745	300	urban area of Twantay
MF0462	MFOCN	Khayan	B	16.912688	96.566357	300	urban area of Khayan
MF0463	MFOCN	Thongwa	B	16.828774	96.509443	300	suburbs of Thongwa
MF0464	MFOCN	Eikthaya	B	16.748783	96.459884	300	suburbs of Eikthaya
MF0465	MFOCN	Ka yart	B	16.640844	96.294124	300	suburbs of Ka yart
MF0466	MFOCN	Kyauktan	B	16.638267	96.328845	300	urban area of Kyauktan
MF0467	MFOCN	Yangon	B	16.734724	96.283845	300	1.28 Kilometers northeast of Phayar Kone Bus Stop
MF0468	MFOCN	Yangon	B	16.765944	96.368356	300	2.4 Kilometers east of Thategwin.
MF0469	MFOCN	Yangon	B	16.814743	96.292747	300	8.5 Kilometers north of crossroads that the crossroads of No.6 Road and Bago River Road
MF0470	MFOCN	Yangon	B	16.745355	96.246633	300	0.45 Kilometers southwest of Golf Course.

MF0471	MFOCN	Yangon	B	16.704673	96.297478	300	0.61 Kilometers southeast of crossroads that the crossroads of No.6 Road and Thanlyin-Kyanktan Road
MF0472	MFOCN	Yangon	B	16.762577	96.248588	300	0.1 Kilometers west of Kyaung Lan(School Street)BEHS 2
MF0473	MFOCN	Yangon	B	16.781137	96.246942	300	0.22 Kilometers north of Aung Thu Kha Bus Stop
MF0474	MFOCN	Yangon	B	16.840379	96.299257	300	2.13 Kilometers east of crossroads that the crossroads of Khun It Minthargyi Road and Kanaung Minthagyi St.
MF0475	MFOCN	Yangon	B	16.8213178	96.273733	300	1.54 Kilometers southeast of Ohane Bus Stop
MF0476	MFOCN	Yangon	B	16.863684	96.281894	300	0.2 Kilometers southeast of crossroads that the crossroads of Ka Yu Nar Road and Kanaung Minthagyi St.
MF0477	MFOCN	Yangon	B	16.836734	96.2604231	300	0.62 Kilometers east of crossroads that the crossroads of Bago River Road and Mya Nandar St.
MF0478	MFOCN	Yangon	B	16.867856	96.223845	300	0.24 Kilometers east of crossroads that the crossroads of No.2 Road and Maung Makan Kanthar St.
MF0479	MFOCN	Yangon	B	16.911855	96.250526	300	3.2 kilometers east of Dagon University Station
MF0480	MFOCN	Yangon	B	16.888883	96.229136	300	0.26 Kilometers east of crossroads that the crossroads of Shin Htee Nyo Road and Kyan Sitthar Road
MF0481	MFOCN	Yangon	B	16.876362	96.217783	300	the crossroads of Shin Htee Nyo Road and Anawrahta Road
MF0482	MFOCN	Yangon	B	16.885783	96.214377	300	0.37 Kilometers southwest of crossroads that the crossroads of Tapin Shwe Htee Road and Kyan Sitthar Road
MF0483	MFOCN	Yangon	B	16.890735	96.216573	300	0.37 Kilometers southwest of crossroads that the crossroads of Tapin Shwe Htue Road and Kyan Sitthar Road
MF0484	MFOCN	Yangon	B	16.877633	96.201573	300	0.30 Kilometers west of crossroads that the crossroads of Pinlon Road and Pyi Htaung Su Main Road

MF0485	MFOCN	Yangon	B	16.865366	96.203233	300	0.30 Kilometers southeast of crossroads that the crossroads of Thakhin Ba Sein Road and Maha Bandoola Road
MF0486	MFOCN	Yangon	B	16.809677	96.229125	300	1.32kilometers northeast of Ah Wine Bus Stop
MF0487	MFOCN	Yangon	B	16.877942	96.268749	300	0.31 Kilometers norteast of crossroads that the crossroads of Ka Yu Nar Road and Min Yo Kaung Pon Road
MF0488	MFOCN	Yangon	B	16.884759	96.258311	300	1.87 Kilometers southeast of crossroads that the crossroads of No.2 and Ayan Sittar Road
MF0489	MFOCN	Yangon	B	16.849001	96.216833	300	0.43 Kilometers south of crossroads that the crossroads of Mingalar Thiri St. and Pyi Htaung Su Main Road
MF0490	MFOCN	Yangon	B	16.835901	96.24092	300	0.60 kilometers east of Theingyaung
MF0491	MFOCN	Yangon	B	16.816395	96.196792	300	0.24 kilometers east of Yay Sat Bus Stop
MF0492	MFOCN	Mezali	B	16.934732	95.800113	300	suburbs of Mezali
MF0493	MFOCN	Samalauk	B	16.991889	95.711552	300	urban area of Samalauk
MF0494	MFOCN	Pantanaw	B	16.991892	95.452573	300	urban area of Pantanaw
MF0495	MFOCN	Ah Thoke	B	17.100892	95.086136	300	suburbs of Ah Thoke
MF0496	MFOCN	Bilin	B	17.075636	95.309134	300	suburbs of Bilin
MF0497	MFOCN	Kyaunggon	B	17.098882	95.183625	300	suburbs of Kyaunggon
MF0498	MFOCN	Gonnyindan	B	16.970825	94.986901	300	urban area of Gonnyindan
MF0499	MFOCN	Tagarat	B	16.857553	94.843988	300	suburbs of Tagarat
MF0500	MFOCN	Begayet	B	16.902901	94.916572	300	suburbs of Begayet
MF0501	MFOCN	Pathein	B	16.770091	94.732356	300	urban area of Pathein
MF0502	MFOCN	Yangon	B	16.856835	96.106001	300	the crossroads of Sabai ST. and Thirimon 6th ST.
MF0503	MFOCN	Yangon	B	16.871466	96.128553	300	0.16 Kilometers west of crossroads that the crossroads of Win Dhama Road and Kyauk Yae Twin Road
MF0504	MFOCN	Yangon	B	16.881788	96.146126	300	0.22 Kilometers west of crossroads that the crossroads of Ma Soe Yein Road and Ma Soe Yein Lane 3 Road
MF0505	MFOCN	Yangon	B	16.888892	96.158014	300	0.15 kilometers south of Padonma 1st Lane
MF0506	MFOCN	Yangon	B	16.936146	96.178002	300	2 kilometers east of wikiloc

MF0507	MFOCN	Yangon	B	16.92099	96.163135	300	0.50 Kilometers northwest of crossroads that the crossroads of Wai Bargi Road and No.3 Road
MF0508	MFOCN	Yangon	B	16.882315	96.031732	300	0.77 Kilometers northeast of Dagon Ayar Highway Bus Station
MF0509	MFOCN	Yangon	B	16.900524	96.046562	300	2.3 kilometers northwest of Hlaingtharya and 30meters right side of Shwe Pyi Thar Bridge Road
MF0510	MFOCN	Yangon	B	16.876901	96.061573	300	the crossroads of Kyan Sittar Road and Hlaing River Road
MF0511	MFOCN	Yangon	B	16.963846	96.060877	300	0.9 kilometers Southeast of Kayya Jetty
MF0512	MFOCN	Yangon	B	16.967224	96.077124	300	0.25 kilometers Southwest of Shwepy ithar
MF0513	MFOCN	Yangon	B	16.943733	96.101862	300	0.8 kilometers south of Kan Thar Bus Stop and 10 meters left side of Lower Mingalar Road.
MF0514	MFOCN	Yangon	B	16.940899	96.091554	300	0.8 kilometers south of Set Hmu Zone Station
MF0515	MFOCN	Yangon	B	16.955802	96.076014	300	0.1 kilometers south of Htann Chauk Pin Junction Bus Stop
MF0516	MFOCN	Yangon	B	17.007156	96.086554	300	800 meters northwest of computer University station and 400meters right side of No.4 Road
MF0517	MFOCN	Yangon	B	16.996556	96.070986	300	580 meters west of Hlaw Karr Railway station
MF0518	MFOCN	Mezali	B	16.934991	95.855991	300	5 kilometers northwest of MF0790
MF0519	MFOCN	Yangon,Katwe	B	16.935933	95.905136	300	0.3 kilometers the right of No.5 road and 3.5kilometers northwest of katwe
MF0520	MFOCN	Yangon	B	16.908556	95.974555	300	1.3 kilometers the right of No.5 road
MF0521	MFOCN	Yangon,Thonse	B	17.542998	95.828992	300	suburbs of Thnse
MF0522	MFOCN	Yangon,Okekan	B	17.494099	95.853157	300	suburbs of Okekan
MF0523	MFOCN	Yangon	B	17.406362	95.898174	300	8 kilometeras northeast of Aing Ka Laung
MF0524	MFOCN	Yangon	B	17.182832	95.976921	300	7.8 kilometeras southwest of Phu Gyi
MF0525	MFOCN	Yangon	B	17.228692	95.963001	300	5.5 kilometeras west of Phu Gyi
MF0526	MFOCN	Yangon	B	17.334356	95.944352	300	suburbs of Taik Kyi and 2.9 kilometeras Northwest of Taik Kyi
MF0527	MFOCN	Yangon,Taik Kyi	B	17.314553	95.957891	300	0.7kilometeras west of Taik Kyi
MF0528	MFOCN	Yangon, Taik Kyi	B	17.313335	95.972315	300	urban area of Taik Kyi
MF0529	MFOCN	Yangon,Ledauggan	B	16.954521	96.300011	300	0.9 kilometers southeast of Ledauggan

MF0530	MFOCN	Yangon	B	16.990891	96.220976	300	3.7 kilometers southwest of MF0808 and the left side of No.7 road 100meters
MF0531	MFOCN	Yangon	B	16.990294	96.299522	300	2.7 kilometers south of MF0807
MF0532	MFOCN	Yangon	B	17.015013	96.296536	300	4.5 kilometers east of Awaing
MF0533	MFOCN	Yangon	B	17.056774	96.307024	300	7.5 kilometers northeast of Awaing and the right side of No.2 road 0.1 kilometers
MF0534	MFOCN	Yangon,Za Yet Kwin	B	17.119578	96.324361	300	1.5 kilometers southwest of Za Yet Kwin and the left side of No.2 road 0.1 kilometers
MF0535	MFOCN	Yangon	B	17.080588	96.240951	300	5 kilometers southeast of Hlegu and the right side of No.1 road 2.3 kilometers
MF0536	MFOCN	Yangon,Nyaunggon	B	17.210892	96.230001	300	5 kilometers Southeast of Nyaunggon and the right side of yangon-mandaly highway 2.3 kilometers
MF0537	MFOCN	Yangon,Phang Gyi	B	17.349467	96.20836	300	4 kilometers Northeast of Phang Gyi and the left side of yangon-mandaly highway 1.5 kilometers
MF0538	MFOCN	Yangon,Indan	B	17.108724	96.054051	300	1 kilometers south of Indan
MF0539	MFOCN	Yangon,Thae Phyu Ein Yar	B	17.054367	96.075773	300	100meters south of Thae Phyu Ein Yar
MF0540	MFOCN	Yangon	B	17.011531	96.148636	300	2.2kilometers north of the MF0827
MF0541	MFOCN	Yangon	B	16.968994	96.151126	300	1.1kilometers south of the MF0826
MF0542	MFOCN	Yangon	B	16.992403	96.150971	300	The left side of NO.3 Road 700 meters,the crossroads of No.3 road and No.7 Road ,along to the south of No.3 road 6 kilometers
MF0543	MFOCN	Yangon	B	16.930591	96.139114	300	the crossroads of Yanggon-Mandalay highway and Khayao Pin Road,Along Khayao Pin Road forward 800 meters
MF0544	MFOCN	Yangon	B	17.032784	96.134726	300	the crossroads of Htauk Kyant Lane Thit Street and Mya Nan Dar Street
MF0545	MFOCN	Yangon	B	16.889001	96.094368	300	500 meters southwest of the Insein
MF0546	MFOCN	Yangon	B	16.933774	96.102914	300	the crossroads of Lower Mingalardon Road and Khayao Pin Road
MF0547	MFOCN	Yangon	B	16.914136	96.096673	300	The left side of Lower Mingalardon Road 50 meters
MF0548	MFOCN	Yangon	B	16.893856	96.113115	300	The left side of St.Mingalar 250 meters
MF0549	MFOCN	Ohn Chaw	B	21.877479	96.229221	300	urban area of Ohn Chaw
MF0550	MFOCN	Ongyaw	B	21.893595	96.260614	300	suburbs of Ongyaw

MF0551	MFOCN	Thon-Daung-Ywa-Ma	B	21.887636	96.316917	300	urban area of Thon-Daung-Ywa-Ma
MF0552	MFOCN	Pyin Sar	B	21.859038	96.349392	300	suburbs of Pyin Sar
MF0553	MFOCN	Yatanarpon Cyber City	B	21.900696	96.361138	300	urban area of Yatanarpon Cyber City
MF0554	MFOCN	Anesakhan	B	21.975761	96.408237	300	suburbs of Anesakhan
MF0555	MFOCN	Nyaung Ne	B	21.972134	96.451761	300	suburbs of Nyaung Ne
MF0556	MFOCN	Pyin Oo Lwin	B	22.017475	96.488988	300	urban area of Pyin Oo Lwin
MF0557	MFOCN	Pwe Gauk	B	22.062599	96.523652	300	suburbs of Pwe Gauk
MF0558	MFOCN	Hton Bo	B	22.059326	96.560963	300	suburbs of Hton Bo
MF0559	MFOCN	Myainggyi	B	22.084248	96.581684	300	urban area of Myainggyi
MF0560	MFOCN	Wekwin	B	22.108701	96.600218	300	urban area of Wekwin
MF0561	MFOCN	Say Ta Lon	B	22.099914	96.550165	300	suburbs of Say Ta Lon
MF0562	MFOCN	Nyaungdauk North	B	22.137731	96.670599	300	suburbs of Nyaungdauk North
MF0563	MFOCN	Zarli	B	22.223091	96.550441	300	suburbs of Zarli
MF0564	MFOCN	Thonze	B	22.28925	96.619837	300	suburbs of Thonze
MF0565	MFOCN	Ommathi	B	22.23166	96.669499	300	suburbs of Ommathi
MF0566	MFOCN	Kankang	B	22.696487	96.775123	300	suburbs of Kangkang
MF0567	MFOCN	Hpa-hpek	B	23.556404	97.836599	300	suburbs of Hpa-hpek
MF0568	MFOCN	Bok	B	22.070292	96.180122	300	suburbs of Bok
MF0569	MFOCN	Alebon	B	22.091769	96.114187	300	suburbs of Alebon
MF0570	MFOCN	Htee Taw Moe	B	22.106797	96.157967	300	suburbs of Htee Taw Moe
MF0571	MFOCN	Lin Mway chaung	B	22.150096	96.179496	300	urban area of Lin Mway chaung
MF0572	MFOCN	Mayabin	B	22.210824	96.10719	300	urban area of Mayabin
MF0573	MFOCN	Yentha	B	22.275716	96.13333	300	urban area of Yentha
MF0574	MFOCN	Nyaung oke	B	22.370924	96.103065	300	urban area of Nyaung oke
MF0575	MFOCN	Nyaung woon	B	22.474556	96.079424	300	urban area of Nyaung woon
MF0576	MFOCN	Shwenyaungbin	B	22.937747	96.265684	300	urban area of Shwenyaungbin
MF0577	MFOCN	Mogok	B	22.911757	96.422635	300	urban area of Mogok
MF0578	MFOCN	Mong Mit	B	23.10802	96.664212	300	urban area of Mong Mit
MF0579	MFOCN	Pinlon	B	23.210019	96.60215	300	suburbs of Pinlon
MF0580	MFOCN	Pinlon	B	23.266026	96.561973	300	suburbs of Pinlon
MF0581	MFOCN	Bahe	B	23.365135	96.562571	300	suburbs of Bahe
MF0582	MFOCN	Mabein	B	23.481622	96.63702	300	suburbs of Mabein
MF0583	MFOCN	Pinkyein	B	23.585157	96.80276	300	suburbs of Pinkyein
MF0584	MFOCN	Tonkwa	B	23.602922	96.961866	300	suburbs of Tonkwa
MF0585	MFOCN	BaHang	B	23.731617	97.041406	300	suburbs of BaHang
MF0586	MFOCN	Sikaw	B	23.833389	97.083154	300	suburbs of Sikaw

MF0587	MFOCN	Man Tha	B	23.941255	97.108878	300	suburbs of Man Tha
MF0588	MFOCN	Bhamo	B	24.089504	97.207547	300	suburbs of Bhamo
MF0589	MFOCN	Man xi	B	24.126645	97.299388	300	suburbs of Man xi
MF0590	MFOCN	Madangyang	B	24.022914	97.33897	300	suburbs of Madangyang
MF0591	MFOCN	Gwina	B	23.932482	97.460085	300	suburbs of Gwina
MF0592	MFOCN	Namhkam	B	23.832011	97.677639	300	urban area of Namhkam
MF0593	MFOCN	Ananbingon	B	16.960949	97.493851	300	suburbs of Ananbingon
MF0594	MFOCN	Myaing ka Lay	B	16.893943	97.601369	300	urban area of Myaing ka Lay
MF0595	MFOCN	Hpa-an	B	16.860932	97.624449	300	urban area of Hpa-an
MF0596	MFOCN	Naunglon	B	16.835473	97.690683	300	suburbs of Naunglon
MF0597	MFOCN	Ein Du	B	16.767328	97.753386	300	urban area of Ein Du
MF0598	MFOCN	Win sein	B	16.741111	97.858253	300	suburbs of Win sein
MF0599	MFOCN	Kawpalut	B	16.687335	97.949384	300	suburbs of Kawpalut
MF0600	MFOCN	juongdu	B	16.596413	98.045465	300	urban area of juongdu

Tower Planning for the Year 2017

Site	Tower Invester	Site Name (MFOCN)	Site Type	Latitude (MFOCN proposed)	Longtitude (MFOCN proposed)	Areas(㎡)	Site Address
MF0601	MFOCN	gaojuli	B	16.555338	98.233098	300	urban area of gaojuli
MF0602	MFOCN	Naungmi	B	16.65252	98.254968	300	suburbs of Naungmi
MF0603	MFOCN	Thin Gan Nyi Naung	B	16.680744	98.307872	300	suburbs of Thin Gan Nyi Naung
MF0604	MFOCN	Myawadi	B	16.695757	98.481546	300	urban area of Myawadi
MF0605	MFOCN	Kawdun	B	16.723677	97.662119	300	suburbs of Kawdun
MF0606	MFOCN	koh lar	B	16.641229	97.702336	300	suburbs of koh lar
MF0607	MFOCN	Zar Ta Pyin	B	16.571756	97.735321	300	suburbs of Zar Ta Pyin
MF0608	MFOCN	Papuagong	B	16.493244	97.673451	300	urban area of Papuagong
MF0609	MFOCN	Chinketkon	B	20.109118	95.489867	300	urban area of Chinketkon
MF0610	MFOCN	KungyiAuk	B	20.526549	95.425082	300	urban area of KungyiAuk
MF0611	MFOCN	Nabudaung	B	20.517062	95.542774	300	suburbs of Nabudaung
MF0612	MFOCN	Kyaungywa	B	20.545926	95.673015	300	suburbs of Kyaungywa
MF0613	MFOCN	Aingmagyi	B	20.658371	95.489661	300	suburbs of Aingmagyi
MF0614	MFOCN	Zayetkon	B	20.793766	95.522173	300	suburbs of Zayetkon
MF0615	MFOCN	Mondaing	B	20.805727	95.748029	300	suburbs of Mondaing
MF0616	MFOCN	Letpanpya	B	20.813009	95.38467	300	suburbs of Letpanpya
MF0617	MFOCN	Kyaukpadaung	B	20.84384	95.123736	300	urban area of Kyaukpadaung
MF0618	MFOCN	Gwegyo	B	20.74298	95.003313	300	urban area of Gwegyo
MF0619	MFOCN	Kyemyin	B	20.586027	94.943961	300	suburbs of Kyemyin
MF0620	MFOCN	Gwepin	B	20.645891	94.975416	300	suburbs of Gwepin
MF0621	MFOCN	singat	B	20.850025	94.915082	300	suburbs of singat
MF0622	MFOCN	Popa	B	20.936527	95.206233	300	urban area of Popa
MF0623	MFOCN	Thabyedaung	B	21.041634	95.273715	300	suburbs of Thabyedaung
MF0624	MFOCN	Wed Laung	B	21.152979	95.386321	300	urban area of Wed Laung
MF0625	MFOCN	Taungtha	B	21.276526	95.445013	300	urban area of Taungtha
MF0626	MFOCN	Myingyan	B	21.438382	95.388181	300	urban area of Myingyan
MF0627	MFOCN	Kamye	B	21.349601	95.2852	300	suburbs of Kamye
MF0628	MFOCN	Kyaw Zi	B	21.325115	95.217476	300	urban area of Kyaw Zi
MF0629	MFOCN	Kyugyaung	B	20.274486	95.237798	300	suburbs of Kyugyaung

