Environmental and Social Impact Assessment Report

2019-08-26

The former Water Transmission Pipeline at MT Coffee HPP in 2011

Millennium Challenge Account (MCA-L)
Liberia

ESIA for the Raw Water Transmission Pipeline Project, Liberia

DENYS

LIBERIA ENGINEERING & GEO-TECH CONSULTANTS

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LIST OF ACRONYMS AND ABBREVIATIONS

BoQ	Bill of Quantities
CBD	Convention on Biological Diversity
CBO	Community Base Organization
CO	Carbon Monoxide
CO_2	Carbon dioxide
CITES	Conventional of International Trade in Endangered Species
CNDRA	Center for National Documents and Record Agency
CNRE	Committee on Natural Resources and the Environment.
CDEC	County and District Environmental Committees
CDEO	County and District Environmental Officer
COD	Chemical Oxygen Demand
COPRC	Convention on Oil Pollution Preparedness, Response, and Cooperation
DLSC	Department of Land Surveys and Cartography
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
ESIA	Environmental & Social Impact Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPML	Environmental Protection and Management Law
ESIA	Environmental and Social Impact Assessment
ESO	Environmental Safety Officer
FGDs	Focus Group Discussion
FDA	Forestry Development Authority
GOL	Government Of Liberia
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HH	Household
ICCPR	International Convention on Civil and Political Rights
ICESCR	International Convention on Economic, Social and Cultural Rights

IFC	International Finance Corporation
ITTA	International Tropical Timber Agreement
IUCN	International Union for Conservation of Nature
KM	Kilometer
LC	Least Common
LD	Liberian Dollars
LEC	Liberia Electricity Corporation
LEG	Liberia Engineering & Geo- Tech Consultants
LLA	Liberia Land Authority
LWSC	Liberia Water & Sewage Corporation
LWQS-I	Liberian Water Quality Standard Class I
LWQS –II	Liberian Water Quality Standard Class II
LC	Least Concern
MCA-L	Millennium Challenge Account- Liberia
MCC	Millennium Challenge Corporation
MCHPP	Mt. Coffee Hydro Power Plant
MCHRP	Mt. Coffee Hydropower Rehabilitation Project
MGCSP	Ministry of Gender, Children and Social Protection
MOA	Ministry of Agriculture
MOJ	Ministry of Justice
MOSHSW	Ministry of Health and Social Welfare
MPW	Ministry of Public Works
NGO	Non-Governmental Organization
NOI	Notice of Intent
NIP	National Implementation Plan
NPHIL	National Public Health Institute of Liberia
NO_2	Nitrogen dioxide (NO_2)
ODS	Ozone Depletion Substance
PACs	Project Affected Communities
PAHs	Project Affected Household

PAPs	Project Affected Persons
PM	Particulate Matter
PPE	Personal Protection Equipment
POP	Persistent Organic Pollutants
PIU	Project Implementation Unit
PVC	Polyvinyl Chloride
RAP	Resettlement Action Plan
RoW	Right-of-Way
RWP	Raw Water Pipeline
RWTP	Raw Water Transmission Pipeline
SS	Suspended Solids
STDs	Sexually Transmitted Diseases
ToR	Term of Reference
USD	United State Dollars
VOC	Volatile Organic Compounds
UNFCCC	United Nations Framework Convention on Climate Change
WTP	Water Transmission Plant

EXECUTIVE SUMMARY

1. Introduction

The United States of America, acting through the Millennium Challenge Corporation ("MCC") and the Government of Liberia (the "Government" or "GOL") have entered into a Millennium Challenge Compact (the "Compact") to help facilitate poverty reduction through economic growth in Liberia. The Compact seeks to address two binding constraints to economic growth currently in Liberia: lack of access to reliable and affordable electricity; and inadequate road infrastructure.

The Compact aims at constructing a 1200mm diameter Raw Water Transmission Pipeline from Mount Coffee Hydropower Plant (MCHPP) to White Plains Water Treatment Plant (WTP) ("the Project). The proposed 1200mm pipeline route is approximately 5 km long and generally follows the original alignment of the 900 mm diameter pipeline with small deviations. The pipeline project, from MCHPP to the WTP, will be implemented in two segments:

1. **Segment 1 (MCHPP Dam to MCHPP property boundary)** is within the construction area of the Mt. Coffee Hydropower Rehabilitation Project.
2. **Segment 2 (MCHPP property boundary to White Plains WTP)** is outside the construction area of the MCHPP Rehabilitation Project.

The Proposed Project upon completion will primarily benefit the people in Monrovia who obtain water from the LWSC system. The new pipeline will provide benefits not limited to the improvement of water quality and the enhancement of water reliability to consumers of the LWSC municipal water system. Based on the project scope, DENYS NV (Belgium), the "Contractor" hired the services of the Liberia Engineering & Geo-Tech Consultants (LEG) (the "Environmental Consultant") to prepare the Environmental and Social Impact Assessment Report (ESIA) and the Resettlement Action Plan (RAP) for the proposed project.

2. Objective of the ESIA Study

The objective of the Environmental and Social Impact Assessment (ESIA) is to identify and assess all potential significant environmental and social impacts of the proposed project and recommend appropriate mitigation and enhancement measures. Additionally, the ESIA also evaluated the potential impacts of engineering and design activities during site preparation, construction and operational phases of the project and verified compliance of the project with stipulated national and international environmental standards and regulations.

3. Legal and Administrative Framework

The ESIA describes the applicable international standards and relevant Liberia regulatory framework that set the context within which the Project will operate. The Environmental Protection Agency (EPA) is the environmental regulatory authority in charge of issuing environmental guidelines and reviewing the ESIA process and is ultimately responsible for issuing the environmental permit.

4. Project Description

The project will be located in Harrisburg and White Plains Township, Lower Montserrado County it will consist of the following main components

1. Pipeline:
    a. Segment 1 will require the installation of approximately 0.7 km of 1200 mm pipeline within a maximum corridor of 36 m (will have to be narrowed in most of the area to the available space) which includes space for the temporary access road, construction equipment, trench widths.
    b. Segment 2 will require the installation of a 4 km pipeline within a maximum corridor of 36 m which includes space for the temporary access road, construction equipment, trench widths, and a spoils pile.
2. Access Road - Building of temporary construction roads for heavy equipment to travel and install the pipeline from Caldwell Road to the St. Paul Riverbank. Currently there are four access roads planed.

5. Public consultation and participation

Public and stakeholder consultations were held both during the scoping studies and full ESIA studies as shown in Chapter 4. Some of the topics raised were:

- The locals should be prioritized regarding job opportunities;
- Involve local leaders in integrating local and non-local workers;
- The project environmental management strategy should be effective to minimize the destruction of the drainage system in the area; and
- That project affected communities benefit from the water supply scheme.

6. Study Methodology

The methodology of the study covers field assessments, document review and discussion with Government officials and project team members such as the Engineer, Geologist, Hydrologist, and Surveyor. The project team provided the proposed project details. Discussions with the Government officials involved an explanation of the proposed project and soliciting their views on environmental and social aspects that need to be considered during the design and implementation of the project. The data collection was carried out through structured questionnaires, use of checklists, observations and photography, site visits, consultation with stakeholders and desktop environmental studies, where necessary.

This assessment examines the baseline environmental, socio-economic and cultural characteristics of the proposed project area. The essence was to describe the potential affected environment prior to the commencement of the project; and includes specific information necessary for identifying and assessing the environmental effect of the proposed project activities as well as information on the existing environmental conditions including sensitive areas that will be potentially impacted. Environmental baseline data collected during the assessment was in relation to ecological data, social data of the project area, soil quality, noise quality and water quality among other. The

importance of gathering these data is to understand the physical, biological and socioeconomic characteristics of the project's environment. Such information sets the ground for analysis of the potential impacts of the project's activities on the existing environment.

7. Potential Impacts and Mitigation Measure

The positive and negative impacts identified during the ESIA study for the construction and operation phase for the Raw Water Transmission Pipeline have been rated and ranked using an impact assessment methodology. The methodology provides a basis for prioritization of impacts to be addressed and also provide a method of assessing the effectiveness of proposed mitigation measures; and provide a scale which shows the level of impact. Most of the negative impacts are related to construction activities and in most cases restricted to the construction site and the close vicinity. The impacts can be mitigated in most of the cases by good engineering practice. Those impacts will be short term and are therefore related to severity small to medium.

The main structures in terms of environmental impacts will be the Pipeline and the corresponding fence. The main impacts will be on land use, fauna and flora and the communities. The project affected people will need to be compensated as detailed in the RAP. The habitat fragmentation caused by the fence is considered as medium since passages have been included into the design.

8. Environmental Management Plan

Best practice in construction environmental management will be achieved through implementation of a detailed Environmental and Social Management Plan (ESMP). DENYS-NV will be responsible for environmental management and related social components. The ESMP covers all necessary steps to mitigate negative impacts. These include measures during construction to: a) mitigate risks of erosion and sedimentation around watercourses; b) restrict water and soil contamination on work sites and waste disposal; c) restrict generation of dust during construction; and, d) minimize risk of accidents and ensure occupational safety of workers on construction sites.

Environmental and social monitoring during construction and operation will help to predict unforeseen environmental and social impacts and allows measures to prevent or avert adverse impacts to be developed or introduced in a timely manner. Maintenance of infrastructure during construction and operation is also important in contributing towards environmental conservation. During the construction and operation phases, monitoring will be undertaken to ensure that proposed mitigation measures for negative impacts and enhancement measures for positive impacts are implemented.

9. Closure and Decommissioning

When no longer required, the pipeline will be decommissioned. Decommissioning activities depend on the proposed subsequent use of the site, environmental sensitivities (such as those associated with natural grasslands) and other project specifics. Generally, there are three main options: suspension, abandonment in place, and removal. Leaving the decommissioned pipeline in place is the safest and least disruptive option; it means

no additional disturbance from excavation and removal and less risk of future soil and slope instability.

10. Conclusion and recommendation

The pipeline will provide benefits in the improvement of water quality and the enhancement of water reliability to consumers of the LWSC municipal water system.

Potential environmental impacts associated with implementation activities of the project are restricted to construction site and period, and can be mitigated through good engineering practice. The major negative social-economic impact of the project activity will be the probable displacement of people and loss of properties and crops within the corridor of the anticipated Raw Water Transmission pipeline transmission route. Due to the rather small footprint of the project the number of directly affected people is limited and the economic loss can be compensated.

The overall benefit of the project for Liberia outbalances the rather small negative impact by far. The project will even have a long-term benefit on the environment since the consumption of diesel for the generators for pumping the water to the White Plains Water Treatment Plant will not be required anymore.

1 INTRODUCTION

The United States of America, acting through the Millennium Challenge Corporation ("MCC") and the Government of Liberia (the "Government" or "GOL") have entered in October 2015 into a Millennium Challenge Compact (the "Compact") to help facilitate poverty reduction through economic growth in Liberia. The Compact seeks to address two binding constraints to economic growth currently in Liberia: lack of access to reliable and affordable electricity; and inadequate road infrastructure.

MCC, the Government of Norway, European Investment Bank and Government of Germany (through KfW Development Bank) jointly financed the rehabilitation of the Mt Coffee Hydropower Plant (MCHPP) which faced a dam break during the civil unrest in 1990. In the 1970s due to saltwater intrusion at the river intake, there was already a gravity pipeline installed leading from the reservoir (intake) of MCHPP to the Water Treatment Plant (WTP) at White Plains. After the dam broke and possibly due to the change in run off the riverbank was washed away, exposed the pipeline, which deteriorated over time.

The objective of the project is to replace the 900 mm diameter raw water pipeline leading from the dam at MCHPP to the WTP in White Plains with a 1200 mm diameter raw water transmission pipeline. In general, the new pipeline will follow the old alignment (±5 km) and will only have small deviations, where required. The project will be implemented in two segments:

3. **Segment 1 (MCHPP Dam to MCHPP property boundary)** is within the construction area of the Mt. Coffee Hydropower Rehabilitation Project.
4. **Segment 2 (MCHPP property boundary to White Plains WTP)** is outside the construction area of the MCHPP Rehabilitation Project.

The project is located in Harrisburg Township, Lower Montserrado County starting at White Plains following from there most of the 5 km the St Paul River on the left bank in north-eastern direction up to MCHPP, which is located in Raymonds Camp.

MCC procured the services of DENYS NV, Belgium, an international Consulting and Construction firm to undertake the planning, design and construction of the aforementioned Project. As part of the overall planning it is required to undertake the Environmental Social Impact Assessment (ESIA) and the preparation of the Environmental Impact Statement and Environmental and Social Management Plan (ESMP) as well as the Resettlement Action Plan (RAP) for the Raw Water Transmission Pipeline Project. Then DENYS NV (the contractor) will need to prepare the site and task specific Environmental and Social Management Plan (CESMP).

All projects and activities identified in Annex I of the Environment Protection and Management Law of Liberia (EPML)[1] are required to conduct an environmental impact assessment. The proposed rehabilitation of the Raw Water Transmission Pipeline Project falls under the "Water Supply" category, Annex I, Number 19, and as such it is required to submit an Environmental and Social Impact Assessment Report. The ESIA has been developed in accordance with Section 13 of the EPML, dated November 26, 2002 and the Environmental Impact Assessment Procedural Guidelines, dated 2006.

[1] An act adopting the Environmental Protection and management of the Republic of Liberia – November 26, 2002.

Correspondingly, the MCC Environmental Guidelines, an adoption of the IFC sustainability framework, requires an Environmental and Social Impact Assessment to be undertaken at the initial stage of a project or development to be integrated closely with the economic, financial, institutional, social, and technical analyses of the proposed project[2].

1.1 Project Rationale

Since 1990 the WTP has obtained water from the St. Paul River, which required pumping and therefore (fossil fuel) energy. Furthermore, due to the tides and low water flow saltwater intrusion occurs regularly in the dry season, and during storm or flood events the turbidity rises in the river water, both resulting in poor water quality. The replacement of the river intake pumps with gravity flow through the new pipeline will reduce energy use at the White Plains WTP.

The Project will primarily benefit the people in Monrovia who obtain water from the LWSC system. The reliability and quality of water will improve, since due to the gravity flow the consumption of energy will be reduced. Additionally, the water will be taken from the intake of the Mt Coffee HPP, which is located about 20 m above sea level (asl).

Saltwater intrusion will not be possible anymore and since the water is passing through a reservoir the sediments usually settle due to the slower flow velocity, which will reduce the turbidity leading to a better efficiency of the WTP. Due to the higher reliability it is to be expected that a greater percentage of the city and county population will obtain their water from the public water system, which will lead to a reduction in bottled water use and therefore as well to a reduction of plastic waste.

1.2 The Assignment

The agreement with the Millennium Challenge Account – Liberia (MCA-L) and DENYS NV (the "Contractor"), Belgium came to effect on February 12th, 2019.

The Contractor's scope of work, DENYS NV (Belgium) is to perform all engineering design and construction services to provide a complete, accessible, functional and usable project. This means that the assignment will consist of two distinct Phases. (a)The Planning Phase, which encompasses the detailed design, ESIA, ESMP, RAP and all the required permits. (b) Implementing Phase, consisting of the preparation of the site-specific Contractor's ESMP, implementation of the RAP and RAP related activities, e.g. public participation, financial management training or other trainings if required, the construction itself and the environmental management and monitoring of the implementation, finally the commissioning and testing of the Raw Water Transmission Pipeline.

It is against this backdrop that DENYS NV (Belgium), hired the services of the Liberia Engineering & Geo-Tech Consultants (LEG) to prepare the ESIA, ESMP and RAP as well as any other environmental and social documents, if required, for the proposed project. The contract was signed March 1st 2019, and March 27th 2019 the application letter was send to EPA to introduce LEG as sub-contractor. April 29th the Project Brief Report was submitted to EPA and May 3rd DENYS received the letter with the request that a full ESIA and RAP is required for the Project.

In Annex 1 a list of the team members is presented.

[2] www.mcc.gov/resources/doc/environmental-guidelines

1.3 Scope and Objective of the ESIA

An Environmental and Social Impact Assessment (ESIA) basically consists of three main steps:

1) description of the prevailing situation,
2) identification of impacts, and
3) the formulation of mitigation measures for the proposed project implementation activities.

The negative and positive impacts of the project activities should be assessed in the form of benefits and losses to the environment and the communities. The required mitigation measures should be developed before the decision is made on the way forward. The decision to approve the project for implementation lies with the EPA-L.

The Environmental and Social Impact Assessment (ESIA) study was carried out to deliver on the following objectives:

- To describe the prevailing situation, generation of the required baseline data for the environment (physical, biological and human). This serves as basis for the impact evaluation, the definition and effectiveness of proposed mitigation measures and the corresponding monitoring during project cycle;
- To identify and assess all potential significant environmental and social impacts of the proposed project and recommend appropriate mitigation and enhancement measures.
- To evaluate potential impacts of engineering and design activities during site preparation, construction and operational phases of the project;
- Verification of compliance of the project with stipulated national and international environmental standards and regulations;
- Foster public involvement and participation throughout the major project phases;
- Recommendation of environmentally sound measures to be implemented in the entire course of the proposed project, and
- To prepare an ESIA report compliant with the relevant national environmental legislation and the International Finance Corporation (IFC) environmental policies and the standard international treaties and conventions on environment and biodiversity.

The ESIA was conducted in adherence with the MCC Environmental Guidelines and the IFC Environmental and Social (E&S) Performance Standards. The EISA was also conducted in accordance with applicable Liberian regulatory requirements. The assessment includes the project description (design, material, activities during construction and operation), methodology to be used, baseline information, assessment of potential environmental, economic and social impacts and the corresponding mitigation measures. Furthermore, it contains a gender assessment as well as occupational and community health and safety (H&S) concerns.

1.4 Main Stakeholders for the ESIA report

This Environmental and Social Impact Assessment Report has been prepared for use by different stakeholders to be involved in the project, both at national and international levels. The report contains useful information on policies and procedures to be adhered to, implementation of modalities, analysis of potential environmental and social impacts and suggested mitigation measures at various stages of the project activities. The information will be useful in planning, implementation, management and maintenance of the Raw Water Pipeline.

In this regard, the report will be useful to the following stakeholders:

- Liberia Water and Sewer Corporation (LWSC);
- Ministry of Public Works (MPW)/Infrastructure Implementation Unit (IIU);
- Environmental Protection Agency of Liberia (EPAL);
- Liberian Electricity Corporation (LEC)
- Millennium Challenge Account – Liberia (MCA – L);
- Millennium Challenge Corporation (MCC);
- The Project Affected Persons (PAPS) living within the project area; and
- Beneficiaries of the project both at local and county levels.

Furthermore, the ESIA Report will be useful during the implementation of the project for DENYS – NV as well as any Sub-contractors engaged in the construction works for the project, since guidance is given on aspects which will need to be covered by the Contractors Environmental and Social Management Plan (CESMP).

1.5 Categorization of Proposed Project

The Project was categorized according to the MCC Environmental and Social Guidelines. Based on the environmental and social impacts and the extent of the Project area, the Project is classified as MCC Category B. The impacts are site-specific; few are irreversible and mitigation measures can be clearly and easily designed. The scope of ESIA for a Category B project is intended to be concise and focused on specific environmental and social impact analyses, including the development of Environmental and Social Management Plans (ESMPs) as appropriate.

The Liberian EPA EIA Procedural Guidelines of 2006 do not include provisions about screening criteria to determine the categorization related to different levels of analysis necessary for the evaluation of the proposed project.

2 LEGAL AND ADMINISTRATIVE FRAMEWORK

This chapter describes the applicable international standards and relevant Liberia regulatory framework that set the context within which the Project will operate. The Environmental Protection Agency (EPA) is the environmental regulatory authority in charge of issuing environmental guidelines and reviewing the Environmental Impact Assessment process.

2.1 Liberian Government Organization

2.1.1 National Government

Liberia's government comprises popularly-elected executive and legislative branches, the latter being a bicameral National Assembly consisting of the Senate (30 seats with members elected by popular vote to serve nine-year terms) and the House of Representatives (64 seats; members elected by popular vote to serve six-year terms). The country operates a dual system of statutory law based on Anglo-American common law for the modern sector and customary law based on unwritten tribal practices for the indigenous sector.

2.1.2 Local Government

Liberia comprises 15 administrative political subdivisions called counties, each headed by a Superintendent and further divided into Districts, each under a District Commissioner. Each District is sub-divided into Chiefdoms headed by a Paramount Chief, and each Chiefdom is divided into clans headed by Clan Chiefs and towns headed by Town Chiefs. The clan areas were originally related to tribal sub-groupings and whilst this still largely applies, increasing urbanization and civil war has disrupted this pattern and Clans are now defined as administrative units.

2.2 Environmental Institutional Framework

2.2.1 National Level

2.2.1.1 Environmental Protection Agency (EPA)

The Environmental Protection Agency (EPA) is an autonomous statutory body, established under the Act creating the Environmental Protection Agency of the Republic of Liberia 2003 (GOL, 2003a), and hereafter referred to as the EPA Act, to address the country's environmental problems. The EPA became a fully functioning entity in 2006, with the appointment of a board of directors and establishment of a Policy Council.

The EPA was established to "coordinate, monitor, supervise and consult with relevant stakeholders on all activities in the protection of the environment and sustainable use of natural resources" and as the lead national environmental agency is charged with executive authority for all environmental activities and programs relating to environmental management in Liberia. The EPA also has a key responsibility for matters relating to the issuing of an environmental impact assessment license and for compliance monitoring relating to environmental regulations and standards.

2.2.1.2 Ministry of Mines and Energy (MME)

The Ministry of Mines and Energy has the statutory responsibility for the development of mineral, water and energy resources in Liberia. It was established by an act of Legislature as part of the executive branch of government. The fundamental legal instrument used to administer the mineral sector is the New Minerals and Mining Law of Liberia which was approved and became effective in April of 2000. MME is in charge of land surveys in all parts of the country and coordinates, administers and regulates the use of public and private lands in Liberia, including mineral resources through granting of operation licenses, and regulates beach sand mining. It works along with the Ministry of Agriculture and the University of Liberia to conduct training and research on land rehabilitation. Energy provision is administered through the same Ministry by the National Energy Committee, while water resources are the responsibility of the National Hydrological Service.

2.2.1.3 Liberian Land Authority (LLA)

The LLA was recently created via the passing of the LLA Act by the Legislature in October 2016. One of the primary functions of the LLA is to assist in the resolution of land tenure disputes. According to the documents guiding the LLA Project:

- The LLA has the legal mandate for land administration in Liberia.
- The LLA will subsume the Department of Lands, Surveys and Cartography (DLSC) under the Ministry of Mines and Energy, the Deeds Registry currently within the Center for National Documents and Records Agency (CNDRA), and relevant functions from the Ministry of Internal Affairs (e.g. County Land Commissioners).
- The LLA's main activities will focus on:
  a. land policy and planning,
  b. provision of land survey, registration and mapping services,
  c. provision of land valuation services,
  d. creation of a national Land Information System,
  e. alternative land dispute resolution services,
  f. coordination of access to government and public land for investment and conservation projects,
  g. promotion of land use planning and zoning by local governments, and
  h. demarcation and titling of the customary land rights of local communities.

2.2.1.4 Ministry of Agriculture (MoA)

The MoA was established by an Act of the Liberia Legislature on May 11, 1972. The 1972 Act repealed the 1964 law created by the then Department of Agriculture (DOA) and assigned specific responsibilities to develop the Liberian agricultural sector. The MoA regulates forestry activities related to plant quarantine, agro-forestry and food crop related plantations, fishery and agriculture sectors, and has specific responsibilities for soil conservation. Some water resource matters used to be managed by the National Water Resources and Sanitation Board prior to the civil war, and proposals have recently been

made for its re-establishment. It plans, executes, administers, manages and supervises agriculture programs and provides extension services, trains local farmers in improved cultural practices, and supplies farm inputs to enhance food security.

2.2.1.5 Liberia Water and Sewer Corporation (LWSC)

According to the LWSC website, their corporate objective is "The provision, distribution, and supply of water in Liberia for public, domestic and industrial purposes." As the Project Implementing Entity, the LWSC has overall responsibilities to be closely involved in the strategic direction and guidance of the Project, and ownership of the assets and the established Project RoW will be transferred to LWSC upon the successful commissioning of the system. The LWSC was created by an Act to amend the Public Utilities Law in 1973. The Corporation is empowered to construct, install, establish, operate, manage and supply to all parts of Liberia, safe drinking water and perform all sewerage services, as well as to maintain such water and sewerage facilities. LWSC also reportedly maintains a working group comprised of representatives from all the Liberian ministries with responsibilities that intersect with their water and sewer work. This working group can likely be leveraged to help identify, facilitate resolutions and overcome Project risks. The LWSC should certainly be represented on the Resettlement Working Group (RWG) and may be considered as a co-chair given their position as Project Implementing Entity.

2.2.1.6 Liberia Electricity Corporation (LEC)

The Liberia Electricity Corporation (LEC) was created in 1973 by the Government of Liberia through an act of legislature with a mandate to generate, transmit, distribute, and sell electricity throughout the country at economically reasonable rates. In July 2006, electricity was restored to parts of Monrovia for the first time in fifteen years. In furtherance, responsibility for implementation of the MCHPP was assigned to LEC by the GoL. The Project was implemented by a Project Implementation Unit (PIU) within LEC, which acts on behalf of the Board of Directors of LEC. The PIU served as the MCHPP project proponent up to October 31, 2018. The starting point of the proposed pipeline is planned to be just outside the gates of the existing facility. Given the PIU's close involvement and oversight of the RAPs for both the MCHP and the Bushrod Transmission Line, the PIU staff has a wealth and diversity of research, information and lessons learned that will be invaluable for the White Plains Pipeline Extension Project.

2.2.1.7 National Public Health Institute of Liberia (NPHIL)

The National Public Health Institute of Liberia (NPHIL) was established in December 2016 by legislative act. NPHIL's mission is to prevent and control public health threats by promoting healthy outcomes while serving as a source of knowledge and expertise. As the center of excellence for better health outcomes for Liberians through a strong health system, this institute aims to strengthen existing infection prevention and control efforts, laboratories, surveillance, infectious disease control, public health capacity building, response to outbreaks, and monitor diseases with epidemic potential.

2.2.1.8 Ministry of Public Works (MPW)

The Department of Public Works (MPW) was created by an act of national legislation in 1928 and was in 1972 changed to the Ministry of Public Works. MPW is responsible for all government constructed infrastructure, i.e. roads, bridges, dams, buildings, etc. It

ensures the quality and standards of the infrastructures and ensures that construction guidelines and laws are followed. The MPW also has the mandate to establish the categorization and gazetting of infrastructure and the corresponding RoWs. Furthermore, the ministry has the statutory responsibility to approve the design and construction of all civil works, including motor road. Additionally, it is also responsible to carry out urban and town planning, as well as provide architectural and engineering supervision of infrastructure required for waste management.

2.2.1.9 The Ministry of Gender, Children, and Social Protection (MGCSP)

The Ministry of Gender, Children, and Social Protection (MGCSP) was in 2001 established by an Act of the National Legislature and is mandated to "coordinate and ensure gender equality and equity, promote the survival, social protection and development of children, vulnerable and excluded and persons with disability and integrate fulfilment of their rights, empowerment and full participation into national development."

The ministry works to promote gender mainstreaming throughout local and national government institutions and promotes programming to address social and economic inequalities and vulnerabilities in Liberia.

2.2.1.10 Forestry Development Authority

The Forestry Development Authority (FDA), established in 1976, was historically the government agency with primary responsibility for environmental management in Liberia. Now an autonomous body, and mandated by the National Forestry Reform Law of 2006, the FDA has responsibility for the protection, management and conservation of government-owned forests and wildlife on a sustainable basis. It manages commercial, conservation and community uses of Liberia's forests. It provides long- and middle-range planning in the forestry sector as well as preparing forestry policy, law and administration. It exercises control of the commercial use of state-owned forests through the granting of concessions, supervises adherence to forest legislation and concession agreements, calculates and determines forestry fees, evaluates investment proposals, executes reforestation and forest research and training and monitors activities of timber companies. The 2006 law revised the institutional framework of the FDA and created a Department of Conservation which is made up of the Division of National Parks and the Division of Wildlife with the responsibility for development and management of protected areas and wildlife respectively.

2.2.2 Local Level

2.2.2.1 County and District Environmental Committees

To decentralize environmental management, the Environmental Protection Agency Act authorizes the establishment of County and District Environmental Committees and directs the National Environmental Policy Council to provide guidelines for their establishment. Each County Committee is composed of county and district officials, traditional leaders, private citizens, and two local representatives to the national legislature. The Committee is staffed by a County Environment Officer, hired by the EPA, but responsible to the County Committee. The District Environment Committees are to be established by and report to the relevant County Environment Committee. They are

charged with promoting environmental awareness and mobilizing the public to manage and monitor activities within the district to ensure that they do not have any significant impact on the environment. The District Committees are composed of district officials, mayors, chiefs, and private citizens and are staffed by a District Environment Officer hired by the EPA.

In addition to assisting the County and District Committees in the fulfilment of their responsibilities, the County and District Environment Officers are responsible for compiling reports to the EPA, promoting environmental awareness, and conducting public hearings on environmental impact assessment in the County and the District.

2.2.2.2 Environmental Inspectors and Courts

To provide for enforcement of environmental requirements and standards, the Environmental Protection Agency Act provides for the appointment of Environmental Inspectors and the establishment of an Environmental Court system.

Environmental Inspectors

The Act authorizes the EPA to "designate its officers and duly qualified public officers/civil servants … to be environmental inspectors within such Counties and District limits." Thus, Environmental Inspectors do not have to be EPA employees, but can also be designated officers or civil servants in other branches of the government. Environmental Inspectors are authorized to enter premises, inspect activities, take samples, and review records to ensure compliance with environmental rules and regulations. The exact nature of the inspector's enforcement authority is not defined in the Act, but the Act does state that the EPA is to "…establish the conditions, rules and regulations governing the qualifications, performance, powers and duties of the Environmental Inspectors." The EPML confirms that Environmental Inspectors can write Restoration Orders to correct an activity deemed to be noncompliant with environmental rules and regulations.

Environmental Courts

The Environmental Protection Agency Act defines a two-tiered court system to hear and rule on compliance with environmental rules and regulations.

The first tier is the Environmental Administrative Court. This court is to hear and rule on complaints relating to the environment. The complaints may concern the actions or decisions of the EPA or an Environmental Inspector, or may be brought by a member of the public to stop activities they believe are damaging the environment. The second tier is an Environmental Appeals Court, established at the Judicial Circuit level.

At present, the Environmental Court system has not been formally established. EPA's five year strategic plan (starting July 2011) provides for an administrative court to handle environmental issues for an intermediate period before the full establishment of an environmental court under the judicial system.

2.3 Relevant National Legislative Framework

Table 2-1 describes the main categories of legislation in Liberia and Table 2-2 provide a summary of relevant Liberian environmental and health legislation and Table 2-3 of the relevant Liberian legislation related to resettlement and expropriation. The following chapters provide a summary of the main applicable environmental laws and regulations.

Table 2-1: Categories of Legislations in Liberia

Law	Laws are passed by the National Legislature of Liberia comprising of the Senate and the House of Representatives. Any citizen or group of citizens, Cabinet Ministers, Managing Directors of public corporations or agencies can propose a bill to the National Legislature for enactment. The draft bill is first passed over to the appropriate Steering Committee of the Legislature. In case of environmental bill, this committee is generally the Committee on Natural Resources and the Environment. The Committee reviews, assesses and presents the bill to the Legislative Plenary with appropriate amendments for debate, public hearing and subsequent enactment by the Legislature.
Executive Order	The Executive Branch of government headed by the President can issue Executive Order without the approval of the National Legislature. The Executive orders have the power of a law provided that they do not contravene the existing law. The power of such orders has a limited time of existence.
Regulations	The national Legislature has empowered Cabinet Ministers and Managing Directors of public corporations and agencies to issue regulations for their respective functionaries without legislative approval or supervision, provided that such regulations are consistent with the statutory laws and the constitution of Liberia.

Table 2-2: Relevant Environmental Laws

Title	*Year*	*Description*
National Health Policy and National Health Plan	2007	The document is a framework for health sector reforms in Liberia. The goal of the policy is to make health care delivery services throughout the country effective and efficient, thereby enhancing the quality of life of the population.
National Integrated Water Resources Management Policy	2007	It covers two broad areas: (1) water resources management; (2) water resources use
National forestry policy and implementation strategy	2006	It describes the main directions for forestry development in Liberia over the coming years and updates earlier policies to consider the national forestry law of 2006.
National New Forestry Reform Law	2006	The administration of this Act provides for the Forestry Development Authority to exercise the power under the Law to assure sustainable management of the Republic's forestland, conservation of the forest resources, protection of the environment, sustainable economic development with the participation of and for the benefit of all Liberians and to contribute to poverty alleviation in the country.
Protected Forest Area Network Law	2003	It expanded the existing area of Sapo National Park (via Sapo National Park Act), established the East Nimba Nature Reserve (Nimba Nature Reserve Act), and identified nine other sites to be considered for protected area status, including a range of options offering varying degrees of restriction on permitted activities.
The National Environmental Policy Act	2002	It defines policies, goals, objectives, and principles of sustainable development and improvement of the physical environment, quality of life of the people and ensures coordination between economic development and growth with sustainable management of natural resources.

The Environment Protection and Management Law	2002	The Act enables the Environment Protection Agency to protect the environment through the implementation of the Law. It arranges the rules, regulations, and procedures for the conduct of EIA. It establishes regulations for environmental quality standards, pollution control and licensing, among others.
The Environmental Protection Agency (EPA) Act	2002	The Act provides the Agency with the authority of government for the protection and management of the environment in Liberia. It provides for an Environmental Administrative Court to hear from aggrieved parties. It requires that an Environmental Impact Assessment (EIA) be carried out for all activities and projects likely to have an adverse impact on the environment.
The New Minerals and Mining Law	2000	The Law and its resulting policy call for restoration of land to its previous state as much as possible after mining activities. All medium to large-scale mining activities are to submit Environmental Impact statements. Environmental audits and periodic assessments will be undertaken to ensure compliance.
Wildlife and National Parks Act	1988	The Act identifies a number of protected areas; specifies policies and objectives regarding wildlife and conservation in the country.
The Natural Resources Law of Liberia	1979	This Law includes chapters on forests, fish, and wildlife, soil, water, and minerals.
Public Health Act	1976	It contains provision for the protection of drinking water resources and the inspection of potential sources of pollution.
The Act that created the Forestry Development Authority (FDA)	1976	The Act established and defined the responsibilities of the FDA, outlined forest offences and penalties; made provision for an Advisory Conservation Committee and specified powers of forest officers with regard to trees in reserve areas.
Supplementary Act for the Conservation of Forests	1957	This Supplementary Law also provided the framework for the use of forest and wildlife resources and allowed for the creation of government reserves, native authority reserves, commercial forests, national parks and wildlife refuges.
Conservation of the Forests of the Republic of Liberia	1953	This Law provided the framework for the use of forest and wildlife resources and allowed for the creation of government reserves, native authority reserves, commercial forests, national parks and wildlife refuges.

Liberia does not have an official Resettlement Policy. However, the following Liberian Legislation spells out how land can be acquired as well as the rights of individuals to own property and be compensated for their losses.

Table 2-3: Relevant legislation related to resettlements and land expropriation

Title	*Year*	*Description*
Land Right Act	2018	The Land Right Act reflects the four categories of land ownership: Public Land, Government Land, Customary Land and Private Land and ensures that customary land is given protection equal to private land for all Liberians. The Land Rights Act prescribes the means by which land may be acquired, used, transferred and otherwise managed.
Land Right Policy	2013	Provides recommendations for land rights, based on four categories: Public Land, Government Land, Customary Land and Private Land. The Policy recommends the full legal recognition of customary land rights by protecting customary and private land equally. The Land Rights Policy aims

		at promoting the judicious use of the nation's land and all its natural resources by all sections of the Liberian society in support of various socio-economic activities undertaken in accordance with sustainable resource management principles and in maintaining viable ecosystems.
Revised Rules and Regulations Governing the Hinterland of Liberia	2001	These rules are a successor to the earlier Law and Regulations on the hinterland. Articles 66 and 67 of the rules grant tribal people in the rural area the right to utilize land in their locale, and that any stranger wishing to utilize such land as against their usage, such stranger shall compensate for the use of the land.
The Constitution of Liberia	1986	Article 22 (a) and (b) of the Constitution vests in all individuals the right to own property either on individual basis or in conjunction with other individuals, as long as they are Liberian citizens. This right however does not extend to mineral resources on, or beneath the land. Article 24 indicates that the state guarantees the inviolability of property rights but then provides for the expropriation of property for public purposes. It requires prompt payment of just compensation where this occurs. However, there is lack of procedural provisions.
County Act	1969	This Act officially distributed and demarcated land boundaries in Liberia. Prior to the Act, counties were created through political means.
Land Acquisition Act	1929	The Act lays down the procedure for obtaining rights to any piece of land in Liberia through purchase. The Act distinguishes land in Liberia into two categories, namely: the Hinterland and the County areas.
Land Act	1856	Prior to independence, land acquisition and distribution was done on the basis of relationship and class system. Opposition to this system of land tenure led to the establishment of a set of rules known as the 'digest of law to govern the affairs of the settlers in terms of land distribution'. This later culminated into the Land Distribution Act of 1856 which removed the restriction to land distribution based on citizenship. This Act was repealed by the 1950 Land Act which restricted land ownership to citizens and naturalized citizens especially those of Negro descents.

2.3.1 Constitution of the Republic of Liberia

Article 7 of the 1986 Constitution of the Republic of Liberia sets the fundamental basis for the constitutional, legislative, and institutional frameworks for the protection and management of the environment. It also encourages public participation in the protection and management of the environment and the natural resources in Liberia.

2.3.2 The Environmental Protection Agency Act

"An Act to establish a monitoring, coordinating and supervisory authority for the sustainable management of the environment in partnership with regulated Ministries and organizations and in a close and responsive relationship with the people of Liberia; and to provide high quality information and advice on the state of the environment and for matters connected therewith"[3].

Thus, the Environment Protection Agency of Liberia (EPA) was created by the Act creating the Environment Protection Agency of the Republic of Liberia, known as the Environment Protection Agency Act. The Act was approved on November 26, 2002 and

[3] Ministry of Foreign Affairs. Monrovia, Liberia. April 30, 2003. Act Creating the Environment Protection agency of the Republic of Liberia. Section 1

published on April 30, 2003. The establishment of the EPA marked a significant step forward in the protection and management of the environment of Liberia.

Section 5 of the Act designates the EPA as the principal Liberian authority for environmental management which shall co-ordinate, monitor, supervise, and consult with relevant stakeholders on all the activities for environmental protection and the sustainable use of natural resources. Section 6 (b) of the Act stipulates that the EPA should propose environmental policies and strategies to the Policy Council and ensure the integration of environmental concerns in the overall national planning. Moreover, the EPA is empowered to carry out, among other things, the following aspects of environmental protection and management in Liberia:

- Establish environmental criteria, guidelines, specifications, and standards for production processes and the sustainable use of natural resources for the health and welfare of the present generation, and in order to prevent environmental degradation for the welfare of the future generations;
- Identify projects, activities, and programs for which environmental impact assessment must be conducted under this Law;
- Review and approve environmental impact statements and environmental impact assessment submitted in accordance with this Act;
- Monitor and assess projects, programs, and policies including activities being carried out by relevant ministries and bodies to ensure that the environment is not degraded by such activities and that environmental management objectives are adhered to and adequate early warning and monitoring on impending environmental emergencies is given;
- Review sectoral environmental laws and regulations and recommend for amendments and to initiate proposals for the enactment of environmental legislations in accordance with this Act or any other Act;
- Encourage the use of appropriate environmentally sound technologies and renewable sources of energy and natural resources; and
- Function as the national clearinghouse for all activities relating to regional and international environment-related conventions, treaties and agreements, and as national liaison with the secretariat for all such regional and international instruments.

2.3.3 National Environmental Policy of Liberia

The national environmental policy of Liberia provides the following:

- The systematic and logical framework by which to address environmental issues. Section 4.7 of the policy calls for an EIA on all major developmental, socio economic and land use activities in any form which may have adverse effect/impact on the environment to one degree or another;
- Benchmarks for addressing environmental problems in the medium and long term;
- Context for financial donor support to particular sector and non-sector projects; and
- Demonstration of Liberia's commitment to sustainable management of the environment and natural resources

2.3.4 The Act Creating the Environmental Protection Agency Provides:

"An Act to establish a monitoring, coordinating and supervisory authority for the sustainable management of the environment in partnership with regulated Ministries and organizations and in a close and responsive relationship with the people of Liberia; and to provide high quality information and advice on the state of the environment and for matters connected therewith"[4]. Thus, the Environment Protection Agency of Liberia (EPA) was created by the Act creating the Environment Protection Agency of the Republic of Liberia, known as the Environment Protection Agency Act. The Act was approved on November 26, 2002 and published on April 30, 2003. The establishment of the EPA marked a significant step forward in the protection and management of the environment of Liberia. Section 5 of the Act designates the EPA as the principal Liberian authority for environmental management which shall co-ordinate, monitor, supervise, and consult with relevant stakeholders on all the activities for environmental protection and the sustainable use of natural resources. Section 6 (b) of the Act stipulates that the EPA should propose environmental policies and strategies to the Policy Council and ensure the integration of environmental concerns in the overall national planning. Moreover, the EPA is empowered to carry out, among other things, the following aspects of environmental protection and management in Liberia:

- Establish environmental criteria, guidelines, specifications, and standards for production processes and the sustainable use of natural resources for the health and welfare of the present generation, and in order to prevent environmental degradation for the welfare of the future generations;
- Identify projects, activities, and programs for which environmental impact assessment must be conducted under this Law;
- Review and approve environmental impact statements and environmental impact assessment submitted in accordance with this Act;
- Monitor and assess projects, programs, and policies including activities being carried out by relevant ministries and bodies to ensure that the environment is not degraded by such activities and that environmental management objectives are adhered to and adequate early warning and monitoring on impending environmental emergencies is given;
- Review sectoral environmental laws and regulations and recommend for amendments and to initiate proposals for the enactment of environmental legislations in accordance with this Act or any other Act;
- Encourage the use of appropriate environmentally sound technologies and renewable sources of energy and natural resources;
- Function as the national clearinghouse for all activities relating to regional and international environment-related conventions, treaties and agreements, and as national liaison with the secretariat for all such regional and international instruments.

[4] Ministry of Foreign Affairs. Monrovia, Liberia. April 30, 2003. Act Creating the Environment Protection agency of the Republic of Liberia. Section 1

2.3.5 Act Adopting the Environment Protection and Management Law of Liberia

"An Act to establish a legal framework for the sustainable development, management and protection of the environment by the Environment Protection Agency in partnership with regulated Ministries and organizations and in a close and responsive relationship with the people of Liberia; and to provide high quality information and advice on the state of the environment and for matters connected therewith"[5]. Section 15 of the EMPL states that business investors should present an environmental mitigation plan to the EPA, which should include the following sections:

- Objectives;
- Description of activities to be carried out by the project to mitigate any adverse effects on the environment;
- Period within which the mitigation measures shall be implemented; and
- Proven efficacy of the mitigation measures of indicating their experimental nature.

Section 12 of the EPML requires environmental review for projects or activities that may have significant impact on the environment. The project proponent shall submit to the EPA their plans for improving environmental performance including:

- Identification of the major environmental effects; and
- A comprehensive mitigation plan in accordance with Section 15 of this Law.

Section 6 of EPML requires an Environmental Impact Assessment license or permit for the commencement of such projects, and Section 13 requires the preparation of an environmental impact study for such a project.

Section 24 of the EPML requires that the EPA should ensure that projects comply with their environmental mitigation plan through monitoring of its operations. Where evidence of non-compliance occurs, the EPA shall impose remedial measures and may bring action before the Environmental Court or through the Ministry of Justice to enforce compliance.

Section 25 of the EPML gives responsibility to the EPA carrying out periodic environmental audit of activities or projects that are likely to have adverse effects on the environment

Section 58 of the EPML requires that a license must be obtained from the EPA for any type of effluent discharge into the sewage system, also in case of operation of a sewage system. This license is provided by the EPA for a period that does not exceed 1 year.

Section 61 of the EPML prohibits pollution of all Liberian Waters. In case of water pollution, a sentence and/or a fine is/are imposed on the polluting party. The latter is also responsible for the cost of the removal of the pollutant and the restoration, restitution or compensation as determined by a law court.

Section 62 of the EPML bans pollution by solid waste of any land, coastal zone or water surface, street, road or site in or on any place to which the public has access, except in a container or at a place which has been specially indicated, provided or set apart for such purpose. In case of such pollution, a fine or a prison term is imposed on the polluting party. The latter is also responsible for the clean-up of the solid waste pollution it caused.

[5] Ministry of Foreign affairs. Monrovia, Liberia. April 30, 2003. Act adopting the Environment Protection and Management Law of the Republic of Liberia. Section 1.

Section 64 of the EPML requires the acquirement of a "Solid and Hazardous Waste Disposal License" in case of generation, storage, handling, transport or disposal of hazardous waste, or else ownership or operation of a waste disposal site. The EPA provides this license for a period of not more than one year. This license entails the party who is generating the waste to take up waste management measures such as treatment, determination or recycling and re-mediation.

Section 71 of the EPML requires the acquirement of a "Pollution Emission License" for any project or activity which is likely to pollute the environment in excess of any standards or guidelines issued under the EPML. This license is provided by the EPA for a period of not more than one year.

Section 75 of the EPML prohibits the below activities in relation with a river, lake or wetland that are declared as protected areas by the EPA. These activities include:

- Use, erect, construct, place, alter, extend, remove or demolish any structure in, on, under, or over the bed;
- Excavate, drill, tunnel or disturb the bed otherwise;
- Introduce or plant any part of a plant, plant specimen or organism whether alien or indigenous, dead or alive in a river, lake or wetland;
- Introduce any animal or micro-organism whether alien or indigenous, dead or alive in a river, lake or wetland;
- Deposit any substance in a river, lake, or wetland or in or under its bed, which is likely to have adverse environmental effects on the river, lake or wetland;
- Direct or block a river, lake or wetland from its natural and normal course; and
- Drain any river, lake or wetland.

Section 91 of the EPML, states that the EPA may impose on the party that has caused or is likely to cause harm to the environment an "Environmental Restoration Order" requiring it to remedy/prevent the harm within 21 days of the service of the order.

Section 92 allows the party to request the Agency to reconsider that order by giving reasons in writing within the same period.

Section 107 states that noncompliance with the restoration order convicts the responsible party to imprisonment and/or a fine.

2.3.6 National Forestry Reform Law of Liberia

The National Forestry Reform Law provides for the conservation and sustainable management of all forest areas in Liberia to ensure continued production of a complete range of goods and services for the benefit of all Liberians and ongoing contribution to poverty alleviation in the nation, while maintaining environmental stability and fulfilling Liberia's commitments under international agreements and conventions.

In order to achieve this aim, the following specific objectives will be pursued:

- To ensure that commercial forestry, community forestry and forest conservation activities are integrated and balanced to optimize the economic, social and environmental benefits from the forest resource;
- To conserve a representative sample of forest ecosystems so that important environmental functions are maintained;

- To contribute to the national development goals of poverty alleviation and increased food security by increasing the opportunities for forest-based income generating activities;
- To grant more equitable access to forest resources so that the potential for future conflict is reduced and the benefits from forestry development are shared throughout Liberian society;
- To ensure that all stakeholders participate in the formulation of forestry policies and in the conservation and management of the forest resource;
- To maximize the contribution of the sector to income, employment and trade through the development of appropriate processing activities; and
- To ensure that forestry development contributes to national development goals and international commitments (including regional cooperation and trans-boundary issues) and is coordinated with other relevant branches of government.

2.3.7 Land Rights and Land Tenure Policy

Lands; property policies and rights in Liberia are unclear, outdated and often contrary to customary laws widely followed by rural Liberians. Customarily, forests are an integral part of community property and this is surprisingly well defined in discrete land areas held by each village (town) or by clusters of towns referred to as clans or chiefdoms. However, the status of forest ownership under national law is unclear and is contradictory with customary law, and people and the state are at odds as to who owns the forests and how the use of forests should be regulated. There are not yet any established mechanisms for linking these two structures in one legal system that protects the rights of all property holders. This limits investment in rural areas held under customary systems and, more critically, makes local communities potential targets for land or resource grabbing.

2.3.8 National Environmental and Occupational Health Policy

The Ministry of Health and Social Welfare has a Division of Environmental and Occupation Health; however, the Division lacks standards and policies specific to industries and/or occupational hazards. The National Environmental and Occupational Health Policy (NEOHP) was developed in 2007 to provide a framework for identifying policy needs and actions to improve occupational health and safety. It supplements the National Health Policy, which focuses on public health and health systems. The NEOHP identified the following key Environmental and occupational health needs:

- Environmental sanitation
- Food Safety Services
- Water Quality and Safety
- Vector Control & Chemical Safety
- Waste Management
- Disaster Management
- Health Promotion
- Occupational Health Services
- Port Health

- Pollution Control
- Sanitary Engineering

2.3.9 ESIA Guideline 2017

The Environmental Protection and Management Law (2003) mandate the EPA to develop administrative procedures for the preparation of EIA to ensure effective environmental governance. In 2006, the EPA developed the EIA Procedural Guidelines to provide guidance on the procedures and steps involved in conducting an environmental impact assessment. The guidelines list the steps involved in the ESIA process as follows:

- Applications for EIA –formal application for environmental permit
- Submission of Project Brief-Summary of project information, proponent, activities, location, preliminary screening of impacts etc.
- Screening-Preliminary evaluation of the project by the EPA to determine the need for an EIA
- Notice of Intent-Public notification to inform the public through relevant media about the undertaken
- Scoping-Defines the key issues and establish the Terms of Reference (TOR) of the project
- Impact analysis-Evaluation of the potential impacts of the project
- Evaluation of significance-Determines the significance level of the impacts
- Mitigation and impact management-Establish measures to mitigate impacts
- Reparation of an environmental impact statement (EIS) or report. Document the environmental issues, baseline conditions, identification of impacts, recommendation, stakeholders etc.
- Review of the EIS-Review of the adequacy of the report
- Decision making – to approve or reject the proposal and to establish the terms and conditions for its implementation.
- Follow up – monitoring of the project

The proposed project will be planned, designed, constructed and operated based on these regulations. It shall also be maintained and guided by the same regulations and an environmental audit study will be done periodically to monitor compliance with the set environmental standards.

A flowchart of the main steps to be carried out is provided below (fig 2-1).

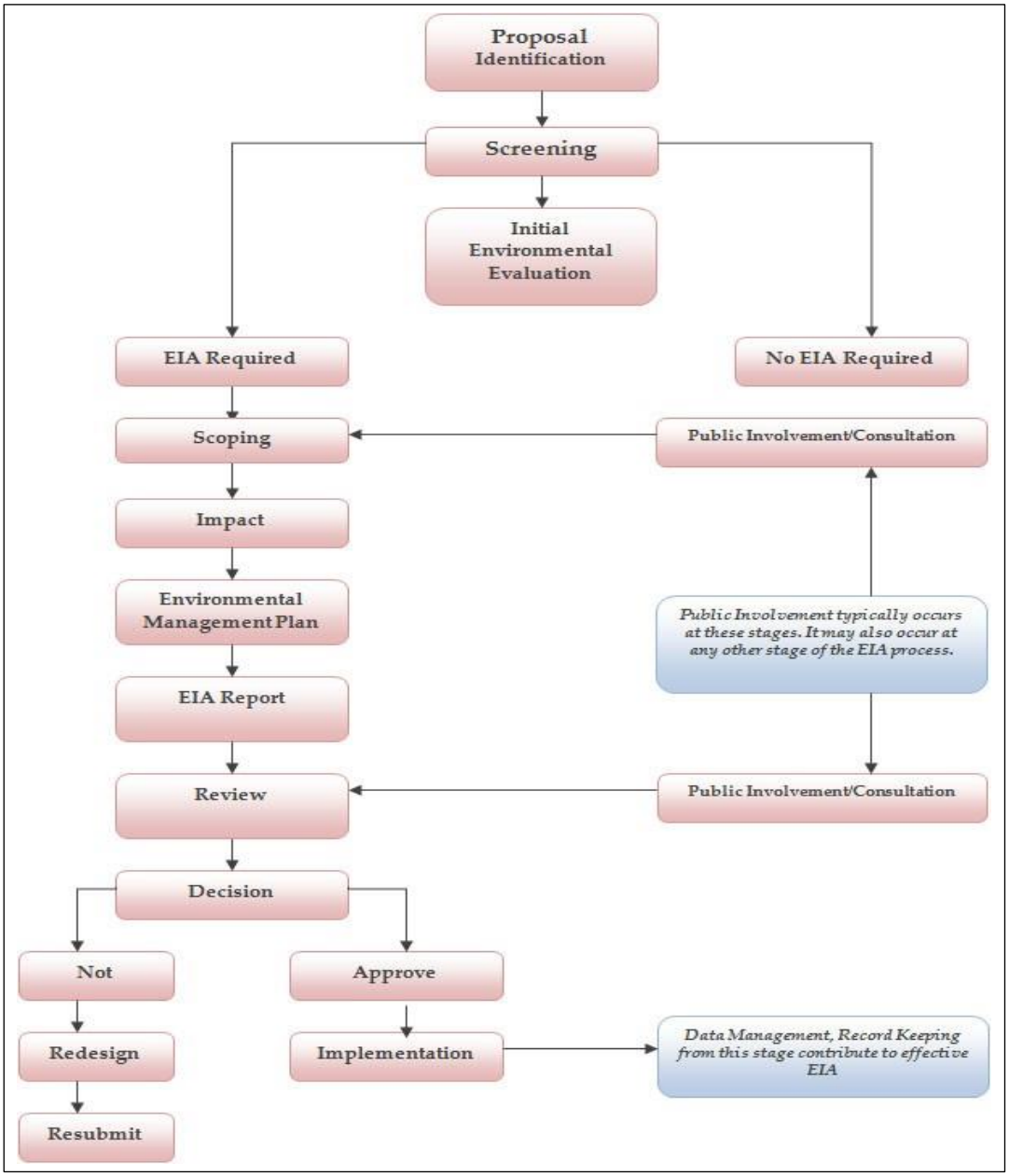


Figure 2-1: EIA Process Liberia (Source: WAPP 2012)

2.3.9.1 Public Consultation Requirements of the EIA Process

Involvement of the public in the EIA commences with the launch of the EIA process and continues throughout its course. Detailed below are the different requirements of the public involvement throughout the EIA process:

1. After the submission of an application for an environmental impact assessment permit, the project proponent should publish a "notice of intent" that states the information that may be necessary to allow the stakeholders or any interested party to identify their interest in the proposed project or activity. This information should include: the nature of the project, its related activities, its timeframe and its site of operation and the area that may be impacted.

2. Before preparing the EIA document, the project proponent should conduct public consultations with the potential affected stakeholders. This procedure is called the "scoping process" which aims to:
    a. inform the stakeholders about the project's details, its potential impacts on the physical, biological and socio-economic environments, and the mitigation measures that can be taken in order to minimize these impacts, and
    b. get the stakeholders' input on the various related issues.

    By achieving this, the scoping process is also a guiding tool for the project proponent and its consultants. It helps them in identifying the project's impacts, mitigation measures and alternatives, which will form the essential part of the EIA document. The scoping process consists of publishing the project's details in the affected district's media, holding public meetings to consult directly with the affected communities and stakeholders, and incorporating the views of these stakeholders in the scoping report which is submitted to the EPA.
3. On the completion of the EIA study report, the public is invited again to participate in the EIA review through public consultation meetings. The public's views on the EIA are taken into consideration by the EPA when deciding about approving or rejecting the project.
4. In some cases, the EPA also decides to hold a public hearing about the project in order to fortify the public participation. These cases include but are not limited to: requests by the public for a public hearing, controversy about the project or expiry of the period stipulated for receipts of comments.

2.4 Multilateral Environmental Agreements

The following Table provides the International Environmental Conventions, which have been signed/ratified by the Government of Liberia (GOL)

Table 2-4: International Environmental Conventions Signed/Ratified by the GOL

Convention	*Status*	*Year*	*Objectives*
African Convention on Conservation of Nature and Natural Resources	Ratified	1978	To encourage individual and joint action for the conservation
Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Ratified	1981	To prevent trade of endangered or threatened species
Convention Concerning the Protection of the World Cultural and Natural Heritage	Signed	2002	To recognize and protect cultural and natural heritage for future generations
Framework Convention on Climate Change and the Kyoto Protocol	Signed	2002	• To achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climatic system. • To strengthen the commitment of developed country parties with a view to reduce their overall emissions.

Stockholm Convention on Persistent Organic Pollutants (POP)	Signed	2002	• To strengthen National Capacity and to enhance knowledge and understanding amongst decision makers, managers, industry and the public at large on POPs. • To develop a National implementation Plan (NIP) to manage the elimination of POPs.
Ramsar Convention on Wetlands of International Importance	Signed	2003	• To manage wetland systems so that the human uses of these areas are undertaken in such a way as to retain their natural capital for future generations. • To encourage and support countries to develop and implement national policy and legislative frame-works, education and awareness raising programs, as well as inventory, research and training projects.
Convention on Biological Diversity (CBD)	Ratified	2000	• Promote Conservation of Biological Diversity. • Sustainable use of its components. • Fair and equitable sharing arising out of the utilization of genetic resources.
Convention on the Conservation of Migratory Species of Wild Animals	Ratified	2004	Aims to conserve terrestrial, marine and avian migratory species throughout their range
The Cartagena Protocol on Biosafety	Ratified	2003	To contribute to ensuring an adequate protection in the field of living modified organisms resulting from modern biotechnology
Convention on Desertification	Signed	1998	To combat desertification and mitigates the effect of drought in countries experiencing serious droughts and/or desertification
International Tropical Timber Agreement	Ratified	2008	Requires sustainable management of timber resource base, simultaneously encouraging the timber trade and the improved management of the forests
Vienna Convention for the Protection of the Ozone Layer	Signed	1996	States agreed to cooperate in scientific research on the ozone problem, to exchange information, and to adopt "appropriate measures" to prevent activities that harm the ozone layer. The obligations are general and contain no specific limits on chemicals that deplete the ozone layer.
Montréal Protocol on Substances that Deplete the Ozone Layer	Signed	1996	A protocol to the Vienna Convention for the Protection of the Ozone Layer, it is designed to protect the ozone layer by phasing out the production of numerous substances believed to be responsible for ozone depletion
International Convention on Oil Pollution Preparedness, Response, and Cooperation (OPRC)	Signed	1995	To strengthen the legal framework for the control of environmental pollution by oil, in general, and marine pollution by oil in particular.
International Covenant on Economic, Social and Cultural Rights	Ratified	2004	ICESCR commits to work toward the granting of economic, social, and cultural rights to individuals, including labor rights and rights to health, education, and an adequate standard of living. ICESCR is part of the International Bill of Human Rights, along with the Universal Declaration of Human Rights (UDHR) and the International Covenant on Civil and Political Rights (ICCPR)

2.5 International Policies and Standards

2.5.1 IFC Performance Standards

The IFC Sustainability Framework (last updated effective January 2012) comprises both IFC policy and established Performance Standards on E&S sustainability. The MCC Environmental Guidelines formally adopted the IFC Performance Standards in 2012 and require all Compact-funded projects such as this one to adhere to the IFC Performance Standards. The IFC Performance Standards define key responsibilities for managing projects' E&S risks, providing guidance on how to identify risks and impacts and to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities.

The IFC Performance Standards are primarily general and qualitative guidelines, and they often do not provide quantitative, targetable goals. As such, they suggest the use of the World Bank Group Environmental, Health, and Safety (EHS). Guidelines published jointly by IFC and World Bank Group, which are defined in the IFC Performance Standards Overview as "technical reference documents with general and industry-specific examples of good international industry practice."

The EHS guidelines include sector-specific standards and quantitative targets in some cases. They include specific EHS guidelines to be applied to water and sanitation projects such as that under consideration as part of the Project. The EHS General Guidelines also contain specific EHS Guidelines for activities as applicable to the construction and commissioning/operation/ decommissioning of the pipeline.

The Performance Standards provide a framework for the design, construction and operations of projects so that they are environmentally and socially acceptable and measures to prevent, mitigate or compensate adverse E&S impacts of projects have to be developed. The Performance Standards focus on outcomes rather than processes, and require the implementation of a robust ESMS.

As required for MCC-funded investments, for which this ESIA is applicable, it is required to apply the Performance Standards to manage E&S risks and impacts, so that development opportunities are enhanced. Table 2-5 presents a summary of each of the eight Performance Standards including their applicability and specific actions to address the impacts and measures to minimize, mitigate and compensate impacts as far as possible.

