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SANAKHAM HYDROPOWER PROJECT

Environmental Management and Monitoring Plan

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Abbreviations

ADB	Asia Development Bank
ASEAN	Association of Southeast Asian Nations
BDP	Basin Development Plan
CA	Concession Agreements
CBD	Convention on Biological Diversity
CEMMP	Contractor's Environmental Management Plan
CIA	Cumulative Impact Analysis
CITES	Convention on International Trade in Endangered Species
DAFEO	District Agriculture and Forestry Extension Office
DOE	Department of Energy
DPRA	Development Project Responsible Agency
ECCD	Early Childhood Care for Development
EFO	Environmental Field Officer
EIA	Environmental Impact Assessment
EM	Environmental Manager
EMO	Environmental Management Office
EMMP	Environmental Management and Monitoring Plan
EP	Environmental Programme
EPL	Environmental Protection Law
ESIA	Environmental and Social Impact Assessment
ESMI	Environmental/Social Monitoring and Inspection Unit
ESO	Environmental Safety Officer
GDP	Gross Domestic Product
GMS	Greater Mekong Sub-region
GoL	Government of Lao PDR
HIV/STD	Human Immune Deficiency Syndrome/Sexually Transmitted Diseases

IEE	Initial Environment Examination
MAF	Ministry of Agriculture and Forestry
MEM-DoE	Ministry of Energy and Mines-Department of Electricity
masl	meters above sea level
MIH	Ministry of Industry and Handicrafts
MOH	Ministry of Health
MONRE	Ministry of Natural Resources and Environment
MPWT	Ministry of Public Work and Transport
MRC	Mekong River Commission
MW	megawatts
NBCA	National Biodiversity Conservation Areas
NES	National Environmental Strategy
NESMC	National Environment and Social Management Committee
NGPES	National Growth and Poverty Eradication Strategy
PEC	Provincial Environmental Committee
PES	Provincial Environmental Strategy
PESMC	Provincial Environment and Social Management Committee
PMF	Probable Maximum Flood
PPE	Personal Protective Equipment
PRP	Preliminary Resettlement Plan
RAP	Resettlement Action Plan
RCC	Reinforced Concrete Cement
SDP	Social Development Plan
SEA	Strategic Environmental Assessment
SIA	Social Impact Assessment
SMMP	Social Management and Monitoring Plan
WCD	World Commission on Dams

1. INTRODUCTION

This Environmental Management and Monitoring Plan (EMMP) has been developed as a tool for the project proponent, the developer of Mekong Sanakham Hydroelectric Power Project (Mekong Sanakham HPP) to implement a series of control measures aimed at the mitigation of the main impacts of the project. The main objectives of measures outlined in this EMMP are:

- To restore the environmental conditions of the affected environmental resources such that they are the same as or improved upon as compared to their original state.
- To ensure effective implementation of mitigation, management and monitoring measures during the construction and operation stages of the project.
- To integrate the EMMP of the Mekong Sanakham HPP into the GoL's environmental management policy; particularly those of, poverty reduction and environmental sustainability.

This Environmental Management and Monitoring Plan (EMMP) has been devised for the Mekong Sanakham HPP according to the latest regulations of Lao PDR:

- Ministry of Energy and Mines - Department of Electricity (MEM-DoE), Environmental Management Standard No. 05/year 2001.
- Lao PDR Environmental Impact Assessment Guidelines, November 2011.
- Lao PDR Standard of Environmental and Social Obligations, April 2012.

The EMMP is considered an integral part of the Final Environmental Assessment process. It is needed for project implementation. Following the EMMP, the construction contractor(s) will be required to develop their Environmental Management and Monitoring Plan - Construction Phase (EMMP-CP) and Environmental Management and Monitoring Plan - Operation Phase (EMMP-OP) for approval by the Ministry of Natural Resources and Environment (MONRE).

1.1 PROJECT NEED AND RATIONALE

Lao PDR is a land-locked country with an agricultural economy and is classified as a “least developed country” where the annual Gross Domestic Product (GDP) per capita of the country in 2008 was only US$ 810. Most of the population lives in the countryside and have very little income with only basic health care. In 1996, at the sixth Party Congress, the GoL set a national poverty reduction program (now changed to the National Growth and Poverty Eradication Strategy (NGPES) with a goal of lifting the country from the list of least developed countries by 2020. NGPES emphasizes that the social and economic development of the country must occur in a sustainable and environmentally sound fashion.

Achieving and securing sustainable and environmentally sound economic development of the country can be facilitated through developing environmentally, socially and economically

sound hydropower as less than 2% of the potential capacity of some 26,000 MW (excluding the mainstream of the Mekong River) has been developed.

The Mekong Sanakham HPP will not only contribute to the national growth and poverty eradication strategy of the government but it will also make a significant contribution to the reduction of global green house gas production. Furthermore, the direct and indirect benefits for the local communities and the nation resulting from the proposed project include the following:

- General improvement of road access to the project area.
- Creation of employment opportunities for local people during the construction and operation.
- A social action plan to improve livelihoods and foster wealth creation in the project area.
- Facilitation of improvements to rural electrification, health care and education facilities.
- Establishment of water supply and irrigation to the villages.
- Promotion of tourist businesses in the area.
- Promotion of trade and services of small and medium businesses.

1.2 PROJECT LOCATION

The Mekong Sanakham HPP is located on the mainstream of the Mekong River, 1.4 km upstream of Nam Heuang River, Kenthao District, Xayaboury Province, Lao PDR. The dam site is 25 km upstream from Sanakham City, Lao PDR, 155 km upstream from Vientiane, Lao PDR, 81 km downstream from the proposed Pak Lay Hydropower Project, and is 1,737 km away from the Mekong River estuary in Vietnam where the river flows into the South China Sea.

Figure 1: Project Location

2. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 POLICY FRAMEWORK

The environmental policies of the GoL are clearly presented in the Political Report of the Lao People's Revolutionary Party, as follows:

To promote the capacity and potential of the country and the regions alike, our Party continues to implement the policies of establishing agroforestry economy, closely linking it to industry and services. We will consider agriculture and forestry as fundamental while focusing on some urgent and potential industrial activities. On the other hand, we will strongly promote the services sector, corresponding to the modern trend.

In materializing the policies of building the infrastructure for these economic sectors, our Party considers the socioeconomic development of the regions as important, and it continues to encourage it. We will be able to appropriately determine the production force for all parts of the country, and exploit the rich natural resources of each region in the most efficient manner. Simultaneously, efforts will be made to protect and rehabilitate them to become the wealthy assets and heritage of the nation.

Further, the Lao Constitution of 1991 states that environmental protection is the responsibility of everyone, and that it is against the law to degrade natural resources that are in principle owned by the State.

The Government's intention is very clear: The Lao PDR Government will take the necessary actions to protect the environmental and natural resources in the process of economic development.

Besides the above policies, the GoL has set up strategies for managing development, natural resources and environmental protection as follows:

- The National Growth and Poverty Eradication Strategy (NGPES).
- The National Environmental Strategy (NES) with the National Environment Action Plan.
- The National Biodiversity Strategy and Action Plan.
- The National Biodiversity Education and Awareness Strategy and Action Plan
- The Provincial Environmental Strategy (PES).
- National Policy on Environmental and Social Sustainability of the Hydropower Sector in Lao PDR.
- etc.

2.2 INSTITUTIONAL FRAMEWORK FOR EMMP

These needs are outlined in Requirement 4 of the Environmental Management Standard and set the regulatory framework and administrative needs that the project must comply with and outlines jurisdiction of the agencies involved. It includes references to the following::

- National Policies and Environmental Regulations of the GoL.
- The jurisdiction of agencies involved such as line ministries or departments at the national, provincial and district levels and any NGOs.
- The organizational framework and the enforcement regime of the project.
- Any International Treaties (e.g. Convention on International Trade in Endangered Species (CITES), Convention on Biological Diversity (CBD) or Agreements of which Lao PDR is a signatory and are applicable).
- Details set out or established during the Environmental Impact Assessment (EIA) process.

The principal institutions involved include:

- GoL agencies at all levels including Ministry of Natural Resources and Environment (MONRE) and MEM-DoE, and any Advisory or Steering Committee or Independent Panel of Experts (POE).
- The Mekong Sanakham HPP or its representatives such as a project - established Environmental Management Office (EMO) operating on its behalf.
- Consulting Engineer's representative or Environmental Advisor.
- Various Environmental Officers associated with the main Contractors.

All these parties' roles and responsibilities as executing agencies will be allocated for the entire EMMP. Measures for monitoring and managing potential environmental and socio-economic impacts have been developed based on Lao PDR legislation, regulations, decrees, standards and guidelines. The following legislation now in force, and supporting regulations (promulgated or in draft), in Lao PDR is relevant to ensuring that environmental and socio-economic issues are addressed during the design, construction, and operation of the project.

2.3 LEGAL FRAMEWORK

The promulgation of the Environmental Protection Law (EPL) in 1999 has advanced the implementation of the above policies. Environmental protection measures in the form of requirements for EIAs are outlined in Part II, Chapter 1, Article 8, of the Law as follows:

a) The Science, Technology and Environment Administration must issue general rules regarding a regime and a methodology for environmental impact assessment;

b) Sectors related to development projects and activities related to these sectors must issue rules regarding a regime and a methodology for environmental impact assessments based upon overarching general rules issued by the Science, Technology and Environment Administration;

c) Before establishing development projects and other activities that are seen to have an impact on the environment, an environmental impact assessment drafted in compliance with the prescribed regulations in clause one and clause two of the Environmental Protection Law must be submitted to an environmental management and inspection agency assigned to consider and issue environmental certificates.

Based on the provision in the Environmental Protection Law that development projects and activities that have the potential to affect the environment shall require an EIA, the GoL has issued EIA regulation for Lao PDR (2010) No.112/PM. This regulation specifies the overall principles for the EIA effort and prescribes the thematic issues to be covered and the outputs expected at the different stages of the EIA process.

MONRE has also instructed the Ministries to develop sectoral guidelines for the project categories within their respective area of responsibilities. The Ministry of Mines and Energy responded promptly to this request and have issued the following guidelines for power and transmission line projects:

- Decree on Environment Assessment No.112/PM, (2010).
- Regulation on Implementing Environmental Assessment for Electricity Projects in Lao PDR, No. 447, 20.11.2001 .
- Power Sector Environmental Policy, No. 581, 4.10.2001 .
- Environmental Management Documents for the Department of Electricity, No. 582, 4.10.2001 .
- Department of Electricity Environmental Records Management, No. 583, 4.10.2001 .
- Environmental Management Plans for Electricity Projects, No. 584, 4.10.2001 .
- Environmental Management Standard for Electricity Projects, No.0366/ MIH.DOE, 2003
- National Environmental Standard of WREA 2009 .

The environmental management standard which addresses Environmental Management and Monitoring Plans for Electricity Projects (No.584/MIH.DOE, dated 04 October 2001), sets out

the requirements for preparing EMMPs for electricity projects. The standard indicates that the following:

- An EMMP is to be part of a Project Screening Report, IEE report and EIA report, whichever is determined to be required for a project.
- An EMMP must cover all environmental management measures that are to be implemented during the project's pre-construction, construction, operation and decommissioning, and is to address all significant environmental issues identified in the Project Screening, IEE or EIA, including a social action plan or resettlement action plan, if required.
- The EMMP must be prepared so as to be able to be used as a stand-alone document for use in implementation.
- A two-stage public involvement process is to be developed and implemented. The first stage is the process established for Screening, IEE or EIA, when the EMMP is under development. The second stage is the process for implementation of the EMMP.

2.4 INSTITUTIONAL FRAMEWORK

Because of the cross-sectoral nature of environmental issues, various Ministries and Agencies are involved in environmental affairs.

The Government Agencies most concerned with environmental protection and natural resource management are as in the Table below:

Table 1: Specific Environmental Government Agencies

Agency	Responsibility
Ministry of Natural Resources and Environment (MONRE)	Overall coordination; oversight of environmental affairs; environmental management (setting policy and regulatory framework; setting standards; monitoring state of the environment and compliance with policies and regulations)
Ministry of Energy and Mines	Electricity/industrial environmental management; mineral resource management
Ministry of Agriculture and Forestry (MAF)	Forest resource management; biodiversity conservation; soil resource management; water resource management
Forest Resource Conservation Division under Department of Forestry, MAF	Forestry/wildlife/conservation
Ministry of Public Work and Transport (MPWT)	Management of communication infrastructure
Ministry of Health (MOH)	Population's health management

2.4.1 ENVIRONMENT PROTECTION

The Lao PDR has a well integrated and comprehensive system of laws to protect the environment. Many of them impinge upon big water resource use projects, such as the Nam Theun 2 Hydropower Project. The basic legal framework is laid down in the Environmental Protection Law of 1999, which was approved by the implementation decree of 2002. The law includes provisions for EIA for projects and activities that might affect the environment, and regulations for all enterprises for the control of pollution and compliance with environmental quality standards. According to the Law:

Environmental protection shall be the priority consideration. Environmental mitigation and restoration are considered to be less preferable, but necessary if protection is not possible.

- All social-economic development plans shall include provisions to protect the environment and national resources.
- All persons and organizations residing in the Lao PDR have an obligation to protect the environment.
- Whoever damages the environment is responsible under the law; and will be sanctioned.
- Natural resources, raw materials and energy shall be used conservatively, minimizing pollution and waste, and promoting sustainable development.

The Environmental Protection Law is executed by MONRE, which is also charged with reviewing EIAs. MONRE has developed specific guidelines for the content and process of environmental assessment, including the preparation of environmental management plans.

MONRE has the mandate to co-ordinate all government activities in the environmental sector. Central line Ministries are responsible for environmental management and monitoring within their respective sector - five ministries have established separate environmental monitoring units.

At provincial level, the policy body is the Provincial Environmental Committee (PEC) under the chairmanship of the Vice-Governor in each province. The responsibility for national policy implementation has been devoted to the provincial governments, and these responsibilities are undertaken through the Provincial Water Resources and Environmental Office, (WREO).

2.4.2 NATURE CONSERVATION

The Forestry Law of 1996 outlines general provisions for the management of all forest related resources, including all plants, wildlife, and watercourses. The Department of Forestry, Ministry of Agriculture and Forestry, has the overall responsibility for its enforcement. The

GoL is responsible for allocating and determining the use to which forest land and forest resources be put. Forests are grouped into the following five categories: Protection, Conservation, Production, Regeneration, and Degraded, and each has a specific management policy. In 2005, the forestry strategy for the period 2005 -2020 was completed.

2.4.3 WATER MANAGEMENT

The Law on Water and Water Resources of 1996 is intended to ensure sustainable use of water, whether it be small medium or large in scale. The legislation prescribes the rights and permit procedures controlling water use. The development of all large-scale user projects will require the preparation of an EIA. The Water Resources Coordination Committee in the Prime Minister's Office has the responsibility for administering the Water Law.

2.4.4 MEKONG RIVER COMMISSION

Lao PDR is one of the four signatories to the 1995 Agreement on the Co-operation for Sustainable Development of the Mekong River Basin and is a member of the Mekong River Commission (MRC). The Commission succeeded the Mekong Committee, which, among other things, was instrumental in the planning of Nam Ngum, the first large hydropower project in Lao PDR. They were also instrumental in early investigations related to the hydropower project. Whereas the Committee was primarily focused on hydrology, navigation and hydropower, the mandate of the Commission's focus is more on co-operation for the promotion of sustainable development, utilization, management and conservation of water and related resources in the Mekong River Basin.

The primary purpose of the Agreement is to promote the economic and social well-being of people in all the riparian countries. This is to be achieved - in part by the protection of the environment, improvement of navigation and the cooperation in the maintenance of flows and intra-and inter-basins diversions. The MRC has initiated several basin-wide planning and research programmes, including the Water Utilization Plan (WUP), the Environmental Programme (EP), the Basin Development Plan (BDP) and the Fisheries Programme.

2.4.5 ASEAN MEMBERSHIP

Lao PDR became a member of the Association of Southeast Asian Nations (ASEAN) in 1997. In 1985, ASEAN adopted an agreement on the Conservation of Nature and Natural Resources, which was ratified by only three countries, and is therefore not in force. ASEAN has provisions which assist member countries to establish trans-boundary nature reserves.

2.4.6 GREATER MEKONG SUB-REGION (GMS) INITIATIVE

In 1992, with the assistance of the Asia Development Bank (ADB), Cambodia, the Lao PDR, Myanmar, Thailand, Vietnam, and Yunnan Province in the People's Republic of China, entered

into a program of sub-regional economic cooperation, designed to enhance economic relations among the countries. The program has contributed to infrastructure development, and a better use of the resource base in the sub-region.

2.4.7 INTERNATIONAL CONVENTIONS AND TREATIES

Convention on Biological Diversity (CBD)

Lao PDR became a signatory to the CBD in 1992, following up the ASEAN Agreement of the Conservation of Nature and Natural Resources, which was signed in 1985. The policy and legislative obligations to the CBD have been fulfilled with the establishment of the national protected areas.

Convention on the Protection of World Cultural and Natural Heritage

This convention was ratified by GoL in 1987. The convention addresses the protection of cultural and natural objects, as well as sites of high national and international value.

Convention on International Trade in Endangered species (CITES)

Lao PDR ratified this convention in early 2004. Prior to the ratification, the Ministry of Agriculture and Forestry (MAF) issued a regulation (MAF 0360) that banned all hunting for trade. Hunting for consumption was still allowed. This is a signal that GoL is now committed to increasing efforts to halt the extensive trade in wildlife from Lao PDR to neighboring countries.

2.5 RELEVANT LAWS

The following Lao laws are pertinent to the Mekong Sanakham HPP:

1. **The Lao PDR Constitution** (1991) acknowledges the need for natural forests as well as environmental protection in Lao PDR and requires that Environmental Assessment give particular attention to the assessment of potential positive and negative socio-economic impacts of project development and to prevention and/or mitigation of harmful impacts.

2. **The Environmental Protection Law** No.02/99/NA, (1999) assigns to the Science, Technology and Environmental Agency (now MONRE) the rights and primary responsibilities for protection, mitigation and restoration of the environment in Lao PDR. The law defines the environmental conservation responsibilities of other GoL agencies such as the Department of Electricity, Department of Forestry, etc. It directs that environmental management and monitoring units (EMMUs) be established at all levels of government, with responsibilities to include such things as: establishing and enforcing sector environmental plans; taking action to mitigate environmental damage;

issuing orders to adjust, suspend, remove or close down activities that cause negative impacts. The overriding principles promulgated by the law are that:

- Environmental conservation comes before mitigation and restoration.
- Those who generate an environmental impact are responsible for the resulting damage caused.

3. **The Water and Water Resources Law** (1997) classifies all catchment areas for various uses and promotes protection and rehabilitation of forests, fishery resources and the environment. It suggests that EIA should be carried out on large-scale water development projects, and requires that funds be provided for protecting and enhancing catchment area resources, and for resettlement compensation.

4. **The Electricity Law** (1997) provides the basis for developing a concession agreement to construct and operate a hydropower project (Article 11), and provides the requirements for construction of transmission lines. In both cases, the Electricity Law provides for minimal damage to the environment that is to be monitored by the Environmental Management Unit (EMU) in the Hydropower Department of the Ministry of Industry and Handicrafts (MIH). The law requires that EIA's be prepared, particularly for large-scale hydropower projects (Articles 6, 12). The EIA is required to incorporate mitigation measures and provide for compensation for damages to the environment, people's livelihoods and if necessary, relocation of affected people (Articles 14, 18).

5. **The Amended Forestry Law,** No 06/NA (Dec. 2007): determines basic principles, regulations and measures on sustainable management, preservation, development, utilization and inspection of forest resources and Forestland, promotion of regeneration and tree planting, and increase of forest resources in the Lao People's Democratic Republic aiming for maintaining the balance of nature, making forest and Forestland a stable source of living and use of people, ensuring sustainable preservation of water sources, prevention of soil erosion and maintenance of soil quality, conserving plant and tree species, wildlife species as well as environment and contributing to the national socio-economic development.

6. **The Wildlife and Aquatics Law,** No 07/NA (Dec. 2007) determines principles, regulations and measures on wildlife and aquatic life and promotes husbandry and breeding; specifies utilization of wildlife and aquatic life in sustainable manner, without harmful impact to natural resources and habitats; restricts the decrease and extinction of wildlife and aquatic life; encourages people to understand and recognize the value and significance of wildlife. The law requires the management, monitoring, conservation, protection, and utilization of wildlife and aquatics in a sustainable manner in order to guarantee the sustainable balance of the ecological system, and to

contribute in upgrading the livelihoods of the people while pursuing national economic development.

7. **Land Law** (1997) Land within Lao PDR is the property of the national community, and individuals are assigned to effectively use the land, but not treat it as a tradable commodity. The law sets out the rights of those who have been allocated land, including the right to transfer that land, and is protected by the State.

8. **Road Law** (1999) Environmental protection is required during road activities. National and provincial authorities of the Ministry of Communications, Transport, Post and Construction are responsible for environmental protection on road projects. Reasonable compensation must be paid to individuals whose land is expropriated for road rights-of-way, relocation of replacement structures, and loss of trees and crops.

2.6 DECREES, REGULATIONS AND INTERNATIONAL CONVENTIONS

The following are relevant to the Mekong Sanakham HPP:

1. **Prime Minister's Decree No. 164/1993** established eighteen protected areas and required that the government develop management plans for each area. Two additional protected areas, referred to now as National Biodiversity Conservation Areas (NBCAs), have since been added and now one more additional NBCA, Nam Kkan NBCA, has been established making the total 21 NBCAs nationwide. The current area totals 3.4 million hectares or 14.3% of the country's area. In addition, provinces and districts have also designated their own conservation areas and protection forests bringing the overall national total to 5.3 million hectares or 22.6% of the total land area.

2. **Decree on the Preservation of Cultural, Historical and Natural Heritage** requires that in order to prevent exploitation of relics and antiquities, any person who discovers archaeological relics or a cultural site must inform the provincial and district offices within three days.

3. **PM Decree No. 102/PM on the Implementation of the Environmental Protection Law (2001)** specifies that:

   Development projects and all development activities that related to the environment shall be conducted as follows:

   - All development projects, including State and private owned, shall have an environmental impact assessment (EIA) before the establishment and operation of those projects. They shall also have method and protecting or mitigating measures to protect social and natural environment that can be approved by the government.

- The owners of the development projects shall have an obligation to bear the cost occurred in any process of EIA.

4. PM Decree No. 192/PM on the Compensation and Resettlement (2005)

The decree comprises six sections and nineteen articles:

- Section I is the general section sets out the objective and fundamental principle for compensation, and relocation of project affected people. It also provides instructions and measurement procedure for mitigation and compensation for all potential negative impacts on socio-economic and livelihood of the affected people within or in the vicinity of the project areas. Defines and classifies affected groups e.g. the vulnerable and ethnic groups of affected people.

- Section II states and defines the right of affected person in receiving compensation.

- Section III states and defines the compensation requirement and procedure, assistance measure during the relocation, settlement and livelihood development.

- Section IV defines resettlement and compensation components which states and emphasizes the significant of local culture and tradition, community participation in the process, grievance measure and budgetary consideration.

- Section V refers to enforcement procedures for both violator and complier.

- Section VI sets out the implementation procedure as well as sets out the institutional frame work of responsibility.

All electricity projects in Lao PDR that fulfill the following criteria are required to develop and implement a full Resettlement Action Plan (RAP):

- All Electricity Projects involving the necessary relocation of 200 or more individuals.

- All Electricity Projects involving the loss of land, community structures, services and/or livelihood (income) for 200 or more individuals.

- All Electricity Projects that result in the loss of housing, land, community structures, resources, habitat and/or livelihood for 100 or more individuals that are disadvantaged, including vulnerable ethnic groups, isolated communities, households headed by women and the poorest communities.

All electricity projects with fewer than 200 individuals affected (100 individuals from disadvantaged groups, requiring relocation, loss of community structures, services, livelihoods, housing and land) by project activities do not require a separate RAP, however, resettlement plans for those individuals that fall into this category shall be included in the Social

Management and Monitoring Plan (SMMP) and Environmental Management and Monitoring Plan (EMMP) that is required for the Environmental Assessment Process. In doing so the resettlement plans included in the SMMP shall incorporate the relevant requirements of the Environmental Management Standard.

5. **MAF Regulation Nº 0360/MAF.2003, on Management of National Biodiversity Conservation Areas, Aquatic Animals and Wildlife** provides guidelines on NBCA establishment and zoning and also on restricted activities and development fund establishment and the rights and duties of state agencies in NBCA management.
6. **Decree on Protection Forest No. 333/PM (2010)** specifies in article 29 that:
   All state and private enterprises that are approved to use the protection forest either directly or indirectly shall have an obligation to protect and implement any development as follows:
   - Follow the rules and regulations concerning protection forests.
   - Rehabilitate, maintain and enrich the protection forest.
   - Protect the environment, non-timber forest product, aquatic and wildlife.
   - In the case of mining, hydropower, road, reservoir, tourism and other development projects will have to contribute to the management of the protection forest.
   - Pay the royalty tax based on regulation.

The conversion of Protection Forests into other land use requires the following:

- Conversion of national and provincial protection forests should be approved by the parliament.
- Conversion of district and municipality protection forests should be approved by the government; it should be proposed by National Land Management Authority and in agreement with the Ministry of Agriculture and Forestry.
- Conversion of village protection forest should be approved by Provincial authorities, and Vientiane capital authorities as proposed by the land management authority of provinces and the Vientiane Capital with agreement by provincial and the Vientiane capital agriculture and forestry departments.

7. **Regulation on Environment Assessment No: 1770/WREA dated 3/10/2000**
   Each Development Project Responsible Agency (DPRA) must ensure that any development project in the Lao PDR carries out an Environmental Assessment in accordance with the content determined in this Regulation, and any regulation of its own line ministry.
   The Environmental Assessment must include at least a Project Description to enable DPRA to perform a project environment screening under Article 7 of this Regulation. If the project is not exempt under Article 8 of this Regulation, the must include an Initial Environment Examination (IEE) as specified in Article 9 of this Regulation. For some projects, through the findings of the IEE, an Environmental Impact Assessment (EIA) is required as specified in Articles 11, 12, 13, and 14 of this Regulation.

8. **Regulation on Implementing Environmental Assessment for Electricity Projects No. 447/MIH, dated 20th November 2001**
   The following noteworthy information is contained in the Regulation regarding development and review of an IEE for electricity projects. The Department of Electricity is required to ensure that environmental assessment is included in its decision to approve, finance or undertake any type of electricity project in Lao PDR.
9. **Prime Minister Decree No. 112 dated 16/02/2010 on Environmental Impact Assessment (2010)** This decree of the prime minister provides an update of the GoL environmental assessment study and approval process. In parallel with this decree, WREA(now called MONRE) issued a decision notice that lists the types of development projects that must prepare and submit IEE and EIA reports for their approval. According to this decree the Mekong Sanakham HPP is required to prepare a full EIA.
10. **The Environmental Management Standard for Electricity Project No.0366/ MIH.DOE, (2003) states that:**
    Environmental screening is a preliminary assessment of a project's potential environmental impact. It is normally completed at a project identification stage. Screening is used to decide whether a project's impacts are of a significant nature to warrant further environmental assessment. The IEE will determine the scope of the EIA. This will include the scope and plan for conducting the study to meet the requirements of an SIA. The IEE shall identify the expected social impacts of the project, and a plan to obtain the necessary information for determining the magnitude of the impact and the potential measures to avoid, minimize, mitigate or compensate for the effects.