MF0630	MFOCN	Meiktila	B	20.849304	96.055549	300	urban area of Meiktila
MF0631	MFOCN	Payangazu	B	20.75346	96.241999	300	urban area of Payangazu
MF0632	MFOCN	Kalaw	B	20.635539	96.568557	300	urban area of Kalaw
MF0633	MFOCN	Haunghauo	B	20.725936	96.818609	300	urban area of Haunghauo
MF0634	MFOCN	Taunggyi	B	20.794298	97.035592	300	urban area of Taunggyi
MF0635	MFOCN	Mong Pawn	B	20.826832	97.352693	300	suburbs of Mong Pawn
MF0636	MFOCN	Loilem	B	20.921285	97.566984	300	urban area of Loilem
MF0637	MFOCN	Pinlon	B	20.987013	97.532738	300	urban area of Pinlon
MF0638	MFOCN	Namhsam	B	20.89143	97.72196	300	urban area of Namhsam
MF0639	MFOCN	Makkeng	B	20.990017	97.962934	300	suburbs of Makkeng
MF0640	MFOCN	Kho Lam	B	21.111193	98.112591	300	urban area of Kho Lam
MF0641	MFOCN	Man Nawngmawn	B	21.235432	98.247767	300	suburbs of Man Nawngmawn
MF0642	MFOCN	kunhing	B	21.301189	98.43184	300	suburbs of kunhing
MF0643	MFOCN	Hoping	B	21.284909	98.513643	300	suburbs of Hoping
MF0644	MFOCN	Ta-kaw	B	21.244209	98.631501	300	suburbs of Ta-kaw
MF0645	MFOCN	Hsenmawning	B	21.27007	98.818203	300	suburbs of Hsenmawning
MF0646	MFOCN	Mongping	B	21.333147	98.970624	300	suburbs of Mongping
MF0647	MFOCN	Wan kao-kwan	B	21.338217	99.138095	300	suburbs of Wan kao-kwan
MF0648	MFOCN	Tontar	B	21.308295	99.330867	300	suburbs of Tontar
MF0649	MFOCN	Tkeny	B	21.288354	99.595756	300	urban area of Tkeny
MF0650	MFOCN	WanTong	B	21.238145	99.630068	300	suburbs of WanTong
MF0651	MFOCN	LoiPangKoi	B	21.161172	99.741178	300	suburbs of LoiPangKoi
MF0652	MFOCN	Monghpyak	B	20.895344	99.938116	300	suburbs of Monghpyak
MF0653	MFOCN	MongLin	B	20.703559	100.109152	300	suburbs of MongLin
MF0654	MFOCN	WanLawngmun	B	20.536259	99.957469	300	suburbs of WanLawngmun
MF0655	MFOCN	Tachileik	B	20.468933	99.918351	300	urban area of Tachileik
MF0656	MFOCN	Hopong	B	20.71124	97.189463	300	suburbs of Hopong
MF0657	MFOCN	Banyin	B	20.465144	97.240096	300	suburbs of Banyin
MF0658	MFOCN	Hsihseng	B	20.162147	97.254526	300	urban area of Hsihseng
MF0659	MFOCN	Tongkaw	B	20.041496	97.242118	300	suburbs of Tongkaw
MF0660	MFOCN	Sa-lawnghtdwng	B	19.936728	97.258682	300	suburbs of Sa-lawnghtdwng
MF0661	MFOCN	Loikaw	B	19.68368	97.208852	300	urban area of Loikaw
MF0662	MFOCN	San Pang chauk maing	B	19.592872	97.210245	300	urban area of San Pang chauk maing

MF0663	MFOCN	Loikaw	B	19.657183	97.218853	300	urban area of Loikaw
MF0664	MFOCN	Hpruso	B	19.414649	97.131903	300	urban area of Hpruso
MF0665	MFOCN	Daw Law khu	B	19.373249	97.192327	300	suburbs of Daw Law khu
MF0666	MFOCN	Bawlakhe	B	19.066622	97.344983	300	suburbs of Bawlakhe
MF0667	MFOCN	Htuchaung	B	18.984361	97.346678	300	suburbs of Htuchaung
MF0668	MFOCN	Hpasawng	B	18.880183	97.322828	300	suburbs of Hpasawng
MF0669	MFOCN	Deikakhi	B	18.714646	97.303702	300	suburbs of Deikakhi
MF0670	MFOCN	Dwedo	B	18.651246	97.299578	300	suburbs of Dwedo
MF0671	MFOCN	Dutado	B	18.482991	97.323625	300	suburbs of Dutado
MF0672	MFOCN	Peinnebin	B	18.396109	97.31928	300	suburbs of Peinnebin
MF0673	MFOCN	Htauyado	B	18.205865	97.419674	300	suburbs of Htauyado
MF0674	MFOCN	Hpapun	B	18.063377	97.438763	300	suburbs of Hpapun
MF0675	MFOCN	Alugyi	B	17.304617	97.226481	300	suburbs of Alugyi
MF0676	MFOCN	Pyintha	B	17.392552	97.239888	300	suburbs of Pyintha
MF0677	MFOCN	Ah Su chaung	B	17.495799	97.277899	300	suburbs of Ah Su chaung
MF0678	MFOCN	Peinnegyaung	B	17.818109	97.378185	300	suburbs of Peinnegyaung
MF0679	MFOCN	Nanthalethe	B	20.55623	96.616008	300	suburbs of Nanthalethe
MF0680	MFOCN	Banhat	B	20.48274	96.659859	300	suburbs of Banhat
MF0681	MFOCN	Bampin	B	20.420422	96.700055	300	urban area of Bampin
MF0682	MFOCN	Naungtayar	B	20.295316	96.750154	300	suburbs of Naungtayar
MF0683	MFOCN	Hkawbu	B	20.190691	96.757174	300	suburbs of Hkawbu
MF0684	MFOCN	Pinlaung	B	20.143391	96.772986	300	suburbs of Pinlaung
MF0685	MFOCN	Mehkun	B	20.004014	96.797659	300	suburbs of Mehkun
MF0686	MFOCN	Pekon	B	19.856425	97.00303	300	urban area of Pekon
MF0687	MFOCN	Sakwel	B	19.776068	97.122266	300	urban area of Sakwel
MF0688	MFOCN	Pekon	B	19.748445	97.094619	300	urban area of Pekon
MF0689	MFOCN	Baw Ga Li	B	18.928673	96.730036	300	suburbs of Baw Ga Li
MF0690	MFOCN	Hoki	B	18.900896	96.906159	300	suburbs of Hoki
MF0691	MFOCN	Kaw Thu Doe	B	18.841766	97.088612	300	suburbs of Kaw Thu Doe
MF0692	MFOCN	Mawchi	B	18.821534	97.162037	300	suburbs of Mawchi
MF0693	MFOCN	Loimut	B	20.300241	97.318799	300	urban area of Loimut
MF0694	MFOCN	Loisawn	B	20.32966	97.230233	300	suburbs of Loisawn
MF0695	MFOCN	Tongkaw	B	20.109455	97.160042	300	suburbs of Tongkaw

MF0696	MFOCN	Samka	B	20.158032	96.959654	300	suburbs of Samka
MF0697	MFOCN	Bankan	B	20.292258	96.917787	300	suburbs of Bankan
MF0698	MFOCN	Banbin	B	20.23354	96.857031	300	suburbs of Banbin
MF0699	MFOCN	Nampan	B	20.433941	96.931211	300	suburbs of Nampan
MF0700	MFOCN	Hkedaung	B	20.51675	96.948516	300	suburbs of Hkedaung
MF0701	MFOCN	Yawnghwe	B	20.654173	96.942436	300	suburbs of Yawnghwe
MF0702	MFOCN	Hang Si	B	20.504381	97.077909	300	suburbs of Hang Si
MF0703	MFOCN	Kon-kawng	B	20.573009	97.066453	300	suburbs of Kon-kawng
MF0704	MFOCN	Ayetharyar	B	20.762832	96.993831	300	urban area of Ayetharyar
MF0705	MFOCN	Htedaung	B	20.881858	96.944249	300	suburbs of Htedaung
MF0706	MFOCN	Pawdangon	B	20.97797	96.934694	300	suburbs of Pawdangon
MF0707	MFOCN	Longping	B	20.908059	97.327477	300	suburbs of Longping
MF0708	MFOCN	Panpyet	B	21.087294	96.925843	300	suburbs of Panpyet
MF0709	MFOCN	Lawksawk	B	21.236099	96.860313	300	suburbs of Lawksawk
MF0710	MFOCN	Alegyaung	B	21.202786	96.693587	300	suburbs of Alegyaung
MF0711	MFOCN	Pong-in	B	21.071364	96.709862	300	suburbs of Pong-in
MF0712	MFOCN	Pindaya	B	20.939238	96.668765	300	urban area of Pindaya
MF0713	MFOCN	Poila	B	20.851607	96.682968	300	suburbs of Poila
MF0714	MFOCN	Konbaw	B	20.762203	96.62303	300	suburbs of Konbaw
MF0715	MFOCN	Nyaungbingwa	B	20.923794	96.568336	300	suburbs of Nyaungbingwa
MF0716	MFOCN	My-aing	B	21.008772	96.525001	300	suburbs of My-aing
MF0717	MFOCN	Ywangan	B	21.168281	96.447668	300	suburbs of Ywangan
MF0718	MFOCN	Ingon	B	21.274531	96.306595	300	suburbs of Ingon
MF0719	MFOCN	Yakainggyi	B	21.336678	96.246872	300	suburbs of Yakainggyi
MF0720	MFOCN	Kume	B	21.357215	96.163437	300	urban area of Kume
MF0721	MFOCN	Myittha	B	21.412208	96.136951	300	suburbs of Kyittha
MF0722	MFOCN	Minsu	B	21.511326	96.136659	300	urban area of Minsu
MF0723	MFOCN	Da Ye Gaung	B	21.488418	96.05714	300	urban area of Da Ye Gaung
MF0724	MFOCN	Poyegwe	B	21.378347	96.90148	300	suburbs of Poyegwe
MF0725	MFOCN	Intaw	B	21.497729	96.891188	300	urban area of Intaw
MF0726	MFOCN	Hsadaw	B	21.631428	96.919419	300	urban area of Hsadaw
MF0727	MFOCN	Zee Bin	B	22.18129	96.634417	300	suburbs of Zee Bin
MF0728	MFOCN	See Son	B	22.283432	96.529872	300	suburbs of See Son

MF0729	MFOCN	Pyawbwe	B	16.678147	96.142277	300	urban area of Pyawbwe
MF0730	MFOCN	Anogyaunggale	B	16.572738	96.217653	300	suburbs of Anogyaunggale
MF0731	MFOCN	Bodin	B	16.452692	96.138187	300	suburbs of Bodin
MF0732	MFOCN	Kungyangon	B	16.441205	96.011525	300	urban area of Kungyangon
MF0733	MFOCN	Kawhmu	B	16.540642	96.063947	300	urban area of Kawhmu
MF0734	MFOCN	Zalokkyi	B	16.591286	96.051266	300	suburbs of Zalokkyi
MF0735	MFOCN	Payagyi	B	16.651734	96.016627	300	suburbs of Payagyi
MF0736	MFOCN	Dedaye	B	16.404086	95.894278	300	urban area of Dedaye
MF0737	MFOCN	Agegyi	B	16.369664	95.778488	300	urban area of Agegyi
MF0738	MFOCN	Nay Yaung Kar	B	16.286729	95.822738	300	suburbs of Nay Yaung Kar
MF0739	MFOCN	Agegyi	B	16.330405	95.712265	300	suburbs of Agegyi
MF0740	MFOCN	Pyapon	B	16.277045	95.680952	300	urban area of Pyapon
MF0741	MFOCN	Gonmingyaung	B	16.266136	95.617963	300	suburbs of Gonmingyaung
MF0742	MFOCN	Bogale	B	16.291035	95.39893	300	urban area of Bogale
MF0743	MFOCN	Akaw	B	16.325351	95.442753	300	suburbs of Akaw
MF0744	MFOCN	Kyagyaung	B	16.263376	95.333772	300	suburbs of Kyagyaung
MF0745	MFOCN	Mawgyun	B	16.353016	95.314132	300	suburbs of Mawgyun
MF0746	MFOCN	Kyaik Pi	B	16.449359	95.40946	300	suburbs of Kyaik Pi
MF0747	MFOCN	Onbinzu	B	16.545824	95.402144	300	suburbs of Onbinzu
MF0748	MFOCN	Shwe Taung Hmaw	B	16.62548	95.421986	300	suburbs of Shwe Taung Hmaw
MF0749	MFOCN	Yelegale	B	16.730794	95.519572	300	suburbs of Yelegale
MF0750	MFOCN	Maubin	B	16.731613	95.646022	300	urban area of Meubin
MF0751	MFOCN	Wadaw	B	16.849863	95.661971	300	suburbs of Wadaw
MF0752	MFOCN	Mawgyun	B	16.379627	95.267271	300	urban area of Mawgyun
MF0753	MFOCN	Payagyi	B	16.431187	95.181417	300	suburbs of Payagyi
MF0754	MFOCN	Kyonmangay	B	16.437985	95.130982	300	urban area of Kyonmangay
MF0755	MFOCN	Wakema	B	16.603462	95.181615	300	urban area of Wakema
MF0756	MFOCN	Kala-ywa	B	16.638567	95.248847	300	suburbs of Kala-ywaa
MF0757	MFOCN	Kanyingon	B	16.674082	95.146798	300	suburbs of Kanyingon
MF0758	MFOCN	Kala-ywa	B	16.706383	95.176127	300	suburbs of Kala-ywa
MF0759	MFOCN	Shwelaung	B	16.748561	95.304135	300	suburbs of Shwelaung
MF0760	MFOCN	Ma-uchaung	B	16.84048	95.325512	300	suburbs of Ma-uchaung
MF0761	MFOCN	Wedaung	B	16.904559	95.45085	300	suburbs of Wedaung

MF0762	MFOCN	Sitkon	B	16.994372	95.211848	300	suburbs of Sitkon
MF0763	MFOCN	Einme	B	16.895302	95.180753	300	urban area of Einme
MF0764	MFOCN	Pyin Ywa	B	16.49541	94.950742	300	suburbs of Pyin Ywa
MF0765	MFOCN	Myaungmya	B	16.597849	94.935051	300	urban area of Myaungmya
MF0766	MFOCN	Kanyingon	B	16.654779	95.042812	300	suburbs of kanyingon
MF0767	MFOCN	Myingazeik	B	16.787982	94.87121	300	suburbs of myingzeik
MF0768	MFOCN	Tagarat	B	16.843199	94.816674	300	urban area of tagarat
MF0769	MFOCN	Taung paw	B	16.82559	94.758174	300	urban area of taung paw
MF0770	MFOCN	kan Ne Ward	B	16.817591	94.733542	300	urban area of kan ne ward
MF0771	MFOCN	Sin thiri ward	B	16.797826	94.745149	300	urban area of sin thiri ward
MF0772	MFOCN	Mayan cho ward	B	16.782359	94.742897	300	urban area of mayan cho ward
MF0773	MFOCN	Payargyi gone	B	16.768269	94.755102	300	urban area of payargyi gone
MF0774	MFOCN	Aung chan thar	B	16.771739	94.72217	300	urban area of aung chan thar
MF0775	MFOCN	pathein	B	16.781943	94.723218	300	urban area of pathein
MF0776	MFOCN	Wegyigwin	B	16.715886	94.674723	300	suburbs of wegyiwin
MF0777	MFOCN	Kyanigan	B	16.78097	94.570143	300	suburbs of kyanigan
MF0778	MFOCN	Kan ywa	B	16.823949	94.606191	300	urban area of kan ywa
MF0779	MFOCN	Hlazingon	B	16.8387	94.643829	300	suburbs of hlazingon
MF0780	MFOCN	Kan ne ward	B	16.817403	94.708061	300	urban area of kan ne ward
MF0781	MFOCN	Hlazingon	B	16.856542	94.691748	300	suburbs of hlazingon
MF0782	MFOCN	Shawpya	B	16.924692	94.648169	300	suburbs of shawpya
MF0783	MFOCN	Ah thoke	B	17.155489	95.09402	300	suburbs of thoke
MF0784	MFOCN	Hpan gapin	B	17.449657	94.999641	300	suburbs of hpan gapin
MF0785	MFOCN	Tingyin	B	17.518925	94.689436	300	suburbs of tingyin
MF0786	MFOCN	Gwa	B	17.596981	94.584685	300	urban area of gwa
MF0787	MFOCN	Kanthaya	B	17.733501	94.54892	300	suburbs of kanthaya
MF0788	MFOCN	Satthwa	B	17.773905	94.505147	300	suburbs of satthwa
MF0789	MFOCN	Tainggye	B	17.829435	94.4928	300	suburbs of tainggye
MF0790	MFOCN	Odein	B	17.933226	94.524607	300	suburbs of odein
MF0791	MFOCN	Kyeintali	B	18.008386	94.488394	300	urban area of kyeintali
MF0792	MFOCN	haukkon	B	18.09085	94.48827	300	suburbs of haukkon
MF0793	MFOCN	Minbyin	B	18.237269	94.466054	300	suburbs of minbyin
MF0794	MFOCN	Nan chaung	B	18.450444	94.342801	300	suburbs of nan chaung

MF0795	MFOCN	Ann taw	B	18.47409	94.37613	300	urban area of ann taw
MF0796	MFOCN	Quarter	B	18.506889	94.363367	300	suburbs of quarter
MF0797	MFOCN	Pyunpye	B	18.55489	94.335529	300	suburbs of pyunpye
MF0798	MFOCN	Kinmaw	B	18.587524	94.350749	300	suburbs of kinmaw
MF0799	MFOCN	Shwehi	B	18.610818	94.294093	300	suburbs of shwehi
MF0800	MFOCN	Lintha	B	18.672032	94.260397	300	suburbs of lintha
MF0801	MFOCN	Ywar pa kar	B	18.691828	94.30215	300	suburbs of ywarpa kar
MF0802	MFOCN	Te mauk	B	18.773478	94.282193	300	suburbs of te mauk
MF0803	MFOCN	Toungup	B	18.845332	94.230961	300	suburbs of toungup
MF0804	MFOCN	Kin taung	B	18.966786	94.205361	300	suburbs of kin taung
MF0805	MFOCN	Ywa ma	B	18.9871	94.13121	300	suburbs of ywa ma
MF0806	MFOCN	Chinbyin	B	19.09312	94.166799	300	suburbs of chinbyin
MF0807	MFOCN	Lamu	B	19.229437	94.156664	300	suburbs of lamu
MF0808	MFOCN	Ma-ei	B	19.342834	94.138868	300	urban area of maei
MF0809	MFOCN	Yanbye	B	19.095178	93.874652	300	suburbs of yanbye
MF0810	MFOCN	Sane	B	19.226514	93.719676	300	suburbs of sane
MF0811	MFOCN	Kowainchawng	B	19.455405	93.895376	300	suburbs of kowainchang
MF0812	MFOCN	Tat taung	B	19.560314	93.944825	300	suburbs of tat taung
MF0813	MFOCN	Yebok	B	19.616238	93.890107	300	suburbs of yebok
MF0814	MFOCN	Mwa-ywa	B	19.537914	94.017795	300	suburbs of mwa-ywa
MF0815	MFOCN	Sakanmaw	B	19.641331	94.034743	300	suburbs of sakanmaw
MF0816	MFOCN	Auk yebein	B	19.687793	94.050532	300	suburbs of auk yebein
MF0817	MFOCN	Ann	B	19.790486	94.052357	300	suburbs of ann
MF0818	MFOCN	Rakhine	B	19.855998	93.90319	300	suburbs of rakhine
MF0819	MFOCN	Kan Taung Gyi	B	19.850419	93.761975	300	suburbs of Kan Taung Gyi
MF0820	MFOCN	Dokekan	B	19.798864	93.808547	300	suburbs of Dokekan
MF0821	MFOCN	Seiktaya	B	19.849868	93.691903	300	urban area of Seiktaya
MF0822	MFOCN	Kazukaing	B	19.930562	93.794204	300	suburbs of Kazukaing
MF0823	MFOCN	Alechaung	B	19.97829	93.719759	300	suburbs of Alechaung
MF0824	MFOCN	Petye	B	18.270336	95.07113	300	suburbs of Petye
MF0825	MFOCN	Tegyigon	B	18.183485	95.246047	300	suburbs of Tegyigon
MF0826	MFOCN	Myanaung	B	18.242133	95.341298	300	suburbs of Myanaung
MF0827	MFOCN	Kanaung	B	18.186493	95.377133	300	suburbs of Kanaung

MF0828	MFOCN	Yetho	B	18.176088	95.25079	300	suburbs of Yetho
MF0829	MFOCN	Yenadaung	B	18.189621	95.155344	300	suburbs of Yenadaung
MF0830	MFOCN	Kongyi	B	18.077418	95.284497	300	suburbs of Kongyi
MF0831	MFOCN	Hngetkyiwin	B	18.073053	95.215113	300	suburbs of Hngetkyiwin
MF0832	MFOCN	Tugyi	B	17.966138	95.262483	300	urban area of Tugyi
MF0833	MFOCN	Ainggalaw	B	17.93949	95.194734	300	suburbs of Ainggalaw
MF0834	MFOCN	Seingwin	B	17.978365	95.153333	300	suburbs of Seingwin
MF0835	MFOCN	Ingapa	B	17.814807	95.264055	300	urban area of Ingapa
MF0836	MFOCN	Pyogon	B	17.858583	95.392999	300	suburbs of Pyogon
MF0837	MFOCN	Monyo	B	18.00008	95.505252	300	suburbs of Monyo
MF0838	MFOCN	Htein Taw	B	17.878994	95.512736	300	urban area of Htein Taw
MF0839	MFOCN	Kha Man	B	17.808283	95.61376	300	suburbs of Kha Man
MF0840	MFOCN	Tharrawaw	B	17.702407	95.470357	300	urban area of Tharrawaw
MF0841	MFOCN	Tawyagon	B	17.616422	95.594005	300	suburbs of Tawyagon
MF0842	MFOCN	Daunggyi	B	17.602565	95.553423	300	urban area of Daunggyi
MF0843	MFOCN	Hinthada	B	17.601785	95.478886	300	suburbs of Hinthada
MF0844	MFOCN	Ah Thoke	B	17.199114	95.087866	300	urban area of Ah Thoke
MF0845	MFOCN	Kyagan	B	16.281472	94.888384	300	suburbs of Kyagan
MF0846	MFOCN	Hlainbon	B	16.258318	94.789103	300	suburbs of Hlainbon
MF0847	MFOCN	Kyaukpyu	B	16.198309	94.785269	300	urban area of Kyaukpyu
MF0848	MFOCN	Labutta	B	16.150434	94.760019	300	urban area of Labutta
MF0849	MFOCN	Lu Daw	B	16.122512	94.776231	300	suburbs of Lu Daw
MF0850	MFOCN	Mahamuni	B	20.870104	93.064209	300	suburbs of Mahamuni
MF0851	MFOCN	Taungdaung	B	20.856399	92.93488	300	suburbs of Taungdaung
MF0852	MFOCN	Apaukwa	B	20.720423	92.959374	300	urban area of Apaukwa
MF0853	MFOCN	Myathle	B	20.614493	92.940795	300	suburbs of Myathle
MF0854	MFOCN	Yeoya	B	20.427516	93.013663	300	suburbs of Yeoya
MF0855	MFOCN	Ponnagyun	B	20.335774	93.002972	300	urban area of Ponnagyun
MF0856	MFOCN	Aindin	B	20.306329	92.92621	300	suburbs of Aindin
MF0857	MFOCN	sittwe	B	20.186312	92.856925	300	suburbs of sittwe
MF0858	MFOCN	Manubin	B	20.175548	92.826904	300	suburbs of Manubin
MF0859	MFOCN	sittwe	B	20.13893	92.893406	300	urban area of sittwe
MF0860	MFOCN	Tonbo	B	18.504472	95.049936	300	suburbs of Tonbo