Table 2-5: Summary of IFC Performance Standards and Applicability to the Project

IFC Performance Standard	Summary of Core Requirements	Applicability	Activities to address the different requirements
1. **Assessment and Management of E&S Risks and Impacts**	Identify and evaluate E&S risks and impacts of the project and adopt measures to anticipate, avoid, and, when avoidance is not possible, minimize and/or compensate PAP and communities and environmental area of influence. To achieve this, an effective ESMS should be established that ensures public participation and grievance redress mechanisms.	Applicable	An ESIA will be carried out for the Raw Water Transmission Pipeline Project and a general Environmental and Social Management Plan (ESMP) will be developed, which should function as basis for the contractor's site specific ESMP (CESMP), including OHS and labor conditions. The contractor will implement an Environmental and Social Management System including monitoring, training, record keeping and reporting, etc.
2. Labor and Working Conditions of Workers	Management of projects should ensure worker safety, promote fair treatment, non-discriminatory and equal opportunity for workers; establish, maintain and improve the worker-management relationship; and comply with national employment and labor laws of the host country.	Applicable	The contractor will develop a site specific ESMP (CESMP). Including a Code of ethic and business conduct, social and gender plan, OHS requirements (PPE, safety induction, task specific training, emergency preparedness, documentation, reporting, grievances redress mechanism, etc.).
3. **Resource Efficiency and Pollution Prevention**	Avoid or minimize adverse impacts on human health and the environment through avoidance or minimization of pollution, including release of greenhouse gases, and promote sustainable use of resources such as energy and water. Ensure the use of efficient pollution abatement machinery.	Applicable	Possible impacts have been assessed and mitigation measures developed, which are described in the ESMP and the CESMP. The most important impacts and mitigation measures will be managed by several sub-plans as the waste management plan, hazardous material management plan, equipment maintenance management plan, emergency preparedness, oil spill contingency plan, etc..
4. **Community Health, Safety and Security**	Evaluate the risks and impacts to the H&S of the affected communities during the project lifecycle and establish preventive and control measures consistent with best international practices and commensurate with the nature and magnitude of impacts.	Applicable	The main risks are associated with the traffic from and to the construction site passing through the villages. Therefore, a traffic management plan will be developed and enforced. Other aspects will be the dust creation during dry season to be mitigated by frequent sprinkling of the road. Excavation and trenches will be marked and temporarily fenced. HIV/Aids Campaigns to raise awareness are planned as well as appropriate measures for preventing malaria. A Code of Conduct will be enforced.
5. Land Acquisition and Involuntary Resettlement	Where avoidance is not possible, displacement should be minimized by alternative project design considerations. No forced eviction should be undertaken. Land acquisition should be done in a manner that minimizes	Applicable	The main measure for minimising resettlement in the present case was the alternative assessment through which the RoW of the Pipeline was finally selected. Passing with the pipeline along the tailrace channel and then along the St Paul River compared to

IFC Performance Standard	Summary of Core Requirements	Applicability	Activities to address the different requirements
	adverse social and economic impacts through the provision of compensation packages and that ensures a humane resettlement procedure, disclosure of information, consultation and participation of affected persons. It should be the project proponent's duty to ensure the physical and economic well-being of displaced people are not worse off than their pre-displaced lives.		passing along the road where all the villages are located reduced the number of PAPs significantly. It is expected that only two PAPs will need to be physically resettled. All other cases will be economic displaced (land use through the footprint of the project), this will be compensated. Sufficient farming land, currently not in use is available in the surrounding area. A Resettlement Action Plan is under preparation.
6. **Biodiversity Conservation and Sustainable Management of Living Natural Resources**	All project proponents should identify both direct and indirect project-related impacts that could potentially threaten biodiversity and ecosystem services. The following indicators should be used as a guide: habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading, and pollution.	Applicable	Main impact on biodiversity will be the loss of vegetation and the fragmentation of habitats due to the fencing of the pipeline corridor. Fragmentation can be reduced by creating passing's as well as by lifting the fence (10 to 20 cm) so that small and medium sized animals can pass below. Other impacts will be related to construction activities which will be minimized by implementing the ESMP.
7. Indigenous People	Project proponents should ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture and natural resource-based livelihoods of Indigenous Peoples. Project proponents should promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner, respecting and preserving the culture, knowledge and practices. Adverse impacts on communities should be anticipated and avoided. When avoidance is not possible, such impacts should be minimized and/or compensated for.	Not Applicable	Indigenous people as defined in the IFC guideline are social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. The population living in the surroundings of the project area are not distinct from the mainstream groups, they belong to the main ethnic groups in that region which are Kpelle, Bassa, Lorma and Gola. However, general mitigation measures as the code of conduct will be implemented, impacts will be mitigated were possible and compensation payments will be made for all assets PAPs will lose. As far as known no sacred sites will be affected.
8. Preservation of Cultural Heritage	Project proponents must protect cultural heritage from the adverse impacts of project activities and support its preservation. Project proponents should also promote the equitable sharing of benefits from the use of cultural heritage.	Not applicable	Related to available information no sites of cultural heritage are within the project area. The new RoW is following to a high percentage the old RoW. Furthermore, chance find procedures will be developed.

2.6 MCC Environmental Guidelines

The MCC Environmental Guidelines use project categories as a concise way of indicating the level of E&S concern posed by a proposed investment. MCC classification uses three main categories, depending on the type, location, sensitivity and scale of the project and the nature and magnitude of its potential impacts. Projects are assigned a category of A, B or C, in descending order of E&S sensitivity. Although not relevant to this assessment, a project may also be classified as Category D if it will involve an intermediate facility to finance subprojects that may result in adverse environmental and social impacts.

These categories are as follows:

- Category A: Proposed projects with potential significant adverse environmental or social risks and/or impacts that is diverse, irreversible, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. Category A requires a full ESIA study.
- Category B: A proposed project with potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands and other natural habitats—those are less adverse than those of Category A projects. These impacts are site specific; few, if any of them, are irreversible and, in most cases, mitigation measures can be designed more readily than for Category A projects. The scope of environmental and social assessment (EA) for a Category B project may vary from project to project, but it is narrower than that of Category A ESIA.
- Category C: Activities with minimal or no adverse environmental or social risks and/or impacts. Beyond screening, no further EA action is required for a Category C project.

Based on the environmental and social impacts and the extent of the Project area, the Raw Water Transmission Pipeline Project is classified as MCC Category B. It requires that an ESIA be developed defining the environmental and social risks that need to be taken into account in the rehabilitation project of a pipeline. The Water Treatment Plant is already existing as well as most of the intake structure. The actual construction work is limited to the RoW of the Pipeline. The impacts are site-specific; only few impacts are irreversible (permanent land use of the RoW) and mitigation measures can be clearly and easily designed. The scope of ESIA for a Category B project is intended to be concise and focused on specific environmental and social impact analyses, including the development of Environmental and Social Management Plans (ESMPs) as appropriate.

3 THE PROJECT

3.1 Project profile

Location	Harrisburg Township, Montserrado County
Start Point	0315073/ 0714547
End Point	0317582/ 0717644
Project Cost	USD $ 14,213,996.19
Project Length	Approx. 5 km
Water Bodies	St. Paul River and its tributaries.
National Park/Forest Reserve	None
Biosphere reserve within 10 km radius	St. Paul River is approximately 40 meter away from the proposed Raw Water Pipeline passage route.

3.2 The Project Site

The Republic of Liberia is a country in West Africa. The neighbouring countries are Sierra Leone to the west, Guinea to the north and Côte d'Ivoire to the east; to the south it is bordered by the Atlantic Ocean. Liberia covers an area of 111'369 km^2 and has an estimated number of 4,7 million inhabitants. Liberia is divided into 15 counties, which are further subdivided into districts and then into clans. The assigned project is sited within Montserrado County and there within the Careysburg District. The main ethnic groups within the Careysburg District are Kpelle, Bassa, Mano, Kissi, Loma and Gola.

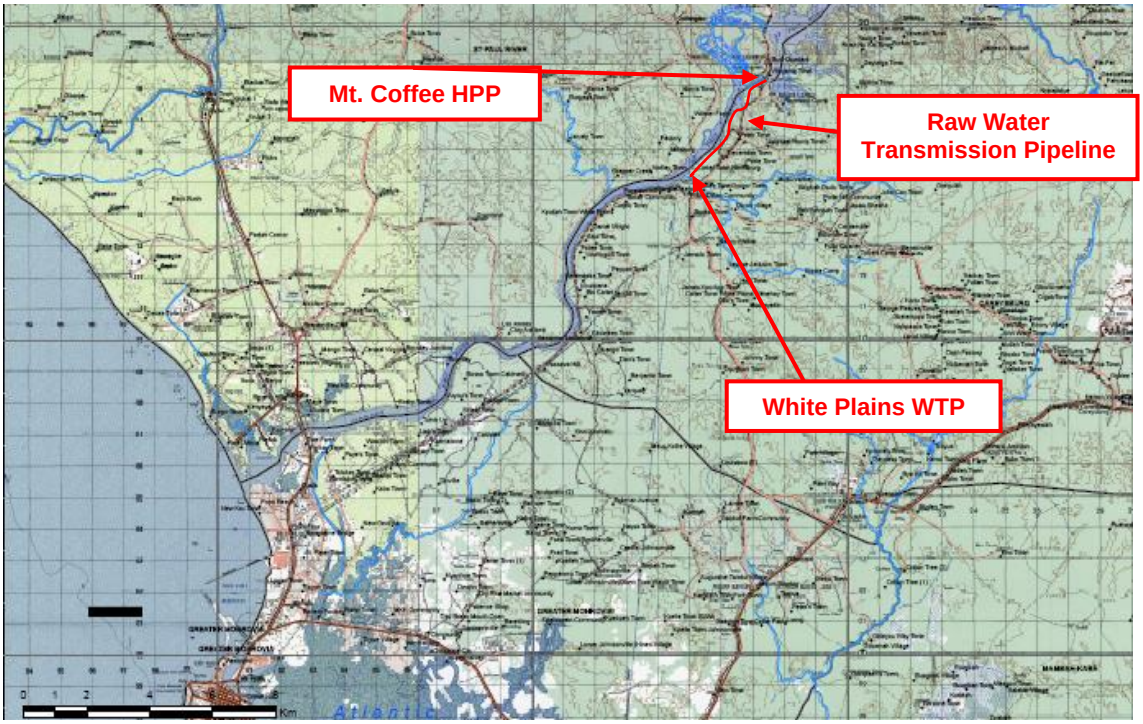


Figure 3-1: Location of Mt. Coffee HPP in Montserrado County

The Raw Water Transmission Pipeline will follow roughly the following routing:

- The pipeline will start at the intake from Mt Coffee HPP, which is located on the St. Paul River, approximately 27 km northeast of Monrovia, in Montserrado County. From there it will follow the tailrace channel and then the St Paul River until the end of the Mt Coffee HPP property to the fence (Segment 1);

- From the fence it will follow the road leading to Monrovia for about 1.2 km until a small creek named Waydou. At Waydou it turns west and continues to the shoreline of the St Paul River which it follows for the remainder of its length to the water treatment plant (Segment 2);

For the project description the two segments have been combined as they both are describing the same component.

3.3 The Project Proponent

The Liberia Water and Sewer Corporation (LWSC) is the project proponent. LWSC was established by an act of National Legislature in 1973 and is a Public Corporation solely owned by the Government of Liberia (GOL) with a mandate to provide, distribute and supply water to the Liberia for public, domestic and industrial purposes.

3.4 Project Benefits and Water Demand

The Project will primarily benefit the people in Monrovia who obtain water from the LWSC system. The service population for the LWSC system is approximately equal to the population of Monrovia and its county, Montserrado County. The Census of 2008 reported a population of 1.12 million for Montserrado County.

The main benefit for the population will be the improved reliability of water and the better quality of the water provided. The current water source is the water which is pumped from the nearby St Paul River to the water treatment plant. The present intake location is subject to possible saltwater intrusion during dry season resulting in poor water quality (undesirable for making coffee, tea or even for bathing).

The new intake location would be at the intake of the Mt Coffee HPP, which is located about 20 m above sea level (asl). Therefore, saltwater intrusion would not be possible anymore. Additionally, the water used in the future for the WTP is passing through a reservoir and sediments are settling due to the slower flow velocity, which will reduce the turbidity leading to a better efficiency of the WTP. Another justification is also the reduced energy consumption due to the gravity flow from the intake to the WTP.

It is expected that through the higher reliability of cleaner water, a greater percentage of city and county population will obtain their water from the public water system, which will lead to a reduction in bottled water use and therefore as well to a reduction of plastic waste.

The water demand depends on the service population, the per capita use, industrial and commercial uses, and water losses in the distribution system. There is no information on the number of people obtaining their water from the Water Treatment System nor on commercial and industrial accounts and their water needs (Feasibility Report, CH2M, 2018). Several values are given in the feasibility study related to water demand. The minimum demand was estimated to be 40 litres per capita per day (lpcd) resulting in a total of 11.6 mgd (0.51 m^3/s) for a service population of 1.1 milllion taking into account the uncertainties the amount was doubled to 23 mgd (1.0m^3/s). According to a news article (March 5th, 2016) the LWSC Managing Director N. Hun-Bu Tulay stated that the water demand for the Monrovia city water service area was 18 mgd (0.79 m^3/s) at that time and that this demand will increase over the years significantly and that the intent is to expand the WTP to a capacity of 32 mgd at some point in the future (Feasibility Report, CH2M, 2018).

To provide a finished water production rate a 10 percent difference between raw water supply and finished water production was used in the Feasibility study and following predictions on supply of water flows are given:

- Initial Project: WTP capacity = 16 mgd; raw water supply need = 16 x 1.1 = 17.6 mgd (0.77 m^3/s)
- Future expansion: WTP capacity = 32 mgd; raw water supply need = 32 x 1.1 = 35.2 mgd (1.54 m^3/s)

The present capacity of the WPT is 0.7 mgd (0.03 m^3/s). The capacity of the WTP before the civil unrest was 16 mgd (0.70 m^3/s). The design flow for the pipeline is 900 l/m (0.9m^3/s) with a maximum flow of 1200 l/m (1.2m^3/s) (Feasibility Report, CH2M, 2018).

3.5 Project Description

The Raw Water Transmission Pipeline will be designed for a technical lifetime of minimum 40 years. The project will consist of the following main components.

1. Intake: The construction of the take off at the penstock was already part of the Mt Coffee HPP construction. Therefore, the pipeline will only need to be connected to the already existing flanges.

Figure 3-2: Connection to the existing flanges at Mt Coffee HPP.

From the flange the pipeline will be elevated on concrete supports to 4.5 m then it will cross the road in a height of 4.5 meters after crossing the road it will be lowered to about 1.2 m above ground following the stone pitching on the right side of the road until it goes underground. Therefore, only minor construction works (4x 4,5 m and 4x 1.2 m concrete supports and the burst control valve building) are required at the water intake.

Figure 3.3.is showing the side view and Figure 3.4 the top view of the routing short after the connection to the flanges at the Mt Coffee HPP

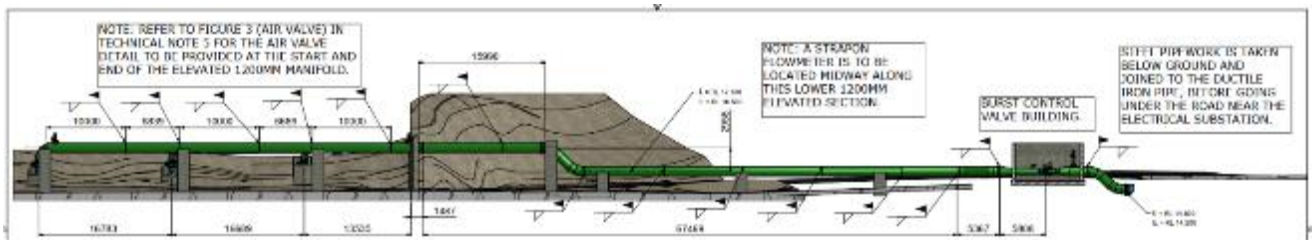


Figure 3-3: Side view of the line routing at the intake structure at Mt Coffee HPP

Figure 3-4: Top view of the line routing at the intake structure at Mt Coffee HPP

2. Pipeline: The design flow of the system is 900 l/s (0.9 m^3/s) while a maximum flow of 1200 l/s (1.2 m^3/s) is required. Minimum design flow is 0.3 m^3/s. The pipeline will require the installation of approximately 4,700 m pipeline within a temporary construction corridor of maximum 36 m to ensure:

   - sufficient storage for the soil (with a separate storage for the topsoil);
   - Safe space for maneuvering the heavy equipment;
   - Safe passage for people and vehicles around the direct trenching operation;
   - Storage of materials for the concrete chambers
   - Stringing of the pipes

   At certain critical points along the pipeline, this corridor can be narrowed to a corridor of minimum 21m to avoid unnecessary impact on a structure or people. No permanent fencing is foreseen during construction period only temporary fencing to secure the trenches and/or excavation areas.

   The width of the permanent corridor is 10 m, which will be permanently fenced with a total of 11 passages. See Figure 3-4 for the location of the passages which were agreed upon with the affected communities. The fence is to ensure maintenance in the future, even if this occurs only sporadically and the fence should avoid structures or crops being built on top of the pipeline. Because of previous related issues on other pipelines, the Owner LWSC is adamant that in Liberia this has to be enforced by a fence as a physical and/or 'psychological' barrier to avoid any discussion or conflict afterwards.

Figure 3-2 provides an overview of the pipeline routing; the blue line is indicating the pipeline the green line the future permanent fencing.

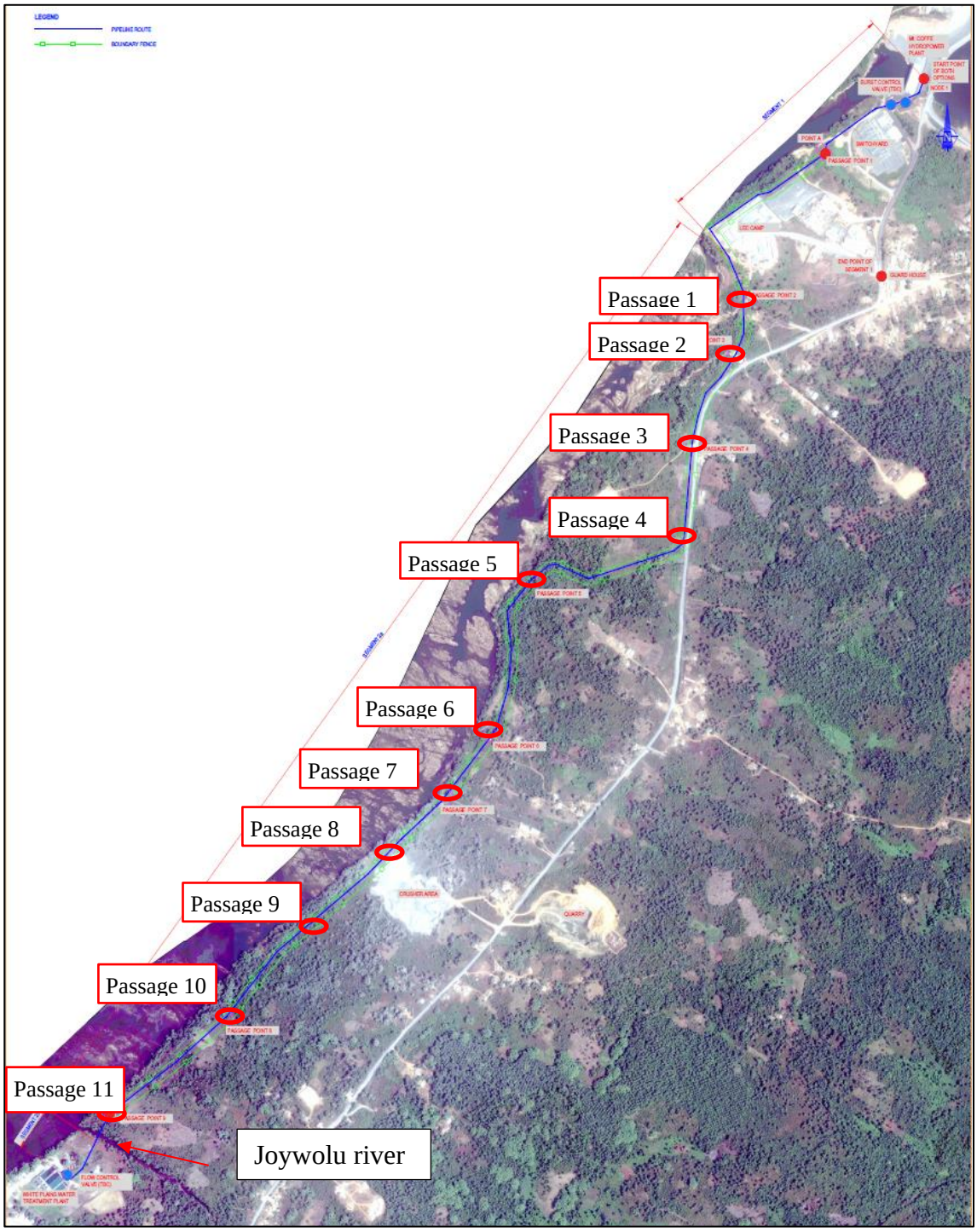


Figure 3-5: Overview map of the Raw Water Transmission Pipeline Project

3. Before the pipeline is reaching the WTP it has to cross the Joywolu river. This stream will be crossed by a pipe bridge. The pipeline runs across the stream with a span of 40m and two side spans of 24 m and 28 m to cross the flood plains as shown below.

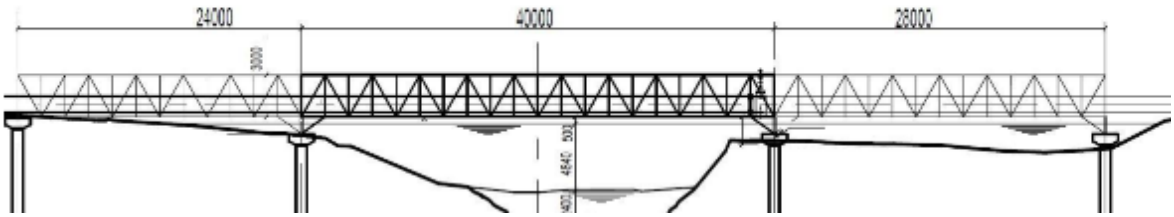


Figure 3-6: Pipeline bridge crossing the Joywolo river

4. Connection to the WTP: The new pipeline will connect to the existing flange of the old pipeline. Therefore, only minor construction activities are expected at the connection to the WTP.

Figure 3-7: Connection to the WTP

5. Access Roads - Building of temporary construction roads for heavy equipment to travel and install the pipeline from Caldwell Road to the St. Paul Riverbank. Currently there are four access roads planned, which will have a maximum width of 5 m.
    a. Access road 1: located between Raymond Camp and Plum Hill is an existing dirt road and will have a total length of about 30 m.
    b. Access road 2: located at Plum Hill, has the total length of 580 m, of while 250 m is an existing road leading to the St John United Methodist Church (operating time: Sunday 9:30 am to 1:00 pm), adjacent to the church is a school (operating time: 8:00 am to 1:00 pm) and 230 m which is currently partly a foot path that will need to be newly constructed.
    c. Access road 3: located at the quarry, is an existing road. No activities are required in the first 230 m to the quarry from there onwards a small dirt road is leading further 300 m to the river, which will be reconstructed.
    d. Access road 4: located at Cook Village passing between two houses, which will need to be demolished, has a total length of 570 m and is currently a foot path and will be newly constructed

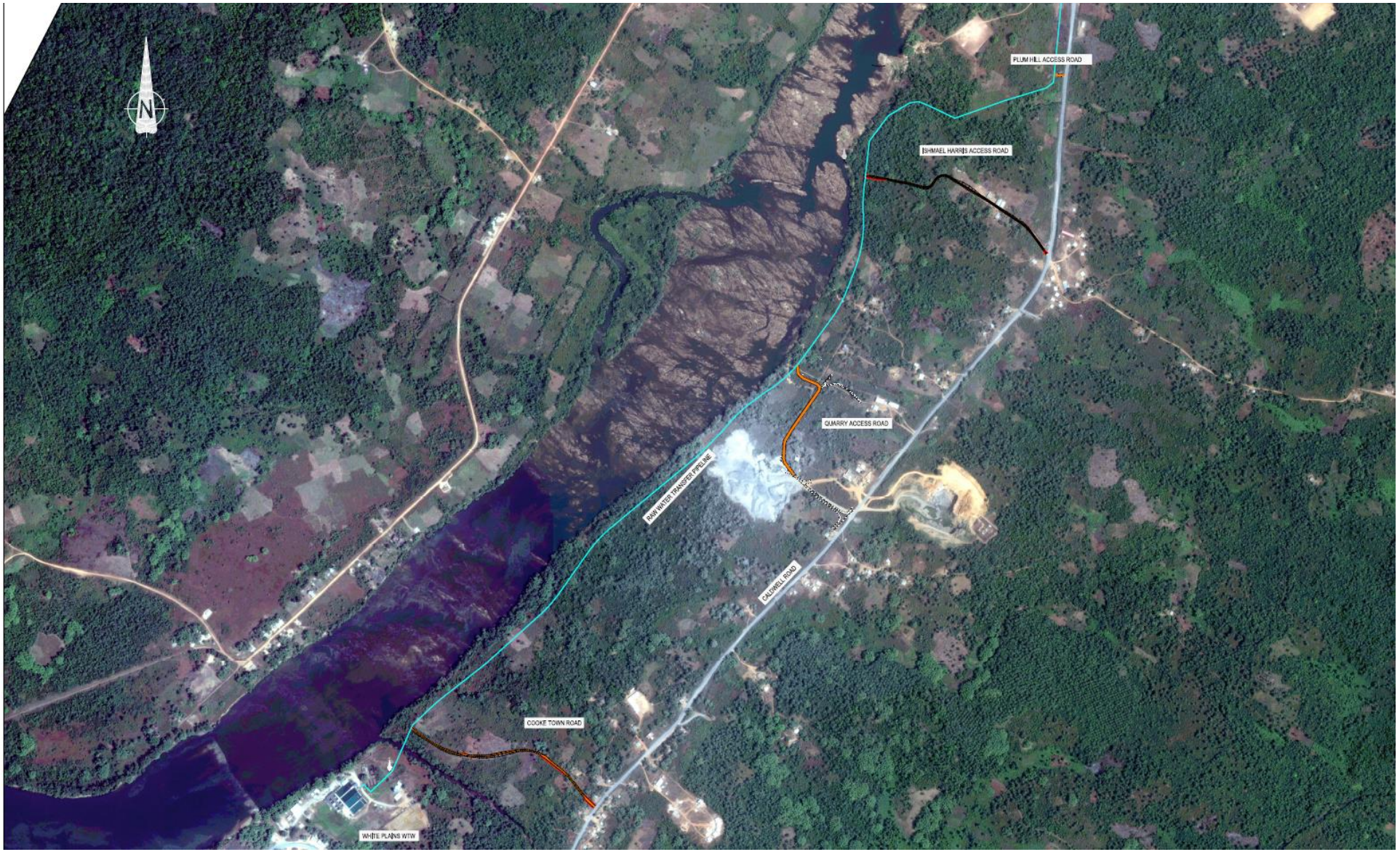


Figure 3-8: 4 Access Roads to the Raw Water Transmission Pipeline (highlighted in red)

3.6 Project Phases and Activities

3.6.1 Construction and Commissioning Phases

The major activities involved in the installation of the pipeline include the following:

- **Land acquisition**: there will be land temporarily used as well as land permanently used. The permanently used land will need to be acquired. The temporary land could be leased for the period of construction and handed back to the owner after finalization of the construction. Topsoil would need to be stored separately and spread out again after the construction works and revegetated in consultation with the Engineer and owner of the land. The temporary RoW will have a width of 36 m. The total area used during the construction period will be around 16.92 hectares (around 41.8 acres). It is estimated that the permanent used area, the right of way of the pipeline, will be around 4.7 hectares of which 0.87 hectares are within LEC Property and 0.25 hectares on LWSC property (both Governmental entities). Therefore, a total of 3.8 hectares of land will need to be acquired (around 9.4 acres).
- **Fencing:** to keep people from building or planting on top of the pipeline, LWSC requested that a fence will be installed along the entire permanent RoW. However, the access of the population to the river is of high importance, therefore, eleven (11) passages have been planned; the exact locations have been agreed upon with the local population.
- **Procurement and manufacturing** of the ductile iron pipe, fittings, air valves, reinforcing steel, excavators, truck cranes, bulldozers, and dump trucks. Any construction material needed should be procured from nearby extraction sites along Caldwell road (including borrow pits and quarries).
- **Transportation of equipment** to the sites. It is expected that the materials and heavy equipment will be stored either within the 36 m corridor, at the LEC-MCHPP PIU Construction Camp or at the WTP.
- **RoW clearance and grading**. Vegetation clearance should be done by physical means and should be provided to the local population. While the contractor is using 36 meters in general for the ROW, this is a maximum estimate, and the ROW can be less. Large trees and vegetation that do not require removal for safe construction and operation will be identified with support from the supervisory engineer, and will be left in place along the ROW.
- **Access Roads**. Building of gravel rough temporary construction roads for heavy equipment to travel and install the pipeline is expected, from Caldwell Road towards the St. Paul River.
- **Trenching and backfilling, dewatering**. Topsoil would need to be stored separately, so that it can be spread out and re-grassed after backfilling occurs.
- **Removal of the old pipeline** in areas where required and disposal of the pipeline as stated in the Employers Requirements.
- **Concrete piers**. Where required according to the final design (at the dam connection and river crossings) the pipeline will be supported on concrete piers up to 4.5 m in height.

- **Laying of pipeline.** Pipeline installation will include string-out of the new pipe segments along the alignment before placement in the trench (or on the piers) and joining; placement of vaults and installation of appurtenances and valves.
- **Testing and commissioning**. A hydrostatic test will be undertaken to ensure that the line performs as per the specifications.
- **Backfilling.** Excavated material will be used to backfill once pipeline installation is completed if deemed suitable according to the Employers Requirements.
- **RoW reinstatement.** Graded soil will be separately stockpiled from other materials and be readily recoverable for reinstatement. All creeks, water courses, streams and irrigation channels will be reinstated to their former condition, including appropriate revegetation to combat erosion. Re-grassing should be carried out before rainy season starts, otherwise erosion damage will occur fast at least at all step locations.

3.6.1.1 Project Equipment

The vehicles will only follow the previously determined access roads. The following vehicles will be used for the whole project site:

- 1 x DAF 45.150 4x4 Mechanic
- 3 x DAF 45.150 4x4 Team Transport
- 1 x DAF 45.150 4x4 Fuel Supply
- 1 x Iveco 4x4 Logistics
- Private vehicles of the project management.

The workers come on site at 7:30 am and leave work at 16:30 pm.

The 4 excavators will be following the pipe alignment from their starting point to do the trenching. They will be transported on site using a low bed (1 time access & egress).

The pipes will come on a flatbed to do the stringing in the pipeline work corridor. This will be the biggest impact and will contain approximately 3 transports (in/out) per day for a duration of 3 months at the start of the project.

For the concrete chambers there will be trucks passing (raw materials or ready-mix concrete) for the duration of the whole project (approximately 2 per day (in/out)).

The transports will be spread out over the 4 access roads, the entrance to the White Plains WTP and the access to the MCHPP.

3.6.1.2 Workforce

During construction, the workforce is anticipated to be approx. 100-150 local laborers (both unskilled and skilled) with high priorities given to the project affected Townships, Harrisburg and White Plains. Furthermore, there will be about 10 international specialists for planning and supervision purposes. However, during operation and maintenance of the pipeline, which is in the responsibility of LWSC, the number of laborers will drop, since only a limited number is required, and skills are specific.

The “Contractor” will be responsible for compliance with the measures that will be contained in the approved CESMP. The Contractor will be encouraged by local authorities, based on required skills and capabilities, to use local personnel for construction works and transportation of equipment to the site. No project dedicated lodging, construction camp, or maintenance office is expected. These are not necessary

to meet the basic needs of the relatively small construction crew. The basic needs consist of providing drinking water, mobile toilets (those will move with the progress of the construction along the RoW), and a dedicated recreation area, which need to provide sufficient shade. Employment regulations will need to comply with international standards.

During operation it is expected that one engineer is required for a monthly visual inspection of valves and pipeline route. Furthermore, there will be about 5 workers required for RoW maintenance (vegetation clearing).

3.6.1.3 Security provision

All trenches and excavation areas will be fenced off temporarily. A minimum of 1 security guard per workplace (equipment and/or storage of materials) will be put in place day and night, 7 days a week. The project yard will be under permanent supervision of a minimum of 2 guards. The guards are part of a professional licensed company and are hired from outside the immediate surroundings to avoid any conflict of interest. The guards will need to follow the code of conduct.

3.6.2 Construction schedule

The project started February 12th, 2019 and should be finalised June 11th, 2020. Mobilisation and site installation took place until March 25th, 2019. The design will need to be finalised on October 7th, 2019, while the RAP and the ESIA Report including permit approval should be finalised on August 30th, 2019. The Contractor's Environmental Management Plan with related sub-management plans will be finalized after submission and approval of the ESIA and ESMP. The RAP implementation is planned to be completely finalised on November 4th, 2019. Construction works will start with Segment 1 August 28th, 2019 and should be finalised with Segment 2 mid May 2020. Commissioning and testing should take place between May 4th and June 11th, 2020. The defect notification period is one year. During the entire construction period EHS monitoring will take place. The following schedule shows the main milestones. Aspects related to ESIA and RAP preparation are marked in yellow as well as the RAP implementation. Approvals are shown in gray. The EHS Monitoring is shown in green.

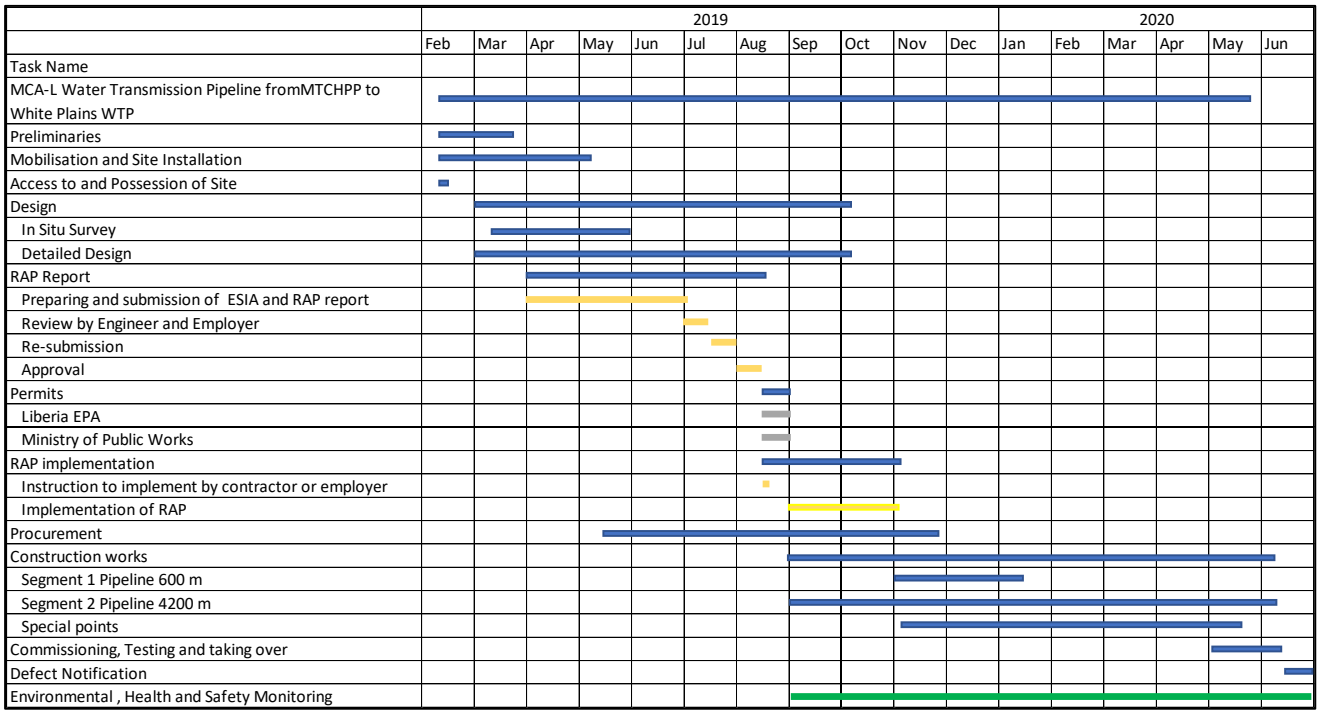


Figure 3-9: Summary of the construction schedule

3.6.3 Operation Phase

Pipeline operation requires inspections and periodic RoW maintenance. LWSC staff will operate and maintain the pipeline once it has been commissioned. Operation activities include maintenance of access to the pipeline and vegetation management, surveillance of the condition of the pipeline, emergency maintenance and repairs. Growth of vegetation in the RoW will be controlled to ensure safe and reliable operation of the pipeline.

3.7 Decommissioning

In case decommissioning is required there are two options.

- Abandonment in place –The pipelines are left to corrode and biodegrade in situ. All above ground structures are removed and the RoW is rehabilitated.
- Removal – As above but all below ground structures are also removed. Removal is not normally the best practice for buried pipelines.

Leaving the decommissioned pipeline in place is the safest and least disruptive option; it means no additional disturbance from excavation and removal and less risk of future soil and slope instability.

3.8 Project Alternatives

3.8.1 Without the Project Scenario

The without project scenario would mean that the project does not proceed. Without the project, the environmental situation will neither improve nor deteriorate due to Project-related activities.

Comparing both scenarios with each other, the only long-term negative impact of the "with project scenario" is the permanent land take of 4.7 hectares (11.6 acres). All other negative impacts are in time restricted to the construction phase. While the main long-term positive impacts of the "with project scenario" are the following ones:

- Higher water service reliability
- Better water quality (prevention of saltwater intrusion and less TSS)
- Reduced energy costs and reduced emissions (gravitation flow from MCHPP to WTP instead of pumping of the water)
- Reduced risk of oil spillage (fuelling of generators and bad maintained generators), therefore a reduced risk of water and soil contamination
- Less plastic waste if more people use tap water than bottled water (in Liberia it is common to use water in small plastic bags)
- Possibly an improved health situation if more people use the treated water than untreated water from creeks often causing dysentery and other sicknesses. However, this will also depend on the coverage of the water service system

Most of the above mentioned positive impacts are affecting a larger surrounding and population than the negative impact of land take and may be seen therefore as more substantial.

Conversely, the positive effects mentioned above would not occur if the project would not be built, which can be added as negative impacts to the without project scenario. This leads to the conclusion that the without project scenario is from a social, economic and environmental point of view not recommended.

3.8.2 Alternative Project Sites

The routing of pipeline is based on the need to interconnect the Mount Coffee Reservoir to the White Plains WTP. Furthermore, several hydraulic criteria need to be taken into account.

During planning stage, the pipeline routing was divided in two segments. For both segments alternative studies were carried out to find the most suitable routing for the entire pipeline.

3.8.2.1 Segment 1: Mt Coffee Intake Structure to the connection Point of Segment 2

For Segment 1 two alternative routes were assessed:

1. Alternative 1 followed mainly the road from Mt Coffee Powerhouse to the entrance gate of Mt Coffee HPP and then it follows the road to Monrovia until it gets connected with Segment 2.
2. Alternative 2 followed the tailrace channel behind the switchyard until the end of the Mt Coffee Camp, then turned south-east to follow the St Paul River to the road to Monrovia where it would be connected to Segment 2.

Figure 3-10: Alternatives assessed for segment 1

The findings from the assessment revealed that the potential environmental and social impacts associated with Alternative 1 (along the main road leading to Mount Coffee HPP) are higher as compared to Alternative 2 (along the St. Paul River, i.e. 20 meters away from the River). From an environmental perspective both alternatives are located within an already degraded area due to the construction of Mt Coffee HPP. The main difference between the two routes is within the social area, Alternative 1 could require physical resettlement and the demolishment of the public toilet. In addition, eleven farms along the road compared to four farms would be affected. The population of Raymond Camp would face more construction noise, dust, etc. Furthermore, the risk of accidents is higher in a populated area; part of the construction would take place right next to the market where children are present. Therefore Alternative 2 was recommended, since the entire route is located in an unpopulated area where the access is restricted, which reduces the risk of accidents.

3.8.2.2 Segment 2: Connection Point of Segment 1 to White Plains Water Treatment Plant

The Feasibility Report for Segment 2 prepared by CH2M in 2018 assessed six alternatives, related to hydraulic capacity, constructability, operability and qualitative cost. Furthermore, they assessed the high-water level of the St Paul River. Only two alternatives meet the original project objectives:

1. Alternative 1 – Original Alignment with Minor Deviations
2. Alternative 4 – Caldwell Road Route with a Deviation Around Ishmael Harris Town Road Hill

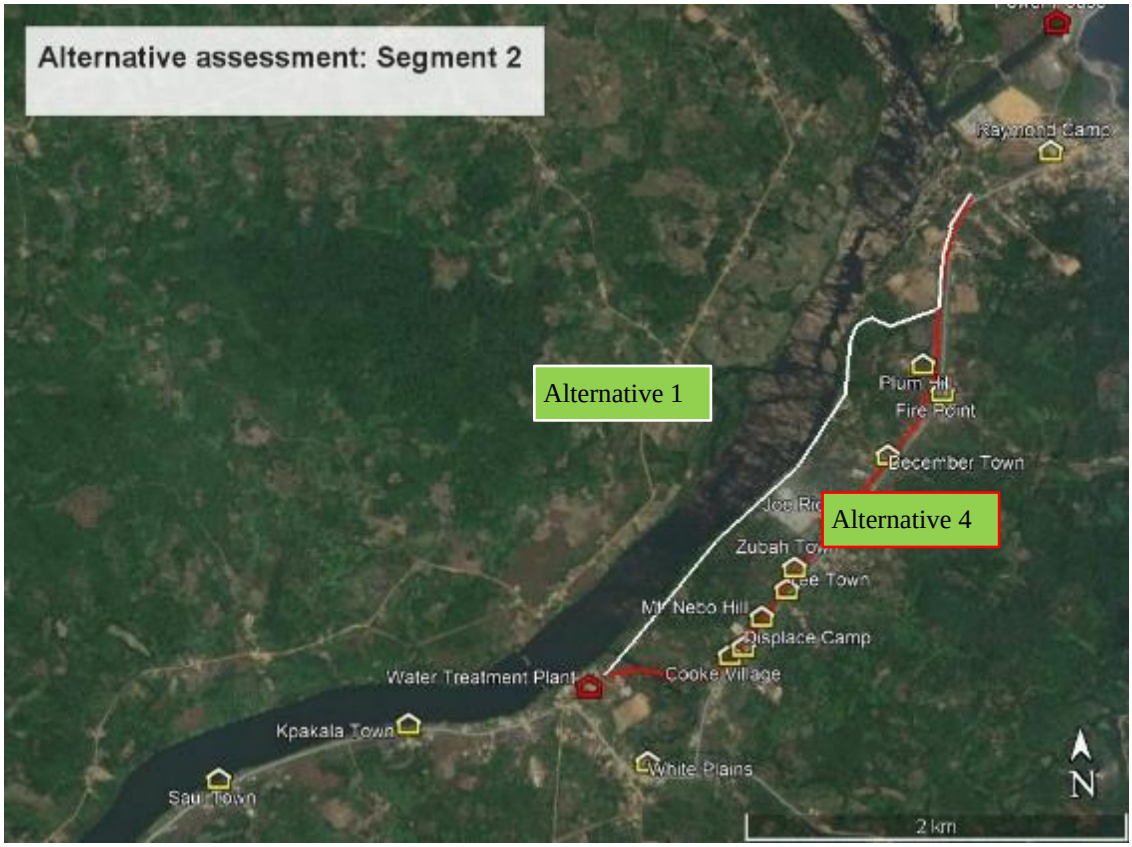


Figure 3-11: Alternatives assessed

The original route (Alternative 1) with minor deviations was recommended.

Alternative 4 would have more impacts on the social environment since most of the villages are along the road, which would result in physical resettlement. The optimum route is defined as a route that maximizes construction feasibility and stability while minimizing negative influences and cost of construction. Analysis of alternatives have determined that the selected footprint is the only cost-effective solution to secure the most environmentally acceptable route that is both technically and economically feasible. Alternative 4 would incur substantially more cost in land acquisition and materials to accommodate the longer route.

4 STAKEHOLDER ENGAGEMENT PLAN AND PUBLIC PARTICIPATION

Stakeholder Engagement and Public Participation Process particularly with local citizens affected by development proposals, is frequently construed as an integral aspect of successful decision making in the ESIA processes for major developments. As such, Public Participation is a policy requirement by the Government of Liberia and a mandatory procedure as stipulated by ESIA Regulations, 2006.

It is an important process through which stakeholders including beneficiaries and members of public living in project areas (both public and private), are given an opportunity to contribute to the overall project design by making recommendations and raising concerns about the proposed projects before they are implemented. In addition, the process creates a sense of responsibility, commitment and local ownership for smooth implementation. Stakeholder involvement and public consultation was carried out within the townships of Harrisburg and White Plain to record concerns of community dwellers. The Stakeholder Engagements were done in order to foster better mutual understanding, addressing concerns and incorporate opinions into the report.

This process enabled the establishment of a communication channel between the general public and the team of consultants, the project proponents and the Government; and the concerns of the stakeholders to be known to the decision making bodies at an early phase of project development.

4.1 Stakeholder Identification

Stakeholders can basically be grouped as follows:

- **Directly interested parties:** persons and (mainly) institutions who have a direct interest in the project, and who also have a more or less decisive influence on project outcome. This is, first of all, GOL represented by the LWSC, i.e. the project proponent, financing institutions (MLA-L, MCC), and other selected organisations.
- **Indirectly interested parties:** this is, in a very general way, the entire population of Liberia, or, in the short and medium term, at least the part of the population which expects to have clean water supply, and with it general living and economic conditions, improved by the project; this also includes enterprises and workers who hope to get contracts and jobs in the course of project implementation. This group, while certainly in favour of the project, has little or no direct influence on project outcome.
- **Involved parties:** these are mainly state organisations that, in their immediate function have no direct interest in the project as such, but are involved *ex officio* in the project preparation and implementation process. This is e.g. EPA, the entity responsible for conducting the ESIA process and of issuing the environmental licence to the project, but also other entities whose interests may be affected by the project (e.g. those responsible for agriculture, forestry, fisheries and public health). They have a direct influence on project outcome.
- **Affected parties:** this is the population directly and physically affected by the project as such, i.e. the population living in the area where the project is located, and which will be changed by construction activities, project implementation and operation. The most direct impact on this group is loss of land and potentially housing, aspect mentioned in this report in a preliminary way and to be dealt with

in detail in the RAP. To some extent, this group is obviously also an "interested party" insofar as they expect jobs and other economic advantages from the project. While this group is the one most directly affected by the project, it is also the one with the least influence on project outcome.

The focus of the participatory process in the ESIA and RAP development lies clearly on this latter group. While at least some of the directly interested stakeholders (like LWSC and MCA-L as Clients for the ESIA) and some of the involved parties (mainly EPA as the institution finally deciding on issues related to environmental impacts) are directly involved in the Project, and automatically receive the reports, it is important that the main stakeholders, the affected parties (PAPs, project affected persons) receive adequate information on the project and are also enabled to voice their concerns and suggestions.

4.2 Consultation and Public Participation

Prior to commencing the ESIA process, public notice was published and posted in local dailies and Project Affected Communities. The public Notice of Intent (NOI) was prepared according to the Liberia Environmental Procedural Guidelines and was posted in the two townships of the project area (Harrisburg and White Plain) requesting interested individuals, organizations and stakeholders to provide their comments and feedback within one month of the publication of the notice.

The public notice provided the public with one of the first formal notifications of the project. The notice contained a brief overview of the technical details of the Project and a description of the activities that are to be undertaken by the proponent (MCA-L). It also satisfied the requirements for environmental compliance for the purpose of collecting the information to prepare an approved Scoping Document and Terms of Reference (ToR) for the ESIA study, as required under the Environmental laws and guidelines.

In order to increase the publicity and inform more stakeholders, notices were also placed in various other prominent public locations such as public and private buildings and communities by the survey teams during the collection of the data. Informal interviews, public consultation meetings and Focus Group Discussions (FGDs) were conducted at various locations by the survey teams during the study. Copies of the public notice and map showing the proposed project operational areas were distributed to individuals attending the meetings with a request to provide feedback. A brief verbal presentation on the proposed project in each of the townships were made and queries were clarified. Some stakeholders were not keen to express their views in public therefore contact details were also made available to reluctant individuals and for those not able to attend the meetings in person. Wherever applicable and appropriate, discussion sessions with the individuals, officials and civil society organizations were made and the comments, feedback and suggestions were collected to support the preparation of the report.

Figure 4-1: Stakeholder Consultation at Fire Point Community

Table 4-1: Consultation Matrix

Date	Location of Meeting	Number of Participants	Matters discussed, questions and answers
Community Consultation Meetings			
April 19, 2019	Harrisburg Township	79	• Introduction of the team • Introduction of the Project and area it covers; project status • Encouraging the Participants to be open and feel free in expressing their opinions. • Presentation of LEC and LWSC (including brief history and overview of the formalities leading to the proposed construction of the pipeline) • Short presentation of standards to be acquired (EPML of Liberia IFC Performance standard 5). • Summary of the impacts that might occur Question and answer session: • Main issues were access to the river, • change in route design between preparation of RFP and RAP, • compensation aspects (graves, land, crops)
April 23, 2019	White Plains	18	• Introduction • Emphasized on the essence of the ESIA and RAP process. • Provided detailed explanation on the new design. • Commented on the role of DENYS as well as provided detailed information of DENYS' involvement with the project.

Date	Location of Meeting	Number of Participants	Matters discussed, questions and answers
			• Distributed and provided detailed understanding of the Stakeholder Engagement Brochure, Grievance Redress Mechanism and Assets Evaluation Forms to the locals. • Posted the Assets Evaluation Form at strategic locations in the project area. • Established the cut-of- date of all affected properties (April 19, 2019, 3:00pm). • Exemplified how the asset evaluation exercise will be carry out. Question and answer session: • Job opportunities, • compensation aspects (graves, land, crops),
Women Focus Group Discussion			
April 19, 2019	Fire Point		• What the women know about the project and if they are participating in decision making? • Do you have access to legal title of land? • What are the livelihood activities and expected changes? • Are there specific needs for women? • What are the existing skills among the women? • What are the common diseases and the current state of health facilities? • What are the expected social impacts related to displacement? • What needs to be taken into account related to resettlement? • What are challenges in the area on women in terms of marketing of local produce? • What is the perceived percentage of educated women in the area and what can be done to improve the condition? Question and answer session: • Job opportunities, • Compensation aspects (is there the possibility of land for land and house for house compensation instead of cash)
Further Focus Group Discussions			
April 19th to 26th 2019	White Plains, Displace Camp, Zubah Town, December Town,		• What is the integrity of the existing water distribution network? • Is the water supply capacity adequate to provide the additional water demand to meet expanded system and expectations of the consumers? • How sustainable is the supply in the long run?

Date	Location of Meeting	Number of Participants	Matters discussed, questions and answers
	Fire Point, Plum Hill and Raymond Camp		• Is there a monitoring procedure and components for the water distributed and supplied to track losses and value of water supplied? • What is the level of ability and willingness of consumers to pay for water as a justification for the construction of the pipeline? • What are implications to the physical environment (drainage, sanitation and hygiene) in the project area following the proposed works?
Household Questionnaire			
April 19th to 26th 2019	Affected PAPs	46	• What is the expected value of the project? • What is the current source of water of the PAPs? • Willingness to pay for the project. • Expected disadvantages of the project • Major concerns and impacts expected on the communities • Road conditions • Land use and land productivity • Involvement of local community in the construction • Expected social impacts and suggestions to reduce impacts • Environmental concerns

4.3 Results of Public Consultation

More than 30 key informants were interviewed from March 26 to April 23, 2019 within Montserrado County and the project area. Formal public meetings were conducted in the Townships of Harrisburg and White Plain. The meetings were held on the 19th and 23rd of April in Harrisburg and White Plain respectively and were meant to introduce the project to the communities and get better understanding of social and community structures. The list of attendants is appended in Annex 5 of this report. Furthermore, a list of Meetings held with stakeholder is provided in Annex 5.

Over 90 members of public attended the meetings in the project areas. The two public meetings had low female turnout because the communities are patriarchal in their social setup and males take the lead in all major decisions and communal development matters. However, with the rising gender sensitization and women involvement in political and social matters, we anticipate more females and gender balance in subsequent consultations.

The results from these consultations are discussed below.

Table 4-2: Results of the public consultation

Issues	Comments
A. Value of the project in the area	
What is the main source of water for general domestic use?	Residents said that they obtained water from the following sources: Hand pumps, wells, and the St. Paul River and water vendors.
Whether their main source of water is the same during the dry and wet seasons	Most of them said no. According to them, the quality of the waters are sometimes clean and sometimes dirty. During the tense stage of the dry season, most of the water is undrinkable.
Whether they find the project (construction of the raw water pipeline useful) and its benefits after upgrading it to the proposed standard	All of them agreed that the project will be useful in terms of: • Provision of quality drinking water and water for domestic use; • Increased wealth creation owing to influx of investors coming to exploit the increased business potential due to availability of hygienically safe and clean water; • Savings arising from reduced price and time spent fetching water; • Increase in the government revenue generation; • Creation of employment during construction and operation phases of the project; and • Boost in business of construction materials and consumables especially during construction phase. **Even though the local population would see the provision of drinking water as one of the main benefits, it needs to be pointed out that there is no water distribution network to the communities. There is only in Monrovia a distribution network.**
Whether they are willing to pay for water from LWSC	Most of the respondents said they are willing to pay at a reasonable cost
Disadvantages of the project	• Loss of properties; • Loss of farmlands; • Change of socio-cultural setup of the community; • Air pollution; • Discharge of runoff to nearby farms thus destroying crops and soil erosion issues
Major concerns regarding the upgrading of the Raw Water Transmission Pipeline	• Drainage and erosion concerns • Pipeline should be constructed to standard so that it can last longer; • Disruption of services; • Health and safety standards should be followed; • Pollution; • Incidences of accidents may increase; • Economic growth in the area • Unlocking the potential of the high potential areas

How the pipeline construction impact on the community	• Opening up of the place for investments; • Increased urbanization • Establishment of institutions e.g. schools and etc.; • Reduced costs on water; • Employment opportunities to work with the construction company
B. Road condition in the area	
Prevalent mode of transport within the two Townships	Pehn-Pehn i.e. motorcycles, private transport and public transport (buses), trucks
Effects of the road condition on the community	• Delay of the farm produces reaching the market; • Waste of time and unreliable means of transport; • Accidents; • Breakdown of vehicles; hence increase in transport costs; • Delays in accessing social amenities e.g. hospitals and schools; • Hinders communication; and • Slowed down economic growth of the area.
C. Impacts on Land Use and Land Productivity	
Centers that are of major economic value along the pipeline transmission route in the two Townships	• Raymond camp (houses largest market center in the area); • Mount Coffee Hydro Power plant.
Major economic activities in the two Townships	• Agricultural crop and livestock production; • Transport; and Trade.
Constraints encountered in the named economic activities	• Access to markets; • Exploitation by brokers;
	• No access to credit facilities; • Poor infrastructure.
How the new pipeline construction will affect land use and land productivity in the area	• Change in land use; • Land value will go up; • High land utility.
D. Raw Water Pipeline Construction and Workforce	
Ways in which the local community can be involved in pipeline construction	• Involve the locals in unskilled labor with a priority on skilled locals; • Recruitment should be done in liaison with provincial administration; and • Use locally available raw materials supplied by locals. • Involve the locals in maintenance of the pipeline.
Locations recommended for the workforce	• Harrisburg and White Plain Townships
Services to be provided by the local community during construction	• Guards including security; • Catering services; • Skilled and unskilled labor; • Accommodation; • Drivers; • Clearing of the pipeline passage route; and • Culvert construction.

E. Social Impacts	
Impacts that the non-local workers will have on the locals	• Increased income; • Disharmony with the local communities; • Pressure on local resources; • Insecurity; • Change of socio-cultural set up; • Integration, peace building and friendship; • Education/exchange of knowledge/ideas; • Disease outbreak.
Suggestions to reduce the resultant negative impacts	• Give the locals jobs; • Involve local leaders in integrating local and non-local workers; • Community policing; • HIV/AIDS awareness; • Sensitization and mobilization of the community; • Increase security patrols; • No grazing along the road to avert accidents; and, • Advertise recruitment to the local community.
F. Environmental Concern	
Changes in Physical Features	Due to felling of trees along the proposed pipeline transmission route, the community felt that this will negatively affect the physical appearance of the area.
Degradation of Water Courses	The communities were of the opinion that the value of the wetlands and water courses will be degraded.
Dust and Noise	The communities expressed fears of possible increase in dust and noise especially during the construction phase.

Figure 4-2: Consultation Town Chief of Displaced Camp Community

4.4 Public Disclosure and Further Consultation

Once the final ESIA, ESMP and RAP report is approved, it will be disclosed in Liberia by the Liberia Water and Sewage Corporation, DENYS, MCA-L and the EPA. There will be newspaper advertisement. Summaries of these documents will be made available in the affected areas. Copies will also be disclosed at the Town Hall in Harrisburg and a public meeting will be held to explain the conditions set in the ESIA, ESMP and in the RAP Report.

For the effective implementation of environmental and social mitigation measures as well as the resettlement, consultations with PAPs must continue during the entire project. Emphasis must be laid on planning and implementing livelihood income restoration strategies, stressing activities chosen by PAPs. The organisation of public consultation will be left to LWSC and DENYS. It is required that the on the ground Liaison Officer (LO) take on this role, as he or she will eventually have an established rapport with the PAPs. The continued consultations should be organised when the RAP report is approved and subsequent to the final public participation related to the RAP Report.

Issues that could be discussed and agreed upon during the continued consultations could include:

- Update on project progress
- Compensation and its contents, additional information on when compensation is to be paid, and how the process will take place should be displayed on notice boards at the project office, District Commissioner's or Chief's residence, and conveyed in the different media.
- All reports, including monitoring and evaluation reports of the project should be made available at the project offices on the ground.
- Inclusion of vulnerable groups and making sure they understand the project and their needs are catered for.
- Continued consultation to encourage PAPs and their leaders to participate in the project and offer their views on any issues affecting the project.
- Grievance mechanism and code of conduct of workers.
- Any job opportunities
- Information of PAPs in case of dangerous activities e.g. passing of heavy goods vehicle trough villages.
- HIV/ AIDS Campaigns

5 ENVIRONMENTAL AND SOCIAL BASELINE

5.1 Methodology

The first step in the assessment was the delimitation of the study area for the ESIA. Therefore, the design was reviewed from an environmental, social and OHS perspective, to understand the footprint of the project and the activities to be carried out. The final corridor and all areas permanently or temporarily in use were defined in close cooperation with the engineers and designers, taking environmental and especially social aspects into account (avoiding physical resettlement). The project footprint is the permanent corridor and permanent access roads as well as all temporary areas like laydown areas and camp area or any other appurtenant facilities (workshops, storage facilities, temporary waste facilities, etc.). All those areas are affected by the project in a way as they might have negative impacts on the environment including local population.

The MCHPP-WTP Pipeline Project is close to Mt Coffee HPP and the pipeline follows in large parts the transmission line to Mt Coffee HPP or is located less than 500 meters from the transmission line ROW. As such, the base line data (physical environment and biological environment) collected for the transmission line and Mt Coffee HPP as well as the ESIA Report from CH2M have been used as secondary baseline data. The desktop studies included the species identified in the above mentioned studies, as well as available species lists for the country. The species have been counterchecked with the IUCN Red List of global threatened species. Further, existing basic documents gathered during the study included topographic maps, scientific and technical reports, and Government reports. Information sources and references are provided in Annex 3.

In addition, discussion with Government officials and project team members such as the Engineer, Geologist, Hydrologist, and Surveyor took place. Discussions with the Government officials involved an explanation of the proposed project and soliciting their views on environmental and social aspects that need to be considered during the design and implementation of the project.

The field data collection (primary baseline data collection) was carried out through structured questionnaires, use of checklists, observations and photography, site visits, and consultation with stakeholders.

The interviews were used to determine the presence and locations of species within the study area. Communities were selected based on their distances apart to ensure that the sampling took place with even resolution. The townships' leadership (Harrisburg and White Plains) were asked to assemble a focus group of hunters and farmers or any other persons they deemed knowledgeable. Three exercises were carried out with the locals to generate information relative to the scope of work.

- The first was to gather a list of common names of animals seen around the communities.
- The second was to undertake a community mapping exercise which aimed to physically plot the spatial distribution of biodiversity in the project area.
- Thirdly, locals were shown a sequence of flash cards of FDA protected species and were questioned as to whether those animals were sighted in their respective communities.

5.2 Physical Environment

5.2.1 Topography

Generally, Liberia has low relief topography. Its coastline is approximately 560 km long characterized by unbroken sand strips and is dominated by lagoons and marshes. The country can be divided into three distinct topographical areas. First, a flat coastal plain which extends up to 80 km inland, with creeks, lagoons, and mangrove swamps; second, an area of broken, forested hills with altitudes from 180–370 m, which covers most of the country; and third, an area of mountains in the northern highlands, with elevations reaching 1,384 m. The project area is located within the coastal plain, which extends up to 80 km inland, generally flat with some undulating rises, with creeks, lagoons, and mangrove swamps and an average elevation of approximately 50 m asl.

5.2.2 Geology and Soil

The geological conditions of the project site are decisive for the routing and design of the raw water transmission pipeline project, and for this reason, geology has to be investigated as part of the technical studies for the project. However, the geology as such will not be influenced by the project.