The IEE shall include the following information related to SIA:

- Discussion of consistency with governmental regulatory requirement.
- Brief description of the social conditions in the project area including an estimate of the number of people to be relocated, distribution of population in project area, a brief discussion of the local economy and primary source of income, the presence of significant cultural and infrastructure facilities that will be affected and a list of issues to be discussed in the SIA relative to the social conditions.
- Preliminary plan for relocating the affected persons (Preliminary Resettlement Plan-PRP). The PRP may provide budget and technical feasibility proposals (availability of relocation sites, etc.) for more than one technical design.
- A preliminary assessment of land acquisition requirements and a determination of whether the land required for the project fall into forest/tribal or other special areas.
- Description of indigenous groups in the project area (if any) to include status of the population from the perspective of the GoL, significant unique characteristics of the cultural tradition of the groups, special economic resources of the group.

In the case of the Mekong Sanakham HPP, screening carried out at the time of the project identification indicated that a full EIA would be required, together with an EMMP, SIA, SMMP, and RAP. Further, individual IEEs are required by MONRE and MIH-DOE to cover the transmission line and access road and bridge.

2.7 BEST PRACTICE

World Commission on Dams(WCD) – Criteria and Guidelines

The World Commission on Dams, having considered the multiple and diverse impacts and interests in dams, have identified five critical decision points within dam planning as having the strongest influence on the performance of projects. These points are strategic in nature, and not directly applicable to the current status of the Mekong Sanakham HPP. However, in regard to other similar projects in the pipeline, the WCD suggests that projects should be reviewed for social aspects such as:

- Stakeholder analysis based on risks and rights and resulting in the formation of a stakeholder forum.
- Supporting vulnerable and disadvantaged stakeholders to participate in an informed manner.
- Understand the distribution of costs and benefits across stakeholders.
- Agree on measures to promote development of, and ensure benefits to project affected and displaced people.
- Include recourse and compliance mechanisms.

Good Dams and Bad Dams: Environmental Criteria for Site Selection of Hydropower Projects

The World Bank concludes[i] that the most effective environmental mitigation measure is good site selection, and that in general, the best sites are those on upper tributaries. While focusing on physical and biological environmental considerations, the paper also notes the following:

- Impacts due to displacement and the need for participatory decision making with resettlers and hosts, and for income restoration assistance in contributing to successful resettlement.
- The importance of determining downstream releases and, among other factors, managing disease vectors and maintaining downstream human uses.
- The role of access roads in facilitating major land use changes (positive and negative), and hence the need for locating them in the least environmentally and socially damaging corridors.

With respect to the Mekong Sanakham HPP, a Cumulative Impact Analysis (CIA) has been carried out to estimate the relative impacts of the Mekong Sanakham HPP and other hydropower projects in the Lower Mekong region. As of this writing, there are over 130 major dams that exist, are under construction, or planned in Lao PDR, Cambodia, Vietnam, and

Thailand. The CIA compares these projects based on World Bank indicators to screen in very general terms the environmental impacts of different types of dams. According to the cited WB paper, the indicators that are most useful for comparison are "Reservoir Surface Area (ha) per MW" and "Number of displaced people per MW".

2.8 MRC AND HYDROPOWER PLANNING IN THE MEKONG BASIN

The Mekong River Commission's (MRC) Agreement on Cooperation for the Sustainable Development of the Mekong River Basin (1995) includes a number of articles that will apply to the Mekong Sanakham HPP including the following: Article 3 – on the need to protect the environment and natural resources; Article 5 – requiring prior notification to and approval by the MRC's Joint Committee; Article 6 – relating to changes in natural flows; Article 7– specifying the need to avoid, minimize and mitigate harmful effects on the environment, especially on water quantity and quality, the aquatic (ecosystem), and ecological balance of the Mekong River system.

The Mekong River Commission has indicated the following general principles for planning Hydropower development in the Mekong Basin:[ii]

- Development must be equitable and sustainable
- Hydropower development in the Basin should be seen in the context of the regional energy sector, in particular realistic future energy demands.
- Fisheries and navigation are integral elements of hydropower dams, it is necessary to find the optimal solution to conjunctive hydropower generation, navigation lock operation and fish migration.

Mainstream Dams: While the 1995 Mekong Agreement does not preclude mainstream dams, their impacts must be environmentally and sociologically acceptable. The MRC should act as the main dialogue facilitator to promote cooperation and best practices. There must be agreement to prioritize mainstream dams and fisheries issues.

The MRC position on mainstream dams can be found in the MRC Initiative on Sustainable Hydropower (ISH) on their web site at this internet address:

http://www.mrcmekong.org/about-the-mrc/programmes/initiative-on-sustainable-hydropower/ (Accessed 7 August 2013).

3. SANAKHAM HYDROELECTRIC POWER PROJECT COMPONENTS

3.1 PROJECT DESCRIPTION

Mekong Sanakham Hydroelectric Power Project is the 5th cascade project planned on the mainstream of the Mekong River in the country of Laos. The Mekong Sanakham HPP is located on the mainstream of the Mekong River, 1.4 km upstream of Nam Heuang River, Kenthao District, Xayaboury Province, Lao PDR. The dam site 25 km upstream from Sanakham City, Lao PDR, 155 km upstream from Vientiane, Lao PDR, 81 km downstream from the proposed Pak Lay Hydropower Project, and is 1,737 km away from the Mekong River estuary in Vietnam where the river flows into the South China Sea. A simple access road to dam site will be available on the left bank.

The Mekong Sanakham HPP would be developed mainly for power generation and is designed with features for river navigation and fish passage; it is a run-of-river type of dam. Major structures include the following: powerhouse, sluice gate, 500 ton navigation lock, fishpass, etc. The specifications of the dam are as follows: normal water level is 220 masl; dam crest level is 230.5 masl; total installed capacity of the power plant is 684 MW; average annual energy output is 3,808 GWh with the annual utilization hours of 5,560 hours. There are 12 bulb turbines in total, with a discharge of 5,801 m^3/s.

The project will be designed to satisfy the requirements for navigation of the Mekong River, it will support ships up to 500 tons.

The effective dimension of the lock chamber is 120 x12 x 4 m and the maximum shipping headroom is 8 m. The mean duration of passing the lock in one time is tentatively defined as 40 minutes; the daily mean passing frequency is 20; the number of navigable days is 330; the annual total dead weight tonnage of one-way passing is 264x104 tons, and the daily mean water consumption is about 5.6 m3/s.

The fishpass will be designed for fish pass facility at the dam to connect the migratory pathway. The baffled fishpass proposed for the project is composed of an entrance, fishpass pond, resting pond, flood gate and a maintenance gate at the entrance and exit.

The majority of the electricity produced is proposed to be transmitted to the Thailand power grid through 500 kV transmission lines and the remaining electricity will be transmitted to Vientiane through one circuit of 230 kV.

The project will create a reservoir capacity of 987 million m3 (below PMF level 222.15 masl) and 8.27 million m^3 (below normal water level 220 masl). The inundated land includes arable land (565.14 ha), orchard (59 ha), woodland (1,750.74 ha) and homestead (28.1 ha). A total of 7 villages including farmland and houses will be affected from the reservoir construction and

621 households and 2,935 people will be resettled, Also, farmlands from another 17 villages will be effected.

3.2 COMPLEX LAYOUT

Key structures from the left bank to the right bank are as follows: concrete auxiliary dam at the left bank, navigation lock, flood release sluice (14 outlets) at left bank, powerhouse (12 generating units) in river channel, sand flushing sluice (4 outlets) at right bank, fishpass section, concrete auxiliary dam at right bank. The dam crest length is 909.9 m in total, the crest elevation is 229.50 m and the maximum concrete dam height is 57.2m. The powerhouse is divided into 8 sections from left to right, i.e. powerhouse containing Unit 1 - Unit 4, main erection bay, powerhouse containing Unit 5 - Unit 12, and auxiliary erection bay.

14 flood release outlets are arranged at the left bank terrace and flood plain at dam site, 4 sand flushing outlets are arranged at right bank. The opening dimension is 15m×22m, the sluices are divided into 11 sections with total length of 348 m.

The navigation lock of the project is designed as per the single-line capacity of 500 dwt. The navigation lock is of Grade IV, the effective dimension of lock chamber is 120×12×4 m (length × width × sill depth). The whole navigation lock is composed of upstream approach channel, upper lock head, lock chamber, lower lock head and downstream approach channel. The crest elevation is defined as 229.5 m considering the requirement of navigable headroom.

The floor elevation of fishpass entrance at right bank is 197 m. The minimum water level is controlled as per 200.22 m (corresponding to the tailwater level when three units are put into operation), and the entrance width is 5m. The basic specifications of the main features are shown in Table 2 below:

Table 2: Basic specifications of Dam

No.	Item	Unit	Qty.	Remarks
I	**Hydrology**			
1	Catchment area			
	Catchment area of whole basin	km^2	795,000	
	Catchment area above dam site	km^2	290,103	
2	Sediment			
	Annual mean suspension load discharge	104 t	6900	
	Annual mean sediment concentration	kg/m^3	0.496	

No.	Item	Unit	Qty.	Remarks
	Measured maximum sediment concentration in flood season	kg/m^3	0.686	September
	Annual mean bed load discharge	104t	138	
II	**Reservoir**			
1	Reservoir level			
	Check flood level	m	223.30	
	Design flood level	m	221.70	
	Normal pool level	m	220	
	Dead level	m	219	
2	Reservoir area at normal pool level	km^2	131.64	
3	Backwater length at normal pool level	km	81	
4	Reservoir volume			
	Total reservoir storage (natural)	10^8 m^3	10.73	
	Dead storage	10^8 m^3	7.602	
III	**Discharge & corresponding downstream level**			
	Maximum discharge at design flood level	m^3/s	34700	
	Corresponding downstream level	M	219.57	
	Maximum discharge at check flood level	m^3/s	38800	
	Corresponding downstream level	m	220.93	
	Minimum discharge	m^3/s	540	
	Corresponding downstream level	m	199.62	
	Discharge at unit operating under full load	m^3/s	5801	
	Corresponding downstream level	m	205.32	

No.	Item	Unit	Qty.	Remarks
IV	**Performance indicators of project**			
1	Power generation benefit			
	Total installed capacity	MW	684	
	Annual mean energy production	10^8 kW.h	38.03	
	Annual utilization hours	H	5600	
V	**Main structure and equipment**			
1	Dam			
	Dam type	Concrete weir dam		
	Foundation property	Slate with sandstone interbed		
	Basic earthquake intensity	Degree	6 / 6	
	Dam crest elevation	m	229.5	
	Maximum dam height (powerhouse section)	m	56.2	
	Dam crest length	m	909.9	
2	Flood discharge			
	Design flood discharge (P=0.2%)	m^3/s	31700	
	Check flood discharge (P=0.05%)	m^3/s	34400	
3	Powerhouse			
	Type	Powerhouse in river channel		
	Foundation property	Slate with sandstone interbred		
	Basic earthquake intensity		6	
	Powerhouse dimension (L×W×H)	m×m×m	262.2×80.7×58.4	
	Unit installation elevation	m	187.4	
	Headrace			

No.	Item	Unit	Qty.	Remarks
	Design available discharge	m^3/s	5801	Single unit 483.4
5	Navigation structures			
	Navigation lock			
	Navigation lock series		Single line	
	Navigation lock lines		Single line	
	Design level of navigation lock			
	Upstream maximum navigable level	m	220	
	Upstream minimum navigable level	m	219	Upstream dead level
	Downstream maximum navigable level	m	212.55	Downstream level corresponding to 3-year flood
	Downstream minimum navigable level	m	199.62	Downstream level corresponding to 95% guarantee rate
5.1	Main dimension of navigation lock			
	Effective dimension of navigation lock	m	120×12×4	
	Maximum lift of navigation lock	m	20	
	Improve navigable waterways	km	81	
	Length of dam axis occupied by upper lock head	m	36	
5.2	Capacity of navigation lock			

No.	Item	Unit	Qty.	Remarks
	Designed standard fleet	T	2×500	
	Designed capacity	104 t/year	264	
	Daily water consumption of lock	m^3/s	5.62	
5.3	Navigation lock structures & equipment			
	Foundation structure	Slate intercalated with sandstone		
	Length of upper lock head	m	30	
	Length of lower lock head	m	40	
	Effective length of lock chamber	m	120	
	Structure of ship lock	The upper head, lock chamber and lower head all adopt the integral structures.		
	Water conveyance way		Lock wall gallery + lateral holes	
Ⅶ	**Construction**			
1	Main civil works			
	Overburden excavation	10 thousand m^3	404.5	
	Rock open excavation	10 thousandm^3	307.43	
	Cement laid stone masonry	10 thousandm^3	3.09	
	Concrete & reinforced concrete	10 thousandm^3	141.56	
	Steels	t	1285.2	
	Installation of hydraulic steel structures	t	22915	Gate, trash rack and hoisting equipment
2	Labor force			
	Total work day	10 thousand man-day	664	
	Mean labor force for construction	person	3500	
	Labor force in peak time	person	4500	

No.	Item	Unit	Qty.	Remarks
3	Transportation			
3.1	Access road inside the plant			
	Length	km	17	
3.2	Outbound traffic			
3.2.1	Highway			
	Distance	km	371	Luang Prabang port (Laos) to the dam
3.2.2	Waterway			
	Distance	km	702	Jinghong port (China) ~ Luang
VI	**Construction Period**			
	Total project duration	Month	85	

3.4 SIZE OF FUNCTIONAL AREA

Sites for project activities should be prepared during the early phase of construction. Areas that need to be cleared are for the main dams, cofferdams, diversion tunnels, power houses, quarry areas, temporary yards, access roads, disposal areas, office, worker camps, waste storage, chemical house, and waste treatment and disposal systems.

Construction procedures of the main power facility would be in this order:

(1) Construction of the new road (to reach the outlet of the diversion tunnel), rehabilitation/expansion of existing road, construction of labor camp, and administration facilities and lay-down area.
(2) Excavation of the diversion tunnel from the outlet toward inlet.
(3) Banking of gravel and soil to construct the pre-coffer dam.
(4) Construction of inlet structure of diversion tunnel and river flow diversion.
(5) Construction of the coffer dam using Reinforced Concrete Cement (RCC) with the appropriate foundation treatment.
(6) Construction of navigation lock structures and equipments.
(7) Construction of fishpass.
(8) Excavation of dam foundation and abutment. Construction of temporary roads, batching plant and crashing plant.
(9) Placing consolidation/curtain grouting for dam foundation.

(10) Placing dam concrete. Clearing major trees in the proposed reservoir area with the cut and burn method.
(11) Installation of turbines, generators, penstock, discharge valve, intake structure, spillway gates and other related facilities once the placement of the dam concrete reaches appropriate elevation. Construction of transmission lines.
(12) Installation of transformer and switching facility.
(13) Impoundment by closing the inlet gate of diversion tunnel.
(14) Placement of concrete in diversion tunnel at the dam axis.
(15) Performance test.

Construction work on the project is to be carried out at the dam sites and at other locations such as the spillway, rock fill quarry, clay and gravel borrow areas, and road works around the dam sites. Since the dam structure is planned for the Mekong River, a river diversion channel is proposed at the main dam and Tributary dam. After diversion, the river bed area should be dry and construction of the dam wall could begin. Foundation preparation consists of two major activities: removal of pockets and seams of weak material, and grouting. The purpose of grouting is to fill open cracks in the rock foundation on which the dam is to be built, so water would not leak from the reservoir after the dam is finished. Grouting involves drilling holes (often to quite great depths, equal to the height of the dam in some cases), and then pumping these holes full of cement grout (a mixture of cement and water).

Once the foundation preparation is complete, the construction of the dam wall itself can commence by hauling, dumping and compacting construction materials such as clay and rock fill. A typical construction sequence for a fill dam is as follows:

Stage 1: Excavate diversion tunnel and build coffer dams.

Stage 2: Strip dam foundation of overburden. Carry out foundation treatment and grouting. Excavate and haul the fill construction materials from their sources, and place and compact the materials in the dam embankment. At the end of this stage, the diversion channels are closed to start the storage of water in the dam reservoir. Excavation of the spillway is also underway during this stage.

Stage 3: Complete outlet works, spillway and all other parts of dam project.

The materials used for the RCC could be limestone powder/cement for the consolidation, mineral admixtures (phosphorous slag/fly ash) to reduce the adiabatic temperature rise of concrete and also reduce costs. It would help improve durability, chemical admixtures (air-entraining and water-reducing admixtures/set-retarding admixtures) to contain higher volume of paste and extend the time up to which the concrete lift should remain unhardened, reducing the risk of cold joints with the subsequence lift, and aggregates.

The total man-days of this project is 7,090,000, with average construction personnel of 3500, and the number of construction personnel in peak period is 4500.

An administration office of the EPC contractor and an owners' office are to be located in the construction area. Management staff of both the EPC contractor and the owner will be stationed within the construction area. Heavy equipment such as bulldozers, dump trucks, excavator, truck cranes, and drilling machines, would be brought in and temporary facilities such as the crushing plant, batching plant and base camp would be constructed.

3.5 HAZARDOUS MATERIALS

Hazardous materials such as explosives, construction chemicals, fuel and oil will be stored under secure and safe facilities following appropriate regulations and good practice.

3.6 QUANTITY AND QUALITY OF WASTE PRODUCTS GENERATED BY THE PROJECT

According to the design of the Project and site survey, the majority of wastes generated from the project would mainly be from:

- Vegetation Clearances from the dam site, powerhouse area, operation villages surge tank, access roads and along the 230 kV transmission line rights-of-way. However, some of these "wastes" will not be without usefulness. Apart the local nearby villagers living in the vicinity who can make use of some of these wastes; for example, for firewood, raw materials for charcoal production, fencing components, materials for farm buildings and animal pens. In the case where forests contain a significant quantity of commercial timber with trees more than 20 cm in diameter the trees, the trees will be identified, logged, and as part of the environmental protection procedure will be sold off by the sectors concerned prior to the clearing taking place. In order to protect the surrounding forests and other natural resources burning off is not permitted.
- Excess Soil as a result of the excavation and preparation for construction of all the civil works need to be handled correctly so that adverse impact to the surrounding environment is minimized. Because of the rugged terrain the access roads alignment will involve a huge quantity of earthwork and cut and fill, most of the excess soil can be used in the construction of the access roads.
- Rock Excavation Spoil resulting from both surface and underground works excavation etc. According to design, some of these spoils will be reused in the construction of the dam hence posing no adverse impact to the surrounding environment.
- The other waste materials anticipated from the project is excess soil excavated during the construction of tower foundations of the 230 kV transmission lines. It is

estimated that there will be approximately 3 m3 to 4 m3 of soil excavated for each tower. However most of these soils will be used as back fill materials for the foundation; only minor portions will be left behind. The excess soil will be spread around the tower bases to facilitate natural re-vegetation and or used as fill in nearby depressions so as to minimize sedimentation of nearby watercourses. Overall the generated wastes are of minimal quantities, therefore will not have any adverse impact to the environment.

- Organic waste waters from worker camps - sewage and cooking wastes. These will be treated on site with appropriate waste water treatment facilities
- Waste oils from vehicle maintenance facilities. These will be collected and disposed of in accordance with regulations covering construction sites and good practice.

3.7 ENVIRONMENTAL AND SOCIAL MITIGATIONS COST

According to the results of environmental and social impacts, environmental and social costs were recommended for mitigation measures as shown in Table 3.

Table 3: Environmental and Social Mitigations Cost

No	Items	Construction (8 Years)	Operation (23 Years)
Environmental		**1,358,872**	**1,500,170**
1	EMMP	1,358,872	1,500,170
Social		**23,441,518**	**180,000**
2	Compensation	2,140,000	0
3	Resettlement Site Development	16,105,950	0
4	Livelihood Restoration Programme	5,101,448	0
5	Social Development Programme	94,120	180,000
Monitoring		**70,000**	**85,000**
6	Internal Monitoring	30,000	40,000
7	Independent Monitoring	40,000	45,000
	Sub Total	**24,870,390**	**1,765,170**
Contingency (4%)		**1,065,422**	
Grand Total		**27,700,983**	

No	Mitigation, Management and Monitoring			
I	**ESMMU Operating Costs**	**Construction (8 Years)**	**Operation (23 Years)**	**Total**
	Environmental Staff of ESMMU	402,560	487,410	889,970
II	**Environment Management Activities Cost**			
2.1	**Mitigation Cost**			
	Fish mitigation	244,800	616,800	861,600
	Erosion and sedimentation	32,800	77,300	110,100
	Upstream pond clearance	166,952	-	200,000
	Environmental Awareness (Publicity)	40,000	110,000	151,000
	Reforestation and maintenance	40,000	115,000	155,000
2.2	**Monitoring Cost**			
	Fish monitoring	11,960	34,760	46,720
	Water quality monitoring	14,600	28,300	42,900
	Air quality monitoring	5,100	15,300	5,100
	Noise quality monitoring	5,100	15,300	5,100
III	**Monitoring and Evaluation Cost**			
	MONRE EMU Monitoring	63,800	-	63,800
	PNREO and DNREO (Vientiane/Sanaham/Met)			
	Logistic Support and Capacity Building for Vientiane Province	57,800		57,800
	Logistic Support and Capacity Building for Sanakham District	55,300	-	55,300
	Logistic Support and Capacity Building for Met District	44,900	-	44,900
	PNREO and DNREO (Xayaburi/Kenthao/Paklai)			
	Logistic Support and Capacity Building for Xayaburi Province	59,400	-	59,400
	Logistic Support and Capacity Building for Kenthao District	57,700	-	57,700
	Logistic Support and Capacity Building for Paklai District	56,100	-	56,100
	Total	**1,358,872**	**1,500,170**	**2,859,042**

3.8 EXECUTIVE AGENCY

Datang (Lao) Sanakham Hydropower Co., Ltd. is the Executing Agency for the project covering, project detailed design, including detailed surveys (dam, powerhouse, headrace tunnels, substation, and transmission line), preparation and evaluation of tenders, and construction supervision. All construction will be carried out in accordance with the Ministry of Energy and Mines and EDL's regulation and guidelines.

4. MITIGATION MEASURES OF CONSTRUCTION AND OPERATION

4.1 CONSTRUCTION PHASE

4.1.1 MITIGATION OF CONSTRUCTION IMPACTS ON PHYSICAL ENVIRONMENT

4.1.1.1 CLIMATE AND AIR QUALITY

Most of the air quality issues are easily controllable through good practice and the impacts will be temporary (i.e. during the construction period) and of limited significance, considering that the dam site is located several km from the nearest village. Mitigation measures may include:

- Water spraying of access roads and key transport routes to minimize dust for adjacent local communities.
- Water spraying of working areas during the dry season will be the primary protection measure against dust.
- Stabilization of spoil areas by herbaceous vegetation will reduce the risk of fugitive dust during any windy days of the dry season.
- Smoke emission from engines can also be controlled by regular maintenance and adjustment of engines.

4.1.1.2 NOISE AND VIBRATION

The noise and vibration from heavy machinery will be largely confined to the dam site area, and will be somewhat reduced by the distance to the nearby villages. Whilst some night work is to be expected, activities such as blasting should be restricted to daylight hours. Noise suppression systems may need to be fitted to equipment while ear protection should be provided for site workers.

The noise level during the construction will vary but will not exceed 85 dBA and it is predicted that the noise level from the sources, or within 1 km of them, should be approximately 45-49 dBA; two km from the source the level should be about 40-43 dBA. According to the IFC guidelines, the noise level may create some nuisances to people living within 1 km. Because the construction site is located in a strategic and remote area which is thinly populated, the noise impact may not significant. However, to prevent and minimize noise impacts during construction and comply with national and IFC noise level guidelines, some applicable measures shall be identified and implemented including the following:

- Identify the noisiest equipment and activities.
- Schedule suitable working time for nosiest equipment and trucks.

- Limit working time and speed of transport and allow only necessary equipment on construction sites.
- Regularly perform inspections and maintenance of
- Equipment and trucks.
- Provide baffles and noise insulating material for specific equipment as necessary.
- Provide mufflers or ear plugs for employees who work in a high level of noise.
- Position any high pressure or noisy equipment far from villages or employee camps; equipment such as generators, air compressors, etc.
- Reduce noisy activities, especially at night time.
- Avoid transporting materials past villages.

4.1.1.3 GEOLOGY AND SEISMICITY

There has been no obvious seismic activity recorded over the past 553 years within 30 km of the project site, and no historical record of a heavy earthquake, which is one with a magnitude higher than 6. In view of regional tectonics and crust activity, the project site is situated in a relatively stable region.

If necessary, areas of rock and soils that may be loosened by the filling of the reservoir should be identified and artificially released to minimize landslides during impoundment.

4.1.1.4 SOILS

Earthmoving activities should be carried out in such a way as to minimize the run off carrying sediments into the river. Much of the earthmoving at the dam site will be carried out within the coffer dams and so be limited. Care should be taken to manage earthwork close to streams and rivers to minimize sediment run-off.

The alluvial top soils are richer than the soils further up the slopes. These should be stored separately and used for landscaping the final dam site.

To minimize the potential impact on soil from the activities of the stone quarries, cofferdam quarries, and borrow pit material extraction, an environmental protection point of view will be used along with economical rationality and quality guarantees.

Borrow pit material extraction will be undertaken in sections with rehabilitation undertaken in stages to minimize erosion. Rehabilitation shall include the following:

- Regrading slopes to minimize erosion.
- Replacing stockpiled soil cover.
- Replanting grass, shrubs, and trees.
- Installing sediment runoff control devices.
- Providing ongoing erosion monitoring.

Impacts on temporarily acquired land will be minimized by comprehensive rehabilitation work. Soil erosion and siltation will be minimized by preventive measures implemented on a case-by-case basis, such as planting shrubs and grass and appropriately engineered storm-water diversions. Construction of the access road could result in increased soil erosion, which will be minimized by appropriate road engineering, including appropriate road compaction and runoff design. Soil contamination will be prevented by installing oil separators at wash-down and refueling areas, and installing secondary containment at fuel storage sites. The largest potential negative impact is related to waste rock disposal and materials mining. Excavated rock and aggregate will be used during construction to the maximum extent possible.

193,900 m3 of spoil will require disposal. Two sites have been selected where the catchment area is minimal, landslide potential is low, and flooding is not expected. Sites will be covered with soil, and planted with shrubs and grasses.

4.1.1.5 SOLID WASTE MATERIALS

To minimize impacts on the environment, the Mekong Sanakham HPP developer will plan and arrange four spoil disposal areas for the disposal of construction solid waste materials and domestic waste as follows:

- Spoil disposal area upstream on left bank with a floor area of 490,300m2.
- Spoil disposal area upstream on left bank with a floor area 100,000m2.
- Spoil disposal area on right bank with a floor area of 100, 000m2.
- Spoil disposal area on right bank with a floor area of 272,500m2.

The total floor area of spoil disposal areas is 962, 800m2.

Spoil disposal areas should be arranged far away from the exit or entrance of any possible debris flow gullies or cultural relic areas. Any waste slag stored in the reservoir area should be far away from water inlets during the construction period and should not occupy the main channel during the flood period.

All these off-site disposal areas should be constructed according to the best practices of solid waste management and approved by the government authorities. No on-site landfills shall be developed.

Hazardous waste will be collected and stored on-site in approved facilities according to relevant standards. Hazardous waste will then be removed from the site to approved hazardous waste disposal facilities.