MF0861	MFOCN	Taledan	B	18.605807	95.015829	300	suburbs of Taledan
MF0862	MFOCN	Padaung	B	18.712074	95.11246	300	suburbs of Padaung
MF0863	MFOCN	Oke shit pin	B	18.75734	95.020336	300	suburbs of Oke shit pin
MF0864	MFOCN	Kyaungu	B	18.827593	94.994626	300	suburbs of Kyaungu
MF0865	MFOCN	Magyibin	B	18.789718	95.094723	300	suburbs of Magyibin
MF0866	MFOCN	Sinde	B	18.834118	95.169726	300	suburbs of Sinde
MF0867	MFOCN	Kyaungu	B	18.850185	94.988672	300	suburbs of Kyaungu
MF0868	MFOCN	Pyindaung	B	18.965901	94.934862	300	suburbs of Pyindaung
MF0869	MFOCN	Kamma	B	19.026193	95.094817	300	urban area of Kamma
MF0870	MFOCN	Duyingabo	B	19.075684	95.091212	300	suburbs of Duyingabo
MF0871	MFOCN	Ye nan thar	B	19.106965	95.035989	300	urban area of Ye nan thar
MF0872	MFOCN	Monda	B	19.202153	94.960585	300	suburbs of Monda
MF0873	MFOCN	Hman	B	19.167629	94.791588	300	suburbs of Hman
MF0874	MFOCN	Okpo	B	19.2706	94.99405	300	suburbs of Okpo
MF0875	MFOCN	Ta la ber	B	19.36485	94.96479	300	suburbs of Ta la ber
MF0876	MFOCN	Ahlele	B	19.371338	94.872947	300	suburbs of Ahlele
MF0877	MFOCN	Natmauk	B	19.293786	94.835525	300	suburbs of Natmauk
MF0878	MFOCN	Mindon	B	19.333309	94.751122	300	suburbs of Mindon
MF0879	MFOCN	Kyaukpyale	B	19.553043	94.713981	300	suburbs of Kyaukpyale
MF0880	MFOCN	Chingon	B	19.696709	94.68668	300	suburbs of Chingon
MF0881	MFOCN	Kandok	B	19.784326	94.656634	300	suburbs of Kandok
MF0882	MFOCN	Manaung	B	19.896592	94.602391	300	suburbs of Manaung
MF0883	MFOCN	Gokkyi	B	19.85528	94.449126	300	suburbs of Gokkyi
MF0884	MFOCN	Ale ngapye	B	19.870708	94.200006	300	suburbs of Ale ngapye
MF0885	MFOCN	Kyaukpe	B	20.019837	94.596912	300	suburbs of Kyaukpe
MF0886	MFOCN	Singaung	B	20.134075	94.772618	300	urban area of Singaung
MF0887	MFOCN	Kyaukp	B	20.177885	94.486419	300	suburbs of Kyaukp
MF0888	MFOCN	Mezali	B	20.314183	94.494632	300	urban area of Mezali
MF0889	MFOCN	Lin zin	B	20.593733	94.463631	300	suburbs of Lin zin
MF0890	MFOCN	Salin	B	20.521665	94.630411	300	suburbs of Salin
MF0891	MFOCN	Kyatpe	B	20.853414	94.401688	300	suburbs of Kyatpe
MF0892	MFOCN	Shaukpin inn	B	20.913875	94.418346	300	suburbs of Shaukpin inn
MF0893	MFOCN	Ngabyagyi	B	20.9327	94.388435	300	suburbs of Ngabyagyi

MF0894	MFOCN	Tha pyay pin	B	20.991319	94.38834	300	suburbs of Tha pyay pin
MF0895	MFOCN	Phat te	B	20.977321	94.467463	300	suburbs of Phat te
MF0896	MFOCN	Kyunchaung	B	21.032733	94.395359	300	suburbs of Kyunchaung
MF0897	MFOCN	Aint gyi	B	21.08131	94.373899	300	suburbs of Aint gyi
MF0898	MFOCN	Wongyi	B	21.16655	94.366301	300	suburbs of Wongyi
MF0899	MFOCN	Thee kone	B	21.112292	94.156475	300	suburbs of Thee kone
MF0900	MFOCN	Saw	B	21.150375	94.151298	300	urban area of Saw
MF0901	MFOCN	Kanpetlet	B	21.190039	94.067291	300	suburbs of Kanpetlet
MF0902	MFOCN	Kyaukhtu	B	21.412661	94.132071	300	urban area of Kyaukhtu
MF0903	MFOCN	Mindat	B	21.370157	93.986985	300	suburbs of Mindat
MF0904	MFOCN	Mgwi	B	21.409511	93.795419	300	suburbs of Mgwi
MF0905	MFOCN	Matupi	B	21.593456	93.448704	300	suburbs of Matupi
MF0906	MFOCN	Thi-ui	B	21.79267	93.40732	300	suburbs of Thi-ui
MF0907	MFOCN	Lungphialia	B	21.945744	93.444889	300	suburbs of Lungphialia
MF0908	MFOCN	Hasaw	B	22.106	93.475144	300	suburbs of Hasaw
MF0909	MFOCN	Aika	B	22.198228	93.611244	300	suburbs of Aika
MF0910	MFOCN	Surkhua	B	22.269581	93.649503	300	suburbs of Surkhua
MF0911	MFOCN	Sakta	B	22.465523	93.626381	300	suburbs of Sakta
MF0912	MFOCN	Loklung	B	22.571857	93.591548	300	suburbs of Loklung
MF0913	MFOCN	Zokhua	B	22.535586	93.691611	300	suburbs of Zokhua
MF0914	MFOCN	Tinam	B	22.490059	93.773158	300	suburbs of Tinam
MF0915	MFOCN	Kan	B	22.407044	94.086769	300	suburbs of Kan
MF0916	MFOCN	Tintha	B	22.775574	94.04805	300	suburbs of Tintha
MF0917	MFOCN	Thangphu	B	22.904524	94.037171	300	urban area of Thangphu
MF0918	MFOCN	Natmyaung	B	23.048574	94.025512	300	suburbs of Natmyaung
MF0919	MFOCN	Kale	B	23.189298	94.05919	300	urban area of khua
MF0920	MFOCN	Siyin	B	23.208466	93.977129	300	urban area of Siyin
MF0921	MFOCN	Kin	B	21.437494	95.01816	300	suburbs of Kin
MF0922	MFOCN	Wagan	B	21.516764	95.000552	300	suburbs of Wagan
MF0923	MFOCN	Aye thar kone	B	21.545048	94.931406	300	suburbs of Aye thar kone
MF0924	MFOCN	Myaing	B	21.610186	94.851703	300	urban area of Myaing
MF0925	MFOCN	Kundo	B	21.711451	94.986065	300	urban area of Kundo
MF0926	MFOCN	Lingadaw	B	21.777263	94.979443	300	suburbs of Lingadaw

MF0927	MFOCN	Kyar tet	B	21.841152	94.93444	300	urban area of Kyar tet
MF0928	MFOCN	Alon	B	21.72898	94.910011	300	suburbs of Alon
MF0929	MFOCN	Damapala	B	22.088594	94.970552	300	suburbs of Damapala
MF0930	MFOCN	Mintainbin	B	21.930912	94.732697	300	suburbs of Mintainbin
MF0931	MFOCN	Kaungbwa	B	21.880259	94.547564	300	suburbs of Kaungbwa
MF0932	MFOCN	Gyat	B	21.885201	94.433501	300	suburbs of Gyat
MF0933	MFOCN	Khampat	B	23.798204	94.149177	300	suburbs of Khampat
MF0934	MFOCN	Mawlaik	B	23.646105	94.406423	300	urban area of Mawlaik
MF0935	MFOCN	Chaungzon	B	23.19777	94.429559	300	suburbs of Chaungzon
MF0936	MFOCN	Pyingaing	B	23.149769	94.820884	300	urban area of Pyingaing
MF0937	MFOCN	Gwedaukkaing	B	23.054035	94.943843	300	suburbs of Gwedaukkaing
MF0938	MFOCN	Aingma	B	23.02781	95.100924	300	suburbs of Aingma
MF0939	MFOCN	Kaduma	B	22.933212	95.232648	300	urban area of Kaduma
MF0940	MFOCN	Thar Yar Kone	B	22.947969	95.35001	300	suburbs of Thar Yar Kone
MF0941	MFOCN	Ywathit	B	22.947332	95.396876	300	urban area of Ywathit
MF0942	MFOCN	Taze	B	22.911201	95.380334	300	suburbs of Taze
MF0943	MFOCN	Pha Lan Gon	B	22.844233	95.411796	300	suburbs of Pha Lan Gon
MF0944	MFOCN	Ywathit	B	22.935721	95.451052	300	suburbs of Ywathit
MF0945	MFOCN	Aingbyaunggyaung	B	22.902506	95.498338	300	urban area of Aingbyaunggyaung
MF0946	MFOCN	Zigon	B	22.92868	95.563582	300	urban area of Zigon
MF0947	MFOCN	Khin-U	B	22.769264	95.620918	300	urban area of Khin-U
MF0948	MFOCN	Ye-U	B	22.756485	95.425318	300	urban area of Ye-U
MF0949	MFOCN	Chaungmagyi	B	22.708156	95.348399	300	suburbs of Chaungmagyi
MF0950	MFOCN	Ywa Shae	B	22.568357	95.275406	300	suburbs of Ywa Shae
MF0951	MFOCN	Let Pan North	B	22.51768	95.213287	300	urban area of Let Pan North
MF0952	MFOCN	Kudaw	B	22.558231	95.076651	300	suburbs of Kudaw
MF0953	MFOCN	Maung Taung	B	22.477585	95.070681	300	urban area of Maung Taung
MF0954	MFOCN	Budalin	B	22.3919	95.146429	300	urban area of Budalin
MF0955	MFOCN	Budaunggan	B	22.317752	95.130667	300	suburbs of Budaunggan
MF0956	MFOCN	Maliwan	B	10.259019	98.600556	300	urban area of Maliwan
MF0957	MFOCN	Nangin	B	10.624352	98.562754	300	suburbs of Nangin
MF0958	MFOCN	Atwin Bokpyin	B	11.253092	98.786935	300	suburbs of Atwin Bokpyin
MF0959	MFOCN	Lehnya	B	11.454159	98.985837	300	urban area of Lehnya

MF0960	MFOCN	Htaunpgru	B	11.833677	99.115224	300	suburbs of Htaunpgru
MF0961	MFOCN	Palon	B	12.353045	98.809063	300	suburbs of Palon
MF0962	MFOCN	Kyaukpya	B	12.526578	98.753993	300	Urban area of Kyaukpya
MF0963	MFOCN	Kawsaing	B	12.70228	98.746257	300	Suburbs of Kawsaing
MF0964	MFOCN	Kanti	B	13.184084	98.633702	300	Suburbs of Kanti
MF0965	MFOCN	Aw	B	13.311552	98.571914	300	Suburbs of Aw
MF0966	MFOCN	Aukthayetchaung	B	13.49706	98.466012	300	Suburbs of Aukthayetchaung
MF0967	MFOCN	Kadwan	B	13.621786	98.382357	300	Suburbs of Kadwan
MF0968	MFOCN	Thayetchaung	B	13.865013	98.25892	300	Urban area of Thayetchaung
MF0969	MFOCN	Yebyu	B	14.252825	98.208065	300	Urban area of Yebyu
MF0970	MFOCN	Dauk Lauk	B	14.318084	98.188118	300	Suburbs of Dauk Lauk
MF0971	MFOCN	Uthayan	B	14.373537	98.178783	300	Suburbs of Uthayan
MF0972	MFOCN	Pagawyun	B	14.471493	98.177469	300	Suburbs of Pagawyun
MF0973	MFOCN	Yebon	B	14.540208	98.174036	300	Suburbs of Yebon
MF0974	MFOCN	Migyanughlaung	B	14.705507	98.112458	300	Suburbs of Migyanughlaung
MF0975	MFOCN	Yapu	B	14.833167	98.03032	300	Suburbs of Yapu
MF0976	MFOCN	Lawthaing	B	14.979877	98.004786	300	Suburbs of Lawthaing
MF0977	MFOCN	Han gan	B	15.162611	97.861738	300	Urban area of Han gan
MF0978	MFOCN	Join Sai	B	15.340562	97.869374	300	Urban area of Join Sai
MF0979	MFOCN	Kawkami	B	15.612587	97.845603	300	Suburbs of Kawkami
MF0980	MFOCN	Wekame	B	15.762176	97.808757	300	Suburbs of Wekame
MF0981	MFOCN	Hnipadaw	B	16.046734	97.757357	300	Urban area of Hnipadaw
MF0982	MFOCN	Ka Mar Met	B	16.144121	97.741519	300	Urban area of Ka Mar Met
MF0983	MFOCN	King Chaun	B	16.281982	97.647464	300	Urban area of King Chaun
MF0984	MFOCN	Shan	B	21.145797	97.584056	300	Suburbs of Shan
MF0985	MFOCN	Na-nai	B	21.200152	97.616114	300	Suburbs of Na-nai
MF0986	MFOCN	MongKung	B	21.606772	97.538236	300	Suburbs of MongKung
MF0987	MFOCN	Bhamo	B	24.247519	97.244465	300	Urban area of Bhamo
MF0988	MFOCN	Myothit	B	24.391795	97.405366	300	Urban area of Myothit
MF0989	MFOCN	Hkapra	B	24.512478	97.429343	300	Suburbs of Hkapra
MF0990	MFOCN	Nawng wamt	B	24.644021	97.464505	300	Urban area of Nawng wamt
MF0991	MFOCN	Damram	B	24.811823	97.483399	300	Suburbs of Damram
MF0992	MFOCN	Maru gahtawn	B	24.870101	97.513859	300	Momauk-Waingmaw Hwy

MF0993	MFOCN	Gundauyang	B	24.978339	97.568458	300	Suburbs of Gundauyang
MF0994	MFOCN	Maliyang	B	25.087867	97.567339	300	Urban area of Maliyang
MF0995	MFOCN	Kaxu	B	25.150494	97.533803	300	Suburbs of Kaxu
MF0996	MFOCN	Shwe Nyaungpin	B	25.190669	97.447615	300	Urban area of Shwe Nyaungpin
MF0997	MFOCN	In lay	B	25.290784	97.438566	300	Suburbs of In lay
MF0998	MFOCN	Man main	B	25.545539	97.794739	300	Suburbs of Man main
MF0999	MFOCN	Na zun baw	B	26.016991	98.44218	300	Suburbs of Na zun baw
MF1000	MFOCN	Mawpow Khar	B	25.33287	97.262761	300	Suburbs of Mawpow Khar

	State	Route	City
001	**Kachin State(KCN)**	Mogok-Bhamo-Myitkyina	Mansi,Bhamo,Momauk, Ziyu Khar,Waimaw,Myitkyina
		Indaw-Bhamo-Muse	Shwegu,Mansi,Bhamo, Manweinggyi
		Bhamo-Myanmar_China border	Bhamo,Momauk,Lwegel
		Indaw-Myitkyina-Myanmar_China Border	Mohnyin,Hopin,Mogaung, Myitkyina,Chipwi
		Khamti-Moekaung	Hpakan,Mogaung
		Tingring-Ngalung Ga	Tingring,Danai
		Ngalung Ga-Nogmung	Putao,Nogmung
		Myitkyina-Putao	Myitkyina,Sumprabum,Putao
		Myitkyina-Nawngmun	Myitkyina,Chipwi,Nawngmun
002	**Sagaing Division(SGN)**	Mandalay-Monywa-Gantgaw-Kale-Tamu	Mandalay,Sagaing,Myinmu, Chaung-U,Monywa,Pale, Kale,Tamu
		Linadaw-Monywa-Khin U	Salingyi,Monywa,Budalin, Ye U,Khin U
		Monywa-Kalewa-Sinlamaung-Indaw	Monywa,Kalewa,Paungbyin, Sinlamaung,Banmauk,Indaw
		Shwebo-Khin U-Kalewa-Kale	Shwebo,Khin U,Kalewa,Kale
		Sagaing-Shwebo-Indaw-Moenyin	Sagaing,Shwebo,Kanbalu, Kawlin,Indaw

		Indaw-Mya Taung	Indaw,Tigyaing,Mya Taung
		Indaw-Katha	Indaw,Katha
		Kawlin-KyaungLe	Kawlin,Pinlebu,Kyaungle
		Sinlamaung-Homalin	Sinlamaung,Homalin
		Tamu-Homalin-Nanyun-Putao	Tamu,Homalin,Khamti, Ngalung Ga ,Nanyun
		Khamti-Hpakan	Khamti
		Kanbalu-Indaw	Kanbalu,Indaw
003	**Chin State (CHIN)**	Kyauktaw-Matupi-Hakha	Kyauktaw,Paletwa,Matupi,Hakha
		Kale-Myanmar_India Border	Tonzang
		Gantgaw-Hakha-Kale	Hakha,Falam
		Surkhua-Gantgaw-Mindat-Datkon	Surkhua,Mindat
		Matupi-Mindat	Madupi,Mindat
004	**Magway Division (MGW)**	Pyay-Taungdwingyi-Natmauk-Pyawbwe	Thayet,Taungdwingyi,Myothit, Natmauk
		Taungdwingyi-Magwe-Chauk-Pakkoku	Taungdwingyi,Magwe, Yanangyaung,Chauk,Pakkoku
		Pakkoku-Myaing-Linadaw	Pakkoku,Myaing,Linadaw
		Pakkoku-Yesagyo-Linadaw	Pakkoku,Yesagyo,Linadaw
		Oke Shit Pin-Mindon-Datkon	Oke Shit Pin,Mindong,Datkon
		Magwe-Datkon-Ann	Magwe,Minbu,Datkon

		Magwe-Chauk-Tilin-Gantgaw	Magwe,Minbu,Pwintbyu,Salin, Chauk,Saw,Tilin
		Kyaw-Gantgaw-Kale	Gantgaw
005	**Mandalay Division (MDY)**	Kyaukpadaung-Nyaung U-Myingyan-Mandalay	Kyaukpadaung,Nyaung U,Myingyan, Tada U,Mandalay
		Toungoo-Naypyitaw-Mandalay-Nawnghkio	Naypyitaw,Tatkon,Yamethin,Pyawbwe,Meiktila,Myittha,Kyaukse,Mandalay, Pyin Oo Lwin
		Chauk-Kyaukpadaung-Meiktila-Taunggyi	Kyaukpadaung,Meiktila,Thazi
		Netmauk-Pyawbwe	Pyawbwe
		Mandalay-Mogok	Mandalay,Sin U,Thabeikkyin,Mogok
		War Hpyu Taung-Mya Taung	Thabeikkyin
		Meiktila-Myingyan	Meiktila,Mahlaing,Taungtha,Myingyan
		Yangon-Naypyitaw-Mandalay Expy	Naypyitaw,Meiktila,Mandalay
006	**Shan State(SHN)**	Meiktila-Taunggyi-Langkho-Tachileik	Kalaw,Aungban,Taunggyi,Hopong, Loilem,Nansang,Mongnai,Langkho, Mongpan,Mongton,Monghsat,Tachileik
		Nansang-Kengtong-Tachileik	Nansang,Kholam,Kunhing, Mongping,Kengtong,Monghpyak, Monglin,Tachileik

		Nawnghkio-Taunggyi-Loikaw	Nawnghkio,Taunggyi,Hopong,Hsihseng,
		Kyaukse-Aungban-Pinlaung-Loikaw	Aungban,Pinlaung,Pekon
		Tatkon-Pinlaung	Pinlaung
		Mandalay-Muse	Nawnghkio,Kyaukme,Hsipaw,Naphai, Lashio,Hseni,Kutkai,Muse
		Mogok-Kyaukme	Kyaukme
		Hsipaw-Tangyan-Kunhing-Mongtong	Hsipaw,Naphai,Mongyai,Tangyan
		Mongping-Monghsat	Mongping,Monghsat
		Mogok-Lashio	Mongmit,Lashio
		Mogok-Bhamo-Muse	Mongmit,Mabein,Namhkan,Muse
		Hsenwi-Kunlong-China	Hsenwi,Kunlong
		Monglin-Kenglat	Monglin,Kenglat
		Hsipaw-Loilem	Hsipaw,Mong Kung,Loilem
007	**Rakhine State(RKH)**	Magwe-Ann-Sittwe	Sittwe,Ponnagyun,Mrauk-U,Ann
		Ann-Gwa-Yegyi	Ann,Tounggok,Thandwe,Shaukkon,Gwa
		Sittwe-Kalarua-Bangaladesh	Sittwe,Buthidaung,Kalarua
		Kyauktaw-Matupi	Kyauktaw
		Ann-Kyukpyu	Ann,Kyaukpyu
		Taunggok-Pyay	Taunggok