The geology of the project area consists primarily of granitic gneiss overlain by recent alluvial and colluvium deposits. The granitic gneiss varies in degree of weathering, depending on exposure and outcropping. Rock observed in recent cuts along the road or quarry site exhibited a highly weathered section that appears to be relic rock and behaves more like a soil referred to as laterite. This zone extends several meters before transitioning to a more competent, still weathered zone referred to as saprolite. The saprolite extends over further meters before it turns into competent rock in which the weathering effects have minimal impact. The rock along the rivers and creeks is usually slightly weathered, as it is anticipated that the erodible rock has been removed through erosional processes.

Soil in the area consists of clay sourced from the weathering breakdown of the rock, or alluvial deposits consisting of sand and silt from the St. Paul River and tributaries. Alongside the stream and riverbeds rich alluvial soils are encountered. They contain a high amount of the necessary plant nutrients and are best for agricultural production.

To assess the soil quality samples were collected at three locations (White Plains, Queens Creek, Thomas Johnson Farm) at a depth of 50 cm. The soil quality parameters considered are consistent with the EPA's approved parameters of concern (POC) for said project. The results of the analysis and method adapted are presented in Table 5-1.

Table 5-1: Soil quality results

Parameter	Unit	Analytical Method (Instrumentation)	SS1	SS2	SS3
pH		Colorimetry	5.73	5.16	5.77
CEC*	cmol/kg	Colorimetry	117.4	119.5	113.5
TPH**	mg/L	Colorimetry	ND	ND	ND
Sulphate	mg/kg	Photometry	0.13	0.11	0.20
Total Nitrogen	mg/kg	Photometry	9.61	8.73	9.03
Lead	ppm	Spectrophotometry	0.03	0.01	0.01
Mercury	ppm	Cold vapor	<0.01	<0.01	<0.01

*Cation Exchange Capacity; **Total Petroleum Hydrocarbon

The results showed that the soil samples at the three collection points were in the acidic range. Cation exchange capacity ranged from 113.5 to 119.5 cmol/kg while total petroleum hydrocarbon (TPH) and mercury remained undetected throughout the study. Lead, sulphate, and total nitrogen were reflective of background levels across the studied area.

5.2.3 Climate

Liberia's climate is humid and tropical with a distinct wet season and dry season. Precipitation shows a clearly seasonal pattern, with a dry season from November/December till April and a rainy season from May till October/November. Overall rainfall decreases markedly from south to north, i.e. from the coast to inland, being on average, in mm/year, 4'540 in Monrovia, 2'508 in Bong Mines. The temperature can range from as low as 15°C to as high as 35°C. The average annual temperature along the coast ranges from 24-30°C.

Relative humidity goes as high as 88-89.2%. The dry season runs from November to March. Worldwide climate variations and change are reported to have had some effect on the existing climate regime in the area, with respect to temperature, rain patterns and seasonal variations.

5.2.4 Water

5.2.4.1 General Hydrology

The hydrological pattern of the proposed project area is drained by the St. Paul River and its tributaries such as the Wayduo. These water bodies serve as a major livelihood income generation for most of the residents of the Project Affected Communities (PACs). The following map shows creeks and stream in the project area.

Figure 5-1: Streams and Creeks in the Project Area.

During the site assessment, it was revealed that the general flow patterns of these water bodies are either from North-West to South-East or South-West to North-East directions and towards the Atlantic Ocean. These streams are influenced by the climatic conditions of the country. During the wet season, large quantities of rain are falling, the streams are draining the surface water into the St. Paul River and some of them seem to disappear or dry up in the dry season.

Figure 5-2: Partial view of the St. Paul River (Left) and the Wayduo Creek (Right)

5.2.4.2 Mt Coffee HPP and its discharge pattern

The Hydrology of the St Paul River for the downstream area is determined by the operation of the Mt Coffee HPP. Therefore, a table of the relevant characteristics of Mt Coffee HPP is given below.

Table 5-2: Main parameters of hydrological importance of Mount Coffee HPP

Parameters Mt Coffee HPP	Unit Metric System	Values	Unit Imperial System	Values
1. Reservoir				
Unplanned Outages Level (UOL)	m asl	29.56	ft asl	97
Full Supply Level (FSL)	m asl	29.08	ft asl	95.4
Area at FSL	km²	13.8	acres	3410
Minimum operation level (MOL)	m asl	27.43	ft asl	90
Normal Drawdown	m	1.65	ft	5.4
2. Power house and capacity				
Total Installed Capacity (tentative)	MW	88	MW	88
Turbine Type and Number of Units	N	4 x Francis	N	4 x Francis
Capacity of Turbines	MW	22	MW	22
Turbine output	m³/s	420 (4 x 105)	cfs	14832 (4 x 3708)
Total Head	m	22	ft	72.4
3. Hydrology				
Catchment Area	km²	19'992	Sq.mi	7719
Average River Discharge at Dam Site	m³/s	564	cfs	19'900
Environmental flow through the spillway	m³/s	8		282
Annual Rainfall (a)	mm	~3'800	in	~150

[a] = average between Bong Mines and Monrovia stations

MCHPP started operation in December 2016, since then the discharge of MCHPP was in a constantly changing process of operation due to optimisation and adaptation to the of the energy consumers.

The first turbine (Unit 1) went in operation December 2016, Unit 2 in February 2017, Unit 3 in March 2017 and Unit 4 finally in April 2019. However, there are some problems with Unit 4, therefore it is currently only on standby. Normally all Units could operate with a flow rate of 105 m^3/s, which would result in a total flow rate to operate the plant at full capacity of 420 m^3/s. However, this is currently an unrealistic scenario, since it requires in addition sufficient energy consumers (end users). The distribution network for energy currently does not provide sufficient end users to actually operate the HPP on full capacity. It is currently operated on one to three turbines. Since March 2017 the plant has an average monthly discharge of 108.27 m^3/s through the turbines (min= 0 m^3/s, 1 quartile =86.68 m^3/s, 3 quartile 137.9 m^3/s, max= 225.4 m^3/s)

The following figure provides the average monthly inflow at Haindi (about 65 km upstream of MCHPP) and the total discharge from MCHPP since operation started. The months marked in light blue should indicate the rainy season. Furthermore, a table providing the inflow at Haindi, the discharge through the turbines, the discharge through the spillway is given below.

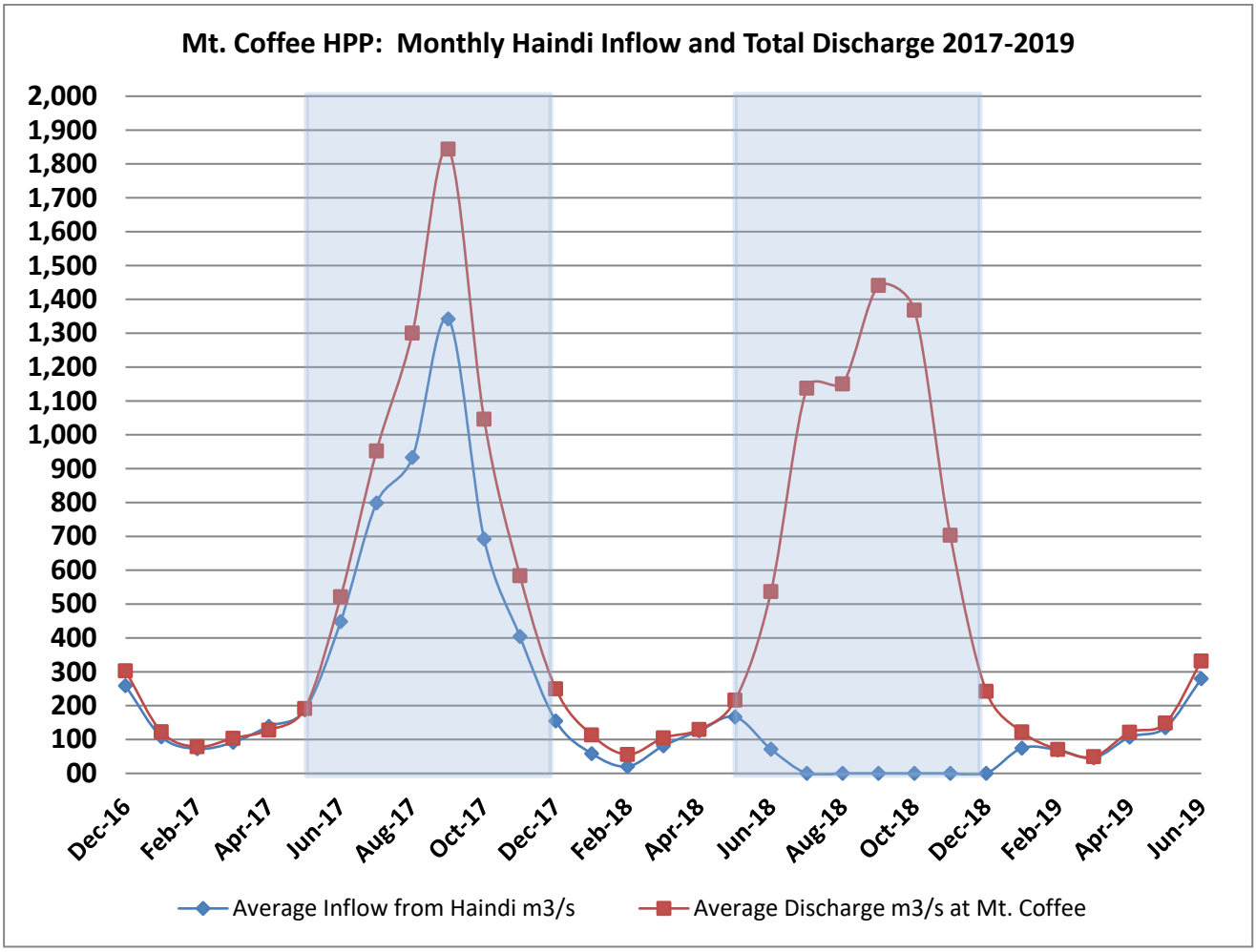


Figure 5-3: Mt. Coffee HPP: Monthly Haindi Inflow and Total Discharge 2017-2019

Table 5-3: Relevant Parameters of Mount Coffee HPP for the project

Time String	Average Inflow from Haindi m^3/s	Average discharge spillway m^3/s at MCHPP	Average discharge turbined in m^3/s at MCHPP	Total Average Discharge m^3/s at MCHPP
Dec-16	259.1	289.27	13.5	302.7
Jan-17	107.9	60.28	62.64	122.9
Feb-17	72.6	28.28	50.15	78.4
Mar-17	91.5	57.41	46.26	103.6
Apr-17	139.2	53.71	74.08	127.8
May-17	187.9	110.5	80.94	191.4
Jun-17	448.3	445.6	75.72	521.3
Jul-17	798.9	867.9	84.36	952.3
Aug-17	933.0	1214.6	85.67	1300.3
Sep-17	1342.2	1743.8	99.81	1843.6
Oct-17	692.2	943.4	102.45	1045.8
Nov-17	404.0	473.2	110.33	583.5
Dec-17	154.7	132.0	117.54	249.5
Jan-18	58.6	12.4	101.06	113.5
Feb-18	20.5	8.4	47.15	55.6
Mar-18	81.5	8.0	96.99	105.0
Apr-18	125.6	8.0	121.60	129.6
May-18	166.7	79.6	136.71	216.3
Jun-18	71.3	397.4	139.47	536.8
Jul-18	0.0*	1009.1	128.47	1137.6
Aug-18	0.0*	1012.2	137.84	1150.1
Sep-18	0.0*	1304.8	136.28	1441.1
Oct-18	0.0*	1219.4	148.67	1368.1
Nov-18	0.0*	581.5	121.45	703.0
Dec-18	0.0*	86.4	156.16	242.5
Jan-19	74.6	6.2	116.26	122.5
Feb-19	69.2	7.44	63.27	70.7
Mar-19	45.5	8.0	41.63	49.4
Apr-19	107.2	8.0	113.24	121.3
May-19	135.1	10.9	137.71	148.6
Jun-19	279.5	191.64	139.91	331.5

* No data available

The average monthly discharge data vary during rainy season between 150 m^3/s and 1850 m^3/s. The amount required to operate MCHPP on full capacity is given for the months between June and November. In May it can operate approximately two turbines. In relation to the overall water discharge during rainy season, the withdrawal of 0.9 m^3/s results in a reduction of flow by max 0.6% and minimum 0.005%. In general, it can be stated that during rainy season there is sufficient water to operate MCHPP (see values on discharge through the spillway) and the Raw Water Pipeline. Additionally, the overall discharge is high enough that the reduction of max 0.6 % can be seen as negligible in relation to impacts on the downstream area.

The overall discharge during dry season in the last three years varied between 50 m^3/s and 250 m^3/s this results in a reduction of max 1.5% and 0.3% when withdrawing 0.9 m^3/s for the Raw Water Transmission Pipeline. As can be seen in the table above the spillway discharge from January to April is around 8 m^3/s, which is the required environmental flow. This means that all the water except of the 8 m^3/s is used for energy production and that the downstream flow during the dry season is almost completely determined by MCHPP. Therefore, it is necessary to look further into the discharge pattern of MCHPP.

The incoming water from Haindi in dry season is not sufficient to operate the MCHPP with more than one turbine. The turbine is either operated on low capacity the whole day, or on full capacity during peaking hours (current practice is to operate it during peaking hours, evening time) and the time between operation is used for the refilling of the reservoir. This results in several factors which have to be taken into account when operating an HPP:

- Amount of incoming water
- Required energy of end consumers and time when it is required
- Reservoir level, there is a range in which an HPP can operated. This range is determined by the dam height/spillway height (full supply level) and the height of the location of intake structure (minimum operation level). Furthermore, the flow (m^3/s) and the head (height difference between turbine and water level) determines the electrical power production. Therefore, it is normally aimed to keep the water level as close as possible to the full supply level.
- Obligational environmental flow

The following figure provides a typical operation pattern including reservoir level from January to March 2018. The yellow lines indicate the range within the reservoir can be operated (27.4 m asl - 29.0 m asl); the blue line shows that during dry season the reservoir level decreases (resulting in a reduction of energy per m^3/s), since sufficient inflow (green line) is not available to refill the reservoir. The gray lines show the total discharge (dark gray line) and the water used for energy production (light gray line) the difference between the two gray lines is the discharge through the spillway (dark red line) which is during the dry season as can be seen below, almost equivalent to the environmental flow (light red line).

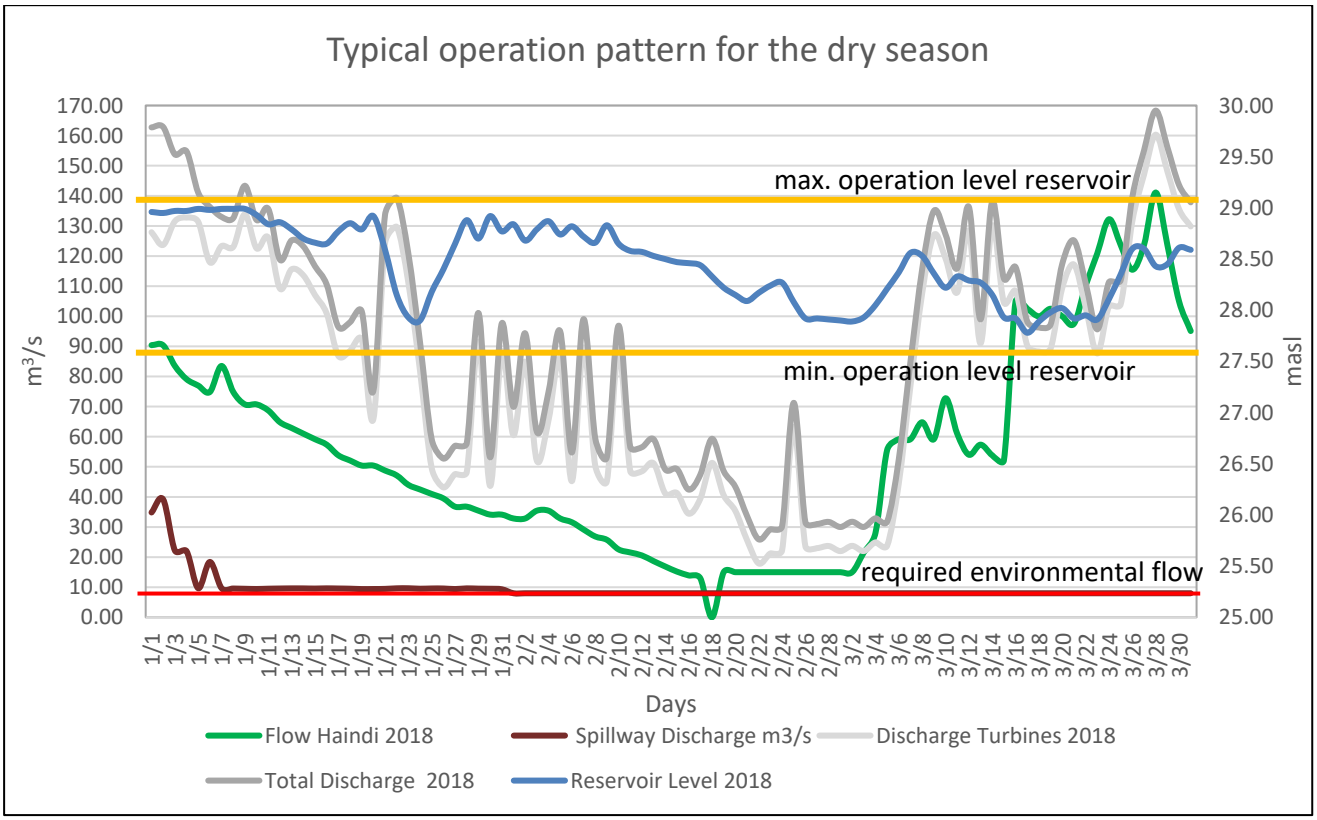


Figure 5-4: Typical dry season operation pattern for MCHPP (Jan.-Mar. 2018)

As can be seen in the discharge pattern there is a constant flow of about 8 m^3/s this flow is obligational and independent of the Raw Water Treatment Pipeline Project. Therefore, the actual environmental impact needs to be assessed on the overall discharge (spillway plus turbine discharge) which will be reduced as already stated by max 1.5% to 0.3%.

The withdrawal of 0.9 m^3/s will have an impact on the amount of water available for energy production and through this it may have the impact that the time to refill the reservoir will last longer which could have a slight increase in times where the St Paul's river receives only the environmental flow.

However, to assess this impact in detail, data over a longer period would be required. Furthermore, hourly discharge data would be required. However, the data currently available are covering 2.5 years (daily discharge) in which the energy sector was and is changing in Liberia, additional people have and will be connected to the net the energy demand will increase and the discharge pattern will be adapted as far as possible to serve the people during dry and rainy season. The impact on energy production will be profound while the impact on the environment is seen as comparably low since it was already caused by MCHPP.

As already mentioned, the impact on the energy production will be more significant, please refer to Chapter 5.4.15 energy production.

5.2.4.3 Water Use and Demand

All activities which require larger amounts of water are usually carried out at the St Paul's river. Those activities comprise of:

- Washing of clothes
- Washing of dishes
- Bathing and toilet

Further activities at the St Paul's river are fishing for fish and crawfish and collection of water snails.

In few cases the water is used for irrigation in case of small vegetable farms the water is carried by buckets. At larger farms small pumps with hoses are used, which are often shared between community members. In relation to the project site only one of those pumps was seen in 2016. The affected people within the questionnaire stated not to own irrigation pumps.

Water for cooking and drinking is mainly collected from creeks and streams (tributaries to St. Paul River) because of the better water quality.

The amounts received related to current water consumption varies since the amount carried depends also on the distance to the water source, as the further the water source is located, the more activities are directly carried out at the river side. While the closer the water source is located, the more water is carried home.

The number of required gallons per person per day ranges between 0.5 gallons (2 litres) and 15 gallons (56 litres) the average is 6 gallons (22.5 litres).

5.2.4.4 Water Quality

The Water Treatment Plant is located about 20 km upstream of the estuary into the Atlantic Ocean, the current water intake is located next to the WTP at the river about 2.24 m asl. The terrain from the water treatment plant to the estuary of the St Paul's river is very shallow without any rapids or higher steps. Furthermore, as the water flow during dry season is very low, this situation was probably even increased through the operation of MCHPP since during reservoir refilling (peaking operation during dry season) only the environmental flow is pushing the saltwater back. Saltwater intrusion is the movement of saline water into freshwaters. It occurs naturally since saline water has a higher mineral content and therefore it is denser and has a higher water pressure than fresh water. The high tide is entering the river from the estuary and pushing up-stream, due to the canalisation in the river the saltwater can overcome several meters in height difference. The amount of river water is not sufficient to push the saltwater back. Saltwater intrusion does not occur on a daily basis it is mainly controlled by river discharge and tide but also influenced by wind, topography, anthropogenic influences on the river and its estuary and sea level rise.

The occasions of saltwater intrusion were anecdotally told in 2012 during the assessment for Mt Coffee HPP and again in 2016 during the ESIA of CH2M. However, a scientific proof through water quality measurements is not available, since as stated above only on specific occasions the saltwater intrusion occurs.

Water quality data are available for MCHPP 4.7 km upstream of the WTP. Continuous water quality monitoring (sampling frequency: every 15 minutes) of five parameters (temperature, pH, turbidity, ORP, conductivity) for three locations (up-stream of the reservoir, at the intake and downstream of the reservoir) is carried out since 2014.

The following figures provide the water quality data of 2018 were most of the construction work were finalised and could therefore not have an impact on the water quality.

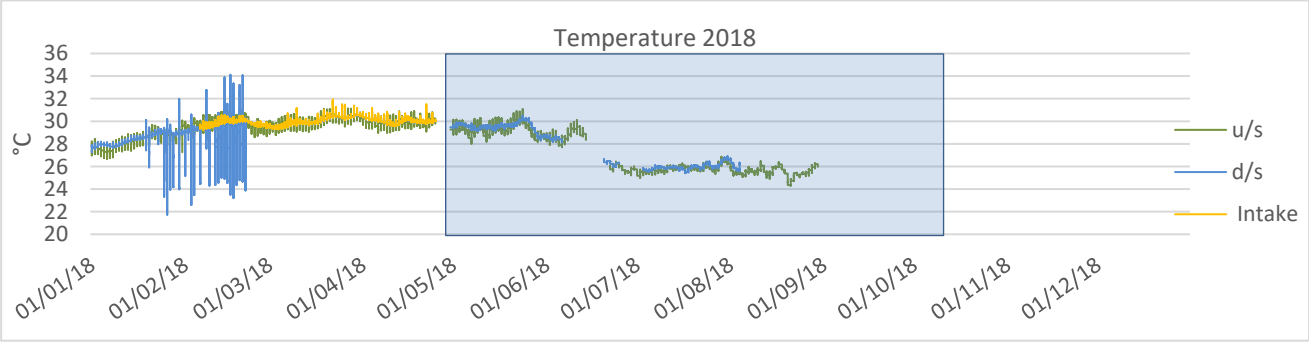


Figure 5-5: Continuous water quality measurements:Temperature-2018.

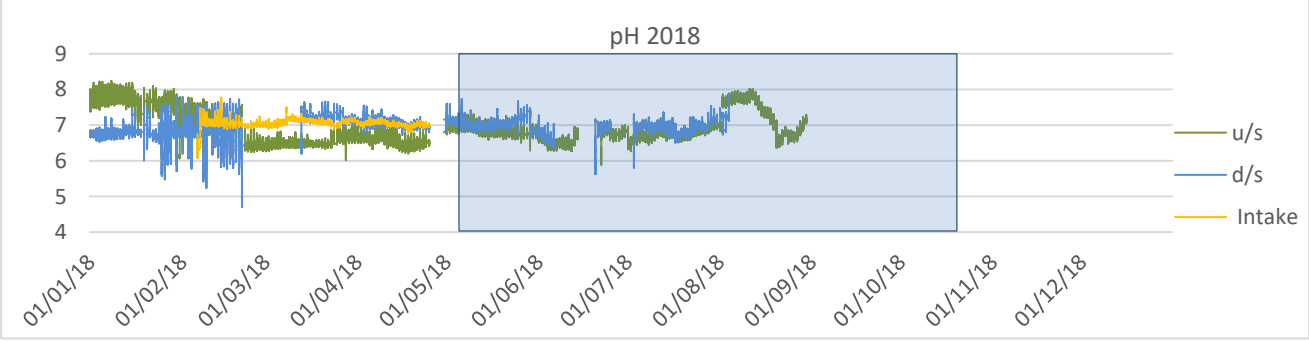


Figure 5-6: Continuous water quality measurements:Ph-2018.

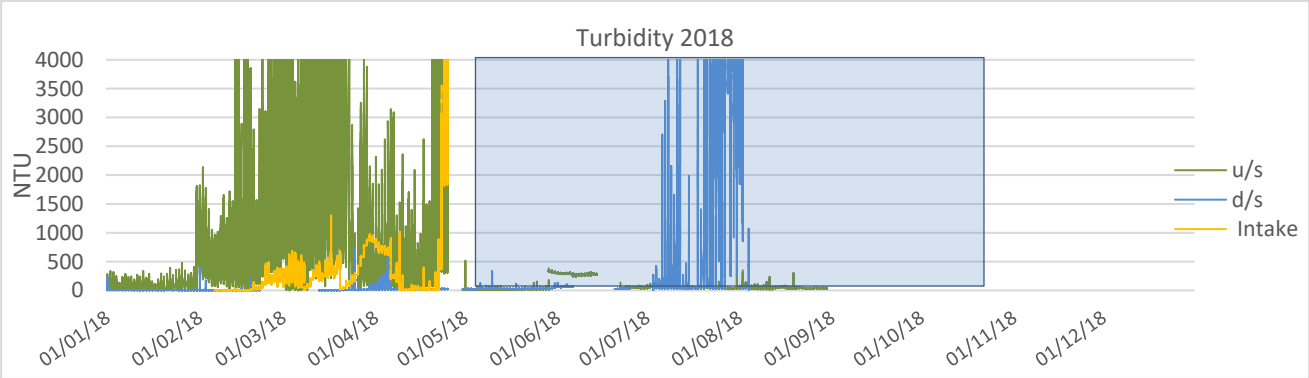


Figure 5-7: Continuous water quality measurements:Turbidity-2018.

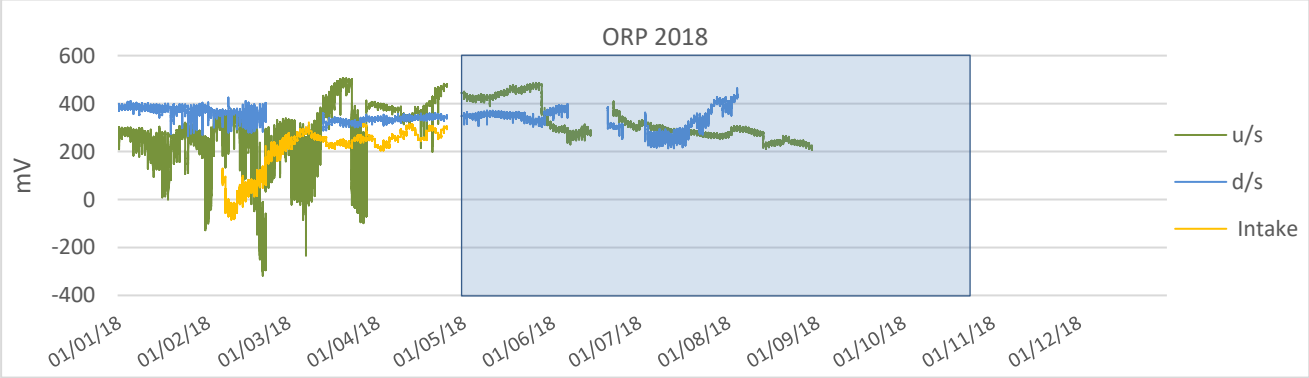


Figure 5-8: Continuous water quality measurements:ORP-2018.

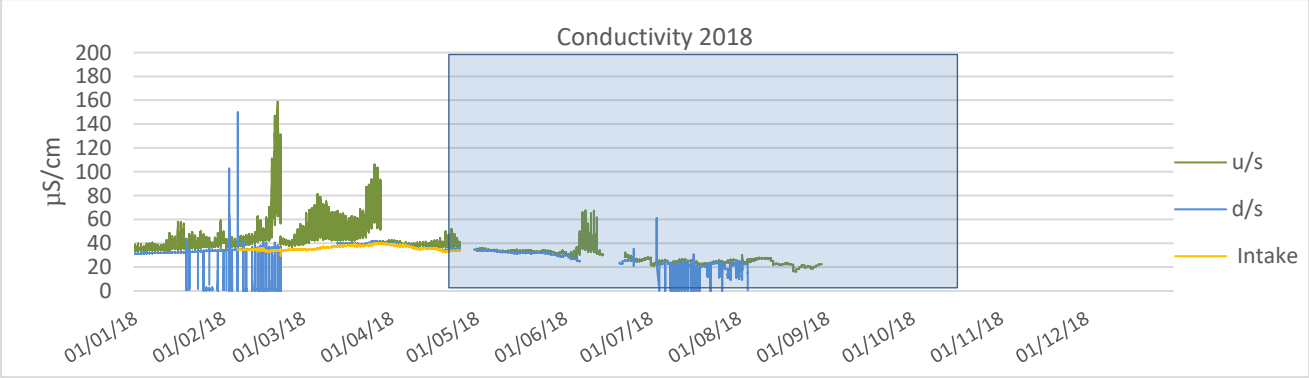


Figure 5-9: Continuous water quality measurements:Conductivity-2018.

In the following, only the downstream and intake data are discussed since they are within the project area. The intake water will be the water used in the WTP and the downstream data are the closest to the current intake.

The temperature in the downstream area raged between 22°C and 34 °C with an average of 28.5°C. The temperature for the intake ranges between 29°C and 32°C with an average of 30°C. The smaller temperature range in the reservoir is caused by the larger water body, low flow velocity and stratification. The measurement device is located at about 25 m asl about 4 meters below FSL.

PH ranged for the downstream area between 4.8 and 8.2 with an average of 6.9 and for the intake between 6.1 and 7.8 with an average of 7.1. The average pH for both locations is within normal limits.

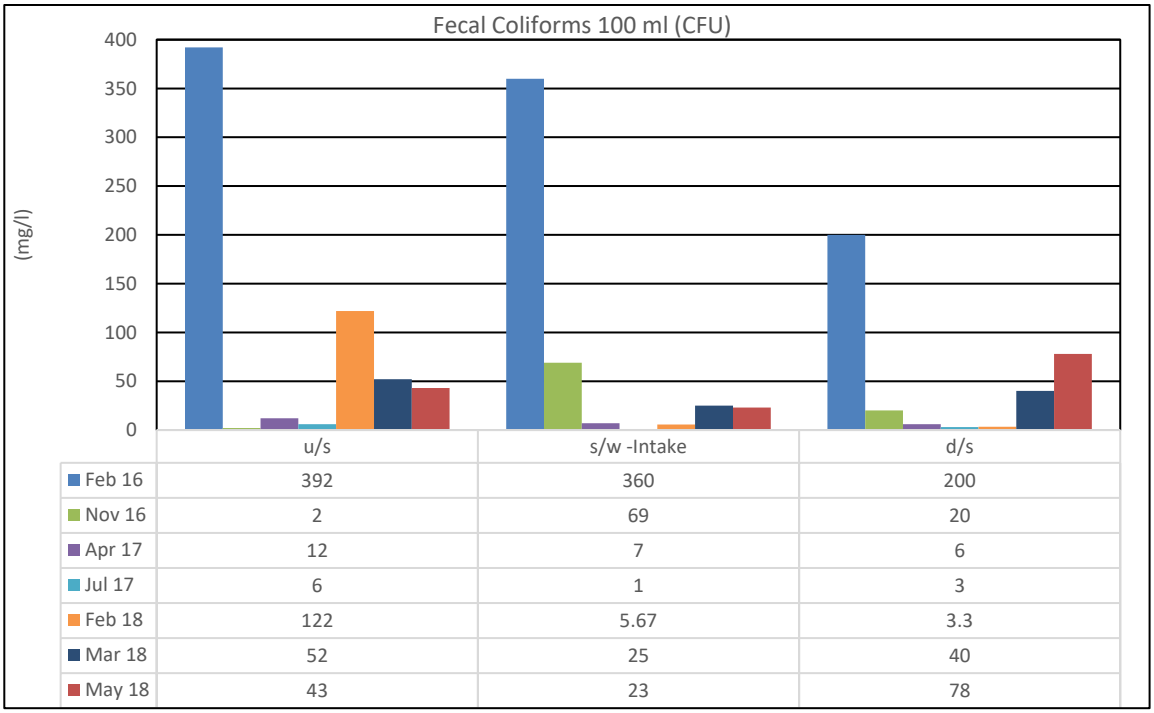
The turbidity ranges for downstream between 0 NTU and 9688 NTU with an average of 272 NTU while at the intake between 2 NTU and 4375 NTU with an average of 311 NTU. The very high values on turbidity for the downstream area are caused by sand mining activities close to the measurement site. The very high measurements above 1500 NTU at the intake were all within three days (23-25 April 2018) and maybe caused by cleaning activities at the intake. If those three days are not taken into account, the average is 235 NTU.

The ORP measures the ability of a river to cleanse itself or break down waste products, such as contaminants and dead plants and animals. The higher the ORP value, the more oxygen is present in the water, the better the ability of the river for self-cleaning. The ORP values for the downstream area rage between 213 mV and 463 mV with an average of 345 mV the average for the intake is at 207 mV which is an indication that the St Paul's river has a rather good self-cleaning potential.

Conductivity ranged between 0 µS/cm, which is normally not possible and 149 µS/cm with an average of 30 µS/cm at the downstream area and between 29 µS/cm and 40 µS/cm with an average of 36 µS/cm at the intake.

In addition to the continuous monitoring quarterly samples were taken on fecal coliforms as well as on chemical parameters.

The following graph shows fecal coliforms per 100 ml upstream of the reservoir, at the intake and downstream of the reservoir.



	u/s	s/w -Intake	d/s
Feb 16	392	360	200
Nov 16	2	69	20
Apr 17	12	7	6
Jul 17	6	1	3
Feb 18	122	5.67	3.3
Mar 18	52	25	40
May 18	43	23	78

Figure 5-10: Periodic Water quality measurements: Fecal Coliforms 2016-2018.

Currently it can be stated that there are less fecal coliforms at the intake than in the downstream area however the data set provided displays the potential for seasonal and/or other variations.

The following table contains the main parameters monitored from 2013- 2018.

Table 5-4: Periodic Water quality: Chemical Parameters 2013-2018

Parameter	USEPA MCL	WHO	Unit	Spillway								Intake			
				2013	2014		2016			2017		2018			
				Nov	Feb	Jun	Feb	Jun	Nov	Mar	Jul	Jan	Feb	Mar	Mai
PH	6-9			5.5	6.3	6.4	7.06	7.06	6.89	7.29	7.22	--	6.81	7.22	7.55
TSS	N/A	N/A	mg/l	0.06	<0.02	0.06	2.5	7	7.8	<2	9	---	---	---	---
COD	N/A	N/A	mg/l	<25	<25	120	<7	15.5		14.9	23.4	---	---	---	---
Mercury	0.002	0	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	---	---	---	---
Lead	0.015	0.01	mg/l	0.003	<0.01	0.008	0.523	0.316	0.251	<0.1	<0.2	---	---	---	---
Nickel	N/A	0.02	mg/l	<0.001	<0.02	0.002	1.48	0.221	0.44	0.576	0.806	---	---	---	---
Nitrate	10	3	mg/l	0.7	<0.06	<0.06	0.5	0.5	0.672	<0.3	0.85	0.39	0.24	0.53	0.58
Nitrite	1	3	mg/l		<0.05		0.01	0	0.054	0.074	<0.05	0	0.01	0.01	0.01
Chloride	n/a	250	mg/l	0.7	0.08	0.9	0.11	0.12	<2	<2	<2	0.1	0.08	0.12	0.22
Cadmium	0.005	0	mg/l	<0.001	<0.002	<0.001	<0.01	<0.01	<0.08	<0.08	<0.08	---	---	---	---
Ammonia			mg/l	0.03	0.03	0.03	---	---	---	---	---	0.02	0.03	0.05	0.04

Parameter	USEPA MCL	WHO	Unit	Downstream												
				2013	2014		2016			2017			2018			
				Nov	Feb	Jun	Feb	Jun	Nov	Mar	Jul	Dec	Jan	Feb	Mar	May
PH	6-9			5.8	5.6	6.4	7.38	7.38	7.01	7.11	7.37	--	--	6.87	7.52	7
TSS	N/A	N/A	mg/l	16	12	15	<2	11.5	5	2	6.15	---	---	---	---	---
COD	N/A	N/A	mg/l	<25	<25	69	<7	10.7		9.13	23.5	---	---	---	---	---
Mercury	0.002	0	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	---	---	---	---	--
Lead	0.015	0.01	mg/l	0.001	<0.01	0.007	0.076	0.035	0.353	0.112	0.221	---	---	---	---	--
Nickel	N/A	0.02	mg/l	0.001	<0.02	0.002	0.788	0.15	0.522	0.487	0.796	---	---	---	---	--
Nitrate	10	3	mg/l	0.74	<0.06	<0.06	0.2	0.2	0.385	<0.3	0.891	0.21	0.27	0.46	0	0.56
Nitrite	1	3	mg/l		<0.05		0	0	0.05	<0.05	<0.05	0.01	0.01	0.01	0.13	0.01
Chloride	n/a	250	mg/l	0.7	0.08	0.9	0.07	0.07	<2	<2	<2	0.24	0.12	0.08	0.13	0.22
Cadmium	0.005	0	mg/l	<0.001	<0.002	<0.001	<0.01	<0.01	<0.08	<0.08	<0.08	--	--	--	--	--
Ammonia			mg/l	0.05	<0.02	0.04	---	---	---	---	---	---	0.02	0.04	0.02	0.07

None of the monitored chemical parameters changed significantly over the course of the last 5 years. Some heavy metals, such as lead, showed spikes caused by the project activities at MCHPP (hydro-jetting), but the levels were still below drinking water levels.

Summarizing the data provided it can be stated that the water quality at the intake and in the downstream area is in most of the parameters comparable. However, the very high levels on turbidity are lower at the intake than in the downstream area. The conductivity is more constant at the intake and the number of fecal coliforms is less in the reservoir than in the downstream area Seasonal variation, discrete weather events and localized characteristics associated with the sample locations are expected to have an impact on the data collected.

In addition to the assessment of previous data water quality data samples were taken May 26th, 2019 in the field. Six sampling points were established at the St. Paul River and

other water bodies along the project corridor in order to established environmental baseline condition before the commencement of the project operation. The samples included one ground water source and five surface water sources.

Table 5-5: Water Quality Sampling Sites

Sample Code	Location	Sampling Time	Date	GPS Coordinates (UTM)	
GW1	Displace Camp	12:58 pm	25-05-2019	0315569	0715149
SW1	Queen Creek	01:20 pm	25-05-2019	0314900	0715213
SW2	Joygbolu	01:40 pm	25-05-2019	0315042	0715373
SW3	St. Paul River Downstream	02:22 pm	26-05-2019	0315750	0716055
SW4	St. Paul River Med stream	04:17 pm	26-05-2019	0316761	0717684
SW5	St. Paul River Upstream	04: 25 pm	26-05-2019	0316772	0717668

GW: Ground Water, SW: Surface Water

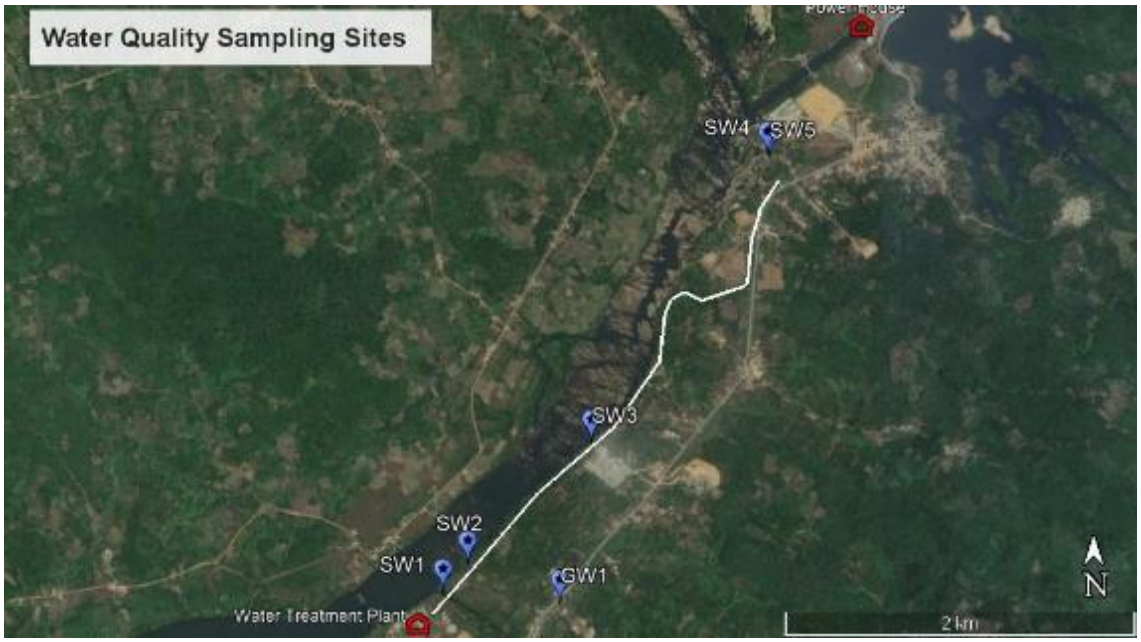


Figure 5-11: Water Quality Sampling Sites

The water quality results for the six sampling points are presented in Table 5-6. The result of the analysis showed that all but one of the samples fell below class II of the Liberia Water Quality standards. The only notable exception was Sample SW5 which recorded higher than permissible level of mercury. The recorded level of mercury in the sample may be due to artisanal mining activities upstream of the sampling point.

It is important to note that class II of the standards describes water used for recreational purposes. None of the samples tested were suitable for human consumption without treatment but can be used for recreational purposes and domestic activities (cooking, bathing, washing etc.).

Table 5-6: Water Quality Results

Parameters	Unit	Method	GW1	SW1	SW2	SW3	SW4	SW5	LWQS-I	LWQS-II
pH		Colorimetry	6.61	6.17	6.28	6.39	6.27	6.40	6.5-8.0	6.0-9.0
Turbidity	NTU	Turbidity Meter	1.03	2.04	2.04	3.95	4.03	4.73	5.0	10
TDS	ppm	TDS Meter	14.6	28.4	29.4	57.3	93.5	110.6	≤500	≤1000
DO	ppm	DO Meter	4.03	5.03	5.19	5.73	5.48	4.90	NS	NS
COD	ppm	Colorimetry	57.4	77.4	61.4	95.7	101.3	115.9	NS	NS
Mercury	ppm	Cold vapor	ND	ND	ND	0.002	0.005	**0.007**	ND	≤0.005
Cadmium	ppm	AAS	ND	ND	ND	ND	ND	ND	ND	≤0.001
Lead	ppm	AAS	<0.01	0.02	0.01	<0.01	<0.01	<0.01	≤0.1	≤0.1
Zinc	ppm	Colorimetry	0.007	0.04	0.02	0.017	0.021	0.016	≤1.0	≤ 2.0
Copper	ppm	Colorimetry	0.009	0.02	ND	ND	ND	ND	≤0.1	≤0.1
Iron	ppm	Colorimetry	0.17	0.32	0.28	0.38	0.43	0.28	≤1.0	≤ 1.5
Oil & Grease	ppm	Infrared (IR) Analyzer K25552	ND	ND	ND	0.003	ND	ND	NS	NS

LWQS-I = Liberian water quality standard class I, LWQS –II= Liberian water quality standard class II
NS = not stated; ND = not detected; Bold value(s) = above permissible limit
Laboratory: University of Liberia Civil Engineering Laboratory

5.2.5 Air Quality

Predominantly, most parts of the project fall within an area with rural characteristics. Therefore, levels of gaseous pollution are low, and sources of air pollutants are limited. The current principal source of air pollution is emissions (PM_{10}, CO2 and NOx) from vehicular traffic along the unpaved road leading from MCHPP, along with dust pollution. The main source of dust is expected to be from vehicles travelling on this road. During dry conditions, vehicle movements across this road raise substantial dust plumes in their wake, which may affect both populations and vegetation close to the roads.

Additional sources for emissions are from:

- charcoal production,
- slash-and-burn activities (burning down the vegetation on farms),
- domestic cooking (firewood or charcoal is used) and
- burning waste.

The first three sources emit mainly smoke, SO_2, CO, CO_2, NO_2 and particulate matter. The emissions of the fourth source depend strongly on the kind of waste burned (plastic, wood, batteries, oil, etc). All activities are important contributors to air pollution but are in general localized to small areas.

The existing ambient air quality was assessed and monitored at nine locations within the project area. These locations were identified by the monitoring team based on sensitive receptors. The appropriate air quality sensor (CO, CO_2, SO_2, NO_2, O_3) was mounted on the air quality device (AeroQual 500) and the readings were taken in situ. Also, the Casella Cel-712 Micro-dust pro was used to scrutinize the dust level within the project terrain during the day. The results of the air quality monitoring are shown below.

Table 5-7: Air Quality Sampling Sites

Sample Code	Location	Start Time	Date	GPS Coordinates (UTM)	
AQ1	White Plains	10:12 am	22-05-2019	0315011	0714565
AQ2	James Dawen Town	10:44 am	22-05-2019	0315319	0714721
AQ3	Displace Camp	11:18 am	22-05-2019	0315658	0715306
AQ4	Joseph Ricks Town	11:45 am	23-05-2019	0316066	0715769
AQ5	December Town	12:05 pm	23-05-2019	0316359	0716146
AQ6	Fire Point	12:30 pm	24-05-2019	0316605	0716419
AQ7	Plum Hill Town	12:50pm	24-05-2019	0316652	0716626
AQ8	Mt. Coffee Highway	1:15pm	25-05-2019	0316718	0717217
AQ9	Raymond Camp	1:35pm	25-05-2019	0316908	0717530

AQ: Air Quality

Figure 5-12: Air Quality Sampling Sites

The air quality parameters considered are consistent with the Environmental Protection Agency's approved parameters of concern (POC) for said project. The results of the analysis and method adapted are presented in Table 5-8.

Table 5-8: Air Quality Results

Parameter	Unit	AQ1	AQ 2	AQ3	AQ4	AQ5	AQ6	AQ7	AQ8	AQ9
CO	Ppm	30.3	51.5	57.08	32.08	51.23	30.16	31.85	27.06	26.73
CO_2	Ppm	417.1	421.2	485.5	475.7	437.6	517.9	500.5	473.9	415.9
SO_2	Ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TVOC	Ppm	0.03	0.01	0.06	0.02	0.03	0.05	0.02	0.06	0.03
$PM_{2.5}$	Ppm	1.54	1.51	2.19	1.95	1.64	1.83	1.05	1.83	2.08
NO_2	Ppm	0.00	0.00	0.003	0.00	0.014	0.000	0.010	0.018	0.000

The air quality results showed carbon monoxide (CO) levels lower than permissible limit (50ppm) at all but three monitoring points (James Dawn Town, Harrisburg Displaced Camp and December Town). The elevated levels of CO at those three points may be due to charcoal (biomass) production. Sulphur dioxide (SO_2) levels were below detection

limits (< 0.01 ppm) at all nine monitoring points. Carbon dioxide (CO_2), total volatile organic compound (TVOC), nitrogen dioxide (NO2) and particulate matter (PM2.5) were all below the appropriate permissible limits as presented in (Figure 5-13).

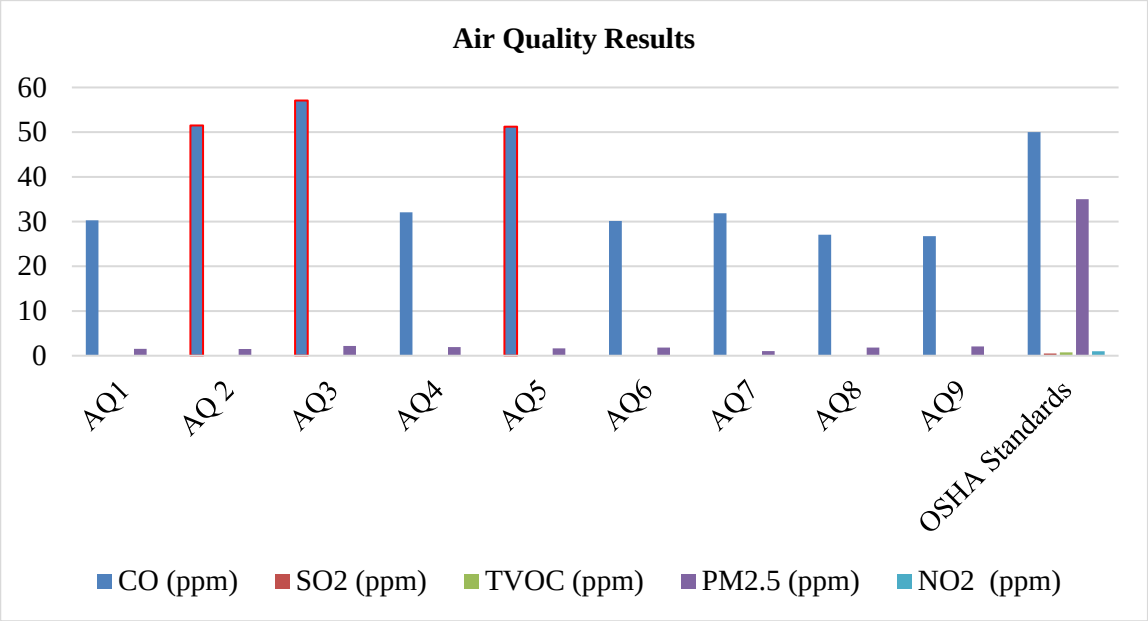


Figure 5-13: Air quality results compared against OSHA Standards

5.2.6 Noise

The acoustic environment depends on the activities in the surrounding of the project area. Related to noise sources the project area can be subdivided in three sub-sections.

- The first section (about 1km) passes behind the switchyard of Mt Coffee HPP, the construction site of the CLSG and the camp site of Mt Coffee HPP. Therefore, the main noise source is caused by the construction activities.
- The second section (about 1 km) passes along the road from Monrovia to Mt Coffee HPP and the main noise source is caused by traffic and the people living along the road.
- The third section (about 3km) is passing along the river, in a distance of about 500 m to the road, in this area the noise emissions are associated with charcoal production and subsistence farming; all of which are operations serviced by foot. In the middle of this section there is a quarry located which is probably the main noise source in that area.

In general, it can be stated that there is mainly transient noise (intermittent with short duration).

In furtherance, baseline sound quality condition was established in order to determine the existing noise level in the project area prior to the project implementation. The monitoring of noise level was carried out at specified locations along the road close to the settlements during the daytime. Ambient Noise levels were recorded at each monitoring point, using the Precision gold N21FR Multisensory instrument. The readings for noise levels were taken in situ. The coordinates for the sample point were recorded. The sound quality

parameters considered are consistent with the Environmental Protection Agency's approved parameters of concern (POC) for said project and the results are presented below.

Table 5-9: Sound Quality Sampling Sites

Sample Code	Location	Start Time	Date	GPS Coordinates (UTM)	
SQ1	White Plains	10:12 am	22-05-2019	0315011	0714565
SQ2	James Dawen Town	10:44 am	22-05-2019	0315319	0714721
SQ3	Displace Camp	11:18 am	22-05-2019	0315658	0715306
SQ4	Joseph Ricks Town	11:45 am	23-05-2019	0316066	0715769
SQ5	December Town	12:05 pm	23-05-2019	0316359	0716146
SQ6	Fire Point	12:30 pm	24-05-2019	0316605	0716419
SQ7	Plum Hill Town	12:50pm	24-05-2019	0316652	0716626
SQ8	Mt. Coffee Highway	1:15pm	25-05-2019	031671	0717217
SQ9	Raymond Camp	1:35pm	25-05-2019	0316908	0717530

SQ: Sound Quality

Table 5-10: Sound Quality Results

Sample Code	Location	Sound Quality (db)	Allowable limit (db)	WB Guidelines for acceptable noise level
SQ1	White Plains	50.3	75	Residential/Institutional/Educational • Daytime:55 • Night-time: 45 Industrial / Commercial • Daytime and night-time: 70
SQ2	James Dawen Town	59.6	75	
SQ3	Displace camp	44.7	75	
SQ4	Joseph Ricks Town	51.4	75	
SQ5	December Town	57.8	75	
SQ6	Fire Point	59.1	75	
SQ7	Plum Hill Town	60.1	75	
SQ8	Mt. Coffee Highway	47.4	75	
SQ9	Raymond Camp	57.7	75	

It is expected that the results obtained herein will be used as baseline environmental data for the purpose of evaluating the project's impact on the environment in the future.

5.3 Biological Environment

Biological resources represent one of Liberia's most abundant raw material resources. Biological diversity contains ecological, economic, and socio-cultural values that justify the need for conservation and sustainable use. The range of biodiversity in Liberia includes forests, wildlife, mangroves, wetlands and swamps. Liberian biodiversity is under threat due to many factors such as ignorance, insufficient public education and awareness, shifting agriculture, unregulated logging, unplanned human settlements, fuel wood gathering, charcoal production, population pressure and establishment of rubber plantations.

Figure 5-14: Slash and Burn farming. GPS location: (29N UTM 0316131/0716781)

The study serves to undertake an ecological assessment of the fauna and flora species associated with the study area in order to determine the current state of these components. Information generated from this survey were used to address the impacts that operational activities that the proposed project may have on the environment. The study also covered the baseline environmental conditions in order to present a clear picture of the project area prior to project commencement. In order to achieve this aim, the following objectives were considered:

- To delineate the various vegetation/habitat types and describe their sensitivity present within the study area;
- Determine degree of correlation between the social survey technique and findings from the site assessment within the concession area;
- Determine if any fauna and flora species or assemblages will be impacted upon by the proposed activity and associated infrastructure. This includes the identification of Red Data Species according to the IUCN and the Convention on International Trade in Endangered Species (CITES); and
- To undertake an assessment of the impacts associated with the various activities regarding the flora and fauna species and to recommend measures that will aid in preventing or mitigating against impacts to the flora and fauna species or communities.

The assessment findings revealed that the major threat to the proposed project area is habitat destruction. This suggests that in order for the project to meet the sustainability benchmarks, key objectives have to be met.

5.3.1 Methodology

5.3.1.1 Flora identification

The site survey uses Recce to determine the vegetation of the project site. Recce was walked between subsequent sample plots and plots segment. Twelve (12) sample plots were

developed with 50m x 10m plots within the study area. During the assessment, flora observation study was undertaken within the project area to identify associated species. Such observation strategy involved sighting leaves formation and slashing of the bark trees for identification of flora species. The use of botanical field manuals also facilitated in the data collection process. GPS coordinates were used to established sample plots within the project area. Twelve sample plots were established along the project terrain to succour in the identification of flora characteristics. The IUCN Red Data list was used to rate identified species.

5.3.1.2 Fauna Identification

In order to conduct a fauna survey over such an area within the timeframe of the study, it was necessary to incorporate the aspect of social surveying. Firstly, the biodiversity team used community engagement method and key informants interview (KII) to facilitate in the data generation exercise. Flash cards showing the lists of FDA Protected Species were shown to residents of the project area to ascertain whether the inhabitants could identify species found in the project area. Key informants interviews (KII) were also conducted with knowledgeable individuals on the existence of the various categories of fauna in the region.

Figure 5-15: Community engagement by using flash cards of protected species.

Apart from the KII, Recce (reconnaissance survey method) was used to identify any sign of sighting live fauna, dung, tracks, food remain, nest among others. The birds' assessments were done along the St. Paul and the Queen Creek. Birds were surveyed along the creek and river as well as the roadsides using the MacKinnon list method in the morning between 6:10am and 6:30pm. The assessments of fish were done through key informant interview. These included fishermen and inhabitants within the study area, using the Participatory Rural Appraisal (PRA). Freshwater fish identification guide was used along with the inhabitant in order to identify the species caught. Mammal assessment took into consideration the establishment of sample plots within the project area to check for live mammal, tracks, food remain, and dungs. Amphibian and reptile surveys were based on direct or indirect signs which included footprints, vocalizations, feeding signs, habitat etc. GPS coordinates were used to established sample plots within the project area.

5.3.2 Vegetation

The project area consists of young bush, low bush and wetland. The area is strongly degraded since it has long been disturbed by human activities over a period of time which allowed the loss of habitats for species in the terrain. The use of heavy equipment, construction of infrastructures, farming activities (shifting cultivation), charcoal production and sand mining amongst others have contributed to the loss of habitats and vegetation in the project area.

Figure 5-16: Photo of an agricultural degraded area (Left) and a Young Bush (Right)

The first 1800 m of the pipeline corridor that are either located between the former construction site of MCHPP and the tailrace channel, the St Paul River, or along the road leading from Monrovia to MCHPP. This entire part is strongly degraded with only very few farms and some small patches of young bush. Then the pipeline turns along the St Paul River and follows the riverbank at a distance of 20 to 50 m. The most important habitats along this part of the pipeline are some smaller wetlands and the riverbank vegetation. Most of the other areas are used for shifting cultivation and therefore either agricultural degraded area (low bush, patches of grassland) and young bush. The following table gives a description of the vegetation classes found in the project area during the survey. A species list is given in Annex 4.

Table 5-11: Description of Vegetation Class

Vegetation Class	Description
Agricultural degraded area/ Low bush	These types of vegetation are shrubby and grasses with 95% ground cover. This vegetation type occurs along the edges of roads specifically. Primary species include both indigenous and invasive species, both of which have ruderal strategies. The species include the *Scleria flexuosa*, *Panicum laxum*, *Fuirena umbellata*, *C. difformis, Pycreus lanceolatus, Spigelia anthelmia*, etc. This constitute 60% of the project area.
Swamp/ wetlands	The project area is characterized by intermittent wetlands occurring in low-lying areas close to the St. Paul River. The

	wetlands are water-logged, muddy and even during the dry season. The wetter areas contain fern species include *Nymphaea micrantha, Limniophyton anolense, Ipomoea asarifola, Alectra sessiliflora, Cyclosorus striatus* were found to be a commonly occurring in swamp habitat along the project corridor. Swamp vegetation constitutes 15% of the project area.
Young bush	Contextually, this type of vegetation contains many forest species which grow exceptionally quickly after clearing (Ruderal species), pole thickets may be formed. Tree species are ruderal in majority with *Parkia bicolor, Uapaca guinensis, Harungana madagascariensis, Ceiba pentandra, Alstonia boonei* dominating and other species typical of Primary Forest starting to grow. This vegetation type constitutes 25% of the project area.