4.1.1.6 HYDROLOGY

The filling of the reservoir is anticipated to start by the end of year 5 as soon as the dam wall is high enough. From an environmental point of view, the seasonal patterns of the flows downstream should be maintained as far as possible, even if the actual flow rate is

considerably reduced. Minimum wet season flows are approximately 1/3 of the average. Releases downstream should be modified according to the season, so that the peak flows are reduced to one third of average monthly flow rates. The environmental flows assessment recommended during preconstruction should provide a hydrological model for filling the reservoir that maintains environmental integrity.

4.1.1.7 RIVER WATER QUALITY

Most of the sources of water pollution should be controllable by good practice on site, for example:

- Installation of waste water treatment plant for worker camps.
- Safe disposal of vehicle maintenance oils.
- Safe storage of chemicals and disposal of used containers.
- Attention to concrete shuttering to prevent accidental spillage of wet cement into water courses, and prevention or washing cement mixing equipment in water courses.
- Attention to good earth moving practice when working near water courses.
- Removal of surplus vegetation in the reservoir area prior to impoundment.

Worker camps will need to be provided with potable water and adequate sanitation facilities and waste water treatment installed. In order to avoid water pollution caused by rubbish and waste, regular waste collection will be part of the camp requirements. Solid wastes should be taken to a managed waste disposal facility. The location of the temporary and permanent camps and water and waste treatment facilities will be determined during detailed design after discussions with contractor and stakeholders.

Downstream villages that rely upon river water as their main water source should be provided with tube wells.

4.1.1.8 Reservoir Water Quality

During and immediately after impoundment, the break-down of vegetation left in the reservoir area has the potential to cause reductions in water quality, especially creating biological oxygen demand, oxygen depletion, and release of hydrogen sulfide and methane. It is recommended that the bulk of the vegetation in the reservoir area is cut, cleared and burnt.

The objectives of the pre-impoundment preparation will be:

- To maximize income to the province from commercially viable timber.
- To minimize adverse impacts of high initial oxygen demand.
- To control nutrient concentrations and risk of eutrophication during initial filling.
- To create a suitable area for fish.
- To allow reservoir navigation and artisanal and commercial fisheries.
- To create stable lake shorelines.

- To minimize greenhouse gas emissions.

The Provincial Government will be requested to adjust its regional logging plan to give precedence to commercial logging of the reservoir area according to Forestry Law and Regulations. On completion of the commercial logging operation, contracts will be let for timber salvage operations that remove timber of marginal use from the inundated area. Both the Provincial and District government will be asked to collaborate with the Environmental Management Office (EMO) to ensure that these operations are constrained to the reservoir area. District government will also be asked to promote the collection of all NTFPs as well as bamboo from the reservoir area prior to clearing and burning. Specific expenses incurred by the government as a result of conducting these operations, will be reimbursed by the developer.

The final slashing and burning of the reservoir area will commence at the dam wall and progress upstream over three years. The clearing operation will avoid removing stumps as disturbed soil may release far more nutrients in water. This requirement favors the use of manual labor as heavy machinery tends to push over the standing timber and attached stumps. The work will be largely undertaken by hand, but heavy machinery will be used as necessary where remnant timber is too large to be effectively cleared this way and after burning where remnant large timber needs to be restacked and burnt. The most extensive cleanup of residual burnt vegetation in the upper reaches of the reservoir where the water depths are shallowest and could cause the greatest hindrance to navigation and fishery operations.

The clearing operation will maintain a 100 m wide buffer zone of vegetation around the perimeter of the reservoir so that the intact root structure of the trees will help bind the soil and reduce shoreline erosion and wave erosion. Along the major tributaries, this buffer zone could be reduced to 20 m along each bank to control sediment movement.

A monitoring program will be implemented that involves District Agriculture and Forestry Extension Office (DAFEO), other concerned authorities, the Village Development Committee, and an independent third party contracted by the developer, who will audit the clearing operation and compensatory replanting operations.

Guidance on clearance operations might include:

- Removal of maximum commercially viable timber except in some designated buffer zones. Since evacuation of logs from the reservoir area may be difficult, costly and impacting for surrounding forest areas (because it would require the creation of access roads), transformation on site with portable sawmills and removal of logs by flotation during the filling phase should be considered.
- Cut, clear and burn a maximum of the remaining vegetation. Experience from other projects shows the possibility of relying on hand clearing in areas inaccessible by heavy equipment. This social approach is also in line with the request of major funding agencies to have this major project to generate benefits not only to the Government but also to local communities.

- Avoid removing stumps as soil disturbed may release faster more nutrients in water.
- Haul as much as possible of the burnt vegetation residual from the reservoir area.

In order to reduce the intrusion into areas outside the reservoir area (which will be cleared), strict rules against logging outside the approved construction areas, and against poaching will be imposed on the project staff, workers, and all contractors engaged to the Project; there will be penalties levied for anyone cutting down trees, collecting NTFPs or burning forest outside approved areas. The developer shall be directly responsible for the dissemination of all necessary regulations and information to its staff and employees as well as for any misconduct made by its staff and workers.

4.1.1.9 GROUND WATER HYDROLOGY AND QUALITY

Apart from monitoring the ground water hydrology and quality, no particular mitigation measures are anticipated.

4.1.1.10 SEDIMENT TRANSPORT

Measures to reduce the sediment inflow into the reservoir area should be started as soon as possible. During earthmoving, attention should be paid, to minimize sediment discharge into the river downstream, and this aspect should be monitored regularly.

4.1.2 GENERAL MITIGATION OF CONSTRUCTION IMPACTS ON BIOLOGICAL ENVIRONMENT

4.1.2.1 VEGETATION AND LAND COVER

The project area lies within the provincial protection forest especially along the two sides of the Mekong River. The description of land use, forest and vegetation types in this section is mainly focused on the areas that are covered by the proposed reservoir area that will be inundated including the dam site and powerhouse.

The vegetation cover and land use in the construction site and the reservoir area will change completely, and the existing areas of unstocked forest and bamboo will be lost. As a form of compensation for the losses of the less disturbed forest, it is recommended that areas within the project are be identified and be the focus for conservation measures. As a guide, the areas of forest lost are 1,846.1 ha of unstocked forest , 470.6 ha of bamboo and 87.5 ha of Ray (shifting cultivation areas). The latter will not be found in the upper project area, but existing stands of Mixed Deciduous forests above the reservoir area could be identified for additional management and protection measures. This should be part of the natural resource assessment carried out as part of the detailed EMMP.

A contract will also be let by the developer to undertake compensatory regenerating and planting as per Article 15 of the Forestry Law (1996) for the logged area of the reservoir and also where temporary access roads will need to be constructed. A subcommittee of the EMU which includes Provincial Agriculture and Forestry Office (PAFO) has responsibility to monitor the implementation of the program.

The areas for compensatory regeneration will partly constitute the planting of woodlots for the resettlement villages and replacement of areas of degraded forest i.e. the un-stocked forest and bamboo areas. Some areas may be used as a trial modification of the traditional slash and burn technique by villagers; it would be changed to an operation which incorporates a managed regeneration of cultivated areas using a species composition that could be slashed and sold as pulp wood on the next rotation.

4.1.2.2 TERRESTRIAL HABITATS AND FAUNA

The loss of wildlife habitats at the construction site and through inundation is an unavoidable loss, for which there is no mitigation possible. Compensation may be made through the allocation of funds for improved management of the habitats, including conservation of existing forest areas and regeneration of other areas within the catchment area.

In the higher areas around the construction site, where some natural habitats and fauna still remain, there will be disturbance, which may be limited through application of measures such as:

- In order to reduce such impacts of noise and disturbance by construction activities, excessively noisy activities such as blasting should be restricted to daylight hours.
- Strict rules against wildlife hunting and poaching will be imposed on project staff, workers, and all contractors engaged to the Project, with penalties levied for anyone caught carrying and using firearms, or using animal snares and traps.
- The sale of wildlife and NTFP products by local people to construction workers and staff will be banned.
- The developer shall be directly responsible for dissemination of all regulations and information concerned to its staff and/or employees as well as for any misconduct made by its staff and workers.

4.1.2.3 AQUATIC HABITATS AND FISH

To prevent fish deaths due to water pollution downstream of the construction site, appropriate good practice measures must be taken to limit pollution coming from the construction site, and to reduce the risk of accidental spillage of contaminants into the water courses. The vegetation clearance in the reservoir should be carried out to minimize the risks of poor quality water being discharged from the dam site, both during impoundment and after operation starts.

To prevent degradation of aquatic habitats and loss of ecosystem integrity during the filling period, it is essential that a seasonal flow pattern that resembles the normal flow regime in the

river downstream of the dam site is maintained. Environmental flow studies should be carried out during the first two years of the construction period to develop knowledge about appropriate flow regimes necessary to maintain the health of the river, its ecosystems and its productivity. This should be agreed between the developer and provincial authorities in consultation with local communities dependent upon the river.

The release of the agreed seasonal flow regimes during the filling period should be facilitated through variation of the flows through the bottom release outlet and through the diversion tunnels.

The project component will include a fishpass facility; therefore, the impact of the barrage to fish migration will be minimized. No design is considered to be a viable answer to the issues regarding fish migration as there is no known type of fishpass that could possibly cope with the large number of Mekong fish species that would need to use it during the critical time periods when fish need to move. The maintaining of downstream flows and upstream migration is crucial to the sustainability of fish populations.

A fishery research station at the project area should be set up near the project area. Many activities will be related to the breeding of indigenous fish species for release to the Mekong River. A fish transport mobile unit with a large container and an aeration system will be used to move collected fish from downstream or the fish pass pond to an upstream location. Adoption of aquaculture within the head pond area would be a partial solution to the loss of migratory species.

4.1.2.4 NON-TIMBER FOREST PRODUCTS (NTFPS)

It is difficult to quantify the extent of the pressure on NTFPs, but experience from worker camps in similar situations indicates that many NTFPs and wildlife species virtually disappear from the vicinity unless strict measures are taken to:

- Limit the sale of NTFPs and wildlife to worker camps.
- Outlaw the sale of NTFPs and wildlife in temporary restaurants that are established to serve the workforce and staff.
- Ban hunting and fishing for recreational purposes by the workers.
- Remove guns, snares etc. from workers.
- Establish strict control to manage explosive theft.

According to the laws and regulations concerned, logging outside the approved construction areas and wildlife hunting and poaching within the area will be strictly enforced on project staff, workers, and all contractors engaged to the Project, with penalties levied for anyone caught carrying and using fire arms, or using animal snares and traps. Project staff and workers will not be allowed and have no right to hunt wildlife and cut any tree except for fallen or dead ones. Even the use of firewood by worker camps can be minimized by the Contactor providing bottled gas or kerosene to workers for cooking as an alternative to fuel-wood. The developer

shall be directly responsible for dissemination of all regulations and information concerned to its staff and employees as well as for any misconduct made by its staff and workers. These requirements will be stipulated in the contract document. These issues need to also be stated in the Environmental Management Statement prepared by the Contractor.

4.1.2.5 EXISTING MANAGEMENT AND CONSERVATION MEASURES

Although the project area does not adjoin any NBCAs, it lies within a proposed provincial protection forest and it covers some important habitat areas, village conservation forests and special spirit pool forests that are unique geological sites. Due to the steepness of these areas and the pattern of settlement concentrating on more accessible land, some vegetation has remained relatively intact; some inaccessible areas, especially above the reservoir, provide important habitat for a range of species.

4.2 OPERATION PHASE

4.2.1 MITIGATION OF OPERATION IMPACTS ON PHYSICAL ENVIRONMENT

4.2.1.1 CLIMATE AND AIR QUALITY

The humidity within the reservoir area will be slightly increased during the dry season. No mitigation required.

4.2.1.2 CONTRIBUTION TO CLIMATE CHANGE

There is a potential for increase in releases of methane from the decaying vegetation in the reservoir after impoundment. The clearance of the vegetation prior to impoundment should be carried out as planned to limit the release of methane and other green-house gases.

4.2.1.3 EVAPORATION

The evaporation from the reservoir area will slightly increase water losses from the run-off in the Mekong River, marginally reducing the volume of water available. No mitigation possible.

4.2.1.4 GEOLOGY AND SEISMICITY

After initial impoundment, there should be no increase in seismicity in an already geologically stable area. No mitigation necessary.

4.2.1.5 SOILS

There is potential for soil erosion in the upper project area as a result of increased agricultural usage, either as a result of increased rotation rate of swidden agriculture, or through development of agro-forestry. The project should pay particular attention to issues of soil erosion and take measures to minimize the risk.

4.2.1.6 HYDROLOGY

Reservoir

The levels in the reservoir will vary depending upon the season and usage of the water for power generation. It is not expected to reach the Minimum Draw Down Level (MDDL) under normal operation even in dry years. Management of the levels is part of the operational management regime and no additional mitigation will be required.

Diurnal Changes in Flows downstream

The diurnal changes in flow will be felt most in the section of the river between the dam and Sanakham town. In this stretch of river the flows will vary during power generation. This could result in variation in height of the river levels at Sanakham town of about 1 - 2 m during the day. There can be no mitigation of this effect, but recognizing that diurnal variations can cause serious problems for river users, a public information network should be set up to advise river users when to expect these diurnal variations. The network should also be used to warn river users of any changes in the patterns of discharge such as artificial flood releases and discharges of excess water over the spillway when the reservoir is full.

Seasonal flows and floods

Under the basic design of operations, run-off during the early part of the wet season will be used to fill the dam which will then be drawn down during the dry season. The flood events that occur naturally during the early wet season would be largely eliminated and discharge of the excess waters over the spillway would occur at least one month later than occurs naturally e.g. in September compared to July/August.

As has been shown, the migratory fishery in particular is dependent upon the early flood events which act as triggers for the migrations. Late flood events would either not trigger the migrations in the same way or if the fish do migrate to spawn upstream the eggs laid may hatch too late in the season to be able to take advantage of food availability. The result would be a much reduced recruitment of new fish stock and populations would decrease.

It is recommended that the first short natural flood event (around 3 to 5 day duration) should be released early in the wet season, coinciding with rainfalls in the catchment, i.e. mimicking natural flows, in order to maintain the ecological integrity of the river and the fish migration triggers. It is important that such flood events are made during dry years as well as normal and wet years.

Floods occurring later in the wet season when the reservoir is full and the water is discharged over the spillway will be transmitted downstream as before (as if the dam were not there). However, because the water has been held back during the refilling of the reservoir in the early wet season, recharge of the floodplain will not have occurred to the same extent. It is therefore likely that in some years the recharge of the floodplain groundwater will be less than before

and that there will be some shrinkage of the floodplain itself over the years. This effect cannot be mitigated and the shrinkage of the floodplain and loss of its productivity is accepted as an unavoidable loss. The extent of this could be a part of the environmental flow assessment.

Water Quality

During the initial impoundment and stabilization period (about 5 years) the water quality in the reservoir will be lowered by the decaying vegetation. This is mitigated by the removal of as much vegetation as possible before impoundment.

After the reservoir has stabilized, water quality will be improved, although there still exists the possibility that deoxygenated and colder water will be released downstream. This will be less of a problem with the water passing through the turbines, which will receive some oxygenation, but releases from the bottom gates, e.g. during maintenance or to create artificial floods, will contain colder, deoxygenated water.

Ground Water Hydrology and Quality

The probable increase in the water table downstream of the dam due to seepage, is not anticipated to be a problem, but requires monitoring, both for the level of the water table and quality.

Sediment Transport

Sediment transport into the reservoir should be controlled through improved upstream management. This would form part of the EMMP Plan.

The sediment transport downstream of the dam will be reduced due to collection within the reservoir. No bed load will be transmitted downstream, as well as a reduced Suspended Solids loading. Signs and indicators of any impacts from discharging "sediment hungry" waters downstream, such as bank and channel erosion, will be monitored regularly.

4.2.2 MITIGATION OF OPERATION IMPACTS ON BIOLOGICAL ENVIRONMENT

4.2.2.1 PRESSURE ON BIOLOGICAL RESOURCES - WILDLIFE AND FOREST PRODUCTS (NTFPS)

The pressure on the natural resources has been discussed above under terrestrial habitats and fauna. The pressure from both within the resettled communities and from outsiders needs to be managed as part of both the Resettlement Action Plan and the EMMP:

- Ensure that resettlement plans consider access to forestland for sustainable NTFP collection for household consumption, and make allowances for losses in economic benefits from NTFPs in livelihood development schemes for resettled communities.
- Include management of wildlife and NTFP collection as part of the EMMP, and include provision for monitoring and policing the wildlife trade.

Management and Conservation Measures

The Mekong basin contains a number of other important tributaries. There may be other tributaries that can be identified for conservation that can continue to provide for migratory fish and other aquatic biodiversity. These should be dedicated as "Conservation Rivers" and further development on them limited.

This mitigation measure is especially urgent in the light of the number of the other Projects being considered before all the options for conservation rivers are closed. The government should consider establishing an Integrated River Basin Management Plan for the Sanakham area to coordinate hydropower, fisheries and conservation objectives for the basin. This could be done under the auspices of a Mekong River Basin Organization.

4.3 MITIGATION OF CUMULATIVE AND TRANS-BOUNDARY IMPACT

With the development of schemes similar to the Mekong Sanakham Hydroelectric Power Project either on tributaries or the Mekong mainstream, there exists an opportunity for coordination and management of the waters and of the basin as a whole. Without such planning there is a real possibility that any individual facility on the Mekong could result in shortages of flow at certain times followed by excessive flows at other times. Coordination can add greater value to the environmental flood flows of each individual Mekong River dam site and be used to maintain ecosystem services such as recharging groundwater in the flood plain and triggering fish migrations.

Coordination in project area can develop a more consistent application of management techniques, provide a shared learning experience and spread the economic benefits over the whole basin rather than on isolated sections of the project area. Also, co-operation in addressing the issues of an even greater loss of the river fishery should exist between all of Mekong River development projects as this will be more productive than individual initiatives.

The cumulative effects from the Mekong Sanakham Hydroelectric Power Project will be felt downstream in Cambodia down to the Tonal Sap and even down to the delta in Vietnam. Migratory fish have been shown to come from both of these parts of the river in to the upper Mekong system.

There is no easy answer to mitigating these cumulative and trans-boundary impacts. However, in dealing with impacts in other countries, it is necessary to show active management of the

resources in such a way as to maintain the ecosystem services that they expect from a trans-boundary river.

The formation of the Mekong River Basin Organization to manage these resources and to coordinate the Mekong schemes is recommended to the Government of Lao PDR to demonstrate the best practice and efforts to maintain ecosystem services. The sharing of information about flows and developments on the Mekong should be one of the functions of the Mekong River Basin Organization with counterparts in Cambodia, Thailand and Vietnam through the Mekong River Commission.

5. INSTITUTIONAL ARRANGEMENT OF ENVIRONMENTAL MANAGEMENT

5.1 INSTITUTIONAL ARRANGEMENTS

The Mekong Sanakham Hydroelectric Power Project (Mekong Sanakham HPP) is intended to conform to the environmental/social management policies and regulations of the GoL. The EIA and SIA has been prepared according to current legislation, policies, directives and procedures. Institutional issues on the Mekong Sanakham HPP are centered upon the GoL's role in instituting mitigation measures and monitoring their effectiveness. The GoL's responsibilities will be primarily in the area of human issues and public participation and involvement. These roles for GoL will be provided through MONRE by establishing an Environmental Management Unit (EMU) in accordance with the Environmental Protection Law with the authority to monitor Company's and the Project's compliance with the environmental measures, standards, and permits.

With the main aim to develop procedures and plans ensuring that the environmental mitigation and enhancement measures and monitoring requirements addressed in the EIA will actually be carried out in subsequent stages of the project development. The project requires two types of organization, company and GoL, to be set up to run the project environmental and social mitigation and enhancement tasks.

The following diagram, Figure 2, shows the proposed ideal GoL/Company's organization chart for the project EMMP implementation.

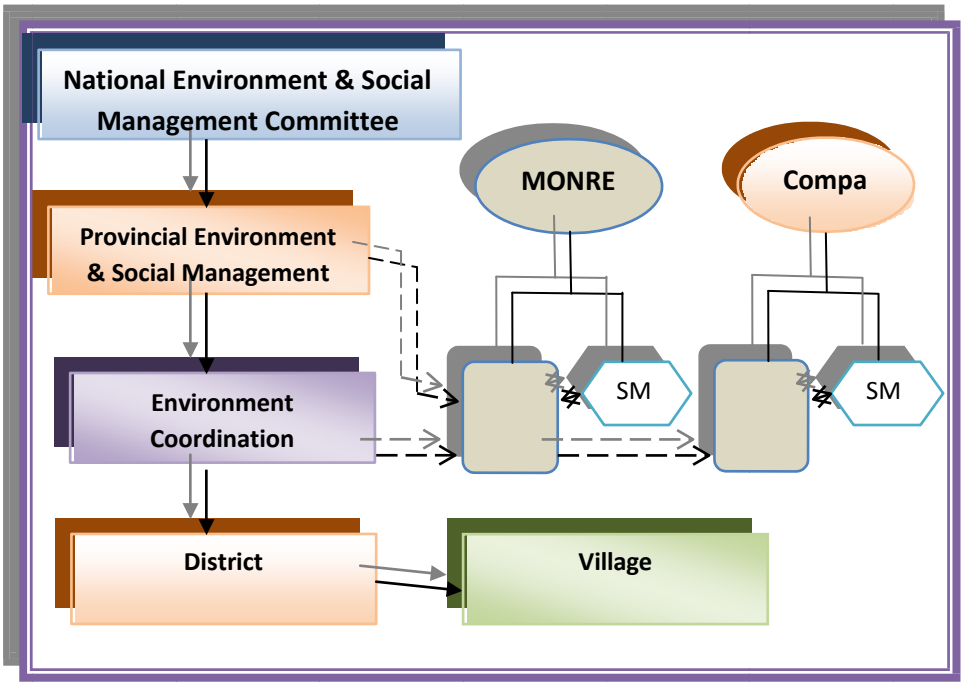

Figure 2: GoL/Company's organization chart for the project EMMP implementation

5.1.1 PROJECT COMPANY ORGANIZATION

The project proponent will provide adequate budget, staff and efficient management system for the implementation of project EMMP. The proposed company organizations to be established for the project are as follows:

1) Company shall establish and maintain an Environmental Management Office (EMO). The company's EMO shall commence operation from the effective Date of the Concession Agreements (CA) and shall continue operation throughout the concession period. The Company shall staff the EMO with a sufficient number of management and professional staff to ensure that the company will fully, effectively and in a timely fashion meet all of its environmental commitments with the GoL. The EMO will be responsible for all environmental obligations of the Company. The staff of the EMO will be drawn from the permanent full-time staff. The major responsibilities of the EMO are to ensure the mitigation measures and monitoring programs are carried out as agreed to in the concession agreement between GoL and the project owner.
2) The EMO shall be responsible for providing MONRE with the information and reporting required.
3) The EMO shall ensure that the relevant environmental commitment is adequately reflected in the project documents including construction contracts.
4) Prepare plans for mobilizing subcontracts for studies that will need to be undertaken by the company.
5) Hold discussions with the Government Authorities participating in the Project such as, provincial/district authorities, MONRE and the GoL's Environmental Management Unit (EMU) so as to develop procedures for interagency coordination and reporting.
6) Ensure that the construction phase activities include appropriate environmental monitoring and surveillance.
7) Assist the EMU to plan and manage an environmental public consultation and information program to keep the Lao public informed of the Project activities.
8) Provide any necessary background information to the EMU to allow it to respond to any public comments, complaints and inquiries in relation to the environmental commitment.
9) During the construction/operation phases, the EMO shall be responsible for implementing and monitoring environmental commitment which includes the following:
    a) Implementing or causing to be implemented the environmental mitigation measures of the EMMP and other related environmental action plans.
    b) Developing and implementing the monitoring program.
    c) Liaising and cooperating in good faith, with the Government Authorities given responsibility for implementing the EMMP.
    d) Preparing work and cost schedules for the monitoring program.

e) Carrying out any appropriate testing to ensure that the environmental commitments have been effectively addressed.
f) Arranging for adequate reporting on a regular basis to be undertaken of the results of the monitoring program.
g) Undertake all necessary record keeping functions and make periodic reports to the company and to the EMU.
h) Create and implement programs for all of the budgeting and financial reporting for the operation of the EMO.
i) Undertake such internal and external audits as may be necessary to comply with the CA and the procedures of the company.
j) Assist the GoL in conducting public consultation programs, documenting the feedback and incorporating that feedback into program planning.

As the project is in the Mekong mainstream, it seems reasonable to adopt an acceptable environmental management system. In this regard, the company shall prepare and implement its Environmental Management Information System in compliance with the 2009 Lao National Environment Standard which will also meet all the requirements of ISO 14001: 2004 and obtain ISO 14001 certification. This will be explained further in the EMU section later in this document.

5.1.1.2 ENVIRONMENT SECTION

The major tasks of the Environment Section Figure 3 is the monitoring of all baseline data and information concerning the environment, such as fish and fishery, hydrology, water quality, river bank erosion as well as any implementation of the mitigation measures that have been mentioned in EMMP. The Environment Section may be divided into two teams as follows:

Environmental Monitoring Team

- Establish baseline data on the environment status of the project area, upstream, dam site and downstream area.
- Carry out daily, weekly or monthly as planned schedule for monitoring of the environmental changes.
- Report to the Environment Working Group for the timely management of the environment status in the Project area.

Construction Monitoring Team

- Make a details plan to follow up with the contractors in different construction site including access road.
- Ensure the contractors to provide the environmental management for the site works.
- Monitoring of the safety issues of the workers in the work site.
- Draft Environmental Instruction for environment management for the Environment Working Group and EMU for consideration to further instruct to contractors.

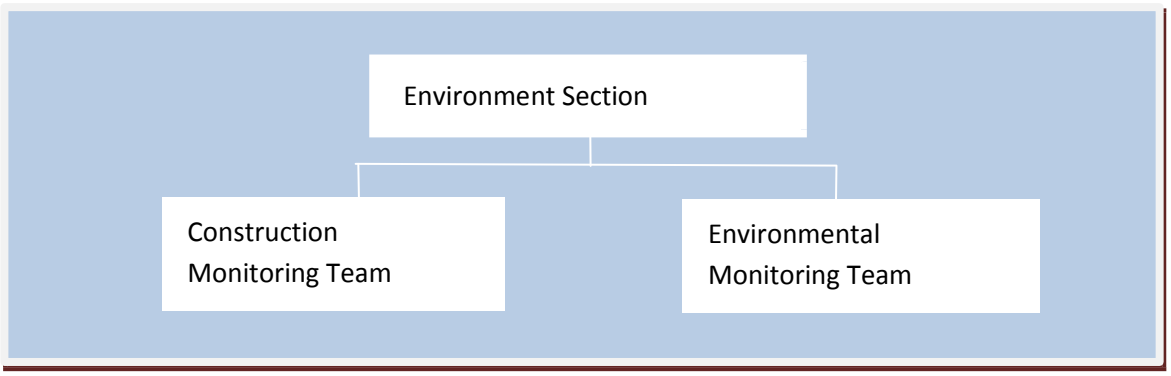

Figure 3: Structure of the Environment Section.

5.1.2 GOVERNMENT OF LAOS ORGANIZATION

On behalf of the Government, there is some level of organization to be established for implementation of the Environment and Social Management Plan of Mekong Sanakham HPP.

a) National Environment and Social Management Committee

It is not always possible for the developer to recognize indirect social and sometimes environmental impacts arising from the projects implementation and its social-environmental mitigation plan. Accordingly, community consultation and consultations with government agencies constitute an important component of the plan. The planning of this project will be undertaken in consultation and with the advice of the district, provincial, national governments. It is proposed to establish of the National Environment and Social Management Committee (NESMC).