008	**Bago Division (BG)**	Yangon-Bago-Phyu-Taungoo-Naypyitaw	Bago,HpaYarGyi,Daik-U,Nyaunglebin Phyu,Oktwin,Taungoo
		Hpayargyi-Waw-Taungoo-Kemapyu	Hpayargyi,Waw,Kyaukkyi,Taungoo
		Taunggoo-Pyay	Taungoo,Oktwin,Paukkaung,Pyay
		Yangon-Tharyarwaddy-Pyay-Taungdwingyi	Tharrawaday,Minhla,Okpho,Nattalin, Paungde,Shwedaung,Pyay,
		Pyay-TaungGok	TaungGok
009	**Kayah State(KYH)**	Demoso-Toungoo	Demoso
		Loikaw-Khehpyu-Toungoo	Loikaw,Demoso,Hpruso, Bawlakhe,Hpasawng,Khe Hpyu
		Loikaw-Taunggyi	Loikaw,Tun-Nyu,Kong Pyek
010	**Ayeyawaddy Division(AYWD)**	Ngwesaung-Kyaunggone-Yangon	Ngwesaung,Pathein,Kyaunggone, Pantanaw,Nyaungdon,Mezali
		Pathein-Myaungmya-Kpyapon-Payagyi	Pathein,Myaungmya,Wakema, Pantanaw,Maubin,Kyaiklat,Kpyapon, Dedaye
		Kpyapon-Maubin-Nyaungdon-Oke Shit Pin	Kpyapon,kyaiklat,Maubin,Samalauk, Nyaungdon,Danubyu,Zalun,Hinthada, Kanyutkwin,Kyangin

		Gwe-Yegyi-Hinthada	Yegyi,Kyonpyaw,Natmaw,Hinthada
		Kyomangay-Pantanaw	Wakema,Mauchaung,Pantanaw
		Maubin-Mezali-naungdon	Maubin,Mezali,Nyaungdon
		maubin-Payagyi	Maubin
011	**Yangon Division (YGN)**	Yangon-Bago	Yangon,Bago
		Yangon-Nyaungdon	Yangon
		Yangon-Taikyi-Thayawaddy	Yangon,Hmawbi,Taikkyi,Okekan
		Yangon-Pyapon	Yangon,Twantay
		Thanlin-Khayan-Bago	Thanlin,Thategwin,Thongwa, Khayan
012	**Mon State(MON)**	Hpayargyi-Waw-Thaton-Mawlamyine-Ye	Kyaikto,Bilin,Thaton,Mawlamyine, Mudon,Thanbyuzayat,Ye
013	**Kayin State(KYN)**	Loikaw-Hpapun-Hpa an	Chawklukhi,Hpapun,Kuzeik,Hpa-An
		Hpapun-Bilin	Hpapun,Hla Gun Pho
		Thaton-Myawaddy	Hpa-An,KawKareik,Myawaddy
		Hpa an-Mawlamyine	Hpa-An
014	**Taninthayi Division(TNTY)**	Dawei-Myeik-Kawthoung	Yebyu,Dawei,Thayechaung, Palaw,Myeik,Tanintharyi, Bokpyin,Kawthoung
		Dawei seaport-Kyauktone	Dawei,Myitta,Kyauktone

		Kawkareik-Kyauktone-Kawthoung	Kameik,Myitta,Kyauktone, Chaungwa,Kawthoung
		Tanintharyi-Mawdaung	Tanintharyi,Naunghwa,Mawdaung

ANNEX 2

DETAIL DRAWING OF TOWER

LADDER COMPONENTS

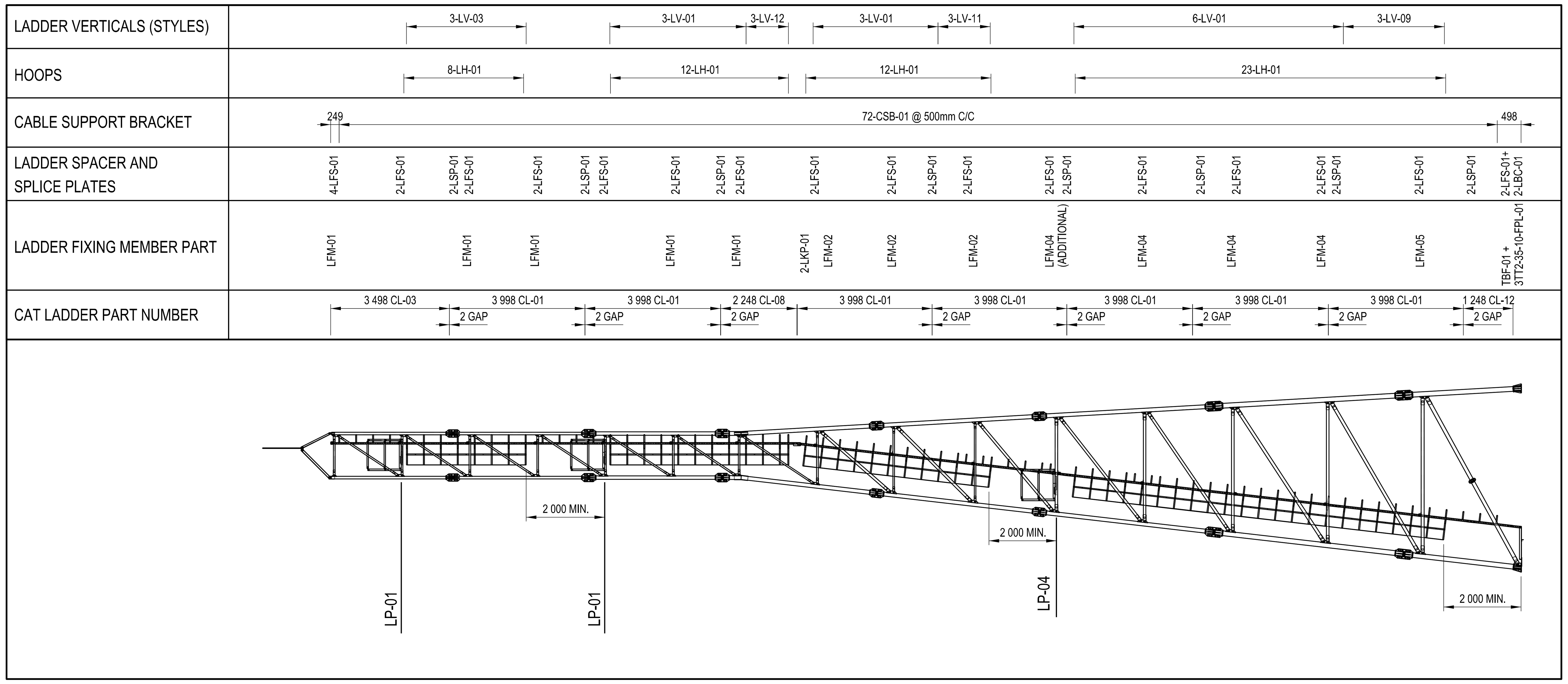
PART DESCRIPTION	No. OFF	UNIT MASS kg.	TOTAL MASS kg.
CL-01	8	34.71	242.97
CL-03	1	30.37	30.37
CL-08	1	19.52	19.52
CL-12	1	10.84	10.84
LH-01	58	1.28	74.24
CSB-01	76	0.71	53.96
LFS-01	36	0.07	2.52
LSP-01	17	0.392	6.66
LKP-01	3	0.74	2.22
LBC-01	3	0.78	2.34
LFM-01	5	8.53	42.65
LFM-02	3	9.74	29.22
LFM-04	4	9.91	39.64
LFM-05	1	10.25	10.25
TBF-01	1	12.02	12.02
3TT2-35-10-FPL-01	1	2.57	2.57
M10 x 30	316	0.04	12.64
M10 NUT	316	0.010	3.16
M10 WASHER	632	0.004	2.53
M16 x 40	116	0.124	14.38
M16 NUT	116	0.030	3.48
M16 WASHER	232	0.011	2.55
LV-01	12	4.76	57.12
LV-03	3	4.17	12.51
LV-09	3	2.40	7.20
LV-11	3	1.81	5.43
LV-12	3	1.51	4.53
TOTAL UNIT MASS			742.23

ADDITIONAL TOWER COMPONENTS

PART DESCRIPTION	No. OFF	UNIT MASS kg.	TOTAL MASS kg.	SEE DRAWING
LADDER	1 OFF	742.23	742.23	THIS DRAWING
LANDING PLATFORM LP-01	2 OFF	63.30	126.60	LP-01
LANDING PLATFORM LP-04	1 OFF	68.27	68.27	LP-04
TOTAL UNIT MASS			937.10	

LADDER ABBREVIATION KEY

CSB	CABLE SUPPORT BRACKET
LFS	LADDER FIXING SPACER
LKP	LADDER KINK PLATE
LSP	LADDER SPLICE PLATE
TBF	LADDER TIE BACK FRAME
LFM	LADDER FIXING MEMBER
CL	CAT LADDER
LH	LADDER HOOP
LV	LADDER VERTICALS (STYLES)
LBC	LADDER BOTTOM CONNECTOR
FPL	FINGER PLATE LADDER



LADDER ASSEMBLY
NTS

Myanmar Fiber Optic Communication Network Co., Ltd. www.mfocn.com.mm 2nd Floor, Right Side, Building 12,MICT Park, Hlaing Tsp, Yangon, Myanmar.	DRAWING NUMBER / REVISION: 3TT2-35-10-A6 REV 0	SHEET NO.: 1 OF 1	SCALE: A/S	DESIGNED: GMS DATE: 2011-10-10
	DRAWING DESCRIPTION: 35m 3 LEGGED CHS TOWER			DRAWN: NC DATE: 2011-10-10
	PROJECT: MYANMAR FIBER OPTIC COMMUNICATION NETWORK COMPANY LIMITED			CHECKED: GMS DATE: 2011-10-10

PROFESSIONAL ENGINEER: ....

ENGINEER SIGNATURE: ....

DATE SIGNED: ....

REVISION DRAWINGS

REV	DATE	DESCRIPTION	BY	CHK	ENG
0	2011-10-24	ISSUED FOR APPROVAL	NC	GMS	MDM

REFERENCE DRAWINGS

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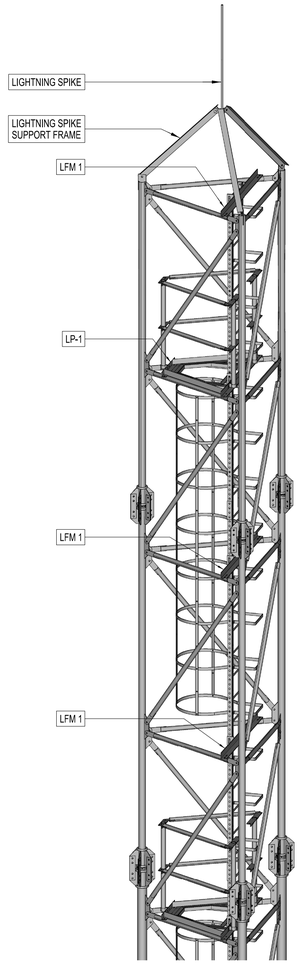
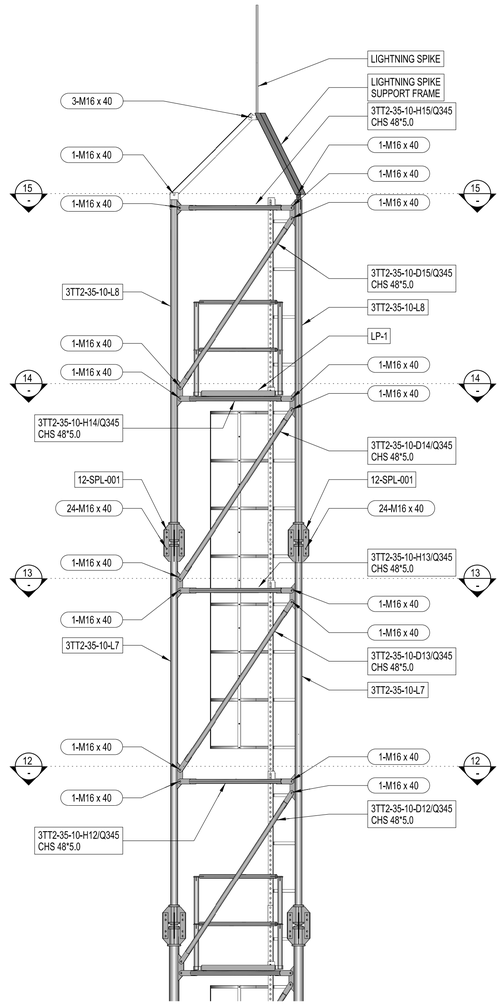


SEGMENT 4 (ISOMETRIC VIEW)
NTS



SEGMENT 4 (ELEVATION)
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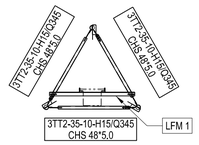
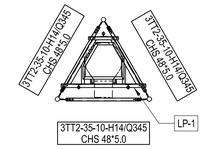


SECTION 15-15
NTS



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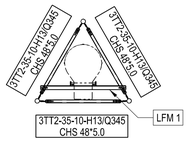

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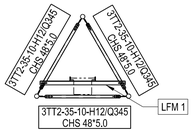

SECTION 12-12
NTS

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DRAWING NUMBER / REVISION: 3TT2-35-10-A5 REV 0	SHEET NO. : 5 OF 6	SCALE: A/S	DESIGNED: GMS	DATE: 2011-10-10	PROFESSIONAL ENGINEER: .....
DRAWING DESCRIPTION: 35m 3 LEGGED CHS TOWER			DRAWN: NC	DATE: 2011-10-10	ENGINEER SIGNATURE: .....
PROJECT: MYANMAR FIBER OPTIC COMMUNICATION NETWORK COMPANY LIMITED			CHECKED: GMS	DATE: 2011-10-10	DATE SIGNED: .....

REVISION DRAWINGS

REV	DATE	DESCRIPTION	BY	CHK	ENG
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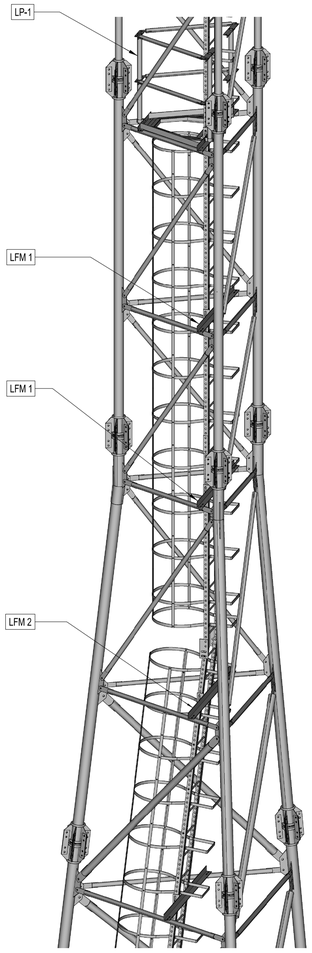

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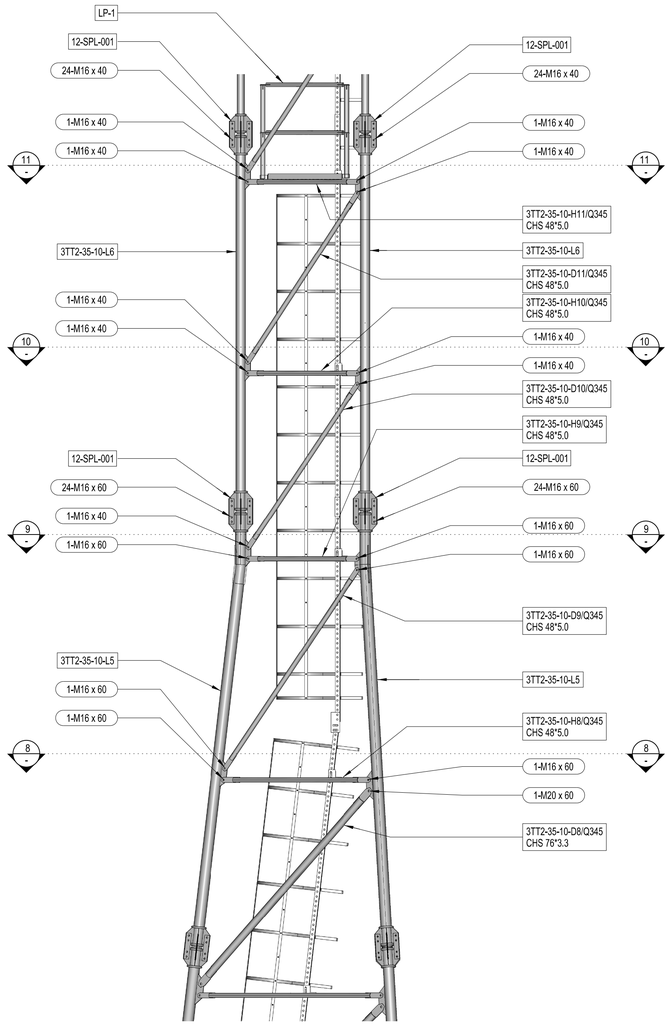

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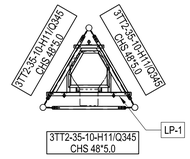

SECTION 11-11
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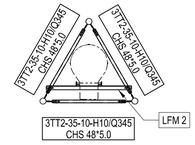

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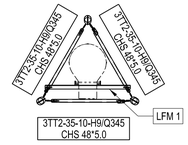

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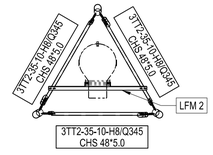

SECTION 8-8
NTS

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DRAWING NUMBER / REVISION:	3TT2-35-10-A4 REV 0
SHEET NO. :	4 OF 6
SCALE:	A/S
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PROJECT:	MYANMAR FIBER OPTIC COMMUNICATION NETWORK COMPANY LIMITED
DESIGNED:	GMS
DATE:	2011-10-10
DRAWN:	NC
DATE:	2011-10-10
CHECKED:	GMS
DATE:	2011-10-10
PROFESSIONAL ENGINEER:	.....
ENGINEER SIGNATURE:	.....
DATE SIGNED:	.....

REVISION DRAWINGS

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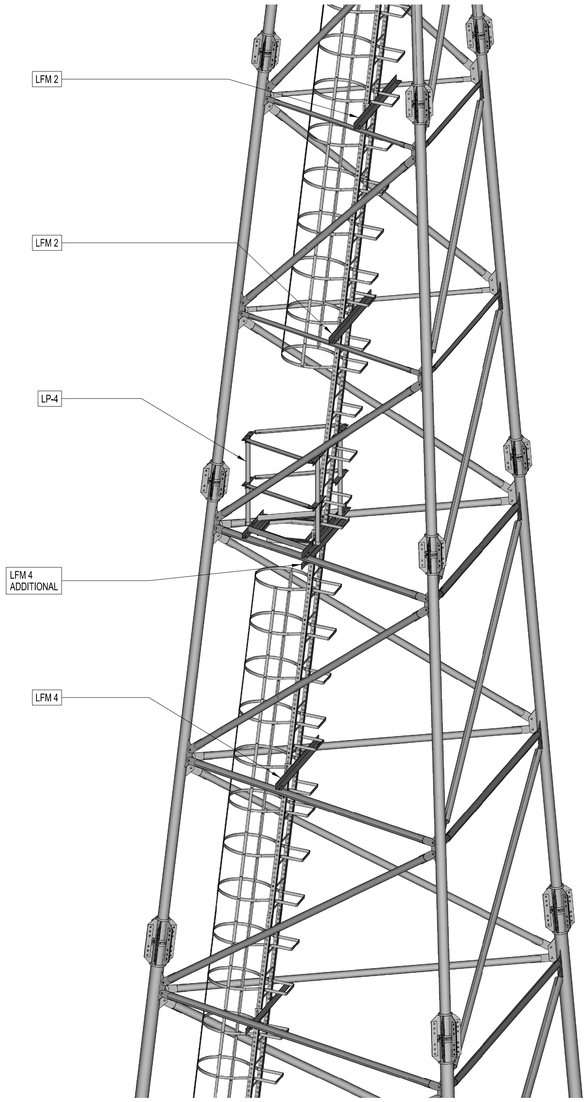

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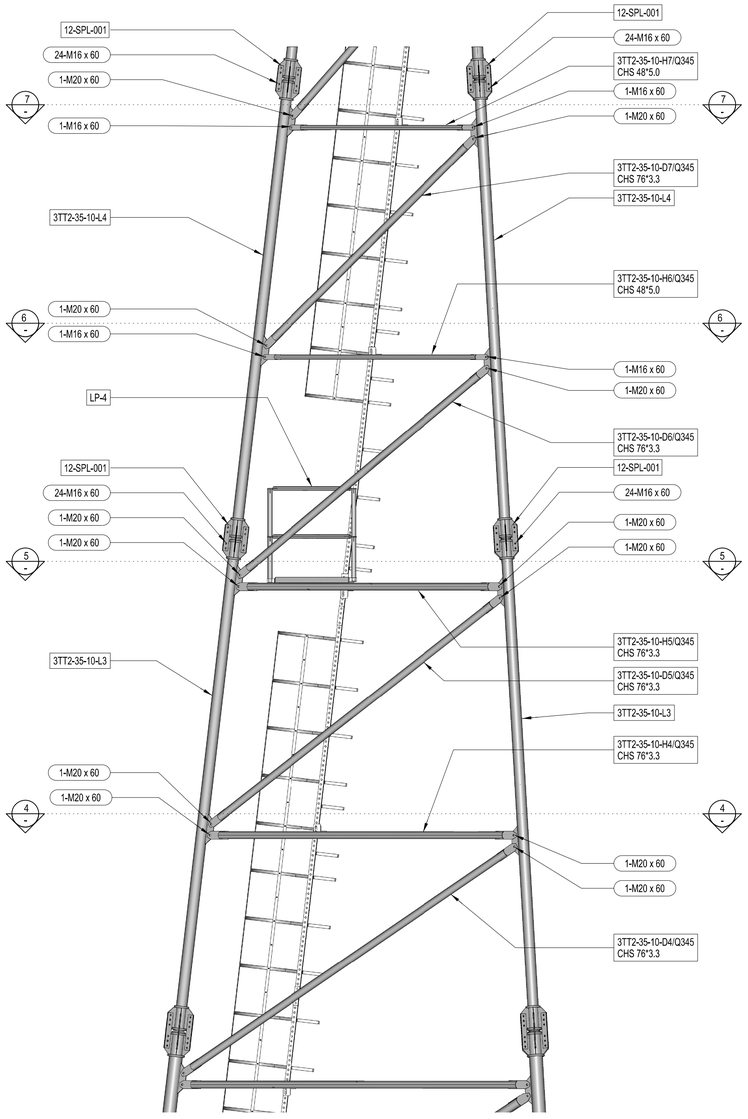

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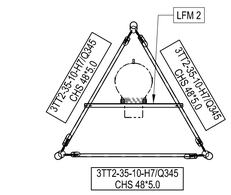

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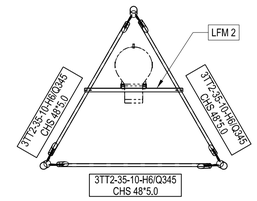

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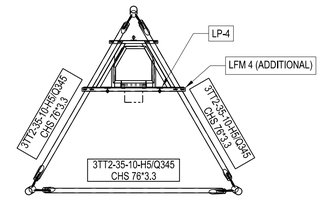

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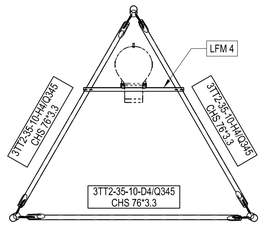

SECTION 4-4
NTS

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DRAWING NUMBER / REVISION:	3TT2-35-10-A3 REV 0
SHEET NO. :	3 OF 6
SCALE:	A/S
DRAWING DESCRIPTION:	35m 3 LEGGED CHS TOWER
PROJECT:	MYANMAR FIBER OPTIC COMMUNICATION NETWORK COMPANY LIMITED
DESIGNED:	GMS
DATE:	2011-10-10
DRAWN:	NC
DATE:	2011-10-10
CHECKED:	GMS
DATE:	2011-10-10
PROFESSIONAL ENGINEER:	.....
ENGINEER SIGNATURE:	.....
DATE SIGNED:	.....