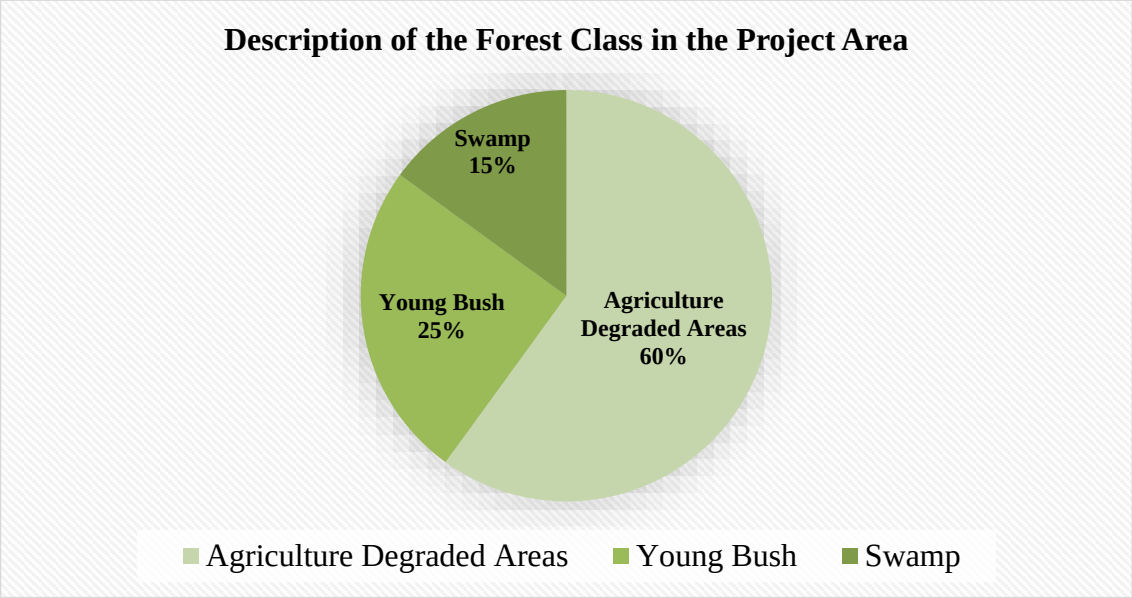


Figure 5-17: Distribution of vegetation classes (in percent) in the project area

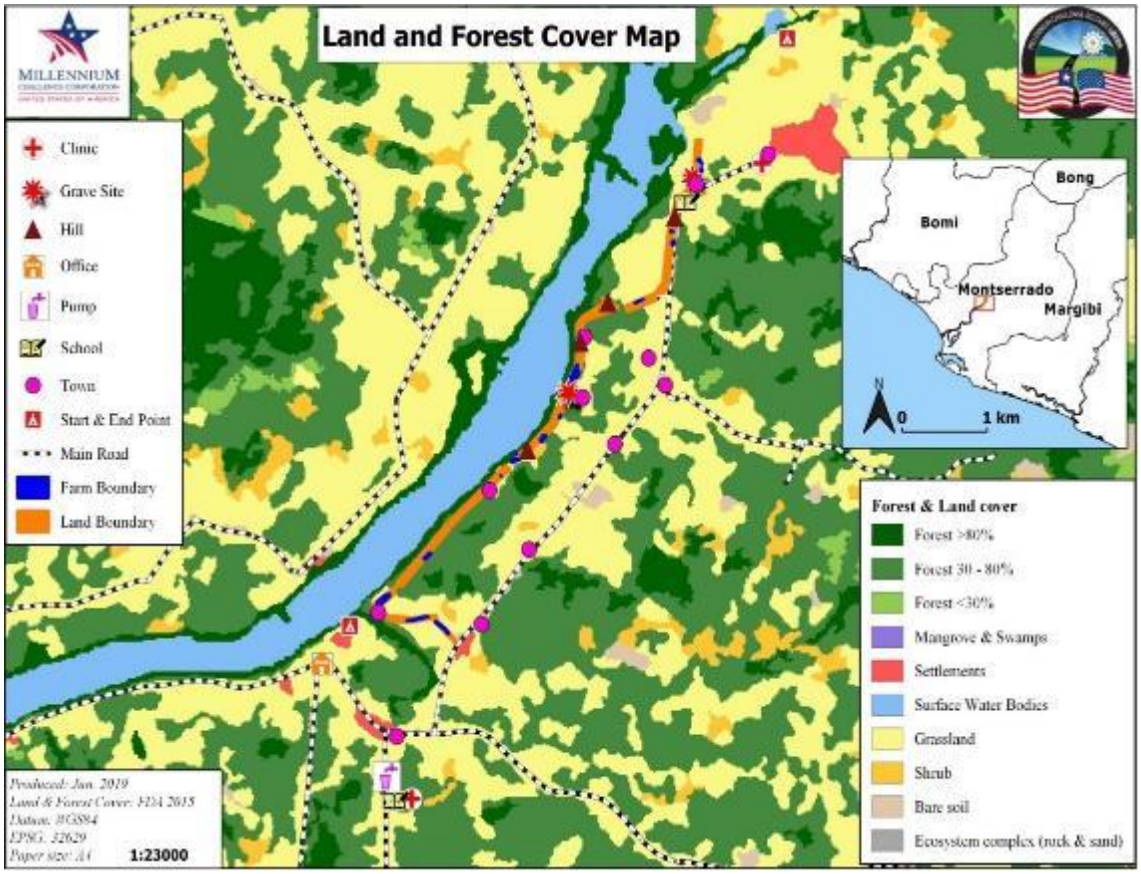


Figure 5-18: Land and Forest cover map of the project area

As can be seen in Figure 5-18 most of the forest is located along the riverbank. Therefore, any clearing of the riverbank vegetation needs to be prohibited, since it is essential for the riverbank stability and it serves birds for nesting, fish for spawning among other functions.

5.3.3 Fauna

5.3.3.1 Mammals

In total there are 193 mammals in Liberia (Groombridge and Jenkins, 1994); the following 31 species can be found in the Red List of IUCN. 9 species are listed as endangered, 12 as vulnerable and 10 as near threatened.

During the reconnaissance site assessment, several mammalian species were reported by surrounding communities and 10 species could be verified by sightings (see Annex 4) within the project area. Some of those reported species are the *Thryonomys swinderianus* (greater cane rat), *Mus minutoides* (African pygmy mouse), *Colomys goslingi* (African water rat), *Grammomys poensis* (shining thicket rat), *Cricetomys gambianus* (African giant pouched rat), *Crocidura jouvenetae* (jouvenet's shrew), *Crocidura obscurior* West African pygmy shrew) amongst others. The reported species are of Least Concern according to the International Union for Conservation of Nature (IUCN) Red list and are of no conservation significance. As already mentioned, the habitat is strongly degraded by logging activities, farming, charcoal production and mining, therefore no larger animals are expected.

5.3.3.2 Birds

The number of bird species known to reside in Liberia varies between 600 (NBSAP, 2004) and 695 (Avibase, 2019). According to BirdLife (2019), there are 410 species documented for Monserrado County, eight of them are globally threatened.

Birds expected to inhabit the project area are species adapted to live in secondary forests, agriculture habitats, and near rural residences. The 2012 survey for the Transmission Line observed as the most abundant species in the project area the red eye dove. Further species of higher frequency were the Senegal coucal (*Centropus senegalensis*), village weaver (*Ploceus cucullatus*), common bulbul (*Pycnonotus barbatus*), orange cheek waxbill (*Estrilda melpoda*), and cattle egret (*Bubulcus ibis*) (WAPP, 2012). The current survey encountered 22 species (see Annex 4), except of the orange cheek waxbill all above species could be recorded again. Additionally, the little greenbul (*Andropadus virens*), slender-billed greenbul (*Andropadus gracilis)* and the little grey greenbul (*Andropadus gracilirostris*) were frequent, among the birds of prey only the African harrier hawk *(Polyboroides typus)* was recorded. None of the birds currently or in the 2012 survey seen are listed in the IUCN Red List. However, this does not mean that no protected birds are in that area. But taking the habitat within the 36 m into account only species which are adapted to live in this type of regenerating and man-made vegetation are expected. These vegetation types are not in short supply in the in the direct and wider surrounding of the project area. Therefore, the project will not have a noticeable negative impact on the avifauna.

5.3.3.3 Reptiles

The National Biodiversity Action Plan (NBSAP, 2004) of Liberia mentions 67 reptiles including two endemic species. The species identified during the 2012 survey (WAPP, 2012) included the brown and green lizard, cassava snake, black snake and boa constrictor.

Throughout the reconnaissance site assessment, 19 reptile species were identified within the project corridor. These species are considered as Least Concern on the IUCN Red list. The lists of amphibian species recorded include: *Agama agama* and Red Headed Rock Agama.

5.3.3.4 Amphibians

38 amphibians including 4 endemic species are recorded in the National Biodiversity Action Plan (NBSAP, 2004). Two species (spring frog and toad frog) were for the project area were mentioned in the survey of 2012 (WAPP, 2012). The lists of amphibians species recorded (see Annex 4) during 2019 within the project area include: African common toad (*Amietophrynus regularis)*, broad-banded grassland frog (*Ptycadena bibronii)* and Ogowe river frog (*Phrynobatrachus ogoensis)*

5.3.3.5 Fish

During the last 8 years several studies were carried out related to the fish species in the St Paul river. The latest study was carried out by MRAG for MCC to assess whether a fish pass is required at Mt Coffee HPP or not. A total of 72 species of riverine fish were within 26 families were identified (MARG, 2019). Six of those species are listed in the IUCN Red List (2 near threatened, 3 vulnerable and one as critical endangered since it is

endemic to the Mt Coffee area). Furthermore, for several of the species the data are deficient for an assessment.

The total of 8 fish species (33 individuals) have been caught within the project corridor specifically the St. Paul River and Queen Creek in the survey for the Raw Water Transmission Pipeline Project (see Annex 4). These species are considered as Least Concern and are Data Deficient on the IUCN Red list. The lists of fish species recorded include: *Heterobranchus longifilis*, *Tilapia zillii*, *Hemichromis bimaculatus*, *Hepsetus odoe*, *Epiplatys sp*, *Chrysichtyhs johnelsi*, *Ctenopoma sp*, *Barbus inaequali* amongst others.

Figure 5-19: Chrysichtyhs johnelsi identified with fisherman along the St. Paul River

5.3.4 Protected Areas

There are 22 protected areas and habitats in Liberia, none of them is close to the project area. The Mesurado Wetland is listed as Ramsar site (Wetlands of International Importance), which is located near the estuary of St. Paul River, is the closest wetland to the project area and is directly connected via the St. Paul River.

Figure 5-20: RAMSAR Wetlands

Source: ESIA and ESMP, CH2M, 2018

5.4 Human Environment

5.4.1 Methodology

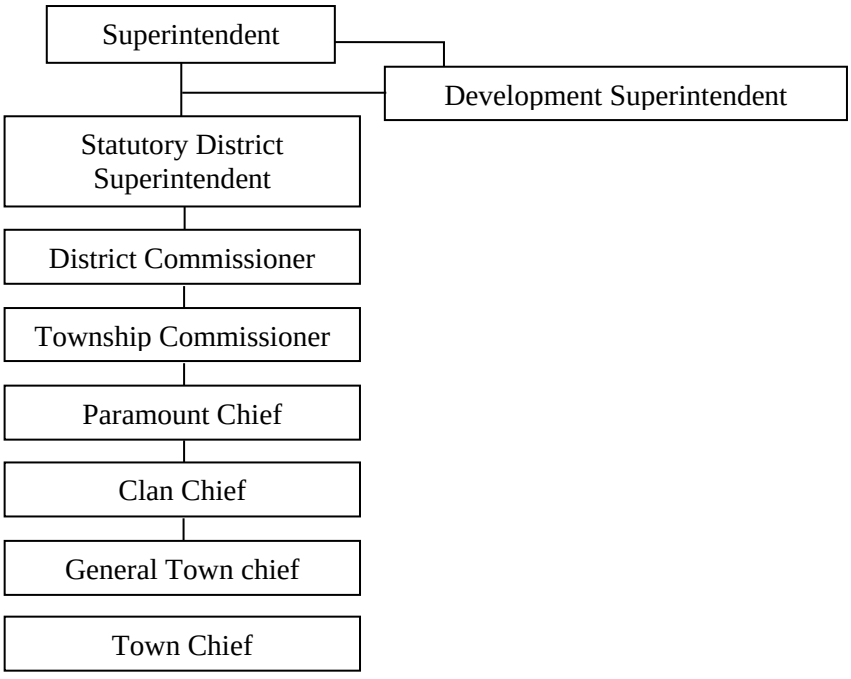
The social baseline assessment has been structured to include baseline conditions across the distinct geographic division of White Plain and Harrisburg Townships. The assessment used both secondary information from the Liberia Institute of Statistics and Geo-Information Services (LISGIS) and primary sources of data. The primary sources of information were mainly obtained through questionnaires conducted by LEG Social Team. The survey adopted a cross-sectional design methodology of households using a structured questionnaire. Questionnaires were carried out in the project area and took into account women as well as youths in these communities. The survey was carried out between May 18th and 26th, 2019. In total 46 people were interviewed. 18 females and 29 males containing one vulnerable affected person, an old age affected female (widow) household head. The samples only take into consideration affected persons.

The following chapters do not describe all aspects of social conditions; instead they focus on those aspects of the socio-economic environment relevant to the impact scoping, impact assessment, mitigation and management process, or the stakeholder and PACs engagement process. The social baseline for the ESIA are discussed in terms of the Governance and Administration, demography, education, health etc.

5.4.2 Governance and Administration

Administrative control of Towns surrounding the project area is maintained by Town chiefs; See below administrative structure:

Flow Chart of Local Administration



Those listed above are responsible for the governance of communities around the project area. The Superintendent is appointed by the President of Liberia along with the Development Superintendent, Statutory District Superintendent and Commissioners.

5.4.3 General Demographic Profile of Liberia and the Respective Counties

The Project Affected Communities considered in this study are located across two townships within the Careysburg District of Montserrado County: Harrisburg Township and White Plains Township. Montserrado County has the highest population of all the counties of Liberia although it is the smallest county in terms of geographic area. The 2008 National Population and Housing Census revealed that Montserrado County has a total population of 1,118,247 consisting of 549,733 males and 568,508 females while Careysburg District population is 29,712 with 15,048 males and 14,664 females.

In terms of household sizes, a typical household in the affected townships consists of approximately four members, (Republic of Liberia, 2009). In terms of population progression, the country's birth rate stands at 38.3 births/1,000 population, whereas the death rate is 7.6 deaths/1,000 population (2017) (Index mundi, 2018.). In light of this, the country seems to be experiencing a population growth rate of 2.5% per annum (Index mundi, 2018). To estimate the study area's population growth rate, data could unfortunately not be obtained on the areas past population figures. However, according to the 2008 Census, Montserrado County experienced between 1984 and 2008 a population growth rate of 3.5% (Republic of Liberia, 2009).

5.4.4 Communities along the Project Road

Relative to the administrative structure of the project area, the Harrisburg and White Plains townships are made of several towns or communities that encompass the project area. Some of these towns are White Plains, Displaced Camp, James Daniel Town, Zubah Town, Joe Ricks Town, December Town, Fire Plum, Plum Hill and Raymond Camp.

Table 5-12: List of Communities along the Project Corridor

Settlements	Names of Town Chief	Total population	Female	Male	Number of Households	Number of Houses	GPS Coordinates UTM	
							X	Y
White Plains	Jefferson Fredmoore	8734	4200	4534	1424	2210	0315070	0714541
Harrisburg Township								
Displace Camp	Konia Cole	175	74	101	12	15	0315569	0715149
James Daniel Town		95	38	57	8	7		
Zubah Town	Jartu Barker	45	27	18	3	3	0315848	0715554
Joe Ricks Town		210	89	121	18	22		
December Town	Joseph Harries	200	110	90	7	10	0316352	0716124
Fire Point	Abraham Armah	750	337	413	36	49	0316647	0716445
Plum Hill	Biomiah Harries	50	21	29	4	4	0316550	0716590
Raymond Camp	Fahn Denies	2500	1650	850	455	464	0317253	0717694
Total		12'759	6'546	6'213	1'967	1'784		

The following figure provides an overview of the villages along the road leading from White Plains to Mt Coffee HPP.

Figure 5-21: Settlements within the project area

All PAPs have been interviewed. The number of affected people (land, crop, structure) per settlement is given in the following figure. The majority of the people are coming from December town (12) followed by Raymond Camp (9), James Daniel Town (7) and Plum Hill (7).

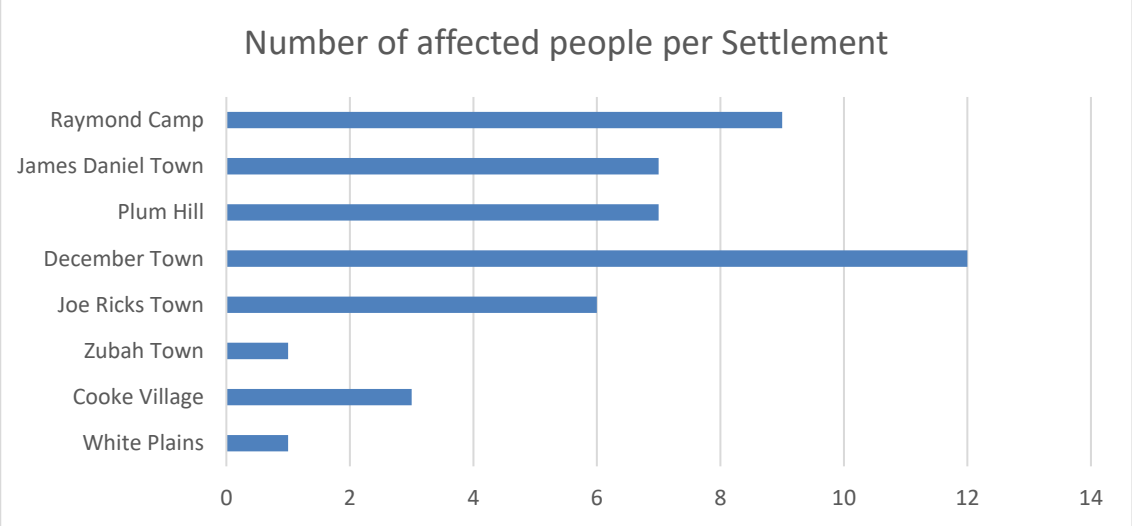


Figure 5-22: Number of affected people within the different settlements

The age distribution of the affected people is given in the following figure.

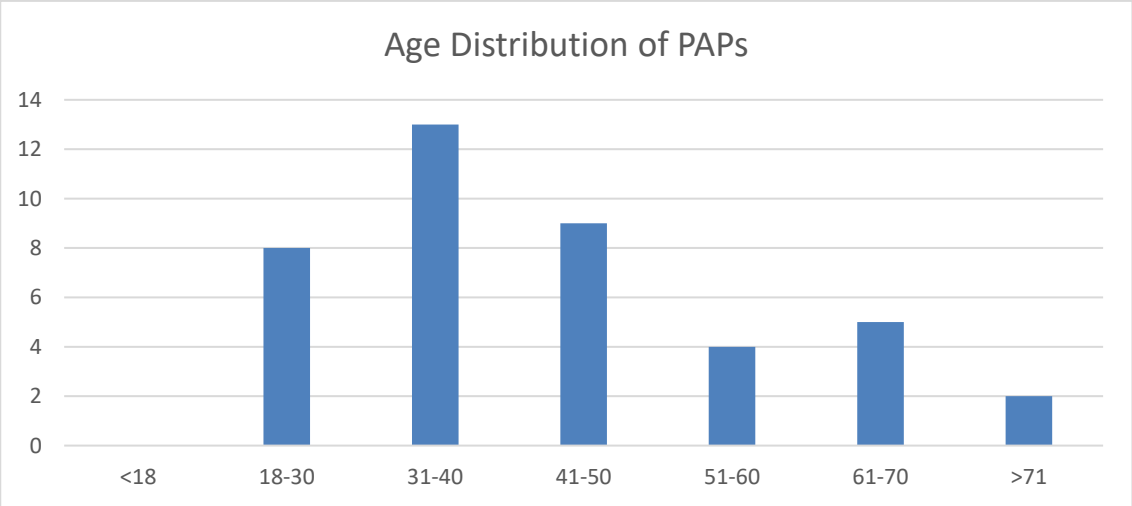


Figure 5-23: Age distribution of PAPs

Since only individuals have been interviewed and the demographic data of the whole household were not captured it is not possible to provide actual data on the age distribution within the communities. However, the RAP carried out for the MCHPP revealed an age distribution for the communities within the reservoir area. Those settlements are close to the current project area and from the general set-up similar. However, it is known that they are not located along a road and may still differ since they were less influenced at that time. During that Survey 139 HH were interviewed containing in total 596 people. The age distribution by gender is shown Figure 5-24.

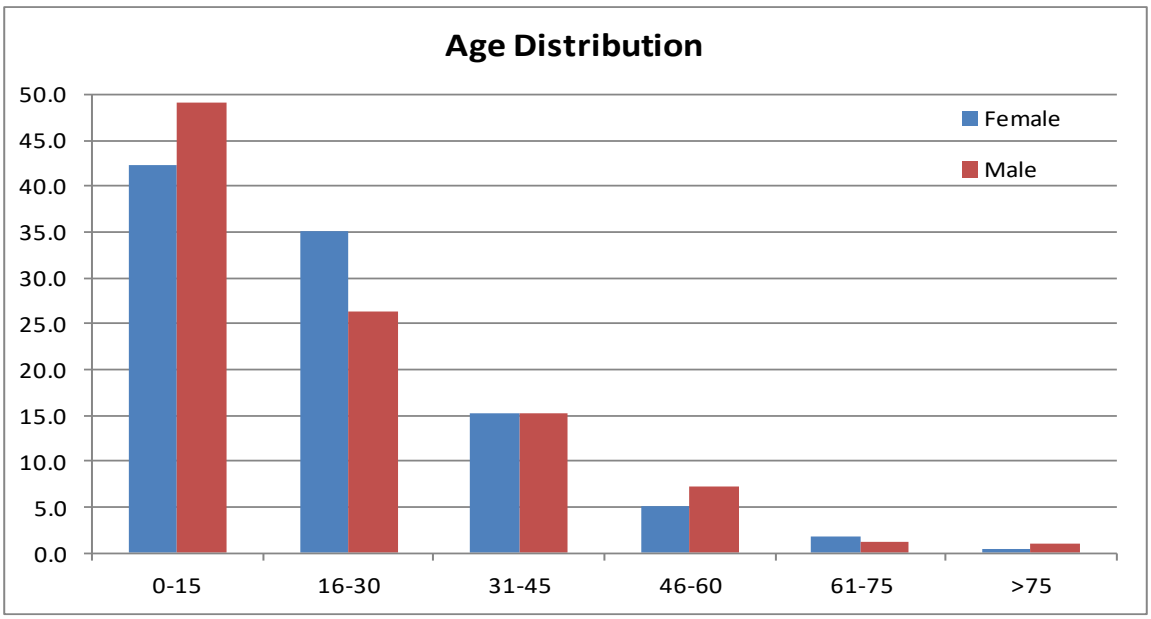


Figure 5-24: Age distribution by gender (WAPP, 2013)

Close to half (49.1%) of the male population were in the age distribution of 0 to 15 years, while only 42.5% of the female population is in this age distribution. Between 16 to 30 years this distribution is changing while males accounted for 26.3 %, the women now account for 35%. The age group of 31-45 for both genders approaches each other again and accounts 15.3% and 15.2%, respectively.

5.4.5 Ethnicity and Religion

The main ethnic group in the project areas of influence is Kpelle. The majority of the respondents (63%) belonged to the Kpelle ethnic group. The other 37% comprised of other ethnic groups, to include Gola, Lorma, Bassa, etc. This speaks to the heterogeneity of the ethnicity pattern of the project area.

The Ethnic affiliation of the PAPs interviewed are given in the table below.

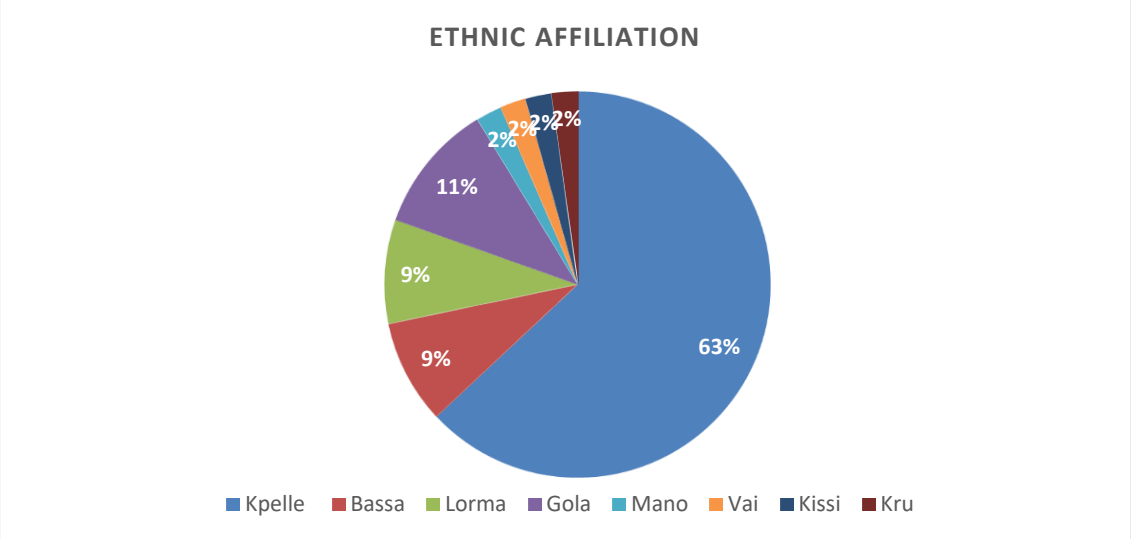


Figure 5-25: Ethnic affiliation

Most of the respondents (99%) were Christians and 1% were Muslims. This is in line with the national figures which show that there are many more Christians than Muslims or practitioners of other religions in Liberia.

The St Johns United Methodist Church including a school, in Plum Hill (see picture below) is of specific concern since it is located at access road 2. The operating hours of the church are Sunday from 9:30 am to 1:00 pm while the operating hours of the school are Monday to Friday from 8:00 am to 1:00 pm

Figure 5-26: A Methodist Church in Plum Hill Community

5.4.6 Economic Environment

Residents of the project area are basically involved in fishing, farming, charcoal production and gold mining as their source of livelihood. They transport farm produce to Monrovia markets (Red Light and Duala market), which are approximately 25 kilometres away from their respective communities (project site). Local markets which are set up in the settlements consists of rudimentary structures with stalls made up of bamboo sticks and planks with or without a zinc roof. The settlements' big market is located in Bensonville, and this market's main operation day is Saturday. Since the Mt Coffee HPP rehabilitation started an additional market at Raymond Camp with around 50 stalls developed. Here are smaller items sold or bartered/traded; varying from food items and agricultural produce to charcoal, medicine and general equipment.

Agriculture accounts for about 71% of the labour force within the Project Area. The remaining 29% are those involved in petty trade and other livelihood enhancement activities, such as low-scale employment. This reflects the agrarian nature of the local economy.

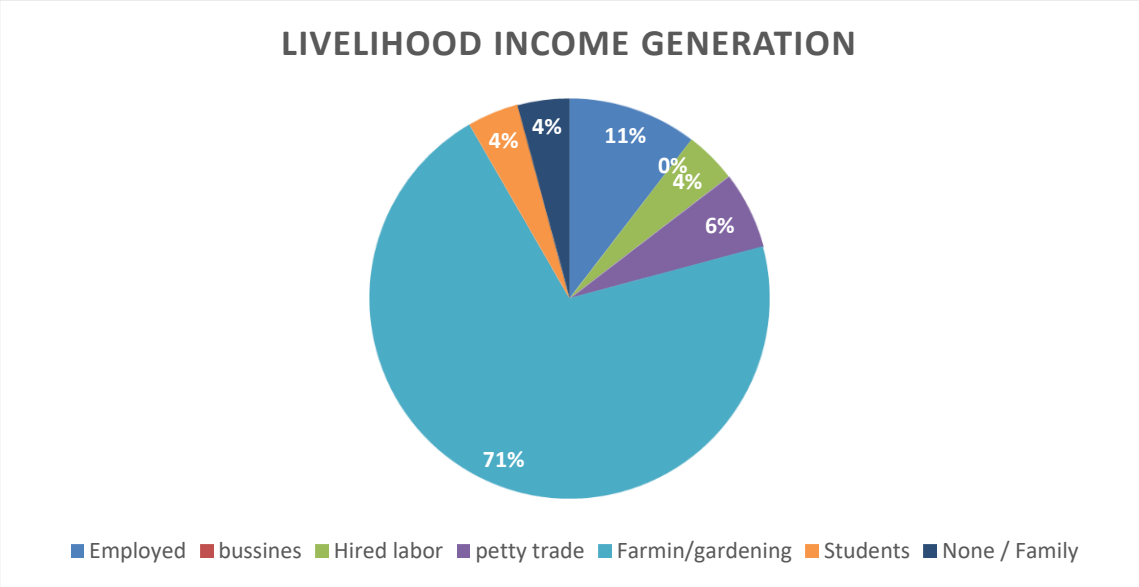


Figure 5-27: Livelihood Income Generation status of PAPs

It can be stated that 100% of the affected people are active in the agricultural area. Some as primary activity, others at secondary activity. Those shown in Figure 5-27 are those for whom agriculture is the primary activity. From the respondents surveyed during the socio-economic study 71% are farmers, 4% are hired labour, 4% students and 4% are not actively generating income but supporting the family, 6% are petty traders, including catering, brick selling, etc, and 11% are either civil servants or are employed with Non-Governmental institutions. This attests to the fact that the project area contains mostly rural communities.

5.4.7 Income and Expenditure

The average monthly income ranges between 1,000 LD (6.25 USD) and 90,000 LD (562.5 USD) with an average of 23,665 LD (148.00USD). However, this income is the cash income and does not include goods they harvest and consume or exchange themselves.

In addition, the respondents were asked inquiries related to their main expenditures. However, some problems arose during the evaluation since it is not every time clear if those expenditures are per month, day or year. The highest amount spent is for food, followed by education. Transportation also makes up a high amount of their total expenditure, depending on how often the people use a motorbike or taxi to get to Monrovia or other larger towns.

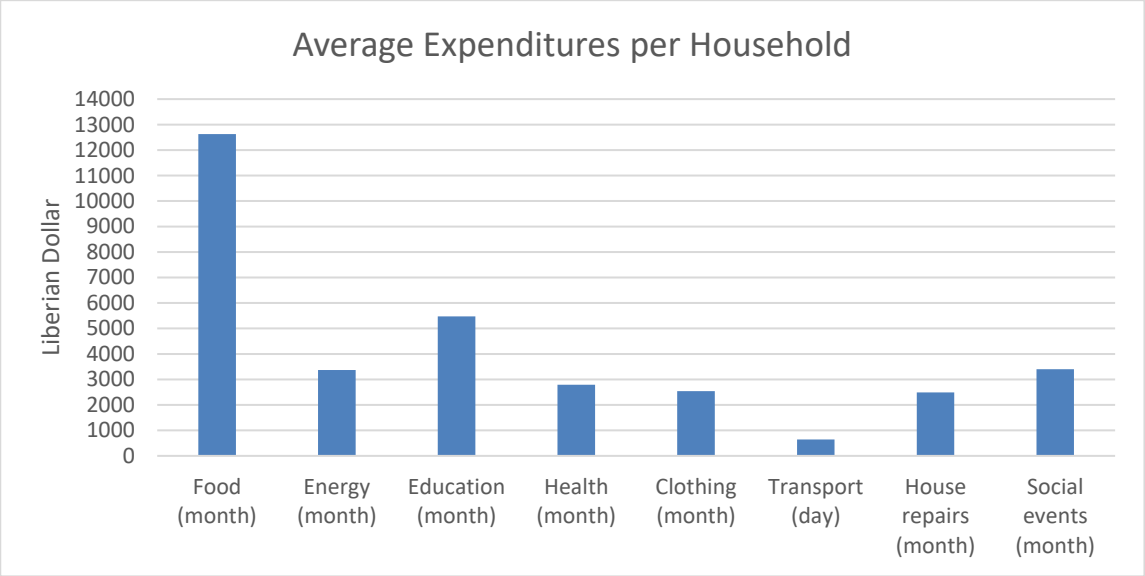


Figure 5-28: Average expenditures of PAPs in LD

Cost of living was observed to be very high in the area, as indicated by many of the residents covered during the socio-economic survey. Difficult roads and long distances are the main reasons for elevated prices. The cost of food varies with the weather. Costs are higher in the rainy season due to difficult access conditions as reported by locals.

A market survey was conducted during the assessment period (May 2019). The principal market surveyed were conducted in Raymond Camp and Duala. The survey procedure involved a social team visiting these markets and recording the range of products sold and the market values for each product. Interviews were also conducted with the stall owners, who were solicited to elaborate upon where their stall products came from. Below is a random sampling list of basic commodities assessed from the market survey.

Table 5-13: Price List of basic commodities

Item	UNIT	Unit Price in L$
Rice	Cup	50.00
Pineapple	Medium size	60.00
Table salt	Tie plastic	15.00
Washing soap	Pc	100.00
Plantains	Bunch	400.00
Okra	Pile	10.00
Pepper	Pile	25.00
Chicken	Medium size	500.00

5.4.8 Vulnerable Groups

There are several categories of vulnerable groups like:

- Female-headed HHs
- Handicapped
- Elderly
- Female-headed HHs who are elderly

Within the group of respondents there was one elderly HH head with the age of 74. The other three respondents which could counted as elderly were not the HH heads they were relatives living with the family. Three PAPs stated that they were handicapped, the kind of handicap was not specified. Related to poorness it is rather difficult to assess the vulnerability. April 9th 2014 it was published in the Observer that the minimum salary for skilled labor are subject to 6 USD (960 LD) per day and for unskilled domestic worker are subject to 4 USD (640 LD) per day which would be 84 USD (13.440 LD) per month. 19 PAPs have less than 84 USD (13.440 LD) per month as cash income (exchange rate was set at 160 LD per 1 USD). However, as already mentioned this income is the cash income and does not include goods they harvest and consume or exchange themselves. Furthermore, it is not clear if it is the total income of a HH or if further members of the HH contribute to the overall income. During the RAP implementation these questions will need to be further assessed.

5.4.9 Agriculture

The households practice only the slash and burn farming method (shifting cultivation), which means that, after several years (five to seven), a new piece of land is cultivated, allowing fields to 'rest' and recover for several years. The fields are rain-fed, cultivated by means of simple hand tools such as a hoe and spade. Generally, no fertilizers are used, households rely on burning their fields after a harvest which is believed to restore the fertility of the land. Most have one field, although some have between two and four. Fields are typically between 2 to 3 acres in size.

Residents of the project areas are principally engaged in subsistence farming; with very few engaged in small-scale cash crop production consisting of oil palm, rubber, cocoa, etc. For the subsistence farmers, crops produced are cassava, corn, potatoes, eddoes, plantains and vegetables.

Following figures are providing the crops encountered in the project footprint. Among the annual crops most households (7) plant cassava. Within 26 farms, banana and plantain was found, they are usually intercropped. Additionally, there were some rather large pineapple farms.

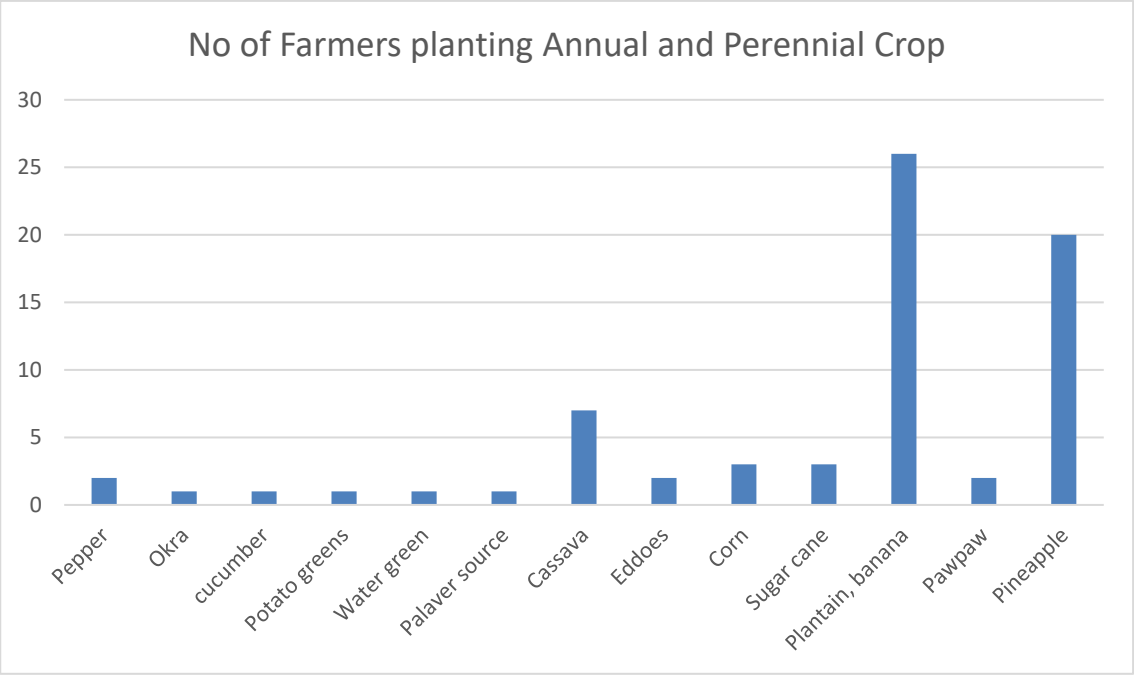


Figure 5-29: Number of Farmer per Crop (annual and perennial)

The majority of the farmers have oil palms on the sides of their field which they use for the palm oil production. All rubbers trees in the project footprint were of minor age and not tapped. Among the fruit trees golden plum and sour sap were most frequent. All other fruit trees are only encountered sporadically in the area.

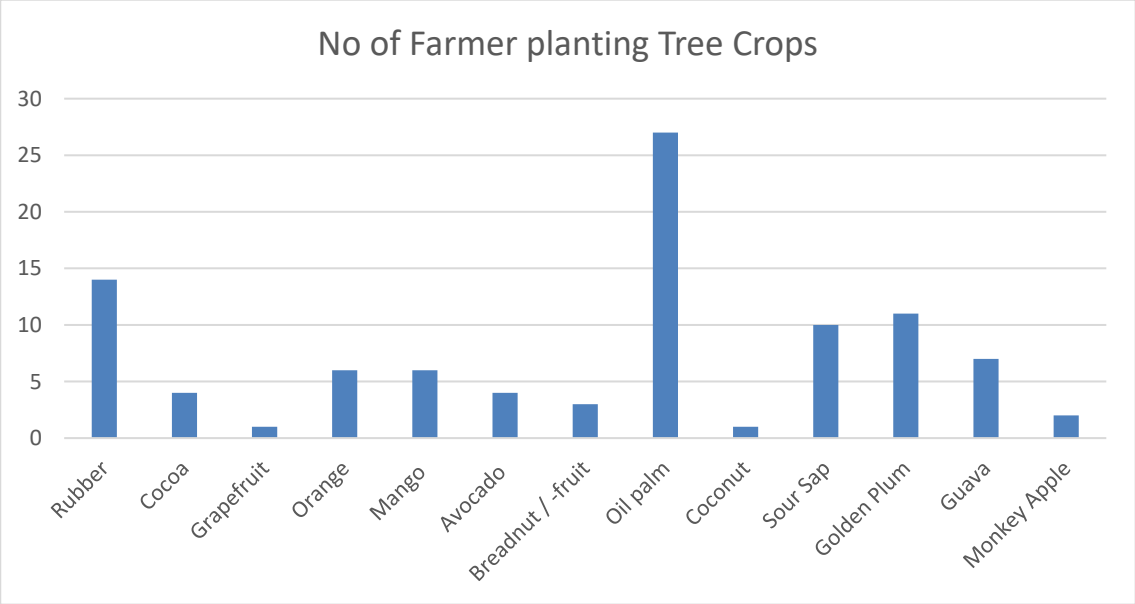


Figure 5-30: Number of Farmers with Tree Crops

The following calendar shows the harvesting and cropping season in the project area.

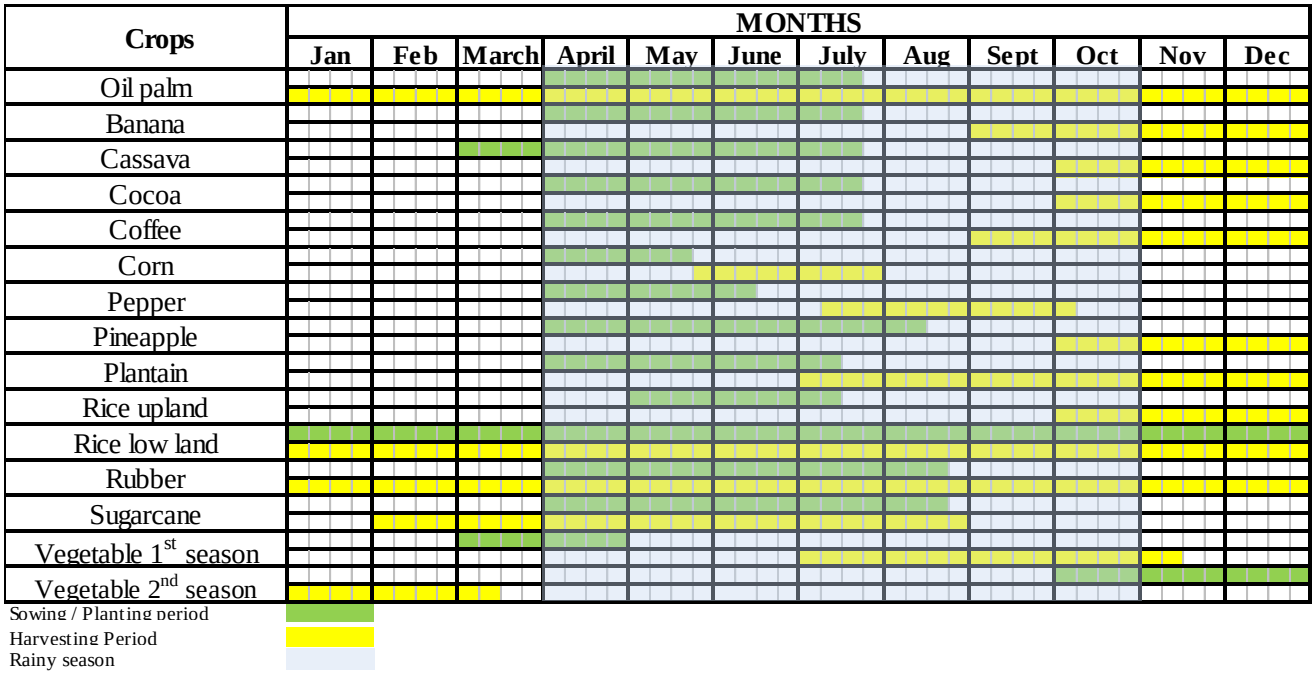


Figure 5-31: Croping calendar in the project area

Note: The columns highlighted in green shows all agronomical activities (nursery/sowing, planting, weeding and fertilization) up to the maturity of the crop, while the yellow shows the harvesting period.

The Cropping Calendar is a tool that provides information on planting, sowing and harvesting periods of locally adapted crops in specific agro-ecological zones.

There are two major seasons in Liberia, rainy season and the dry season. The rainy season starts in mid-May and it ends in October while the dry season starts mid-November and ends in early May each year. The peak planting season of farmers in the project are is from May to June. This time is the beginning of the rainy season, while peak harvesting period is October to November/December, which is considered the end of rainy season and beginning of the dry season.

Farming is divided into different activities, which are carried out by the family. Furthermore, farmers in the rural areas of Liberia often organise themselves in groups, farming associations called "koo" to help each other during farm clearing and harvesting. The project area is already further developed than most of the rural areas in Liberia therefore those farming associations are not as frequent as in other areas. In addition to food the helpers receive a salary for their work. Burning and clearing of the farms is usually carried out by the men while sowing, caring, and harvesting is mainly carried out by the women. The subsistence farming like vegetables and cassava is in the responsibility of women, while cash crop like sugar cane, rubber, oil palms is in the responsibility of men. Selling of the surplus of crops at the market is also usually carried out by the women. However, they normally deliver the money to the household head, which are in most cases the men.

5.4.10 Land Tenure

Land in Liberia is considered common property but with superior land rights or ownership rights vested on the Government of Liberia (GOL). This is dictated by the country's Constitution. Traditional rights also exist and are vested in the indigenous people who

claim ownership of the land on the basis of "ancestral inheritance". For this project, the relevant land tenure is based on private ownership, communal/customary ownership.

Communal/customary rights are claimed by people whose ancestors lived on a piece of land from generation to generation. The boundaries of the land are often and generally acknowledged by their neighbours. Ownership is not based on formally-recorded deeds or titles. The Law, therefore, confers upon the inhabitants of such lands "custodianship" without the right to sell. This type of land ownership does not give the people security in tenure since the GOL claims superior rights and ownership. It is therefore the government, represented by the President of Liberia, who issues and signs all deed to all public land purchasers. Would-be purchasers, however, must obtain what is referred to as "tribal certificate", which is supposed to indicate the "custodian" of the land, have accepted the would-be purchaser to purchase land that they hold in custody. To actually legalize this tribal certificate the certificate holder needs to engage the LLA to survey the land, which involves rather high costs and most of the rural population cannot afford it.

Private land is either purchased from government for which a deed signed by the President and issued to the purchaser. Or it is land that is sold by a land seller to a land purchaser for which the seller must sign and issue a transfer deed to the purchaser, as evidence of consummation of the transaction. This transfer deed will then need to be legalised by the LLA, with costs involved for issuing a land certificate or permanent title.

Currently there are 24 people claiming that they have some kind of ownership, however this has not been verified so far and will need to be verified during implementation of the RAP. Those farming on the land are normally family or extended family. Agricultural land, if not privately owned is usually obtained by the so called "landlord" of a community in case of small rural villages or from the local authorities (land commissioner) who distributes the land among the residents.

During the Focus Group Discussions (FGDs), community members were requested to elaborate upon ownership. According to several of them, land ownership and land/house plots held largely under community land are obtained through consultation with the competent leadership structure. In case those were not officially purchased from the community with the required survey and the resulting documents, those land plots stay community land and the person has only the right to use the land.

In respects to private family land, it can be obtained by means of land purchase from family representatives. Articulated by some key informants, a plot of land which is equivalent to ¼ of an acre (1,011.7m^2) can be sold for anything from US $800 or more. This price is subject to negotiation, especially depending on the number of lots the buyer may want to purchase. In such a case, local authorities are normally part of the deal, acting as witnesses. As stated above the seller needs to provide a transfer deed and the LLA needs to legalize the deed.

In the case of wetland and river land, the government holds ownership and sub-surfaces rights. For example, the riverbank of the St Pauls river, stretching 50 ft inland, is governmental land. To date there is no major restriction on the local usage of such resources. Immigrants need permission from the local authorities to use such resources.

5.4.11 Social Network and Support System

The communities in the project affected area have social network and support systems. Generally, the social networks include associations along activities, for example, farmers and marketers. Other associations are on the basis of age, such as youth groups; while

some associations are on gender basis such as the woman development groups. Such interactions are used to promote and protect personal relationships and welfare.

Another social network in the project affected communities is called "Susu". This social network is particularly a support group of small-scale businessmen and women, investors coming together for saving and loan purpose. The "Susu" does not only provide financial security to its members, but fosters solidarity and greater cohesion within the communities.

5.4.12 Cultural and Archaeological Resources

The historic resources and general archaeological potential of the area were also taken into consideration during the study. Aside from graves observed along the project corridor, no areas or objects of archaeological significance were captured by the social survey team. Many of the studied communities either have one or several cemeteries. Some families also bury the deceased in their backyards. Culturally, it has been acknowledged, that if a community member drowns in the river, the community would bury their body along the riverbank. It is important to note however, that grave markings will not necessarily be apparent to an outsider, but community members near are reported to know where grave sites may be located.

In furtherance, all of the residents of the project area still hold on to their cultural beliefs and tradition. These include religious worship center and traditional societies, such as the Sande. No sacred sites have been seen or have been reported (by the communities) to the survey team.

5.4.13 Educational Facilities and Attainment

Education and literacy levels are key indicators of development in a population. Education attainment levels as well as access to education facilities are also important indicators. At the national level, the schooling system consists of three levels: primary (elementary), middle (junior high) and secondary school (senior secondary education). Elementary (ages 6-12) and junior high school (12-15) are free and compulsory in Liberia, although the enforcement of this remains challenging; especially in rural areas. Most schools in the country are operated by Christian missionary churches (especially the Catholic and Methodist churches), although many are funded by the Monrovia Cooperative School System.

The immediate Project Affected Communities have five basic academic institutions both private and public dispensing education at various levels to include, basic primary and secondary education. Post-Secondary Institutions are only located in Monrovia. Students usual stay during the week in Monrovia with relatives and go back at the weekends.

Access to school is in general given. From the 46 households, 40 households send their children to school, two (2) households stated that they cannot afford the school, in one (1) household the children are in Monrovia in school and three (3) households do not have children in school age.

The household responses collated revealed that 46% attended secondary school (See Figure 5-32), the majority attending secondary school were males (3 females, 18 males) and 17% of the respondents were attending primary school (3 females, 5 males). On the other hand, 13% of the household sampled disclosed that they have obtained some level of tertiary education (5 females, 2 males), while 24% acknowledging the fact that they have obtained no level of formal education (7 females, 4 males). The education level of

women is in most cases lower, however, when they reach a specific degree, the number increases again compared to the men.

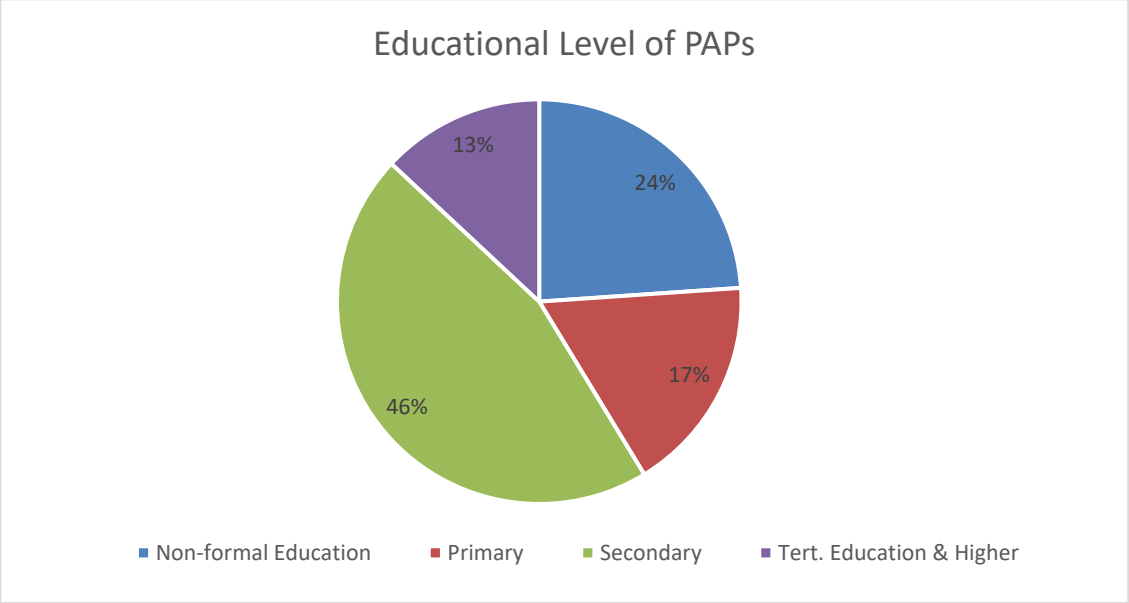


Figure 5-32: Educational level of PAPs

5.4.14 Access to Communication

The most common means of communication in the project areas is by means of radio stations. There are also mobile phone services in most of the project area, provided by MTN Communication and Orange GSM. Towns and villages further away have limited phone service. As part of the survey, respondents were asked to elaborate upon the means used to receive or convey essential information or news. Most sources of information are either received by listening to the radio, or through communities' leaders (chiefs). Most households stated that they normally confront or discuss problems/issues with their leaders, such as their chiefs. This finding reinforces the relationship citizens seem to have with their leaders, which also confirms a sense of possible trust they have in them for dealing with community issues or problems. This is followed by households who mentioned that they usually refer to the area's local government authorities, although it is true in these areas for many residents to be suspicious of the government.

5.4.15 Transport

The project area is accessible from Monrovia through the Duala – Caldwell route in Montserrado and through Bensonville and other towns from the Monrovia to Kakata Highway corridor. The primary modes of transport are motorbikes and/or cars. Communities that are located along the main access roads are most often accessible by vehicle. Walking is still the predominant means of mobility. There have been significant efforts made by both the government and NGOs in making some of these communities accessible. However, there is a need for improvement.

5.4.16 Energy

Related to energy two components need to be taken into account.

- The energy used by the local communities
- And the energy produced by MCHPP for Monrovia and its surroundings.

5.4.16.1 Energy used by the local communities

The study revealed that the direct Project Affected Communities (PACs) are situated along the pathway of the national electricity grid, which runs from the MCHPP to Monrovia and its environs. However, it was discovered that many of the households are without power. The reasons why they are without power have not been assessed. There can be a number of different reasons:

Either the power is too expensive for them compared to the current practice of using Chinese lights for lighting purposes, whilst either charcoal or firewood is used for cooking or houses are not yet connected and meters provided. However, it is not in the Scope of the current ESIA for the Raw Water Transmission pipeline to assess the problems LEC has to connect the people to the grid. Still it is recommended that efforts should be made by LEC to connect the Villages close to existing distribution networks.

5.4.16.2 Energy produced by Mt Coffee HPP

The Mount Coffee Hydropower project was constructed between 1963 and 1966 and went in operation in 1967. The initial generating capacity was 30 MW produced by two turbines, which was increased by two additional turbines to 64 MW in 1973. MCHPP was the most important power plant in Liberia until the civil war started in 1990. On June 28, 1990, the National Patriotic Front of Liberia (NPFL) took control of Mount Coffee HPP. On June 30th, 1990, all Units were out of operation. With no units on-line the spillway gates could not be raised and the Forebay Dam 1 broke on August 12, 1990. Since then, powerhouse, substation and spillway structures have suffered considerable looting and damage.

In late 2011, the Government of Norway (GON), the European Investment Bank (EIB), and the Government of Germany (through KfW Development Bank) agreed with the Government of Liberia (GOL) to jointly finance the Mt. Coffee Hydropower Rehabilitation Project. The GOL and its funding partners agreed that the project should be carried out on a fast-tracked basis, with first commercial power achieved by end of year 2015. Implementation of the project began in May 2012 with the establishment of the Mt. Coffee Project Implementation Unit (PIU), and signing of all original financing agreements was concluded by September 2013. The cost raised higher than expected caused by several reasons (e.g., optimization study and suspension required by the Ebola crisis). Therefore, additional financing was requested and was confirmed from MCC and KfW in October and November 2015, respectively.

Construction began January 2014 and was concluded 2018. The Mt Coffee HPP is composed of a powerhouse containing 4 turbines each with a capacity of 22MW (max flow rate of 105 m^3/s each turbine). The main dam is an earthen embankment dam with a height of 23.00 m and a crest length of 466.34 m. Behind the dam forms a reservoir with an surface area of 13.8 km^2 at Full Supply Level (FSL), which is at 29.00 m asl. The minimum operation Level is at 27,4 masl. The switchyard at Mt. Coffee HPP is connected to two of LEC's main Monrovia substations via two high-voltage (132 kV) transmission lines (TLs) that run from the Project site to Bushrod Island and Paynesville. Both lines run parallel, for about 4.7 km, from the site to White Plains, where the water treatment

plant is located. From there they split off in two directions to Monrovia. Together the TLs have a combined length of 49.7 km.

Production of energy started in December 2016 with Unit 1. Unit 2 and Unit 3 went in operation in February and March 2017 and Unit 4 finally in April 2019. Unit 4 it is currently only on standby.

As already stated in Chapter 5.2.4.2 Mt Coffee HPP and its discharge pattern there are several factors which have to be taken into account when operating a Hydropower Plant:

- Amount of incoming water
- Required energy of end consumers and time when it is required
- Obligational environmental flow
- Reservoir level and turbine performance, there is a range in which an HPP can operated. This range is determined by the dam height/spillway height (full supply level) and the height of the location of intake structure (minimum operation level). Furthermore, the flow (m^3/s) and the head (height difference between turbine and water level) determines the electrical power production. Therefore, it is normally aimed to keep the water level as close as possible to the full supply level.

The following figure provides the Hill Chart of the turbines at Mt Coffee. Showing the operating limits of the turbines, which are between a head of 18 m to 24 m and a minimum flow of 37.5 m^3/s and a maximum flow 108 m^3/s. The best efficiency is given with a high head and a flow of about 100 m^3/s. If the flow is between 37.5 m^3/s and 70 m^3/s the turbine can only be operated temporary.

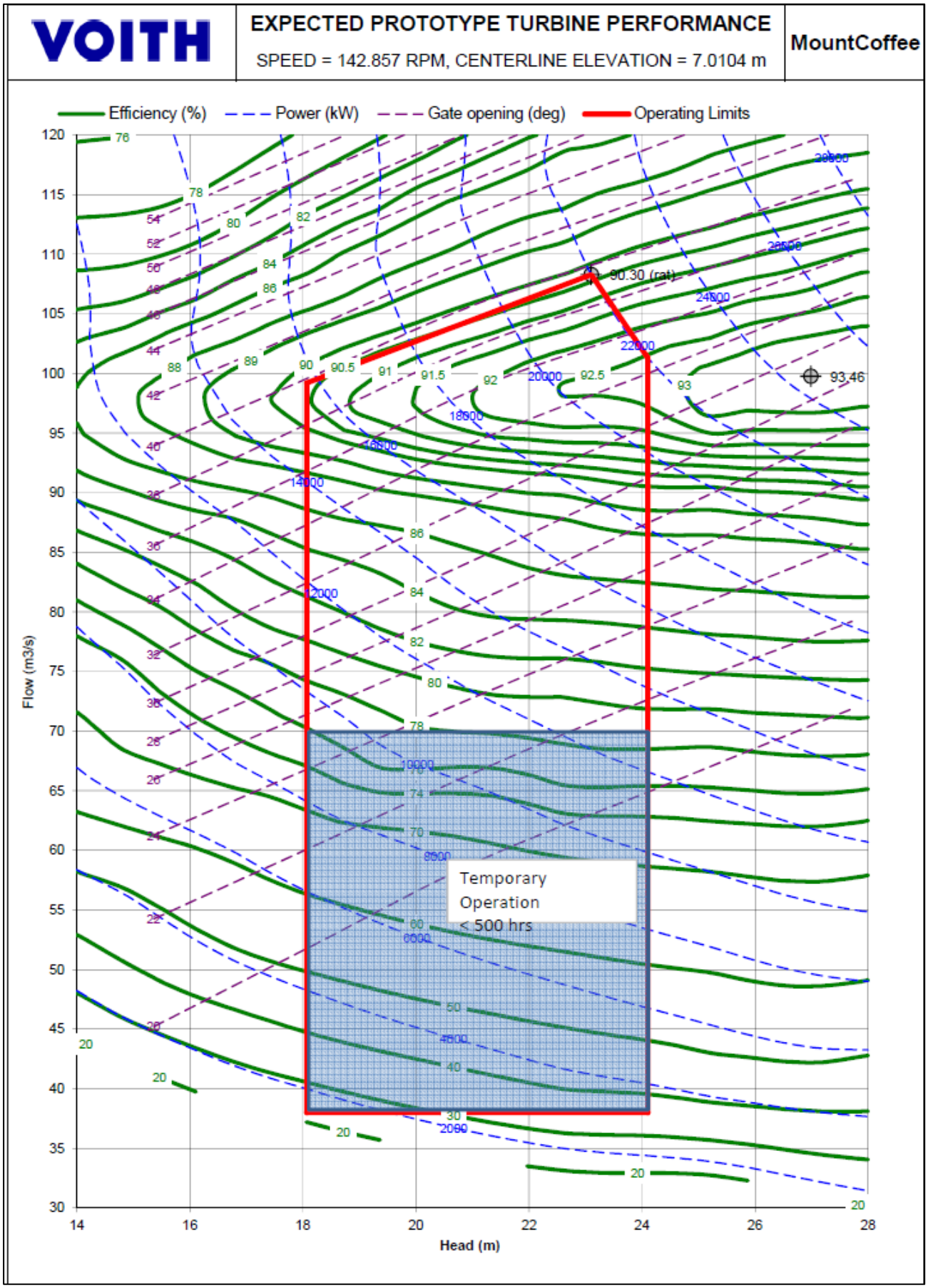


Figure 5-33: Hill Curve of the turbines at MCHPP

Furthermore, it was shown that during rainy season there is sufficient water to operate the Raw Water Transmission Pipeline and HPP on full capacity for June till November and for May at least on two turbines, which is sufficient for the given distribution network.

During dry season this is different due to the shortage of water MCHPP can only operate on one turbine. The turbine is either operated on low capacity the whole day, or on full capacity during peaking hours (current practice is to operate it during peaking hours, evening time) and the time between operation is used for the refilling of the reservoir.

The following table provides the MWh produced in the year 2018, as can be seen during dry season (mainly January to March) less MWh are produced due to a shortage of water.

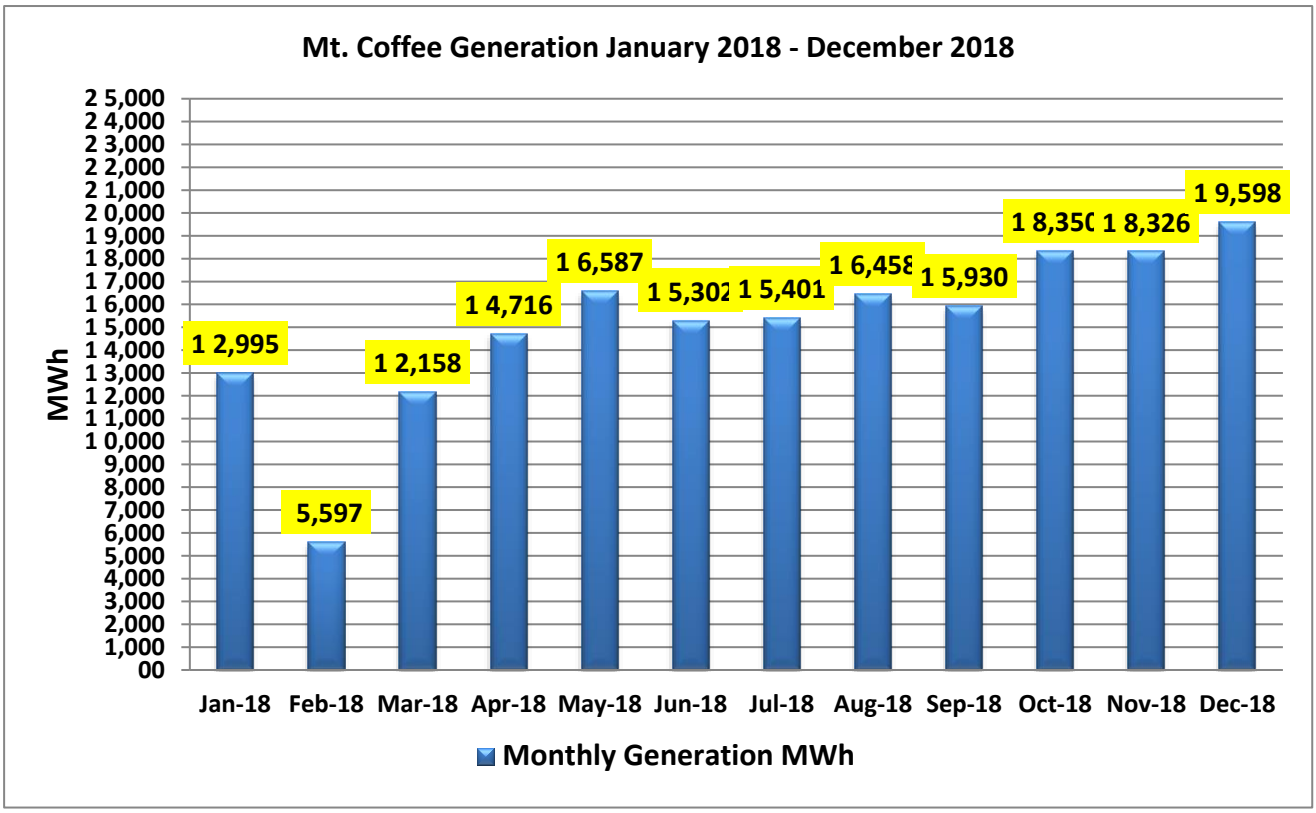


Figure 5-34: Monthly Generation MWh

Table 5-14 provides the inflow at Haindi, the discharge trough the turbines, the discharge through the spillway and the total discharge for the years 2017/18 and 2018/19 during dry season.