The major scopes of works of the NESMC are to provide guidance and to direct implementation of the Social Development Plan and the Resettlement Action Plan.

The operational costs of the Mekong Sanakham HPP NESMC will be supported by the project proponent. To avoid conflicts of interest, no member of the NEMSC will be contracted to implement any part of the Environmental Management Plan, Resettlement Action Plan and any others.

National Environmental and Social Management Committee may consist of the following at the ministerial level:

- Minister/Vice to Prime minister's office/President or Vice President of MONRE.
- Minister/Vice of Energy and Mines.
- Agriculture and Forestry Permanent Secretary Office.
- And any other relevant Ministerial personnel.

NESMC may conduct a meeting every 3 months to evaluate the overall progress of the project, and if required may organize a special meeting at any time to solve any issues or emergencies that require a quick decision.

b) Provincial Environment and Social Management Committee

Following precedents set by earlier projects the developer proposes that a Provincial Environment and Social Management Committee (PESMC) will be composed of officials from relevant Departments and Sectors of each provincial government chaired possibly by either the Provincial Governor or Vice governor. Representatives from the District government may include:

- Provincial Governor
- Provincial Cabinet Officer
- District Governor
- Environmental Manager
- Provincial Energy and Mines Officer
- Provincial Forestry Officer
- Provincial Land Officer
- Lao Woman's Union representative
- And other concerned authorities

The Mekong Sanakham HPP, PESMC will meet regularly, maybe once a month. The committee will have its inaugural meeting at least 1 month before the start of the Project and will operate for the construction stage and few years after to monitor post impoundment impacts and take action as necessary.

c) Environmental Management Unit

MONRE will establish an Environmental Management Unit (EMU) in accordance with the Environmental Protection Law with the authority to closely monitor the Company's and Project's compliance with environmental measures, standards, and permits. One of the EMU's major tasks will be to act as secretary to the NESMC with the major task of preparing all relevant Mekong Sanakham HPP implementation policies and directions for approval by the NESMC. The EMU has the full right to inspect all the implementation of the EMMP, SMMP and RAP of the Project.

During preparation of the Concession Agreement (CA) of the project, many obligations of the GoL and the Mekong Sanakham HPP including the environment and social management conditions are to be discussed. The EMU will be set up to see that Mekong Sanakham HPP has fulfilled those requirements and obligations during the implementation phase of the project. The complete EMU operational budget will be fully supported by project proponent.

The EMU may be headed by Director/Vice Director General of the ESIA Department, they will regularly report to MONRE and NESMC as representative of the GoL on environment and social management and development of Mekong Sanakham HPP.

The EMU will have the following responsibilities:

1) Assisting MONRE with reviewing and approving subject to conditions.
2) Coordinating with Government Authorities in relation to the implementation of the Environmental Objectives of the GoL and the Company.
3) Monitoring and inspecting the implementation and compliance of the Environmental Obligations of both the GoL and the Company.
4) Conducting field monitoring and inspections of the Company's compliance with its environmental obligations.
5) Advising MONRE and the Government Authorities on the adequacy of proposed environmental mitigation measures and recommending amendments following findings from project monitoring.
6) Setting set up a process to record all monitoring data compliance, management decisions and corrective actions taken.
7) Setting up the Environmental Management Information System; this is described in detail in section 6.4 and 7.2 of this document.
8) Liaising with external organizations in relation to environmental issues relating to the Project, which include the following:
    - Coordinating the resolution of issues which arise among the various Government Authorities and the company relating to the environmental measures.
    - Developing and updating work schedules for the monitoring and inspections of the EMU.
    - Managing its financial and manpower resources.
    - Procuring technical assistance or other services or goods.
    - Advising the GoL through MONRE using periodic reporting on the performance of the Environmental Measures, including the performance of the financial aspects of the Environmental Measures.
    - Coordinating any necessary interfaces between the Company or the EMO with any of the government authorities with respect to environmental issues.
    - Working with the Independent monitoring agencies in order to periodically assess the performance of Environmental Measures.
    - Following the provision of any required input from the EMO, responding to any public comments, complaints and inquiries in relation to the environmental measures.
    - Assisting MONRE with giving instructions to the company regarding compliance with its environmental obligations.
    - Assisting MONRE with issuing non-compliance notifications to the company and sanctioning the company in cases of non-compliance.

Since the GoL monitoring task is considered very important, the MONRE will establish an Environmental/Social Monitoring and Inspection Unit (ESMI) within its organization. The ESMI shall be under the direction of MONRE to monitor and inspect the compliance with the environmental and social measures of the GoL and the company. The ESMI's responsibilities in terms of monitoring and inspection of environmental and social measures shall be addressed in the CA. The ESMI will have the following responsibilities:

1) Assisting GoL with reviewing the EMMP and any revisions or detailed plans thereof.
2) Conducting monitoring and field inspections of the social measures of the Company and the GoL with respect to compliance with the environmental and social obligations of the Company and the GoL.
3) Assisting GoL with the following:
   - Issuing instructions to the company regarding compliance with its social obligations including the law of the Lao PDR.
   - Issuing non-compliance notifications/enforcement notices to the company.
   - Solving problems for the Company in cases of non-compliance.
4) Advising relevant government authorities on the adequacy of proposed social measures and recommending amendments following findings from project monitoring.
5) Periodic reporting on the performance of the environmental and social measures, including the performance of the financial aspects of the environmental and social measures.
6) Developing and updating work schedules for the monitoring and inspections of the ESMU.
7) Managing its financial and manpower resources.
8) Procuring technical assistance or other services or goods including the following:
   - Assist GoL with reviewing all documents related to the social measures.
   - Monitoring and auditing funds for social obligations that are earmarked by the company for GoL activities.
   - Report to GoL about monitoring findings.

d) Village Development Cluster

A Village Development Cluster has been established in districts according to decree No.09/PMO dated 07/05/2008 on Village and Village Development Clusters and will serve as counterparts to the EMU. The actual type and number of staff will be determined upon a detailed needs assessment prior to implementation. District staff involvement in EMU implementation will be primarily task-based. In some cases provincial and district staff will be involved in implementation arrangements when district staff is not available or adequately qualified. In some programs, such as consultations, both provincial and district staff have been members of project proponent teams. The Project will arrange for capacity building for social development for these keys staff for a long term management. The tasks of the Village Development Clusters will be to:

In collaboration with the EMU team, provide technical input to the Resettlement Action Plan and Social Development Plan and participate in capacity building for village facilitators - at times as trainers and at other times as trainees.

Provide human resource and informational input to infrastructure and livelihood activities, as required and assist with training activities.

Village-Level Organizations

In each relocated and adjacent village it will be necessary to delegate to an existing organization the responsibility for formulating village policy on resettlement, overseeing the resettlement process, recruiting head village coordinators, and leading the community participation process and other identified tasks. This key person will create the link between several project working groups and the EMU. Several assistant coordinators may need to be established to help.

The village coordinators will receive a regular honorarium for their work and will have funds to engage a secretary to ensure that all delegated issues are tracked and addressed. The head village coordinators should act as the formal contact point and have the responsibility for selecting and supervising the assistant village coordinators, as well as representing the village in inter-village meetings to discuss, monitor and evaluate progress.

5.1.3 AUDITOR OR THIRD PARTY MONITORING

- The project monitoring group will be composed of staff members from each of the Resettlement, Social Development and Environment groups. The members of each group will monitor their own group according to the requirements laid out in the RAP, SDP and EMMP. The Monitoring Unit should include the following specialists:
- A project monitoring Specialist with a strong background in mathematics or statistics and a relevant social or natural science plus experience in planning, implementing, monitoring and evaluating resettlement plans or projects to international standards on large hydropower projects, and preferably with relevant experience in Lao PDR or elsewhere in the region.
- Lao National Resettlement Specialists or Social Development Specialists with strong backgrounds in relevant social sciences and demonstrated experience in organizing and managing socioeconomic data collection and analysis, PRA, group facilitation, and with relevant experience in the Project area.
- Surveyors with demonstrated experience in household surveys, data input and analysis and participatory rapid appraisal techniques, and group facilitation will be used. Surveyors and monitoring team leaders should have an equal gender mix and local language skills.

- An Ethnic and/or Gender Specialist who will probably be a member of the social development team and will assist the monitoring unit to ensure that Ethnic and Gender issues are included in the various monitoring programs.

Good practice in resettlement requires continuously incorporating the learning that takes place in programs using a variety of implementation strategies and institutional models, allowing the Social Development Plan (SDP) to evolve as needed. Monitoring provides the mechanism by which to do this. Monitoring and evaluation of the SDP will occur as part of the overall RAP Monitoring and Evaluation Plan. Participatory self-monitoring by affected people will be essential to accurate monitoring of the SDP. For example, the monitoring of the effectiveness of the health team in providing access to health services will be undertaken by individual resettled people through their own personal assessment of the community's access to health services. The monitoring team will simply undertake an abbreviated social assessment every 6 months.

Questions the monitoring team will be asked to answer through such assessments will include as a minimum the following:

- Have any people used the grievance redress procedures? What were the outcomes?
- Have any intra-community conflicts been reported? How were they resolved?
- Were special measures for ethnic peoples implemented?
- What changes have taken place in key social and cultural parameters relating to living standards?
- What changes have occurred for vulnerable groups?
- Are people able to access schools, health services, cultural sites and activities?
- What is the extent and quality of participation in community groups?
- Has access to cultural sites and events been restored?
- Have perceptions of "community" been restored?
- Do people believe local spiritual needs are being met?
- Have people achieved any replacement of key social and cultural elements?
- Have people reported incidents of corruption?
- Are women taking increasing roles in public decision making?

In addition, to answering these questions through appropriately designed survey questions, specific data will also be collected based on a set of indicators of both the state of social development and the state of the livelihood system. Quantitative data on the level of social development attained will include, but will not be limited to the following: school attendance, Early Childhood Care for Development (ECCD) centre attendance, teacher attendance (ensuring all schools have sufficient teaching staff assigned and active), number of classrooms with adequate learning materials, participation rate in adult literacy classes, village literacy rate, ratio of women to men on village committees, etc. All of the above data will be disaggregated by sex.

Quantitative Indicators of the system of livelihood for each family include:

- Paddy yield in tones per ha.
- Vegetable crop yields.
- Fish production (spawning and nursing survival rates, yield by weight and by cash value).
- Animal production: the animal weight and the survival rate after disease control.
- Design, making and marketing for women's products.
- Whatever overall socio-economic well-being indicators that Mekong Sanakham HPP selects as measures of the attainment of livelihood targets, income/poverty levels at both household and village level.

Monitoring of community management and benefit distribution will also be undertaken and will have its own indicators which will be decided upon by the communities themselves.

It is not possible to accurately define cost when the level of impact is not known. The Mekong Sanakham HPP needs to characterize the existing situation accurately, and then closely monitor what actually happens when the dam's effects begin to be felt. A contingency budget has been established for livelihood improvement in the upstream villages in case fisheries monitoring shows a significant impact on the fishery by the Mekong Sanakham HPP. The budget is by no means meant to be used equally for each village. The amount to be used will depend on the impact, the size of the village, the importance of fishing and cost of livelihood activities (crop and livestock production) for each specific village.

5.1.4 CONSTRUCTION CONTRACTORS AND SUBCONTRACTORS

The developer will appoint a contractor to implement the physical components of the RAP including the construction of housing. The Contractor will in turn appoint subcontractors to manage specific aspects of the Resettlement, e.g. removals and relocation, construction of infrastructure, and construction of housing. Certain aspects of the resettlement could be contracted out to government agencies - e.g. agricultural extension, land development. The RAP Contractor will appoint a Social Manager who will speak and write fluently in English. The EMU will execute monitoring tasks and report to the Environmental Manager (EM). The EM will coordinate implementation of the RAP with subcontractors.

Other RAP Contractor Personnel with responsibilities in relation to implementing the RAP will include the Resettlement Site Foremen and a Medical Officer with supporting staff. The Resettlement Site Foremen will ensure that social protection measures are implemented and utilized as documented in the RAP.

The Medical Officer and supporting staff will implement the Projects Occupational Health & Safety Plan in the EMMP which will also apply to implementation of the RAP.

5.1.5 WORK PLAN OF ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

An outline of the proposed schedule for the implementation of the EMMP is given in the Table below. The preconstruction phase will last approximately one year. The construction phase will last 5 years. The post construction phase will involve site rehabilitation and establishment of an operating plan for environmental optimization. During this time there will additional baseline data collected to augment the information compiled during the EIA for incorporation into the EMMP and design of the dam where certain design operations have been left open. Such information will also be used to modify the project EMMP, particularly in relation to the design of the construction camp and facilities and controls on the workforce. The TOR for the EMMP CP and EMMP -OP unit will also be drafted in consultation with provincial and local government authorities with some national participation as required. It will be necessary to start the RAP at least one year before reservoir filling commences.

There is also a need to establish the viability of the fishery upstream of the dam for detailed planning of the resettlement and to implement the EMMP program as soon as construction begins. A number of monitoring activities will be undertaken as in the preconstruction phase to provide baseline data for this plan and also to provide further design inputs into the dam construction and operational plan.

Table 4: Work Schedule of Environmental Management and Monitoring Plan(EMMP)

Activities	**Pre- Construction**	**Construction Phase**						**Operation Phase (Whole Concession Period)**				
Year		1	2	3	4	5	6	1	2	3	4	5
Pre-construction												
Community Consultations												
Establishment of EMO Unit												
Social assessment in Project area												
Resource assessment/Baseline Monitoring												
Construction												
Clearing of Reservoir												
Implement EMMP												
Implement Construction EMMP												
Clearing of Transmission Line												
Filling of Dam												

Resettlement												
Payment of compensation to all PAPs												
Preparation of Detailed RAP												
Implementation of RAP												
Monitoring of Implementation of RAP												
Environmental Optimization												
Water quality downstream												
Changes in Flows downstream												>
Fishery (Upstream)												>
Fishery downstream												>
Operational Monitoring												

>

5.1.6 FURTHER ASSESSMENT FOR IMPROVING ENVIRONMENTAL PERFORMANCE

Immediately after the Project has been assessed as feasible including the implementation of resettlement according to the policies of the Lao government, the developer should support a number of studies and programs aimed at improving the environmental and social performance of the project. This program of activities will involve the collection of additional baseline data across the whole of the project area that can only be obtained at reasonable expense once access to the project area has been improved.

- **Resettlement Action Plan**

A program of community consultations will be undertaken in the detailed design phase in relation to the following:

- Detailed Resettlement planning which will determine which villages partially affected by the reservoir could be resettled upslope providing suitable land is also available.
- Layout, size and ethnic composition of villages in the resettlement area.
- Villagers desire or dislike of relocating to new locations.
- Detailed consultations will also be required of residents of surrounding villages in relation to their views concerning the relocation of other villages and District incorporating the Local government centre, to this area.

Location of Workers Facilities: It is proposed that the workers camp will be a closed community. However, it is recognized that villages near the dam site could see the influx of workers as an opportunity for increasing their own incomes; another issue is that in the past residents have objected to construction projects with workers camps located in isolated areas because of the associated loss in economic opportunities to local villages. It is also recognized that workers will need recreation facilities and that a large influx of workers into the town seeking recreation could cause social problems. Extensive community consultations will be undertaken prior to the planning of the workers facilities so that local communities might benefits from the presence of these temporary residents with minimal negative impacts.

Integration of Regional Development Strategy and Related projects; There are other projects undergoing feasibility studies in the Mekong Basin including rubber and teak plantations. There are also plans to increase trade between the provinces with neighboring countries like Thailand, these projects have the potential to influence the community development programs and accordingly need to be integrated into the Sanakham EMMP. Extensive consultations will need to be undertaken with Provincial authorities, local communities and other project developers on how this integration is to precede; also, the future labor and skill needs in the province and the extent to which the resettled community might be involved in meeting these needs to be understood.

Social Assessment of Upstream and Downstream Populations

Studies should be ongoing regarding effects of the project on livelihood strategies. This will help to identify how the livelihood systems might best be improved in the project area. Issues could include the relative importance of low lying areas and upland areas as sources for various NTFPs, the importance of river bank gardens, the relative merits of access via river/reservoirs and roads, the wildlife and pest management, the potential for raising certain wildlife species commercially so as to meet the insatiable demand for wildlife meat in the Lao PDR and elsewhere.

6. MANAGEMENT OF ENVIRONMENTAL IMPACTS DURING CONSTRUCTION

The main contractor(s) will be responsible for implementing a Construction Environmental Management Plan as part of the construction contract. The Developer will apply certain principles in establishing this construction EMMP seeking to undertake best practice construction management giving full consideration to all environmental matters in connection to major construction activities, and attribute high consideration to the preservation of biodiversity and natural resources, to the prevention of pollution, to the public safety and to respect local communities.

The Developer will seek a commitment from its Construction Contractors to be certified according to ISO Standard 14001 or be working towards certification and to respect the following principles during the whole period of the construction activities:

- To protect the environment and to minimize construction impacts, by employing the best control
- Mechanisms, procedures and processes within the limits of their economic feasibility.
- To comply with Developers EMMP, Lao environmental legislation and to undertake self-monitoring to ensure compliance and contract consults to undertake regular audits of performance.
- To respect internationally recognized good practices in environmental management and health and safety issues.
- To provide training and awareness programs to construction staff in order to achieve continual progress in health safety and environmental protection performance.
- To protect the environment on site and downstream by effective pollution control, minimum clearing of land, respect of local communities and their culture and where possible protect the forest and wild life therein.
- To implement efficiently measures outlined in the EMMP and regularly monitor relevant activities and results.
- To measure environmental performance by conducting regular environmental audits.

6.1 CONSTRUCTION PHASE COMPONENTS

There are number of project components containing similar activities with similar potential downstream impacts and mitigations to be implemented during the construction phase. These components area:

Surface Excavations and Construction which includes construction of the power house, the dam the water intake structure, the spillway chute the coffer dams, the penstocks the tail race canal and the switchyard.

- Underground excavations consisting of the construction of two diversion tunnels.
- Construction of Roads and access which can impinge on local communities

- The Construction Camp consisting of accommodation block, garages workshops and storage areas and buildings.
- The reservoir and transmission line which involves clearing and removal of large areas of vegetation.

6.2 IMPACTS AND MITIGATION MEASURES FOR EACH COMPONENT

The environmental impacts associated with each activity undertaken in each of these project components are similar and so too are the mitigation strategies. A total of seventeen socio-environmental impact mitigation plans associated with construction activities have been drafted, referred to as Environmental Management sub-Plans. These sub-plans are common to most construction projects and can be applied to each of the above project components and subcomponent activities. There are some sub-plans that are more specific to a particular project component than others.

6.3 COMPLIANCE MONITORING

The Construction Contractor will be responsible for ensuring his own activities are monitored on a day to day basis and that mitigation measures are fully implemented with construction activities. Each Environmental Field Officer (EFO) will conduct routine inspections of sites and activities in their area of responsibility to evaluate compliance with commitments defined in this EMMP. Compliance will be reported on standard forms.

The EM with the assistance of the staff of the EMU will ensure that monitoring results provided by the Construction Contractors are true and correct comprehensive picture of the current environmental situation and efforts at site level. To this end the EMU will implement a global environmental monitoring program that will indicates the effectiveness of the implementation of the Construction EMMP at all project sites.

6.4 ENVIRONMENTAL MANAGEMENT INFORMATION SYSTEM

To respond effectively to matters raised by the Environmental Management Committee and to effectively manage the environmental performance of the Project, the EMU will set up an Environmental Management Information System to process and record all monitoring data compliance, management decisions and corrective actions taken.

Anticipated documentation to be filed includes:

- Active and obsolete printed versions of the EMMP, sub-plans and site plans.
- All site plans as approved by the developer.
- All communications with environmental implications.
- All environmental monitoring reports from EMU and the Contractor staff.
- Quarterly Reports.
- Complaints register.

- Training materials.
- Training attendance registers.
- Non-compliance special reports
- Lao environmental legislation.
- Permits, legal documents and authorizing letters.
- Monthly site meeting minutes.
- Occupational Health and Safety reports.
- Medical reports.
- Disciplinary procedures.

6.5 TRAINING CAPACITY BUILDING

Both general training at induction and job specific training will be implemented through the contractor. This worker induction program will include training on the following:

- Worker's obligations regarding basic environmental and social protection measures.
- General measures to follow throughout the construction period, such as the prohibitions on hunting and poaching of wildlife, purchasing wildlife meat, fishing, gathering and harvesting medicinal or valued plants and trees, and possessing firearms, snares, traps and other hunting equipment.
- Housecleaning and waste management in worker camps, in construction sites, along roads, nearby villages.
- Pollution control during construction activities.
- Ban of all kind of narcotic drugs for all employees of developer and contractor.
- Attending works while under the influence of alcohol.
- Measures for preserving health and the dissemination of vectors and transmissible diseases, including basics on hygiene.
- Disciplinary consequences for violation of the measures presented as part of the Environmental Awareness Program. The consequences will be important to add accountability to the EMMP.
- General Occupational Health and Safety issues will be addressed under the implementation of the OH&S Plan. The issues addressed under the awareness program will complement those in the OH&S Plan and will focus particularly on basic hygiene practices, vector control and AIDS/STD.
- The developer is aware of the risk of development of AIDS and STD among the workforce, as most of the workers will live far from family, for a significant period. In order to reduce the risk of transmission, a specific awareness program will be implemented during the project construction. The program will address all employees, with special attention for groups presenting higher risks such as truck drivers.
- The program will include:
- Information workshops for all workers on AIDS and STD transmission and protection measures.

- Readily available supply of prophylactics in the medical centres.
- Use of information posters to be posted in workers camps and in medical facilities buildings
- Leaflets and information stickers.

Training activities will be organized as workshops, focusing on the presentation, content and application of specific procedures and measures included in the EMMP. Training will be supplemented using posters and signs in the workplace depicting the various steps of relevant procedures (explosive management, fuelling vehicles, spill response, etc).

Each participant in the general training program will be given supporting paper text and graphic documentation in his/her language. Videos for refresher courses will be prepared. Posters, in relevant languages will be posted around the site reminding workers of key aspects of their training in environment health and safety.

For supervisors and foremen, as well as staff working on environmentally critical activities, additional specific environmental training will be provided.

The developer will ensure that the staff of the Environmental and Social Management and Monitoring Unit will have appropriate educational and technical backgrounds according to the level of responsibility being undertaken. Staff implementing the monitoring program will be given job-specific training.

The Contractor will ensure that the Environmental Manager (EM) will have an appropriate practical background to provide foremen and subcontractors with advice on how to implement the Construction EMMP. The Environmental Field Officers are to be trained as necessary at the contractor's expense to undertake the monitoring of operations. The Contractors contract will specify that suitably qualified personnel are required to assist the EM to implement the EMMP.

7. CONTROL AND CORRECTIVE ACTIONS FOR EMMP

The objective of EMMP monitoring activities is to ensure that mitigation measures listed in the ESIA and EMMP are implemented and are effective in minimizing or preventing negative environmental and social impacts.

Specific objectives of monitoring should include:

- At Construction EMU monitoring level, ensuring on a day to day basis that mitigation measures are fully implemented with construction activities, and that results observed comply with the contractual obligations, national laws and regulations and Developer's requirements.
- Ensuring that monitoring results are true and correct, and providing the necessary environmental coordination and interface between the Construction Contractors.
- Provide the Developer with a comprehensive picture of the current environmental situation and efforts at site level.
- Conducting routine inspections of sites and activities in their area of responsibility to evaluate compliance with commitments defined in this EMMP.

Results of field observations, either documenting compliance or non-compliance with environmental requirements should be reported on standard forms. The use of these standard forms should help ensure that compliance-related observations are recorded in a consistent manner and in a standard format. As such, the information can be entered into the database that should be used to track the status of and allow analysis of non-compliance situations.

7.1 NON-COMPLIANCE DETECTION, CORRECTION AND PREVENTION

An important element of the internal communication process is the organized relay of non-conformance information. To prioritize management attention on the most important issues, noncompliance observations should be separated into three levels on the basis of importance, and communications requirements for the observations should be commensurate with the severity of the non-compliance situation.

The three levels of non-compliance situations are:

1) *Non-Compliance Level I*

   Definition: A non-compliance situation not consistent with EMMP requirements, but not believed to represent an immediate or severe threat to people or to the environment. Repeated Level I concerns may become Level II concerns if left unattended.

2) *Non Compliance Level II*

Definition: A non-compliance situation that has not yet resulted in clearly identified damage or irreversible impact, but which potential significance requires expeditious corrective action and site-specific attention to prevent severe effects. Repeated Level II concerns may become Level III concerns if left unattended.

3) Non Compliance Level III

Definition: A critical non-compliance situation, typically including observed significant damage on people or the environment or a reasonable expectation of very severe impending damage. Intentional disregard of specific prohibitions is also classified as a Level III concern.

7.2 ENVIRONMENTAL RECORDS

To effectively manage the environmental performance of the Project, the EMU function should include a process to document and track non-compliance observations, decisions on situation resolution, corrective actions taken, and the observed results of those corrective actions in the Environmental Management Information System; this is also defined in section 6.4 of this document. The EMU should use a database to track and allow analysis of this information. The database should likely be capable of generating a variety of reports sorted by key fields which may include non-compliance situation level, non-compliance type, date range, location, etc. Topics of these reports would likely include:

- Comprehensive listings of all non-compliance situations observed.
- Summaries of non-compliance situations observed.
- Status of non-compliance situation resolution based on last monitoring observation.

7.3 ENVIRONMENTAL AUDITING

The Developer should initiate scheduled audits of the Project activities, construction sites and contractors against the requirements established in this EMMP and relevant sub-plans.

The Audit Schedule anticipates one Internal Audit every year. Additional audits may be programmed should a system non-conformance indicate significant areas of concern. Non-conformances or observations identified during audits should be subject to the provisions of corrective action.

Audit findings should be reported to the Developer and discussed with the EMU. An Action Plan for corrective action required from the audit should be prepared by the EMU, submitted to the Developer for non-objection and then implemented in a timely manner. Follow up monitoring should be undertaken to verify implementation of approved corrective actions and their effectiveness in preventing recurrence.

At the end of construction activities for each main Contractor a Post-Construction Environmental Audit should be carried out. This will establish the success or otherwise of

Mitigation and rehabilitation work. An Action Plan for any outstanding issues should be developed by the EMU. Release of the final payment to the Contractor(s) should be tied to verification of site condition by the audit.

7.4 SENIOR MANAGEMENT ENVIRONMENTAL REVIEW

Senior management from the Developer should review annually the EMMP implementation to ensure its continuing suitability, adequacy and effectiveness regarding the project construction progress, and the Developer's commitment to continual improvement.

The review should utilize information collected by the EMU carrying out monitoring specified above, and results of audits. The EMU is responsible for ensuring that relevant information is collected for the Senior Management Environmental Review.

The review should address any need for changes to the environmental policy and objectives, and to the environmental activities and practices of the EMMP, in light of the audit results, of changing circumstances and of the commitment to continual improvement.

The Senior Management review should be documented and the results communicated to the EMU involved in the EMMP implementation.