REVISION DRAWINGS

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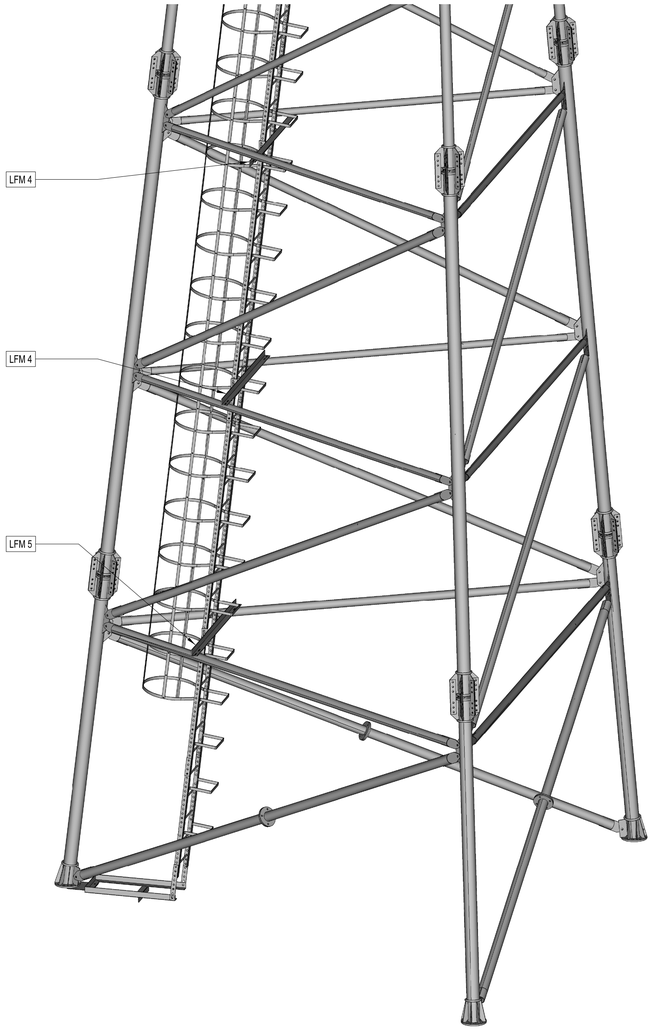
3TT2-35-10-A1	REV 0

REFERENCE DRAWINGS

REFERENCE DRAWINGS



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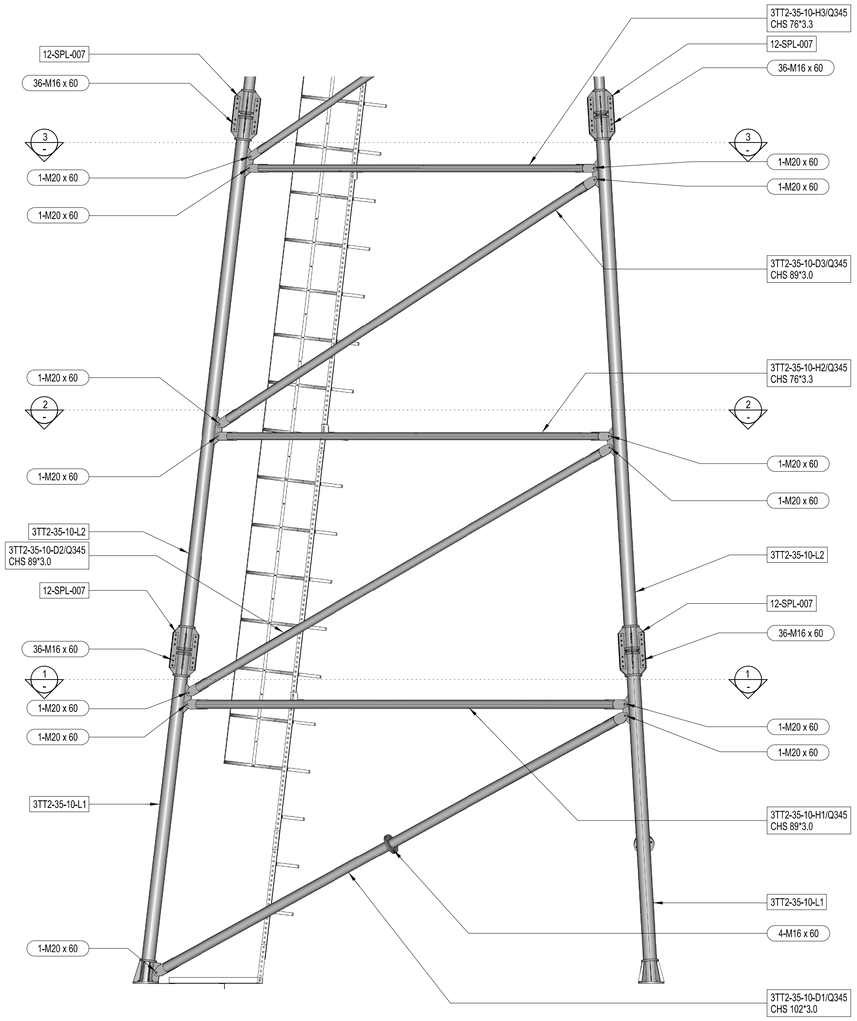

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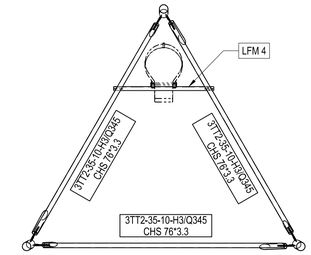

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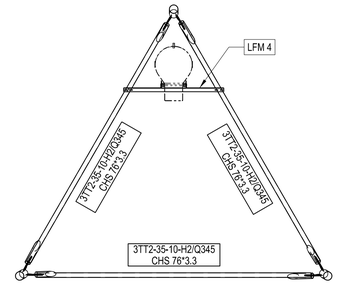

SECTION 2-2
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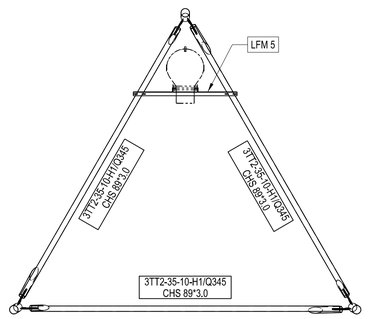

SECTION 1-1
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DRAWING NUMBER / REVISION:	3TT2-35-10-A2 REV 0
SHEET NO. :	2 OF 6
SCALE:	A/S
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PROJECT:	MYANMAR FIBER OPTIC COMMUNICATION NETWORK COMPANY LIMITED
DESIGNED: / DATE:	GMS / 2011-10-10
DRAWN: / DATE:	NC / 2011-10-10
CHECKED: / DATE:	GMS / 2011-10-10
PROFESSIONAL ENGINEER:	.....
ENGINEER SIGNATURE:	.....
DATE SIGNED:	.....

REVISION DRAWINGS	REV	DATE	DESCRIPTION	BY	CHK	ENG
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REFERENCE DRAWINGS		

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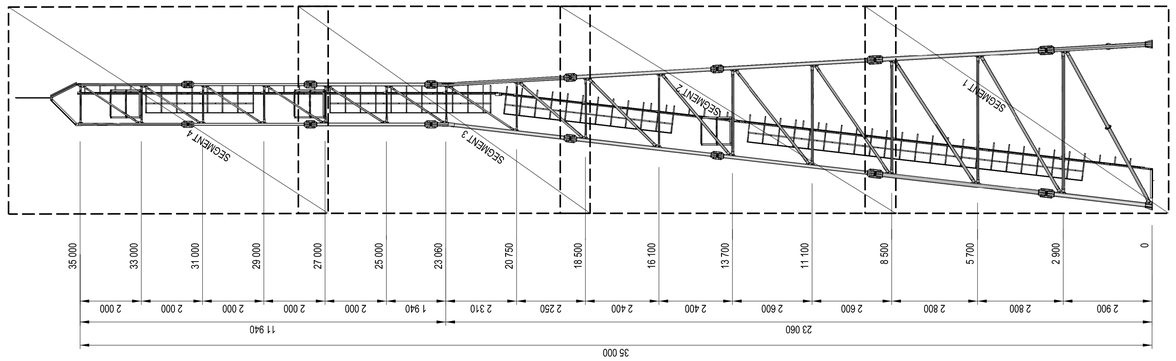
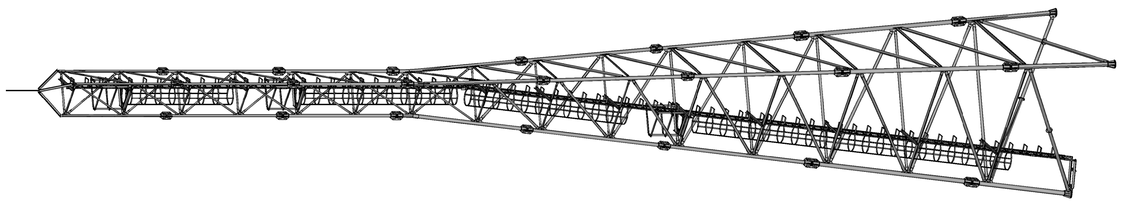


ELEVATION
NTS



GENERAL ARRANGEMENT OF ACCESS LADDER
NTS

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DRAWING NUMBER / REVISION:	3TT2-35-10-A1 REV 0
SHEET NO. :	1 OF 6
SCALE:	A/S
DRAWING DESCRIPTION:	35m 3 LEGGED CHS TOWER
PROJECT:	MYANMAR FIBER OPTIC COMMUNICATION NETWORK COMPANY LIMITED
DESIGNED:	GMS
DATE:	2011-10-10
DRAWN:	NC
DATE:	2011-10-10
CHECKED:	GMS
DATE:	2011-10-10
PROFESSIONAL ENGINEER:	.....
ENGINEER SIGNATURE:	.....
DATE SIGNED:	.....

REVISION DRAWINGS

REV	DATE	DESCRIPTION	BY	CHK	ENG
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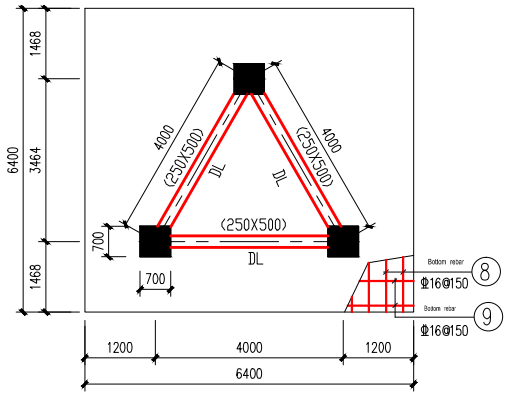
3TT2-35-10-A2	REV 0
3TT2-35-10-A3	REV 0
3TT2-35-10-A4	REV 0
	REV 0

REFERENCE DRAWINGS

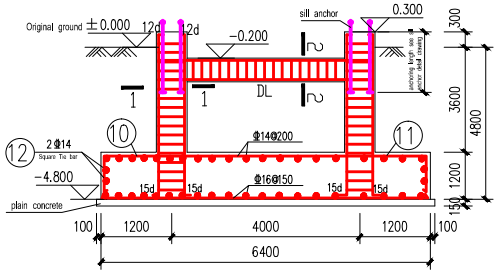
REFERENCE DRAWINGS

ANNEX 3

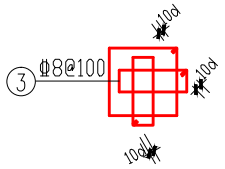
DETAIL DRAWING OF TOWER FOUNDATION

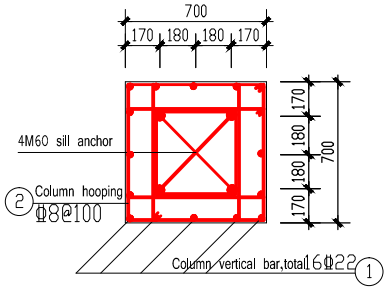


Foundation Plan

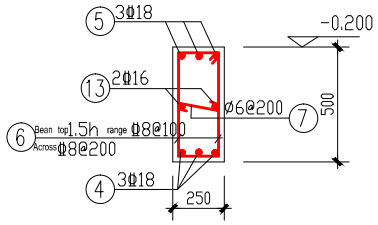


Foundation structure drawing





1-1 Column section



2-2(DL Section)

Steel bar integredients sheet						
No.	Diagram	Size	Length	Quantity	Weight (kg)	
①	330 5100 250	Φ22	5680	48	812.46	
②	600 600	Φ8	2560	153	154.71	
③	600 480	Φ8	1760	306	212.73	
④	270 4500 270	Φ18	5040	9	90.63	
⑤	270 4500 270	Φ18	5040	9	90.63	
⑥	430 180	Φ8	1380	81	44.15	
⑦	200	Φ6	320	60	7.86	
⑧	6300	Φ16	6600	43	488.55	
⑨	6300	Φ16	6600	43	488.55	
⑩	110 6300 410	Φ14	8500	32	329.12	329.12
⑪	110 6300 410	Φ14	8500	32	329.12	442.25
⑫	6300 6300	Φ14	25500	2	61.71	seperately welding is available
⑬	4300	Φ16	4300	6	40.76	
C25 concrete: 56.38m³; C15 concrete: 6.14m³; Bar weight : 3050.98kg						

Notice:

1. The original ground serves as independent foundation, gravel clay soil layer as supporting course, foundation bearing capacity eigenvalue no less than fak=120kPa.
2. Deviation of independent foundation orientation shall not more than 5mm, anchor bolts shall not more than 2mm, pre-buried sill anchor before pouring concrete of column.
3. Paint engine oil on lead screw and dress a oilcloth before pour concrete. After tower installed, paint another engine oil on lead screw and dress another oilcloth. Seal sill anchor with C20 concrete after tower stablized, usually after half to one year.
4. Curing poured concrete. After concrete intensity exceed 70% of the designed intensity, back fill soil to design height layer by layer. Each lay shall not exceed 200mm, compacition coefficient shall no less than 0.92. Water flowing slop shall be considered.
5. Sill anchor of tower feet shall apply Class IV in sill anchor chart, diameter 60mm. Sill anchor and column rebar shall be connected with horizontal steel and spot weilding.
6. Foundation and upper structure are both made of concrete. Protection layer of rebar shall be 35mm. Column center insert to foundation center and beam vertical rebar both shall be 45d. 135° hook shall be made in bean hooping, length of hook shall be 10d.

Myanmar Fiber Optic Communication Network Co;Ltd

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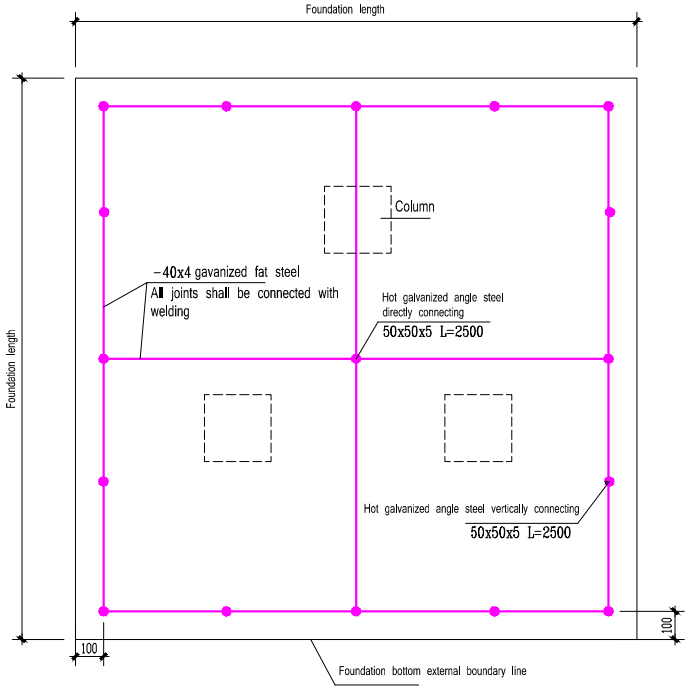
Mobile: +9594317433

E-mail: cao.xuewu@mfocn.com.mm

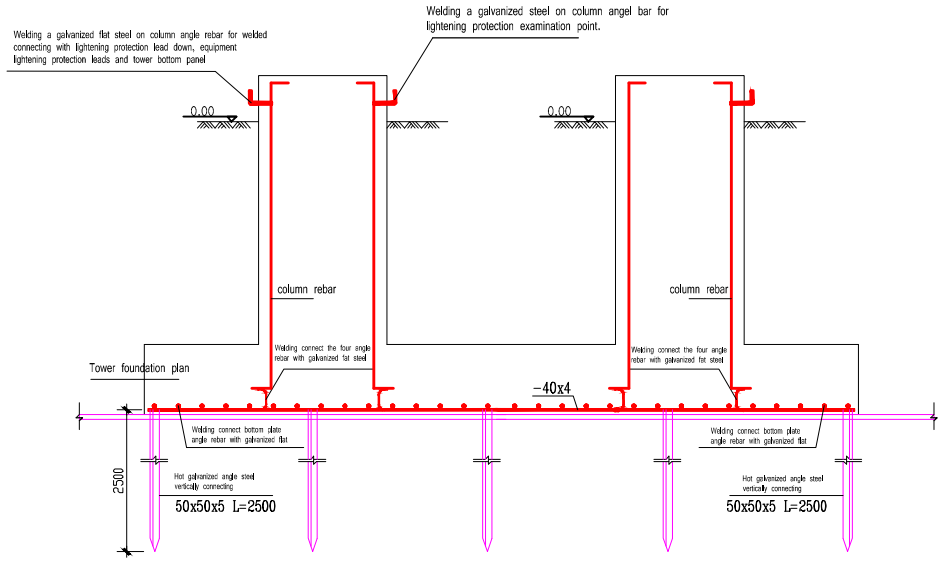
MFOCN SITE CODE				DRAWER		DATE		PROJECT	MFOCN SELF SUPPORT TOWER 45M
SITE TYPE				TECHNICAL DIRECTOR		DATE		SUBJECT	Myittha Site 45m triangle independent foundation drawing
AERIMETER AREA	<M>	LEASED AREA	<SQM>	REVIEWER		DATE			
LATITUDE		LONGITUDE		APPROVED BY		DATE		DRAWING NO.	



Foundation earth screen plan

Notice:

1. Tower foundation nature earth body serves as work proctetion and integrated grounding device. weilding connect inner rebar of foundation as a whole. welding 4X40 galvanized flat steel for connecting with outdoor circle earth body.
2. The resistance of integrated earth body shall not more than 10Ω. If resistance fails to meet requirement, shall expance earth screen area, as following: add more artificial grounding device on the outside of circle earth body, untill meet the requirement.Grounding device consist of horizontal earth body and vertical earth body. Horizontal earth body shall be in the same level as earth screen. Circle earth device shall welidng connect with earth screen every 3-5m.
3. Earth body shall apply 40mmX4mm hot galvanized flat steel. Vertical earth body is 50X50X5 L=2500 hotgalvanized angle steel. If pre-buried vertical earth body is difficult, add more circle earth body. Buring distance of vertical earth body shall be 5m, welding connect every 3-5m.
4. If the soil resistance is very high, usually over 500Ω, shall improve resistance by apply nonmetal material,such as graphite, or resistance reducing agent. For the site of soil resistance exceed 2500Ω, suggest apply nonmetal grounding material to improve resistance.
5. Earth screen and earth body shall be welding connected. All welding joint shall conduct anti-corrosion. Flat stell welding length of earth body is twice of the wide edge, round steel is 10 times of diameter.
6. Instal earth collective row on the wall inside equipment room, see following detail methods: Welding two pieces of 40X4 up-lead galvanized flat steel on earth screen or on grade beam main rebar. Welding 120X5 L=500 cooper plate above ground 0.3m for the earth of equipment room.
7. Metal pipe or parts, such as cable and metal drivepipe, shall connect with grounding device. All wire access equipment room shall installed lightening rod in outlet. Coaxial cable feeder line shall be installed feeder lightening protection machine on the connection joint with telecom equipment to prevent lighting form feeder line. Feeder lightening protection machine shall connect with closest grounding lead in inlet. Selection of feeder lightening proteciion machine shall consider the impedance,pad control and frequency range compled with telecom equipment.