Table 5-14: Inflow, discharge turbines & spillway and total discharge during dry season

Time String	Average Inflow from Haindi m^3/s	Average discharge spillway m^3/s at MCHPP	Average discharge turbined in m^3/s at MCHPP	Total Average Discharge m^3/s at MCHPP
Dec-17	154.7	132.0	117.54	249.5
Jan-18	58.6	**12.4**	101.06	113.5
Feb-18	20.5	**8.4**	47.15	55.6
Mar-18	81.5	**8.0**	96.99	105.0
Apr-18	125.6	**8.0**	121.60	129.6

Time String	Average Inflow from Haindi m^3/s	Average discharge spillway m^3/s at MCHPP	Average discharge turbined in m^3/s at MCHPP	Total Average Discharge m^3/s at MCHPP
Dec-18	0.0*	86.4	156.16	242.5
Jan-19	74.6	**6.2**	116.26	122.5
Feb-19	69.2	**7.44**	63.27	70.7
Mar-19	45.5	**8.0**	41.63	49.4
Apr-19	107.2	**8.0**	113.24	121.3

As can be seen during dry season the discharge through the spillway is around $8m^3/s$ (bold numbers) which is the environmental flow. All other water is used for energy production and the withdrawal of an extra of 0.9 m^3/s from this water will reduce the energy production.

The following calculation should illustrate the lost energy production per month.

$P=Q*p*g*h*\eta$

$P=0.9\ m^3/s*1000\ kg/m^3*9.81\ m/s^2*22\ m*0.85$
$P=165$ KW per hour

Loss per day: 3.96 MWh
Loss per month (30 days): 118.8 MWh

P = electrical power (KW)
Q= Flow rate in (m^3/s)
p = water density (kg/m^3)
g = Acceleration of gravity (m/s^2)
h = Head (net)
η = global efficiency ratio

This loss of energy will need to be replaced by other energy sources through LEC and those other sources are thermal power plants operated with either heavy fuel oil or with diesel. The current price for one MWh generated by diesel is 220 USD, using 118.8 MWh lost per month this would result in a financial impact for LEC of 26.136 USD per month. Over the period of minimum three month and maximum four month, the financial loss for MCHPP will be anywhere between 78'408.00 USD and 104'544.00 USD

The energy produced via the diesel power plants will impact the environment especially the air quality. However, the current practice at the water treatment plant is to operate diesel generators for pumping the water from the St Paul's river to the water treatment plant. It is assumed that the diesel generated energy used for pumping causes higher emission per year then either using them only for the dry season or compensating LEC.

5.4.17 Water and Sanitation

As already mentioned, it is rather difficult to estimate the water demand by household and it varies significantly and depends on the distance to the water source. Walking distances are between 5 and 25 minutes. The number of required gallons per person ranges between 0.5 gallons (2 litres) and 15 gallons (56 litres) the average is 6 gallons (22.5 litres).

Currently the St Pauls river is the main source for domestic use and even for drinking water, followed by creeks/streams and wells.

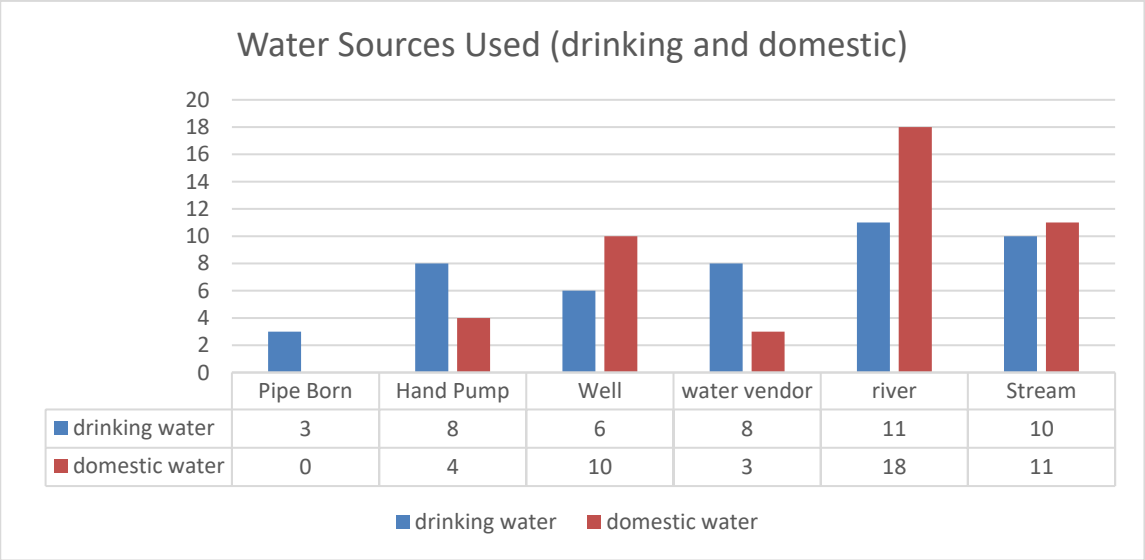


Figure 5-35: Water sources used (drinking and domestic)

The quality depends on the source the household uses. Twelve PAPs responded that the water source is sometimes not drinkable, either using the river or the stream. The 13 PAPs who state that the water is sometimes dirty but drinkable also use the river or the stream and some use the wells. Three of the 21 PAPs who state the water is good use the river; the others buy their water or use hand pumps, wells or pipe borne water.

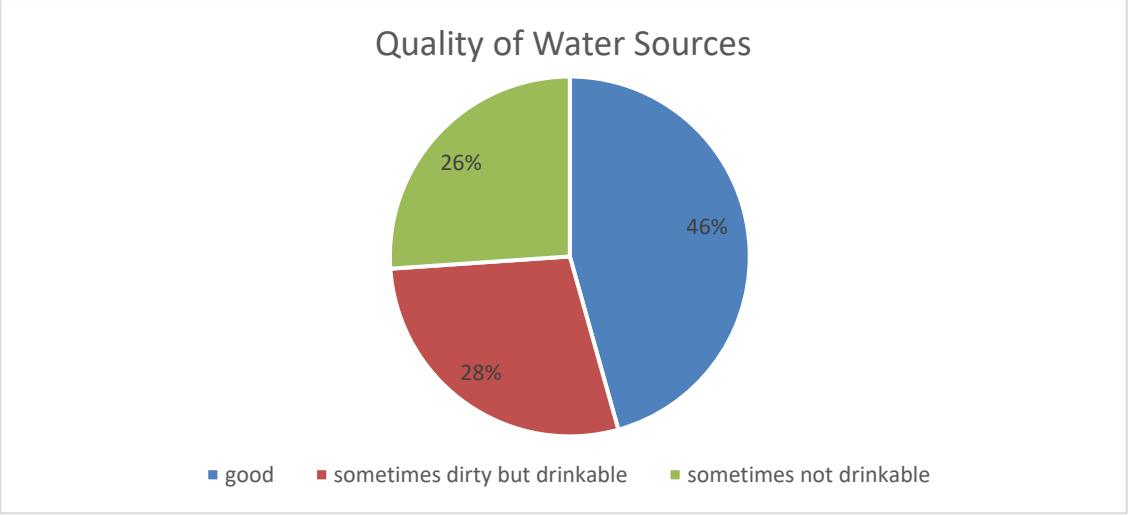


Figure 5-36: Quality of water sources

Many of the communities in the project area depend on natural water sources from rivers and/or streams for their consumptive water uses. An overwhelming proportion of the communities' wells/boreholes obtain water directly from sources that dry up during the dry season (November – March).

In terms of sanitation, 52% of the households have access to pit latrines, 26% have even flush toilets, while 20 % of the residents practice open defecations using the bushes along the bank of various rivers and streams. This practice threatens the health and wellbeing of the inhabitants.

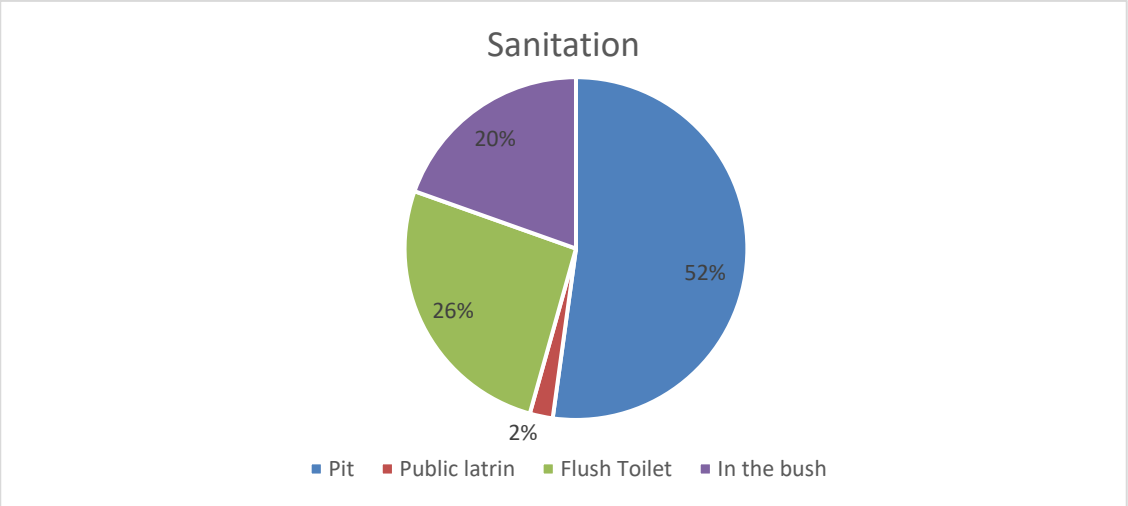


Figure 5-37: Sanitation

5.4.18 Disposal of Garbage

It must be stated that most of the project areas transverse rural-like communities. A proper waste management system does not exist, so the people are left alone with the problem of the waste disposal. 34% of the respondents have a pit where they bury the waste, 26% burn their waste and 6% state that a garbage collection firm is collecting their waste, while 34 % are throwing their waste in the bush.

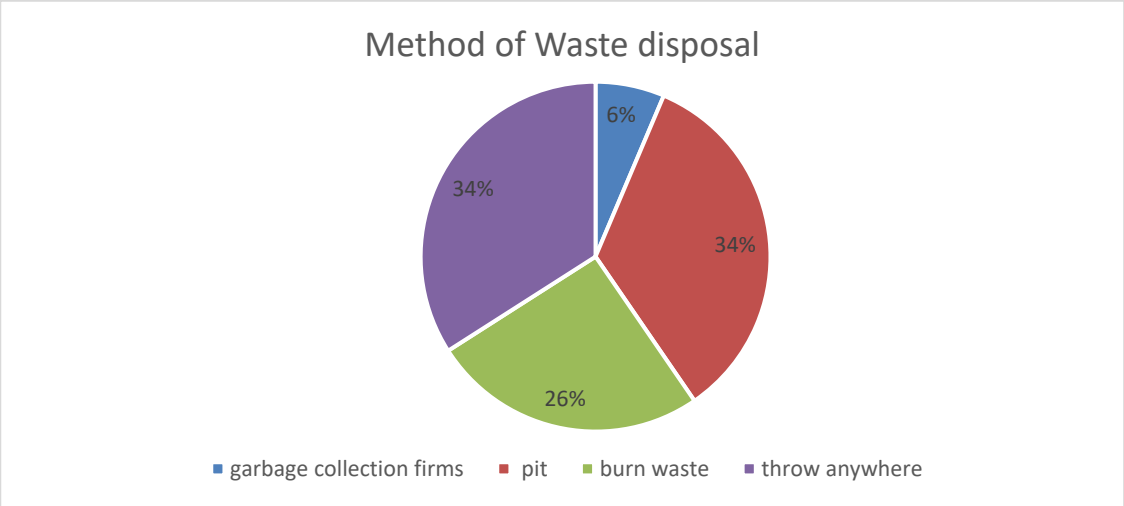


Figure 5-38: Quality of water sources

5.4.19 Health Facilities and Access

There are two health facilities in the project area. The Harrisburg Clinic located in Raymond Camp with at least one nurse and the White Plains Health Center. Both are public, with limited medical supplies, both operate at clinical levels without any major surgical work being done. Those clinics work towards ensuring that the community's medical related illnesses, which mostly results from the lack of safe drinking water and water borne diseases like malaria are adequately addressed. In the event where there is a serious medical case needing surgical operations, the victims are transferred to nearby hospital in central Monrovia.

Walking distance to the health facilities ranges between 5 minutes to one hour. Almost all PAPs prefer to use the Harrisburg clinic. As reported by the PAPs and the nurse of the clinic of Harrisburg, malaria, diarrhoea, typhoid and the common flu are the most common sicknesses affecting the community.

5.4.20 Gender Issues

Since the end of the civil crisis, Liberia has made significant progress in enhancing the status of women and girls. However, the paternal system of the country has made it difficult for the participation of women in decision making positions at most levels of the society.

Gender inequality and women's marginalization in Liberia is maintained and sustained by traditional and religious perceptions of women as subordinate and men as superior. Girls and boys, women and men are socialized and culturally ascribed different and rigid roles, duties and responsibilities with regard to division of labor, access and control over resources, and decision-making positions. In turn, these are transferred to schools, the community and the workplaces. The Government established the Ministry of Gender and Development that is implementing the National Gender Policy, geared to usher the country towards achieving gender equity and equality, building and utilizing the potential of women and girls in pursuing and benefiting from national development goals. There is also a local women organization called "Harrisburg Women Association" in the project area that foster the goals of women development. The organisation has 30 members and is mainly engaged in following activities:

- Daily susu saving club
- Farming activities
- Sharing with members in bereavement of family members associated with the club.

5.4.21 Situation of Women

Respondents were asked about what is most needed to improve the situation of women in the project areas. 19% of the respondents indicated that women needed attention and assistance in the society, 11% responded that women needed empowerment from both Governmental and Non- Governmental institutions, 60% responded that women needed skills-training and employment opportunities and 10% indicated that women needed better medical and social attention.

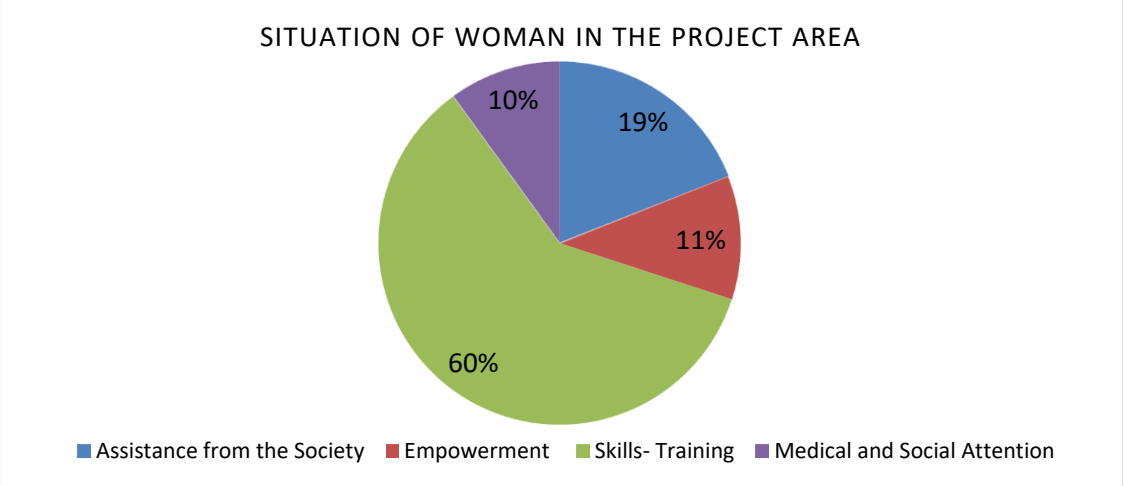


Figure 5-39: Status of women in the PACs

It was revealed that many women are uneducated and as such, lack the means for employment. Even those with some degree of education will have to seek permission from their husband before seeking employment. This is meant to prevent domestic conflict in that some men do not encourage their wives in the company of other men at the work site.

All of the respondents supported the project and stressed that during the time of pipeline construction, employment opportunities should be provided less opportune women, even at unskilled participation.

5.4.22 Situation of Children

The situation of children was also assessed. 50% of the respondents were of the view that children needed more opportunity for school, 37% indicated that children needed better feeding and medical care, 9% indicated that children needed better training at the home level, while 4% of the respondents indicated that children needed recreational facilities.

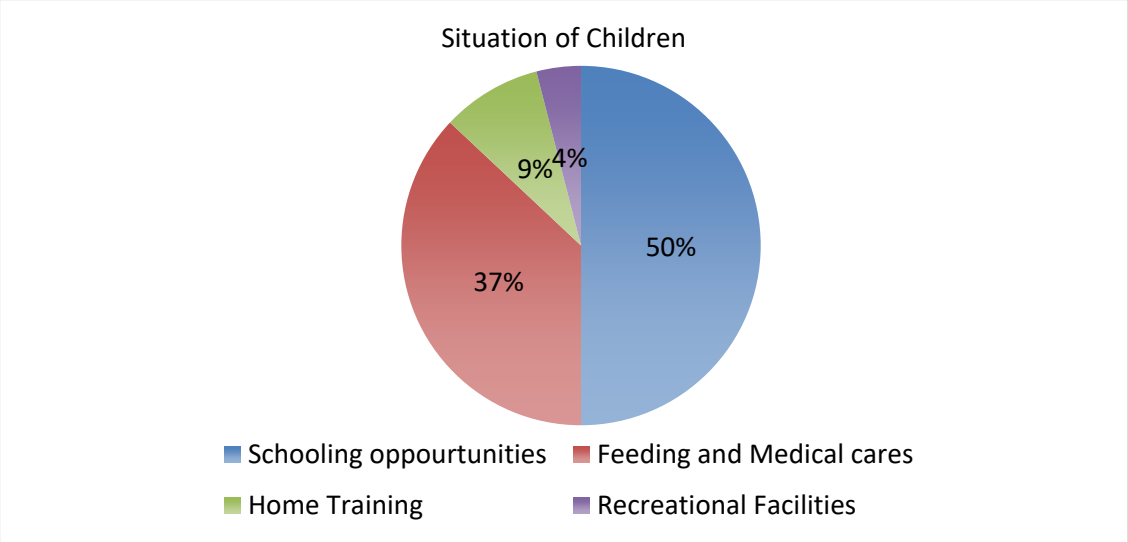


Figure 5-40: Situation of Children in the Project area

Many respondents were of the view that due to lack of means; many parents could not send their children to school or provide them proper medical attention. And the fact that such children are made to tend for themselves, they engage in theft and other vices.

5.4.23 Standard of Living in the Project Areas

Many residents are of the opinion that living conditions in the project areas is very poor. Majority of the people are subsistence farmers. Due to the difficulty of travelling, excess crops cannot be taken to market to be sold as one has to walk several hours to markets, usually located in the larger towns. Some decried the lack of employment opportunities for residents, with NGOs fading out. Many residents lack opportunity to basic services, including electricity, good water, access to health services, etc.

5.4.24 Recreational Facilities

Access to recreation has over the years proven to be a sure way to sustaining the quality of life in every society. Its contribution to health and recreational facilities can help to reduce obesity among children and adults. It does because it provides the environment for exercises, that are likely to keep the minds of the youths and the unemployed engaged from becoming involved in crime related activities such as armed robbery or engage in taking drugs and other harmful substances. Therefore, football and kickball are the most notable sports identified within the area.

Realizing that the sport of football is practiced by a considerable number of men in the area, it is unsurprising that most communities have at least one football field. However, women on the other hand, play kickball, a form of soccer that is unique to Liberia. Aside from football and kickball, most community members have or hold traditional dances and song sessions for their own entertainment. Some youths have live bands, together with gospel choirs; usually practiced and performed in churches. There are also rituals and ceremonies carried out to signify the inauguration or celebration of events, mostly intended to invoke the blessings of ancestors. These events are usually colourful, and celebrated in grand style. Drinks are given, and offerings made to ancestors including important community leaders or chiefs when they die, especially when such leaders are of higher status and ranks.

5.4.25 Expectations of the PAPs in relation to the Water Transmission Pipeline Project

Main benefits are seen in the supply of safe drinking water (38 PAPs) to the communities. Further benefits are seen in the general development of the area (9 PAPs), in job opportunities and in the compensation of the farms and crops. Main disadvantages and challenges for the PAPs are seen in the restricted access to the river, and if jobs are not provided to the local communities and workers from outside the area will be employed. Furthermore, it was mentioned that compensated land may not have the same soil fertility and that crops will be destroyed.

In general, PAPs are supportive of the project and see it as a good project as long as the compensation will be paid in time.

Even though the local population would see the provision of drinking water as one of the main benefits, it needs to be pointed out that there is no water distribution network to the communities. There is only in Monrovia a distribution network.

6 ENVIRONMENTAL IMPACT IDENTIFICATION AND EVALUATION

Development initiatives such as the Raw Water Pipeline construction and operation have some level of impact on the surrounding environment. Nevertheless, the extent and nature of the impact can vary widely depending on the method/technology, the characteristics of the project site and its surroundings, and the control and management of the project operation. The environmental impacts that will be caused due to the construction of the pipeline can be categorized as primary (direct) and secondary (indirect) impacts. Primary impacts are those which will be induced directly by the project, whereas the secondary impacts are those that will be indirectly induced and typically include the associated investment and changing patterns of social and economic activities due to the proposed action.

The nature and degree of impact however varies depending on the location and the type of operation. The magnitude of each impact is described as significant, minor or negligible, temporary or permanent, long-term or short- term, specific (localized) or widespread, reversible or irreversible. Some mitigation measures of impacts have already been addressed in the proactive design and other mitigation measures can only be guaranteed through active, responsible management, helped by following the guidelines in the project environmental management plan. This section highlights the anticipated impacts of the proposed project and outlines measures to be put in place to minimize the predicted adverse impacts.

The procedures used to identify and valuate impacts are described in detail in this chapter. Those procedures included a standard set of identification tools, desk-top analysis, as well as discussions with specialist and project team members.

Potential impacts were assessed against a set of assessment criteria and a significance value was assigned. Mitigation measures proposed by LEG to minimize the environmental impacts associated with the operation of the project are presented in this report.

6.1 Methodology

The methodology presented here has been followed to identify and assess the potential impacts of the proposed Project. After the identification of the impacts the magnitude of the impacts was assessed. Impacts can be categorised as

- direct – indirect;
- total – partial;
- permanent – transient;
- important – negligible;
- positive – negative;
- acceptable – not acceptable.

While the first three categories are rather clearly identifiable and therefore undisputed in most cases, the question whether an impact is important, positive, or acceptable can be, to a certain degree, a matter of conventions, agreed upon values, or even personal preferences.

Based on a description of the prevailing situation, project dimensions (e.g. occupation of land) and values accorded to certain habitats (e.g. based on their rarity and/or the number of legally protected and threatened species they harbour), the importance of an impact was identified and required mitigation measures defined.

To be as objective as possible and to use the best practice for ESIAs impacts have been rated. Impact ratings are derived to:

- Provide a basis for prioritization of impacts to be addressed;
- Provide a method of assessing the effectiveness of proposed mitigation measures; and
- Provide a scale which shows the level of impact both before and after a proposed mitigation measure has been applied.

For this ESIA, a consistent system for rating impacts in order to apply analytical rigor to the assessment and rating process has been used. It must be remembered, however, that any outcome with regard to reducing major negative impacts or enhancing positive impacts is dependent on the selection, applicability, implementation and effectiveness of mitigation measures for the proposed Project.

6.1.1 Steps of Impact Assessment

The process of impact assessment is completed through a series of steps. In general, these steps are as follows:

1. Characterize the baseline – the existing conditions before the Project is undertaken and any effects are generated;
2. Describe the Project components throughout the Project lifespan (Construction and Operation) to develop a Project Description;
3. Evaluate alternatives to the Project to see if impacts can be reduced;
4. Based on the Project Description and evaluation of alternatives, identify sources of impacts and the impacts themselves that are generated by any aspect of the Project;
5. Rate impacts before any mitigation (for negative impacts) or enhancement (for positive impacts) is implemented; and
6. Identify mitigation and enhancement measures to address the impact.

6.1.2 Criteria for Rating Impacts

Potential social and environmental impacts are rated based on two elements: (1) the severity and enhancement of the potential impact and (2) the likelihood that the impact will occur. The derivation of these elements is described in the subsequent sections. This methodology has been devised by the EIA evaluators and is adapted from an Environmental Health and Safety (EHS) risk rating system and adapted to ESIAs. No standards or guidelines can be found for the same. Ranking impacts is useful because it helps a project address the major impacts first and prioritize mitigation measures.

6.1.3 Severity and Enhancement Criteria

The severity or enhancement of each potential impact has been rated using the criteria identified in Tables 6-1 and 6-2.

Table 6-1: Severity Criteria (Negative Environmental Impacts)

Severity	Duration	Description
Low	Short-term Low frequency	Affects environmental conditions, species, and habitats over a short period of time, is localized and reversible.
Medium	Medium-term Medium or intermittent frequency	Affects environmental conditions, species and habitats in the short to medium term. Ecosystems integrity will not be adversely affected in the long term, but the effect is likely to be significant in the short or medium term to some species or receptors. The area/region may be able to recover through natural regeneration and restoration.
High	Long-term Irreversible Constant frequency	Affects environmental conditions, species and habitats for the long term, may substantially alter the local and regional ecosystem and natural resources, and may affect sustainability. Regeneration to its former state would not occur without intervention. Affects environmental conditions or media over the long term, has local and regional affects or is irreversible.

Table 6-2: Severity Criteria (Negative Social or Health Impacts)

Severity	Duration	Extent	Ability to Adapt	Socio-cultural Outcome	Health Outcome
Low	Short-term (<1 year) Low frequency	Individual/ Household	Those affected will be able to adapt to the changes with relative ease, and maintain pre-impact livelihoods, culture, quality of life and health.	Inconvenience but with no consequence on long-term livelihoods, culture, quality of life, resources, infrastructure and services.	Event resulting in annoyance, minor injury or illness that does not require hospitalization
Medium	Medium-term (1-7 yrs) Medium or intermittent frequency	Small number of households	Those affected will be able to adapt to change, with some difficulty, and maintain pre-impact livelihoods, culture, quality of life and health but only with a degree of support	Primary (direct) and secondary (indirect) impacts on livelihoods, culture, quality of life, resources, infrastructure and services	Event resulting in moderate injuries or illness, which many require hospitalization
High	Long-term (> 7 years)/ Irreversible Constant frequency	Large part or entirely	Those affected will not be able to adapt to changes and continue to maintain pre-impact livelihood	Widespread and diverse primary and secondary impacts likely to be impossible to reverse or compensate for.	Catastrophic event resulting in loss of life, severe injuries or chronic illness requiring hospitalization.

6.2 Identification of Potential Impacts

The nature of environmental impacts is that they have far reaching primary, secondary and tertiary consequences on the surrounding environment. It is therefore difficult to classify, group or define their limit as natural systems are linked in many ways. Potential impacts identified during the construction and operation phases of the project are provided in Table 6-3 and Table 6-4 and have been broadly categorized according to their

receptors. The activity/activities contributing to the impact and the primary and secondary recipients are provided for each impact.

6.2.1 Assessment of Impacts Caused by Structures

Pipeline and fencing

The main structure in terms of environmental impact is the pipeline and the corresponding fence of the permanent RoW, the main impact is on land use, fauna and flora and the communities. The impact of the pipeline is considered as relatively small for fauna and flora and small for the human population. However, the impact of fencing the permanent RoW of the pipeline is compared to the impact of the pipeline itself the main impact of the project and considered as medium, since it results in a fragmentation of habitats and it restricts the access of the local population to the river, which is one of their main water sources for washing, bathing, fishing (fish and crawfish), collecting of snails, etc. This impact was already recognized during the planning stage of the project; therefore, eleven passages with an average distance of 350 m to 400 m between them were included into the design, the communities were involved in the selection of the 9 main passages, all passages are located on the main footpaths the communities use currently to reach the river. Two passages have additionally added to further reduce the impact. Furthermore, it is in discussion to lift the fence by 10 to 15 cm so that small and medium sized animals can pass below. However, a decision will need to be taken related to the lifting of the fence.

The total area used during the construction period will be around 16.92 hectares (around 41.8 acres). It is estimated that the permanent used area, the right of way of the pipeline, will be around 4.7 hectares of which 0.87 hectares are within LEC Property and 0.25 hectares on LWSC property both Governmental entities. Therefore, a total of 3.8 hectares (9.4 acres) of land will need lost for agricultural production.

Access roads

There are four access roads planned to reach the pipeline. The alignment of the access roads follows existing roads or footpaths to reduce the negative impact. The existing roads have a width of ± 2.5 m to 3 m and the footpaths a width of 0.5 m to 1 m. Those roads/footpaths will be broadened to about 5 m to enable the delivery of equipment.

- Access road 1: located between Raymond Camp and Plum Hill is an existing dirt road and will have a total length of about 30 m. The impact is negligible since the access road falls within the RoW of the road and the RoW of the transmission line both are cleared periodically, no farms or structures are affected.
- Access road 2: located at Plum Hill, has the total length of 580 m while 250 m follows an existing dirt road leading to the St John United Methodist Church (operating time: Sunday 9:30 am to 1:00 pm) adjacent to the church is a school (operating time: 8:00 am to 1:00 pm). The last 230 m is largely a foot path that will need to be newly constructed. This access road is required to serve about 600 m section of pipeline construction. The impact is seen as medium due to the disturbance of the Church and the School (risk of accidents). However, the impact can be reduced to small if proper mitigation measures are included. As already described, the main traffic will be when the pipes are coming. The transportation of the pipes for that section should be organised in a way to minimize disturbance during the operation hours of school and church. It is recommended to only use this access road after 2:00 pm for pipe transportation. The time span will be

maximum 2 weeks, 3 trucks a day, in which the pipes will be stored on the RoW of the associated length of pipeline. Furthermore, two times per day trucks for raw materials (concrete, rebar, etc.) will pass by for a time span of maximum 6 weeks. Here it is required to agree with the school on one time in the morning and the second truck should pass after 2:00 pm. Any other traffic should as far as possible minimize disturbance during operating hours or should use access road 3.

- Access road 3: located at the storage area quarry, is an existing road. No activities are required in the first 230 m to the quarry from there onwards a small dirt road is leading further 300 m towards the river, minimal widening of the dirt road will be required. The impact is seen as negligible since a road is already existing and no farms or structures will be affected. Large parts of the environment are already degraded by the storage area of the quarry.
- Access road 4: located at Cook village is passing between two houses, which will need to be demolished. The access road, with a total length of 570 m, is currently a foot path and will be newly constructed. The section between access road 3 and 4 is 1400 m long and about half of it will be served by access road 4. In addition, the part of the bridge construction is located at the end of the access road meaning this area will be one of the areas with more construction activities. The delivery of the pipes and steel parts for the bridge will take about three weeks, the actual construction time about 8 to 10 weeks. Impact is seen as medium since the demolishing of the two structures cannot be prevented. Two farms will be affected. However, structures, land and crops will need to be compensated.

Due to the circumstances that the roads and footpaths are already existing and that the distances per access road are rather small, the time period each of the access roads is used as well as the frequency of trucks passing, the overall negative impact if the required mitigation measures are implemented was still considered as small.

Quarry, burrow areas and dumping sites

It is expected that any material required will be purchased at already existing sites in the close surroundings e.g. left-over rocks from Mt Coffee HPP/ quarries. Excavated material from trenching will be backfilled. Possible dumping sites for uncontaminated soil (approx. equal to the volume of the pipe) will be approved by the Engineer (NOD) and any spreading/disposal will be undertaken in a manner that does not cause erosion and sedimentation of nearby waterways, or negative impacts to wetlands.

6.2.2 Assessment of Impacts Caused by Construction Activities

The presence of the work force causes a number of impacts: on water quality (waste water), potentially on animals (hunting, fishing) and on the local population; these latter can be positive (by generating income in the area) or negative (by competing for jobs at the construction site).

The construction activities as such (including transports etc.) are an important cause of environmental impacts. Problems with air quality, water quality, and noise could arise as results of these activities. However, all these impacts are limited, restricted to the construction site (and, given the difficult terrain, without much risk of spreading) and to the construction period.

The construction period is also the period causing the largest impact, some of which are limited to this period; such impacts are, e.g.:

- temporary occupation of areas for construction site installations; risk of increased erosion on surfaces where vegetation was cleared;
- risk of soil and water contamination due to storage and use of fuels, lubricants and other potentially toxic substances, and by activities like maintenance of vehicles and machines;
- risk of water contamination with concrete (cement), which can increase pH to a level which is toxic to fish and other aquatic organisms;
- noise and vibrations stemming from traffic and the operation of machines (e.g. small rock crusher); dust from the same sources;
- generation of solid waste of different types and wastewater;
- Loss of land and crops within the permanent (10m) and temporary (max. 36 m) RoW. This is the largest impact of the project activity (see impacts by Structure). The 36 m corridor is necessary to ensure:
    - sufficient storage for the soil (with a separate storage for the topsoil);
    - Safe space for manoeuvring the heavy equipment;
    - Safe passage for people and vehicles around the direct trenching operation;
    - Storage of materials for the concrete chambers
    - Stringing of the pipes

  All this in a very limited timeframe so any time delays because of the interference between these operations and traffic flows have to be avoided at all times. At certain critical points along the pipeline, this corridor will be narrowed to a corridor of minimum 21 m to avoid unnecessary impact on a structure or people or unnecessary clearing of mature trees and vegetation. In the further planning it will be assessed were it is possible to reduce the width of the corridor, e.g. to prevent impact on grave sites and one of the structures.
- social and health impacts due to in this case rather small work force coming from other areas of the country or even abroad. The workforce will vary between 100 and 150 people. However, most of them will be recruited from the surrounding communities and only few (10-20%) will be from abroad

Given this number of effects specific to the construction period, the CESMP has also foreseen a number of measures specifically for this period.

The positive impacts which need to be mentioned are:

- Employment Opportunities: The construction of the Raw Water Pipeline will create employment opportunities both directly or indirectly during the construction phase of the project. Socio-economic study infers that there are a lot of local human resources. Therefore, most people will be employed as semi-skilled and casual workers. Few skilled workers will be available. It is anticipated that approximately 100 to 150 people will be employed directly and indirectly during the project period.
- Improved Local Socio-economy: The communities acknowledged that the project will contribute to the growth and development of the local economies of the two (2) townships; business at major communities along the project corridor which will result in (a) Increased business opportunities at the market centres due to the

presence of the project workforce during construction; (b) Employment of locals during the construction phase of the project; and (c) Strengthening of local economy through the establishment of micro-enterprises such as catering services etc.

- Gender issues: The Contractor will be required to give women the same opportunities to work on the construction site, which will improve their situation. From experiences at Mt Coffee HPP some of the best unskilled workers were women. Furthermore, there will be other opportunities for women in income generating activities e.g. through provision of catering services, selling of local goods/products. Women will also be engaged in various tendered activities as provided by the law.

The following table provides a summary on potential direct and indirect negative and positive impacts during construction.

Table 6-3: Major Negative Impacts during Construction

Issue	Type of Impact	Receptors of Impact	Cause of Impact	Severity of impacts	Likelihood	Impact Rating
Physical Environment						
Soils	Soil erosion	Soil environment (loss of fertility)	• Exposing the soil to erosion agents because of vegetation removal and soil compaction. • Alteration of drainage characteristics and erosion processes. • Alteration of soil quality used for agriculture activities.	High	High	Major
	Soil Contamination	Soil environment (loss of fertility) Fauna and Flora	• Mostly caused by the maintenance of machinery, incorrect storage of hazardous material, dumping and spilling of waste, wastewater.	High	Medium	Major
Water	**Water quality:** Deterioration of surface water quality (pH, suspended solids, oil and grease)	Surface water, aquatic fauna (micro-organisms, insects, fish) and aquatic flora; Downstream communities within and outside of the project area utilizing river for domestic purpose	• Site clearance and construction of access roads and trenches could result in an alteration of drainage pattern and an increase of sediments in runoff water. • Instream constructions, for passing the tributaries of the St Paul river could result in increased suspended solids. • Maintenance of equipment and accidental spillages can contaminate the water with oil and lubricants. • Cleaning of any construction machinery including trucks and cars at rivers and creeks will contaminate the water and needs to be forbidden.	High	High	Major

Issue	Type of Impact	Receptors of Impact	Cause of Impact	Severity of impacts	Likelihood	Impact Rating
	Changes in quality of ground water resources	Inhabitants using ground water	• Potential seepage from oil spills etc.	High	Low	Moderate
Air Quality	Particulate matter (dust) and nitrogen oxides (NOx), carbon dioxide (CO_2)	Pedestrians walking along roads; Site workers including vehicle drivers; and Flora adjacent to disturbed areas and roads	• Emission related to construction activities operation of machinery. • Site clearance of surface areas required for trenching and backfilling in dry season will increase dust emissions. Impact is restricted to construction site. • Vehicle movements and material haulage to the construction sites increases	Medium	High	High
Noise and vibration	Noise and vibration	Related to construction activities the inhabitants of settlements along the project corridor are affected. Related to transportation of equipment the population along the Caldwell road will be affected. Effect will be only of short time	• Increased noise level due to the movement of vehicles and construction activities. About 700 m of the construction of the pipeline is in a very close vicinity to populated areas. The other 4.5 km have a distance of about 200 to 400 m to populated areas. • Transportation of equipment	Low	High	Moderate
Waste, hazardous material and storage of hazardous materials	Contamination of soil, water, health risk	The Environment Inhabitants of the project area	• Solid wastes to be generated during the construction phase of the project include wasted mortar, ballast, cement and other packaging materials, sand, metals, plastics and parts of PVC pipes, and garbage. These wastes generated during construction may impact negatively on the environment	High	High	Major

Issue	Type of Impact	Receptors of Impact	Cause of Impact	Severity of impacts	Likelihood	Impact Rating
			(physical, biological and human) if not properly handled and managed • Furthermore, any hazardous wastes or stored hazardous materials if accidental spilled and not immediately cleaned up will lead to contamination of the environment			
Visual Intrusion /aesthetic	Visual Intrusion /aesthetic	Users of public roads along the project site; Local residents	• Disruption of scenic integrity by constructing access roads (most of them are already existing roads) and warehouses.	low	High	Moderate
Biological Environment						
Vegetation	Loss of habitat, loss of topsoil, Loss of timber	Flora	• Loss of vegetation due to the cutting of trees to create corridor for the pipeline passage; soil will be prone to erosion, topsoil required for better regrows could be washed away. • Degradation of surface water and groundwater quality due to spillage from construction machineries. • Lowering the amount of photosynthesis and nutrient cycling in the permanent RoW.	High	High	Major
Terrestrial Fauna		Terrestrial Fauna	• Disturbance to wildlife during vegetation clearing within the RoW including during potential breeding/nesting seasons. Disturbance due to the presence of humans and heavy machines are operating.	High	High	Major

Issue	Type of Impact	Receptors of Impact	Cause of Impact	Severity of impacts	Likelihood	Impact Rating
			• Specific care needs to be taken related to clearing activities close to the river or tributaries. • Fragmentation of the habitat due to the construction of the security fence, even if there are eleven passages animals need to find the passages, this can cause stress especially during dry season when the river is the main source of drinking water for animals. Lifting the fence by 15 cm would reduce the impact drastically. Best option would be to go without fence.			
Aquatic Fauna	Risk of water contamination	Aquatic Fauna	• High amounts of concrete (cement) could lead to a high pH (accidental spillage when working near the water e.g. installing the foundations of the bridge) which has a negative effect on fish. • Any instream activities required precaution measures to reduce the risk of contamination and drastically increased suspended solids. • Contaminated runoff (accidental spillages) water, which enters rivers and streams.	Medium	High	Major
Human Environment						
Socio-economic		Residents within the project area; and Project Affected Persons (PAPs)	**Negative impacts** • Temporary lack of access to agriculture land in working corridor	High	High	Major

Issue	Type of Impact	Receptors of Impact	Cause of Impact	Severity of impacts	Likelihood	Impact Rating
			• Permanent loss of agriculture land in permanent RoW. The amount of permanently lost land is 9.4 acres (3.8 hectares) • Disturbance from temporary blocked river access near construction sections • Loss of crop/tree or other assets in working corridor. • Temporary loss of agriculture-based income • Permanent reduction agriculturally based livelihood related to the 9.4 acres of lost agricultural land. However, there is unused land in the surrounding area. • Increased noise and dust due to construction activities • Possibility of increased traffic accidents. • Influx of workers, therefore local worker will need to compete with new comers for jobs. Furthermore, an increased pressure could result on the local infrastructure and could increase crime. **Positive impacts** • Generation of jobs, although limited to construction period • Possible improvement of commercial activities.			

Issue	Type of Impact	Receptors of Impact	Cause of Impact	Severity of impacts	Likelihood	Impact Rating
			• Possibility of starting other economic activities than faming			
Health	**Public health**	Residents within the project area; and Construction workers.	• Increase in communicable diseases AIDS/HIV. Which potentially increases the vulnerability of women. • Increase of water borne diseases (malaria), through provision of breeding places (ponds, tiers, etc.) • Disturbance created by dusts and noise • Introduction of new diseases from exposure to waste and other pollutants • Increased risk of accidents on roads (increased traffic) and trespassing of construction sections. However, construction sections are limited in size and security will be engaged during night and daytime. To prevent people from entering the construction areas, excavation will be temporarily fenced off.	High	High	Major
	Occupational Health and safety and working conditions.	Workforce	• The majority of the workers will be from the local communities. To reduce the risk of accidents an Occupational Health and Safety Procedure will need to be developed. • Contractor's Labour Force Management Plan will need to be developed to ensure that IFC PS 2 and ILO standards are respected (establishing formal employment, ensuring legal protection,	High	High	Major

Issue	Type of Impact	Receptors of Impact	Cause of Impact	Severity of impacts	Likelihood	Impact Rating
			form and frequency of pay, working hours, prevention of child labour, rights and human rights, grievance mechanism etc. and containing a code of conduct, which every worker has to follow including all sub-contractors e.g. security personnel) • Local workers will need to be trained in a way that they are able to apply the procedures. • The relevant protective equipment has to be provided. • Dangerous areas need to be restricted. • Sufficient water and shading needs to be provided to reduce the risks of sicknesses and accidents. • Portable toilets will be put in place since the work area varies every single day (going along with the pipeline).			
Heritage and Cultural Resources	Destruction of grave sites and or secret sites	Heritage and cultural sites	• Ground disturbance via heavy equipment operations disrupting or damaging sites.	Medium	Medium	Moderate

6.2.3 Assessment of Impacts Caused by Operation of the Project

These impacts are important, since they will be permanent, at least for the life span of the Raw Water Transmission Pipeline and/or the Water treatment Plant.

The main negative impact of the operation of the Raw Water Transmission Pipeline will be on the operation of MCHPP. As described in Chapter 5.2.4.2 there will be a reduction in the quantity of water available in dry season for energy generation. As shown in Chapter 5.4.15.2 this will have financial implications for LEC, since LEC will need to use cost intensive thermal power to generate the missing energy. Through the use of thermal power to generate the missing energy additional emissions will be generated for the energy production in dry season. However, this effect is offset somewhat because without the Project, the Water Treatment Plant would need to use diesel to generate power to pump the water.

Operation of the Project will have several positive effects.

- Improved Living Standards: The implementation of the project will result in the improvement of the living conditions of population within the two townships, thus contributing to poverty reduction. The communities felt that there will be increased wealth creation owing to influx of investors coming to exploit the increased business potential due to availability of hygienically safe and clean water. However, up to now there is no water distribution system from LWSC in the two Township. Therefore, the positive impact will mainly be attributed to the population of Monrovia. An increase in the government revenue generation is expected. The project will be maintained by skilled employees.
- Health impacts: One of the main positive impacts will be on health. Clean drinking water will have a positive impact on health and potentially reduce any illnesses associated with drinking water and water-borne illnesses. This may have a knock-on positive benefit in terms of the amount of money people spend on medical treatment for the population of Monrovia. Furthermore, it is planned to implement further wells and handpumps, which would improve the drinking water situation in the two Townships.
- Waste impact: if people are able (financially and availability) to buy drinking water in bags, they do it. Then the plastic bags are thrown on the ground as can be recognized all over Liberia. Providing drinkable tap water could reduce the plastic waste significantly.
- Contamination of soil and water: due to the aspect that the water will be transported through the Raw Water Pipeline via gravitation, less oil/ diesel will be required at the Water Treatment Plant, which results in less handling of hazardous material and therefore a lower risk of accidents.
- Air Quality: CO_2, NOx emissions will be compared to the current situation lower since less energy for pumping produced by diesel generators will be required (the additional emissions through generation of energy with thermal power will be restricted to the dry season)

The following table provides a summary on potential direct and indirect negative and positive impacts during operation and maintenance.

Table 6-4: Major Impacts during Operation

Issue	Type of Impact	Receptors of Impact	Cause of Impact	Severity of impacts	Likelihood	Impact Rating
Physical Environment						
Soils	Soil Contamination erosion	Soil	**Positive impact.** • Reduced risk of oil spillage at the Water Treatment Plant since generators are not anymore required for pumping the water **Negative impact.** • Low negative impact since it is limited to maintenance works the pipeline itself is operated by gravitation.	High Low	High Low	Major Positive Impact Minor Negative Impact
Water	**Water quality**	Surface water, aquatic fauna and flora, Downstream communities	**Positive impact.** • Reduced risk of oil spillage at the Water Treatment Plant since generators are not anymore required for pumping the water **Negative impact.** • Low negative impact since it is limited to maintenance works the pipeline itself is operated by gravitation. • Waste and wastewater of the personnel operating the WTP	High Low	High Low	Major Positive Impact Minor Negative Impact
	Water Use	Mt Coffee HPP Human population	**Negative impact.** • Use of water from the reservoir therefore a reduced flow and less water available for the generation of energy during dry season. • Impact on the environment and downstream water users will only be minor affected since the required environmental flow will still need to be provided by MCHPP therefore the	High	High	Major Negative Impact

Issue	Type of Impact	Receptors of Impact	Cause of Impact	Severity of impacts	Likelihood	Impact Rating
			difference is small since the flown of 0.9 m3/s has to be taken from the overall flow which makes a total reduction of max. 1.5 % and min 0.3%			
	Water supply and demand	Population of Montserrado county	**Positive impact** • Will increase the reliability of water • Will provide a better water quality of the supplied water. • Sufficient water to cover the current demand	High	High	Major Positive Impact
Air	Particulate matter (dust) and nitrogen oxides (NOx), carbon dioxide (CO_2)	Flora adjacent to disturbed areas and road; Maintenance worker; and Residents of Project Affected Communities.	**Positive impact.** • Emission related to pumping water will be reduces at least during dry season. **Negative impact.** • The periodical clearing of the RoW can result increased dust in the surrounding areas. Machinery for maintenance	Low	High	Moderate Positive Impact Moderate Negative Impact
Noise and vibration	Noise and vibration	Inhabitants of settlements along the project corridor.	**Negative impact.** • Increased noise pollution due to the vehicular movement during maintenance activities, however, the vehicles will be normal cars and only once a month for inspections.	Low	Low	Minor Negative Impact
Waste, hazardous material and storage of hazardous materials	Contamination of soil, water, health risk	The Environment Inhabitants of the project area	**Positive impact.** • Since the pipeline is operated via gravitation the consumption of hazardous material will be reduced. **Negative impact.** • Minor quantities of oil fuel and lubricants for maintenance	Low High	Low High	Minor Negative Impact Major positive Impact

Issue	Type of Impact	Receptors of Impact	Cause of Impact	Severity of impacts	Likelihood	Impact Rating
Waste in general	Contamination of soil, water, health risk	Population of Montserrado	**Positive impact.** • The use of plastic water bags in Liberia could be reduced through provision of safe water from the tap.	High	High	Major Positive Impact
Visual Intrusion /aesthetic	Visual Intrusion /aesthetic	Users of public roads along the project site; Local residents	**Negative impact.** • Permanent changes of landscape due to the fencing of the RoW. • Temporary impact on public views of the site because of maintenance works	Medium	High	Moderate Negative Impact
Biological Environment						
Vegetation	Loss of habitat, loss of topsoil, Loss of timber	Vegetation and Habitats	**Negative impact** • Clearing of the RoW, due to the limited extend of 10 m it is rated moderate.	High	High	Major Negative Impact
Terrestrial Fauna		Terrestrial Fauna	**Negative impact.** • Disturbance to wildlife during vegetation clearing for the maintenance of the RoW • Fragmentation of the habitat due to the construction of the security fence, even if there are eleven passages animals need to find the passages, this can cause stress especially during dry season when the river is the main source of drinking water for animals. Lifting the fence by 15 cm would reduce the impact drastically. Best option would be to go without fence.	High	High	Major Negative Impact

Issue	Type of Impact	Receptors of Impact	Cause of Impact	Severity of impacts	Likelihood	Impact Rating
Human Environment						
Socio-economic		Residents within the project area; and Project Affected Persons (PAPs)	**Positive impacts** • Improved Living Standards for the surrounding communities thus contributing to poverty reduction. • possible influx of investors to exploit the increased business potential due to availability of safe and clean water • Savings arising from reduced price and time spent fetching water The population of Monrovia will benefit from the better water supply. **Negative impact** • Restricted access to the river due to permanent fencing, as mitigation measure there are eleven passages planned, which were agreed upon with the communities. However, the fencing still occurs to be the main impact during operation. • Security personnel will need to comply with a code of conduct. • Permanent loss of agricultural land and the corresponding agricultural livelihood.	High High	High High	Major Negative Impact Major Positive Impact
Health	**Public health**	Residents within the project area; and Construction workers.	**Positive impacts** • The costs for medical treatment will be reduced, when people are able to get comparable cheap clean drinking water.	High	High	Major Positive Impact

Issue	Type of Impact	Receptors of Impact	Cause of Impact	Severity of impacts	Likelihood	Impact Rating
	Occupational Health and safety and working conditions.	Workforce	• The majority of the workers are already employed by LWSC. However, LWSC should establish formal employment, ensuring legal protection in form and frequency of pay, working hours, prevention of child labour, rights and human rights, grievance mechanism etc. and containing a code of conduct, which the workers have to follow, including all sub-contractors e.g. security personnel, vegetation clearing, etc. Total number to be employed for operation is one on a permanent basis and max 5 in addition for vegetation clearing. • Security personnel will need to comply with a code of conduct. • However, those will need to be equipped with the required PPEs and should receive the required training. To comply with IFC PS2 • Local workers will need to be trained in a way that they are able to apply the procedures.	Medium	Medium	Major Positive Impact
Heritage and Cultural Resources	Destruction of grave sites and or secret sites	Heritage and cultural sites	**Negative impact** • RoW and access roads maintenance	Low	Low	Minor

6.3 Cumulative Impacts

Cumulative impacts are the total impact arising from the project (under the control of the developer), other activities (that may be under the control of others, including other developers, local communities, government) and other background pressures and trends which may be unregulated. The project's impact is therefore one part of the total cumulative impact on the environment.

The main cumulative impact during operation will be on water availability for MCHPP during dry season as already shown in Chapter 5.2.4.2. The major impact on the downstream water availability is already caused by the MCHPP. The downstream area has to receive the obligational environmental flow of 8 m^3/s. The reduction of 0.9 m^3/s will reduce the amount of water in the reservoir before energy generation. This can lead to slightly longer periods of refilling the reservoir for keeping it on an acceptable filling stage. This will increase the times when the downstream areas receive only the environmental flow. To assess this further an hourly operation pattern would be required. However, the increase in time when the downstream area receives the environmental flow could have a larger impact. The overall flow during peak operation will be reduced by maximum 1.5% and minimum 0.3 %, which is seen as a rather small impact.

Cumulative negative impact related to the RAW Water Transmission Pipeline mainly arise during construction time caused by construction activities and increased vehicle movement on Caldwell Road. However, all construction related impacts will be of short duration and related to the construction site limited to a small area except the increased vehicle movements. Therefore, only the impacts related to vehicle movement are listed.

- Increase in dust dispersion along unpaved sections of Caldwell road because of increase vehicles movement.
- Increase in traffic accidents due to increased vehicle movement
- Increased Air pollution and noise due to construction activities (operation of machinery) and vehicle movement

The main negative cumulative impact during operation is related to the loss of vegetation.

- In addition to the local shifting cultivation practice which causes a reduction of vegetation and habitats, the RoW will be cleared periodically, which will add on to the general reduction of vegetation. However, this impact is limited to the RoW which will permanently cover an area of approx. 9.4 acres (3.8 ha).

7 MITIGATION MEASURES

In order to better recognize the connections between impact and mitigation measure, the impacts are briefly discussed again, and the associated mitigation measures are assigned to them.

7.1 Basic Approach to Mitigation Measures

Mitigation measures, where necessary, were identified with the following priorities:

- Avoidance: if possible, e.g. by modifications of the Project, measures will have to be sought which can avoid relevant impacts altogether; such measures have to be checked with the Technical Consultant in order to ensure that they are feasible, acceptable for the Project, and actually integrated in the planning.
- Minimisation: measures to reduce impacts to an acceptable level (e.g. noise reduction measures to ensure that legally defined noise levels are respected).
- Compensation: if avoidance and minimisation is not possible, then adequate compensation will have to be provided; this will be the case mainly for the human population presently using the area (compensation for field and other uses).

7.2 Physical Environment

7.2.1 Topography

Related to topography, no permanent major impacts are expected; the only location were there could be a small impact is at the access road passing the Methodist Church, since it is a hilly area.

The purpose of the pipeline is to transport the water from Mt Coffee reservoir to White Plains WTP by gravitation, therefore the RoW is selected in a way that it follows the smooth slope along the St Paul River. After trenching, laying of the pipeline and backfilling the surface will be levelled to the same level as before. Therefore, only negligible impacts, if at all, are expected.

7.2.2 Soil

7.2.2.1 Erosion

It was observed along the project corridor that erosion is a common phenomenon. Most of these soil movements are small, but the areas affected by mass movements are usually destroyed and rendered non-productive for further agricultural use. Such areas need considerable efforts and investments for reclamation. The loss of fertile land, even if the area is very small, is a serious drawback for farmers. Because of the evenly distributed rainfall in that part of Liberia, the soil remains saturated over long periods. Less permeable under-layers restrain deep percolation, encouraging lateral water movement and lead to temporary waterlogged conditions. This tendency will be greatest on steep slope.

Good engineering practices will help controlling soil erosion both at construction sites and in peripheral areas, particularly along access roads as described hereafter.

Following measures are as a minimum required:

- Install sediment traps;
- Drainage channels where necessary (roads);
- Prevent steep slopes, define optimum height of work evaluating the instability of the rock, soil etc.;
- Stabilise, compact and strengthen steep slopes;
- Re-vegetation.

7.2.2.2 Contamination of Soil

Contamination of soil during construction stage is primarily due to construction and related activities. The sites where construction vehicles are parked and serviced are likely to be contaminated because of leakage or spillage of fuel and lubricants. Refuse and solid waste from recreation and lunch areas including mobile toilets can also contaminate the soil. Contamination of soil during construction might be a major long-term residual negative impact. Unwarranted disposal of construction spoil and debris will add to soil contamination. This contamination is likely to be carried over to water bodies in case of dumping being done near water body locations.

Following measures are as a minimum required:

- The maintenance including washing of machinery and trucks has to be done in workshops, liquids including cleaning water should be collected in tanks.
- Workshops as well as cleaning areas for equipment and vehicles should be in a distance to any open waterbody. They need to have a sealed surface including drainage channel equipped with an oil trap (skimmer).
- Storage of fuel and lubricants must be in tight containers placed on sealed surfaces underneath a roof. The storage must be equipped with all safety measures to prevent oil spilling including firefighting equipment. The area needs to be marked.
- In the case of an oil spill sufficient quantities of oil absorbent have to be stocked. The contaminated absorbent has to be disposed of properly.
- Hazardous waste must be stored in designated closed tanks or areas. Solid waste generated during construction and at from recreation and lunch areas including mobile toilets will be properly treated and safely disposed of only in demarcated waste disposal sites.
- All activities which could contaminate the soil have to be carried on a sealed surface and if accidental spillage occurs the contaminated soil has to be excavated and disposed properly.
- Awareness has to be raised within the workforce to properly dispose of the waste.

7.2.3 Water

7.2.3.1 Hydrology and the Impact on Energy Production

As shown in Chapter 5.2.4.2 there will only be a minor impact on the St. Paul's water flow during rainy season. In relation to the overall water discharge during rainy season,

the withdrawal of 0.9 m^3/s results in a reduction of flow by max 0.6% and minimum 0.005%, which is negligible since the discharge is very high and MCHPP operates like a run-off river plant (flow that comes in goes out through the turbines and through the spillway).

The overall discharge during dry season in the last three years varied between 50 m^3/s and 250 m^3/s this results in a reduction of max 1.5% and 0.3% when withdrawing 0.9 m^3/s for the Raw Water Transmission Pipeline. The discharge through the spillway from January to April is around 8 m^3/s which is the required environmental flow. This means that all the water except of the 8 m^3/s is used for energy production and that the downstream flow is during dry season almost to 100 % determined by MCHPP, which is during dry season more in peaking operation. The 8 m^3/s is obligatory and independent of the RAW Water Treatment Pipeline Project. Therefore, the actual environmental impact is on the overall discharge (spillway plus turbine discharge) which will be reduced by max 1.5% to 0.3%.

The withdrawal of 0.9 m^3/s will have an impact on the amount of water available for energy production and through this it may have the impact that the time to refill the reservoir will last longer which could have a slight increase in times where the St Paul's river receives only the environmental flow.

Special measures to reduce the impact on hydrology are not foreseen since the main impact was caused by MCHPP.

As already mentioned, the impact on the energy production is significant. On how to compensate LEC will need to be agreed between LWSC and LEC, since the water should be a common good. First question would be, where is the priority for GOL, Energy production or reliable water supply. There are several options on compensation and / or agreement.

- Paying amount to LEC of lost water cost for replacing the lost energy through Thermal Power
- Sharing the costs between LEC and LWSC
- Deciding that affordable and reliable drinking water is more important than energy
- Or deciding that LWSC should operate during dry season again on the generators pumping water from the St Paul river downstream of the power plant.

7.2.3.2 Surface Water Drainage

Several streams cross the Project corridor. Apart from these, there are various small drains and water pans draining the Project areas. In the hilly section, there are valley drainage lines which cross the project corridor. Minor impacts are anticipated on the surface water drainage in the area during the construction phase due to the diversion of waterway. Precautions need to be taken during the construction work across these streams such that the flow in these water bodies is not obstructed, thus affecting the cross drainage. In addition, any embankment work in low lying areas shall have provisions for cross drainage for natural drains to ensure that flow is not affected during the construction phase.

Further measures are:

- Prevention of siltation and erosion of water bodies from construction activities

- Reclaiming the disturbed bed and banks of all water bodies and areas associated with the activities following completion of the works
- Any instream construction should be carried out during dry season.
- Any construction activities within streams need to be carried out as fast as possible.

7.2.3.3 Surface Water Quality

The proposed Project corridor is not expected to alter the existing water quality on a permanent basis. There are various water bodies, along the corridors including the St. Paul River, backwaters, and streams. Some impacts are anticipated on the water quality of these water bodies during the construction phase. The issue of blocking of cross drainage should be taken care throughout the construction phase. Care needs to be taken during the establishment of trenches for the passage of pipelines. Water quality during construction can be affected by an increased load in suspended solids stemming from the construction site, by contamination with concrete (cement), resulting in a higher pH which could potentially be toxic for fish, by contamination with hydrocarbons (fuel, lubricants etc.) and other toxic substances used on site, and by contamination with human waste (including feces). It needs to be mentioned that the RoW of the pipeline is following the St Paul river in a distance of between 20 m and 50 m, therefore most of the construction activities will be close to the water and have the potential to contaminate the surface water.