8. SPECIFIC ENVIRONMENTAL MONITORING ACTIVITIES

(see Table below)

Responsible Parties:

ESM = Environmental & Social Manager (from EMU)

ER = Environmental Regulatory officer (from EMU)

SR = Social Regulatory officer (from EMU)

CC = Complying Contractor (The contractor that the responsibility has been assigned to)

Table 5: Specific Environmental Monitoring

Category & topic	Monitoring action	Resp.	Frequency of monitoring	Monitoring criteria	Contractor non compliance level*	
					First notification	Multiple notification
Water quality management & pollution control						
Drinking water	Visual inspection of treatment facilities	ER	Weekly	Cleanliness of system, etc		
	Visual inspection of water sources protection	ER	Monthly	Location, distance to pollution sources, fencing, information signs	2 or 3	3
	Water quality Monitoring in residence and main worker camps	ER	Weekly monitoring of potable water Once a month, full Analysis	Color, odor, free chlorine	1 or 2	2 or 3
	Water quality random monitoring in temporary camps	ER	Weekly monitoring of potable water	Same as above		
	Visual inspection of treatment facilities and water protection sources	ER	Monthly	Cleanliness of facility, maintenance register review, availability of chemicals & spare parts	1 or 2	2 or 3
	Review CC monitoring data	ESM	Monthly	Compliance with design criteria (WHO)	2 or 3	3
	Random sampling, main camps and temporary camps	ESM /ER	Monthly	Color, odor, free chlorine, FC	2 or 3	3

Category & topic	Monitoring action	Resp.	Frequency of monitoring	Monitoring criteria	Contractor non compliance level*	
					First notification	Multiple notification
	when required					
Effluents	Routine sampling of treated effluents by operating CC	ER	Monthly monitoring of treated effluents	Temperature, pH, Suspended Solids (SS), DO, Faecal Coliforms		
	Visual Inspection	ER	Weekly inspection	Cleanliness of station, drainage of sludge and screenings storage area, total infiltration of treated effluent	1 or 2	2 or 3
	Review of monitoring data	ESM	Weekly inspection by ESM	Compliance with effluent design criteria	2	2 or 3
	Random sampling of treated effluents	ER	Monthly	Discharge, temperature, pH, Suspended Solids (SS), Fecal Coliforms , DO	1 or 2	2 or 3
	Registration of sludge movements	ER	When required	Date & volumes of movements: from station to disposal area and from septic tanks to station	1 or 2	2 or 3
	Review of sludge movements registration	ER	Once a month	Date & volumes of movements; Cross check with landfill reception records	1 or 2	2 or 3
Worker camps (main)	Routine maintenance and monitoring of CC	ESM /ER/SR	Weekly	Cleanliness of camps and maintenance of drainage & sanitation facilities		
	Registration of septic tank emptying operations	ER	When required	Date of maintenance & facility concerned	1 or 2	2 or 3
	Visual Inspection of camps waste water and rainstorm water drainage	ER/ ESM	Bi-weekly	General cleanliness of camp, collection and drainage of all water from sanitary facilities and canteens; stormwater drainage;	1 or 2	2 or 3
	Review of septic tank emptying operation register	ER	Once a month	Date of maintenance & facility concerned	1 or 2	2 or 3

Category & topic	Monitoring action	Resp.	Frequency of monitoring	Monitoring criteria	Contractor non compliance level*	
					First notification	Multiple notification
Workers Camps (temporary)	Routine maintenance and monitoring of CC	ESM /ER/ SR	Weekly	Cleanliness of camps and maintenance of drainage & sanitation facilities		
	Registration of maintenance	ER	When required	Toilets regularly maintained	1 or 2	2 or 3
	Visual inspection of facilities and camps	ER	Bi-weekly	Appropriate system Condition of toilet Defecation around camp	1 or 2	2 or 3
	Review of maintenance register	ER	Once a month	Date of maintenance & facility concerned	1 or 2	2 or 3
Construction areas	Visual inspection of pollution control measures implementation	ER/ ESM	Weekly	Refuelling area and practice Temporary storage of chemicals Temporary storage of wastes		
	Sampling of drainage water at area outlet	ER	Monthly	SS, oil and fuel, FC		
	Review of monitoring data	ESM	Monthly	SS, oil and fuel, Fecal Coliforms	1 or 2	2 or 3
	Random sampling of stormwater outlet	ER	Monthly	pH, SS, Temperature	1 or 2	2 or 3
Maintenance areas (workshops, garages)	Visual inspection of pollution control measures implementation	ER/ ESM	weekly	Refueling area and practice Bunded storage for HM as waste engine oil, grease, hydraulic oil Stormwater design (hydro-carbon separation pit)		
	Ensure presence and maintenance of spill response equipment kit according to products stored	ER	Weekly	Presence of equipment according to standard Procedures posted in the premises Emergency response team identified & trained	2 or 3	3
	Registration of used waste generated	ER	Daily registration by garages and workshops as	Date & volumes	1 or 2	2 or 3

Category & topic	Monitoring action	Resp.	Frequency of monitoring	Monitoring criteria	Contractor non compliance level*	
					First notification	Multiple notification
			concerned			
River water	Routine sampling of river water at Upstream、 dam site area、Downstream area	ER	Monthly in construction and the first three years of operation period, and then quarterly after that	temperature, pH, SS, oil and fuel, DO, COD, BOD, NH_4-N, Total nitrogen, Total phosphorus, Total Solids, Turbidity, Chlorophyll-a, Coliforms, Harmful substances		
reservoir water temperature	temperature monitoring for the deep water region upstream of the dam in the operation period		Monthly	Set vertical monitoring sections in the deep water region and monitoring temperature at a spacing of 1m .		
Hydrology						
Spoil Disposal and Drainage	Ensure spoil disposal areas located & designed in accordance with hydrological Requirements	ESM /ER	As required when delineating disposal site	Design and effective delineation of disposal site compared on map photo or GPS control		
	Register claims from communities regarding flooding etc	SR	As required	Location Type of problem		
	Ensure natural drainage respected or mitigated during earthworks and site development	ESM /ER	Weekly	Visual observation	1 or 2	3
	Monitor spoil areas	ER	Bi-weekly inspection	Visual inspection	2 or 3	3
	Record presence of impeded drainage and ponding or velocity increases	ER	Bi-weekly inspection	Visual inspection	2 or 3	3
Soil Conservation						
Erosion Control Measures	Ensure implementation of erosion control measures	ESM /ER	Weekly	Visual observation Design documentation		
	Ensure implementation of sediment transport reduction measures	ER	Weekly	Visual observation	1 or 2	3
	Monitor stormwater drainage from concerned areas	ER	Bi-Monthly	Suspended Solids	1 or 2	2 or 3
Top soil	Ensure top soil properly managed	ER	Weekly during large	Visual observation Design		

Category & topic	Monitoring action	Resp.	Frequency of monitoring	Monitoring criteria	Contractor non compliance level*	
					First notification	Multiple notification
protection	and preserved for eventual use in restoration		excavation works As requested later	documentation		
	Monitor application of design standards for erosion control and topsoil protection	ER/ ESM	Bi-weekly	Visual observation	1 or 2	2 or 3
Biodiversity Conservation						
Clearing	Ensure demarcation & tree marking for clearing and respect of clearing limits	ESM /ER	Daily observation during clearing by Forestry Department	No. of trees		
	Ensure log evacuation completed before work starts	ESM /ER	Weekly	Visual observation		
	Monitor clearing operations by CC to ensure no trees felled	ESM /ER	As required	According to Project design and Clearances given	3	
Re-vegetation	Ensure re-vegetation done with native species	ER	As needed, control site and nursery	Species used not considered as exotic invasive	1	1 or 2
Wildlife Conservation	Check species used	ESM	As needed	Species used are suitable	1	1 or 2
	Ensure hunting ban respected	ESM /ER/ SR	Daily observation	Control at check-points the transport of any dead or alive wild animal Presence of hunting gear Workers cooking wildlife meat		
	Delineate sensitive natural areas to be avoided and inform by flagging	ESM /ER	Random observation	Direct observation of non avoidance by contractor staff	3	

Category & topic	Monitoring action	Resp.	Frequency of monitoring	Monitoring criteria	Contractor non compliance level*	
					First notification	Multiple notification
	Ensure all staff attended environmental awareness program	ESM /SR	Random observation and review of training attendance register	At least 80% workers on site at any time attended awareness program	1	2 or 3
	Monitor conservation efficiency	ER	Direct random observation	Number of non-compliance observed including persons having not attended awareness program	1	2 or 3
Chemicals and Waste Management						
Non-Hazardous Waste Landfill	Visually inspect & evaluate with emphasis on review on clay or/and synthetic liner permeability	ER	Weekly	Design criteria		
	Monitor maintenance and management of landfill	ER/ ESM	Weekly	Access restricted, waste compacted, absence of Hazardous waste, pest control effectiveness,	1 or 2	2 or 3
	Visual inspection of leachate leakage	ER	Rainy season	Pollution indicators	1 or 2	2 or 3
	Random sampling of wells water & stormwater	ER	Seasoning	Absence of pollution indicators	1 or 2	2 or 3
	Monitor landfill site cleanliness and management	ER/ ESM	Monthly	Visual inspection of facility	1 or 2	2 or 3
	Monitor slope stability of disposal	ER	Weekly	Visual inspection	1 or 2	3
Garbage collection	Ensure regular collection of garbage	ER	Weekly	Visual inspection and organization of unit		
	Monitor effectiveness of garbage collection	ER	Bi-weekly	Visual inspection during site visits regarding equipment and presence of uncontrolled waste dumping sites along roads	1	2 or 3
Hazardous	Ensure temporary storage sites comply	ESM	Weekly site	Containers, labels, collection register, drainage water		

Category & topic	Monitoring action	Resp.	Frequency of monitoring	Monitoring criteria	Contractor non compliance level*	
					First notification	Multiple notification
Waste	with safety obligations	/ER	inspection	control, etc		
	Ensure appropriate HW registration & disposal in accordance with obligations	ER	Weekly	Registration, design of storage area (bunded and fenced area), containers quality, labeling, spill response kits, safety procedures posted, workers in charge trained and PPE available	2	2 or 3
	Inspection of temporary and main HW disposal sites	ER	Bi-weekly to monthly	Same criteria as above	1, 2 or 3	3
Hazardous Chemicals	Ensure appropriate Hazardous material registration, storage & handling in accordance with safety regulation	ESM /ER	Weekly	Registration, design of storage area (bunded and fenced area), containers quality, labeling, spill response kits, safety procedures posted, workers in charge trained and PPE available		
	Inspection of Hazardous material management	ER	Monthly	Same criteria as above	1, 2 or 3	3
	Eventual safe disposal of Hazardous Waste & Chemicals	ESM	As required	According to HP State pollution Control Board and national specifications	2 or 3	3
Cultural Properties						
	Ensure no cultural site notified prior to works is disturbed without community agreement	ESM /SR	As needed	Documentation review and site visit	3	
	Ensure procedure implemented if heritage discovered	ESM /SR	As justified	Notification to Owner Effective application of decisions on site Temporary fencing of zone and signs posted	3	
	Monitor appropriate procedure	SR	Daily to monthly (risk	Effective suspension of works Temporary fencing of	3	

Category & topic	Monitoring action	Resp.	Frequency of monitoring	Monitoring criteria	Contractor non compliance level*	
					First notification	Multiple notification
	implementation if heritage discovered		based) checks at identified sites	zone and signs posted Subsequent conservation measures implemented		
Access to Site and Road Safety						
Road safety	Ensure implementation of road signs & speed reduction bumps	ESM /ER	Daily observations	Compliance with design		
	Ensure respect of signs & speed limits & parking areas by project drivers	ER	Daily observations	Register non-compliances on project roads and on public roads	1	2 or 3
	Check road signs and respect of speed limits & parking areas	ER	Daily observations	Direct observation Number of non-compliances observed in a month	1	2 or 3
	Ensure trucks & vehicles appropriately maintained (engine, breaks, tires, lamps)	ER	Daily observation & registration of vehicles service maintenance	Non-conformity observed on the road Register of truck/car maintenance for sub-contractors	1 or 2	2 or 3
	Ensure truck load not overweight, stabilized and covered if bulk	ER	Daily observation	Non-conformity observed on the road registered with No. of plate & driver name	1 or 2	2 or 3
	Monitoring of traffic safety	ESM /ER	Daily observation Random control point once a month	Direct observation Systematic control regarding truck condition & load and absorption of alcohol or drugs by drivers	1 or 2	2 or 3
	Ensure watering of roads is provided in residential areas and in dangerous/dusty road sections to limit dust emission	ER	Daily observation in dry season	Visual observation Number of waterings/day Number of watering trucks	1 or 2	2 or 3
Barriers	Ensure all areas of works and contractor compounds are	ER/ SR	Weekly	Visual inspection	1 or 2	2 or 3

Category & topic	Monitoring action	Resp.	Frequency of monitoring	Monitoring criteria	Contractor non compliance level*	
					First notification	Multiple notification
	adequately fenced					
Worker Health						
Health awareness program	Ensure any worker attended awareness program	ESM /SR	Weekly	Registration of training attendance		
	Review training register to confirm employee training	ESM /SR	Bi-weekly to monthly depending on turnover	At least 80% of staff at any time has received training	1	2 or 3
STD and AIDS prevention program	Ensure program implemented	SR	Bi-monthly	At least 80% of staff at any time has received induction course, Posters printed and posted, Leaflet printed and distributed, Prophylactics available and number distributed		
Pre-employment and annual medical checks	Ensure pre-employment and routine annual medical checks for all staff, with particular check for respiratory and STDs	SR	Monthly	Number of pre-employment checks Number of routine annual checks Statistics of disease incidence		
	Review registers	ESM	Quarterly	Number of medical checks compared to number of staff recruited	1	2
Medical facilities	Ensure medical facilities implemented, equipped and appropriately staffed	ESM /SR	Monthly	Staff & equipment available per facility Number of consultations registered		
	Monitor efficiency and cleanliness of medical facilities	SR	Monthly	Visual observation Inspection of medical supplies and sterile procedures	1 or 2	2 or 3

Category & topic	Monitoring action	Resp.	Frequency of monitoring	Monitoring criteria	Contractor non compliance level*	
					First notification	Multiple notification
Vector control	Ensure measures implemented in worker camps and in construction sites	SR	Weekly	Camps inspection for hygiene Awareness posters posted in camps and on working places Medicine for treatment available to staff Prevalence statistics		
	Monitor enforcement of control and effects	SR	Monthly	Visual observation from camps inspection Review of medical register	1 or 2	2 or 3
Hygiene related disease control	Ensure water-borne diseases and food-borne illness reporting, investigation and remediation procedures, implemented and effective	SR	Weekly	Number of cases and events Implementation of sanitation and waste management practices Observation of good personal hygiene practices		
	Monitor enforcement of control and effects	ESM /SR	Quarterly	Visual observation from camps and canteens inspection Review of medical register	1, 2 or 3	2 or 3
Occupational Safety						
First Aid Training and Field Implementa-tion	Ensure Foremen and key personnel of "at risk" activity received First Aid Training	ESM /SR	Monthly	Registration of personnel attending training and subsequent job affectation Ensure responsible staff for explosive, chemical and hazardous waste management has attended training		
	Ensure First Aid Kits available and fully supplied	SR	Weekly	Review of equipment and location	1 or 2	2
	Monitor First Aid equipment and	ESM	Quarterly	Visual observation of equipment, Review register	1 or 2	2 or 3

Category & topic	Monitoring action	Resp.	Frequency of monitoring	Monitoring criteria	Contractor non compliance level*	
					First notification	Multiple notification
	capacity	/SR		of First Aid training attendance		
Injury/Illness reporting	Verify implementation of occupational injury and illness reporting procedure	SR	Monthly	Register and compile injuries and illness (occupational)		
	Review OH&S efficiency	ESM	Quarterly	Review register of Occupational injuries & illness % of change from previous quarter	1 or 2	2 or 3
Safety procedures	Verify availability and use of appropriate equipment and procedures	ESM /SR/ ER	Monthly	Visual observation of procedure posters in key sites: Harzardous material storage, explosive storage, construction sites, garages, sticker in trucks, etc		
	Verify adequate signage and barricades in hazardous construction zones	ER/ SR	Daily during field visits	Visual observation	1	2 or 3
	Review OH&S accident prevention activities	ESM	Quarterly	Visual observation and questioning of workers during site inspection Number of non-compliance detected and trend	1 or 2	2 or 3
Community Relations (Project Issue - Not Directly CC Responsibility to Implement)						
Community liaison	Ensure participation of community/leaders in all monitoring activities directly affecting them	ESM /SR	Bi-monthly	Regular contact with individuals and community leaders recorded		
	Check employment opportunities	SR	Monthly	Ensure PAP are given the opportunity to provide labor or services to the Project if they so wish monitored through community liaison		

Category & topic	Monitoring action	Resp.	Frequency of monitoring	Monitoring criteria	Contractor non compliance level*	
					First notification	Multiple notification
Grievance Redress	Ensure function of grievance redress mechanism	ESM /SR	Weekly	Grievance Redress Cell available and at least twice a week		
	Check Grievance Register	SR	Weekly	Ensure all grievances recorded have been subject to a prompt response		
Compensation	Ensure disbursement of funds	SR	Bi-Monthly	Ensure all funds and actions for compensation have been disbursed/executed by the Project by liasing with communities		
Security	Check police records	SR	Bi-Monthly	Inspect police reports of project related security issues. Ensure that women's security is adequately catered for.		
Working/Living Conditions						
Migrant Labour	Check eligibility	SR	Weekly	Ensure no child labor is utilized by inspection of site and employment records		
	Monitor dependents	ESM /SR	Weekly	Ensure living conditions of dependents are acceptable to the Project by site inspection	1 or 2	3
Fuel	Check CC is providing wood or kerosene to workers and their families	SR	Weekly and Monthly	Visual inspection of camps Inspection of CC fuel purchase		
Shelter	Check quality of accommodation at camps	ESM /SR	Bi-monthly	Ensure no un-authorized indigenous materials are used for building by visual inspection and check of CC purchase orders Ensure provision of separate single and married quarters by visual inspection		

Category & topic	Monitoring action	Resp.	Frequency of monitoring	Monitoring criteria	Contractor non compliance level*	
					First notification	Multiple notification
Facilities	Check for presence of acceptable sanitation, washing and bathing facilities	ER/ SR	Monthly	Ref. water quality parameters above. Ensure no washing and bathing directly in water courses or discharge of wastewater directly to streams etc. Visual inspection		
Personal Safety Equipment	Ensure all workers adequately equipped with PPE.	ESM /ER/ SR	Daily	Visual inspection to determine use of proper footwear, hard hats, goggles/masks, gloves etc where required. Ref OH&S Sub-plan		

1. Non-Compliance Level I: A non-compliance situation not consistent with EMP requirements, but not believed to represent an immediate or severe threat to people or to the environment. Repeated Level I concerns may become Level II concerns if left unattended.
2. Non Compliance Level II: A non-compliance situation that has not yet resulted in clearly identified damage or irreversible impact, but which potential significance requires expeditious corrective action and site-specific attention to prevent severe effects. Repeated Level II concerns may become Level III concerns if left unattended.
3. Non Compliance Level III: A critical non-compliance situation, typically including observed significant damage on people or the environment or a reasonable expectation of very severe impending damage. Intentional disregard of specific prohibitions is also classified as a Level III concern.

ANNEX A: EMMP SUB-PLANS

I. Erosion and Sediment Control Management Plan

No.	Description of Measure	Monitoring	Links to Sub-Plans
Design and implementation of erosion and sediment controls			
SP1.01	Erosion and Sediment Control Design Plans will be prepared prior to the commencement of works which will contain details of the following: Conceptual design of erosion and sediment controls to be implemented on-site in accordance with the requirements of this sub-plan. Water quality monitoring points in accordance with the requirements of Sub-Plan No. 4– Water Quality Monitoring Plan (as required). Erosion and Sediment Control Plans will be included in the Site Specific Plans prepared for each construction site.	EMU to verify completion of plans prior to commencement of construction	Sub-Plan 4
SP1.02	The erosion and sediment works will be implemented prior to the commencement of any construction works on the site.	EMU to verify implementation of erosion and sediment works prior to the commencement of construction	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
Measures to minimize erosion			
SP1.03	The extent of areas to be cleared will be minimised as far as practical.	Visual observation by EMU during site inspection	-
SP1.04	The use of existing cleared areas will be maximised.	Visual observation by EMU during site inspection	-
SP1.05	All areas required to be disturbed will be clearly identified and the boundaries marked on the ground	Visual observation by EMU during site inspection	-
SP1.06	Areas not required to be disturbed will be retained in their original condition.	Visual observation by EMU during site inspection	-
SP1.07	'Sensitive erosion areas', are defined as follows: i. Areas with slopes > 30% ii. Areas within 30m of a bank of a natural watercourse iii. Cut and fill slopes in areas of slope instability or erodible geology	-	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
SP1.08	The location of works in sensitive erosion areas will be minimised.	Visual observation by EMU during site inspection	-
SP1.09	Where possible, works in sensitive erosion areas will be restricted to the dry season.	Visual observation by EMU during site inspection	-
SP1.10	Clearing of sites will be undertaken in the sequence that sites are required for construction.	Visual observation by EMU during site inspection	-
Stockpile management measures			
SP1.11	Temporary topsoil stockpiles will be developed in accordance with the following: 1. Stockpiles will be constructed with smooth slopes and free draining patterns 2. Stockpiles will be located in existing cleared areas 3. Stockpiles will be located at least 50m from any watercourse or drainage line and not located in identified floodways 4. Stockpiles will be deep ripped to provide for moisture retention and re-growth 5. Stockpiles will be located on land with a gradient of < 20% 6. Stockpile height should not exceed 3m and batter slopes will not exceed 1.5:1. The criteria may be evaluated considering the nature of the material.	Visual observation by EMU during site inspection	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
	7. In windy conditions, watering of stockpiles will be carried out if excessive dust generation is evident 8. Diversion banks will be constructed uphill of stockpiles where there is a potential for run-off to erode the base of the stockpile 9. Silt fences will be constructed downstream of stockpiles to control runoff where necessary		
SP1.12	Topsoil removed from the site will be stockpiled and saved for use in future revegetation and rehabilitation activities.	Visual observation by EMU during site inspection	
SP1.13	Long term spoil placement sites will be managed in accordance with the requirements of Sub-Plan No. 2 – Spoil Disposal and Management Sub-Plan	Refer Sub-Plan No. 2 – Spoil Disposal and Management Sub-Plan	Sub-Plan No. 2
Design specifications for erosion and sediment control measures			
SP1.14	All erosion and sediment controls will be designed to cater for a minimum of a 2 year ARI flood event	EMU to verify Erosion and Sediment Control Plans	-
SP1.15	Runoff velocities will be reduced by minimising the length of flow paths, constructing any	EMU to verify Erosion and	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
	channels with gentle gradients and providing rough lining for steeper channels.	Sediment Control Plans	
SP1.16	Rip-rap, or similar, will be installed at the inlet and outlet of all culverts to prevent scour erosion.	EMU to verify Erosion and Sediment Control Plans	-
SP1.17	Retention of existing vegetation along watercourses will be maximised to reduce flow velocities and act as a sediment filter.	EMU to verify Erosion and Sediment Control Plans	-
SP1.18	'Clean' runoff from undisturbed areas will be diverted away from the construction site and into established watercourses.	EMU to verify Erosion and Sediment Control Plans	-
SP1.19	Runoff from disturbed areas will be directed into sediment trapping or filtering devices	EMU to verify Erosion and Sediment Control Plans	-
SP1.20	Sediment trapping or filtering devices such as sediment fences, sediment basins or traps will be constructed to capture and treat sediment laden runoff from all disturbed areas.	EMU to verify Erosion and Sediment Control Plans	-
SP1.21	Sediment collection devices (including sediment basins, silt fences and sediment traps) will be cleared when basin capacity is reduced by a maximum of 50%.	EMU to verify Erosion and Sediment Control Plans	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
	A marker will be installed in sediment collection basins to show when the basin is 50% full and requires emptying.		
SP1.22	Sediment collection devices will be sized to collect and treat run-off from the site as appropriate.	EMU to verify Erosion and Sediment Control Plans	-
SP1.23	Release of discharge will only occur after monitoring as required to meet the requirements of Sub-Plan No. 4 – Water Quality Monitoring. All discharge from sediment collection devices will pass through a vegetative or silt filter, prior to release to an established watercourse.	EMU to verify Erosion and Sediment Control Plans	Sub-Plan No. 4
SP1.24	Trash racks will be provided at the outlet of all main drainage points entering watercourses. Trash racks will be inspected and cleared daily and waste disposed off in accordance with the requirements of Sub-Plan No. 12 – Waste Management.	EMU to verify Erosion and Sediment Control Plans	-
Maintenance and inspection of erosion and sediment controls			
SP1.25	All erosion and sediment controls will be visually inspected at least once a week during the dry season and every 24 hours during the wet season to ensure their ongoing effectiveness. Any required remediative or replacement works will be undertaken within 24 hours of	ESO and EMU to monitor daily during wet season and weekly	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
	detection.	during dry season.	
SP1.26	At least one month prior to the anticipated commencement of the wet season, a review of the effectiveness and adequacy of the existing erosion and sediment controls will be made and any necessary modification and/or augmentation of controls carried out.	EMU to verify review findings	-
Revegetation of disturbed areas			
SP1.27	Progressive revegetation of exposed areas will take place as soon as practical following completion of construction works in that area. Reference will be made to Sub-Plan No. 10 in relation to suitable species for revegetation works.	Visual observation by EMU during site inspection	Sub-Plan 10
SP1.28	If construction works are temporarily stopped in an exposed area (for longer than 30 days), temporary stabilisation of exposed surfaces will be undertaken.	Visual observation by EMU during site inspection	Sub-Plan 10
Used of designated access roads			
SP1.29	Access to and within construction sites will be limited to designated access roads and	EMU during site inspection	Sub-Plan 15

No.	Description of Measure	Monitoring	Links to Sub-Plans
	internal haul roads.		
In-stream works			
SP1.30	In-stream works will be carried out in low-flow conditions where possible. When required and where flow conditions allow it, silt-curtains will be installed to protect against sediment transport during in-stream works.	EMU during site inspection	-
Wastewater from tunnelling works			
SP1.31	Wastewater generated during tunnelling works either from rain infiltration or groundwater seepage will be collected in a sediment basin prior to discharge.	EMU during site inspection	-
Maintenance areas			
SP1.32	In any construction areas where equipment or vehicle maintenance or refuelling takes place, the following measures will be implemented: i. Construction of area with sealed floor, bunding and roof cover for all maintenance and refuelling activities	EMU during site inspection	Sub-Plan 4

No.	Description of Measure	Monitoring	Links to Sub-Plans
	ii. Installation of grease trap for treatment of runoff prior to discharge iii. Installation of hydrocarbon separation pit for treatment of runoff prior to discharge		

II. Spoil Disposal Planning and Management Plan

No.	Description of Measure	Monitoring	Links to Sub-Plans
Principles for spoil placement activities			
SP2.01	The spoil placement area will be developed in accordance with the following requirements: i. Constructed with smooth slopes and free draining patterns ii. Located in existing cleared areas, where practical iii. Stockpiles will be located as far as practical from any watercourse iv. Located on land with a gradient of < 10% v. Height will not exceed 6 m and a 2m berm will be provided at a height of approximately 3m, and batter slopes will not exceed 1.5:1. The criteria may be evaluated considering the nature of the material. vi. Temporary seeding of stockpiles will be undertaken until the permanent revegetation	Visual inspection by Environmental Unit (EMU)	Sub-Plan 10