Circle earthing body plan

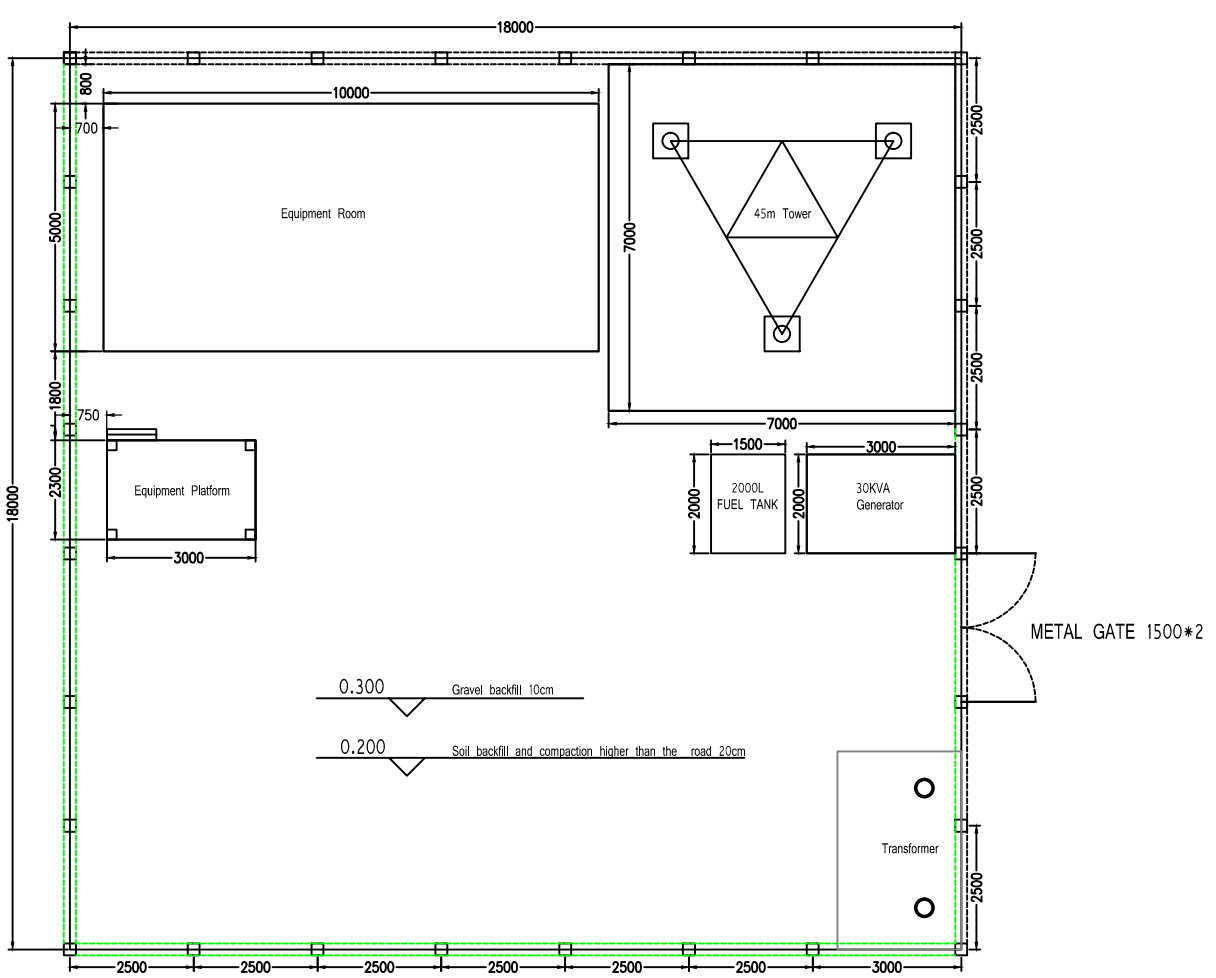
	Myanmar Fiber Optic Communication Network Co;Ltd		MFOCN SITE CODE			DRAWER		DATE		PROJECT	MFOCN SELF SUPPORT TOWER 45M
			SITE TYPE			TECHNICAL DIRECTOR		DATE		SUBJECT	Myittha Site 45m triangle tower foundation earth screen plan
	Adrress	2nd floor,building 12,MICT Park,Hlaing Tsp,Yangon,Myanmar	AERIMETER AREA	<M>	LEASED AREA <SQM>	REVIEWER		DATE			
	Mobile	+9594317433	LATITUDE		LONGITUDE	APPROVED BY		DATE		DRAWING NO.	
	E-mail	cao.xuewu@mfocn.com.mm									

ANNEX 4

DETAIL DRAWING OF TOWER

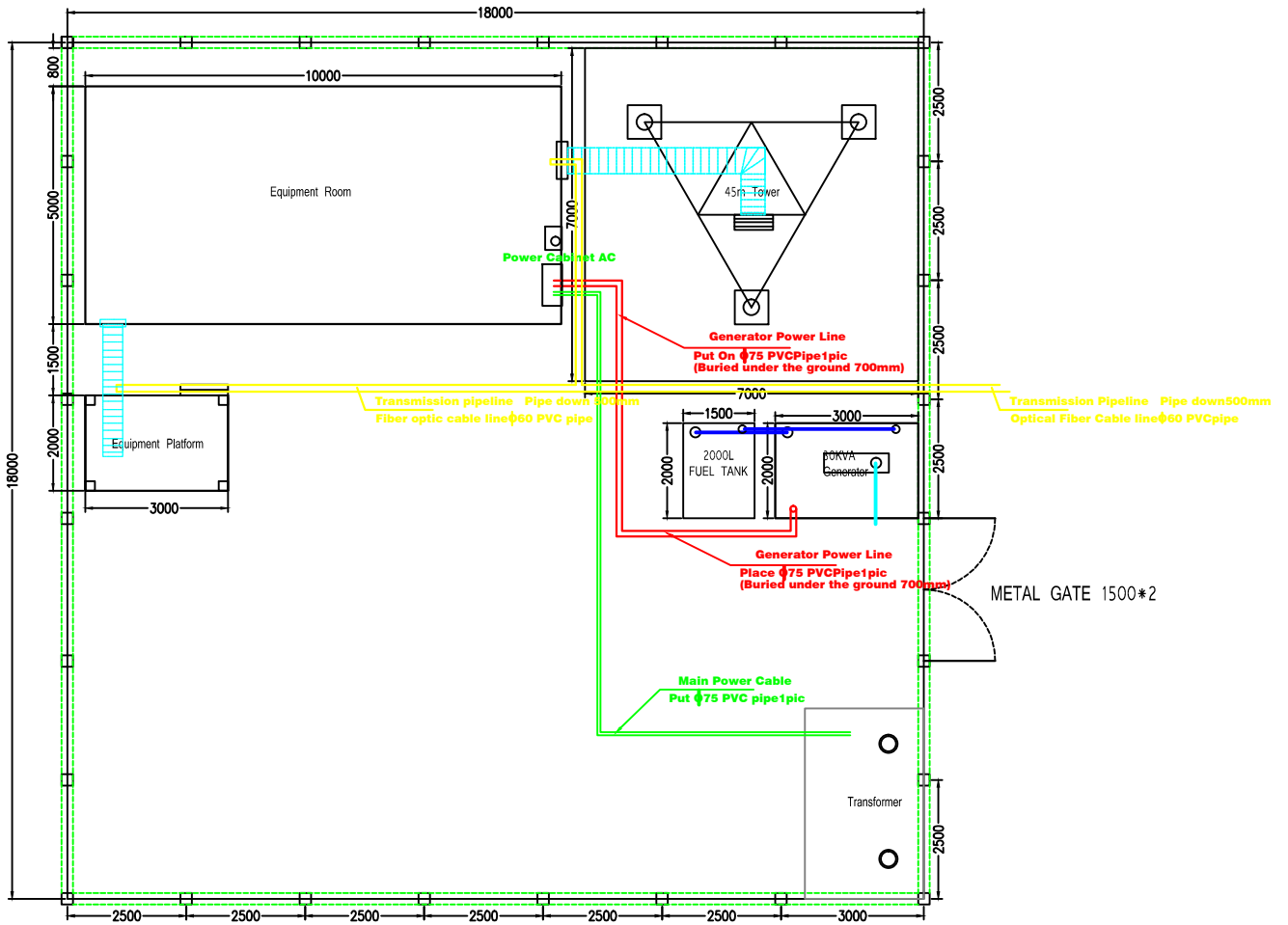
AND

BASE TRANSMISSION (BTS)



ARCHITECTURAL PLAN VIEW

	Myanmar Fiber Optic Communication Network Co;Ltd	MFOCN SITE CODE			DRAWER		DATE		PROJECT	MFOCN SELF SUPPORT TOWER 45M
		SITE TYPE			TECHNICAL DIRECTOR		DATE		SUBJECT	Myittha Site Layout Plan
	Adrress: 2nd floor,building 12,MICT Park,Hlaing Tsp,Yangon,Myanmar	AERIMETER AREA	<M>	LEASED AREA <SQM>	REVIEWER		DATE			
	Mobile: +9594317433	LATITUDE		LONGITUDE	APPROVED BY		DATE		DRAWING NO.	
	E-mail: cao.xuewu@mfocn.com.mm									



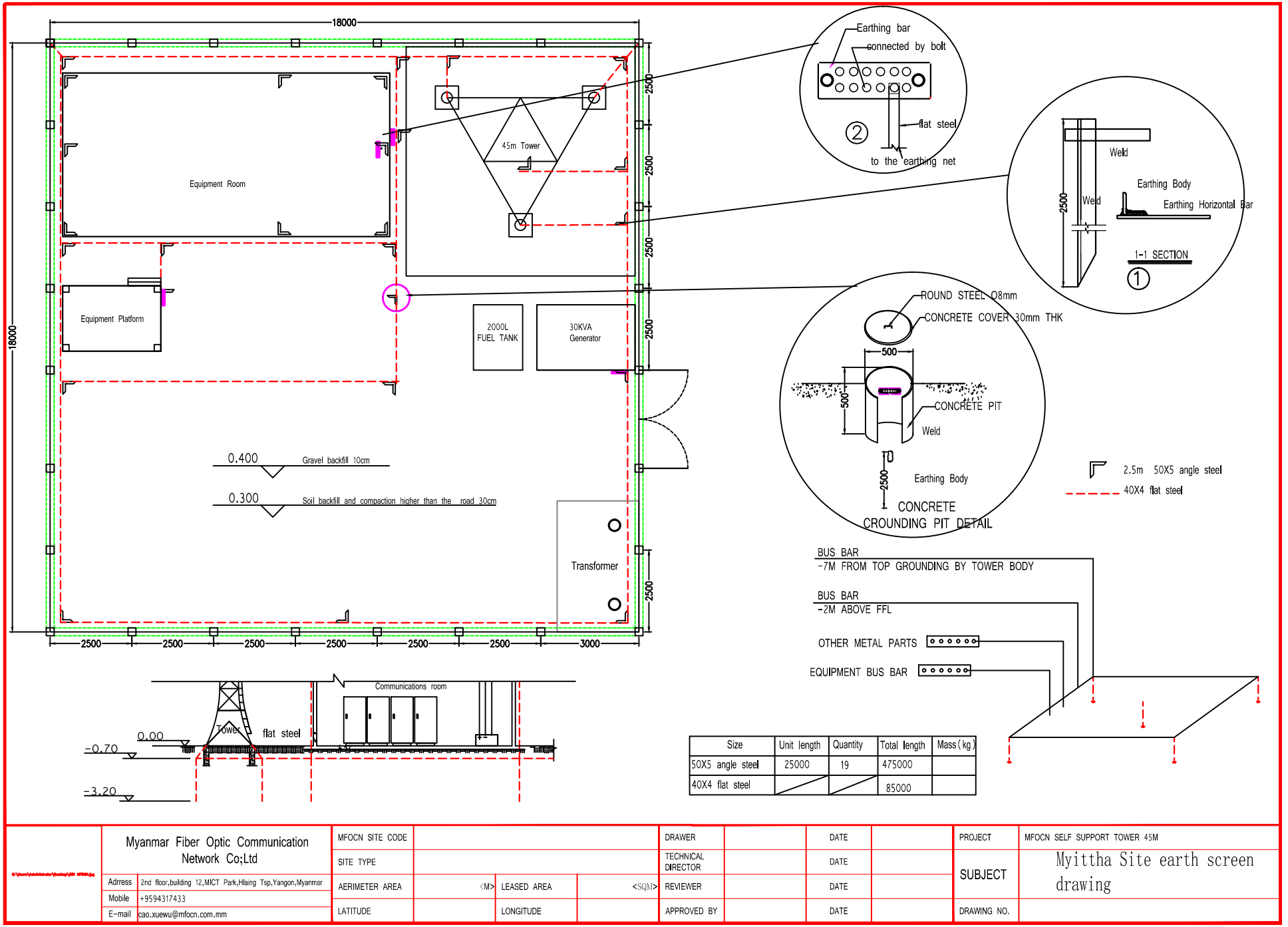
Notice

1 **All the buried pipe shall be 700 See details in drawing**

2 **Design basis Basic wind pressure0.4KN/M×M Bearing capacity of foundation FK≥90Kpa Earthquake intensity 7degree**

3 **Leveling and compacting ground Laying and compacting 100 gravel Main access road 1000width thickness100 concrete c10**

	Myanmar Fiber Optic Communication Network Co;Ltd	MFOCN SITE CODE			DRAWER		DATE		PROJECT	MFOCN SELF SUPPORT TOWER 45M
		SITE TYPE			TECHNICAL DIRECTOR		DATE		SUBJECT	Myittha Site Pre-Buried Pipeline Plan
	Adrress 2nd floor,building 12,MICT Park,Hlaing Tsp,Yangon,Myanmar	AERIMETER AREA	<M>	LEASED AREA <SQM>	REVIEWER		DATE			
	Mobile +9594317433	LATITUDE		LONGITUDE	APPROVED BY		DATE		DRAWING NO.	
	E-mail cao.xuewu@mfocn.com.mm									



Size	Unit length	Quantity	Total length	Mass(kg)
50X5 angle steel	25000	19	475000	
40X4 flat steel			85000	

Myanmar Fiber Optic Communication Network Co;Ltd		MFOCN SITE CODE			DRAWER		DATE	PROJECT	MFOCN SELF SUPPORT TOWER 45M
		SITE TYPE			TECHNICAL DIRECTOR		DATE	SUBJECT	Myittha Site earth screen drawing
Adress	2nd floor,building 12,MICT Park,Hlaing Tsp,Yangon,Myanmar	AERIMETER AREA	<M>	LEASED AREA <SQM>	REVIEWER		DATE		
Mobile	+9594317433	LATITUDE		LONGITUDE	APPROVED BY		DATE	DRAWING NO.	
E-mail	cao.xuewu@mfocn.com.mm								

ANNEX 5

SPOOLS OF FIBER OPTIC CABLE

Figure : Component of Fiber Optic Cable and Cable Spool

ENVIRON

Date: April 2015

ANNEX 6
RESUMES OF ENVIRON PERSONNEL

Virginia Alzina, PhD | Principal Consultant and Director.

Yangon, Myanmar
+95 (9) 431 58604 | valzina@environcorp.com | Skype: virginiaalzina

Dr. Virginia Alzina has over 19 years of experience in environmental and social sciences, policy and engineering with emphasis on environmental and social assessments, resource efficiency, pollution control, climate change and sustainability. Virginia has global experience in applying resource efficiency audits for private companies, reviewing environmental and social assessments of major projects, managing projects related to climate change and promoting green technologies. She has held a broad spectrum of professional roles on advisory services, investment screening, capacity building, coaching teams and knowledge management. Her work has been conducted in over 45 countries of Latin America, the Caribbean, Europe, Asia, Africa and the Middle East. She has extensive experience with international environmental and social impact assessment (ESIA) practices and other safeguard policies such as the Equator Principles, the International Finance Corporation Performance Standards and other international financial institution requirements having screened and reviewed environmental documentation at various stages of major development projects.

EDUCATION

2001 DSc Engineering Management and Systems Engineering, George Washington University, USA

1998 MSc Environmental Sciences and Policy, Johns Hopkins University, Washington DC, USA

1996 Licenciatura Political Science and Sociology, Universidad Pontificia de Salamanca, Spain (recognized as a M.A. in Sociology by World Education Services)

EXPERIENCE

Environmental and Social Impact Assessment

- Acted as technical reviewer of environmental and social management plans and other EA related documentation of public and private operations for categorization and compliance with Equator Principles policies and standards on behalf of IDB. The screening was conducted over 500 projects.
- Prepared and delivered over 20 training courses on ESIA for different stakeholders on behalf of IDB at national and regional level and including training of trainers.
- Acted as team leader of the strategic environmental assessment (SEA) for over 150 infrastructure projects of the 12 countries of South America joining the Initiative for the Integration of the Regional Infrastructure of South America (IIRSA) on behalf of IDB.
- Acted as team leader of the regional EIA systems review for Latin American and Caribbean countries on behalf of IDB. The project covered 26 countries and analysed strengths and weaknesses of national legislation, institutions, ESIA studies and ESMP.
- Acted as project manager and both environmental and social specialist on several ESIA teams conducted in Asia-Pacific countries. Also prepared numerous proposals and environmental assessment and management reports on the following sectors; agribusiness, real estate, oil and gas, mining, infrastructure, and manufacturing among others.

Pollution Control

- Acted as team leader of the Green Competitiveness Initiative that carried out around 120 audits to companies in over 20 countries of Europe, Eastern Europe, Middle East and North Africa (MENA). Led numerous partnerships on behalf of CP-RAC with national financial institutions, governments, international

financial institutions (IFIs) and national and regional agencies around MENA countries to promote the application of green technologies in private companies while making substantial economic profits.

- Acted as team leader of numerous projects and sectoral guidelines promoting the application and compliance of best available techniques (BATs) and best environmental practices (BEPs) for manufacturing industrial sectors including petrochemical, olive oil, tanning, food and beverage, meat processing, dairy, cement and ceramic. Specific projects included:
  - Lake Mariout integrated management project, Alexandria, Egypt
  - Coastal areas management program, Morocco and Spain
  - Sustainable management of industrial areas project, Tunisia and Morocco
- Prepared the research and reviewed trends (as team leader) of sustainable production and consumption in the Mediterranean region of the industrial sector for CP-RAC. Included 18 national country profiles of Mediterranean countries and a regional analysis of the trends.
- Acted as team leader promoting the EU Integrated Pollution Prevention and Control (IPPC) principles and standards in the industrial sector in Mediterranean countries on behalf of CP-RAC. Conducted several regional and national seminars and training activities.

Climate Change

- Led the preparation of the environmental component of the Green Neighborhood project for Metropolis Global promoting green technologies and CO2 emission reduction in Latin American municipalities in Colombia, Brazil, Ecuador and the Dominican Republic. The environment component specifically targeted the reduction of CO2 in the transport, waste and building sector and at the promotion of renewable energy and promotion of projects to obtain carbon credits.
- Acted as team leader of a project financing innovative practices and technologies for climate change mitigation in sectors including ceramic, cement, meat industry, used oils, batch chemical, pulp and paper, metal, logistic, dairy, olive oil, textile, hazardous waste, office and hotels on behalf of CP-RAC.
- Acted as team leader of a project financing innovative practices on CO2 mitigation in the urban transport, waste and forestry sectors on behalf of IDB. The outcome of this project was summarized in one regional and three national publications.

Sound Chemical Management (Persistent Organic Pollutants, Mercury, REACH, SAICM)

- Acted as team leader of a project financed with global environment facility (GEF) funds to assist MENA countries on environmentally rational management of equipment, stocks and waste containing PCB's or contaminated by them, specifically for the elimination and disposal of PCB's in Egypt, Libya, Albania, Syria and Lebanon on behalf of CP-RAC. Included a range of activities from project inception to project execution and numerous partners from multilateral organizations and national counterparts.
- Assessed as team leader the real uses and production of brominated flame retardants in MENA countries including Croatia, Cyprus, Israel, Libya, Monaco, Serbia and Syria on behalf of CP-RAC. Analyzed the legal and management framework including its production, use and reserves.
- Directed the regional research of the strategic document to facilitate information on financial resources for the implementation of the Stockholm convention and synergies between the Stockholm, Basel and Rotterdam conventions and the strategic approach for international chemicals management (SAICM) among the MENA countries.
- Organized training on the assessment of national implementation plans under the Stockholm convention on behalf of CP-RAC. Included participants from Cameroon, Chad, Djibouti, Greece, Guinea, Jamahiriya Arab Republic of Libya, Mali, Mauritania, Morocco, Senegal, Spain, Tunisia and Turkey, and

representatives from the GEF, the World Bank and the Association for the Development and Protection of the Environment.

- Led the partnership with UNITAR to provide technical support on the preparation of the national chemical products profile for Malta on behalf of CP-RAC.
- Contributed as a team member to the regional seminar on the presentation and implantation of REACH to non EU members of MENA countries on behalf of CP-RAC.
- Implemented UNEP's plan for mercury and other heavy metals on behalf of CP-RAC. Supervised the study Vigilance and Monitoring of Heavy Metals in Spain and its Geographic Reference and the new Spanish Plan for Heavy Metals; both of which formed the basis of the strategy on mercury of the Mediterranean.