Following measures are as a minimum required:

- All equipment, machinery, trucks (if not in operation) and office installations have to be located in a distance of more than 75 m to any surface water body.
- Strict measures must be taken to prevent oil pollution of the river. The most important are:
    - Storage of fuel and lubricants away from the river, in tight containers placed on sealed surfaces.
    - Storage areas shall be designed such that they will contain 110 % of the largest container/ vessel stored in the storage area and waterproof; have available on-site equipment and materials to execute clean-up (sufficiently absorbent).
    - Good maintenance of vehicles and machines to prevent oil losses.
    - No cleaning or maintenance of vehicles or machines in close proximity to the river. This must be done on specially prepared places (workshops) equipped with oil skimmers.
- Unnecessary dangerous chemicals and/or toxic substances are forbidden to use.
- Do not install deposits near any surface water body
- All the waters from the batching plants, the concrete mixer, washing facilities and the crusher plants needs to be collected and treated before releasing to the environment.
- Wastewater from the offices or construction site must be collected in portable latrines or septic tanks and has to be treated before releasing into a river

7.2.3.4 Ground Water Quality

No activities of the Project construction or operation are expected to have an impact on the ground water quality of the region; hence the impacts on the ground water quality are not anticipated.

7.2.4 Air Quality

Vehicular emissions are one of the major sources of air quality impacts of construction projects. Impacts are mainly restricted to construction site and phase, with the exemption of the transportation of the equipment to the construction site.

Following measures are as a minimum required:

- Use adequate and well-maintained construction and transportation equipment and the contractor has to develop a maintenance program to ensure this.
- Take good measures for dust suppression:
    - this includes among others good housekeeping,
    - instruct workforce on appropriate measures to minimize air pollutants.
    - optimization of storage on-site of materials that are known to be whirled up by wind
    - water sprinkling especially on unpaved roads during dry season.
- Truck which transport construction material for longer distances (quarry to construction site) should be covered also those of sub-contractors.
- Do not exceed speed limits
- Do not burn waste
- Organize the sequences of construction activities in a way that the use of equipment powered by diesel fuel is optimized and duration is minimized (switch-off the engine during parking periods)

7.2.5 Climate Change

The short-term negative impact of the Project through emissions during the construction phase is far outweighed by the positive impact during operation, when the water does not need to be pumped up anymore. Mitigation measures to reduce emissions are given under air quality. Climate change induced impact on the project has not be assessed in detail. However, if through climate change less water is coming down the main impact will be on MCHPP. Since it will take again longer to refill the reservoir and there will again be less water available for the generation of energy, this it will depend on the agreement found between LEC and LWSC on the way forward.

7.2.6 Ambient Noise Level

During the construction of the pipeline, the major sources of noise pollution are vehicles transporting the construction material to the construction site. Mixing, casting and material movement are primary noise generating activities and will be uniformly distributed over the entire construction period. Careful planning of machinery selection, operations and scheduling of operations will reduce these levels.

- Use adequate and well-maintained construction and transportation equipment including state-of-the-art built in systems (muffler) to reduce the noise.
- The contractor has to develop a maintenance program to ensure this. Instruct the workforce to avoid unnecessary noise.
- Workers exposed to excessive noise have to wear ear protectors and the exposition time has to be limited.
- Avoid any noise intensive works such as metalworking, etc. during night-time. Avoid transporting of material (rock, concrete, etc.) during night.

7.2.7 Waste

Several different types of waste occur, which can be categorized as: domestic waste (plastic, glass, paper, etc.) at offices, camps and construction site, solid waste mainly from trenching activities, liquid waste like waste water from toilet facilities, cleaning water, etc. and hazardous waste like oil and lubricants. Waste in general has a strong negative impact on the environment and on human health and animal health as one example water accumulates in tires, containers or buckets and which are a perfect breeding place for mosquitos and will increasing the rate of malaria.

Following measures are as a minimum required:

- Install garbage cans for temporary waste disposal of domestic waste. Those have to be collected and disposed according to the regulation of solid waste management and approved by the local authorities.
- Collect any waste seen along the construction site and dispose it off properly e.g. plastic of drinking bags (start awareness raising among the workers from the first day. Waste needs to be part of the induction training of workers)
- No waste shall be disposed of or buried on the site. Illegal dumping, either at the construction camp, along the roads or in the surrounding areas, or into the river shall not be allowed.
- The different types of solid waste have to be separated and disposed of separately according to the environmental guidelines and best practise.
- Solid waste generated during construction and at campsites will be properly treated and safely disposed of, only in demarcated waste disposal sites.
- In general waste should be reduced, re-used, recycled and the disposal should be controlled. Currently there are no recycling companies in Liberia except, as far as known for possibly glass. However, wood can be given to local community for reuse or as firewood (if not contaminated) as well as other material if needed. Currently there is one waste disposal site close to Monrovia. An agreement with a waste collection Company will need to be made to collect the waste and to carry it to the Monrovia waste disposal site. The detailed steps with Monrovia Waste Corporation will need to be described in the Waste Management Plan of the Contractor.
- Hazardous waste (oil, chemicals, etc.) must be stored in a designated closed tank and/or area. Until it will be delivered to companies specialised on the proper disposal or recycling of those hazardous wastes. In case hazardous wastes arise,

which cannot be treated or disposed of adequately the contractor will need to take them to a country where they can be disposed properly.

- During implementation of Mt Coffee HPP there were companies taking the old oil.
- Containers must be available at the workshops for the disposal of used filters, gaskets and other spare parts.
- The maintenance of machinery and lorries have to be done in workshops, liquids and including the cleaning water to be collected in tanks and transported to the wastewater treatment plant.
- Oil contaminated water to be treated with an oil skimmer.
- A full clean-up of the site has to be carried out after construction. All wastes accumulated during construction and all demolishment wastes from temporary structures have to be disposed properly.
- A continuous monitoring of the proper waste handling by the contractor and by the Owner is indispensable to ensure that problems are identified and addressed early.
- Instruct workforce on appropriate measures to minimize waste and raise the awareness of the workforce.
- Sanitary waste from the portable toilets should be collected by liquid waste sucking truck and transported to the official disposal site.

7.3 Biological Environment

7.3.1 Vegetation

During site investigation of the project areas, no habitats of very high value have been observed. As already mention most important habitats are the wetland and the riverbank vegetation. The loss of vegetation will not be very severe. Specific consideration should be given to:

- Minimizing the impacts of loss of vegetation by limiting the number of trees to be felled where possible with support from the supervisory engineer;
- Do not disturb vegetation especially trees at the riverbank;
- Do not use any herbicides for vegetation clearing (manual cleaning rather than herbicides) (during construction and operation);
- Landscaping should be done with a lag of 3 to 4 months from the start of the work on any section. The section should be deemed to be complete when the landscaping is over;
- Any illegal logging by the workforce needs to be forbidden.

7.3.2 Fauna

From the site visits and discussion with officials, it is inferred that there are no noticeable habitats or wild or endangered animal habitats along close vicinity of the project corridor. This can be inferred due to the presence of human settlements and farmlands along the

existing areas. Further, noise due to construction machineries and increased vehicular movement for raw material transportation for access road construction and raw water pipeline passage route will disturb the fauna along the area during construction phase. Due care should be taken in the construction stage such that human activities should be completely restricted to the proposed project corridor.

- Damage to the natural habitat should be minimized where possible.
- Hunting by members of the work force must be forbidden.
- Strengthen the awareness of the workforce for the environment (plants and wildlife) to avoid logging, hunting etc. at project site and in the surrounding.

The main impact during operation will be the fencing of the RoW.

- Passages have already been implemented during design stage
- Lifting the fence for 10 to 15 cm to let small and medium sized animals pass (not at locations along the road, LEC property and LWSC property)
- Hunting should be forbidden to workers,
- Construction activities are limited to daytime from 7:00 am to 5:00 pm

7.4 Human Environment

7.4.1 Socio-Economic

Land Acquisition

The construction of the raw water pipeline will involve land acquisition and demolition of structures. A detailed analysis of the impacts of land acquisition (temporary and permanent displacement) and structures in the project area are part of a RAP already undertaken.

- The total area used during the construction period will be maximum 16.92 hectares (maximum 41.8 acres).
- The permanent used land, the right of way of the pipeline, will be around 4.7 hectares (11.6 acres) of which 0.87 hectares (2.15 acres) are within LEC Property and 0.25 hectares (0.6 acres) on LWSC property, both Governmental entities. Therefore, a total of 3.8 hectares (9.4 acres) of land will need to be acquired, which will be lost for agricultural activities. Currently there are 20 PAPs and the Harrisburg Community claiming ownership of parts of the land within the RoW.
- The temporary used land will be maximum 12.22 ha (30.2 acres). This includes the parts within LEC property and LWSC property as well as the parts which are located directly next to the road. Therefore, the actual size will be smaller.

For the temporary land acquisition in case land will be leased, following mitigation measures are required.

- Agreement for a lease price for one year (actual construction period is 9 month)
- Topsoil would need to be stored separately, spread out, landscaped and revegetated.

- It should be agreed with the landowner if he wants to use the land right away for farming activities then it would not make sense to revegetate it.

Mitigation measures related to the permanent RoW are:

- Compensation at replacement cost of the land, if the legal documents on ownership are provided.
- Compensation of crops and all other assets

The client will therefore ensure that the Resettlement Action Plan prepared for the project area is implemented to mitigate / minimize and compensate this impact.

Generation of Jobs:

Give first priority to people in the project area when employing labourers and other unskilled workers, e.g. vegetation clearance, guards, etc. Should additional skilled workers also be required, take on workers from the area should they have the skills. There are in total 9 settlements on the road. The Community Liaison Officer should visit those settlements and should ask them that they should decide with their leadership who of the village should be placed on a list for recruitment. Depending on the size of the village they can place between 5 and 20 people (both genders, minimum 30 % female). The list should contain the skills they have and a contact person/number. For the recruitment those people can then be called. In total a list of 250 people should be put together. To have replacement if required.

Furthermore, information dissemination and teaching of local population should be carried out on traffic safety, especially among young people, to curtail traffic accidents.

7.4.2 Public Safety, Health and Security

Potentially significant impacts during the construction phase are related to restricted access to the river, and project-induced and the related indirect consequences for community health safety and security. Therefore, a public safety health and security management plan should be developed, which should contain following aspects

- Management of safe access to the river. Adequate information needs to be given to the local population on when and where the construction activities are taken place. The communities get with this information the possibility to plan ahead on when and where to go to the river to gather what they need for their livelihood or to carry out the activities they need to carry out at the river. Security personnel will be 24 hours at the construction site to secure that no tresspassing onto the construction site can take place. The security personnel will be trained to comply with the Voluntary Principles on Security and Human Rights and have to follow the code of conduct implemented. A detailed stakeholder engagement plan will need to be developed on how to disseminate all the information (access issues, transport of heavy equipment, job opportunities, etc.) to the local population. This includes awareness campaigns at local schools and affected communities along the road. Furthermore, periodical meetings are recommended to discuss advantages and disadvantages and to give an understanding why some disadvantages cannot be prevented. Problems which occurred, if not already documented through the grievance mechanism, need to be documented e.g. (destruction of crops, open defecation of workers, any unsocial behaviour of workers, dangerous traffic behaviour, etc.) and followed up.

- The size of each construction section should be limited in a way that people can walk without too much effort around it (each site max 200m to 300 m).
- Management of communicable diseases HIV/AIDS and other STD, related to the workforce shall be outlined in the labour force management plan, which will include the code of conduct. Related to public health it will contain awareness campaigns throughout the project period while the proponent will carry out sensitization campaigns throughout project life.
- The Code of Conduct shall contain the key health and safety elements
    - Zero tolerance of illegal activities by all personnel;
    - Forbidding the use of prostitution;
    - Forbidding illegal sale or purchase of alcohol;
    - Forbidding the sale, purchase or consumption of drugs; and
    - Forbidding illegal gambling and fighting.
    - It should provide guidance for security on how to behave when solving a problem.
- Management of the transmission of malaria, awareness raising among workforce and communities, provision of mosquito nets, prevention of creation of unnecessary breeding places (buckets tires, ponds), provide testing kits for workforce and treatment.
- Management of anti-social behaviour caused by the influx of workers occurs, however, due to the small number of workers required and the large number of workers already trained through MCHPP and due to the rather small size of the project and the limited time of actual construction time of 8 month it is not expected that a large influx of workers will occur.
- The project area traverses rural communities. They have established social organization systems. The construction of the pipeline is likely to increase the attractiveness of the area, which may result in the degradation of the cultural values and norms in the area. The increase in the levels of crime of the area and the increased of desirable and undesirable social interaction in the area. To mitigate this, DENYS should strengthen the cultural organizations ensure that the project contributes to the creation of an atmosphere that is conducive to the functioning of all social and religious centers which are in the project zone of influence.
- During dry season, sprinkle dirt roads to cut down on dust that would irritate neighbouring settlements and population.
- Ensure that the use of heavy machinery only during normal working hours
- Excavation of stones, rocks and other construction materials during the night hours should not take place and during the day this should start when the surrounding population normally start their daily chores.
- Ensure general hygiene standards are kept and this might be learnt by the surrounding population.

- Overall good housekeeping contributes to maintain hygienic and safe conditions on the construction site.
- An awareness and sensitization campaign by the contractor should ensure that the people in the project area are made aware of the issues. A complimentary initiative has been discussed to mitigate these issues.
- Speed limits and a safety driving training should be implemented (see Traffic)

7.4.3 Traffic

Traffic is one of the main causes of accident on the construction site as well as off site. Therefore, it is mentioned specifically, and minimum mitigation measures are provided.

- A Traffic Management plan will have to be developed, which has to be compulsory for all contractors and subcontractors on roads within the project area as well as on all public roads.
- Regular maintenance of the vehicles (brakes, wheels, lights, brakes and power lines, etc.)
- The driver has to adapt his driving style to type of charge and the weight of the charge (braking distance increases with the weight),
- special caution has to be taken in front of schools where children suddenly cross the street.
- Where possible traffic should avoid populated areas.
- In the villages animals and pedestrians have the right of way.
- Procedures if an accident occurs (whom to call, which is the next hospital, etc.) including reporting procedures.
- Actions to be taken if the driver does not comply with the set guidelines.
- Adequate signing, warnings and controls have to be implemented like speed limits.
- Enforce maximum load restriction and implement a maintenance program for access roads carried out before rainy season
- Develop procedures for parking and on-site traffic movement. Use if feasible project buses to transport workers to the site.

7.4.4 HIV/AIDS

Nowhere is impact prevention more important than in the area of human health. The project activities may have serious negative consequences for the health of local populations. Throughout the world, the spread of HIV and other sexually transmitted diseases (STDs) can be linked to the large construction activities for which this study is no exception. Sensitization and awareness campaigns should be the responsibility of the National Aids Control Programs, together with local and international partner organizations. The contractor and proponent have the responsibility to sensitize communities and staff on HIV/AIDS related issues. The contractor has a social responsibility to run awareness campaigns throughout the project period while the proponent will carry out sensitization campaigns throughout project life.

7.4.5 Occupational Health and Safety

Injuries resulting from falling from heights and falling objects, as well as from the misuse of equipment and tools, cuts from stepping on sharp objects such as nails and other metal off-cuts and injuries resulting from clashes between vehicles and the workers as they both operate within the same space are likely to occur during the implementation of the project. This impact is considered significant since it affects human lives and would therefore require adequate mitigation measures. The contractor shall prepare an Occupational Health and Safety plan and ensure that it is compliant with the safety aspects and a Labour Force Management Plan ensuring that IFC PS 2 and ILO standards are respected during the project. The contractor will ensure a contractual commitment on the part of labour providers to comply with all relevant aspects of Liberian national labour law, including the establishment of formal employment relationships with labourers – ensuring legal protection on form and frequency of pay, working hours.

- All workers have to use the relevant protective equipment (helmet, gloves, goggles, work boots, masks, ear plugs, etc.)
- All restricted plant facilities have to be labelled with caution signs, especially those with potential risk for workers
- All construction areas shall be marked to avoid intrusion of unauthorised people.
- Fence off all areas like open excavation pits, trenches to prevent accidents
- First aid kits need to be available at the construction site for fast action if an accident occurs.
- Accessible consultation sheets for review in case of contingency or emergency situations. These should have phone numbers for police, fire-fighters, Red Cross, personal supervisor or project leader.
- Prepare a scheme of the evacuation routes and where the fire extinguishers are located within the camp and at the construction site and place them at conspicuous places.
- maintenance of machinery (preventive and corrective; during construction and operation)
- Provide sufficient potable water.
- Assign during construction a special area for the food intake.
- Install portable toilets for the disposal of manure generated by the builders in a distance of at least 15 m to the river. They should be regular maintained and disinfected.
- The number of latrines is correlated with the number of employees and there should be one toilet for every ten (10) workers. Portable toilets will be put in place since the work area varies every single day (going along with the pipeline).
- Workshops and camp site must have acceptable conditions of light, ventilation and safety for workers.
- Commit, where requested, to provide a copy of employment registers and records including details of hours/overtime worked, wages paid and the employment status of workers, both those employed directly and indirectly;

- Put in place a mechanism for checking the age of workers (prevention of child labour)
- Put in place a worker grievance mechanism and details of any complaints lodged under the procedure
- Nearest Health facility will depend on the location of construction activities, but it will either be the Harrisburg Clinic in Raymond Camp, the MCHPP Health Facility or the White Plains Clinic. For serious accidents it will be required to go to Monrovia (20 km).

7.4.6 Impacts during Decommissioning Phase

The project is expected to be in operation for many years. The actual lifetime of the pipeline is minimum 40 years and then it may need to be replaced and decommissioning is not anticipated. But should this happen, all the positive impacts mentioned in this report would be reversed to be negative. Other negative impacts during decommissioning may include:

- Solid waste generation;
- Noise pollution;
- Dust and exhaust emissions; and
- Occupational hazards.

In case of replacement the same construction activities will be required as described in this ESIA.

7.4.7 Summary on Compliance with IFC Performance Standards

Table 7-1: Summary of Compliance with IFC Performance Standards

IFC Performance Standard	Activities to address the different requirements
1. **Assessment and Management of E&S Risks and Impacts**	The current report is the ESIA for the for the Raw Water Transmission Pipeline Project and a general Environmental and Social Management Plan (ESMP) has been developed, which will function as basis for the contractor's site specific ESMP (CESMP), including OHS and labor conditions. The contractor will implement an Environmental and Social Management System including monitoring, training, record keeping and reporting, etc.
2. Labor and Working Conditions of Workers	The impacts and Mitigation measures have been identified and defined. A general ESMP developed containing OHS and labor conditions. The contractor will develop a site specific ESMP (CESMP). Including a Code of ethic and business conduct, social and gender plan, OHS requirements (PPE, safety induction, task specific training, emergency preparedness, documentation, reporting, grievances redress mechanism, etc.).
3. **Resource Efficiency and Pollution Prevention**	Possible impacts have been assessed and mitigation measures developed, which are described in the ESMP and the CESMP. The most important impacts and mitigation measures will be managed by several sub-plans as the waste & hazardous material management plan, equipment maintenance management plan, emergency preparedness, oil spill contingency plan, etc. See ESMP and monitoring

IFC Performance Standard	Activities to address the different requirements
4. **Community Health, Safety and Security**	The main risks are associated with the traffic from and to the construction site passing through the villages. Therefore, a traffic management plan will be developed and enforced. Other aspects will be the dust creation during dry season to be mitigated by frequent sprinkling of the road. Excavation and trenches will be marked and temporarily fenced. HIV/AIDS Campaigns to raise awareness are planned for communities as well as for workers, examination of worker will be included and appropriate measures for preventing malaria, reduction of vectors provision of mosquito nets, testing and medication if required. A Code of Conduct will be enforced. • Zero tolerance of illegal activities by all personnel; • Forbidding the use of prostitution; • Forbidding illegal sale or purchase of alcohol; • Forbidding the sale, purchase or consumption of drugs; and • Forbidding illegal gambling and fighting. • Forbidding hunting, • Forbidding open defecation by workers and burning of waste, etc. • Forbidding to disturb local population by their activities at the river (bathing, washing, etc) • It should provide guidance for security on how to behave when solving a problem, A stakeholder engagement plan will be developed to disseminate the information required for the local population including frequent meetings with the communities to raise advantages and disadvantages. Additionally, grievance mechanism will be put in place which should cover all aspects from compensation issues over, claims related to unsocial driving behavior, etc.
5. Land Acquisition and Involuntary Resettlement	The main measure for minimising resettlement in the present case was the alternative assessment through which the RoW of the Pipeline was finally selected. Passing with the pipeline along the tailrace channel and then along the St Paul River compared to passing along the road where all the villages are located reduced the number of PAPs significantly. It is envisaged to reduce the impact by reducing the width of the temporary RoW were possible e.g. where the graves are located. It is expected that only two PAPs will need to be physically resettled and one PAP will lose his business facilities. All other cases will be economic displaced (land use through the footprint of the project), this will be compensated. Sufficient farming land, currently not in use is available in the surrounding area. A Resettlement Action Plan is under preparation.
6. **Biodiversity Conservation and Sustainable Management of Living Natural Resources**	Main impact on biodiversity will be the loss of vegetation and the fragmentation of habitats due to the fencing of the pipeline corridor. Fragmentation can be reduced by creating passing's as well as by lifting the fence (10 to 20 cm) so that small and medium sized animals can pass below. Other impacts will be related to construction activities which will be minimized by implementing the ESMP.
7. Indigenous People	Indigenous people as defined in the IFC guideline are social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. The population living in the surroundings of the project area are not distinct from the mainstream groups, they belong to the main ethnic groups in that region which are Kpelle, Bassa, Lorma and Gola. However, general mitigation measures as the code of conduct will be implemented,

IFC Performance Standard	Activities to address the different requirements
	impacts will be mitigated were possible and compensation payments will be made for all assets PAPs will lose. As far as known no sacred sites will be affected.
8. Preservation of Cultural Heritage	Related to available information no sites of cultural heritage are within the project area. The new RoW is following to a high percentage the old RoW. Furthermore, chance find procedures will be developed.

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental and Social Management Plan has been developed as a manifestation of the commitment of DENYS – NV to the management of the environment in its project area in compliance with the Environmental Protection laws of Liberia and MCC Environmental Guidelines and the IFC Performance standards as well as the World Bank EHS Guidelines. It is intended to mitigate and minimize the environmental consequences identified in the Environmental and Social Impact Assessment.

Finally, it must be pointed out that LWSC will operate the project in accordance with Liberia legislations, regulations, guidelines and standards and other appropriate international environmental standards. Furthermore, it is envisaged that LWSC will meet the requirement of IFC Environmental standard and procedures to contain all solutions and to prevent any adverse effects on the health and safety of the workers, local population as well as the project area and regional environment.

The Environmental and Social Management Plan (ESMP) was developed based on the two proceeding chapters.

All the relevant measures will be included in the ESMP.

This will define:

- The impact.
- The proposed mitigation measure (detailed description).
- Responsibility for implementation (note: this can include the necessity for further specifying certain measures at later stages of the Project).
- Means required for implementation (staff, infrastructure, equipment, funds).
- Costs (as far as they can be identified or estimated at this point; it also has to be noted that some measures might be included in the technical project, and that these costs will be considered there.
- Monitoring process.

The Environmental and Social Impact Assessment, and Environmental and Social Management Plan prepared by CH2M, February 5, 2018 was used as basis for the current ESMP and was only in some areas adapted.

8.1 Objectives of Environmental and Social Management Plan

This ESMP defines the framework, program-level E&S control and mitigation measures, monitoring programs, and responsibilities that should be applied to the Project.

This ESMP is based on the results of the environmental, social and H&S impact assessments conducted for the Project, and based on the design specifications developed so far.

An ESMP identifies the environmental, social, and H&S management strategies, measures, plans, and programs needed to avoid, minimize, mitigate, and monitor temporary and permanent projects impacts to the natural environment, managed landscapes, workforce, and human communities. It details proactive facility planning/siting efforts, management systems, and impact/risk mitigation and monitoring activities to be continuously carried out to prevent or minimize physical, biological, cultural, and socio-economic impacts, while protecting the occupational safety and health

of employees, and the public health. It proposes plans and actions to manage environmental risks and impacts from facility construction and operation, including institutional arrangements, environmental documentation procedures, MCA-L, LWSC and contractor environmental, social, H&S responsibilities and training programs, and estimates of ESMP implementation costs.

It is important that all employees and contractors involved with implementation of the various MCC-funded projects comply with all relevant Liberian laws, IFC Performance Standards, World Bank EHS guidelines, project-specific permit, and EHS requirements.

The ESMP has the following specific objectives:

- Reducing waste
- Practicing good housekeeping
- Reducing consumption of energy, fuel and materials
- Controlling environmentally hazardous operations with regard to spills and leaks
- Controlling pollution of soil, water and air
- Reducing the production of polluting releases to the environment and minimizing the effects
- Assessing the environmental effects arising from spills, incidents and emergency situations
- Auditing and reviewing activities to ensure that the program is compliant with the contractual requirements.

The targets of this ESMP are to do the following:

- Comply with all applicable laws, regulations, ordinances, statutes, rules, and codes governing environmental, social, and H&S requirements, as may be required by the MCC-MAC-L, EPA, and the other relevant parties
- Provide a tool for ensuring all recommended mitigations required within the ESIA study are implemented during the Project
- Provide and maintain effective planning and field control measures for the construction and operation activities
- Identify ESMP implementation responsibilities of the company and its contractors/consultants
- Confirm financial commitment to EHS management through budget estimates, schedules, staffing and training requirements, and other necessary support services to implement the mitigation measures

8.2 Environmental and Social Management System

This ESMP constitutes the framework document to maintain control over and tracking of implementation of the Project and to ensure that commitments are acted upon in a comprehensive and acceptable manner. Therefore, the Contractor will set up and Environmental and Social Management system and will develop project-specific CESMP, before implementing the project. As part of MCA's and MCC's commitment towards improving environment and community development throughout the project life, environmental, gender, social and H&S management requirements then will need to be implemented by all associated parties including contractors.

8.2.1 Construction Phase

8.2.1.1 Project Owner

As the Project Accountable Entity and "Owner", the MCA will also carry responsibility for providing technical guidance and oversight of the Project E&S performance and mitigation measures implementation during construction, and for maintaining close collaboration with the LWSC in the overall oversight of Project design and implementation.

MCA-L is ultimately accountable for E&S management for its activities in the Compact and delivery of the Compact's E&S commitments. The ESP Director is responsible for E&S management and is responsible for the E&S aspects of MCA-L's Compact activities.

MCA-L is responsible party to deliver the Compact including the approval of the designs with local stakeholders and overseeing the design/construction follow-on work in accordance with the Compact, the GoL and its agencies as appropriate.

Most of the MCA-L requirements for plans/procedures are passed to contractors through the procurement processes, and the appointed Contractors must ensure that their systems and processes align with the Compact, the Program Implementation Agreement, this document, the IFC Performance Standards and any other relevant internationally recognized standards.

The MCA-L Team will review the systems contractors may have in place for managing E&S risks and mitigation for the Program to confirm they are aligned with MCA-L's requirements. Contractors must document how they will implement their commitments in delivering E&S management of each Activity.

The roles and responsibilities of key MCA-L and non-MCA-L staff relative to the implementation of the ESMS are detailed in Table 8-1.

Table 8-1: MCA-L Key E&S Roles and Responsibility

Role	Responsibilities
CEO	• Leads the political coordination within government agencies, in general and for any E&S issues that arise • Accountable for the implementation of E&S management of the activities delivered by MCA-L under the Compact • Ensures adequate resources (technical, financial and human) are available where necessary to ensure effective E&S management • Maintain oversight of Project and MCA-L activities and performance, including E&S performance
DCEO	• Convene and chair the meetings with Directors of MCA-L to discuss progress, coordination and procurement panels • Review E&S risks to escalate to CEO for decision making • Maintain oversight of Project and MCA-L activities and performance, including E&S performance
Director of Communications	• Manages relations with local communities relevant to the Program, as well as communications and consultations with relevant interested parties from the surrounding area • Facilitates effective interface between MCA-L and relevant Program stakeholders to catalyze and facilitate open and transparent reporting and communications on E&S management • Maintains oversight of the SEP for the Program, including documentation relating to the Grievance Mechanism
General Counsel	• Day-to-Day custodian of the Business Conduct Policies and codes of practice. • Reviews Liberia legislation for applicability and relevance to the Program

Role	Responsibilities
	• Communication of legislation to relevant MCA-L Directors and staff as appropriate, and provides support on the actions to implement as required
Director of ESP	• Day-to-day custodian of the ESMS and E&S Policies. • Day-to-day management and responsibility for the oversight of E&S implementation for the Compact activities by MCA-L and ensuring compliance with MCC Environmental Guidelines and the IFC Performance Standards • Manages review of the ESP progress for each activity under the Program • Reviews ESIA studies and other documents provided by third parties and contractors for E&S risks, management and mitigation
Director of Social Gender and Integration	• Directs community affairs and community engagement under the Program in coordination with the Director of Communications and Director of ESP • Collaborates with ESP Director in review of TORs and advising on community engagement plans/strategies • Support road safety activities in road maintenance areas in coordination with the ESP and Roads Project Directors
Director of Private Sector Development	• Manages the Contract Management Consultant obligations and oversight of Contract Management Consultant
Director of Procurement	• Owner of the Contract Administration Manual, developed in coordination with other MCA-L stakeholders as appropriate
Each Project or Sector Director related to contract management	• Day-to-day management of specific contracts under the Program
	• Oversees implementation of Commitments under each Project, including E&S commitments and mitigation measures as set out in the relevant ESIA and this ESMS • Ensure construction works and contractor activities are carried out in accordance with MCA-L expectations, Program Standards, and all relevant commitments • Ensure that monitoring to be undertaken during construction is implemented • Ensure that H&S requirements are respected • Performance reviews and review of Contractor monthly reports
Non-MCA Staff	
Community Liaison Officer(s) (CLO) (Local community volunteer roles)	• Monitors and implements terms of /commitments in the ESMP and ESIA and social study assessments with the communities • Facilitates meeting with communities • Manages information and communication flow to and from communities • Maintains a dossier on critical stakeholder groups (stakeholder list, meeting minutes) and an up-to-date update incident and grievance register including measures taken to address incidents/resolve grievances • Manages interventions in the community and social inclusion and empowerment activities/programs in the communities • Directs interaction with communities to manage and maintain positive relationships in that regard, in coordination with the Director of Communications and the Director of ESP.

Source: MCA-L ESMS 2017

8.2.1.2 Project Engineer and Contractors

In general, the Contractor (DENYS-NV) will be responsible for compliance with the measures as contained in the approved ESMP and for actual construction work for the

project and any remedial works that may be required during the project implementation. The Project Engineer (NOD) will serve in a supervisory role and be responsible for ensuring that the Contractor maintains compliance with applicable measures as contained in the ESMP and that any necessary corrective measures are appropriate and effectively implemented. The Engineer will have the authority to issue a stop works order if violations or other Project risks warrant such action.

All contractors will be required to adhere to MCA's Business Conduct Policies, HR Policy and E&S Policies. All policies will be communicated to Program personnel as part of the office site induction process to ensure all personnel are aware of their individual E&S obligations. Policies are posted in visible areas on-site and made available to interested parties (on request, and in due course via the website). The HR Policy will be communicated in a culturally appropriate manner to the workforce. Policy requirements have also been transferred to contractors through bid clauses and explicit references to the IFC Performance Standard and MCC's Environmental Guidelines.

The Contractor must ensure all subcontractors adhere to the requirements set out in the ESMP document and other supporting documentation. MCA-L reserves the right to review any contractor documentation which relates to management of E&S risks. The ongoing review and approval process for critical risks and operational controls will be an integral part of the review processes outlined in MCA-L's Contract Administration Manual, and will also be embedded into MCA-L contracts.

Table 8-2: Engineer and Contractors Roles and Responsibility

Role	Responsibilities
OE	• Oversight and technical support of implementation of commitments at the Project, including E&S commitments and mitigation measures as set out in the relevant ESIA and in accordance with this ESMS • Oversight and technical support of Project-level responsibility for E&S risk management and program implementation on-site during construction / ground works • Ensure construction works and activities are carried out in accordance with MCA-L expectations, Program Standards, and all relevant Program commitments • Ensure that monitoring to be undertaken during construction is implemented • Ensure that H&S requirements are respected • Identify and define E&S roles, responsibility and authorities within their organization • Ensure that human, technical and financial resources are provided where essential to the implementation and control of the E&S management • Ensure E&S plans, procedures and control mechanisms are prepared, implemented, evaluated and improved on a continued basis, incl. planning, risk assessment and risk response measures, monitoring and evaluation, etc. • Report E&S performance to the appointed Contract Manager at MCA-L on a periodic basis, in accordance with MCA-L requirements • Conducts EHS assessments and evaluations and participates in external/internal audits, to ensure any non-conformities are identified, managed and closed out effectively • Ensure development of accident reports and track accident statistics • Co-ordinate investigation of incidents and accidents, as well as other EHS-related concerns and complaints.
Contractors	• Ensure the E&S competency of all Project personnel through co-ordination of critical personnel, appropriate training, communication and awareness initiatives • Ensure all relevant documentation is managed in accordance with Program Standards, including legal requirements • Accountable for implementation of commitments at the Project, including E&S commitments and mitigation measures as set out in the relevant ESIA and in accordance with this ESMS

Role	Responsibilities
	• Has overall Project-level responsibility for E&S risk management and program implementation on-site during construction / ground works • Ensure construction works and activities are carried out in accordance with MCA-L expectations, Program Standards, and all relevant Program commitments • Ensure that monitoring to be undertaken during construction is implemented • Ensure that H&S requirements are respected • Identify and define E&S roles, responsibility and authorities within their organization • Ensure that human, technical and financial resources are provided where essential to the implementation and control of the E&S management. • Ensure E&S plans, procedures and control mechanisms are prepared, implemented, evaluated and improved on a continued basis, incl. planning, risk assessment and risk response measures, monitoring and evaluation, etc. • Report E&S performance to the appointed Contract Manager at MCA-L on a periodic basis, in accordance with MCA-L requirements • Conducts EHS assessments and evaluations and participates in external/internal audits, to ensure any non-conformities are identified, managed and closed out effectively • Ensure development of accident reports and track accident statistics • Co-ordinate investigation of incidents and accidents, as well as other EHS- related concerns and complaints • Ensure the E&S competency of all Project personnel through co-ordination of critical personnel, appropriate training, communication and awareness initiatives • Ensure all relevant documentation is managed in accordance with Program Standards, including legal requirements

Source: MCA-L ESMS 2017

8.2.1.3 Overall Contractors ESM and EH&S Organisation

The basic organisation for implementing the CESMP, including EH&S measures during construction is shown in the following chart.

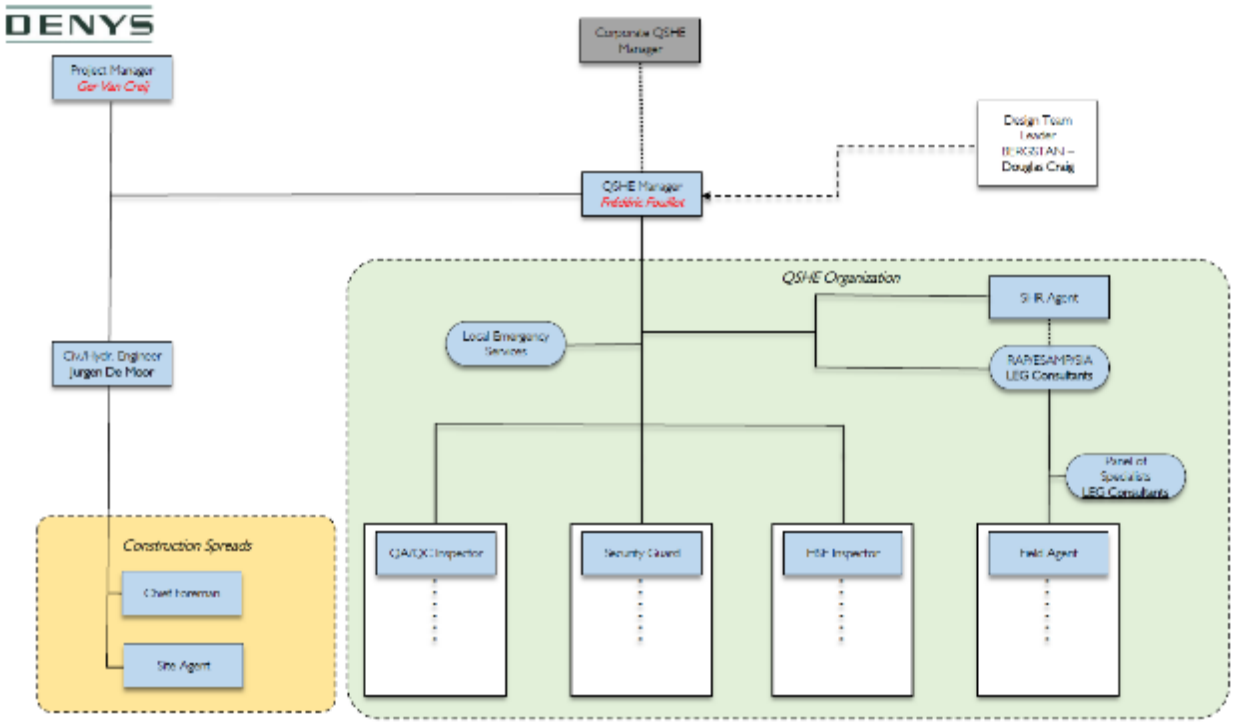


Figure 8-1: Environmental and Social Organisation Chart

8.2.2 Operation Phase

It is recommended that LWSC appoint an Environmental and Safety Manager/Officer who will lead an environmental unit during the operational phases of the project to manage and implement the ESMP.

The E&S Manager will develop the Operational Environmental and Social Management Plan (OESMP) document detailing the objectives, organizational structure, responsibilities, resources, mitigation and control measures, monitoring and auditing plans, and review systems, provisions for implementing corrective actions for deviations from OESMP, and training systems for the operational phase of the project. The E&S Manager will ensure effective implementation of ESMS on a day-to-day basis with the support of the various managers such as the technical managers, administrative managers, etc.

8.2.3 National Roles and Responsibilities

8.2.3.1 National Public Health Institue/Ministry of Health (NPHI/MoH)

NPHI/MoH is responsible for promulgating, adopting, adapting, and implementing occupational health laws, policies, regulations, guidelines and programs.

Environmental Health Technicians have the authority to, among others, inspect any workplace, investigate any potentially hazardous situation and work refusal, order compliance with the Public H&S Laws, policies and regulations and initiate prosecutions. In particular, related to Project implementation:

- They only supervise the disposal of medical wastes, no solid wastes in general.
- They do investigations on groundwater wells in case of diseases and in case of questionable source of pollution in the proximity of the wells.
- They can do inspections during the construction phase of the Project to ensure the enforcement of the Public H&S Laws, Policies and Guidelines.

8.2.3.2 Ministry of Labour (MoL)

The MoL will ensure that workers' rights are adequately addressed in terms of labor abuse, formulation and formation of leadership at the work place which will encourage good working relations among the workforce and the management. The MoL will ensure regular monitoring of all labor matters as defined in the act creating them. In particular:

- MoL performs routine inspections to verify permits requirements are accomplished in terms of workers safety (e.g., PPE, not overworked, etc.) according to labor standards.
- In case of irregularities after an inspection, MoL gives advices on how to correct the non-compliance and allows for a certain period to implement necessary corrective measures. Fees are applied after the given deadline.
- Joint inspections with MoH are performed to verify conditions in case of accidents and fatalities.

8.2.3.3 Environmental Protection Agency

Following the registration of the project, EPA issues an ESIA Permit to allow for the physical construction of projects to commence. The permit outlines various conditions that must be adhered to during project implementation.

- Exercise general supervision and co-ordination over all matters relating to the environment;
- Be the principal instrument of Government in the implementation of all policies relating to the environment; and
- Ensure that all mitigation measures proposed are actually implemented.

EPA performs official inspections and audits.

8.2.3.4 The Ministry of Public Works/Infrastructure Implementation Unit

The Ministry of Public Works has established an Infrastructure and Implementation Unit to supervise and monitor all infrastructure projects in the country, including all construction projects. Therefore, the responsibility for ensuring that mitigation measures specified in this ESMP and the contract documents are implemented will be supervised by this unit.

8.2.4 Key Contacts

Key contacts associated with the construction and operation/maintenance of each project will be identified and included in the corresponding CESMP and OESMP.

8.3 ESMP Implementation

Various mitigation measures have been recommended in Section 7 to avoid, minimize or compensate the identified Project's potential impacts on the environment and social aspects. Each mitigation measure, to be made operative and minimize E&S impacts requires one or more action(s) to be adopted. The recommended mitigation measures are based on and data available at the time of writing. Therefore, as the project proceeds and a clearer indication of the E&S management challenges especially for the construction develops, this section will be modified and updated accordingly by the contractor.

Table 8-3: Project Impacts, Mitigation Measures and Responsibilities

Potential Impacts	Mitigation Measures	Institutional responsibilities		Preliminary Cost estimate	Timing
		Implementing	Supervising		
Physical Environment					
Soil, Surface water					
Construction					
• Altered soil structure • Altered erosion processes • Increased surface water runoff and change in concentration of suspended solids in creeks, streams and St. Paul River	Development of an Erosion Protection Management Plan including Erosion Monitoring	DENYS-NV	NOD/ MCA-L	Part of Construction cost	During Construction Phase
	Reduce the footprint of the project as much as possible, and avoid extending working areas and access roads				
	Rehabilitate any areas that will be exposed for any reason, as soon as possible, to prevent possible soil erosion; Rehabilitation will be by replacing topsoil followed by replanting the area using vegetation like that removed before construction; Do not use seed with invasive species or allow invasive species to establish				
	Schedule construction to avoid heavy rainfall periods (i.e., during the dry season) to the extent practical				
	Minimize vegetation removal as much as possible.				
	Maintain native ground cover in the ROW				
	Develop a revegetation and reinstatement plan for the ROW				
	Avoid construction activities beyond 15-m buffer from streams, creeks, or on the banks of St. Paul River (identify the riparian zone)				
	Prevention of siltation and erosion of water bodies from construction activities				
	Avoid excavations within streams or waterbodies even if of a temporary nature, in case this is not possible instream activities need to be carried out as fast as possible (small streams within 24 h larger streams 72 h)				
	Reclaiming the disturbed riverbeds and -banks of all water bodies before rainy season				

Potential Impacts	Mitigation Measures	Institutional responsibilities		Preliminary Cost estimate	Timing
		Implementing	Supervising		
	Avoid stockpiling close to surface water bodies				
	Stabilize slopes and construct diversion channels to control and reduce erosion				
	Restore topsoil (separate storage of topsoil, max height of stack 2 m.)				
	Restore the natural drainage system.				
	Rehabilitate with natural vegetation in early succession stages, or with alternative vegetation to meet specific objectives.				
	Cover exposed areas quickly by vegetative regrowth to stabilize the soil and minimize erosion				
Altered soil quality Degraded water quality if a spill/release occurs and is not contained immediately	Implement a Spill Prevention and Response Plan	DENYS-NV	NOD/ MCA-L	Part of Construction cost	During Construction Phase
	Ensure proper storage and management of liquid hazardous (fuels, lubricants etc.) and non-hazardous waste Strict measures must be taken to prevent oil pollution of the river. The most important are: • Storage of fuel and lubricants away from the river, in tight containers placed on sealed surfaces. • Storage areas shall be designed such that they will contain 110 % of the largest container/ vessel stored in the storage area and waterproof; have available on-site equipment and materials to execute clean-up (sufficient absorbent). • installation of oil traps at all drainage channels at workshops or other areas where oil, fuel and lubricants are used • Good maintenance of vehicles and machines to prevent oil losses. • No cleaning or maintenance of vehicles or machines in close proximity to the river. This must be done on specially prepared places (workshops) equipped with oil skimmers.				
	Observe standards for use of contaminating substances				
	Vehicle maintenance in appropriate workshops				

Potential Impacts	Mitigation Measures	Institutional responsibilities		Preliminary Cost estimate	Timing
		Implementing	Supervising		
	Provide at strategic locations oil spill kits and contaminated soil needs to be disposed of properly				
	Pre-treat pipeline at a designated facility to ensure chemical fixation and prevent leaching into the soil among others				
	Collect hazardous waste and dispose of properly				
	All equipment, machinery, trucks (if not in operation) and camp installations have to be located in a distance of than 75 m to any surface water body.				
	Proper disposal of fuels, lubricants etc.				
	Do not install any deposits near any surface water body				
	Install sediment tramps at required location (siltation basins)				
	Sewage water has to be treated				
	Open defecation must be forbidden				
Operation					
Alteration of soil quality and structure Degradation of soil / water quality if a spill/release occurs and is not contained immediately Limited change in concentration of suspended solids in creeks, streams and St. Paul River	Implement a Spill Prevention and Response Plan	LWSC and/or any contractor to LWSC	LWSC	Part of operation costs Monitoring device (MCHPP). Share costs for consumables/ maintenance Between LEC and LWSC	During operation Phase
	In case of a leakage or replacements of parts of the pipe the same measures are required as for the construction period.				
	Proper waste disposal				
	Sewage water has to be treated				
	Proper maintenance of installation				
	Proper disposal of fuels, lubricants etc.				
	Cooperation with MCHPP with water quality data of the reservoir				

Potential Impacts	Mitigation Measures	Institutional responsibilities		Preliminary Cost estimate	Timing
		Implementing	Supervising		
Use of water, resulting in reduced flow and less water for energy generation.	Water flow monitoring at MCHPP to assess the lost energy generation. Agreement between LWSC and LEC on Compensation for water use during dry season	LWSC and LEC	LWSC and LEC		During operation Phase
Air Quality					
Construction					
Particulate matter (dust) and nitrogen oxides (NOx), carbon dioxide (CO_2) • Emission related to construction activities operation of machinery. • Site clearance required for trenching and backfilling in dry season will increase dust emissions. Vehicle movements and material haulage to the construction sites increases	All the vehicles should be attached with the latest, advanced pollution control measures	DENYS-NV	NOD/ MCA-L	Part of Construction cost	During Construction Phase
	Limit traffic speed				
	Periodic vehicle maintenance				
	Shut off motorized equipment and machines when they are not in use				
	Construction site organisation (good housekeeping)				
	Optimize storage of materials known to be whirled up by wind				
	Keep soil moist while loading during excavation, sprayed on piles of cleared debris/loose soil during the dry season near working areas especially if they are close to settlements, including regularly spraying water on the road network leading to the locations under construction				
	Truck which transport construction material for longer distances (quarry to construction site) should be covered also those of sub-contractors.				
Operation					
Temporary air quality degradation from increased concentrations of dust and pollutants	Limit traffic speed	LWSC	LWSC	Part of operation costs	During operation Phase
	Ensure all project vehicles and equipment are in good operating condition.				

Potential Impacts	Mitigation Measures	Institutional responsibilities		Preliminary Cost estimate	Timing
		Implementing	Supervising		
Noise and Vibration					
Construction					
Temporary increase in noise and vibration	Use of appropriate vehicles and machines with state-of-the-art built in systems (muffler) to reduce the noise. Avoid using equipment producing excessive noise	DENYS-NV	NOD/ MCA-L	Part of Construction cost	During Construction Phase
	Periodic vehicle maintenance				
	Work scheduling (no noisy work during night: 6 pm to 8 am)				
	No transport through residential areas during night				
	Adequate distance between installation areas and recreation areas at the construction site				
	Use noise shields in sensitive areas (populated areas along the road if required), when required.				
	Periodic noise monitoring at sensitive areas				
	OHS Management Plan • Ensure worker training and availability of information on these risks • Operators of noise generating equipment are to be protected with PPE against adverse effects of noise.				
Operation					
Temporary increase in noise and vibration	Avoid using equipment producing excessive noise	LWSC	LWSC	Part of operation costs	During operation Phase
	Work scheduling (no noisy work during night: 6 pm to 8 am)				
	Ensure worker training and availability of information on these risks				

Potential Impacts	Mitigation Measures	Institutional responsibilities		Preliminary Cost estimate	Timing
		Implementing	Supervising		
Waste Management (minimal during operation)					
Construction					
Improper hazardous and non-hazardous waste management and disposal could affect soil, water resources, flora/fauna, threatening community health as well	Develop a Waste Management Plan	DENYS-NV	NOD/ MCA-L	Part of Construction cost	During Construction Phase
	Domestic waste: collect and deposit in municipal waste deposit				
	Separate waste according to categories and dispose of properly				
	Forbidden to dispose-off or buried waste on the site. Illegal dumping, along the roads or in the surrounding areas, or into the river is forbidden.				
	Provide specific collection points for hazardous waste. Hazardous waste (oil, chemicals, etc.) has to be stored in a designated closed tanks and area. Until it will be delivered to companies specialised on the proper disposal or recycling of those hazardous wastes.				
	Containers have to be available at the workshops for the disposal of used filters, gaskets and other spare parts.				
	The construction wastes has to be dumped in selected pits, developed on infertile land and approved. Acquire all applicable waste disposal licenses. Approved waste land to be preferred for construction debris disposal.				
	A full clean-up of the site has to be carried out after construction. All wastes accumulated during construction and all demolishment wastes from temporary structures have to be disposed properly.				
	A continuous monitoring of the proper waste handling by the contractor and by the Owner is indispensable to ensure that problems are identified and addressed early				
	Instruct workforce on appropriate measures to minimize waste and raise the awareness of the workforce.				

Potential Impacts	Mitigation Measures	Institutional responsibilities		Preliminary Cost estimate	Timing
		Implementing	Supervising		
No waste management system in communities	Awareness raising of waste problem in the communities	DENYS-NV	NOD/ MCA-L	Part of Construction cost	During Construction Phase
Visual Intrusion /aesthetic					
Construction					
Disruption of scenic integrity due to construction activities	Revegetation where required	DENYS-NV	NOD/ MCA-L	Part of Construction cost	During Construction Phase
Biological Environment					
Terrestrial Fauna and Flora					
Construction					
Loss of habitat, loss of topsoil, Loss of timber Flora/fauna disturbance because of dust, noise, lighting, man-made structures, vehicle traffic Accidental releases/ leaks of Hazmat material	Reduce the footprint of the project as much as possible, and avoid extending working areas and access roads	DENYS-NV	NOD/ MCA-L	Part of Construction cost	Part of construction costs
	Minimizing the impacts of loss of vegetation by limiting the number of trees to be felled where possible				
	Do not disturb vegetation especially trees at the riverbank of St Paul River or the tributaries				
	Contractor should procure materials from licensed sources.				
	Landscaping and revegetation (with native plant species) of all areas not anymore in use.				
	Do not use any herbicides for vegetation clearing				
	Illegal logging of the work force must be forbidden				
	Hunting by members of the work force must be strictly forbidden				

Potential Impacts	Mitigation Measures	Institutional responsibilities		Preliminary Cost estimate	Timing
		Implementing	Supervising		
	Limitation of working hours to max 7:00 am to 5:00 pm.				
	Implement mitigation for air quality and noise/vibration impacts				
	Ensure proper storage and management of liquid hazardous and non-hazardous waste				
	Ensure proper storage and management of hazardous chemicals				
	Ensure worker training and availability of information on these risks				
Habitat fragmentation	Lifting the fence by 15 cm would reduce the impact drastically (not required for LEC property, LWSC Property and the section along the road). Best option would be to go without fence.	DENYS-NV	NOD/ MCA-L	Part of Construction cost	Part of construction costs
Operation					
Disturbance during RoW clearing	Do not use any herbicides for vegetation clearing of the RoW during Maintenance.	LWSC	LWSC	Part of operation costs	During operation Phase
Aquatic Fauna and Flora					
Construction					
Contamination with cement Contaminated runoff (accidental spillages). Instream activities required precaution measures to reduce the risk of drastically increased suspended solids.	Precaution measures related to water quality (see water quality)	DENYS-NV	NOD/ MCA-L	Part of Construction cost	During Construction Phase
	Ensure proper storage and management of liquid hazardous and non-hazardous waste				
	Instream activities need to be limited in time at small streams to one working days and larger streams 3 working days.				
	Prevention of siltation and erosion of water bodies from construction activities				
	fishing activities of the workforce needs to be monitored or even forbidden to reduce conflicts between local population and workforce				

Potential Impacts	Mitigation Measures	Institutional responsibilities		Preliminary Cost estimate	Timing
		Implementing	Supervising		
Human Environment					
Socio Economic Aspects					
Construction					
Temporary access restriction	Development of the detailed Stakeholder Engagement Plan to disseminate the information required for the local population, to plan their daily life taking into account risks and restrictions through construction activities.	DENYS-NV	NOD/ MCA-L	Part of Construction cost	Part of construction costs
	Construction sections have to be in size limited in a way that people can walk without too much afford around it (each site max 200m to 300 m).				
	The security personnel must be trained to comply with the Voluntary Principles on Security and Human Rights and have to follow the code of conduct implemented				
Permanent loss of agriculture land (9.4 acers / 3.8 hectares) Temporary and permanent loss of agriculture-based income (loss of crops and trees) Loss of infrastructure	Development and implementation of the Resettlement Action Plan	DENYS-NV	NOD/ MCA-L	Part of Construction cost	Part of construction costs
	Compensation for land permanent acquired land and temporary leased land including requirements for landscaping and revegetation if required by the owner.				
	Compensation for crops and trees				
	Lost infrastructure will have to be relocated or compensated				
	Training on Financial Management				
Influx of workers. Local worker will compete with newcomers for jobs. Possible increased pressure on the local infrastructure and possible increase anti-social behaviour.	Management of Anti-social behaviour caused by the influx of workers. Due to the small number of workers required for the limited construction time of 8 month it is not expected that a large influx of workers will occur, since there is a large number of workers already trained through MCHPP. However, a code of conduct will be developed and enforced	DENYS-NV	NOD/ MCA-L	Part of Construction cost	Part of construction costs
	Development of a process to select workers from the affected communities and to give priority to people from the affected communities. (preparation of lists of possible workers including skills of each community minimum 30% women)	DENYS-NV	NOD/ MCA-L	Part of Construction cost	Part of construction costs

Potential Impacts	Mitigation Measures	Institutional responsibilities		Preliminary Cost estimate	Timing
		Implementing	Supervising		
Operation					
Permanent Fencing of the RoW, restriction in access to the river	The fencing will have 11 passages, which were agreed with the communities. The security personnel must be trained to comply with the Voluntary Principles on Security and Human Rights and have to follow the code of conduct implemented	LWSC	LWSC	Part of operation costs	During operation Phase
Public Health					

Increase in communicable diseases HIV/AIDS.
Increase of water borne diseases (malaria), through provision of breeding places (ponds, tiers, etc.)
Introduction of new diseases from exposure to waste and other pollutants
	Management of communicable diseases HIV/AIDS and other STD, related to the workforce will be outlined in the labour force management plan, which includes pre-placement medical examination of all workers, and the code of conduct.
	• Health check for workers at employment
	• The Code of Conduct should contain the key health and safety elements
	  • Zero tolerance of illegal activities by all personnel;
	  • Forbidding the use of prostitution;
	  • Forbidding illegal sale or purchase of alcohol;
	  • Forbidding the sale, purchase or consumption of drugs; and
	  • Forbidding illegal gambling and fighting.
	• Related to public health it will contain HIV/ AIDS awareness campaigns throughout the project period while the proponent will carry out sensitization campaigns throughout project life.
	Management of the transmission of malaria, awareness raising among workforce and communities
	• provide testing kid for workforce and treatment.
	• Overall good housekeeping
	• do not create additional breeding places at the construction site for arthropods and snails e.g. unnecessary ponds, tires etc.
	• vector control at the individual level (use of mosquito nets, repellents, etc.)
		DENYS-NV	NOD/ MCA-L	Part of Construction cost	Part of construction costs

Disturbance created by dusts and noise	During dry season, sprinkle dirt roads to cut down on dust that would irritate neighbouring settlements and population. Implement all air and noise pollution precautions measures	DENYS-NV	NOD/ MCA-L	Part of Construction cost	Part of construction costs

Potential Impacts	Mitigation Measures	Institutional responsibilities		Preliminary Cost estimate	Timing
		Implementing	Supervising		
	Restriction of working time to daytime 7:00 am to 5:00 pm				
Increased risk of accidents on roads (increased traffic) and trespassing of construction sections.	Management of safety and security risks Construction sections are limited in size and security will be engaged during night and daytime. To prevent people from entering the construction areas, excavation will be temporarily fenced off. The security personnel must be trained to comply with the Voluntary Principles on Security and Human Rights and have to follow the code of conduct implemented • Information of local population related to dangerous activities e.g. transportation of heavy equipment (pipelines) • Prevent school operation times and specifically when school is just ending for any heavy transport operation. • Adequate signing, warnings and controls have to be implemented like speed limits • A safety driving training should be implemented • driver have to adapt his driving style to type of charge and the weight of the charge (braking distance increases with the weight), special caution has to be taken in front of schools where children suddenly cross the street. Further measures are given in Chapter 7.4.3 of the ESIA • Best practice related to maintenance of vehicles	DENYS-NV	NOD/ MCA-L	Part of Construction cost	Part of construction costs
Occupational Health and Safety including Labour Conditions					
Construction					
Labor Conditions	Develop a Labor Force Management Plan in compliance with IFC SP2 and ILO Standards: The contractor will ensure a contractual commitment on the part of labor providers to comply with all relevant aspects of Liberian national labor law, including the establishment of formal employment relationships with laborers – ensuring legal protection on form and frequency of pay, working hours, etc.	DENYS-NV	NOD/ MCA-L	Part of Construction cost	Part of construction costs
	Commit, where requested, to provide a copy of employment registers and records including details of hours/overtime worked, wages paid and the employment status of workers, both those employed directly and indirectly;				

Potential Impacts	Mitigation Measures	Institutional responsibilities		Preliminary Cost estimate	Timing
		Implementing	Supervising		
	Put in place a mechanism for checking the age of workers (prevention of child labor)				
	Commitment to comply with rights and human rights.				
	Put in place a worker grievance mechanism and details of any complaints lodged under the procedure.				
	Management of communicable deceases: • health check for workers at employment • appropriate measures for preventing malaria and dengue • information on HIV/AIDS of contractor's staff • good housekeeping • HIV/ AIDS Campaign at the surrounding communities • The Code of Conduct should contain the key health and safety elements o Zero tolerance of illegal activities; o Forbidding the use of prostitution; o Forbidding illegal sale or purchase of alcohol; o Forbidding the sale, purchase or consumption of drugs; and o Forbidding illegal gambling and fighting. o It should provide guidance for security on how to behave when solving a problem, o				
Worker exposure to hazards Worker injuries and accidents	Develop an Occupational Health and Safety Plan in compliance with IFC SP2 and ILO Standards for construction sites containing all activities required including emergency preparedness, documentation and reporting requirements etc.	DENYS-NV	NOD/ MCA-L	Part of Construction cost	Part of construction costs
	Carry out site and activity specific risk assessment				
	Ensure supervision during project activities				
	Provide required health and safety measures (PPE)				
	Provide first aid on site				

Potential Impacts	Mitigation Measures	Institutional responsibilities		Preliminary Cost estimate	Timing
		Implementing	Supervising		
	Accessible consultation sheets for review in case of contingency or emergency situations. These should have phone numbers for police, fire-fighters, Red Cross, personal supervisor or project leader.				
	Provide training and instruction to workers in a way that the workers are able to apply them (rather High illiteracy rate in Liberia and the region, providing only leaflets will not be sufficient, toolbox talks, and demonstrations required)				
	Provide sufficient potable water and shading				
	Dangerous areas need to be restricted.				
	Assign during construction a special area for the food intake.				
	Install portable toilets for the disposal of manure generated by the builders in a distance of at least 15 m to the river. They should be regular maintained and disinfected. The number of latrines is correlated with the number of employees and there should be one toilet for every ten (10) workers. The portable toilets are going along with the pipeline since it is a moving construction site.				
	Workshops and construction site must have acceptable conditions of light, ventilation and safety for workers.				
	Sufficient water and shading needs to be provided to reduce the risks of sicknesses and accidents.				
	Provide training on tree felling activities and provide safety equipment (chainsaw safety trousers, helmet with integrated visor and ear defenders, etc.) for tree felling activities (highest rate of accidents is in the forestry sector).				
Heritage and Cultural Resources	Ensure to agree with communities on a proper management (e.g. ceremonies to move graves) of any grave sites identified during the project phases and activities	DENYS-NV	NOD/ MCA-L	Part of Construction cost	Part of construction costs
	Implement Chance Find Procedures				

8.3.1 Socio-economic Impact Management

To minimize the socio-economic impacts of the Project, public consultations were carried out as part of the data collection efforts to inform the development of both the Project ESIA as well as the RAP. To the extent practicable and justified, the proposed pipeline will be cited in proximity to the existing pipe, and inside any existing and enforced RoW alongside the St. Paul River.

The Contractor will develop a public relations program that promotes respect for the rights of peoples, and which aligns with public relations guidance and planning of the MCA and LWSC. The Contractor will actively recruit employees from the surrounding communities and encourage community involvement in environmental monitoring programs to ensure compliance with accepted standards. The Contractor will establish a method of response for the community to intake, communicate and address concerns that arise from the Project. A committee comprised of community members, county officials, LWSC and MCA representatives will meet periodically to discuss issues and concerns and identify evolving interests and issues.

The Contractor will establish an equal employment opportunity policy in adherence to LWSC policy and the IFC Performance Standards which will not discriminate against residents in the surrounding communities, will meet or exceed Liberian discrimination standards, and is consistent with the standard specified under International Labour Convention No. 111. The Contractor will provide company employees with a copy of the equal employment opportunity policy upon hiring and any approved supplements, modifications, or amendments to the policy.