No.	Description of Measure	Monitoring	Links to Sub-Plans
	works identified in Sub-Plan No. 10 – Landscaping and Revegetation have been established vii. In windy conditions, watering of stockpiles will be carried out if excessive dust generation is evident viii. Diversion banks will be constructed uphill of stockpiles where there is a potential for run-off to erode the base of the stockpile ix. Silt fences will be constructed downstream of stockpiles to control runoff x. Not located in identified floodways or flood storage areas		
Design of spoil disposal area and establishment activities			
SP2.02	All spoil from the PCA component of the works will be placed in within the general boundaries of the spoil disposal area identified in the relevant site specific plans. Spoil placement in other areas will not be permitted.	Visual inspection by EMU	-
SP2.03	Prior to any placement of spoil, the detailed engineering design of the spoil disposal area will be completed. The design will provide details of the staged development of the spoil disposal area and will include details on the final landform to be achieved. The design will incorporate the following principles: i. Spoil placement activities will be contained within designated boundaries ii. Spoil placement activities will be staged with progressive revegetation of areas as	EMU to verify design	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
	they are completed iii. Natural drainage patterns will be avoided where possible iv. Where natural drainage lines are affected, they will be reinstated following completion of the spoil placement v. The final landform will be stable, adequately drained and suitable for long term use vi. The final landform will be compatible with the existing and surrounding landforms and designed to minimise visual intrusion		
SP2.04	Prior to the placement of any spoil, a detailed Erosion and Sediment Design Plan will be prepared for the spoil disposal area. The Erosion and Sediment Design Plan will be prepared in accordance with the requirements of Sub-Plan No. 1 – Erosion and Sediment Control.	EMU to verify Erosion and Sediment Control Plan	Sub-Plan 1
SP2.05	Prior to any placement of spoil, the boundaries of the spoil disposal area will be marked with temporary fencing or similar.	Visual inspection by EMU	-
SP2.06	Vegetation from the spoil disposal area will be cleared in accordance with the requirements of Sub-Plan No.11 – Vegetation Clearing Management.	-	Sub-Plan 11
SP2.07	Topsoil from the spoil disposal area will be cleared prior to the commencement of spoil disposal activities and stored for subsequent rehabilitation activities.	Visual inspection by EMU	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
Transport of spoil			
SP2.08	Vehicles transporting spoil to the spoil disposal area will abide by the management measurements identified in Sub-Plan No. 15 – On-site Traffic and Access Management.	-	Sub-Plan 15
Temporary stockpile management			
SP2.09	All temporary topsoil and spoil stockpiles that are required during the spoil placement activities will be managed in accordance with the requirements identified in Sub-Plan No. 1 – Erosion and Sediment Control.	-	Sub-Plan 1
Dust control			
SP2.10	Dust control measures will be implemented as identified in Sub-Plan No. 7 – Dust Emissions and Control.	-	Sub-Plan 7
Water quality monitoring			
SP2.11	Water quality monitoring from the spoil placement area will be carried out in accordance with	-	Sub-Plan 4

No.	Description of Measure	Monitoring	Links to Sub-Plans
	the requirements of Sub-Plan No. 4 – Water Quality Monitoring Plan.		
Revegetation measures			
SP2.12	Revegetation of the site will occur progressively as spoil placement activities are completed in each component of the spoil disposal area. The site will be revegetated in accordance with the requirements of Sub-Plan No. 10 – Landscaping and Revegetation Plan.	-	Sub –Plan 10

III. Quarry and Control Layout Management Plan

No.	Description of Measure	Monitoring	Links to Sub-Plans
Detailed Site Layout Plan			
SP3.01	Prior to the commencement of any construction works, detailed site layout plans will be prepared for each site. The site layout plans will include details of the areas of disturbance for the activities and all infrastructure and equipment required for the activities, including erosion and sediment controls, and will be based on the following principles:	EMU to verify plans prior to commencement of construction	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
	i. Clearing of vegetation will be minimised and the use of existing cleared areas will be maximized ii. The separation distance between dust generating activities and villages, construction camps will be maximized as far as practical to reduce noise and dust impacts iii. No components will be located within 30m of a watercourseiii, and all construction work within 100m of a watercourse will be minimized. In case of the components are needed to be located within 30 m of the watercourse, an appropriate environmental protection facilities must be provided. iv. All infrastructure and equipment will be sited to maximise screening from public vantage points		
Clearing and disposal of vegetation			
SP3.02	Vegetation clearing will be carried out in accordance with the requirements of Sub-Plan 11 – Vegetation Clearing Plan	Refer Sub-Plan 11	Sub-Plan 11
SP3.03	Clearing of vegetative groundcover will be restricted to that area required for test material excavation, internal access road development, establishment of the crushing plant and other required site infrastructure.	EMU to inspect extent of clearing	

No.	Description of Measure	Monitoring	Links to Sub-Plans
SP3.04	All vegetation cleared from the sites will either be mulched on-site for re-use in landscaping or ground stabilization works, burnt on-site or disposed of in accordance with Sub-Plan 12 Waste Management. Any burning of vegetation on-site will be undertaken in accordance with the requirements of Sub-Plan No. 7 – Dust and Emissions Control.	Refer Sub-Plan 12 Refer Sub-Plan 7	Sub-Plan 12 Sub-Plan 7
Topsoil management and erosion and sediment control			
SP3.05	Topsoil from the sites will be cleared and stockpiled for use in the ultimate site rehabilitation activities.	EMU to inspect establishment and maintenance of stockpiles	
SP3.06	Erosion and sediment controls will be designed and implemented for the sites in accordance with the requirements of Sub-Plan No. 1 – Erosion and Sediment Control.	Refer Sub-Plan 1	Sub-Plan 1
SP3.07	Notwithstanding the requirements of Sub-Plan No. 1 – Erosion and Sediment Control, sediment basins of adequate size to cater for all contaminated runoff from the site will be implemented at each of the sites as practical.	EMU to verify site layout plan prior to commencement of works EMU to verify implementation of erosion and sediment controls prior to commencement of works	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
Quarry face stability			
SP3.08	The risk of quarry face instability and failure quarry will be stabilised using appropriate methods such as: i. Implementation of slope drainage measures ii. Benching of slopes iii. De-scaling of excess material The proposed measures will be detailed in the site layout plan for the quarry.	EMU to inspect quarry face stability measures	-
Air quality management			
SP3.09	Dust suppression measures will be implemented on exposed areas during windy conditions, or when visual inspection indicates excessive dust generation. Dust suppression measures will be implemented in accordance with the requirements of Sub-Plan No. 7 – Emissions and Dust Control Plan and will include: i. Watering of exposed surfaces and crusher operation ii. Covering of stockpiles	EMU to inspect use and effectiveness of dust suppression measures	Sub-Plan 7

No.	Description of Measure	Monitoring	Links to Sub-Plans
SP3.10	All construction vehicles and equipment will maintain in accordance with the requirements of Sub-Plan No. 14 – Traffic and Access Plan.	Refer Sub-Plan 14	Sub-Plan 14
SP3.11	Access to and from and within the sites will be along designated routes as required by Sub-Plan No. 14 –Traffic and Access Plan.	Refer Sub-Plan 14	Sub-Plan 14
Internal access roads			
SP3.12	Internal access roads within the quarry sites will be designed in accordance with the requirements of Sub-Plan No. 14 – Traffic and Access Plan.	Refer Sub-Plan 14	Sub-Plan 14
Waste management			
SP3.13	Waste from the sites will be managed in accordance with the requirements of Sub-Plan No. 12 – Waste Management and Disposal Plan.	Refer Sub-Plan 12	Sub-Plan 12
SP3.14	An adequate number of pit latrine toilets will be provided at the sites for the use of construction personnel (1 toilet for every 20 people). Waste from the toilets will be treated in accordance with the requirements of the Sub-Plan No. 12 – Waste Management and Disposal	Refer Sub-Plan 12	Sub-Plan 12

No.	Description of Measure	Monitoring	Links to Sub-Plans
	Plan.		
Noise and blasting controls			
SP3.15	Noise generated by activities at the sites will be managed in accordance with the requirements of Sub-Plan No. 8 – Noise Control Plan.	Refer Sub-Plan 8	Sub-Plan 8
SP3.16	General construction works (excluding blasting) within a distance of 1km from villages, construction camps, will be carried out between 06.00 and 18.00. Construction in all other areas may be undertaken 24 hours a day subject to suitable safety and lighting measures being implemented.	EMU to verify compliance with construction hours	Sub-Plan 8
SP3.17	Blasting activities within a distance of 2km from villages, construction camps, will be carried out between 06.00 and 18.00. Blasting in all other areas may be undertaken 24 hours a day subject to suitable safety and lighting measures being implemented.	EMU to verify compliance with construction hours	Sub-Plan 8
SP3.18	All construction personnel working in the vicinity of noisy construction activities (defined as those activities generating noise levels greater than 80 dB(A)), or any construction personnel who requests hearing protection, will be provided with hearing protection. Training will be provided to personnel in relation to the need for hearing protection to be used.	EMU to verify PPE available and in use	Sub-Plan 8

No.	Description of Measure	Monitoring	Links to Sub-Plans
Water quality management			
SP3.19	Prior to release, effluent discharged from the crushing plant will be monitored in accordance with the requirements of Sub-Plan No. 4 – Water Quality Monitoring Plan.	Refer Sub-Plan 4	Sub-Plan 4
SP3.20	Effluent from the sediment basins will be regularly monitored in accordance with the requirements of Sub-Plan No. 4 – Water Quality Monitoring Plan. Discharge will be immediately stopped if the quality is not conforming to the requirements.	Refer Sub-Plan 4	Sub-Plan 4
Sub-camp construction			
SP3.21	The design of the construction work sub-camps will be carried out in accordance with the requirements of Sub-Plan No. 16 – Construction Work Camps Plan.	Refer Sub-Plan 16	Sub-Plan 16
Use of quarry materials			
SP3.22	Materials, other than waste materials, which are sourced from the sites will only be used for the construction of the project.	-	-

IV. Water Quality Monitoring Plan

No.	Description Of Measure	Monitoring	Links to Sub-Plans
Water quality monitoring schedule			
SP4.01	Water quality monitoring will be undertaken in accordance with the requirements contained in an EIA report.	EMU review of monthly reports	-
Water quality criteria			
SP4.02	Water quality criteria for the works are included in an EIA report.	EMU review of monthly reports	-
Water quality monitoring locations			

SP4.03	The Erosion and Sediment Design Plans referred to in Sub-Plan No. 1 Erosion and Sediment Control Management Plan will include details of upstream and downstream water quality monitoring locations, as required by an EIA report. Upstream and downstream monitoring locations will be identified using the following criteria: i. Monitoring locations will be located within 50m upstream and downstream of the relevant discharge point, where practical ii. If more than two discharge points are located within less than 100m of each other, only one upstream and one downstream monitoring location will be required for the combined discharges monitoring the upstream monitoring location will be located within 50m of the most upstream discharge, and the downstream monitoring location will be located within 50m of the most downstream discharge. iii. Where access is available, monitoring locations will be located mid-stream	EMU verify design plans	Sub-Plan 1
Notification of risks to humans or environment			
SP4.04	Based on the results of water quality monitoring, EMU and Owner will be notified within 48 hours of the discovery of a condition that could cause harm to humans or the environment.		-
Reporting requirements			
SP4.05	The results of water quality monitoring will be reported monthly. Monitoring will include comparison of monitoring results of downstream locations and discharge outlet and potable water.	EMU review monthly reports	-

Groundwater monitoring			
SP4.06	The presence of any groundwater wells or tube wells downstream of the waste disposal areas will be identified. If any wells are present, monthly monitoring of faecalcoliform levels will be undertaken and reported in accordance with the above requirements.	EMU review of monthly reports	-

V. Chemical Products and Spillage Management Plan

No.	Description Of Measure	Monitoring	Links to Sub-Plans
SP5.01	Safe Storage & Handling for Explosives Explosives will be stored in facilities located underground or sufficiently protected by bunding and will be located close to areas for use. Only explosive needed for one week will be stored in these facilities. Site storage facilities will be kept locked, and access limited to authorized staff. The facilities will be located at least 50 m from camps. Log book at each facility will register movements of explosives: quantity, name of user and date. Explosive boxes will be labelled with "Explosive sign" and Explosive sign posters will be dispatched at each site storage facility. Fire fighting equipment will be kept available next to each storage facility.	EMU to visit sites on a weekly basis to ensure explosive is stored in safe conditions, facility is locked permanently with watchman. Control of explosive register in each storage facility to check if document is filled and up-dated Check presence of posters and if fire fighting equipment is appropriate and operational	Sub-Plan 13

No.	Description Of Measure	Monitoring	Links to Sub-Plans
Prevention of Pollution by Hazardous Materials			
SP5.02	Selection of safer chemical types Chemicals to be stored and use on construction site will be selected as much as possible in accordance with general good practices recommendations for environmental conservation. Pesticides for vector control (mosquitoes) and for vegetation control will be selected in accordance with the list of recommended pesticides provided by EMU.	EMU to review list of products to be imported on site and provide advice to CC Construction Manager	Sub-Plan 17: Project Personnel Health Program
SP5.03	Storage of Hazardous Materials All fuels and oils are stored in a 6 m container that has a full perimeter bund 500mm deep. The volume of the bund is in excess of 110% of the volume of the largest single container within the bund. Diesel is stored in a 2,000 l maximum storage tank within the container. Waste oil within the container is stored in a 1,000 l tank. All areas concerned by the storage or the use of Hazardous Materials (Workshops, Garages & storage areas) have their storm water drained and collected in hydrocarbon separator basins/pits before discharge. Acids, coagulants and flocculants are all stored within a separate container that may comprise the water treatment facility. A similar bund is constructed around the perimeter to contain a spill if it were to take place. Acids are also stored at batching plant sites where they are used to buffer plant effluents before discharge in a stream. Shotcrete accelerators, chemical resins and cement grouts will be stored together and will be	Weekly monitoring by EMU to check conditions of bunded areas, of fuel/oil separators on storm water drainage system, of container conditions, to record incidents observed during week All employees working with chemicals shall also perform the following; Conduct regular inspections of valves, pumps etc,	SP 6: Emergency Plan for Hazardous Materials SP 12: Waste Management & Disposal Plan SP 13: Environmental training for Worker Plan

No.	Description Of Measure	Monitoring	Links to Sub-Plans
	protected from the weather. The storage location will be within a safe area of the sites, as such any spill would be easily contained and out of flooding occurrence. Waste oil and other liquid Hazardous Materials waste will be collected by a liquid waste removal tanker and will be disposed of at a safe temporary disposal area for Hazardous Waste, as described in the Waste Management and Disposal Plan No. 12.	Carry out preventative maintenance Fire fighting if appropriate Stop substances escaping to the environment in the event of a spill	
SP5.04	Registration of Hazardous Materials All chemicals and waste considered as potentially Hazardous Materials will be registered in order to follow up type, quantities stored, quantities used or generated. Movements from storage and to waste disposal site will be registered. Information will be available from a register, open in each Hazardous Materials storage area. A register of fuel dispensed will be kept, along with the records of fuel deliveries to reconcile the quantities used.	Weekly monitoring by EMU, to check if Hazardous Materials register appropriately filled and up-dated	SP 6: Emergency Plan for Hazardous Materials SP 13: Environmental training for Worker Plan
SP5.05	Labelling of Hazardous Materials Containers of hazardous chemical or waste must be labelled with: i. the words “Hazardous Waste” ii. name of the CC user or generator iii. the date of storage of chemical or initial date that waste accumulation began in the container	Weekly monitoring of EMU	SP 13: Environmental training for Worker Plan SP 17: Project Personnel

No.	Description Of Measure	Monitoring	Links to Sub-Plans
	iv. the name of the material and its physical state (solid or liquid) v. the hazard characteristics of the waste (ignitable, corrosive, toxic, reactive) vi. main danger for user (poison, burning, dangerous for eyes, skin, lungs, etc)		Health Program
SP5.06	Handling Safety Procedures and Personal Protective Equipment Safety procedures applicable to the handling and use of Hazardous Materials will be established and become a part of the training program. Safety rules will be translated in Lao languages and printed on posters to be posted on the walls of the dedicated buildings where Hazardous Materials are to be used; Personal Protective Equipment will be provided to concerned workers and their use will be enforced	Visual observation of EMU during site inspection	SP 13: Environmental training for Worker Plan
SP5.07	Refuelling procedures Fuel will be stored in a secure area in a steel tank supplied and maintained by the fuel suppliers. An adequate bund wall (110% volume) will provided for fuel and diesel areas to accommodate any spillage or overflow of these substances. Drainage water is collected and oil/petrol collected in oil trap before storm water released in stream. Fuel tanks are protected from accidental dislodgement by plant vehicles or natural causes. Tanks and tankers to be fitted with a screw fitting connection. Tanker to be equipped with auto shut off valve to prevent overfilling. Appropriate service vehicles are dedicated to the refuelling of heavy equipment and machinery. Tanker driver to be made aware of the need to take precautions to prevent harm of the environment. Issue is covered in SP13 Environmental Training for Worker Plan	Weekly monitoring by EMU, to check refuelling procedures implemented, particularly in the tunnel area	SP 13: Environmental training for Worker Plan

No.	Description Of Measure	Monitoring	Links to Sub-Plans
	For safety purpose, fuel storage in the tunnel is limited to daily requirements. Safety procedures regarding fire and accidental spill management are posted on site. Non smoking label & posters posted in each place where fuel is handled or stored.		
SP5.08	Spill Response Kits Spill response kits will be used to contain any spills to ground that may occur as a result of servicing or through other means. The spill response kits will be located at the workshop where the servicing will take place and also at the refuelling point. All personnel involved with refuelling and with the servicing of equipment will be familiar with the use of the spill response kits and will be trained in the emergency procedures as described in the Emergency Response for Hazardous Materials Sub Plan.	Fortnightly monitoring by EMU to check presence of spill response kits and operational condition of equipment, To request new equipment where and when considered necessary	SP 6: Emergency Plan for Hazardous Materials SP 13: Environmental training for Worker Plan
SP5.09	Selection, handling & Application of Pesticides Pesticides for vector control (mosquitoes) and for vegetation control will be utilized in accordance with: i. Authorized pesticides, in accordance with the list approved by EMU ii. Labelling and storage of pesticides will satisfy measures SP05.3/4/5 of this sub-plan iii. All information related to toxicity of pesticide, and instruction for users will be translated in Lao language iv. Safe handling of pesticides will rely on training of users, on the basis of a specific training program and supporting communication materials and on the supply of	Weekly monitoring by EMU To check pesticide selection is in accordance with authorized list, To check labelling and precautionary information for users To check availability and enforcement for pesticides users To ensure users have received training	SP 13 Environmental training for Worker Plan

No.	Description Of Measure	Monitoring	Links to Sub-Plans
	appropriate. v. Ref to “ESCAP/ARSAP Safety Guide for Pesticides Users”	on pesticides use	

VI. Emergency Plan for Hazardous Materials

No.	Description Of Measure	Monitoring	Links to Sub-Plans
Hazardous Materials Register			
SP6.01	At each construction site where hazardous materials are used, a Hazardous Materials Register will be prepared detailing the following: i. Identification of all hazardous materials used on-site ii. Amount of each hazardous material stored on-site iii. Nature of each hazardous material (solid, liquid, gas) iv. Hazardous characteristics of each material (e.g. ignitable, corrosive, toxic, reactive) v. Main dangers posed by each material (poison; burning; danger for eyes, skin, lungs; environmental pollution) vi. Detailed emergency response procedure to be implemented based on the requirements of this sub-plan A copy of the MSDS for each material will be attached to the list. A copy of the register will be provided to EMU and the relevant local emergency authorities	EMU to verify Register EMU inspection	-
Storage of hazardous materials			

No.	Description Of Measure	Monitoring	Links to Sub-Plans
SP6.02	Hazardous materials will be stored on-site in accordance with the requirements of Sub-Plan No 5 Chemical Products and Spillage Management Plan.	Refer Sub-Plan 5	Sub-Plan 5
Spill response procedures			
SP6.03	In the event of a spill of any hazardous material, work will be ceased in the immediate vicinity and the area will be cleared of all construction personnel except those involved in the clean-up activities. The detailed emergency response procedures contained in the Hazardous Materials Register will be implemented.	EMU review post clean-up report	-
SP6.04	In the event of a spill of any hazardous material, the following response hierarchy will apply and will be used in the development of the detailed emergency response procedures: i. First priority is to seek medical attention for any injured personnel ii. Second priority is to prevent further injury to personnel iii. Third priority is to prevent environmental damage iv. Fourth priority is to clean-up spill v. Fifth priority is to remediate area of spill vi. Sixth priority is to complete reporting requirements	EMU review post clean-up report	-
SP6.05	For spills of solid materials, emergency response procedures will be developed in	EMU to verify register	Sub-Plan 5

No.	Description Of Measure	Monitoring	Links to Sub-Plans
	accordance with the guidelines contained in the MSDS and the following principles: i. The need to temporarily cover the spill to avoid dust generation will be considered ii. Containment barriers will be installed as required to stop the spilt material spreading iii. Suitable equipment will be used to pick-up the spilt material and place it in a suitable receptacle which conforms to the requirements pf Sub-Plan No 5 – Chemical Products and Spillage Management Plan and Sub-Plan No 12 – Waste Management and Disposal Plan. iv. Waste material to be disposed of in accordance with the requirements of Sub-Plan No 12 – Waste Management and Disposal Plan. v. Potential for contamination of the spill area to have occurred and the need for site remediation (e.g. removal of topsoil, capping of area) will be determined		Sub-Plan 12
SP6.06	For spills of liquid materials, emergency response procedures will be developed in accordance with the guidelines contained in the MSDS and the following principles: i. Containment barriers will be installed as required to stop the spill spreading, particularly in the vicinity of watercourses or drainage channels ii. In the case of a small or shallowly spread spill, absorbent materials, such as sawdust or clean rags, will be used to soak as much of the spill as possible iii. In the case of larger or deep spills, pumping equipment will be used to collect the spilt liquid	EMU to verify register	Sub-Plan 12

No.	Description Of Measure	Monitoring	Links to Sub-Plans
	iv. Materials to buffer acidic or alkaline spills will be added as required v. Sodden absorbent materials or pumped liquid waste will be disposed of in accordance with the requirements of Sub-Plan No 12 – Waste Management and Disposal Plan. vi. Potential for contamination of the spill area to have occurred and the need for site remediation (e.g. removal of topsoil, treatment of watercourses) will be determined		
SP6.07	For accidental releases of gaseous materials, emergency response procedures will be developed in accordance with the guidelines contained in the MSDS and the following principles: i. The extent of any evacuations required will be determined ii. The need for ventilation equipment to be used to disperse the release will be considered	EMU to verify register	-
SP6.08	Spill response kits will be available in each construction sites where hazardous materials are used and will be relevant for the materials used on that site and the appropriate emergency response procedures. Skill response kits will contain appropriate PPE and spill response equipment. The condition and availability of the spill response kits will be checked on a monthly basis.	EMU inspection	-

No.	Description Of Measure	Monitoring	Links to Sub-Plans
SP6.09	Portable spill response kits will be available throughout the construction area for use in the event of a release from a vehicle or other source not located at a construction site.	EMU inspection	-
Emergency contact details			
SP6.10	At each construction site, information on emergency response procedures, emergency contact numbers and communication and reporting procedures to be implemented in case of an emergency situation will be clearly displayed.	EMU inspection	-
Training of personnel			
SP6.11	At each construction site where hazardous materials are used, and there is a potential for a spill, there will be at least two employees on-site at all times who are trained in appropriate emergency response procedures and communication and reporting procedures to be implemented in case of an incident (refer Sub-Plan No. 13 – Environmental Planning for Workers Plan)	EMU inspection of training register	Sub-Plan 13
SP6.12	All construction personnel will be trained in basic emergency response procedures including communication and reporting procedures to be implemented in case of an emergency situation.	EMU inspection of training register	Sub-Plan 13

No.	Description Of Measure	Monitoring	Links to Sub-Plans
Emergency incident communication processes			
SP6.13	In the event of an accidental release or spill of a hazardous material, the following communication processes will be implemented: i. ESO immediately notifies EMU ii. EMU immediately notifies emergency response team iii. EMU immediately notifies external emergency authorities (if required) Communication will initially be verbal, with written communication as soon as practical.	EMU review post clean-up report	-
SP6.14	The communication processes identified in SP6.12 will include the following information in relation to accidental releases or spills: i. Location ii. Nature of material spilt iii. Amount of material spilt iv. Clean-up processes to be implemented v. Any injuries to personnel vi. Need for emergency or external assistant vii. Any safety/evacuation requirements to be implemented on the construction site	EMU review post clean-up report	-

No.	Description Of Measure	Monitoring	Links to Sub-Plans
SP6.15	Within 48 hours of the completion of a spill clean-up, a report will be submitted to the Owner. The report will be used to identify any required corrective pr preventive actions and emergency response procedures and training programs will be modified accordingly.	EMU review post clean-up report	-

VII. Emissions and Dust Control Plan

No.	Description of Measure	Monitoring	Links to Sub-Plans
Minimisation of dust generation			
SP7.01	Exposed areas will be minimised as far as practical and progressive revegetation of disturbed areas will be carried out.	EMU inspection	-
SP7.02	All vehicle movements will be confined to designated access routes and haul roads.	EMU inspection	-
SP7.03	Management of short term and long term materials stockpiles will be carried out in accordance with the requirements of Sub-Plan No. 1 – Erosion and Sediment Control Management Plan.	EMU inspection	Sub-Plan 1
Dust suppression measures			
SP7.04	Watering of exposed surfaces will be implemented in the following situations: i. During windy conditions ii. When visual inspection indicates excessive dust generation iii. When dust generating activities are being carried out within 100 m of a village or construction work camp	EMU inspection	-

No.	Description of Measure	Monitoring	Links toSub-Plans
	iv. During period of heavy traffic use on unsealed haul roads v. In response to complaints by external parties		
SP7.05	If high dust levels are evident in the vicinity of the crushing plant on a regular basis within the first three (3) months of the construction works, water sprayers will be installed on the plant if feasible.	EMU verify actions re installation of water sprayers	-
Vehicle maintenance			
SP7.06	A maintenance program for the construction vehicle fleet will be implemented which will include consideration of the following issues: i. General condition and safety of vehicles ii. Check of vehicle brakes and tyres iii. Vehicle exhaust emissions (no visible fumes for > 10 seconds) iv. Vehicle noise emissions Each construction vehicle in the fleet will be inspected at least every 6 months and a written certificate provided by a qualified mechanic as to its fitness for service (refer Sub-Plan No. 14 – Traffic and Access Plan).	Refer Sub-Plan 15	Sub-Plan 14

No.	Description of Measure	Monitoring	Links toSub-Plans
Burning of waste			
SP7.07	The burning of waste materials will only take place under the following conditions: i. Only those materials identified as Group A1 waste (combustible solid waste) in Sub-Plan No. 12 – Waste Management will be burnt. ii. Burning will only be undertaken in the presence of a trained fire protection officer. iii. Prior to any burning, the EMU will be notified. iv. Burning will not be undertaken during severe wind conditions v. Appropriate fire protection equipment will be available on-site during the burn. vi. Burning will be undertaken at a safe distance from vegetated areas. vii. Burning will not be undertaken within 5km of a village. viii. Following completion of the burn, the trained fire protection officer will inspect and certify that the fire has been extinguished	EMU inspection EMU record when burn to occur	Sub-Plan 12
Odour control			
SP7.08	Measures to reduce odour from the waste disposal area will be implemented in accordance with the requirements of Sub-Plan No. 12 – Waste Management and Disposal Plan.	EMU inspection	Sub-Plan 12