Sustainability

- Acted as technical reviewer of the guidelines targeted at assisting Hong Kong listed companies in compliance with environmental social governance (ESG) reporting on behalf of Civic Exchange. Tasks included developing ESG indicators, interviewing key stakeholders and preparation of comments.
- Acted as team leader of a project financing innovative practices on resource efficiency and CO2 mitigation in the hotel and office sectors on behalf of CP-RAC. Subsequently two environmental management guidelines were published and numerous training sessions conducted for Mediterranean countries.
- Acted as a team member and technical reviewer in the preparation of safeguards policies and strategy documents for both the environment and social sector including strategic environmental assessment guidance for conditional credit lines and enclave projects on behalf of IDB.
- Acted as a team member in the preparation of an environmental management project in Guyana on behalf of IDB. Participated in loan identification, orientation and analysis of the project.
- Acted as team leader of the regional project to assess the regulatory and institutional capacity of public institutions in Latin American and Caribbean countries on behalf of IDB.
- Acted as a team member in the preparation of the revised version of the environmental strategy of Costa Rica on behalf of IDB. Participated in loan identification, orientation and analysis of the project.

Prior to joining ENVIRON, Virginia held the following positions:

- International Advisor, Metropolis Global, Inventec and Civic Exchange, Washington, China and Hong Kong
- Director, United Nations Environment Program, Mediterranean Action Plan, -Cleaner Production Regional Activity Centre, Barcelona, Spain
- Senior Environmental Protection Specialist, InterAmerican Development Bank, Washington DC
- Social Specialist, InterAmerican Development Bank, Washington DC
- Consultant, United Nations Secretariat, New York

CREDENTIALS

Professional Affiliations and Activities

Member, International Association for Impact Assessment

LANGUAGES

Fluent in English, French, Spanish, Catalan, Italian and Portuguese, Beginner Arabic and Myanmar.

Juliana Ding, PEng | Principal

Singapore
+65 6469 9918 | jding@environcorp.com

Juliana Ding is the Managing Director of ENVIRON's Asia operation. She has over 20 years of experience in environmental science and engineering; occupational health and safety, with emphasis on regulatory advisory; health, safety and environmental assessments; management systems and due diligence; environmental impact assessments; contaminated land assessments; and water resources engineering and hydrogeology. She has worked extensively in the Asia-Pacific region, and is familiar with the environmental, health and safety regulatory framework in several regional countries. She is a registered professional engineer in Australia, an accredited environmental consultant with the Singapore National Environment Agency and an accredited workplace safety and health officer with the Singapore Ministry of Manpower.

EDUCATION

2000 MSc Safety, Health and Environmental Technology, National University of Singapore

1987 Postgraduate courses in environmental engineering, soil and land evaluation, and land drainage, University of Alberta, Canada

1989 BSc Agricultural Engineering, University of Alberta, Canada

EXPERIENCE

Environmental Management Systems (ISO 14000)

- Principal Consultant for the development and implementation of an EMS for a major Japanese electronics manufacturing plant, one of the largest manufacturing facilities in Singapore. The project included preparation and presentation of training workshops to over 30 company personnel. Facility certified to ISO 14001 in November 1996, one of the first 5 companies in Singapore, by the Singapore Productivity and Standards Board.
- Principal Consultant for the development and implementation of an EMS for two concrete batching plants in Singapore including the training of about 10 middle to senior managers. Facilities certified in December 1998 by the Singapore Productivity and Standards Board.
- Principal Consultant for the development and implementation of an EMS for a multi-national packaging firm at their Jurong plant in Singapore. The project involves the training of over 20 personnel in environmental awareness, auditing and environmental management system. Facility certified to ISO 14001 in October 1997 by Lloyds.
- Principal Consultant for the development of an environmental management system based on ISO14000 for two industrial estates, one in Thailand, the other in the Philippines. The project included the training of park management staff.
- Lead Consultant for the development of an environmental management system of two assembly plant facilities and a service centre in Malaysia for Ford Malaysia. Facilities were certified to ISO14001 in early 2001 by TUV.
- Project team member in the preparation of environmental compliance/management manuals for Colgate Palmolive facilities in Malaysia, Thailand and the Philippines.

Environmental, Health & Safety Audit, M&A Due Diligence and Impact Assessment

- Completed numerous environmental, health and safety site assessments, compliance auditing and environmental impact assessment projects. Some key project experience are detailed below:
- Principal Consultant for the preparation and development of the Pollution Impact Assessment for Exxon Chemical's Singapore Chemical Complex (SCC) on Pulau Ayer Chawan, Singapore in fulfillment of the requirements of the Ministry of Environment for planning submission and approval. The SCC comprised an ethylene cracker plant and four downstream plants.
- Principal Consultant for the preparation and development of the Pollution Impact Assessment for Singapore Syngas Pte Ltd's gasification facility (a JV between Messer and Texaco) on Jurong Island, Singapore in fulfillment of the requirements of the Ministry of Environment for planning submission and approval. Was retained by Syngas to undertake a hazard analysis of the tanker sulfur transport operations under the requirements of the Ministry of Environment, assist in the development of an environmental management system for the facility and ongoing environmental programs.
- Asia-Pacific Project Coordinator for several large environmental mergers and acquisitions due diligence with multi-sites in the Asia-Pacific region.
- Project Manager for the environmental due diligence for the privatization and divestiture of 5 power plants.
- Consultant to a US multinational corporation in undertaking environmental site assessments and regulatory compliance reviews of agro-chemicals/ pharmaceutical/ medical device facilities in Taiwan, Korea, Singapore and the Philippines.
- Consultant for environmental, health and safety audits of various industrial facilities including semi-conductor facilities, copper-clad laminate plants, aero-engine maintenance facilities, automotive facilities, pharmaceutical facilities, packaging plants, electronic manufacturing plants, chemical and petrochemical plants in Singapore and the region.

Environmental Baseline and Hydrogeological Studies

- Member (Project hydrogeologist) of a project team involved in the investigation and assessment of the extent of groundwater contamination at a large industrial Superfund site in Connecticut, USA. Key responsibilities include mapping of hydrochemistry and hydrogeological characteristics, and interpretation of field data from over 100 boreholes/wells.
- Completed Phase I, II, III and independent remediation validation of a site contaminated with hydrocarbons, refinery catalysts and other related refinery wastes for a US multinational corporation in Singapore.
- Project Manager of an environmental site assessment, site contamination investigation and review of operations of an oil terminal facility in Shandong Province, China. The study included recommendations for site clean up and improvements to the management of operations to minimize their impact on the environment.
- Project Manager for an environmental baseline study of a petrochemical complex in Singapore in support of financial backing. The project involved soil and groundwater, marine, air quality and noise assessments.

- Conducted and supervised an environmental soil and groundwater baseline assessment of petroleum product storage facilities in Kuantan and Pasir Gudang, Malaysia for Mobil.
- Supervised and coordinated field programme for an environmental soil and groundwater contamination assessment at Subic Bay, Philippines immediately following the closure of the US naval base.
- Project Manager for Phase II environmental baseline and contamination assessments at various plant locations in Singapore and the Asia region.
- Site Manager for the installation of groundwater monitoring bores to assess the extent of groundwater contamination at a nickel refinery in Western Australia.
- Project Manager for the assessment of the impact of residue disposal areas on surface waters and groundwater at the Alcoa's Pinjarra Alumina Refinery, Western Australia. Also completed an aquifer performance review of the Pinjarra Alumina Refinery borefield in fulfillment of licensing requirements.
- Project Manager for a project involving the monitoring and management of a contaminant plume using a network of recovery bores at a cement plant in Western Australia. Responsible for the preparation of reports on the performance of the recovery system required under the terms and conditions of Pollution Control Licence. Coordinated and supervised the installation of a new recovery bore and aquifer testing. Completed a groundwater quality audit for the site and a cost analysis for the upgrading of the recovery system.
- Project Engineer for the investigation of potential impacts on the shallow groundwater regime as a result of a proposed golf course development in Jandakot, Western Australia for Westralian Forest Industries Ltd. The site is located near a major potable groundwater resource for the city of Perth.
- Completed the aquifer performance review and assessment of the Boyanup town water supply borefield for the Water Authority of Western Australia.
- Completed a review on the potential impacts of the Dawesville Channel Development on the groundwater regime which includes proposals for groundwater and nutrient management for CP Developments Pty Ltd, Western Australia. The report forms part of a Public Environmental Review (PER).
- Completed hydrogeological analysis to evaluate aquifer characteristics and tidal influence, for an investigation and environmental baseline assessment of a proposed Adipic Acid plant site in Singapore.
- Resident hydrogeologist for three weeks at the Worsley Alumina Pty Ltd Boddington Gold mine in Western Australia, supervising the installation and testing of dewatering and monitoring bores for Pit B0 dewatering project. The field results were used to develop the dewatering strategy.
- Field supervisor for the installation of groundwater monitoring bores around a tailings dam to assess the extent of cyanide contamination at Leinster, Western Australia.
- Completed several hazardous waste contamination investigations at petrol station sites in Perth, Singapore and Malaysia.

- Coordinated and supervised the installation of a network of groundwater monitoring bores around residue disposal areas at both Alcoa's Wagerup and Pinjarra alumina refineries in Western Australia. Each project consisted of about two months site work followed by submission of a comprehensive hydrogeological report to the client. Was retained by Alcoa to manage and supervise the retrofitting and replacement of 150m deep production wells.

Hydrological Studies

- Alcoa of Australia. Completed a hydrological assessment of the Hedges and Boddington open cut gold mines catchment near Boddington, Western Australia. The data and results from the study were used as input data for a groundwater model of the Hedges site. The purpose of the overall study is for the planning of the rehabilitation of the mine following cessation of mining activities.
- Westralian Sands Limited. Project Engineer for the assessment of final water levels in two open cut mines located in Boyanup, Western Australia following cessation of mining activities. The purpose of the study is to determine whether the open cuts could be rehabilitated as groundwater-fed lakes for recreational use. Issues such as water quality, short and long term impacts on neighbors following cessation of dewatering activities at the mine site and subsequent rehabilitation, flood levels and control requirements were also addressed. These 'lakes' have since been rehabilitated with water levels within the predicted range in stage heights.
- BHP Petroleum Pty Ltd. Completed a flood risk analysis for the Tubridgi gas field flow line process plant near Onslow, Western Australia. The study provided recommendations for minimum elevations allowable for siting of critical plant and equipment. Peer reviewed the subsequent hydrological study and design of the drainage system for the site. The site has since experienced a major cyclone with limited flooding and no damage to critical equipment.
- Multiplex Constructions Pty Ltd. Completed a hydrogeological and water supply study for an irrigation project in the Upper Swan Valley, Western Australia.
- Sanwa Vines Pty Ltd. Project Manager for the implementation and management of data logging systems to monitor stream flow discharge from a golf course and resort development into nearby rivers. This forms part of an ongoing management programme to monitor and minimise the export of nutrients derived from on-site fertiliser application and domestic waste disposal.
- Portman Mining Ltd. Completed the flood hydrology study and design of stormwater diversion channels around the Cracker Pit mine at Woodie Woodie, Western Australia.
- Placer (Granny Smith) Pty Ltd. Project Manager for a feasibility study on the use of surface runoff to augment mine process water supply. The project entailed the installation of rainfall and stream gauging stations in the catchment to collect data for rainfall runoff analysis.
- Placer (Granny Smith) Pty Ltd. Completed a flood study for the Granny Smith mine using hydrological models, HEC-2 and RORB. Predicted flood stages in channels were determined to assist in mine planning and in the construction of flood control structures such as levees. Other flood hydrology studies completed for Placer include those for Childe Harold Pit and Keringal Pit.

- Canning Resources Pty Ltd. Completed a hydrology study for the proposed Kintyre uranium mine in northern Western Australia . Backwater analysis were performed using the HEC-2 model and from stream flow data to determine stage-discharge relations. These were then used to estimate volumetric runoff coefficients for the catchment.
- Western Mining Corp Ltd. Completed field infiltration trials and analysis for a tailings dam site selection at Leinster, Western Australia.
- Rhone-Poulenc Chimie Australia. Completed a water pollution control assessment for a gallium extraction plant at Pinjarra under the terms and conditions of the Pollution Control Licence.

Prior to joining ENVIRON, Juliana held the following positions:

- URS/Dames & Moore, Manager – Singapore, 1995 – 2001
- Dames & Moore, Singapore, Project Manager, 1993 – 1995
- Secondment to Dames & Moore, Boston (Jan – April 1991)
- Dames & Moore, Perth, Western Australia, Project Engineer, 1988 – 1993
- Total Eden Irrigation, a subsidiary of Universal Waldeck, Irrigation Engineer, 1987 - 1988

CREDENTIALS

Registrations and Certifications

Institution of Engineers, Australia (1989) Registration No. 99813

Accredited Auditor under Singapore Ministry of Environment's Safety Audit Scheme

Professional Affiliations and Activities

Committee Member, Institution of Engineers, Australia (IE Aust), Singapore Branch (1995 – 2002);

Vice President, IE Aust, Singapore Branch (1995- 1997; 1999- 2002);

Committee Member, Hydrology and Water Resources Panel, IE Aust, Western Australia

Division (1989 - 1991)

PUBLICATIONS & PRESENTATIONS

"Environmental Management for Industrial Operations", Paper presented at the 2nd annual Conference on Servicing the Oil and Gas Industry in Asia, 11-12 January 1996 organized by Asia Business Forum.

"Development and Implementation of an Environmental Management System", Paper presented at the 1996 Pan-Asian Summit on Dangerous Goods, 20-22 March 1996 in Singapore organized by Institute for International Research (IIR).

"Regulatory Compliance and Beyond – Cost or Opportunity", Paper presented at the Asia Business Forum Conference on Chemicals Industry in the Emerging Countries, 16-18 September 1996.

"Environmental Impact Assessment in the ASEAN Region", Paper presented to senior employees of Shell Brunei Berhad at a two day seminar/workshop on Environmental Assessment, 14 15 October 1996, Brunei Darussalam.

Chaired Panel Discussion at an Environmental Management System and ISO14000 Seminar for industry members presented by Dames & Moore and organized by Singapore Polytechnic, 5 December 1996.

"Applying Practices in Safety Management to Environmental Management", Paper presented at International Communications for Management (ICM) Conference on Best Practices in ISO14000 in Kuala Lumpur, Malaysia, 22-23 February 2000.

"The Rationale and Benefits of Corporate Environmental Reporting", Paper presented at the Association of Chartered Certified Accountants, UK Corporate Environmental Reporting Conference in Kuala Lumpur, Malaysia, 10-11 March 2003.

"Environmental Issues and Liabilities in the Asia Pacific Region", Presented at a seminar on Mergers and Acquisitions organized by AEL Oy, Helsinki, Finland, 5 November 2003.

"Chemical Control – Recent and Upcoming Legislation and Trends in Asia", Presented at a seminar on REACH for Compliance, Managing New Global Chemical Initiatives organized by Squire Sanders and Dempsey LLP, Hewlett Packard and the Silicon Valley Manufacturing Group, Palo Alto, USA, 20 April 2004.

Neil Daetwyler | Principal

Singapore
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Neil Daetwyler is a leader of ENVIRON's International Finance practice. Neil specialises in the environmental and social assessment of major resource development projects, many of which require compliance with internationally recognised standards and guidelines, such as the Equator Principles and the policies and procedures of the World Bank Group. He also contributes to the environmental and social management of these projects, including the development and implementation of environmental and social action plans (ESAP). These plans are used to translate project sponsor commitments into realistic and verifiable environmental and social management programs during project construction and operations. Neil also provides project management for a wide variety of environmental services.

EDUCATION

BSc (Hons) Engineering Geology and Geotechnics, Portsmouth Polytechnic, UK

EXPERIENCE

- Project Director for the development of a comprehensive environmental and social management plan (ESMP) to international Lender standards (the Equator Principles and the OECD Common Approaches) for the 1,220 km Nord Stream gas pipeline project between Russia and Germany. Development of the ESMP required the establishment of a Commitments Register that compiled a wide range of project commitments including those made in national EIAs for Russia, Finland, Sweden, Denmark and Germany. The ESMP comprised 18 Construction Management Plans and supplementary documentation such as a Project Standards Document.
- Project Director for a range of services when ENVIRON was subsequently retained to assist Nord Stream with the implementation of the ESMP during project construction.
- Project Director for services associated with the development of an Environmental and Social Assessment of a world-class copper-gold mining project in Mongolia. ENVIRON provided assistance in upgrading an existing draft ESIA to satisfy the requirements of international lenders (including the Equator Principles, the Performance Standards of the IFC and the Performance Requirements of the EBRD).
- Responsible for the delivery of a wide range of social and environmental services to ensure Equator Principles compliance of a 13,000km long fibre optic submarine telecommunications cable system running the entire length of the India Ocean coast of Africa from South Africa to Egypt. The project provides cable landings in South Africa, Mozambique, Tanzania, Kenya, Djibouti, India and Egypt, and ENVIRON is responsible for securing environmental approvals in all landing countries. The environmental approvals process involved formal environmental assessments in five countries, an Equator Principles EIA for the overall project in addition to the development of a Social and Environmental Management System incorporating an Environmental and Social Action Plan.
- ENVIRON's Project Manager for an assignment as Monitoring Consultant to a Lender Group to monitor implementation of an Equator Principles-compliant Environmental and Social Management Plan during the construction and operation of a 2.5 million tonnes per annum cement project in Nigeria (which includes a 47 MW dual fuel captive power plant).

- Project Director for an ESIA for the development of a 600MW coal-fired power plant in Asia. The project is required to be developed and operated to a wide range of Lender standards and guidelines, including the IFC Performance Standards.
- Retained by a major UK Equator Principles bank to present seminars on the practical applications of the Equator Principles. Presentations were made to thirty bank staff at two locations in the UK.
- Project Manager for ENVIRON's role in the development and review of an extensive range of Environmental and Social Management documentation associated with the financing, construction and operation of the PERU LNG project. The project includes a 4.4Mtpa LNG Plant and marine facilities on the Pacific coast of Latin America and a 400km gas pipeline from Amazon basin gas fields to the LNG Plant. The environmental and social documentation included the upgrading of elements of the project environmental and social impact assessments that were responsive to national requirements to the standards required of International Finance Institutions including multi-lateral development agencies such as the Inter-American Development Bank, and various Export Credit Agencies. Applicable standards included the IFC's Performance Standards, the revised (July 2006) Equator Principles, and the OECD Common Standards.
- Equator Principles Gap Analysis for a mining and mineral processing project involving a rare earths mine in Western Australia and a rare earths processing plant in Malaysia. This involved: checking the project environmental impact assessment documentation (for both Malaysia and Australia) against the EP social and environmental assessment requirements (IFC Performance Standard 1, in essence); for the Project in Malaysia, identification of applicable EP numeric standards and guidelines, and comparison with predictive data given in the Malaysia EIA; for the Project in Malaysia, identification of social issues that are required to be addressed by the EP, comparison with any treatment given in the Malaysia EIA and against the proponents plans for social and community engagement; assessment of any other relevant EP requirements (including EMS provisions for the project in both Malaysia and Australia).
- Project Manager when ENVIRON was retained by a consortium of international finance institutions to act as Lenders' Independent Environmental and Social Consultant in respect of a Greenfield cement project in Nigeria. A Gap Analysis was performed, comparing the project environmental and social impact assessment documentation prepared for host country purposes to international standards, specifically: the Equator Principles; various standards, guidelines and policies of the World Bank Group; and various standards of the European Finance Partners. Based on the results of the Gap Analysis an Environmental and Social Action Plan was prepared detailing the sequence of actions necessary for the project to achieve compliance with the international standards. A suite of Environmental and Social Management Plans was then prepared, to set out the operational details of how identified adverse environmental and social impacts were to be eliminated, offset, managed or mitigated.
- Project Manager when ENVIRON was commissioned to conduct a Sustainability Assessment for an Alumina Refinery project in West Africa, for a confidential client. The scope of the work of the Sustainability Assessment included extensive Stakeholder Engagement activities, various environmental and social inputs to a Site Selection process, and a World Bank Group Category A Environmental Assessment, in accordance with the requirements of the IFC.
- Project Manager for environmental and socioeconomic services for the development of production facilities at oil fields in central Africa, a 1000 km export pipeline to the Gulf of Guinea, a marine

terminal and associated facilities such as pump stations, and infrastructure upgrades. Services included the preparation of environmental assessment documentation responsive to World Bank and IFC Category A requirements, training of project contractors in the preparation of their environmental and social plans, and field monitoring of contractor work activities and on-site training in the implementation of environmental management plans.

- Assisted with the air dispersion modelling assessment and pollution control study for Shell Eastern Petroleum Limited's long residue cracking unit revamp project, Bukom Refinery, Singapore.
- Conducted air dispersion modelling and assisted with the air quality impact assessment for Technip Oceania's proposed Kupe gas project, New Zealand.
- Conducted air dispersion modelling and assisted with the air quality impact assessment for Lynas (Malaysia)'s proposed advanced materials plant, Malaysia.
- Assisted with the air dispersion modelling assessment for Invista (Singapore)'s nitric acid plant project, Singapore.
- Conducted air dispersion modelling and assisted with the air quality impact assessment for Perth Energy's proposed open cycle gas turbine peaking plant, Perth.
- Assisted with the air dispersion modelling and air quality impact assessment for the proposed Unimatec acrylic rubber plant, Jurong Island, Singapore.
- Completed a stud of ecological water requirements on the Gnangara and Jandakot Mounds under Section 46 of the Environmental Protection Act. Reviewed and redeveloped a monitoring programme and developed a management framework, and identified the ecological values of groundwater dependent systems (including groundwater dependent vegetation, wetlands and aquatic macroinvertebrate assemblages) on the Gnangara and Jandakot Mounds, Western Australia.
- Conducted the south-west Yarragadee vegetation susceptibility assessment identifing the ecological values of groundwater dependent systems (including groundwater dependent vegetation, wetlands and aquatic macroinvertebrate assemblages) in the southwest region Western Australia.
- Conducted vegetation assessments and monitoring of wetland ecosystems and groundwater dependent vegetation on the Swan Coastal Plain and in the southwest region of Western Australia.