In collaboration with the LWSC, the Contractor will implement on-the-job education programs, and will sponsor skills training programs and other educational programs for area residents to enhance the skills of the local employment pool.

8.3.1.1 Residents and Public Infrastructure and Services

To mitigate negative impacts of the Project on settlement areas, efforts will be made throughout the final design process to avoid and/or minimize impacts to residences, businesses, and public infrastructure and services to the extent practicable. The Contractor will comply with the IFC Performance Standards including IFC Performance Standard 5 on Land Acquisition and Involuntary Resettlement as standard requirements to reduce impacts to the local community.

Additionally, mitigation measures to reduce negative impacts from the Project on cultivation include ensuring that project timing does not intrude on planting or harvest times, and that Project construction work areas result in the least amount of disturbance of cultivated land as practicable.

8.3.1.2 Traffic and Road Network

Access to the construction work areas for installation will be primarily off Caldwell Road. Traffic on these roads will be heaviest during the construction phase which is anticipated to last approximately 10 months including delivery of all equipment. The primary measures that the LWSC and Contractor will adopt to mitigate road traffic impacts during the construction phase include the proper dissemination of information regarding the construction schedule, as well as providing alternate routes if feasible during all phases of construction. In this respect, proper planning and development of a traffic control plan

that considers the reservations and inputs of local stakeholders is important to minimize the effects and inconvenience of construction activities and to ensure the safety of motorists, pedestrians and workers near construction zones.

Although the roads will be used by heavy equipment transporting heavy loads to the Project area, roads are not anticipated be blocked to other users. However, the Contractor will provide appropriate signage and safety flaggers as warranted.

8.3.2 Cultural Resources

The Contractor will implement, in accordance with the IFC Performance Standard 8 on Cultural Heritage which encompasses properties and sites of cultural, artistic, and religious significance. This includes the operationalization of Chance Find Procedures if previously unreported and unanticipated cultural resources are found during construction and operations of the pipeline. Before commencement of site disturbance activities, the Contractor personnel will receive environmental training which will include guidance on identifying potential cultural resources.

In summary, in the event of an unanticipated discovery of cultural heritage or human remains, the following will occur.

- Work will be stopped in the immediate area.
- The Resident Project Representative/Environmental Officer will be notified and will notify all other appropriate authorities.
- The find will be protected.
- Construction will be directed elsewhere along the pipeline route.
- A cultural heritage specialist will be contacted to identify the find.
    - If it is determined to be of cultural significance, additional notifications will be provided to Governmental agencies, the Ministry and appropriate local indigenous community leaders and the find will be documented appropriately.
    - If not determined to be of cultural significance, work will continue in the area.

8.4 Environmental and Social Impacts Monitoring Plan

A monitoring plan has been developed to monitor potential impacts on the physical, biological and socio- economic aspects within the PAI of the proposed pipeline. The monitoring results are expected to indicate whether the predictions of potential environmental impacts are accurate and whether the recommendations and mitigations proposed adequate.

For effective compliance monitoring, the following shall be assured:

- Monitoring the performance and effectiveness of E&S management plan including mitigation measures.
- Determine project compliance with regulatory requirements.
- Adopt remedial action and further mitigation measures if found to be necessary.
- Train staff (operators, laboratory staff, maintenance team, etc.) and define responsibilities, and knowhow of the whole process.

- Adequate analytical facility, equipment and materials.
- Maintenance of all operational equipment and calibration of monitoring equipment.
- Provision of safety at all different locations of the working area and retention of records.

Monitoring of noise levels, waste management practices, traffic, landscape, and socio-economic indicators shall be undertaken sometimes by sampling, and sometimes only by visual inspection, photographic documentation and surveys by experienced personnel. In the case of non-compliance, efforts should be made to:

- Identify the most probable sources of non-compliance.
- Verify the proper implementation of the previously specified mitigation measures.
- Review the effectiveness of environmental management plans including mitigation measures and propose alternative actions as appropriate.
- Increase the monitoring frequency to assess the effectiveness of remedial measures.

The selection of parameters to be included in the monitoring plan has been based on the results of the impact assessment exercise. The proposed monitoring plan is described in Table 8-4.

Table 8-4: Monitoring Plans

No.	Proposed Mitigation Measure	Parameters to be Monitored	Phase and Location	Unit – Monitoring Means	Frequency of Measurement, Reporting	Responsibility for monitoring	Preliminary costs estimates for the contractor
Soil							
1.	Erosion Monitoring	Erosion on steep slopes and on the and on the crossings of the tributaries	Construction Phase Construction site, roads, dumping sites	Visual inspection	On a continuous basis (regular inspection tours). Reporting: monthly and quarterly	Contractor	Control is part of the responsibilities of the contractor's environmental specialist (CES).
2.	Measures to prevent soil contamination	Check on housekeeping, storage and handling of hazardous substances	Construction Phase Construction site, roads, dumping sites	Visual inspection	On a continuous basis (regular inspection tours). Reporting: monthly and quarterly	Contractor	Control is part of the responsibilities of the CES
Air Quality							
3.	Minimisation of air pollution	Control vehicles and machines Check conditions on construction sites	Construction Phase Construction site, to some extent transport corridor	Air quality (dust, and emissions)	Measurement: depending on construction activities; in high activity phases and at the beginning more frequent, later quarterly Reporting: monthly and quarterly	Contractor	Control is part of the responsibilities of the CES Air Quality monitoring device: USD 4’000.00
Noise							
3.	Noise protection	Control vehicles and machines Check conditions on construction sites	Construction Phase Construction site, to some extent transport corridor	Noise level (Leg) at sensitive points	Measurement: weekly and as needed whenever the highest impacts are likely to occur to ensure noise impacts do not exceed the level set by EPA and IFC, 2007. Reporting: monthly and quarterly	Contractor	Control is part of the responsibilities of the CES Noise monitoring device: USD 1’000.00
Water quality							
4.	Water quality protection	Check on wastewater collection and treatment Check river on run off water from the construction site	Construction Phase Discharge point of treated wastewaters to the river and at nearby surface water bodies	Water quality (selected water quality parameters)	Construction: depending on construction activities; in high activity phases and at the beginning (until satisfactory conditions achieved): daily Reporting: monthly and quarterly	Construction phase: contractor	Part of respective specialists' duties. Monitoring instrument: Handheld water quality monitoring device

No.	Proposed Mitigation Measure	Parameters to be Monitored	Phase and Location	Unit – Monitoring Means	Frequency of Measurement, Reporting	Responsibility for monitoring	Preliminary costs estimates for the contractor
Waste Management							
5	Waste management	All waste produced: • Recyclable domestic waste • Non-hazardous construction waste • Metallic waste • Hazardous waste Conditions in and around construction site	Construction and Operation Phase Construction site and surroundings	Visual inspection Recording Kg ow waste products	Contractor has to keep track on all wastes of the construction site during construction Reporting: monthly and quarterly LWSC has to keep track on all wastes during operation	Contractor LWSC	Control is part of the responsibilities of the CES
Clearing of RoW and Access Roads							
6.	Vegetation clearing	Tree felling	RAP implementation	Number of trees	On a continuous basis during felling activities	MCA-L/ EPA/ Contractor	RAP implementer and CES Part of Construction costs
		Clearing of farmlands	RAP implementation	Ha	On a continuous basis	MCA-L/Contractor	
		Clearing of ROW	RAP implementation	Ha	On a continuous basis	Contractor	
		Clearing access roads	RAP implementation	Ha	On a continuous basis	Contractor	
Biodiversity							
7.	Protection of terrestrial habitat	Work carried out	Construction site	Visual inspection	On a continuous basis (regular inspection tours)	Contractor	Control is part of the responsibilities of the CES
Socio Economic Aspects							
8.	Mitigation of loss of farms, crops, trees and structures Mitigation of influx of worker	Affected persons	RAP Development	Number	On a continuous basis Reporting: monthly and quarterly	Contractor	See RAP Report
		Payment of compensation	RAP Implementation	Amount			
		Graves and cultural sites	RAP Implementation	Number			
		Employment and job creation	Construction Phase	Number	On a continuous basis	Contractor	Control is part of the responsibilities of the CES
		HIV/AIDS education program	Construction Phase	Number	Annually	Contractor	See RAP Report

No.	Proposed Mitigation Measure	Parameters to be Monitored	Phase and Location	Unit – Monitoring Means	Frequency of Measurement, Reporting	Responsibility for monitoring	Preliminary costs estimates for the contractor
Community Health and Safety							
9.	Prevention of waterborne diseases Prevention of communicable diseases	Good Housekeeping Workforce	Construction site	Visual inspection	On a continuous basis (regular inspection tours)	Contractor	Control is part of the responsibilities of the CES Part of Contractors cost
	Increased risk of accidents	Accidents involving structures	Construction site	Number	On a continuous basis (regular inspection tours) Reporting: monthly and quarterly		Control is part of the responsibilities of the CES Part of Contractors cost
		Hazards and accidents because of construction works	Construction site	Number			
		Traffic accidents affecting public safety	Construction site and access roads	Number			
Occupational health							
10.	Accident prevention measures	PPE	Construction site	Visual inspection	On a daily basis (regular inspection tours)	Contractor	Control is part of the responsibilities of the contractor's safety and security specialist. Part of Contractors cost
		Housekeeping					
		Prevention of falls from heights					
		Electrical hazards					
		Machinery safety					
		Welding safety					
		Provision of first aid items					
		Manual lifting					
		Fire extinguishers and fire alarm systems					
		Proper storage/handling of waste and materials					

8.5 Training

The Contractors, is committed to providing the competencies to effectively manage E&S through measures including the following:

- Clear definition of critical E&S roles and responsibilities
- Interview processes and consultancy selection processes
- Ongoing training and development activities
- Use of external specialist support, where appropriate

MCA-L will work with the Contractors to understand any additional training needs which may be required. Any material gaps in training/competency will be identified before commencement of the contracted scope of works, and addressed as required. As a minimum, all workers will receive general orientation training on site H&S procedures and arrangements through inductions, toolbox talks and weekly refresher sessions. These will be communicated using non-technical language and in the worker's language. Additional training specific to individual roles will be identified and arranged for all relevant workers.

MCA-L will communicate its requirements and competency expectations to contractors during the contracting process. They will be required to provide information to demonstrate the competence and training of its workers in particular those who will be required to undertake tasks that are safety-critical.

Areas earmarked for E&S awareness creation will include the following:

- General site issues
- Traffic and access
- Proper usage and definitions of basic environmental terminologies
- Environmental, social, H&S laws, regulations, and environmental compliance in Liberia
- MCC/MCA-L EHS and social policies, including the MCC-adopted IFC Performance Standards
- General E&S policies, procedures
- Introduction to environmental, social and H&S management planning, especially for the following:
    - Air quality, including dust
    - Noise
    - Waste disposal and recycling
    - Water quality
    - Flora and fauna
- Environmental social and H&S impact and risk assessment
- Mitigation measures
- Reporting procedures including incident/emergency response procedures and reporting accountabilities
- E&S impact monitoring plans
- Internal and external audits, including permit compliance and policy conformance

8.6 Communication and Participation

8.6.1 Information, Education and Communication

In addition to the provision for continuous public and worker education during the project and subsequent posting of warning Signs, sustained information, education and communication programs to promote overall community safety will be implemented on regular basis. These information, education and communication programs will be designed to remind the Contractors staff, Sub-contractors, and the community about project activities, risks or safety hazards that could endanger their lives, as well as the need to adhere to warning signs, especially during construction.

8.6.2 Grievance Mechanism

The grievance mechanism will consist of the following four-stage resolution procedure:

- Resolution by the person with whom the grievance is lodged
- Resolution by an internal dispute system established within the team with whom the grievance is lodged
- Resolution by a formally constituted Grievance Redress Committee
- Resolution through the legal system

Other important features of the grievance mechanism are as follows:

- Awareness of the grievance mechanism will be promoted throughout the project areas through public meetings, leaflets, media and local officials.
- Complaints lodged with team members not responsible for the type of grievance to which the complaint refers (e.g., construction damage claims lodged with a member of the resettlement team) will be referred to the Compact unit or outside agency for action.
- Copies of all grievances received will be submitted to the MCA-L E&S team, which will maintain a comprehensive register. The register will indicate whether the grievance has been resolved and whether it has been referred to another team. The register will form the basis of monthly progress reports. If grievances are not resolved when they are lodged, the team dealing with the grievance will inform the E&S team once it has been resolved and appropriate action taken.
- The E&S team will undertake periodic follow-ups with the team/ agency dealing with non-environmental / social grievances to ensure that action is being taken on unresolved grievances and that outstanding grievances are not threatening project implementation.

8.6.2.1 Workers Grievance Mechanism

The workers grievance mechanism shall be recognised as legitimate by all parties and workers should feel that they are able to raise their grievances without fear of victimisation or negative consequences. Before a new mechanism is set up, there shall be consultations on the draft mechanism between management, workers and their representatives. Once it is implemented, all managers, supervisors and workers need to be fully briefed (awareness raising) and trained concerning the procedures. It is important to follow the procedures.

A grievance can be defined as any concern, unhappiness or discontent that a worker might have in the workplace. Grievances can be related to:

- Infrastructure (e.g. no portable toilet available at the construction site, no shade for resting during breaks, etc)
- Personal relations (e.g. a supervisor has used physical or verbal harassment; there is a conflict between co-workers)
- Contractual rights (e.g. payment is systematically delayed; there are illegal deductions; overtime is not paid in premium rate or it is paid in a lower amount than initially agreed)
- Human and labour rights (e.g. a worker has suffered discrimination based on gender; religion; place of origin, etc)

Workers' grievances may also be related to issues other than what is described.

8.6.2.2 Community Grievance Mechanism

The Contractor as well as LWSC will need to have a procedure to receive grievances from local people, in case of noise, dangerous driving behaviour, destruction of any crops, or related to any aspects for resettlement. The levels of the Grievance Redress Mechanism present the various stages at which concerned stakeholders are to be involved during the grievance resolution and/or redress process. The grievance mechanism will be widely advertised to the stakeholders so that they are aware of the process, know they have the right to submit a grievance, and understand how the mechanism will work and how their grievance will be addressed. The process of information dissemination will be part of the Stakeholder Engagement Plan it will be primarily carried out through community visits and distributing flyers. For a detailed description of the process see the RAP.

The Instances of Grievance Redress are as follows:

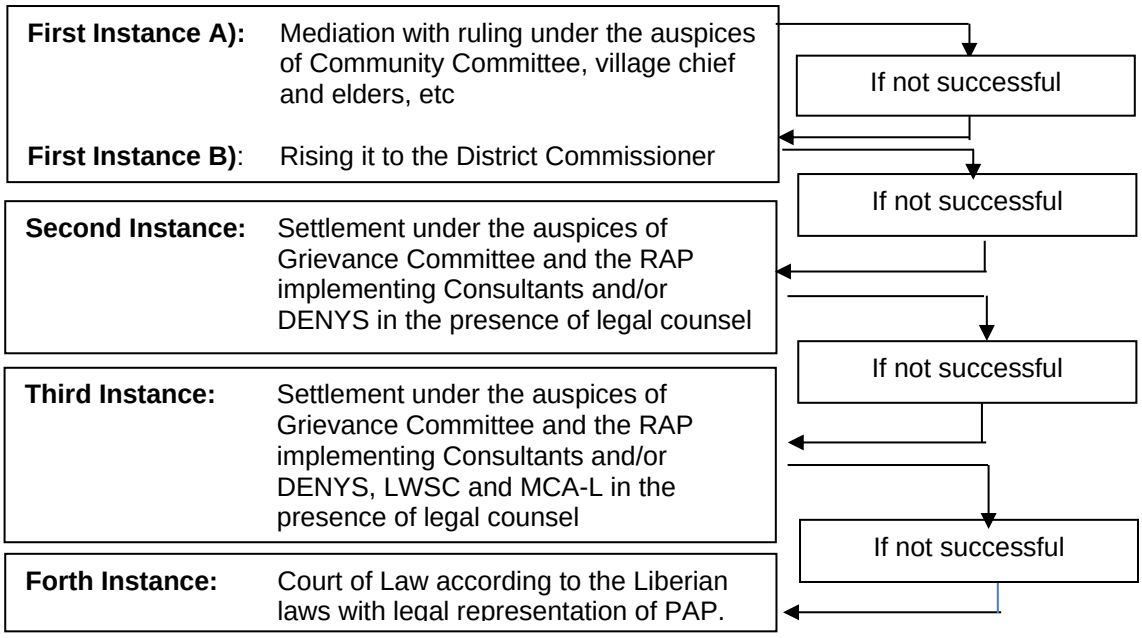


Figure 8-2: Grievance Instances

8.6.3 Public Consultation

The support and involvement of government agencies are essential to the successful implementation of the project. Consultations play a major role in identifying the potential impacts of such a project. Subsequently, MCA-L and/or the Contractor and LWSC must carry out extensive consultations through the project life cycle and consultations must be held with all stakeholders, including land owners, community members, chiefs and opinion leaders, elected local government representatives and governmental agencies with the aim of providing information on project E&S management issues.

8.7 Audit, Corrective Action and Reporting

8.7.1 Site Inspection

The MCA-L E&S Director will be responsible for planning and implementing environmental, safety and health inspection and audit. The frequency of these is governed by the level of activity on the site. Any serious hazard identified during an inspection that represents an immediate risk to safety or health is to be remedied immediately. The results of each inspection will be included in a report, including identified issues, recommended corrective actions and correction and a schedule.

Contractors are responsible for developing and implementing audit programs consistent with MCA-L requirements. The MCA-L environmental officer will review the individual contractor's program, and will perform periodic audits of the contractors onsite.

Incidents and nonconformities relating to activities being managed by a contractor will be reported to MCA-L's ESP Director using a standard incident reporting form. The incident/nonconformity reporting process will be communicated as part of Program induction training before any individual commencing work for, or on behalf of, the Program, and included in contract documents as relevant.

Any accidents resulting in personal harm or injury, high potential near-misses, a legal noncompliance, or significant environmental or community impact, and/or an exceedance of an IFC performance standard or threshold will be recorded as an incident and will be reported immediately (within 12 hours) to MCA-L. MCA-L will report incidents and accidents in accordance with MCC and regulatory requirements.

Root cause analysis will be undertaken to determine the underlying causes of all such accidents and incident by the Contractor, and undertake remedial actions as appropriate.

Incident reports will be provided formally to MCA-L for discussion in Contract Administration meetings.

8.8 Document Control and Recordkeeping

The management of documents should be consistent with the project's overall documentation system. It is expected that documents be legible, dated and readily identifiable using the project's documentation numbering system. Controlled documents shall be input into a document register, which will identify the current version, the date of issue and the owner. Such records shall be made available to project personnel for viewing.

MCA-L will maintain appropriate levels of documentation to demonstrate compliance with Program Standards and Compact requirements as set out in MCA-L ESMS. A document and record management system will be established by MCA-L to manage E&S

documentation in line with the requirements of ISO 9001 (Quality Management System) and other international standards as appropriate (i.e., ISO 14001 and OHSAS 18001 [to be renamed ISO 45001]).

Contractors working for MCA-L are required to operate an Open File Policy for all E&S documentation in order that MCA-L representatives can review any aspect of the Project E&S documentation within a reasonable timeframe.

All training must be registered in a training register. The training register is to be maintained in accordance with the projects document control procedures of MCA-L. Recommended corrective actions and correction proposed during audit will also have to be registered.

8.8.1 Monitoring Records

Monitoring requirements shall at a minimum be:

- Maintained in a clear legible format;
- Retained for at least four years after the monitoring or event;
- Maintained with the following details for each sample required to be collected:
    - The date(s) on which the sample was collected
    - The time(s) at which the sample was collected
    - Sample ID code
    - Sample method
    - The point at which the sample was collected
    - The name of the person who collected the sample

8.9 Sub Management Plans related to EHS aspects

The Owner will also be committed to the creation and implementation of programmes to reduce the probability of occurrence of deleterious environmental incidents. Contingency plans will be developed for dealing with such adverse incidents, if they occur. Since the management plans were already developed by CH2M for the ESIA and ESMP for Segment 2 they have been used equally for the overall project Segment 1 and Segment 2. Those Sub-Management Plans are described below adaptations or changes were not required.

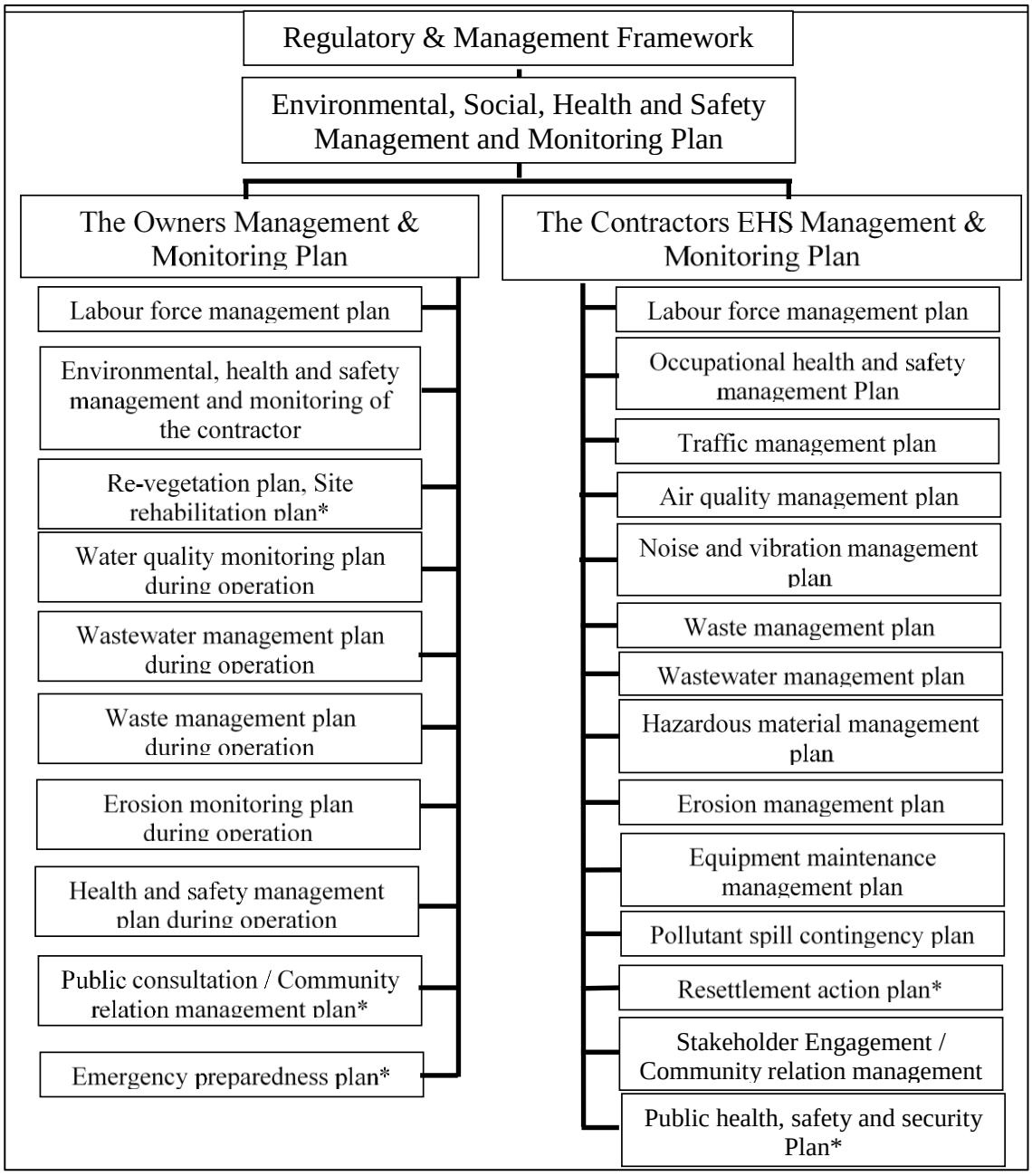


Figure 8-3: Sub ESMPs

The Content of each Sub ESMP should include the following.

- The purpose
- Reference and relevant documents (legislation of Liberia and other applicable international standards and other documents used)
- Roles and responsibilities
- The management process
    - Emission standards and requirements
    - The project emission sources
    - Prevention and control
- Surveillance
    - Inspections
    - Monitoring (measurements)
    - Reporting
- Actions to be taken in the case of non- compliance
- Awareness and training
- Documentation and communication

8.10 Sub Management Plans During Construction

8.10.1 Contractor's Labor Force Management Plan (CLFMP)

The contractor will ensure that labor standards (IFC Performance Standards 2 and ILO Standards) are respected during the project, as set out in the contractor ToR and contract. Under the contractor LFMP, the contractor will take into account the capacity of sub-contractors to achieve sound labour management.

The contractor will ensure a contractual commitment on the part of labour providers to comply with all relevant aspects of Liberian national labour law, including the establishment of formal employment relationships with labourers – ensuring legal protection on form and frequency of pay, working hours.

Under the Contractor's LFMP, the contractor will:

- Commit, where requested, to provide a copy of employment registers and records including details of hours/overtime worked, wages paid and the employment status of workers, both those employed directly and indirectly;
- Assume primary responsibility for day-to-day monitoring of the implementation of labour standards requirements placed by project financiers on the Project Proposer (LWSC) and thereby designate a manager who is responsible for ensuring labour and health and safety legislation is complied with, both in the direct and indirectly-employed workforce (namely, subcontracted labour);
- Provide or ensure that training is carried out on health and safety issues with regard to all workers, direct and indirectly employed;
- Put in place a mechanism for checking the age of workers (prevention of child labour);

- Carry out risk assessments in relation to all employees who are under the age of 18;
- Put in place a worker grievance mechanism and details of any complaints lodged under the procedure
- Undertake to inform LWSC – and thereafter the project financiers – of all serious accidents that take place in relation to the project; and,
- Provide LWSC – and thereafter the project financiers – with sample copies of payslips for direct and sub-contracted workers indicating payment of wages and social security contributions.

The Labor Force Management Plan will also include a Code of Conduct that shall cover main rules of interaction with local communities; rules of conduct in case of conflict situations; emphasizing cultural characteristics of the local communities if migrants from different cultures enter the area. It will also include a grievance mechanism, which will allow the affected communities to express concerns about the conduct of personnel. The grievance mechanism will include a mechanism for assessing the credibility of allegations, investigation of credible allegations of unlawful behaviour, corrective actions and documentation and (where appropriate) reporting of such incidents.

8.10.2 Occupational Health and Safety

8.10.2.1 Regulatory Requirements Summary

National Regulatory Requirements

The Contractor will be responsible for adherence to the National OHS Guidelines as developed by the MoH and DEOH. These draft guidelines have been developed to reflect the GoL values and instruments relevant to the protection of workers' H&S, and have been written for use by all those who have responsibility for occupational H&S management. They are intended to be used to:

- Protect workers from hazards and eliminate work-related injuries, ill health, diseases, incidents and deaths
- Establish a national framework for OHS management systems, preferably supported by national laws and regulations
- Provide guidance for the development of voluntary arrangements to strengthen compliance with regulations and standards
- Provide guidance regarding the integration of OHS management system elements in organization as a component of policy and management arrangements

IFC Performance Standards Requirements

IFC Performance Standard 2 sets the requirements for promoting safe and healthy working conditions, and the health of workers. IFC Performance Standard 2 requires the following:

- To provide a safe and healthy work environment, considering inherent risks in its sector and specific classes of hazards in the client's work areas, including physical, chemical, biological, and radiological hazards, and specific threats to women.
- To take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during work by minimizing, as far as reasonably practicable, the causes of hazards.

- To address areas that include the (i) identification of potential hazards to workers, particularly those that may be life-threatening; (ii) provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) training of workers; (iv) documentation and reporting of occupational accidents, diseases, and incidents; and (v) emergency prevention, preparedness, and response arrangements.
- To manage emergency preparedness and response (also referenced in IFC Performance Standard 1); this preparation will include the identification of areas where accidents and emergency situations may occur, communities and individuals that may be impacted, response procedures, provision of equipment and resources, designation of responsibilities, communication, including that with potentially affected communities and periodic training to ensure effective response. The emergency preparedness and response activities will be periodically reviewed and revised, as necessary, to reflect changing conditions.

MCC and MCA-L Requirements

MCC and MCA-L are committed to promoting the continuous improvement of H&S and will seek to avoid providing Compact assistance for any project that is likely to cause a significant EHS hazard. The MCC H&S Policy states that MCC-funded projects and activities shall meet or exceed all applicable in-country H&S laws and regulations, and, where such laws and regulations are insufficient or absent, encourage and facilitate the application of responsible international practices and standards. A holistic and risk-based approach will be implemented to help improve H&S performance and capacity in MCC partner countries and promote dialogue on H&S performance among other agencies, donors, and relevant stakeholders to contribute to innovation and the sharing of knowledge in this area.

National Roles, Rights, Duties and Responsibilities

NPHI/MoH

NPHI/ MoH shall be responsible for promulgating, adopting, adapting, and implementing occupational health laws, policies, regulations, guidelines and programs. This shall be done in consultation with other relevant agencies, stakeholders, and collaborating partners.

MoL

The MoL will ensure that workers' rights are adequately addressed in terms of labor abuse, formulation and formation of leadership at the work place which will encourage good working relations among the workforce and the management. The MoL will ensure regular monitoring of all labor matters as defined in the act creating them.

EPA

EPA provides regular monitoring and supervision of all environmental concern and ensure that all companies/enterprises seeking accreditation or environmental permit be given a copy of the OHS Guidelines to be used as a working tool for the H&S of the workers.

NPHIL/MoH/DEOH (Enforcement)

If the internal responsibility system fails to address adequately the H&S issues in a workplace, the NPHIL/MoH should ensure the enforcement of the Public H&S Laws and Policies.

Environmental Health Technicians have the authority to, among others, inspect any workplace, investigate any potentially hazardous situation and work refusal, order compliance with the Public H&S Laws, policies and regulations and initiate prosecutions. Employers, supervisors and workers must assist and co-operate with environmental health technicians. Make sure to inspect all employees and employers, including contractors within the workplace medical records in accordance with the public H&S laws which state that all employees obtain a medical certificate on a six months' interval.

NPHIL/MoH through the OHS program of the DEOH should implement regulations and carry out the followings:

- Inspections
- Investigation and inquiries
- Improvement notices
- Recommend Prosecution, Closure and other Administrative penalties
- Commendation – to reinforce good practices

8.10.2.2 General Project Design and Operation

The Project will be constructed and operated in a manner which will eliminate, control, or minimize occupational hazards which could impact employee H&S. Drawing from the recommendations contained in this ESMP, the Contractor will prepare a Project-specific H&S Plan for both the construction and operation phases of the Project to ensure compliance with the MoH's Guideline for OHS and the IFC Performance Standards. In accordance with contractual requirements, the contractor will be required to comply with Liberia and IFC occupational H&S requirements.

To ensure its employees' H&S, the Contractor will provide the following:

- Safety devices to protect employees from injuries or hazardous conditions
- Safe drinking water
- Immunizations, as applicable
- Clean eating area
- First aid facilities
- Bathroom facilities
- Sanitary conditions
- Waste management and proper disposal procedures
- Appropriate signage
- Fire prevention facilities, training, and awareness
- PPE

The Contractor will be required to maintain a dedicated safety specialist who will be responsible for the preparation, implementation and maintenance of a comprehensive safety program, which will be periodically evaluated by the OE and MCA. The Contractor safety specialist will be provided written safety instructions including instructions on correct storage, handling and disposal of hazardous waste (not anticipated), and written contingency plans/guidelines of action for accidents, spills, and fire. The responsibility of the safety specialist will include performing safety training and conducting safety inspections, sessions and practice. She/he will also be responsible for the investigation of accidents. A safety committee should be formed including personnel from the MCA and the OE and regular safety meetings should be carried out.

General mitigation measures aimed at individuals employed on site include the following:

- Provision of training about the fundamentals of occupational H&S procedures
- Provision of appropriate PPE (e.g., impermeable latex gloves, working overalls, safety boots, safety helmets, hearing protection)
- Ensuring that especially sensitive or dangerous areas (like areas exposed to high noise levels, areas for especially hazardous work etc.) are clearly marked
- Ensuring that all maintenance work necessary for keeping machines and other equipment in a good state will be regularly carried out
- Ensuring that the workers (and especially those doing hazardous work or otherwise exposed to risks) are qualified, well trained and instructed in handling their equipment, including health protection equipment
- Provision of adequate loading and off-loading space
- Development of an agreed emergency response plan
- Provision of appropriate lighting during night-time works (if applicable)
- Implementation of speed limits and other traffic safety measures for trucks/equipment entering and exiting the site

8.10.2.3 First Aid Program

A basic first aid program will be extended to all employees and individuals working on site and will ensure that in the event of an accident or injury, someone with first aid knowledge will be present to render initial assistance until further medical attention can be made available. Qualified Contractor personnel will run seminars to provide the necessary theoretical as well as practical skills required. The advanced first aid program will be an extension of the basic first aid program attended by selected employees, including supervisors and the H&S Officer, and will train participants in the recognition and initial management of serious injuries and illnesses. Employee H&S orientation will train all employees on the basic rules of work, safety procedures, site-specific hazards, and emergency procedures. A visitor orientation and control program will be implemented if visitors will be entering areas of the site where hazardous conditions or substances are present. Supervisory personnel and safety representatives will attend training on accident investigation and reporting procedures. In the event of an accident, the following protocol will be followed:

- A person trained in basic first aid (first responder) will be summoned if not already present at scene of accident.
- The first responder will render first aid care.
- The first responder will summon a person trained in advanced first aid who will administer further care if necessary and evaluate the necessity for removal to the first aid station.
- The advanced first aider will summon the ambulance and supervise the removal of the injured to the first aid station.
- The employee's immediate supervisor must be notified.

A first-aid facility will be located near the project site, together with trained staffing. Serious injuries or medical emergencies will be referred to an appropriate medical practitioner and medical institution chosen from the nearest town/city to the project site. Contact will be maintained by radio/radiophone always. The employee's supervisor will contact the identified medical practitioner and institution and inform them of the time of arrival of the injured employee. The supervisor will complete the accident form and forward it along with the injured to the medical institution for completion by the medical practitioner.

8.10.2.4 Employee Health and Safety Orientation

New employees and contractor personnel will be provided H&S training before commencing work or a new assignment. The training will consist of basic hazard awareness, identification of site-specific hazards and how they are controlled, safe work practices, potential risks to health and precautions to prevent exposure, hygiene requirements, PPE requirements and proper use, equipment labeling, accident prevention and reporting, and emergency procedures for fire, evacuation, or natural disaster.

All employees will be informed of their responsibility to participate in the creation of a healthy and safe environment by reporting unsafe and hazardous conditions when detected, and performing work in a safe manner by following the correct work procedure. It is expected that a brief daily H&S meeting will be conducted each day before the commencement of work.

8.10.2.5 Hazard Communication

Hazardous areas will be marked with appropriate signs which identify hazards and their associated safety measures. All signs will conform to international standards and will be designed to be understood by all employees and visitors. Signs may contain both text and pictures, as necessary, to ensure that any illiterate employees or visitors would be made aware of the hazard. As applicable, containers of hazardous materials will be labeled with the contents and associated hazards. A color coding system will be implemented to allow immediate visual identification of containers or equipment which contains hazardous substances. Emergency personnel should be made aware of the types of hazardous materials, typical amounts stored onsite, and storage locations, to expedite emergency response actions. If possible, local emergency response personnel will be invited to inspect the site periodically to ensure familiarity with potential hazards present.

The physical hazards identified for construction and operation of the Project include short-duration noise, work in confined space, work at height (for constructing pipe support piers), earth movement and trench work.

Noise

Contractor employees and individuals on site will have exposure to high noise levels from operation of equipment during construction and maintenance activities. To minimize the impacts of noise hazards, the contractor will:

- Enforce the use of hearing protection actively when the equivalent sound level over 8 hours reaches 85 decibels, the peak sound levels reach 140 decibels, or the average maximum sound level reaches 110 decibels.
- Install warning signs in areas of high noise levels.

Electrical

Energized equipment and power lines can pose electrical hazards for workers. To prevent, minimize, and control electrical hazards, the Contractor will:

- Deactivate and properly ground live power equipment and distribution lines according to applicable legislation and guidelines before work is performed on or proximal to them.
- Follow general IFC guidelines regarding electrical devices and overhead wires.

Work at Heights

The pipeline will generally either be placed in a shallow trench, or on concrete piers which are not generally to exceed 3 m off the ground. The total height from ground to the top of the pipe is not to exceed approximately 4 m. IFC Performance Standard 2 requires that fall prevention and protection measures should be implemented whenever a worker is exposed to the hazard of falling more than 2 m. When working on sections at or near the top of the pipe, the Contractor will ensure that precautions are taken in these cases such as the implementation of fall prevention and protection measures such as the use of appropriate PPE in adherence to Performance Standard 2 which may also include required training on the proper use of ladders and scaffolds or other fall prevention measures as warranted.

Excavations and Trench Work

The pipeline will generally be placed in a shallow trench not to exceed approximately 4 m in depth. In cases of excavation of earth and working in trenches; no excavation will be permitted without a suitable and sufficient risk assessment or method statement covering proposed work from contractor or staff engaged to carry out the work, and all digging will be done by a competent person. If risk assessment identifies a requirement or if excavation is more than 2 m deep, a substantial barrier consisting of guardrails and toe boards will be provided around surface of working area, and trained and competent person must supervise work and workers given clear instructions on working safely in the excavation. Excavations 1 to 1.5 m deep and more than 2 m deep will be supported by timbering and props with guard rails to prevent falls. The sides must be prevented from collapsing by shoring and battering and safe ladder access must be provided and supported. Barricades and temporal fencing may also be used to prevent any incidents. Caution tapes will be used for all shallow excavation (less than 1 m) to prevent falls and prevent the general public and unauthorized persons from using these areas as a pathway. Entry will be restricted to competent and authorized persons only. Excavated areas should be fenced or otherwise appropriately restricted at all times.

Biological Hazards

Biological hazards associated with biological agents, wildlife and insects may pose a potential risk to employees and individuals working with or around these hazards. To protect and prevent against potential injury caused by biological hazards the Contractor will:

- Take precautions to ensure that the risk of exposure to harmful biological agents is as low as possible.
- Provide insect repellant for employees working in areas where there is a risk of injury from insect bites.
- Provide snake bite and first-aid kits for employees if an employee has encountered a wildlife hazard.

Regarding waterborne and water-related diseases substances, the following measures should be implemented:

- The adoption of good housekeeping practices for ensuring hygiene on site.
- The minimization of created pools of stagnant water, which could serve as breeding places for mosquitoes.
- The provision of bed nets for workers living on site. Ideally, these nets should be treated with an insecticide.
- The appropriate disposal of waste of all types, including wastewater.

- Provision of onsite food/water for employees to ensure good nutrition and decrease risk of food/waterborne diseases.

Personal Protective Equipment

PPE is equipment worn by a worker to minimize exposure to specific occupational hazards. When the hazard cannot be eliminated or controlled, then PPE must be worn to reduce or minimize the exposure or contact with physical, chemical, or biological hazards.

The PPE that will be used to protect against the Project's occupational H&S hazards include gloves, ear plugs, ear muffs, dust masks, respirators, fall protection, protective clothing, hard hats, goggles, safety glasses, and safety boots. It will be mandatory for all employees to wear hard hats, safety glasses (or goggles), and safety boots always while in the construction work areas.

In close collaboration with the OE, the Contractor will review work practices, job procedures, equipment, and the construction work sites to determine the degree of protection and proper PPE to match the hazard. Physical comfort, costs, and compliance with internationally recognized standards will be considered when selecting PPE. Workers will be instructed on the proper use, maintenance, and inspection of their PPE.

8.10.3 Risk Assessment, Emergency, Preparedness and Response Plan

In collaboration with the OE, the Contractor will integrate the measures as contained in this ESIA, and others as applicable, into a Project Emergency Preparedness and Response Plan (EPRP) which will assist Project staff in effectively responding to emergencies associated with Project hazards. The EPRP for the construction and operational phases of the Project will comply with the IFC Performance Standards and Occupational Safety Guidelines and. The EPRP will include the following:

- Roles and responsibilities of emergency personnel
- Emergency contacts and communications systems/protocols, including procedures for interaction with local and regional emergency authorities
- Specific emergency response procedures
- Identification of supplies and resources to be utilized during an emergency event, including emergency equipment, facilities, and designated areas
- A training plan, which includes specific training and drill schedules for personnel who are responsible for rescue operations, medical duties, spill response, and fire response

If an emergency develops, all persons on the project site will be notified immediately and efforts will be coordinated with others in the vicinity surrounding the project area to reduce impacts. The EPA, the County Superintendent, local police, and all other authorities will be immediately notified. If an emergency is imminent, but has not yet begun, steps will be initiated to immediately advise persons near the emergency to evacuate and notifications will be made to the EPA, the County Superintendent, local police, and all other authorities which have responsibility regarding the emergency.

If there is a slowly developing emergency or unusual situation where an emergency is not imminent, but could occur if no action is taken, project personnel will notify the EPA, the County Superintendent, local police, and all other authorities of the potential problem and keep them advised of the situation. These agencies will be requested to indicate if there are any immediate actions that should be taken to reduce the risk of the emergency and if necessary, preventative actions will be implemented. In an emergency, equipment and

supplies will be needed on short notice. Therefore, The Contractor will maintain an accurate inventory of emergency response equipment and supplies, which will be periodically reviewed by the OE.

8.10.3.1 Fire Prevention and Response

The Fire Prevention and Response chapter of the EPRP will outline prevention measures and procedures related to fire emergencies in compliance with the International Fire Code. Fire risks and ignition sources associated with construction and operation of the Project will be identified during the final design phase of the Project. A summary of the fire prevention and response provisions that will be addressed in the EPRP are presented below.

Fire prevention measures will be implemented to limit the potential for fire development and will adhere to International Fire Code requirements. Good housekeeping and maintenance practices will be utilized during construction and operation of the Project to prevent the accumulation of combustible waste material such as trash and vegetation. Smoking will be prohibited in areas where conditions exist that would make smoking a hazard, and "No Smoking" signs will be posted in these areas.

To decrease the potential for fuel-related fires, fuel oil storage areas will be located well away from areas of fire hazard. Waste oil and flammable materials will be stored in suitable containers at designated areas selected based on proximity to water, migration routes, fire risks and access.

8.10.3.2 Disease Prevention

Communicable and vector-borne diseases can pose significant health hazards to workers. To reduce the impact of disease, the Contractor will implement the following strategies:

- Provide disease surveillance and active screening of workers
- Provide health awareness education and disease treatment training
- Use proper sanitation and vector control programs to reduce mosquito and other disease vector populations

8.10.3.3 Clean-Up of Pollution by Hazardous Materials

In case of leakage or spillage of any environmentally hazardous material, such as fuel, oil, chemicals of any kind, into either a water course or standing waterbody, or into soil, Contractor shall take appropriate clean-up measures. Before bringing any hazardous materials to the site, the contractor must prepare a Spill Contingency Plan in accordance with this standard and gain the approval of MCA-L.

The purpose of a Spill Contingency Plan is to provide guidelines to prevent environmental contamination, and the procedures to be followed should hazardous materials enter the environment. It applies to all working areas of the Project.

The contractor must prepare a Spill Contingency Plan for the material storage areas if hazardous materials are to be stored. This is a regulatory requirement of the GoL, and the minimum details that must be in the plan are as follows: (a) how incidents will be contained and controlled so as to minimize the effects and to limit danger to persons, the environment and property; (b) how the necessary measures will be implemented to protect people and the environment; (c) a description of the actions that will be taken to control the conditions and to limit their consequences, including a description of the safety equipment and

resources available; and (d) arrangements for training staff in the duties they will be expected to perform. The Spill Contingency Plan shall be simple and straightforward.

The following principles must be included in the plan: (a) the source of the leak or spill must be stopped immediately once discovered; (b) the alarm must be raised throughout the site; (c) work on the site must be stopped and all available resources directed into resolving the problem; (d) emergency measures must be taken to contain all remaining material; (e) where appropriate, measures must be taken to neutralize hazardous substances; (e) MCA-L shall be informed immediately; and (f) site-specific and material-specific details will be given for the disposal of contaminated soil and water, and mitigation of the damage caused.

The contractor shall ensure that all site supervision staff is aware of the plan and capable of implementing it. In the event of a leak or spillage, the contractor shall bear all liability whether the plan is implemented or not.

Every Spill Contingency Plan must contain, as a minimum, details of the following emergency procedures:

- The person who discovers any spill must notify fellow workers and inform the supervisor that a spill has occurred. If anyone is injured or in danger, they must be rescued if it is safe to do so, and appropriate rescue and medical assistance called if required. All site staff must be informed if there is a risk of fire or explosion, or of a collapse of infrastructure, and in these cases all unnecessary personnel must be evacuated to a safe location.
- All trained contractor staff will react promptly to all spills, no matter how insignificant they may appear. Whatever resources are at the contractor's disposal will be diverted immediately to assist in resolving the spill.
- MCA-L's management will be notified immediately if any spill or release occurs, however small. As much information as possible should be provided about the spill location, type of material, approximate quantity, and extent of damage.
- The area surrounding the spill will be secured and contained to minimize additional contamination, for example by building an earth bund. Emergency containment should be started as soon as possible. This will give time for a full pollution-control strategy to be designed, agreed and implemented.

8.10.4 Trafficking in Persons Risk Assessment and Management Plan

In 2014, MCC adopted a Counter-TIP Policy that requires that specific tasks be completed to avoid or minimize the potential for human rights impacts on projects. This policy applies to all MCC-funded projects and seeks to implement safeguards against sex trafficking and forced, fraudulent or coerced recruitment and labor practices. As such, a TIP risk assessment is a required component of this report.

8.10.4.1 TIP Overview and Tier Ranking

As noted by the United States Department of State, Liberia is known to be a source and destination country for TIP. Although men, women, and children are subjected to forced labor and sex trafficking, children are the primary victims. The GoL does not meet the minimum guidelines for elimination of human trafficking. Although Liberia was added to the Tier 2 Watch List from 2011 through 2013, it has been ranked as a Tier 2 country since 2014. Countries given the Tier 2 designation are those whose governments do not fully

comply with minimum Trafficking Victims Protection Act standards but are making significant efforts to come into compliance.

Trafficking primarily occurs within Liberia from rural to urban areas instead of transnational trafficking, which is predominant in areas throughout Africa. The type of exploitation includes domestic servitude, forced begging, sex trafficking, or forced labor in street vending, and extractive (mining) or manufacturing (rubber) industries. The Liberian government has not convicted any trafficking offenders under the 2005 Act to Ban TIP and does not effectively investigate cases of internal trafficking. As such, given that laws (judicial mechanism) and governmental structures exist, Liberia has maintained a Tier 2 level since 2013.

8.10.4.2 Risk Assessment

Economic conditions and desire for employment opportunities are key drivers of intranational TIP (from urban to rural settings) in Liberia. This project will occur in rural settings only within a limited distance of 4 km.

The following four key criteria are used to evaluate TIP risks.

1. **Project location risk** – An assessment of the project corridor and area of influence does not provide any indication of a potential increase in TIP risk resulting from this project. The pipeline corridor passes through largely rural areas with adjacent small townships.

   Economically induced child labor throughout Liberia including communities along the pipeline corridor exists. Trafficking in Liberia primarily involves children who migrate from rural to urban settings in search of work or who begin working to provide additional income for the family. Given that school fees may make education cost-prohibitive, children stay at home or are forced to begin working at very early ages. This actively occurs in the PAI according to inputs received as part of the community consultations.

   Consultation participants did not mention issues of forced labor or exploitation. The primary concerns expressed relate to the potential economic benefits or harm (related to land loss or interrupted land use) derived from project activities, particularly related to agricultural sector, and current lack of local employment opportunities. The proposed project activities minimally increase the number of people along the pipeline corridor during construction. There will likely be work crews including 20 or fewer persons. Given the size of the work crews and the short duration of the work, a work camp is not likely to be established. The potentially direct impacts (related to land) have been addressed in the Resettlement Policy Framework (RPF), which addresses entitlements compensation for temporary or permanent losses of assets and/or livelihood. In terms of other potential impacts, the ESIA has not identified any evidence to expect significant negative economic or social outcomes. As such, this project is not anticipated to increase levels of exploitation in the project location.

   Although there is forced child labor occurring in the area, the project location risk is low, given that there are no TIP-specific risk factors related to the project. Project implementation is not anticipated to increase the incidence of economically-induced child labor.

2. **Project implementation-related risk**—The relatively small work force will be primarily sourced locally and not be comprised of migrant laborers. There will be opportunities for local residents to provide support during construction clearing brush, installing protective fencing, guarding equipment and supplies, and providing similar site-related support. Given that this project will occur in rural areas within a 4-km linear distance, project vehicles are unlikely to be used to transport trafficked persons. Despite the low risk of transporting children or other trafficked or exploited persons, strict guidelines about the use of cars and worker behavior should be communicated before commencing work.

   Temporary roads will be necessary to facilitate construction of the pipeline. Some of roads will remain as permanent gravel roads to support operations and maintenance activities. The new roads and improved access to electricity may stimulate limited relocation to some of the more isolated villages where untitled land is still easy to attain. This may result in limited migration.

   The project involves minimal land acquisition within the pipeline corridor and very few if any permanent household relocations. As such, there are no TIP risks related to resettlement. There may be compensation for temporary loss of income, but no significant changes to community lifestyle or livelihood.

   The project implementation-related risk is low, given that there are no TIP-specific risk factors given nature and extent of project work to be completed. Project implementation is not anticipated to increase the incidence of economically-induced child labor.

3. **Recruitment and labor practices related risk**—Pipeline installation is expected to generate a small number of temporary jobs during construction, which should benefit the nearby population. Foreign labor may be used to staff the project. Employers and contractors should provide assurances including policies and procedures indicating that child labor will not be used on the project.

   Although there will be minimal recruitment of local staff, there is a possibility that forced labor could occur.

4. **Possible TIP risks following project completion**—Following project completion, there may be new opportunities for small businesses but it is unlikely that there will be significant changes in the lifestyles of local communities. There may be a net increase in small-industry and service-level employment.

   Although there is economically-induced forced child labor occurring in the area, post-project completion risk is low, given that there are no TIP-specific risk factors related to the project. Project-completion is not anticipated to increase the incidence of economically-induced child labor.

8.10.4.3 Management Plan

The TIP risk category for this project is low, given that there are no TIP-specific risk factors related to the project and there are no significant TIP problems already present in the project area. A small team of predominantly local workers will be working in an area of low TIP risk.

As such, the Counter-TIP Minimum Compliance Requirements will need to be included in the solicitation documents and contracts to ensure contractors are engaged in addressing TIP concerns during construction.

These requirements include:

- An assurance that contractors, consultants, and any of their respective employees shall not engage in any form of TIP. They should also conduct proper notification and remedying should an allegation occur.
- The contractor shall notify its employees of MCC's Counter-TIP Policy and of the actions that will be taken against employees for violations of this policy. Such actions may include, but are not limited to, removal from the contract, reduction in benefits, or termination of employment.
- The contractor shall take appropriate action, up to and including termination, against employees or subcontractors or sub-consultants that violate the prohibitions set out in this policy.
- The contractor shall certify that it has not engaged in, facilitated, or allowed any activities constituting TIP or related activities for the duration of the contract.
- The contractor shall provide assurances that activities constituting TIP or related activities also prohibited under this policy, will not be tolerated by its employees.
- The contractor shall acknowledge that engaging in such activities is cause for suspension or termination of employment or of the contract.
- In terms of notification, the contractor shall inform the MCC immediately of any information it receives from any source (including law enforcement) that alleges its employee, subcontractor, sub-consultant, or the employee of a subcontractor or sub-consultant, has engaged in conduct that violates this policy and of any actions taken against any employee, subcontractor, sub-contractor/consultant, or the employee of a subcontractor or sub-consultant, pursuant to these requirements.
- When a contract breach regarding TIP has occurred, the MCC is required to notify MCC within 24 hours of becoming aware of the incident

In additional to these requirements, it is recommended to implementing the following measures.

- Despite the potential low risk of transporting children or other trafficked or exploited persons, strict guidelines about the use of cars and worker behavior should be communicated before commencing work.
- Employers should provide assurances, specifically policies and procedures, indicating that child labor will not be used on the project.

8.10.5 Community Health and Safety Plan

8.10.5.1 Purpose

This Community Health and Safety Plan seeks to anticipate and avoid potentially adverse impacts on the health and safety of directly and indirectly affected communities in the project area during the project lifecycle. It additionally provides safeguards to protect construction staff and ensures that relevant human rights protocols are incorporated into project implementation. The purpose of this plan is to promote the health, safety, and security of the public by identifying and avoiding or minimizing related risks and impacts that may arise from project related-activities.

The community health area of influence is defined as the villages and settlements near the pipeline and those further from the pipeline and associated with river access. Unlike other infrastructure development projects that transect urban areas and create significant interruption to daily activities, this pipeline is limited to 4 km and occurs in largely rural

areas. Also, construction will be completed by small work crews comprised of local community members, hence reducing the incidence of introduction of disease by foreign labor and related issues when large migrant labor populations enter local communities. The plan considers the nature of the work to derive mitigation measures commensurate with its potential impact.

8.10.5.2 Preliminary Plan of Action

This plan addresses safety measures to be incorporated during construction and operations. It includes waterborne disease incidence, increased exposure to STIs and HIV/AIDS, and other diseases and issues.

Before initiating construction and operations, as part of team chartering, a thorough review of health and safety measures that includes training should be provided. At least a half day training session should be dedicated to required policies, repercussions for violations, and field implementation strategies. This should include role plays. Each participant should sign a document that indicates that they understand the requirements and agree to comply with them as a condition of employment.

As there are no medical facilities in the project area, a comprehensive first aid kit will be required to be onsite during all phases of construction. Maintenance teams will also be required have one with them while carrying out maintenance activities. There should be a designated site safety team that includes a site safety supervisor, an employee who is conducting field work and a local community member. This team will meet monthly during construction to review H&S issues and address outstanding issues that arise that are not addressed by this plan. The plan will be updated based on those meetings.

The site safety supervisor is responsible for implementing all tasks described in Table 8-5.

Table 8-5: Community Health and Safety Plan of Action

Impact	Project Phase		Action	Key Implementer	Time Frame	Expected Output
	Construction	Operations				
Waterborne disease incidence, such as malaria and schistosomiasis, from insects breeding in standing water in excavated pits	X		Ensure that open trenches or excavated areas are covered so as to eliminate the potential for insect breeding Remove any standing water accumulating in work areas and treat appropriately with pesticides Check excavated areas to ensure that they are covered after construction is completed	Contractor	Complete during all phases of construction Conduct post-construction completion follow-up to ensure proper coverage of all previously excavated areas	Reduce incidence of increases in vector borne diseases
Increase in communicable diseases such as an increase in exposure to HIV/AIDS	X	X	Develop public health education and HIV and AIDS education for all employees.	Contractor OHS Supervisor Oversight by MCA-L	Provide initial training; address this during Site Safety Team meeting to see if further action during implementation required	No noticeable increase in incidence
Injury to workers during construction, such as while conducting site – ROW and access road - clearing, trench digging, transporting equipment/materials, mobilization, installing the pipeline and concrete piers, conducting heavy machinery operations.	X	X	Train field crews in safe working techniques, provide PPE and maintain a first aid kit onsite Prepare a H&S plan and ensure that H&S policies are in place, understood, and implemented by maintenance staff	Contractor	Train staff prior to construction start Provide PPE including safety boots during construction and maintenance Provide OHS inspector to monitor implementation of safe work practices during construction Ensure adherence to H&S policies during maintenance; conduct performance assessment at least biannually	Reduce incident of injuries
Injury to local residents during construction (from equipment transport, falls into open trenches, hauling materials through communities, potential vehicle/pedestrian accidents, etc.)	X		Develop a maintenance of traffic plan Conduct outreach to inform residents on construction activities and safety measures; provide timelines; monitor for H&S impacts Provide proper signage around construction area to deter trespassing and prevent the potential dangers of falling into trenches. Secure materials in a laydown area	Contractor	Conduct outreach to local residents prior to construction Monitor H&S impacts monthly during construction; revise and conduct outreach as necessary	Reduce the potential risks to public safety during construction and maintenance activities.

8.10.6 Hazardous Material and Waste Management Plan

8.10.6.1 Objectives and Target

The WMP is intended to achieve the following objectives:

- Ensure compliance with applicable regulations, laws and provisions of Project contracts by:
    - Providing proper training to Project personnel and contractors
    - Monitoring contractor's performance
    - Auditing contractors
- Minimize waste generation during construction and operation activities by:
    - Following MCA-L ESMS and policies
    - Emphasizing the waste minimization hierarchy
- Minimize impacts to the environment from waste production by:
    - Ensuring appropriate treatment of waste to reduce toxicity and/or volume
    - Ensuring responsible disposal at authorized facilities

To achieve these objectives, the WMP provides the following :

- Provide legal framework of the applicable waste management legislation in Liberia and international conventions
- Identify and catalog the types of wastes expected to be generated Project activities
- Review available infrastructure and services available in Liberia for waste disposal
- Identify waste management options and associated infrastructure, considering the constraints imposed by the location and facilities availability

8.10.6.2 Legislative Framework

This section presents a review of the Liberian legislation governing waste management. Where activities are not yet covered by Liberian regulations, the relevant international or MCA-L standards and directives have been used as guidance references.

National Legislation on Waste Management

Waste management is regulated by Part IV (Environmental Quality Standards) of the 2002 EPML. Specific sections related to waste management applicable to this project Include:

- Section 37 - Standards, Classification and Identification of Hazardous Waste and Materials
- Section 38 - Classification of Hazardous Waste
- Section 39 - Solid Waste Management Standards
- Section 40 - Solid Waste Quality Standards
- Section 55 - Importation and Exportation of Hazardous Waste Prohibited
- Section 62 - Prohibition of Solid Waste Pollution
- Section 64 - Application for Solid and Hazardous Waste Disposal License
- Section 68 - Register of Waste License and other Pollution License

The EPA Act provides the EPA authority to set up (develop and publish) national guidelines for solid waste management in Liberia, environmental quality standards (and related penalties and fines), and ensure compliance for pollution control. It has been acknowledged

from EPA that the following regulations will be developed by 2018 to implement and enforce Liberia's own complete set of national standards and guidelines, including as follows:

- Guidelines for the Identification, Handling, Storage, Transportation, Segregation and Destruction of hazardous wastes
- Solid wastes management standard/ Guideline
- Regulations on the management of Pesticide, toxic and hazardous chemicals

The Ministry of Health and Social Welfare has, through its DEOH, the mandate to assess "the environmental health of the population". This grants this Division the power to conduct sanitary inspections evaluate compliance with the Public Health Law.

The MPW together with the MLME are in principle responsible for the installation of the entire infrastructure required for waste management delivery services, including waste collection and transfer stations, and the construction of engineered landfill sites.

The Municipalities have been granted, by the Public Health Law of 1975 (still valid), the responsibility of ensuring clean and sanitary environmental conditions on the territory under their respective jurisdictions. They are thus responsible for sanitation activities including the cleaning, collection and disposal of generated solid waste.

In case of a Project requiring disposing waste during construction or operation, it has been acknowledged that the Project Proponent should select and make an agreement with a solid waste collector as provided by the EPA within the existing licensed provider list to identify disposal sites and schedule.

International Standards

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

According to the Basel Convention, transboundary movements would generally be approved in the following cases:

- The state of export does not have the capability of managing or disposing of the waste in an environmentally sound manner, such as may be the case for Liberia.
- The receiving state has appropriate, environmentally sound facilities, and agrees to accept the waste.

Because of Liberia's accession to the Basel Convention on September 2004, the GoL must comply with all requirements of the Convention. Certain wastes generated in Liberia and exported to another country will therefore be subject to provisions of the Convention. A new national Guidelines for the Identification, Handling, Storage, Transportation, Segregation and Destruction of Hazardous Wastes is currently under development and is expected to be issued by 2018.

Bamako Convention - Convention on the Ban of the Import into Africa and the Control of Transboundary Movement of Hazardous Wastes within Africa

The Bamako Convention is a treaty of African nations prohibiting the import into Africa of any hazardous (including radioactive) waste. The Bamako Convention is a response to Article 11 of the Basel Convention, which encourages parties to enter into bilateral, multilateral and regional agreements on hazardous waste to help achieve the objectives of the convention. The impetus for the Bamako Convention arose also from the following:

- The failure of the Basel Convention to prohibit trade of hazardous waste to less developed countries
- The realization that many developed nations were exporting toxic wastes to Africa

The Convention covers more wastes than the Basel Convention, as it not only includes radioactive wastes but also considers any waste with a listed hazardous characteristic or a listed constituent as a hazardous waste. The Convention also covers national definitions of hazardous waste. Finally, products that are banned, severely restricted or have been the subject of prohibitions are also covered under the Convention as wastes.

EHS IFC Guideline

Guideline on Waste Management Facilities (2007) covers facilities or projects dedicated to the management of municipal solid waste and industrial waste, including waste collection and transport; waste receipt, unloading, processing, and storage; landfill disposal; physic-chemical and biological treatment; and incinerations. They consider hazardous and non-hazardous waste management, including different types of waste treatment. An environmental monitoring of all waste treatment activities that have potentially significant impacts on the environment is recommended (IFC, 2007).