VIII. Noise Control Plan

No.	Description of Measure	Monitoring	Links to Sub-Plans
Minimise noise generation at source			
SP8.01	For any particular construction activity, the quietest vehicles and/or equipment, which are suitable for use for the construction activity, will be selected for use.	EMU to inspect equipment used on site	-
SP8.02	All equipment and vehicles will be maintained in good mechanical condition and will be fitted with appropriate silencers, mufflers or acoustic covers.	EMU to inspect equipment used on site EMU to review vehicle maintenance register and certificates required under Sub-Plan 14	Sub-Plan 14
SP8.03	Construction equipment and vehicles will be subject to regular inspections to check noise emissions and noise control equipment in accordance with the requirements of Sub-Plan No 14 – Traffic and Access Plan	Refer Sub-Plan 14	Sub-Plan 14
Reduce transmission of noise to receivers			
SP8.04	Stationary noise sources will be sited as far as possible from villages, construction camps	EMU to verify site layout plans for	Sub-Plan 3

No.	Description of Measure	Monitoring	Links to Sub-Plans
	and settlement areas.	quarries (refer Sub-Plan 3), spoil disposal area (refer Sub-Plan 2) and construction camps (refer Sub-Plan 16)	Sub-Plan 2 Sub-Plan 16
SP8.05	Where possible, topographic features will be used to provide shielding between stationary noise sources and villages and construction camps.	EMU to verify site layout plans for quarries (refer Sub-Plan 3), spoil disposal area (refer Sub-Plan 2) and construction camps (refer Sub-Plan 16)	Sub-Plan 3 Sub-Plan 2 Sub-Plan 16
SP8.06	All construction personnel working in the vicinity of noisy construction activities (defined as those activities generating noise levels greater than 80dB(A)), or any construction personnel who requests hearing protection, will be provided with hearing protection. Training will be provided to personnel in relation to the need for hearing protection to be used.	EMU to monitor availability and use of PPE EMU to monitor training register	Sub-Plan 13
SP8.07	No construction worker will be exposed to noise levels of 80dB(A) or above for more than 8 hours within any 24 hour period.	EMU to monitor exposure of workers	-
Construction hours			

No.	Description of Measure	Monitoring	Links to Sub-Plans
SP8.08	General construction works (excluding blasting) within a distance of 1km from villages, construction camps, will be carried out between 06.00 and 18.00. Construction in all other areas may be undertaken 24 hours a day subject to suitable safety and lighting measures being implemented.	EMU to verify compliance with construction hours	-
SP8.09	Blasting activities within a distance of 2km from villages, construction camps, will be carried out between 06.00 and 18.00. Residents will be provided with at least 24 hours notice that blasting is to take place and given information on the likely timing and number of blasts. Blasting in all other areas may be undertaken 24 hours a day subject to suitable safety and lighting measures being implemented.	EMU to monitor compliance with construction hours	-
SP8.10	The movement of vehicles to and from the construction site and within the construction site will only take place subject to the restrictions identified in SP8.08.	EMU to verify compliance with construction hours	-
Response to complaints about noise generation			
SP8.11	If complaints are received about excessive noise levels in the vicinity of villages, the EMU will consult with the complainant to identify appropriate additional mitigation measures (e.g. additional shielding, change of equipment type, restriction of construction hours in particular area) to be implemented.	EMU to verify complaints actioned	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
SP8.12	Monthly reports will be prepared identifying any complaints received in relation to construction noise and documenting the actions that were undertaken to resolve such complaints.	EMU to review reports	-

IX. Cultural Resource Plan

No.	Description of Measure	Monitoring	Links to Sub-Plans
Avoid impacts on significant cave network			
SP9.01	Construction activities will be undertaken in a manner to avoid any Physical effect on known sites of cultural and religious significances.	EMU inspection of protection measures	Sub-plan 13
Definition of physical cultural resources			
SP9.02	Physical cultural resources will be defined as: i. remains left by previous human inhabitants (for example, shrines)	-	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
	ii. unique natural environmental features		
Training of construction workers			
SP9.03	ESOs will be trained to identify potential sites or items of cultural significance. Construction workers will be trained in the appropriate reporting and communication procedures to be followed if they identify any potential sites or items and the importance of implementing these procedures.	EMU review of training register	Sub-Plan 13
Steps to be implemented if sites identified			
SP9.04	The following steps will be implemented to protect any previously unidentified sites of potential cultural significance: i. If a construction worker identifies a potential site or item of cultural significance, he/she will immediately notify the ESO. ii. The ESO will determine whether the site/item has potential significance iii. If the site/item is considered to have significance, the ESO will immediately cease work within a 50m radius of the site iv. The ESO will immediately notify the EMU	EMU review of potential site notification form	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
	v. The EMU will notify the Owner of the potential site as soon as practical vi. The report will be completed within 24 hours of a potential site being identified.		
SP9.05	Temporary fencing or similar will be used to mark a 50m radius from the site.	EMU site inspection	-
Directions from Owner			
SP9.06	No work will be carried out within a 50 m radius of a potential site until directed by the EMU.	EMU site inspection	
SP9.07	Any directions or requirements from the EMU in relation to measures to protect the site will be recorded and communicated by the EMU to the construction workforce. All such requirements will be strictly adhered to.	EMU site inspection EMU review of site notification form	-

X. Landscaping and Revegetation Plan

No.	Description of Measure	Monitoring	Links to Sub-Plans

No.	Description of Measure	Monitoring	Links to Sub-Plans
Progressive revegetation of sites			
SP10.01	All disturbed areas will be progressively revegetated using temporary revegetation and/or permanent revegetation methods.	EMU to carry out visual inspection	-
Species list to be prepared			
SP10.02	A qualified horticulturist will develop a species list to be used for temporary and permanent revegetation works.	EMU to verify species list prior to commencement of revegetation	-
Collection and storage of seeds and seedlings			
SP10.03	During the construction activities, collection of seeds and seedlings of plant species to be used in the permanent revegetation works will be carried out. Seeds and seedlings will be maintained and stored in suitable conditions until required for use in the revegetation works. Horticultural advice will be sought on suitable propagation and storage methods	EMU to verify suitable facilities for collection and storage of seeds and seedlings EMU to monitor collection activities	-
Initial revegetation works			

No.	Description of Measure	Monitoring	Links to Sub-Plans
SP10.04	Initial revegetation methods will be used: i. When the disturbed area will be disturbed again at some time in the construction works ii. When the disturbed area will be permanently revegetated in the future but permanent works cannot be undertaken immediately (i.e. prior to commencement of wet season, unsuitable growing conditions) iii. When the disturbed area to be revegetated is small and/or will be easily revegetated by natural processes iv. In areas where construction works are temporarily stopped for more than 14 days	EMU to monitor implementation of temporary revegetation works	-
SP10.05	Temporary revegetation works will involve seeding of disturbed areas using fast-growing, sterile grass species as defined in the species list. Hand or mechanical seeding methods will be used depending on the size of the area to be covered. The seeded area will be covered with weed-free, locally obtained straw or similar mulching product to enhance seed growth. Adequate watering will be applied to the seeded areas to enhance seed growth.	EMU to monitor implementation of temporary revegetation works	-
SP10.06	One month after the completion of temporary revegetation of a disturbed area, a visual inspection of the effectiveness of seeding will be carried out. If seeding of the area has been unsuccessful (i.e. continued erosion, lack of growth), additional seeding will be carried out.	EMU to carry out visual inspection	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
Permanent revegetation works			
SP10.07	Permanent revegetation will be used: i. When the area to be revegetated will not be disturbed by future construction activities ii. When the area to be revegetated is not identified for use as agricultural land use	EMU to monitor implementation of permanent revegetation works	-
SP10.08	Permanent revegetation will involve the following steps: i. Reinstatement of original land contours and drainage patterns, including filling of local depressions ii. Temporary fencing of area to be revegetated iii. Removal of weeds and/or temporary seeded vegetation using manual methods or herbicides iv. Spread topsoil taken from site during clearing activities v. Establish under-storey and over-storey vegetation using a combination of manual and mechanical planting methods vi. Application of mulch and fertilisers to enhance growth vii. Watering of vegetation as required to enhance growth	EMU to monitor implementation of permanent revegetation works	-
SP10.09	Fencing will be maintained around the area of permanent revegetation to exclude people	EMU to monitor implementation of	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
	and animals until the vegetation is well-established and construction works in the immediate vicinity of the area have ceased.	fencing	
SP10.10	At monthly intervals for the first 12 months and thereafter at 3 monthly intervals, visual inspection of the revegetated areas will be undertaken to evaluate the condition of the vegetation. Based on the results of the inspection, appropriate maintenance activities will be identified and implemented. If necessary, a horticulturist or botanist will be consulted to identify suitable maintenance activities.	EMU to carry out visual inspection	-
Avoidance of weed spread			
SP10.11	To avoid the spread of non-endemic species between different areas of the construction site, topsoil and vegetation (for mulching) removed from an area during site-clearing activities will as far as practical only be re-used on that area.	EMU visual inspection	-
Restoration of other land uses			
SP10.12	Land that was used for agricultural activities prior to disturbance from construction activities will be restored to a condition that will allow the agricultural land use to continue. This will include, as necessary:	EMU visual inspection at completion of works in relevant areas	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
	i. Re-spreading of topsoil ii. Installation of drains, channels etc iii. Erection of fencing or other structures		

XI. Vegetation Clearing Plan

No.	Description of Measure	Monitoring	Links to Sub-Plans
Identification of vegetation to be cleared			
SP11.01	A plan will be prepared which will include: i. Mapped boundaries of vegetation to be cleared, including identification of which clearing will be undertaken by the Forestry Department and which will be undertaken by the project. ii. Any areas of 'sensitive vegetation' located on-site which require specific protection (e.g. vegetation adjoining drainage channels). iii. Any required temporary timber storage sites for placing prior to its removal from site.	EMU to verify mapping prior to commencement of construction	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
SP11.02	No clearing of vegetation outside of those areas identified in the plans will take place.	EMU to inspect extent of clearing	-
SP11.03	Where possible, corridors or tracts of vegetation will be left intact to form connections to larger areas of un-cleared vegetation to allow dispersal of fauna during clearing activities.	EMU to verify mapping of vegetation to be cleared prior to the commencement of construction	-
SP11.04	All areas of vegetation to be cleared and the boundaries of 'sensitive vegetation' areas will be marked with temporary fencing or similar (using different colours or types for each).	EMU visual inspection	-
SP11.05	No construction works, storage of materials/equipment or access by construction personnel will be permitted in 'sensitive vegetation' areas.	EMU visual inspection	-
Clearing methods			
SP11.06	Vegetation clearing will be undertaken by a combination of manual, mechanical and chemical methods, in accordance with the following principles: No chemical clearing methods (i.e. use of herbicides, defoliants) will be used within 50m of any areas of vegetation not to be cleared including areas of 'sensitive vegetation' No mechanical clearing methods (i.e. bulldozers or other equipment) will be allowed	EMU to monitor use of clearing methods	-

No.	Description of Measure	Monitoring	Links to Sub-Plans
	within 5m of an area of 'sensitive vegetation'.		
SP11.07	Burning will not be used as a clearing method and burning of waste vegetation will only take place in accordance with the requirements of Sub-Plan No 7 Emissions and Dust Control Plan.	EMU to monitor use of clearing methods	Sub-Plan 7
Use of herbicides			
SP11.08	Herbicide use and management will be undertaken in accordance with the requirements of Sub-Plan No 5 Chemical Products and Spillage Management Plan.	Refer Sub-Plan 5	Sub-Plan 5
Retention of large trees			
SP11.09	As required by Sub-Plan No 16 Construction Work Camps Plan, the retention of existing vegetation, especially large trees to provide shade and improve visual amenity and vegetation along drainage lines, will be maximised.	Refer Sub-Plan 16	Sub-Plan 16
Erosion and sediment controls			

No.	Description of Measure	Monitoring	Links to Sub-Plans
SP11.10	Erosion and sediment controls as required by Sub-Plan No 1 Erosion and Sediment Control Management Plan will be in place prior to the commencement of any vegetation clearing works.	Refer Sub-Plan 1	Sub-Plan 1
Tree cutting			
SP11.11	Only authorised agent will be permitted to cut the tree	EMU to verify compliance with clearance permit	-
Storage and disposal of timber products			
SP11.12	Any required temporary timber storage sites will be designed to ensure that they are stable and protected from the risk of fire.	EMU visual inspection	-
SP11.13	Timber products that are not to be removed from site will be disposed of in accordance with the requirements of Sub-Plan No 12 Waste Management and Disposal Plan and Forestry Department guideline.	Refer Sub-Plan 12	Sub-Plan 12
Impacts on agricultural land use			

No.	Description of Measure	Monitoring	Links to Sub-Plans
SP11.14	All works will be designed and implemented in a manner that minimises the impacton agricultural land use and apple orchards.	EMU visual inspection	-

XII. Waste Management and Disposal Plan

No.	Description of Measure	Monitoring	Links toSub-Plans
General requirements			
SP12.01	Non-hazardous wastes will be collected and disposed of at one or more central waste disposal areas.	EMU inspection	-
SP12.02	Hazardous wastes will be stored at a single, central hazardous waste storage area.	EMU inspection	-
Location and design of waste facilities			
SP12.03	Prior to the commencement of any construction works, the location of wastedisposal site(s) and the hazardous waste storage area will be finalised. The rapid assessment checklists will be used for the identification of the waste disposal areas and hazardous waste stroge area. The location of the waste disposal areas and hazardous waste storage area will be approved by the EMU.	EMU to verify location of waste disposal areas and hazardous waste storage area	-
SP12.04	Prior to the commencement of any waste disposal activities, a waste disposal area plan(s)	EMU to verify waste disposal area	-

No.	Description of Measure	Monitoring	Links toSub-Plans
	will be prepared which will contain the following details for each waste disposal area(s): i. Site boundaries and layout ii. Details of membrane type to be used iii. Placement schedule for waste, including details of progressive covering and rehabilitation of waste cells iv. Plans for the final landform of the completed waste disposal area v. Location of any groundwater monitoring wells	plans	
SP12.05	Prior to the commencement of any construction works, a hazardous waste storage area plan will be prepared. The plan will contain details on: i. Site boundaries and layout ii. Construction details including bunding and provision of smooth, hard, non-porous floors with no cracks or spaces that might allow spilled wastes to fall into inaccessible areas iii. Emergency protection equipment to be provided	EMU to verify hazardous waste storage area plan	-
Implementation of waste management hierarchy			
SP12.06	All construction activities will be undertaken in a manner that minimises the generation of waste as far as practical. This concept will be incorporated into all construction site	EMU inspection	-

No.	Description of Measure	Monitoring	Links toSub-Plans
	planning and activities. Examples of measures that could be implemented include: i. Minimising spoil generation and maximising cut and fill balance ii. Minimising amount of vegetation clearance iii. Installing water efficient plumbing and toilet facilities Review of the records required will be used to assist in the identification ofwaste minimisation practices.		
SP12.07	Opportunities to maximise the reuse and recycling of waste products will be identified and maximised as part of all construction activities. Specific opportunities that will be considered include: i. Reuse of grey water for dust suppression or watering of landscaping works ii. Reuse of construction debris/overburden for landfill stabilisation and covering iii. Reuse of spoil for development of construction platforms for project components Review of the records required and will be used to assist in the identification ofsuch opportunities.	EMU inspection	-
Waste separation and provision of facilities			
SP12.08	Solid waste will be separated into the waste streams.	EMU inspection	-

No.	Description of Measure	Monitoring	Links toSub-Plans
SP12.09	Workers will be trained in the requirements for waste separation as documented in Sub-Plan No. 13 – Environmental Training for Workers Plan.	EMU review of training register	Sub-Plan No. 13
SP12.10	At each construction site, the following facilities will be provided: i. Bin(s) for general domestic litter and rubbish ii. Storage area for combustible solid waste iii. Storage area for non-combustible, non-putrescible solid waste iv. Storage area for non-combustible, putrescible solid waste v. Temporary storage area for hazardous wastes The size of the storage will be calculated based on the nature of construction activities and the number of construction workers. All storage areas will be constructed with impermeable bases and bunding to divert runoff from the storage area. Where feasible, bins or waste receptacle will be used in preference to storage areas on the ground. The storage areas will be protected from the weather to minimise ingress of rain. All storage areas/receptacles will be clearly marked in Lao and English.	EMU inspection	-
Schedule of waste removal			
SP12.11	The CC will be required to make a schedule of waste removal	EMU inspection of schedule and	--

No.	Description of Measure	Monitoring	Links toSub-Plans
		waste removal activities	
Group A1 Waste			
SP12.12	Only Group A1 – Combustible Solid Waste will be burnt. All burning of waste on-site will be undertaken in accordance with the requirements of Sub-Plan No. 7 – Emissions and Dust Control Plan. If the conditions for burning contained in Sub-Plan No. 7 – Emissions and Dust Control Plan cannot be met, the waste will be treated as Group A2 – Non-combustible, Non-Putrescible Waste.	Refer Sub-Plan 7	Sub-Plan 7
Group A2 and Group A3 wastes			
SP12.13	Group A2 and Group A3 waste will be removed from construction sites and transferred to the nearest waste disposal area.	EMU inspection	-
SP12.14	The form will be used to record the amount of Group A2 and A3 waste removed from construction sites.	EMU inspection	-

No.	Description of Measure	Monitoring	Links toSub-Plans
SP12.15	A standard will be used at each waste disposal area to record the cumulative amounts of waste placed in the waste disposal area.	EMU inspection	-
SP12.16	Group A2 and Group A3 waste will be placed in the waste disposal area in an orderly manner in accordance with the sequence identified in the waste disposal area plan. Where practical, Group A2 and Group A3 waste will be placed separately in the disposal area. Compaction of waste will occur as necessary.	EMU inspection	-
SP12.17	Covering and rehabilitation of the waste disposal area will be undertaken in a progressive manner as defined in the waste disposal area plan. When parts of the waste disposal area are full, they will be covered by a minimum depth of 1.5 m of soil, and then re-vegetated according to relevant requirements included in Sub-Plan No. 10: Landscaping & Re-vegetation Plan.	EMU inspection	Sub-Plan No. 10
SP12.18	Prior to covering and rehabilitation of sections of the waste disposal area, temporary covering (using plastic sheets or similar) will be used as required to control vermin and odours and reduce generation of polluted runoff (for Group A3 waste in particular) and control dust generation (for Group A2 waste in particular).	EMU inspection	-

No.	Description of Measure	Monitoring	Links toSub-Plans
Group B1 waste			
SP12.19	The composition of Group B1 waste at each construction site will be recorded prior to its transfer to the Hazardous Waste Storage Area.	EMU inspection	-
SP12.20	Group B1 waste will be transported in covered vehicles to the Hazardous Waste Storage Area.	EMU inspection	-
SP12.21	The following requirements will be met at the Hazardous Waste Storage Area: i. There will be no sources of ignition permitted within 50m of the perimeter of the storage area (such as heat, sparks, flames). ii. Within the storage area, liquid wastes will be stored in leak proof, securely sealed containers. iii. Solid wastes will be stored in covered receptacles or bins. iv. Wastes will be separated to allow easier disposal, e.g., keep oils and solvents separate. v. Storage containers will be checked periodically for signs of leakage or damage. vi. Containers will be adequately and legibly labelled “Hazardous” (also see SP05). vii. All waste chemical movements to the storage site will be recorded on the Waste Chemical Register in order to track and reconcile quantities (refer Sub-Plan No. 5 –Chemical Products and Spillage Management Plan.	EMU inspection	Sub-Plan 5 Sub-Plan 6

No.	Description of Measure	Monitoring	Links toSub-Plans
	viii. All waste chemicals stored in the storage area will be accompanied by their material safety data sheet (MSDS) where one exists ix. Unused commercial products containing a hazardous substance will not be discarded and all reasonable effort should be made to use them until their container is completely empty; x. Spill kits will be located at the storage location in case of a spill. Refer to SP6: Emergency Plan for Hazardous Materials Sub-Plan		
SP12.22	A standard form will be used to record all waste received at the Hazardous Waste Storage Area.	EMU inspection	-
SP12.23	During the pre-start-up phase investigations will be undertaken to identify a suitable hazardous waste treatment facility for disposal and treatment of hazardous waste generated by the project.	EMU to verify results of investigation	-
Training of workers			
SP12.24	All workers responsible for handling hazardous waste will receive appropriate training in accordance with Sub-Plan No. 13 – Environmental Training for Workers Plan	EMU to review training register	Sub-Plan 13

No.	Description of Measure	Monitoring	Links toSub-Plans
Wastewater treatment			
SP12.25	Wastewater generated at the construction sites (excluding domestic wastewater generated at the construction camps) will be treated in accordance with the requirements of Sub-Plan No 1 – Erosion and Sediment Control Management Plan.	Refer Sub-Plan 1	Sub-Plan 1
SP12.26	A sewage treatment plant will be deal with in accordance with the requirements contained in Sub-Plan No. 16 – Construction Work Camps Plan.	Refer Sub-Plan 16	Sub-Plan 16
SP12.27	Septic tank systems will be installed at each construction work camp in accordance with the requirements contained in Sub-Plan No. 16 – Construction Work Camps Plan.	Refer Sub-Plan 16	Sub-Plan 16
SP12.28	The effluent from any septic tank system that requires emptying will be transported off-site to a suitable treatment facility.	EMU inspection	-
SP12.29	Monitoring of the effluent quality from the wastewater treatment plant will be undertaken in accordance with the requirements of Sub-Plan No. 4 – Water Quality Monitoring Plan.	Refer Sub-Plan 4	Sub-Plan 4

XIII. Environmental Training for Workers Plan

No.	Description of Measure	Monitoring
SP13.01	All workers will complete the training programs	EMU monthly review of training register.
SP13.02	Participants in job-specific training will be identified as required on the basis of their skills and capacity to undertake the training.	EMU monthly review of training register.
SP13.03	All training sessions will be conducted in Lao language for Lao personnel and as appropriate for foreign staff. All written materials will be provided in Lao language and other languages as appropriate.	EMU inspection of training materials/ courses
SP13.04	A training register will be maintained that will contain details of the following: i. Name of training session ii. Date of training session iii. List of attendees and signatures iv. Name of trainer	EMU monthly review of training register.
SP13.05	At completion of each relevant training course, each participant will be issued with a certificate of successful completion. A copy of the certificate will also be placed on each participant's employment file.	EMU random review of employment files.

No.	Description of Measure	Monitoring
SP13.06	The EMU will implement a rolling program of refresher courses in environmental and health and safety awareness issues through the use of 'tool-box' sessions at construction sites. The program will aim to visit every construction site for a 2-hour session at least one time within a 6-month period.	Review of training register
SP13.07	During audits of the construction areas, workers knowledge of environmental, health and safety issues will be examined.	EMU review of audit reports.
SP13.08	Workers who have undergone job-specific training will be examined every 6 months in relation to their knowledge and skills and subject to re-training as required. Records of examination results and any re-training will be kept as part of the training register.	EMU monthly review of training register
SP13.09	All new employees will complete relevant training prior to commencement of any activities on the construction site.	EMU random review of employment files.
SP13.10	The key messages from the training sessions will be produced in poster and leaflet form in Lao language. Posters will be displayed prominently in construction work camps and construction areas and leaflets will be distributed to staff on a regular basis.	EMU visual inspection of construction camps and construction areas

XIV. Traffic and Access Plan

No.	Description of Measure	Monitoring	Links toSub-Plans
Road signage and speed limits			
SP14.01	All roads within the construction area will be signposted with the following information in Lao and English: i. Speed limit ii. Any applicable load limit iii. Road features that may affect driving conditions (crests, hidden accesses etc) iv. Identification of road v. Direction to construction areas	EMU visual inspection	-
SP14.02	Traffic speed regulation devices, such as speed humps, and signage will be installed at sensitive locations including in the vicinity of villages, construction camps and at busy intersections. A speed limit of 25km/hour will apply in all these locations.	EMU visual inspection	-
Maintenance of construction vehicles			
SP14.03	A maintenance program for the construction vehicle fleet will be implemented which will include consideration of the following issues:	EMU monthly review of vehicle certificates	-

No.	Description of Measure	Monitoring	Links toSub-Plans
	i. General condition and safety of vehicles ii. Check of vehicle brakes and tyres iii. Vehicle exhaust emissions iv. Vehicle noise emissions and noise control measures Each construction vehicle in the fleet will be inspected at least every 6 months and a written certificate provided by a qualified mechanic as to its fitness forservice.		
Traffic movements on internal roads			
SP14.04	Visual inspection of traffic movements within the construction area will be carried out. If there is evidence that congestion is occurring on roads. If traffic congestion is found to beoccurring, appropriate management measures will beimplemented.	EMU visual inspection EMU to approve management measures	-
SP14.05	Movement of construction vehicles and traffic on-site will be confined to the designated access road network. No movement of vehicles outside the designated access road network willbe permitted.	EMU visual inspection	-
Parking areas			

No.	Description of Measure	Monitoring	Links toSub-Plans
SP14.06	Off-road parking areas will be provided at each construction site. Parking areas will bemarked with temporary fencing or the like. Parking areas will be located in existing cleared areas within the designated construction area. No on-road parking will bepermitted.	EMU visual inspection	-
Traffic movements on public roads			
SP14.07	Prior to the movement of special loads on public roads, including hazardous materials orlarge items of construction equipment, the EMU will be notified. All reasonable and practical measures required by the EMU will be implemented to ensure that the risk of harm to the communityand environment is minimised during transportation of special loads.	EMU to be notified	-
SP14.08	Construction activities on public and internal roads should be marked by safety fencing and appropriate warning signs in Lao and English.	EMU to verify surveys and details of remediative works	-
Site access			
SP14.09	Access to the construction site will be controlled as detailed in the Site Security Plan.	-	-
Training			

No.	Description of Measure	Monitoring	Links toSub-Plans
SP14.10	Traffic safety issues and site access and traffic regulations will be included in the trainingplan for construction personnel (refer Sub-Plan No. 13 – Environmental Training for Workers Plan).	Refer Sub-Plan 13	Sub-Plan 13
Borrow areas for road construction			
SP14.11	Any borrow areas that are required to be developed for the road construction works willbe subject to evaluation using the Rapid Assessment Checklist. The EMU will approve the location of any identified borrow areas prior to theirestablishment.	EMU to review and approve checklists	-
SP14.12	Notwithstanding the above, material for construction of the roads should utilizeconstruction spoil if possible.		