Prior to joining ENVIRON, Neil was a partner at Dames and Moore.

CREDENTIALS

Registrations and Certifications

Chartered Professional Engineer, Institution of Engineers, Australia

Chartered Engineer; Chartered Environmentalist, Institute of Materials, Minerals and Mining, UK

Kaythi Soe Myint

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Kaythi Soe Myint earned her Master of Public Health from Mahidol University of Thailand and worked in health education programs in Thailand for years. She designed and implemented a health education and outreach program for migrant workers in Thailand. She conducted extensive discussion sessions with migrants to determine gaps in health knowledge and services for Burmese migrant workers on rubber plantation, construction and other sites. She also has experience in facilitating the interacting process to solve the social issue among the refugees in Thailand.

She has worked in the field with migrant groups, refuges, local communities and NGOs, and has been conducting health and social baseline survey to assess working conditions, identify medical access, hygiene and water sanitation. Moreover, she also has expertise in survey design, qualitative and quantitative techniques for data collection. She has more than 12 years of work experience in various sectors. She also has experience in seeking cooperation with various agencies from Government in Thailand, Singapore and Myanmar. She is also acknowledged for her leadership, analytical, problem solving and communications skills.

EDUCATION

2004 Master of Public Health, supported by partial scholarship from open Society institute, Focus on primary health care, Mahidol University, Bangkok, Thailand

1994 B.S.(Honours), University of Yangon, Myanmar

EXPERIENCE

Health Specialist — *Jun. 2014 – Present*

ENVIRON Myanmar
In Myanmar

Environmental and Social Assessment

- Acted as social researcher to gather all information pertinent to the development of the area, review the relevant laws, policies, guidelines, contributed to setting up of project work programing.
- Coordinated budget planning and executed office administration task.
- Liaised with key relevant government departments, learn administrative structures and social structures.

Project Services Manager — *Oct. 2012 – Feb 2013*

Building Markets
In Myanmar

- Took part in planning and implementing country strategy
- Oversaw project's services and operations

- Contributed to the establishment and supervised the project's work plan and the departmental work plan
- Worked with Project Director in establishing office administration, human resources, IT and logistics support
- Liaised with relevant government agencies from Myanmar
- Tracked activities by other teams and contributed to donor reporting
- Ensured the maintenance of property and assets
- Managed logistics for expatriate visitors and new hires (e.g. staff orientation, visa, work permits, etc.)
- Ensured effective internal communications with project team and attend to regular Skype calls and correspondence with HQ
- Coordinated budget planning with HQ

Administrative Executive (Management Trainee) *Aug. 2009 – Aug 2012*
Bunka Language School
Singapore

- Served as assistant manager in small management team in Japanese language school, serving over 1,000 students and offering innovative short courses in Japanese language, both on school premises and in-house to companies.
- Was responsible for program development and outreach, including carrying out student surveys to determine how to enhance programs, tracking enrollment figures and trends, and preparing reports. Handle information requests, explaining teaching methods to prospective students and companies.
- Provided student services, overseeing new student enrollment, planning course schedules, assistance to students. Assist teachers to prepare packages of course material, enrollment lists, and exam papers.
- Maintained student database and records, including data entry, generating reports for manager and other staff.
- Oversaw financial administration, including collection and tracking of payments, preparing purchase orders, and maintaining inventory.

Management Trainee *Jan 2008 – April 2009*
Harriet International Business School
Singapore

- Undertook a range of responsibilities in business school providing a range of entry to advanced level courses. Responsible for student recruitment, including outreach to prospective students, responding to questions, preparing enrollment documentation.
- Provided student support services, regular interaction with students, including consultation on courses and schedule planning. Also liaised with banks to secure education loans, processed student pass or work pass applications with the Ministry of Manpower.
- Maintained student database, generated monthly reports for school management on enrollment and progression.

Training and Outreach Team leader *Jun 2005 – Dec 2006*
Foundation for Education and Development, Phang-na, Thailand

- Designed and implemented health education and outreach program for Burmese migrant workers in Phang-na.
- Undertook mapping and baseline survey of community and held extensive discussions with migrants to determine gaps in health knowledge and services among migrants. Identified malaria prevention education as greatest need among Burmese workers on rubber plantation and other sites.

- Designed and carried out trainings on HIV/AIDS, malaria, and diarrhea prevention for migrant workers, in homes or places of work.
- Oversaw medical support program including coordination of a nurse and doctor serving migrant workers, facilitated medical outreach and referrals of HIV patients to hospitals.
- Sought cooperation with various agencies from the Royal Thai Government

Medical Sales Representative *Aug 1998 – Dec 2002*
Diethelm Pharmaceutical Co Ltd, Myanmar

- Organized promotional activities for medical products, including product presentations and conferences, appointments with doctors and professors.
- Built and maintained positive working relationship with medical staff, wholesalers, and retailers. Worked with wholesalers and retailers to achieve sales targets.
- Managed budget for promotional activities, including catering, speakers, conferences, and hospitality.

Clerk *Apr 1996 – Aug 1998*
Sedona Hotel Yangon, Myanmar

- Provided routine administrative support including reception, filing.
- Managed inventory, prepared purchase orders, and tracked supplier invoices.
- Assisted in hiring and training of new staff, staff data entry, compiled monthly. statistics and prepared report for management and other departments.

OTHER TRAINING

Effective communication Internship Programme, in Indonesia, 2005
Advocacy Strategy and Techniques Development Internship, Philippines, 2005
Accounting, Human Resources Management, SHARTEC in Myanmar, 1997

LANGUAGE and COMPUTER SKILLS

Burmese – mother tongue
English – Fluent
Thai, Japanese – basic

Microsoft office (Word, Excel, PowerPoint)
Database programs – SPSS, other customized database programs

Khaing Thwe Oo

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Ms. Khing Thwe Oo received Master of Engineering specializing in Air Quality Management and Monitoring from Asian Institute of Technology – Thailand in 2014. She also worked as a research assistant for Myanmar of PEER-SEA project when she was doing her thesis (2013-2014). She have a lot of experience in monitoring, lab analysis, and data analysis of environmental engineering especially in air pollution. She had experience in design of air pollution monitoring and management model.

She also earned her first Master of Engineering in Chemical Engineering from Technological University Mandalay, Myanmar in 2012. She has a couple years of experience as an assistant research officer for a research institute and Myanmar Engineering Society in Myanmar. She was conducted in environmental research testing for soil test, waste water testing (DO, pH, BOD and other contaminants) and pilot wind turbine test, staff administration, conducting extension, awareness and management training, She also worked as a trainer for engineering student and a supervisor for many social and technical activities. She attended numerous Engineering trainings and workshops from Myanmar Engineering Society and Asian Institute of Technology (Thailand).

EDUCATION

2014 M.E., Environmental Engineering and Management, Asian Institute of Technology, Thailand
2012 M.E., Chemical Engineering, Technological University Mandalay, Myanmar
2009 B.E., Chemical Engineering, Mandalay Technological University, Myanmar
2008 B.Tech., Chemical Engineering, Mandalay Technological University, Myanmar
2005 Dip. In Food and Chemical Engineering, Associateship of Government Technical Institute, Mandalay, Myanmar

EXPERIENCE

- Research Assistant activities
  -Collected the air samples in Yangon City during a dry season at two sites in Yangon.
  -Chemical analysis and modelling
  -Preparing a technical paper to be publish
- Assistant research officer activities
  -Team leader of the university students for Soil test, DO test, CO_2 measurement around research area.
  -Coordinator of Myanmar Engineering Society (Mandalay) and AIT-MCC.i student for engineering development activities
- Research Young Engineer activities
  -Team leader of the Young Engineer organization of MES-Mdy for local development project. Prepared many technical trips, seminar and workshop for Myanmar Engineering Society (Mandalay)
  -Design calculating for Carbon reduction in emission gases of biomass fuel using Steamer and constructed the pilot tower based on Kyar Minn Gyi, alcohol plant in Mandalay industrial zone. Preparing a technical paper to be publish
- Prepared and delivered some training courses for air pollution problem and related environmental management topics in university students and Engineering conferences.

- Served as team leader and assistant research officer for regional and local development projects especially in environmental engineering activities.
- Delivered an oral presentation in the Fourth National Conference on Science and Engineering (Northern Myanmar)

CREDENTIALS

Member at Myanmar Engineering Society
Member at Myanmar Chemical Engineer Group

TRAINING AND WORKSHOP

- Regional Workshop on Hazardous Chemical Management held in Yangon, Myanmar
- International Confrence CAFEO 32th (The conference of ASEAN Federation of Engineering Organization, SEDONA, Yangon Myanmar)
- First Annual Review Workshop and Technical Training of PEER-SEA Research Network "Assessment of Impacts of the Emission Reduction Measures of Short-lived Climate Forcing Pollutants on Air Quality and Climate in Southeast Asia" in Bangkok, Thailand
- The Special Seminar on "Geotechnical Engineering for Landslides, Foundations and Geotechnical Investigation" , Mandalay, Myanmar
- "Japan-East Asia Network of Exchange for Students and Youths Programme" by Japan International Cooperation Center, in Japan.

HONORS AND AWARDS

- Full Scholarship for 2 Years Master Degree in Asian Institute of Technology at Thailand by The Ministry of Foreign Affairs, Norway
- **"The Best Effort Prize"** on the project title of "*Test Production of Chalk-Sticks for School, Colleges and Universities*" Department of Chemical Engineering, TU-Mdy 2007
- **Third Prize** of Young Engineer Project competition in "*The upper Myanmar Project and Product Show*".2009

PUBLICATIONS & PRESENTATIONS

- Publication a technical paper on the following topic " Study on Carbon Reduction in Emission Gases of Biomass Fuel using Steamer as a Clean Development Mechanism" by CAFEO 30th (The conference of ASEAN Federation of Engineering Organization, Cambodia)
- Publication a technical paper on the following topic "Monitoring for Characterization of Levels and Source Apportionment of Particulate Air Pollution in Yangon, Myanmar" by Asian Institute of Technology, Thailand

LANGUAGE and COMPUTER SKILLS

Burmese – mother tongue
English – Fluent

Htay Aung Pyae, Master of Engineering

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Htay Aung Pyae join Environ starting September 2014. Before employed at Environ, he worked as Assistant Engineer at Aerodrome Standard and Safety Division, A Sub division of Department of Myanmar Civil Aviation for more than 2 years. Concerning to environmental Engineering, he conducted research on municipality of Bago City in 2010. The drainage system of the city has been designed and he introduced appropriate measures to manage wastewater and solid waste along the channel with the consideration for potential risks and hazards in the design. He recommended the municipal department a proposal to avoid flooding due to overflow from Bago River. Now he is working as associate consultant at Environ Myanmar and contribute his knowledge and expertise for making Initial Environmental Examination, Environmental and Social Impact Assessment and Environmental Management Plan.

EDUCATION

2012 M.Eng; Environmental Engineering, Yangon Technological University, Yangon, Myanmar.

2010 B.Eng; Civil Engnieering, Hmawbi, Technological University, Yangon, Myanmar.

EXPERIENCE

Civil Engineering

- Worked as Aerodrome Engineer and prepared design and drawing of aerodromes at Department of civil Aviation, Yangon Myanmar
- Led the team for preliminary engineering works and mass concrete construction at Loikaw Airport Development Project
- Participated as co-auditor when the DCA makes periodical audit dills to aerodrome operators
- Supervised the construction projects scheduling and ensuring the safety, standard and quality assurance at every construction stage and day to day operation
- Reporting the development and discrepancy in timely manner and troubleshooting the problems

Environmental Engineering

- Worked as Researcher at Bago City Development Committee and conducted the Research relating to Municipality, drainage system, Water Supply and Waste Management
- Routed potential water resources for city dweller and proposed feasible process for water treatment for portable water
- Introduced sewer fixtures and appurtenances to avoid accumulative sediment in each channel and waste treatment structure before discharging into nature water body (Bago River)
- Proposed flood mitigation system and structure to avoid inundation from Bago rivers which affect both economy and livelihood of people living in low lying areas.

Zin Mar Lwin, PhD

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Zin mar lwin studied PH.D in environmental science at the University of the Philippines Los Baños, in the Philippines and she has experience on environmental and social assessments, ecosystem structure and dynamics, system analysis, landscape ecology, climate change, economic valuation of environmental and natural resources, pollution control, waste management, water quality and sustainable livelihood analysis. She has over 10 years of experience in agricultural science, plant species diversity analysis and social science, strategic planning, public policy and reporting agricultural projects. Zin Mar emphasis also on watershed management and natural resource conservation, reviewing environmental and social assessments of environmentally critical projects, capacity building on mainstreaming disaster risk and climate risk management into development planning and promoting green technologies. She has held a broad spectrum of professional roles on advisory services, investment screening, environmental training and agro based chemicals, production practices and management. She has knowledge in international environmental and social impact assessment (ESIA), environmental management plans (EMP) with multidisciplinary approach.

2013 PhD Environmental Science, University of the Philippines Los Banos, Philippines

2007 M.Agr.Sc Agricultural Sciences, specialization in Agricultural botany, Yezin Agricultural University, Naypyitaw, Myanmar

2002 B.Agr.Sc Agricultural Science, specialization in Crop science, Yezin Agricultural University, Naypyitaw, Myanmar

EXPERIENCE

Environmental Assessment

- Initial environmental examination for information technology park development project, social management plans and environmental management plan
- Prepared and delivered training courses on disaster and climate risk management for development projects and project proposal writing in ASEAN
- Reviewed on payment for environmental services, clean development mechanism CDM, carbon trading, resource use efficiency projects and papers
- Agro-ecosystem analysis, water quality control and sustainable livelihood management in causal loop and conceptual framework for local community

Pollution Control

- Application of Landscape ecology principle in Inle Lake ecosystem management project, watershed management, ridge to reef conceptual approach, strategic planning, driver-pressure-state-impact- response(DPSIR) and strength-weakness-opportunity and threat(SWOT)analysis
- Economic valuation of the mangrove ecosystem in support to ecotourism in snake island, Honda bay, Palawan, Philippines in response of cost-benefit analysis, with and without project scenario

Waste management

- Analysis on Institutional awareness and solid and liquid waste management techniques for waste segregation and suitable operations methods, controlling open dumping of hazardous wastes for co-existing disposition to systematic sanitary landfill and incineration/thermal treatment process
- Reviewed numerous publications and guidelines on operation to abandonment of resource extracting industries, sustainable production and mitigation, air and noise pollution control, climate change, environmental and social governance, green economy, policies recommendation

Climate Change

- Good knowledge in proactive approach and early warning system, hazard management by reducing vulnerability and exposure, risk avoidance, residual management, coping, adaptation and resilience of natural ecosystems
- Good knowledge in sources of green house gases, mainly CO2 emission reduction, carbon credit and treading, clean development mechanism (CDM), payment for environmental services(PES), innovative practices for renewable energy sources and technologies for climate change mitigation
- Training about international conventions and related organizations as Basal, Stockholm, Minamata etc, and global temperature changes and increasing sea surface temperature creating storm and extreme weather conditions

Sound Chemical Management (Mercury, Lead, Cadmium, and dioxin)

- Assessment on Floating garden tomato production, water quality degradation and sustainable livelihood in Inle Lake, Myanmar.
- Assessment on lifespan of agro-chemicals pesticides residues, lethal dose and persistence mainly of organo-chlorine, organophosphate and carbamate group for human health and natural ecosystem equilibrium.
- Identification of organic and synthetic fertilizers contamination, pollution, eutrophication on lake ecosystem
- Knowledge on point source and non-point source pollution, effluent discharge without treatment to public water and water quality management
- Reviewed on hazardous waste management practices, surveying, classification, monitoring and evaluation for policy recommendation and guidelines.
- Training on hazard of dioxin from incomplete burning of household and hazardous wastes, improper waste management practices in developing countries and related chronic diseases

Sustainability

- Assessment on tomato production practices and income generation of local community in Inle Lake for sustainable livelihood at southern Shan state, Myanmar
- Identification on social institutions for environmental education and awareness raising
- Assessment on physical, chemical and biological water quality analysis in Inle Lake, Myanmar
- Assessment on plant species diversity of home gardens including farming in rain-fed and irrigated areas

- Analysis on Simpson diversity index of plant species richness and evenness in different ecosystem
- Experiment on varietal improvement by cross breeding of green gram species

Others

- On Job training on agricultural research in crop production and agribusiness management in ARAVA international centre for agricultural training (AICAT) in Israel.
- Training on research methods, modelling and data analysis, natural resources management and biodiversity conservation practices
- Participant for Asia-Pacific Regional Conference on Community Development in college of social work and community development, UP Diliman, in Philippines.
- Trainer on liaison officers for English language proficiency, international protocol and practices for ASEAN summit and related ministerial meetings
- Trainer on mainstreaming disaster risk and climate risk management into national development planning for government staffs
- Knowledge on trade negotiation, small and medium enterprises development projects, laws, intellectual property right on geographic region and products

Prior to joining ENVIRON, Zin Mar held the following positions:

- Deputy assistant programme officer, Department of Agricultural Planning, Ministry of Agriculture and Irrigation Myanmar
- Assistant programme officer, Department of Agricultural Planning, Ministry of Agriculture and Irrigation Myanmar
- Deputy programme officer, Department of Agricultural Planning, Ministry of Agriculture and Irrigation Myanmar

CREDENTIALS

Professional Affiliations and Activities

Member, Yezin Agricultural University Alumni and University of the Philippine Los Banos alumni

Member, SEARCA Scholar Association

Life Membership, The honour society of agriculture GAMMA SIGMA DELTA, UP chapter

ANNEX 7
PHOTOLOGS

Photo 1: Prefabrication Tower Segements at Steel Factory

Photo 2: Stacking Tower Sagments at BTS Site Station

Photo 3: Newly Erected Tower (Base and Foundation)

Photo 4: Newly Erected Tower (Super Structure)

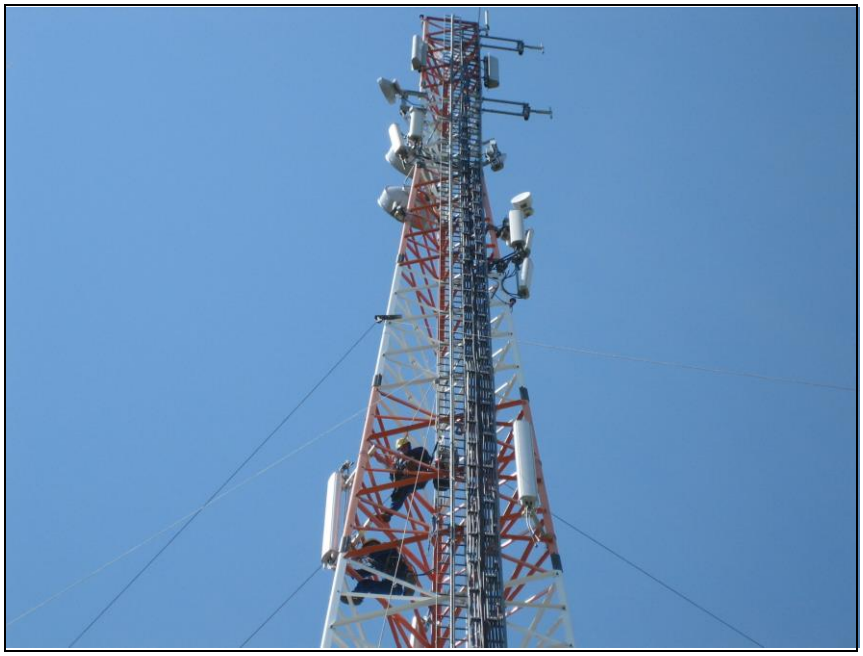

Photo 5: Visual Signal and Nevigational Light Installation

Photo 6: Base Transmission Station BTS (Outside)

Photo 7: Base Transmission Station BTS (Equipment Room)

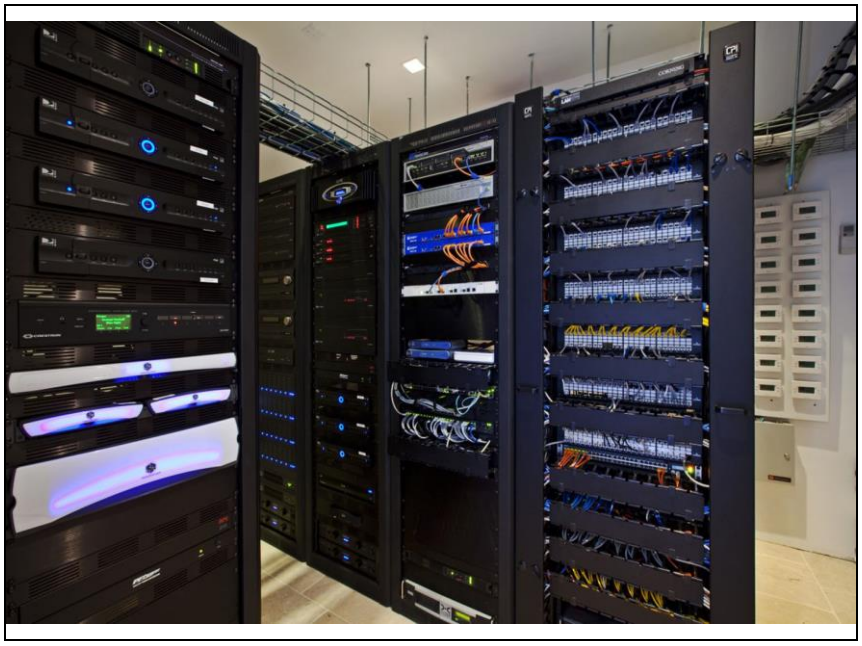

Photo 8: Base Transmission Station BTS (Network and Server)

Photo 9: Trench Operation

Photo 10: Cable Landing in Developed Land

Photo 11: Manhole Cover

Photo 12: Manhole

Figure 13: Stockpiled cable pool in temporary camp