XV. Unexploded Ordnance (UXO) Survey and Disposal Plan

No.	Description of Measure	Monitoring	Links toSub-Plans
Appropriately qualified organisation to undertakework			

No.	Description of Measure	Monitoring	Links toSub-Plans
SP15.01	An appropriately qualified organization will be engaged to undertake survey and disposal of UXO in areas where project activity are to take place, prior to the commencement of any construction works on-site.	EMU to verify qualifications of organisation	-
Planning for survey and disposal work			
SP15.02	The organisation engaged to carry out the UXO survey and disposal works will submit the following information to the contractor prior to the commencement of survey or disposal works: i. Mapping showing confirmation of area to be subject to UXO survey and disposal ii. Detailed methodology of survey and disposal works including shallow and deep search methodologies iii. Schedule of works consistent with schedule of construction works iv. Quality Control (QC) Plan for the survey and disposal works v. Occupational Health and Safety (OH&S) Plan for the survey and disposal works addressing inclusion of medical staff and facilities as part of the project team and procedures for emergency evacuation from the project site vi. Staff Training Plan for the survey and disposal works	EMU to verify information and complete form	-
Vegetation clearing for UXO works			

No.	Description of Measure	Monitoring	Links toSub-Plans
SP15.03	Vegetation clearing required for the UXO survey activities will be undertaken in accordance with the requirements of Sub-Plan No. 11 – Vegetation Clearing Plan	Refer Sub-Plan 11	Sub-Plan 11
Requirements for survey and disposal			
SP15.04	The first priority method for disposal of UXO should be in-situ explosion. Where this is not possible, due to potential danger to personnel or nearby population or damage to infrastructure, alternative proven methods of disposal may be implemented.	EMU to review site clearance reports and six-monthly report	-
SP15.05	Where disposal of UXO may cause physical damage to infrastructure, protective measures such as sandbagging, burial and trenching will be undertaken.	EMU visual inspection	
SP15.06	Storage and handling of explosives will be undertaken in accordance with the requirements of Sub-Plan No. 5 – Chemical Products and Spillage Management Plan	Refer Sub-Plan 5	Sub-Plan 5
Marking of cleared areas and clearance reports			
SP15.07	All cleared areas will be semi-permanently marked with concrete posts or similar. Within 14 days of completion of the clearing work at a site, a clearance report will be prepared and will contain the following information:	EMU to review site clearance reports and six-monthly report EMU visual inspection of	-

No.	Description of Measure	Monitoring	Links toSub-Plans
	i. Description (using GPS coordinate system or similar) and mapping of boundaries of the cleared area – area identifiers will be in keeping with the overall identification process used for engineering design drawings ii. Description of the survey, disposal and QC processes that were implemented on the site iii. Description of UXO located, UXO destroyed and amount of scrap metal recovered iv. Report of any medical or environmental incidents occurring during site clearance v. Certification that the area has been cleared of UXO and is suitable for its intended purpose	cleared areas	
Construction worker training			
SP15.08	As part of the construction worker training program contained in Sub-Plan No. 13 – Environmental Training for Workers Plan, construction workers will be trained in the potential risks associated with disturbance of UXO and procedures to be followed if potential items of UXO are identified during construction activities.	Refer Sub-Plan 13	Sub-Plan 13
Notification of local communities			
SP15.09	A UXO consultation and notification program will be implemented in communities that are located in the vicinity of survey and disposal works at the time that the survey and disposal works	EMU to review six-monthly report	-

No.	Description of Measure	Monitoring	Links toSub-Plans
	are being undertaken. The UXO Awareness program will include the following: i. Consultation with local communities regarding the purpose and process of the proposed survey and disposal activities prior to the commencement of works. ii. Notification of local communities of the commencement and likely duration of UXO disposal activities in their area and any likely precautions that should be taken. iii. Information to communities about the location of cleared areas and the meaning of the cleared area marking – i.e. delineation between cleared and un-surveyed areas.		
Reporting requirements			
SP15.10	Six monthly reports will be prepared which contain the following information about activities during the period: i. Summary of all survey activities – areas, methods etc. ii. Summary of all clearing activities – UXO located, UXO destroyed etc iii. Summary of QC and OH&S Plan activities iv. Identification of all certified cleared areas v. Report of any medical or environmental incidents occurring vi. Summary of UXO awareness training activities carried out in local communities	EMU to review six-monthly report	-

XVI. Construction Work Camps Plan

No.	Description of Measure	Monitoring	Links toSub-Plans
Use of camps			
SP16.01	All workers who are based on the construction site will be accommodated in either construction camps or other approved accommodation	EMU Inspection	-
SP16.02	The sanitation facilities will be designed to meet the effluentrequirements.	EMU monitoring	Sub-Plan 4
Construction work camp design			
SP16.03	All construction work camps will include the followingcomponents: i. Residential accommodation for workers comprising one bed and 0.5m3 ofpersonal storage space per person ii. Canteen and kitchen iii. Shops to supply basic food, toiletries and personal items iv. Recreational areas v. Medical facilities (refer Sub-Plan No. 17 – Project Personnel Health Program) vi. Potable water supply infrastructure including pumping facilities and water storage areas vii. Sanitary facilities comprising a septic tank system with adequate capacity to treat wastewater from the ultimate camp population	EMU to verify site layout plan	Sub-Plan 17 Sub-Plan 12

No.	Description of Measure	Monitoring	Links toSub-Plans
	viii. Waste collection and management facilities (refer Sub-Plan No. 12 – Waste Management and Disposal Plan) ix. Suitable lighting for security and amenity x. Internal roads of at least 4m width with gravel surface xi. Emergency protection equipment including fire protection xii. Temporary erosion and sediment controls during construction and storm water drainage to minimise mosquito breeding		
Construction work sub-camp design			
SP16.04	All construction work sub-camps will include the following components: i. Residential accommodation for workers comprising one bed and 0.5m3 of personal storage space per person ii. Canteen and kitchen iii. First-aid station iv. Potable water v. Pit latrine toilets to cater for the expected PCA workforce, with one toilet for every 20 workers vi. Waste collection and management facilities (refer Sub-Plan No. 12 – Waste Management & Disposal Plan) vii. Suitable lighting for security and amenity	EMU to verify site layout plan	Sub-Plan 12

No.	Description of Measure	Monitoring	Links toSub-Plans
	viii. Emergency protection equipment including fire protection ix. Erosion and sediment controls during construction and ongoing operation of sub-camp		
Preparation of site layout plans			
SP16.05	A site layout plan will be prepared prior to the commencement of construction of Residence and the construction camps and sub-camps. The plan will include information on the location of the components and will be based on the following principles: i. The use of cleared areas for locating construction camps will be maximised ii. The retention of existing vegetation, especially large trees to provide shade and improve visual amenity and vegetation along creeklines, will be maximised iii. Measures to minimise the potential for disease transmission within the constructions camps will be taken into account including provision of suitable drainage, water supply and sewage disposal methods iv. No components will be located within 10m of a watercourseiv, and all construction work within 30m of a watercourse will be minimised v. Residential and medical facilities shall be located a suitable distance from waste management and sanitary facilities vi. Buildings shall be sited within the existing topography to maximise screening of the camps from public vantage points	EMU to verify site layout plan	-

No.	Description of Measure	Monitoring	Links toSub-Plans
Disease control, health and safety issues			
SP16.06	Buildings in Residence camps and sub-camps will be made 'mosquito-proof' as far as possible through ensuring adequate sealing of doors and windows, provision of suitable ventilation and as necessary, installing mosquito-nets and other prevention devices.	EMU to verify site layout plan EMU visual inspection	-
SP16.07	Medical, sanitary and disease prevention measures for each camp will be implemented in accordance with the requirements of Sub-Plan No. 17 – Project Personnel Health Program.	Refer Sub-Plan 17	Sub-Plan 17
SP16.08	Pesticide use in the camps and sub-camps will be carried out in accordance with the requirements of Sub-Plan No. 17 – Project Personnel Health Program.	Refer Sub-Plan 17	Sub-Plan 17
SP16.09	Waste generated at the construction camps will be managed in accordance with the requirements of Sub-Plan No. 12 – Waste Management and Disposal Plan.	Refer Sub-Plan 12	Sub-Plan 12
SP16.10	The camp sites and surrounds will be kept in a tidy and clean manner. Inspections of the camp sites will be carried out weekly.	EMU monthly review of site condition forms	-
SP16.11	Construction workers will be trained in health and safety issues relating to the camps in	Refer Sub-Plan 13	Sub-Plan 13

No.	Description of Measure	Monitoring	Links toSub-Plans
	accordance with the requirements of Sub-Plan No. 13 – Environmental Training for Workers Plan		
Camp access			
SP16.12	Access to construction camps will be controlled in accordance with the requirements of the Site Security Plan. In general, access to the camps will be restricted to construction workers and visitors with an authorised access pass.	EMU inspection of site access register	-
Potable water supply			
SP16.13	All potable water storage facilities will be secured with access limited to authorised personnel. Local rivers will be used as the source of the potable water supply. The intake for thepotable water storage will be located a suitable distance upstream of any wastewater discharge point.	EMU inspection	-
SP16.14	Water quality monitoring of the potable water storage in camps and sub-camps will be carried out in accordance with the requirements of Sub-Plan No. 4 – Water Quality Monitoring Plan.	Refer Sub-Plan 4	Sub-Plan 4
Camp rules and regulations			

No.	Description of Measure	Monitoring	Links toSub-Plans
SP16.15	A set of rules and regulations applicable to camps and sub-camps will be developed. The rules and regulations will include: i. Prohibitions on hunting and poaching of wildlife, purchasing wildlife meat, fishing, gathering and harvesting medicinal or valued plants and trees, and possessing firearms, snares, traps and other hunting equipment ii. Access restrictions for non-construction personnel iii. Housecleaning and waste management requirements iv. Prohibitions v. Measures for preserving health and the dissemination of vectors and transmissible diseases	EMU to verify documented rules	-
SP16.16	Residents of the camps shall be provided with written information and training on camp rules and regulations. Camp rules and regulations will be prominently displayed in the camp areas.	EMU visual inspection	-
Landscaping and erosion and sediment control			
SP16.17	Landscaping works for each camp will be developed and implemented in accordance with Sub-Plan No. 10 – Landscaping and Revegetation Plan.	Refer Sub-Plan 10	Sub-Plan 10
SP16.18	The erosion and sediment controls implemented during construction will be developed in	Refer Sub-Plan 1	Sub-Plan 1

No.	Description of Measure	Monitoring	Links toSub-Plans
	accordance with the requirements of Sub-Plan No. 1 – Erosion and SedimentControl Management Plan		

XVII. Project Personnel Health Program

No.	Description of Measure	Monitoring	Links to Sub-Plans
SP17.01	The "Health and Safety Manual" will be distributed to the personnel attending health andsafety training in the language used by the workers during trainings. It contains the following contents: ***Health:*** i. Anti malaria precautions ii. HIV / AIDS and other venereal diseases precautions iii. Diarrhoea precautions iv. Symptoms of other diseases typical of the area (such as dengue fever) v. Recommendations regarding proper disposal of all wastes vi. Use of proper drinking water vii. Use of appropriate toilets ***Safety:***	EMU inspection of manual Safety Engineer monitoring of rule compliance	Sub-Plan No. 13

No.	Description of Measure	Monitoring	Links to Sub-Plans
	i. Use of Personal Protective Equipment (PPE) ii. Use of specific equipment according to the safety procedure iii. Use of appropriate clothing iv. Use of appropriate ladders v. Use of appropriate slinging vi. Attention to signals of danger vii. Attention to suspended weights viii. Attention to unprotected pits ix. Attention to buried cables x. Attention to overhead power cables xi. Attention to all inflammable items xii. Procedure for fire extinguishing xiii. Etc.		
SP17.02	First aid teams will be specifically trained and assigned in groups of two to three persons to the different sites	EMU to inspect training and keep contact detail	Sub-Plan No. 13
SP17.03	Medical facilities sufficient	EMU monitoring	Sub-Plan No. 13
SP17.04	The Site Doctor available	EMU monitoring	Sub-Plan No. 13
SP17.05	In the event of a spill of any hazardous material, actions and responses will be taken according to Sub-Plan No. 06 – Emergency Plan for Hazardous Materials.	Referred to Sub-Plan 06	Sub-Plan 06
SP17.06	Control of mosquito and pests through	EMU inspection	

No.	Description of Measure	Monitoring	Links to Sub-Plans
	effective storm water drainage system to avoid stagnant water keeping storm water drain and borrow pit free of vegetation minimizing presence of containers full of water removal of discarded items that could contain water providing mosquito nets to buildings safe application of pesticides when necessary		
SP17.07	Solid waste that might attract pest such as domestic rubbish and food waste shall be managed properly	EMU monitoring	Sub-Plan 12
SP17.08	Water supply and sewage system especially in camp sites will be maintained in a good condition through regular monitoring according to the required standards	EMU monitoring	Sub-Plan 04 Sub-Plan 16
SP17.09	Control of pest by pesticide will be limited to only necessary cases. Selection of pesticide will be according to following Owner Requirements: i. Have negligible adverse human health effects ii. Effective against target species iii. Have minimal effect on non-target species and natural environment. iv. Safe for inhabitants and domestic animals as well as personnel applying hem v. Use and handling of pesticides will be conducted on the appropriate manners	EMU monitoring EMU monitoring	Sub-Plan 05

ANNEX B: ENVIRONMENTAL AND SOCIAL CLAUSES FOR CIVIL WORKS' CONTRACTS

The Mitigation Measures of the EMMP provide general and specific guidance on protection and mitigation of potential environmental damage. The EMMP is attached to the Technical Specifications and shall be considered as binding on the Contractor. All necessary measures on protection of the environment shall be carried out by the Contractor in accordance with the order of competent authorities, the EMMP, and instructions of the Engineer (MFCB Engineer).

1. Obligations of the Contractor

The general environmental and social obligations of the Contractor within this Contract, without prejudice to other official provisions in force, include the following:

- Respecting and abiding by the environmental, health, safety and labor regulatory provisions in force in Lao PDR (including those announced during the execution of the works if imposed by the Engineer), the contractual provisions of this Contract as well as the conditions fixed by the various authorizations or approvals required;
- Respecting and abiding by national and international labor codes, including the ILO Conventions ratified by Lao PDR and ensure that it and its sub-contractors make available employment opportunities for both men and women and ensuring a gender-sensitive work environment;
- Assuming full responsibility for the consequences of its choices and actions; in particular, and without prejudice to the regulatory provisions in force, it guarantees, if necessary, the repair at its cost and according to the most appropriate technologies and deadlines, notably with regard to the level of sensitivity of the site concerned, of damage caused to the environment and residents by failure to respect regulatory and/or administrative provisions and/or the applicable technical specifications, as well as the payment of fines, damages or other penalties which may be incumbent upon it;
- Agreeing with the Engineer and implementing technical approaches and solutions to the design of the Mekong Sanakham HPP where the Project will encroach on private or communal lands. Preference shall be given to the technical solutions that do not require taking or demolition of temporary and permanent properties. In case the taking or demolition of property cannot be avoided the Contractor shall notify the Engineer and cease the works in that particular section of the Project. Construction activities may only proceed with approval of the Engineer.

- Taking all measures to ensure the environmental quality of operations which are the subject of this contract and not disrupt the quality of life of the adjacent villages, in particular by applying the applicable specifications and provisions. The Contractor shall consider the execution of works or the implementation of environmental and social provisions as an integral part of the operations relating to the general construction program of the works;
- Providing appropriate information and training for Contractor personnel, including management staff, with regard to the environmental and social quality of operations;
- Informing the local authorities (village heads, district governor) and the affected population on planned construction activities, sites and schedule at least 2 weeks in advance of any planned construction activities (including signage);
- Holding information meetings at least 2 weeks before entering any village area for planned construction activities, to inform and consult with the villagers regarding the nature of the forthcoming works, their duration and all effects such as dust, smoke, or noise that will be felt in the village, the mitigation measures that will be applied, and provide villagers with opportunities to ask questions and express concerns;
- Providing a medium for ongoing communication with villagers, including a point of contact/ liaison to address any potential issues during construction with the physical works or with subcontractors, and provide a plan for mediation of any problems that arise in relation to the works under this Contract and documenting concerns and resolution of these.
- Refraining from destroying, removing or clearing trees, timber, scrub, crops and other flora to any extent greater than is approved by the Engineer as being necessary for the execution of this Contract and shall take such measures as may be necessary to prevent its employees from hunting, disturbing, capturing or destroying stock, crops and such flora as may be protected by relevant statutes;
- Sitingborrow pits or other similar excavations as well as waste accumulation and disposal sites only in locations approved by the Engineer;
- Controlling pollution, noise and nuisances generated by the works;
- Re-using materials available on the existing site each time the technical and financial conditions allow for this in a satisfactory manner from the point of view of the Engineer. Recycling and reuse of wastes (e.g. lubricants, plastic bottles, paper) is encouraged where appropriate. Strictly banning the use of fire for clearing and grubbing and cleaning sites, except for the treatment of organic waste as approved by the Engineer;
- Preserving to the maximum extent possible natural resources and the minimizing the use of space, soil and vegetation, in particular by minimizing

cleared and stripped surfaces, by the passage of blades at a high level (5 cm above the natural ground level) each time that a simple clearing or a provisional storage of material is required, by controlling logging, including any tree removals, by the appropriate management of the topsoil, by driving and working the machines perpendicular to the slope, by the maintenance on the sites of naturally grassed areas, and by the control of site erosion;

- As appropriate, systematically stripping topsoil of all work sites unless (with prior consent of the Engineer) the soil structure of the surface, predominantly organic matter ("topsoil" or mud), does not exist or has a thickness less than the working height adjustment of the blade of the excavator or machine used, taking into account the state of the terrain (eroded soil, gravel, soil with rocks that prevent the passage of the machine, etc.);
- Respecting, for the whole of its site (including borrow sites and disposal areas, quarries and installations) the zones, areas, elements and periods which are environmentally sensitive, including, but not limited to locations and areas identified in the EMMP. In the project areas adjacent to specially protected areas, machinery shall not go beyond the work zone as approved by the Engineer; there shall be no waste accumulations and waste disposal sites in the same areas; and there shall be no use and storage of explosives and toxic and chemical substances.
- Discharging or disposal of used water, mud, grout, bituminous products, pollutants of any kind, etc. into wells, boreholes, surface water or groundwater, water courses, natural streams, drains, ditches, etc. is strictly forbidden;
- Not creating a dam or altering a permanent or temporary watercourse for the requirements of the site (unless otherwise specified in the Design), without authorization of the Engineer;
- Ensuring that all construction vehicles shall travel at low speed (as specified in Lao PDR regulations) within 100 m on either side of any areas around villages where children are present;
- Controlling health risks relating to the works and personnel of the Contractor, in particular the adoption of minimum hygiene rules at the work sites and camps and for the benefit of residents in the affected communities, the control of dust emissions in populated areas and the control of stagnant waters as specified in the EMMP;
- Exercising every reasonable precaution to protect persons or property from injury. The Contractor shall erect and maintain all necessary temporary fencing, barricades, barriers, signs and lights and provide fire alarm, fire extinguishing and fire fighting services at strategic points on the Site. The Contractor shall also be responsible for erecting and maintaining structures for storage and containment of hazardous materials or liquids. The Contractor

shall adopt and enforce such rules and regulations as may be necessary, desirable or proper to safeguard the public, all persons engaged in the work and its supervision. The Contractor shall be responsible for the flagging and control of traffic and he shall comply with the requirements of the Engineer and competent authority in these matters. The Contractor shall keep clear and in good working order all temporary access road structures, bridges, culverts, drains and other waterways necessary for the execution of the works during the term of the Contract;

- Providing for the safety of its personnel as well as nearby residents during blasting operations. This will include appropriate signage, fencing, or other means to keep the blasting area secure, and a warning system to ensure that its personnel and nearby residents are aware that a blast is about to occur.
- Ensuring, in as far as is reasonably practicable, the health, safety and welfare at work of its personnel including those of its subcontractors and of all other persons on the Site or crossing the site. The Contractor shall provide protective clothing and equipment to workers that are appropriate to the workers' tasks. The Contractor shall be fully responsible for ensuring necessary first aid services to its staff and workers, including transport for injured personnel to hospital or other appropriate accommodation as and when required. The organization of the construction sites and work places, and the Contractor's approach to the aspects listed below, shall be included in the Contractor's Environmental Management Plan (CEMMP) to be prepared by the Contractor and approved by the Engineer.
- Cleaning, restoring and then, if necessary, providing for the appropriate rehabilitation or redevelopment of work sites, camps, quarries and borrow pits released by the Contractor as the work progresses. This obligation, which includes possible drainage of stagnant water and the completion of compensatory tree plantations (if envisaged by the Design), is a condition of the acceptance of the works;
- Taking appropriate sanctions against personnel violating the applicable specifications and provisions on environmental and social matters;
- Checking, by regular inspection, that all stipulated environmental and social provisions are being adhered to;
- Systematically and in a timely manner informing the Engineer of each incident or accident, damage or degradation caused to the environment, workers or residents or their assets, in the course of the works. Contractor shall also take appropriate measures, as approved by the Engineer, to address the incident or accident in timely fashion; and
- Providing environmental and social monitoring of the works and the writing of corresponding monthly reports.

2. Contractor's Environmental Management Plan

The Contractor shall establish a Contractor's Environmental Management Plan (CEMMP) in order to meet his obligations concerning this matter; the CEMMP shall include in particular the following:

- Management Acknowledgements.
- Organization & Staffing.
- Communications and Reporting.
- Environmental, Health and Safety Management Provisions.

The Contractor shall prepare and submit for the Engineer's approval a CEMMP within 30 days of the commencement date. The Engineer may require periodic reviews, including updating of the CEMMP during the Works.

2.1 Management Acknowledgement

(i) Certification and Commitment

The CEMMP submitted by the Contractor shall provide a signed statement from the Contractor's Managing Director(s) attesting to a commitment that all environmental protection, safety, and occupational health aspects of the Contract will be given highest priority in the discharge of contractual obligations and certifying a commitment to the provisions in the EMMP and CEMMP as approved by the Engineer.

(ii) Statutory Understanding and Compliance

The Plan shall provide a statement attesting the firm's understanding of, and means of ensuring due compliance with, the statutory regulations relating to construction work in Lao PDR, specifically in regard to compliance with:

(a) All *safety and occupational health legislation including, without limitation, the Rules and Regulations of Lao PDR and the authorities having jurisdiction.*

*(b) All curren*t environmental laws and regulations, including both national and local regulations, related to the following, but not limited to the following:

- Noise.
- Vibration.
- Air pollution.
- Water contamination.
- Solid and hazardous waste disposal.

- Liquid waste disposal.
- Sanitary conditions (water supply, sewerage, etc.).
- Use of explosives.
- Protection of public traffic.
- Historical, cultural and archaeological monuments/sites,.
- Resettlement, land acquisition, servitude, temporary use of land and compensation.
- etc.

(iii) Availability of Documents

The Plan shall state where copies of safety and occupational health regulations and documents will be available on the construction site and verify that all regulations and documents have been or will be available.

(iv) Management of Subcontractors

The requirements of this and related sections and obligations therein shall be required for execution of parts of the Works by the approved subcontractors while the Contractor shall:

Provide subcontractors with copies of the CEMMP, incorporate such provisions into all sub-contracts, and ensure compliance with such plan under the Contract.

Require all subcontractors to appoint a safety representative who shall be available on the site throughout the operational period of the respective sub-contract and ensure as far as is practically possible that staff and employees of subcontractors are conversant with appropriate parts of the CEMMP and the statutory regulations.

2.2 Organization and Staffing

(i) Organization Chart

The Plan shall include an organization chart identifying (by job title and by the name of the individual) the personnel to be engaged solely for environmental protection, health, safety and traffic control. The chart and the supporting text shall identify participants and their areas of responsibility and contact details.

(ii) Appointment of Environmental Safety Officer (ESO)

The Contractor shall submit for approval the name and details (full CV) of its proposal for an ESO to the Engineer within 14 days of the commencement date. The ESO shall be responsible for day-to-day issues of environmental management for the duration of the Contract. The Contractor shall obtain approval of such person being appointed, who shall be in position to carry out his duties prior to Works activities

commencing on site except as may be agreed in exceptional circumstances in writing with the Engineer. The ESO will not be removed from the site without the express written permission of the Engineer. Within fourteen (14) days of any such removal or notice of intent of removal, a replacement ESO will be nominated for approval by the Engineer.

The ESO shall be empowered to instruct employees of the Contractor and Subcontractors to cease operations and shall take the appropriate action as is necessary and within his limits of delegation by informing others as may be appropriate to prevent unsafe working practices or other infringements of the Plan or the statutory regulations. The ESO shall maintain a daily site diary comprehensively recording all relevant matters concerning site environmental management, safety and traffic control, inspections and audits, related incidents and the like. The site diary shall be available at all times for inspection by the Engineer and his staff.

2.3 Communication and Reporting

The Contractor shall prepare and submit to the Engineer for his approval monthly progress reports on compliance with implementation of EMMP and CEMMP. It is expected that these reports will include information on:

- Environmental, social, health, and safety management actions/measures taken, including approvals sought from local or national authorities;
- Problems encountered in relation to environmental, social, health, and safety aspects (incidents, including delays, cost consequences, etc. as a result thereof);
- Lack of compliance with contract requirements on the part of the Contractor;
- Changes of assumptions, conditions, measures, designs and actual works in relation to environmental, social, health, and safety aspects;
- Observations, concerns raised and/or decisions taken with regard to environmental, social, health, and safety management during site meetings;
- Chance historical, cultural and archaeological finds;
- Follow-up on the status and efficacy of remedial measures and/or corrective actions identified in Incident Reporting Forms included in EMMPs or otherwise; and
- Follow-up, including remedial measures, status of measures and their efficacy, related to lack of compliance with contract requirements.

2.4 Environmental, Health and Safety Management Provisions

The CEMMP should include, as a minimum, the methodology and resources to meet the requirements of these Technical Specifications including but not limited to the following:

- Stakeholder communication (including nearby affected residents) and mechanism for documenting public concerns in relation to the works under this Contract and resolution of these.
- Relevant staff training;
- Maintaining farmers' access to irrigation water if the works are implemented during the irrigation season;
- Maintaining vehicle access to the communities;
- Pollution control (including spill prevention, dust abatement, noise, etc.);
- Provision of potable water and washing/toilet facilities to workers;
- Provision of lodging and insecticide-treated mosquito nets to workers as appropriate;
- Provision of health care to workers and treatment for injuries and infections; and providing workers with access to condoms;
- Assessing importance of, and reporting and investigating, chance historical, cultural and archaeological finds;
- Inspection and monitoring.

2.5 HIV-AIDS provisions

The Contractor shall:

- Require its personnel to attend the HIV Awareness Program provided by the UNAIDS and/or the National Committee for the Control of AIDS (NCCA) which has developed and launched the National Strategic and Action Plan on HIV/AIDS/STI 2006-2010. Attendance shall be in the course of their employment and during their normal working hours or any period of overtime provided for in the relevant employment contracts and uses all reasonable endeavors to ensure this instruction is followed;
- Deliver to all employees an HIV/AIDS leaflets available through UNAIDS and/or the NCCA.
- Give all reasonable cooperation to the UNAIDS and/or the NCCA office on providing the HIV Awareness Program. if any planned, by providing suitable space for delivery of the Program and do nothing to dissuade the personnel from attending the Program;
- Encourage voluntary HIV/STD testing.

The Contractor shall not be required to undertake or pay for treatment or medication for personnel found to be suffering from HIV/AIDS. Such personnel shall not be discriminated against however (including discrimination in employment opportunities, employment retention, treatment, etc.)

i Latin America and Caribbean Region -- Sustainable Development Working Paper 16, “Good Dams and Bad Dams: Environmental Criteria for Site Selection of Hydroelectric Projects”, November 2003, by George Ledec and Juan David Quintero

ii http://www.mrcmekong.org/download/programmes/hydropower/presentations/6.2%20-%20Summary%20of%20national%20hydropower%20consultations.pdf#search=%22mainstream%22 (Access 1 May 2011)

iii As measured from the nearest bank.

iv As measured from the nearest bank.