MCA-L E&S Management System

MCA-L requires its contractors and subcontractors to identify activities with the potential to cause E&S impacts, and implement appropriate controls, including waste management. Individual procedures are developed for the management of specific E&S aspects and impacts. These are aligned with general considerations outlined in the World Bank General EHS Guidelines.

8.10.6.3 Roles and Responsibilities

Contractors will be responsible during construction for cradle to grave management of all waste generated through their activities and will provide all necessary planning, materials, equipment, tools and training required to mitigate the potential environmental impacts caused by waste handling, collection, storage and disposal.

The Project OE will serve in a supervisory role and be responsible for ensuring that the Contractor maintains compliance with applicable measures as contained in the WMP and that any necessary corrective measures are appropriate and effectively implemented. The OE will have the authority to issue a stop works order if violations or other Project risks warrant such action. As the Project Accountable Entity and "Owner", the MCA will also have responsibility for providing technical guidance and oversight of the Project E&S performance, and for maintaining close collaboration with the LWSC in the overall oversight of Project design and implementation.

MCA-L E&S Performance Manager will have the following responsibilities for construction activities:

- Ensuring that Project waste is managed in a manner consistent with Liberian regulations, IFC performance standards and the framework of this WMP
- Preparation of contracts that include requirements to manage Project waste in accordance with this WMP
- Monitoring waste management performance of Project contractors
- Specific responsibilities for Contractors Health, Safety and Environment (HSE) coordinator having a role in waste management are described below:

- Contractor HSE Coordinator has a duty of care to ensure that only appropriate permitted/licensed waste contractors as agreed with EPA during permitting process are selected and to monitor their activities to ensure correct handling, treatment and disposal of waste.
- Where applicable, the Contractor HSE Coordinator shall ensure that this WMP is reviewed and updated reflecting any changes that will occur during the project execution, that may have a significant environmental impact, to properly manage them.
- Contractor HSE Coordinator, together with the selected waste contractors, should prepare a Waste Transportation Plan that assures an efficient transport of wastes from the site location to waste transfer station than final disposal facility.

Waste Management Contractors of the waste handling, storage, collection, transport, treatment and disposal service should respect requirements set up in the contract. Waste management should include the segregation of wastes according to types of wastes and review the integrity and accuracy of waste records. Waste management contractors should also fill out waste documentation as needed (e.g. transfer notes) and return a copy to Contractors as evidence of receipt of Project wastes. Access to audit waste management facilities and operations should be allowed to MCA-L.

Whole Project Teams involved in the Project field execution (management, supervisory, and field execution/commissioning staff) are collectively responsible for executing their work in a manner that prevents harm to the environment and community.

8.10.6.4 Waste Minimization

In all stages of the project life cycle a hierarchy of waste management practices must be applied, starting from waste prevention. Prevention refers to the avoidance or removal of waste by modification of design and operating practices.

In order of preference, the aim will be to perform the following:

- Reduce the amount of waste generated
- Re-use materials, where appropriate
- Recycle wastes, where appropriate
- Recover as many materials as practical from the remaining waste
- Treat wastes as necessary to render them less hazardous and/or to enable them to be reused or recycled
- Dispose of residual wastes responsibly at authorized facilities

The application of the above principles will be addressed during the procurement of goods and services for the Project and will be taken into consideration when reviewing waste storage and disposal methods throughout the Project's life.

Prevent/ Reduce

Source reduction can be mainly achieved through:

- Process or procedure modifications
- Improvements in housekeeping, maintenance, training or inventory control

The Contractor must evaluate elimination or decrease options, to the extent practical, of the volume of wastes generated at the Project site. Source reduction is often the most cost-effective way to manage waste. Source reduction opportunities should initially be reviewed at the design phase.

Reuse

After all waste reduction options have been evaluated, the Contractor should adopt the next strategy, consisting of waste reuse. The re-use of materials in their original form as much as possible shall be maximized.

Examples of reuse are the following:

- Supply of equipment in reusable containers. For example, the use of plastic boxes rather than cardboard can be considered. It is essential to identify a re-use option and to implement it; otherwise it may be better to use recyclable materials.
- Chemical / pesticides containers. Some containers can be reused only once to provide container integrity while others can be reused multiple times using an approved chemical vendor to refill chemical 'x' into the same used chemical 'x' container with the correct choice of container material and stock return procedures. Quality control checks should avoid cross contamination and integrity issues.
- Refurbishment of equipment.

The Contractor should evaluate which options for reuse are applicable and document them to MCA-L.

Recycling

After all waste reduction and reuse options have been considered, the next strategy is to evaluate recycling and recovery of the waste material either in-process, on-site, or with outside contractors.

All used oils, lubricants will be recycled whenever possible. No recycling companies of waste such as paper, aluminum containers and glass bottles are known in Liberia.

Responsible disposal

The last step in the waste management hierarchy is responsible disposal. Responsible disposal methods must be evaluated with MCA-L and EPA. This includes selection of EPA registered waste contractors for waste collection and transport to the identified waste facilities.

8.10.6.5 Waste Identification and Classification

Expected waste streams have been identified based on the following activities:

- Construction activities
- Maintenance activities
- Presence of workforce in field

Waste classification

Activities that generate waste should characterize their waste according to composition, source, types of wastes produced, generation rates, or according to local regulatory requirements.

According to 2002 EPML, waste is defined as any substance that may be prescribed as waste or any matter, whether liquid, solid, gaseous, or radioactive, which is discharged, emitted or deposited in the environment. Hazardous wastes are classified as waste that is poisonous, corrosive, noxious, explosive, inflammable, radioactive, toxic or harmful to the environment.

The EPML sets provisions for the establishment of criteria by EPA for the classification of hazardous wastes to determine:

- Corrosive waste
- Carcinogenic waste
- Flammable waste
- POP
- Toxic waste
- Explosive waste
- Radioactive waste
- Wastes, reactive otherwise than as described in the forgoing

In addition, the Law requires the EPA to issue guidelines for the handling, storage, transportation, segregation, disposal and treatment of hazardous waste and Solid Waste Management Standards.

No national regulations regarding classification or specific management procedures have been issued so far. Liberian EPA is going to implement specific regulations by 2018 to enforce Liberia's own complete set of national standards and guidelines.

Proper wastes classification should be made by the Works Contractor in accordance with MCA-L and EPA and the licensed EPA waste management contractor identified for the final management disposal.

Waste streams generated from Construction Activities

Because of the nature of the site and the works to be undertaken, general construction wastes are predicted to be minor.

The material storage area and construction site will be sources of scrap materials and packaging, domestic waste (including liquid wastes from mobile toilets), cleared solid waste debris, backfill, earthwork and other general construction wastes. The following wastes are likely to be generated because of construction activities for the project, minimal in quantities:

- Clearance of site vegetation and removal of soils, inert construction materials and residues
- Waste construction materials and pipework
- Excavation wastes, minimal excess excavated material
- Domestic wastes

The material excavated along the roadway and hillslopes could be used for backfilling or access roads base, as this mostly consists of weathered rock. For the clay soil encountered along the riverbank section, this will likely be used for some backfill but also would be a good candidate soil for mounding if required. Except for some highly plastic clay that may be present in some sections of the riverbank and near the WTP, most of the soil is likely to be used in some degree. In case of need, excess excavated material will be removed and disposed of in line with local regulations and agreement with Waste contractors as identified with EPA. Soil and waste rock will be temporarily stockpiled within construction corridor before disposal or backfilled.

Solid wastes like trees, tree stumps and vegetation will be gathered together and generally made available to the local communities close to the site of clearance as fuel wood.

Metal and plastic wastes, domestic rubbish like plastic bottles, aluminum cans, tin food cans, glasses, food waste; waste oil from the servicing of vehicles and miscellaneous solid wastes, including spent welding rods, packaging waste, used drums, wood, any tires or car batteries, scrap metal, oil filters, contaminated PPE, accidentally contaminated soils could be generated, even if in minimal quantities. Liquid waste-like sewage could be generated if mobile toilets will be provided.

Also included in the solid waste are the polyethylene bags and paper that will serve as carrier bags and waste packaging materials for workers, as well as empty water sachets.

Hazardous wastes may potentially be generated in case of the need for disposal of any non-significant residual arises such as empty lubricants and residual oils canisters, contaminated soils or PPE.

Waste Streams Generated during Commissioning/Operation

During the operation of the pipeline, little waste will be generated compared to already minimal quantities expected during construction. Waste oil from the servicing of vehicles and miscellaneous solid wastes, including spent welding rods, packaging waste, used drums, wood, scrap metal, domestic rubbish could be generated.

Hazardous wastes may potentially be generated in case of the need for disposal of any non-significant residual arises such as empty lubricants and residual oils canisters, contaminated soils or PPE.

8.10.6.6 Waste Collection, Storage and Handling

Contractors must collect, recycle and dispose of these wastes at designated facilities and in compliance with EPA policies. An agreement will be drafted with a solid waste collector by the EPA to identify disposal sites and schedule.

All generated waste will be collected inside the construction ROW and stored temporarily until they can be suitable managed (reuse, recycle, treat, dispose) and disposed of through the EPS licensed contractor.

According to EPA, waste licensed providers generally have their own facility where waste is stored before final disposition, called a transfer station.

Both Contractor and OE should assure that a temporary waste storage area for segregation and storage is present onsite. The temporary waste storage area should be fenced and located at the construction ROW boundaries. Proper labeling indicating that unauthorized personnel are not permitted within the area should be present and the area should be protected from direct contact with the soil and shielded from bad weather conditions (e.g. wind, sandstorm).

General refuse generated during the construction phase will be stored in enclosed bins or compaction units separate from construction and any chemical (oil, lubricants) wastes. General refuse is generated largely by food service activities on site, so reusable rather than disposable dishware will be promoted if feasible. Aluminum cans and plastic bottles will be recovered from the waste stream by individual collectors if they are segregated and made easily accessible, so separate, labeled bins for their storage should be provided if feasible.

The burning of refuse on the construction site will be strictly prohibited and penalized. Adoption of a re-use/recycle program on site will minimize the quantities of wastes.

In case of liquid waste, containers should be provided with secondary containment.

For any hazardous wastes, the following should be applied:

- Clearly label all chemical waste in English and Liberian, storing it in corrosion resistant containers and arranging so that incompatible materials are adequately separated
- Secure a prior agreement with the EPA for the disposal of hazardous waste generated onsite
- Draft an agreement with the solid waste collector in the county where the Project is being implemented to identify collection sites and schedule
- Handling shall be carried out using proper PPE

Table 8-6: Waste Storage Skip and Bins

Waste Type	Storage Type	Color of Bin, Skip or Bag
Recyclable domestic waste	Bins with lids, metal or plastic, lined with plastic bags. Then metal skip.	Color TBD, one for each material Glass Paper Plastic
Non-hazardous waste	Metal skip	Color TBD
All metallic wastes (including scrap metal)	Metal skip	Color TBD
Hazardous wastes	Metal skip	Color TBD
Used oils and lubricants	Dedicated drums on secondary containment basins	Color TBD

For environmental reasons, absorbent spill response kits for both oils and chemicals and fire extinguishers should be placed in near the liquid waste drums and skips. Again, for safety reasons adequate and sufficient protective tools shall be provided nearby.

8.10.6.7 Waste Disposal – Available Infrastructures and Services

In Liberia, land filling practices are uncontrolled, and there are no proper facilities for disposing of wastes. Burning household waste in backyards is a common practice, together with informal waste dumps in the streets and drainage channels of most towns. The industrial waste management is still not developed technically and organizationally. Existing structures struggle indeed to eliminate their hazardous waste and leftovers of hazardous products. This promotes practices such as: the open burning, the mixture of different categories of waste, the unauthorized discharge and other forms of inappropriate storage.

According to the Act Adopting the EPML of 2002, no person shall export from Liberia to any county hazardous waste or substances unless he has a license issued by the Agency; no person shall transport within Liberia hazardous waste or substances except under a license issued by the Agency subject to such conditions as the agency may impose. Any development in the country should dispose of wastes using an EPA approved licensed and registered contractors in Liberia.

The country is a signatory to the Basel Convention on the Control of Trans-Boundary-Movements of Hazardous Wastes and their Disposal (1989), Convention on POPS, and Bamako Convention on the Ban of the Import into Africa and Control of Transboundary

Movement and Management of Hazardous Wastes within Africa (2003). The resolutions of these international conventions provide the technical guidelines for the appropriate management of waste. However, the UNEP reveals that the technical guidelines of these international conventions on the management of waste have so far not been implemented.

The Whein Town landfill site, accepting solid non-hazardous wastes, was reported to be fully filled with no more availability as of the end of 2016. The Monrovia City Corporation was planning to construct a New Landfill in the Township of Cheesemanburg by 2018 for solid non-hazardous wastes but the status of this facility was unknown at the time the EIA was prepared.

Based on the consideration above, the following should be considered:

- Best waste-disposal methods will be decided on a case-by-case basis with EPA, once the final design and complete waste inventory will be available, during the construction and environmental permit approval process.
- The material excavated along the roadway and hillslopes will be mostly used for backfilling or access roads base.
- Solid wastes like trees, tree stumps and vegetation will be gathered together and generally made available to the local communities close to the site of clearance as fuel wood.
- General domestic refuse will be stored in enclosed bins and collected by a solid waste collector certified by the EPA, with recycling wastes such as aluminum cans and plastic bottles segregated where possible. Agreement within MCA-L and EPA should be made to ensure the disposal option follows MCA-L environmental principles.
- The lack of capacity in the Whein Town landfill for final solid non-hazardous waste disposal represents a potential risk for the project. It is recommended that most construction waste be sorted onsite, transferred by the Contractor to their transfer station then hauled to the final storage or disposal site agreed upon with EPA through the EPA-licensed contractor during the construction approval process. Given the expected minimal quantities of construction wastes to be produced, no construction of a permanent local waste disposal facilities is considered.
- If any non-significant hazardous wastes / any non-significant residual of used oils and lubricants will have to be disposed, given the lack of the proper facilities in country, in absence of any other proper disposal methods, the possibility for the contractor to have to transfer this waste to a facility across the border should be discussed and agreed within MCA-L and EPA for the proper management of the hazardous wastes and residual material.
- Liquid waste like sewage could be generated if mobile toilets will be provided. Chemical toilets shall be transported to the approved emptying point for careful disposal under proper supervision. Disposal holes must be dug, and the waste from the chemical toilets emptied into them. The holes must be situated at least 100 m from any dwelling and at least 100 m from a water course, spring or well. Wherever possible, they should be on a permeable but not sandy soil. Holes shall be two meters deep when first excavated. Each time a toilet is emptied into the hole, the waste shall be covered with 100 mm of soil. When the hole has only 0.5 m of depth remaining, it shall be filled and a new hole started.

In general, the contractors will need to assure the compliance of waste management related to their activities during the Project period to the WMP. As regards offsite disposal solutions, the contractor should perform the following:

- Identify, discuss and share with MCA-L strategies and options for waste management during operations and potential sub-contractors
- Track waste generation processes and report quantities for any pattern of wastes as of MCA-L formats
- Ensure proper supervision of subcontractor activities, collect evidences and verify the final disposal of labeled wastes

8.10.6.8 Waste Transportation

Once the disposal solutions have been selected, shipment of waste from the production and/or temporary storage sites to the disposal sites will have to be organized in accordance with applicable legal requirements.

Routes shall be selected based on logistics, safety and economic aspects. The contractor, together with the selected waste contractor, should prepare a waste transportation plan that assures an efficient transport of wastes from the remote location of the Project site to waste facilities.

Transportation equipment shall be adequate to the quantity of substance to handle.

From the construction site and the temporary storage area within the 21-36-m corridor, the EPA waste licensed providers will have the responsibility to transfer those wastes to their own temporary storage facilities (if any) prior to final disposal.

Management of wastes from transfer station to final disposal site is under Government responsibility, specifically Monrovia City Corporation.

8.10.6.9 Training

The Contractor HSE Manager will be responsible for carrying out waste management training and environmental incident training programs for all relevant site based personnel (including contractors) involved in the waste management. They will also be responsible for the retention of environmental training materials and records on site.

A general awareness training on waste management will be provided to all personnel on main aspects summarized in this Plan such as the following:

- The waste management policies
- The waste management procedures
- The waste management hierarchy
- The waste classification
- Waste handling procedures at the temporary storage area (segregation, storage, labeling, loading/unloading, transportation)
- Waste monitoring, recording and tracking procedures

Suitable notices on waste management matters will be available for construction workers to provide a continuous reminder and improve individual awareness on waste management procedures during the whole project. Periodical retraining, if required, will be provided for all relevant personnel.

8.10.6.10 Monitoring and Audit

Following the initiation of construction activities, construction spoils and construction-related materials will be monitored on a weekly basis during the entire construction phase.

Furthermore, site audits on the general refuse streams will be conducted to examine existing waste management and handling procedures that include storage, segregation, recycling, transport, as well as disposal. The objectives of the audit are to ensure that the generated wastes are accounted for and to ascertain that they are handled in an environmentally sound manner that complies with proposed mitigation measures. Quantities, photographic documentation, and interviews are essential elements of the audits. It is also necessary to implement waste consignment notes indicating source/dates/quantities of generation along with periodic analysis of constituents. Monitoring will also include the following:

- Disposal route
- Visual inspection of waste storage, collection and disposal areas
- Records to be maintained for inspection

8.10.6.11 Hazardous Materials

According to 2002 EPML, "Hazardous substance" means a chemical, waste, gas, liquid, odor, heat pharmaceutical, plant, animal which, because of their concentration or physical, chemical or biological characteristics is harmful to human health and the environment and includes narcotics and drugs and substances that are toxic, corrosive, irritating radioactive, biologically infectious, explosive or flammable.

Hazardous materials pose a severe risk to surface and ground water sources when released into the environment. Fuels, oils and lubricant used for operation and maintenance of vehicles and machinery, insulating oils will likely be transported, stored and used during the construction and operation phases of the Project.

These activities will pose a certain risk of accidental discharge of hazardous materials to the environment. Sites prone to such events will be the material storage areas established at the LEC-MCHP PIU Construction Camp or at the WTP or within the construction ROW, as well as the construction and maintenance areas.

The potential for hazardous material spills which may impact environmental resources are greater during the construction phase. The following measures will be implemented to reduce impacts resulting from hazardous material transportation, storage and use during construction and operation of the Project.

Storage

- Hazardous material properties should be labeled with the appropriate internationally recognized diamond shaped hazard symbol. Clear guidance on the compatibility of different chemicals to be stored can be obtained from the related Safety Data Sheet (SDS) which should be readily available from the manufacturer and on site.
- Contractor must keep an accurate inventory of all hazardous materials stored on site
- The responsibility for hazard classification and related provisions such as packaging, hazard communication and SDS on the suppliers of substances and mixtures.
- Always make sure that hazardous material containers are correctly labeled.
- All materials that are potentially hazardous to the environment must be stored or disposed of in accordance with this standard. Hazardous materials could include substances such as fuels, lubricants, coating or other chemicals, in solid or liquid form.
- Hazardous materials shall be stored at least 30 m from a water course, spring, swamp, drain or well, and at least 30 m from a dwelling. Storage areas shall have barriers and

secondary containment. They shall be protected from rainfall and secured against intrusion by people other than the Contractor's personnel.

- Mobile bowsers should be used and must be located to avoid the risk of spillages entering a watercourse or groundwater. Bowsers should be secured to prevent unauthorized access and stored within a security compound when not in use.
- Enclosures used for the storage of significant quantities of hazardous materials must be indicated by a suitable warning sign unless the labeling of the individual packages or containers is adequate for this purpose.
- When storing hazardous materials, ensure they are stored properly according to the manufacturers' instructions and the precautionary statements reported in the hazardous material label, providing advice on safe storage and disposal as further detailed in the related SDS.

Handling

- The Contractor shall take full responsibility for the use and effects of any hazardous materials that are required for construction and operations that are part of the Project. The Contractor is further responsible for complying with the MCA-L policies and procedures and will ensure that all aspects of the Spill Contingency Plan are followed in the event of a spill.
- Fuel tanks will be bunded: i.e. there must be secondary containment for the full capacity of the tank in the event of a leak from the tank. A trained attendant will always be in control of fueling nozzles during refueling operations. Designated fueling areas will be bunded (diked) and lined to capture any unexpected releases of fuel. Oil and lubricant dispensing drums will have spill containment trays and liners, or both, to catch and contain material. Refer also to the specific standards for the bunding of tanks and dispensing of fuel.
- SDSs for hazardous materials being handled should be readily accessible to employees in their local language. The SDS indicates the classification and intrinsic hazardous properties of each substance. This allows all hazmat users quick and easy access to important information about the hazard profile of the substance they use and safe handling.
- Using portable oil collection pans during refueling operations.

Disposal

- All used oils and lubricants will be recycled whenever possible. Where excess quantities of a hazardous material need to be disposed of, then the contractor shall prepare a disposal plan and seek the approval of MCA-L before implementing it. Spent or residual hazardous materials will be disposed of at EPA-approved locations in accordance with MCA-L, in compliance with applicable international standards as reported in the WMP.

Prevention and Spill Response

- MCA-L will require its Contractor to prepare and implement a Spill Contingency Plan that identifies the procedures to prevent, contain, cleanup, and report spills and releases of oil and any hazardous materials.
- Every effort will be made to prevent spills and leaks of any kind. All hazardous materials will be stored in appropriate ways, in line with international safety practices. All operators and supervisors will be trained in appropriate inspection procedures and checks. All problems detected during monitoring and inspection must be passed on to the relevant superior officer. Appropriate repairs will be made immediately.

- Fuel contamination of water: Where there is a significant risk of water becoming contaminated with any form of fuel, then appropriate containment equipment (e.g., floating bunds or barriers, absorbent pads, etc.) will be kept in readiness at fuel dispensing areas to assist in cleaning up any spills that may occur. Large spills will be contained by constructing a berm around the spill area to control runoff to surface water or deploying a spill boom if the spill is in a waterbody.
- Cleaning up spills: In the event of a spill or release of any material, the spill will be stopped and the incident reported to the nearest representative of MCA-L. The substance will then be cleaned up immediately, disposed of in an approved manner and the contaminated environment cleaned to the satisfaction of the Company. All soil contaminated by the spills will be excavated and disposed of as hazardous wastes.
- Inspect equipment and containers for spills and leaks, corrosion, or other signs of deterioration.
- Maintain spill response equipment near material storage areas and on heavy equipment.
- Ensure all workers dealing with such substances are adequately informed about the risks.
- Train employees on material storage, transfer, and transportation procedures, spill response procedures, and reporting requirements.

8.10.7 Biodiversity Action Plan

The project area is being used for a variety of human-related activities such as fuelwood harvesting and agricultural. The lack of larger diameter trees also indicates timber harvesting has occurred in the past and non-developed habitat is now in early successional stages indicated by a semi-open over-story canopy, the high density herbaceous canopy, and high density of small diameter woody species. Larger woody diameter trees (greater than 15 to 20 cm) are typically trees with a human-related value such as rubber trees. The habitat would be classified as Modified Habitats by the IFC with little natural biodiversity intact. The IFC defines Modified Habitat as “areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area’s primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands” (IFC Performance Standard 6). IFC Performance Standard 6 requires that this Performance Standard only be applied to Modified Habitats with significant biodiversity value.

One species of fish, Labeo curriei (rockfish), in the St. Paul River has been designated as Critically Endangered. An aquatic species survey conducted by the Liberian Bureau of National Fisheries observed this species at the northern end of the proposed pipeline route. It would be expected to occur in reaches adjacent to the remainder of the proposed pipeline.

Given the existing environmental baseline conditions around the proposed pipeline corridor and the relatively low likelihood and significance of Project-induced impacts on biodiversity, a Biodiversity Action Plan is not necessary to be prepared.

However, Construction Best Management Practices in compliance with the ESMP will be implemented to avoid potential impacts to the river ecosystem.

8.10.7.1 Ecosystem Restoration Plan

This ecosystem restoration plan focuses on restoring the areas affected by construction and operation that will not be used for ongoing maintenance activities. As discussed in the Biodiversity Plan, the project area is classified as Modified Habitats by the IFC with little natural biodiversity intact. Therefore, the objective of the plan is to add diversity into the project area by re-establishing a variety of native plants.

Much of the area to be permanently or temporarily disturbed is secondary forest with some invasive species present. Implementation of the restoration plan will re-vegetate the disturbed areas with native species. Deep-rooted plants would affect the buried pipeline, so areas above the pipeline will be re-vegetated with herbaceous species or shrubs with shallow rooting depths. The remaining area, such as material laydown areas, equipment storage areas, temporary construction RoWs, and temporary access roads will be planted with trees, shrubs, vines, and herbaceous plants native to the region. Areas within the riparian forest habitat will utilize native riparian species. Because much of the project area is interspersed with agricultural plantations and fields, trees having medicinal or food values should be considered in the planting mix.

During construction, the top 12 to 16 inches of soil will be removed from the trench and stockpiled separately from the lower soil horizons. The reserved topsoil will be spread evenly over the buried pipeline as the last fill layer to a depth similar to that from which it was removed. The topsoil layer will then be graded to pre-construction contours to the extent practicable and then lightly compacted before planting or seeding.

The restoration areas will be planted immediately after compacting to minimize the potential for erosion. Erosion control measures will be implemented as needed, particularly in sloping areas, to prevent erosion and sediment-laden runoff leaving the site until the vegetation becomes established.

In addition to restoring habitat values, habitat connectivity will be restored where possible. This can be accomplished by connecting adjacent habitat on both sides of a temporary access road or other disturbed area using vegetation. This will provide hiding cover for wildlife moving through the area. Where the pipeline is above ground, it should be raised high enough for small wildlife to pass under it. Larger wildlife are able to move along the raised pipeline until they encounter a buried section to cross.

The restored areas should be monitored for the first year after planting to ensure plant survival and control non-native invasive plants that colonize the area. Plants should be replaced where mortality has left open areas. If ornamental plantings are to be established around maintenance areas, consideration should be given to using native species. The operation and maintenance facilities, such as the permanent access road, should be monitored each year to remove non-native invasive plants colonizing the berms or roadway.

8.11 Miscellaneous Referenced Plans and Outstanding Issues

In addition to the various plans described in the previous sections 8.1 through 8.11, the following plans are cited in this ESIA and shall be drafted and provided as either part of another cited Management Plan (such as the CESMP) or as stand-alone documents. These will be short, operational documents to guide the work in the field and manage risks during the construction phase. The table below shows the current status of these and when they must be available over the project schedule. These plans should not require additional EPA review as they merely place the requirements in a construction

and performance management context, operationalizing mitigation and monitoring requirements already in the ESMP, and for that reason, will consist largely of standardized language, modified to be consistent with the ESIA, RAP and design documents.

Table 8-7 Additional Management Plans, Codes, and Procedure Statements

Cited Plan	Current Status (August 2019)	When required
Code of Conduct	Drafted	Before start of construction
Labor Force Management Plan	Required	Before start of construction
Traffic Management Plan	Drafted, but requires additional site-specific details	Before start of construction
Waste and Hazardous Materials Management Plan	Drafted, but requires additional site-specific details	Before start of construction
Waste Management Plan	Drafted, but requires additional site-specific details	Before start of construction
Equipment Maintenance Plan	Required	Before start of construction
Occupational Health and Safety Plan	Required	Before start of construction
Emergency Preparedness and Response Plan	Required	Before start of construction
Spill Prevention and Response Plan	Required	Before start of construction
Erosion Protection Management Plan	Drafted, but requires additional site-specific details	Before start of construction
Stakeholder Engagement Plan	Incorporated in RAP and will be detailed in RAP implementation plan	Before start of RAP implementation
Chance Find Procedures	Required	Before start of construction
Grievance Redress Mechanisms (Worker and Community)	Required	Before start of RAP implementation
Ecosystem Restoration Plan	Required	Before start of construction

There are also several outstanding issues that require additional design calculations and/or data to refine the specific actions, and subsequent incorporation into applicable management plans or developed as stand-alone method statements when the design team has a clearer understanding as to how the works will be implemented. None of these issues materially affect the conclusions of this ESIA, but may affect details of how construction proceeds or may result in minor design adjustments. Table 8-8 lists these issues with notation on the expected impact on the project and management plans.

Table 8-8 Outstanding Technical Issues

Issue	Notes	Requirement (all required before start of construction)
Scour valve operation	The ESIA does not describe potential impacts resulting from scour valve effluent or how these will be mitigated. IMPACT TYPE: operational, intermittent, fully mitigated	The affected Management Plan shall include: 1) how often the valves will be operated, 2) what flow rates/durations are expected, 3) type of potential impacts (i.e. erosion and sedimentation, biological effects on tributary ecosystems), and 4) a method statement for management of impacts
Bridge clearance	It is not clear from the designs that the bridge just north of the treatment plant will not 1) impair under-bridge	The final designs shall include appropriate calculations and, if

	access during high flows and/or 2) create a backwater and flooding during high flow conditions. NOTE: Supervisory Engineer has requested that designer evaluate the free-board of the bridge taking into consideration both issues listed above. IMPACT TYPE: operational, intermittent, fully mitigated	required, adjustment of the bridge design to avoid adverse impacts.
Reforestation	The ESIA has highlighted the challenges associated with unregulated logging and deforestation for charcoal production that is leading to a rapid loss of tree cover and biodiversity. The report has recommended that a sensitization campaign on environmental conservation be done to the communities along the project route. There are no specifics yet for reforestation requirements, since the details are dependent on 1) actual clearing areas and 2) agreements with landholders IMPACT TYPE: construction, fully mitigated	The fundamental requirement is NO NET LOSS OF TREES. The procedure for documenting lost trees during clearing and agreements reached with landowners shall be outlined in the appropriate management plans and the monitoring and compliance plans shall document compliance with NO NET LOSS including procedures for ensuring tree survival including Owner commitments post-construction and handover. Planting shall be conducted just before the rainy season. The project itself is too short to set-up a nursery. As applicable, reforestation shall be coordinated with the RAP implementation plan. The budget (to be determined) is included in the RAP implementation and is currently estimated at USD 13,000.

8.12 Sub Management Plans During Operation

8.12.1 Owner's Labor Force Management Plan (OLFMP)

In order to safeguard workers' rights and implement good practice in relation to labor and working conditions, LWSC will implement a Labor Force Management Plan. This will contain the human resource policies and procedures already in place or to be put in place by LWSC in relation to its own staff, and also the commitments it will require of the contractor and its sub-contractors in relation to human resource management and compliance with labor standards during the construction phase.

The Owner's LFMP will contain requirements in relation to policies and procedures on:

- Human resources policy and information provision to workers (on terms and conditions, relevant employment policies and training opportunities) in line with the lender's requirements (IFC Performance Standards 2 and ILO Standards);
- Maintenance of accurate records in relation to each worker's employment covering issues such as payment of wages and social security, and working hours
- Respect for collective agreements and provision of reasonable working conditions and terms of employment;
- Freedom of association and collective bargaining;
- Non-discrimination and equal opportunity;
- Retrenchment;
- Grievance mechanisms;

- Child labor and forced labor - including verification procedures to check employees' age.
- Health and safety;
- Non-employee workers;
- Supply chains; and,
- Labour standards-related ToR for contractor, and subcontractors, including security personnel;
- Local workforce recruitment

8.12.2 Owners Environmental Management Plan

LWSC will be responsible for the operation of the pipeline. It has been acknowledged that LWSC has its own ESMS, but the document has not been provided.

Environmental and social impact of the Project during operation will be much reduced as compared to the construction phase. Still, a number of obligations will remain with LWSC, to be continued from the construction phase, to be modified or to be started as new activities:

- HR policy and management, including health provision for staff.
- Good housekeeping: these basic activities, like waste management, wastewater treatment, general hygiene, accident prevention etc., need to be continued. Given the small number of employees the plant has, and the very much reduced activities, this will obviously be on a small scale.
- Good maintenance of all structures.
- Management of oil and lubricants (e.g. generator oil, diesel).
- Hydrological monitoring in cooperation with LEC to assess the actual impact on energy production and to find an agreement with LEC.
- Water quality monitoring at the intake of MCHPP in cooperation with LEC.
- Maintenance of the RoR and the fencing.

The Management plans which will have to be developed for the operation phase are similar to those related to the construction period. A risk assessment should be carried out to identify areas for risk of health and safety as well areas on risk of erosion. Following Management plans will have to be developed:

- Health and Safety Management Plan
- Waste Management Plan
- Wastewater Management Plan
- Erosion Monitoring Plan
- Hydrological Monitoring
- Vegetation Clearing Management Plan

9 ADDITIONAL INITIATIVES

As a policy, gender mainstreaming and inclusivity are among the development pillars of the Millennium Challenge Corporation (MCC). The Compact requires that projects include complimentary initiatives that will improve socio-economic conditions of the local communities. The complimentary initiatives are proposed based on the general understanding of the project area, the nature of the project, constraints identified through the ESIA study, and stakeholder consultation.

9.1 Provision of Water supply for the local communities

During community engagement, the issue of the domestic water supply was discussed with the RAP team. Currently, the communities along the pipeline have no access to a reliable, quality, convenient water supply. The consultation process created an expectation of some positive action for community water supply. It is not feasible within the constraints of the project and Compact to engineer and install a distribution line from the WTP to service the communities, but installation of community wells may be feasible.

The Contractor is required in parallel to the RAP implementation to conduct the following:

- Evaluation of optimal well locations and alternates;
- Assessment of the existing water resources (e.g. functionality of wells and hand pumps, existing well rehabilitation potential). NOTE: Raymond Camp was included in the MCHPP WASH program and has already received two handpumps and will not be included in this program.
- Evaluation of existing groundwater and geotechnical data to assist in optimizing well locations;
- Provision of a final budget for inclusion in the RAP implementation budget;
- Installation of at least eight (8) wells;
- Purging, disinfection, functionality testing and water quality sampling of all wells; and
- Handover of wells to the communities with information on the well installation details with suggested maintenance plans.

The actual cost will depend on the geology, well depth and current market prices for drilling, however, we expect the cost for the wells to be in the range of **USD 100,000 to 200,000**, which will be added to the RAP implementation budget.

9.2 Gender Mainstreaming and Sensitization Campaigns

This will include creation of opportunities for both men and women to obtain jobs during construction; delivery of messages that would inform and educate communities to refrain from gender-based violence; enforcing preparation and compliance with Workers Code of Conduct; and provision of training sessions for women traders in business related activities. Furthermore, it will contain HIV/AIDS Sensitization Campaigns and Malaria Prevention Campaigns. Those should be carried out before the main construction starts.

The HIV/ AIDS and Malaria Prevention Campaigns budget is estimated at USD 5,000.

9.3 Youth Empowerment

The project area has a significant number of youths who are unemployed. The project shall offer job opportunities to youth to work either as direct labour or as a supplier of certain types of material. Detailed arrangements will be made with the Contractor to assess suitability and mechanisms of engaging the youth associations to participate in the construction of the pipeline.

No budget is associated with this feature, since it is labor associated with the project construction.

10 CLOSURE AND DECOMMISSIONING

When no longer required, the pipeline will be decommissioned. Decommissioning activities depend on the proposed subsequent use of the site, environmental sensitivities (such as those associated with natural grasslands) and other project specifics. Activities may include demolition and removal of installed infrastructure and reclamation of the project site, including ground stabilization. Generally, there are three main options:

- **Suspension** – the pipelines are isolated from the system. They may be purged with inert material and they are blinded at the ends. The pipelines are maintained as per an operating system in accordance with required standards
- **Abandonment in Place** – Pipelines are physically disconnected, purged, cleaned and capped at the ends. The pipelines are depressurized and not maintained. They are left to corrode and biodegrade in situ. All above ground structures are removed and the RoW is rehabilitated.
- **Removal** – As above but all below ground structures are also removed. Removal is not normally the best practice for buried pipelines.

Leaving the decommissioned pipeline in place is the safest and least disruptive option; it means no additional disturbance from excavation and removal and less risk of future soil and slope instability.

11 CONCLUSION AND RECOMMENDATION

The Millennium Challenge Compact Account-Liberia aims at constructing a Raw Water Transmission Pipeline from Mount Coffee Hydropower Plant (MCHPP) to White Plains Water Treatment Plant (WTP) so as to benefit the people in Greater Monrovia who obtain water from the LWSC system. The pipeline will provide benefits in the improvement of water quality and the enhancement of water reliability to consumers of the LWSC municipal water system.

Potential environmental impacts associated with implementation activities of the project i.e. construction and operation phases have been assessed and analysed carefully and the necessary mitigation measures have been formulated. The impacts include soil erosion, generation of dust, noise disturbance, and destruction of natural habitat for fauna and flora species that occur in these areas. All those impacts are restricted to construction site and period and can be mitigated through good engineering practice. Required mitigation measures and the monitoring plans are provided in the ESMP.

The most significant negative social- economic impact of the project activity will be the probable displacement of people and loss of properties and crops within the corridor of the anticipated Raw Water Transmission pipeline transmission route. Due to the rather small footprint of the project the number of directly affected people is limited and the economic loss can be compensated. For details on resettlement see the RAP.

The overall benefit of the project for Liberia outweighs the rather small negative impact by far. The project will have a long-term beneficial effect on the environment since the consumption of diesel for generators for pumping the water will not be required anymore.

However, the following is still required:

- RAP Implementation: This should commence as soon as possible, establishing institutional arrangements and commencing compensation activities.
- Project design: The ESIA was based on feasibility level design. Detailed design should consider opportunities to further minimize environmental and social impacts by avoiding, where possible, sensitive areas or increasing positive biodiversity outcomes.
- Management measures: This ESIA report recommended a series of management measures, mitigation strategies and actions for the various environmental and social impacts created by the Project. These measures will be actively implemented and with committed intent to ensure that environmental and social impacts are managed appropriately.
- Management Plans: The key commitments to environmental and social impact management and mitigation are set out in the ESIA and RAP. Prior to Project development, these plans will need to be reviewed and updated to reflect specific development consent conditions and management details.

ANNEX 1: THE ASSIGNMENT

A1.1 The ESIA and RAP Team

The members of the Consultant's team who are so far included in the assignment are listed here.

Table 11-1: ESIA and RAP team

Name	Position	Nationality	Observations
Nelson S. Jallah	Technical Director / ESIA and RAP Specialist	Liberian	Served as the Lead Consultant and ensured that required tasks are implemented.
N. Macpherson David	Deputy Team Leader/ Policy Analyst	Liberian	To review all legal and institution framework and match national and international policy for the preparation of the ESIA and RAP report.
Patrick M. Scere	Environmental & Social Scientist	Liberian	To conduct Social- economic survey of PAPs within the project area and contributed to the RAP and ESIA report writing.
Darius Nuah	Fauna & Flora Expert / Forester	Liberian	Collected data on fauna and flora within the project terrain and contributed the writing of the RAP and ESIA
Desmond T. Thompson	GIS Specialist	Liberian	Collect all coordinates within the project locality and prepared maps for the reporting.
Amejor Senegah	Enumerator	Liberian	Directly involves with the counting of PAPs, affected crops and structures in the project area.
Trokon G. Gargar	Enumerator	Liberian	Directly involves with the counting of PAPs, affected crops and structures in the project area.
Kunu B. Dehfer	Enumerator	Liberian	Directly involves with the counting of PAPs, affected crops and structures in the project area.
Moses Kpaan	Enumerator	Liberian	Directly involves with the counting of PAPs, affected crops and structures in the project area.
Trokon Brown	Enumerator	Liberian	Directly involves with the counting of PAPs, affected crops and structures in the project area.
Hailary Obey	Cumulative Impact Specialist	Liberian	To conduct air , noise quality analysis and collect water and soil sample for chemical analysis
Ms. Britta Lammers	ESIA Expert	Germany	To review the reports and re-write it to reach international standards

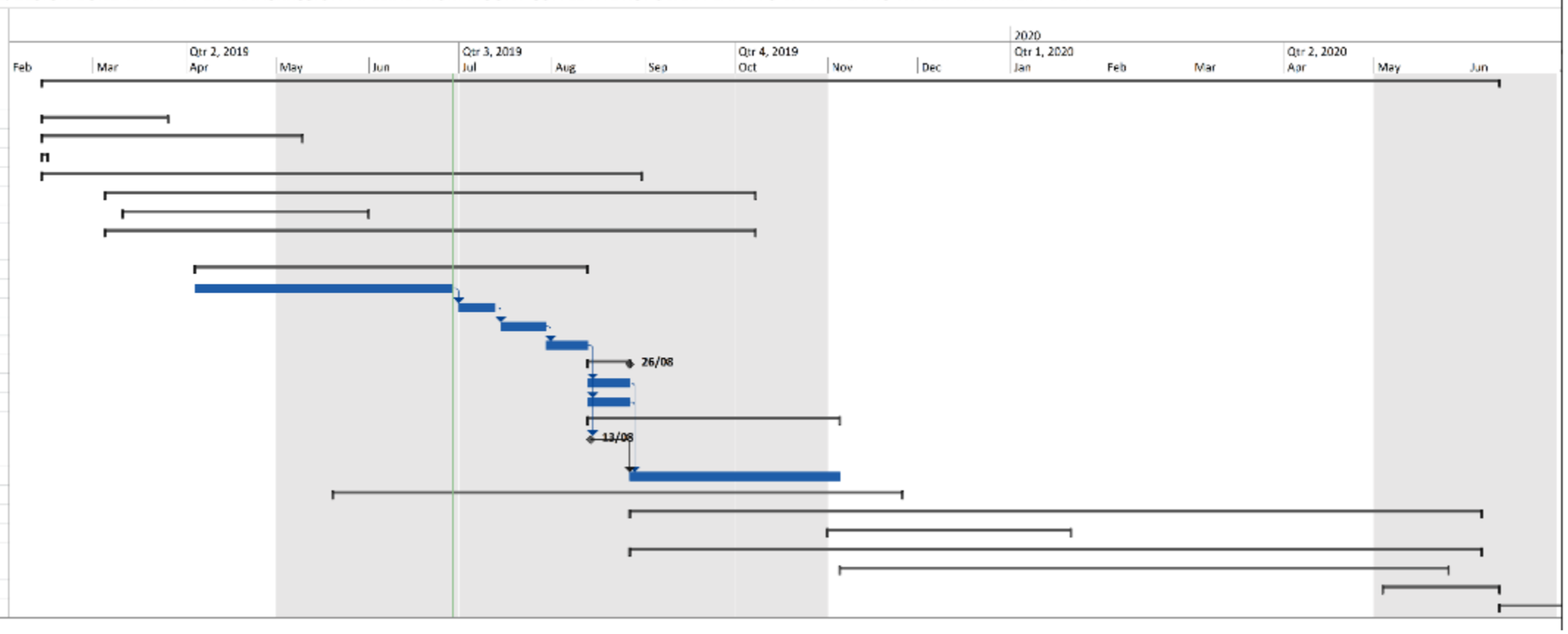
ANNEX 2: CONSTRUCTION SCHEDULE

DENYS

Revision 09-05-2019

MCA-L: DESIGN-BUILD RAW WATER TRANSMISSION PIPELINE FROM MOUNT COFFEE HYDROPOWER PLANT TO WHITE PLAINS WATER TREATMENT PLANT

ID	ID	Task Name	Duration	Calenderday
1	1	**MCA-L WATER TRANSMISSION PIPELINE FROM MT COFFEE HYDROPOWER PLANT TO WHITE**	**169 d**	**486 d**
2	2	**Preliminaries**	**28 d**	**42 d**
8	8	**Mobilisation and Site Installation**	**53 d**	**87 d**
13	13	**Access to and Possession of Site**	**2 d**	**2 d**
18	18	**Contractor's Documents**	**53 d**	**200 d**
60	60	**Design**	**38 d**	**217 d**
61	61	**In Situ Surveys**	**56 d**	**82 d**
66	66	**Detailed Design (By BERGSTAN - Nominated subcontractor)**	**150 d**	**217 d**
157	157	**RAP report (By LEG - Nominated subcontractor)**	**18 d**	**131 d**
158	158	Preparing and Submission of RAP report	60 d	86 d
159	159	Review by Engineer and Employer	10 d	12 d
160	160	Re-submission	10 d	15 d
161	161	Approval	10 d	14 d
162	162	**Permits**	**0 d**	**14 d**
163	163	Liberia Environmental Protection Agency	10 d	14 d
164	164	Ministry of Public Works	10 d	14 d
165	165	**RAP Implementation (option)**	**2 d**	**84 d**
166	166	Instruction by Employer to implement RAP by Contractor (Option) or by Employer	1 d	1 d
167	167	Implementation of RAP	50 d	70 d
168	168	**Procurement**	**136 d**	**190 d**
196	196	**Construction Works**	**116 d**	**284 d**
197	197	**Segment 1 Pipeline (600m)**	**45 d**	**81 d**
207	207	**Segment 2 Pipeline (4200m)**	**116 d**	**284 d**
218	218	**Special Points**	**114 d**	**203 d**
244	244	**Commissioning, Testing and Taking-Over**	**28 d**	**39 d**
251	251	**Defects Notification Period (1 year)**	**0 d**	**119 d**



ANNEX 3: LITERATURE

The following project-related documents provided by MCC have been studied in order to get a broader understanding of the project area and the nature of the project activities.

1. Feasibility and Preliminary Design of the White Plains Pipeline Extension Project (Part 2), Liberia: Environmental and Social Impact Assessment, and Environmental and Social Management Plan, CH2M, February 5, 2018
2. Stakeholder Engagement Plan for the White Plains Pipeline Extension Project (Part 2), Liberia, November 2017
3. RPF for the White Plains Pipeline Extension Project (Part 2), Liberia, November 2017
4. Final Draft Updated RPF for the White Plains Pipeline Extension Project (Part 2), Liberia, Godwin K. Senagah, November 2018

As already mentioned, the Mt Coffee HPP as well as the Transmission Line leading from Mt Coffee HPP to Paynesville and Bushrod are located in short distance to the Raw Water Transmission Pipeline project and have therefore been reviewed as well.

5. Environmental & Social Impact Assessments and Environmental & Social Management Plan for the Mount Coffee – Monrovia Transmission Line Project, Earthtime, March 2012.
6. Environmental and Social Impact Assessment for MCHPP, Pöyry, September 2012.
7. Environmental and Social Management Plan for MCHPP, Pöyry, February 2013.
8. Resettlement Action Plan for MCHPP, Pöyry, June 2013
9. Addendum (I) to the RAP, Caliqua, January 2015; Addendum (II) to the RAP: Bushrod – Mt Coffee Transmission Line, Caliqua, August 2015; Addendum (III) to the RAP: Paynesville – Mt Coffee Transmission Line, Caliqua, January 2016; Addendum (IV) to the RAP: Emergency Spillway, Caliqua, July 2016
10. An act adopting the Environmental Protection and management of the Republic of Liberia – November 26, 2002, Page: 1
11. Bongers, F., L. Poorter, R.S.A.R.Van Rompaey, and M.P.E. Parren, M.P.E. 1999. Distribution of twelve moist forest canopy tree species in Liberia and La Côte d'Ivoire: Response curves to a climatic gradient. Journal of Vegetation Science 10:371-381.
12. European Bank for Reconstruction and Development, 2010: Sub-sectorial Environmental and Social Guidelines: Pipelines
13. Liberia Ministry of Health and Social Welfare 2010. An Act to Amend the Public Health Law, Title 33, Liberian Code of Laws Revised (1976).

Accessed from the GOL website: http://legislature.gov.lr/sites/default/files/Public%20Health.pdf

14. Ministry of Foreign Affairs. Monrovia, Liberia. April 30, 2003. Act Creating the Environment Protection agency of the Republic of Liberia. Section 1

15. www.mcc.gov/resources/doc/environmental-guidelines Page: 6

ANNEX 4: SPECIES LISTS

Table 11-2: Mammals species list

Scientific name	Common name	Encounter Rate	IUCN Status	Sighted
Procolobus badius	Red Colobus	-		Not seen
Procobus verus	Olive Colobus	-	NT	Not seen
Tragelaphus scriptus	Bush buck	-	LC	Not seen
Cephalophus maxwelli	Maxwell's duiker	-	LC	Not seen
Cricetomus emmi	Giant rat	3	LC	Habitat seen
Thryonomys swinderianus	Greater Cane rat	10	LC	Dung seen
Atherurus afrienus	African bush tail porcupine	-	LC	Not seen
Cercopithecus diana	Diana Monkey	-	VU	Not seen
Protoxurus stangeri	Forest giant squirrel	-		Not seen
Cephalophus niger	Black Duiker	-		Not seen
Cricetomys gambianus	Gambian pouched rat	5	LC	Track seen
Atherurus afrienus	Bush-tailed porcupine	-	LC	Not seen
Micropotamogale lamottei	Pigmy Otter shrew	-		Not seen
Crocidura jouvenetae	Jouvenet shew	3	LC	Sighted
Crocidura obscurior	West African long tailed Shrew	6	LC	Sighted
Crocidura olivieri	Olivier's Shrew	4	LC	Sighted
Crocidura theresa	Theresa Shrew	5	LC	Sighted
Crocidura poensis schweizeri	Fraser Musk Shrew	8	LC	Sighted
Grammomys poensis	Shining thicket rat	7	LC	Sighted
Protoxerus aubinnii	Slender-tailed squirrel	-	-	Not seen
Heliosciurus punctatus	Small sun squirrel	-	-	Not seen
Mus minutoides	African pygmy mouse	7	LC	Sighted
Colomys goslingi	African wading rat	9	LC	Sighted
Total Encounter Rate		**67**		

Table 11-3: Birds species list

Scientific name	Common name	Encounter Rate	IUCN Status	Sighted
Bubulcus ibis	Cattle Egret	6	-	Sighted
Milvus migrans parasi	Yellow-billed Kite	-	-	Not seen
Polyboroides typus	African Harrier Hawk	5	LC	Sighted
Kaupifalco monogrammicus	Lizard Buzzard	-	-	Not seen
Treroncalvus	African Green Pigeon	-	-	Not seen
Turtur afer	Blue-spotted Wood Dove	7	LC	Sighted
Streptopelia semitorquata	Red-eyed Dove	5	LC	Sighted
*Oxylophu slevaillanti*i	Levaillant's Cuckoo	-	-	Not seen
Chrysococcyx cupreus	African Emerald Cuckoo	-	-	Not seen
Centropus senegalensis	Senegal Coucal	6	LC	Sighted
Halcyon senegalensis	Woodland Kingfisher	-	-	Not seen
*Merops albicolli*s	White-throated Bee-eater	2	LC	Sighted
Merops gularis	Black Bee-eater	-	-	Not seen
Tockus fasciatus	African Pied Hornbill	-	-	Not seen
Pogoniulus scolopaceus	Speckled Tinkerbird	3	LC	Sighted
Pogoniulus atroflavus	Red-rumped Tinkerbird	-	-	Not seen
Pogoniulus subsulphureus	Yellow-throated Tinkerbird	-	LC	Sighted
Hirundo abyssinica	Lesser striped Swallow	-	LC	Sighted
Hirundo rustica	Barn Swallow	-	LC	Sighted
Hirundo nigrita	White-Throated Blue Swallow	-	-	Not seen
Andropadus virens	Little Greenbul	8	LC	Sighted
Andropadus gracilis	Little Grey Greenbul	7	-	Not seen
Andropadus gracilirostris	Slender-billed Greenbul	8	LC	Sighted
Chlorocichla simplex	Simple Leaflove	2	-	Not seen
Thescelocichla leuco pleura	Swamp Palm Bulbul	1	-	Not seen
Pycnonotus barbatus	Common Bulbul	10	LC	Sighted
Cisticola lateralis	Whistling Cisticola	1	LC	Sighted
Cisticola brachypterus	Short-winged Cisticola	-	LC	Sighted
Prinia subflava	Tawny-flanked Prinia	-	LC	Sighted
Camaroptera brachyura	Grey-backed Camaroptera	-	LC	Sighted
Camaroptera superciliaris	Yellow-browed Camaroptera	-	-	Not seen
Ploceus aurantius	Orange Weaver	3	-	Not seen
Ploceus cucullatus	Village Weaver	5	LC	Sighted
Ploceus albinucha	Maxwell's Black Weaver	-	-	
Lanius collaris	Common Fiscal	3	LC	Sighted
Chalcomitra adelberti	Buff-throated Sunbird	-	LC	Sighted
Cyanomitra cyanolaema	Blue-throated Brown Sunbird	-	-	Not seen
Cyanomitra olivacea	Olive Sunbird	3	LC	Sighted
Hedydipna collaris	Variable Sunbird	1	-	Not seen
Cinnyris venustus	Johanna's Sunbird	-	-	Not seen

Cinnyris superbus	Superb Sunbird	-	-	Not seen
Platysteira cyanea	Common Wattle-eye	-	-	Not seen
Francolinus bicalcaratus	Double-spurred Francolin	-	-	Not seen
Lamprotornis splendidus	Splendid Glossy Starling	-	LC	Sighted
Nigrita canicapillus	Grey-headed Negrofinch	-	-	Not seen
Spermestes cuculata	Bronze Mannikin	7	-	Not seen
Senegalensis	Laughing Dove	3	LC	Sighted
Total Encounter Rate		**95**		

Table 11-4: Amphibian species list

Scientific name	Common name	Encounter Rate	IUCN Status	Sighted
Phrynobatrachus taiensis	Tai River Frog	-	-	Not seen
Cardioglossa liberiensis	Liberian Long fingered Frog	-	-	Not seen
Bufo danielae	Ivory Coast toad	-		Not seen
Conraua alleni	Allen's Slippery Frog	-	VU	Not seen
Phrynobatrachus annulatus	Ringed River Frog	-	EN	Not seen
Leptopelis macrotis	Big-eyed Forest Treefrog	-	NT	Not seen
Kassina cochranae	Chochran's Running Frog	-	NT	Not seen
Hyperolius wermuthi	Wermuth's Reed Frog	-	NT	Not seen
Amietophrynus togoensis	Togo Toad	-	NT	Not seen
Amietophrynus regularis	-	5	LC	Sighted
Ptycadena bibroni	-	12	LC	Sighted
Phrynobatrachus oogenesis	-	2	LC	Sighted
Total Encounter Rate		**19**		

Table 11-5: Reptiles species list

Scientific name	Common name	Encounter Rate	IUCN Status	Sighted
Bitis gabonica	Cassava snake	-	LC	Not sighted
Atheris chlorechi	Green snake	-	LC	Not sighted
Varanus niloticus	Nile monitor	-	LC	Not sighted
Osteolaemus tetraspis	African `Dwarf Crocodile	-	VU	Not sighted
Crocodylus niloticus,	Nile crocodile	-	LC	Not sighted
Mecistops cataphractus,	African sharp-nosed crocodile	-	CR	Not sighted
Agama agama	West African Rainbow Lizard	15	LC	**Sighted**
Red Headed Rock Agama Agama	-	8	LC	**Sighted**
Caretta,	Loggerhead	-	VU	Not seen
Lepidochelys olivacea,	Olive Ridley	-	VU	Not sighted

Dermochelys coriacea	Leatherback turtle	-	VU	Not sighted
Chelonia mydas	Green turtle	-	EN	Not sighted
Python regius	Ball python	-	LC	Not sighted
Causus maculatus	Spotted Night Adder	-		Not sighted
Atractaspis irregularis	Variable Burrowing Asp	-	LC	Not sighted
Afronatrix anoscopus	African Water Snake	-	LC	Not sighted
Dendroaspis viridis	Western Green Mamba	-	LC	Not sighted
Pseudohaje nigra	Black Tree Cobra	-	-	Not sighted
Atheris chlorechis	Green Bush Viper	-	-	Not sighted
Causus maculatus	Spotted Night Adder	-	-	Not sighted
Atractaspis irregularis	Variable Burrowing Asp	-	LC	Not sighted
Dispholidus typus	Boomslang	-		Not sighted
Thrasops occidentalis	Black Tree Snake	-	LC	Not sighted
Crotaphopeltis hotamboeia	Herald Snake	-	-	Not sighted
(Hapsidophrys smaragdinus)	Green Keeled Snake	-	LC	Not sighted
Philothamnus irregularis)	Green Snake	-	LC	Not sighted
Total Encounter Rate		23		

Table 11-6: Fish species list

Scientific name	Common name	Encounter Rate	IUCN Status	Sighted
Heterobranchus longifilis	Black catfish	3	LC	Sighted
Papyrocramus afer	Reticulate knife fish	-	LC	Not seen
Chrysichthys auratus	Catfish	-	LC	Not seen
Schilbe mystus	African butter catfish	-	LC	Not seen
Hemichromis fasciatus	Banded Jewlfish	-	LC	Not seen
Tilapia zillii	Redbelly tilapia	5	LC	Sighted
Hemichromis bimaculatus	Jewlfish	3	LC	Sighted
Hepsetus odoe	-	4	LC	Sighted
Hemichromus fasciatus	-	-	LC	Not seen
Hemichromus bimaculatus	-	-	LC	Not seen
Epiplatys sp.	-	4	LC	Sighted
Chrysichtyhs johnelsi		6	LC	Sighted
Ctenopoma sp	-	1	DD	Sighted
Brycinus longipinnus	-	-	LC	Not seen
Brycinnus nurse	-	-	LC	Not seen
Barbus inaequali	-	7	DD	Sighted
Total Encounter Rate		33		
*DD: Data Deficient; *EN: Endangered; *LC: Least Concern; *NE: Not Evaluated; *NT: Near Threatened; *VU: Vulnerable				

Table 11-7: Other aquatic fauna species list

Scientific Name	Common Name	Encounter Rate	IUCN Status	Sighted
Globonautes macropus	Tree Hole Crab	-	EN	Not seen
Liberonautes grandbassa	Grand bassa River Crab	-	CR	Not seen
Liberonautes lugbe	Lugbe River Crab	-	CR	Not seen
Liberonautes nanoides	Dwarf River Crab	-		Not seen
Liberonautes rubigimanus	Lobster Claw Crab	-	EN	Not seen
Achatina ventricosa	Giant African land snail (black)	-	LC	Not seen
Achatina achatina	Giant African land snail (red)	-	LC	Not seen
Archachatina ventricosa	Black achatina snail	6	LC	Sighted
Total Encounter Rate		6		

Table 11-8: Flora species list

Scientific Name	Common Name	IUCN Status	Sighted
Afzelia bella	Doussie	VU	Sighted
Alstonia boonei	Emien	NE	Sighted
Anthonacleista nobilis	Cabbage Tree	LC	Sighted
Bussea occidentalis	Samanta	LC	Sighted
Chlorophora	Iroko	NE	Sighted
Ceiba pentandra	Fromager	LC	Sighted
Fagara macrophylla	Olondu	VU	Sighted
Futumia elastica	Mutundu/Futumi	-	Sighted
Hallea ciliate	Abura	-	Sighted
Harungana madagascariensis	n/a	-	Sighted
Cassia siamea	-	NE	Sighted
Managifera indica	Plum	NE	Sighted
Cocos nucifera,	Coconut	NE	Sighted
Spathodea campanelata,	-	NE	Sighted
Musanga cecropioides	African corkwood	-	Sighted
Parinari excels	Songue	LC	Sighted
Parkia bicolor	Parkia/Lo	LC	Sighted
Hevea brasiliensis	Rubber	LC	Sighted
Uapaca guinensis	Rikio/Uapaca	-	Sighted
Clappertonia ficifolia	-	-	Sighted
Cyclosorus striatus	-	-	Sighted
Mimose pudica	-	NE	Sighted
Solanum tarvum	-	NE	Sighted
Ipomoea asarifola	-	-	Sighted
Cyperus *spp*	-	NE	Sighted
Anadelphia leptocoma	-	LC	Sighted

Ctenium newtoni	-	LC	Sighted
Saggitaria latofolio	-	LC	Sighted
Leersia oryzoides	-	LC	Sighted
Scleria species	Soft grass	LC	Sighted
Elies guinesis	Palm	LC	Sighted
Phragmite Austialis	Reeves	LC	Sighted

ANNEX 4: SOCIO ECONOMIC BASELINE QUESTIONNAIRE

SOCIO-ECONOMIC & DEMOGRAPHIC SURVEY DATA QUESTIONNAIRE

PROJECT: CONSTRUCTION OF THE RAW WATER TRANSMISSION PIPELINE, FROM MOUNT COFFEE TO WHITE PLAINS

Good morning/afternoon and welcome to our session. Thanks for taking the time to talk with us. My name is _____ and assisting me is _____. We are working on the Raw Water Transmission Pipeline Project that is being financed by the Millennium Challenge Corporation (MCC).

You are being interviewed because your property (structure, land, tree, crops) have been affected. This interview allows us to gather information on you, your household and livelihood activities. It will also be used to understand what benefits and allowances will be applied to you and your household

The interview will last between 40-45 minutes. Do you agree? **Yes____ No_**
Questionnaire Number_____

SECTION A. GENERAL INFORMATION

Name of Respondent:	**Enumerator:**
House Number/	**Interview Date:**
Community:	**Start Time:**
Phone Number:	**End Time:**
County:	**GPS coordinates:**

SECTION B: INFORMATION ABOUT THE HOUSEHOLD MEMBERS

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
No.	**Relationship to Household Head**	**Gender (M/F)**	**Age (Years)**	**Education**	**Occupation**	**Residential**	**Disabled?**	**Religion**	**Ethnicity**
1									
2									
3									
4									
5									
6									
7									
8									
9									

Relationship	Residential Status	Education	Occupation	Religious Affiliation	Ethnic Group
1 – Household Head (HH) 2 – Spouse of HH 3 – Son/Daughter of HH 4 – Son-in-law/Daughter-in-law of HH 5 – Grandchild of HH 6 – Parent of HH 7 – Brother/sister-in-law of HH 8 – Brother/Sister of HH 9. Other (Specify)	1 – Living on the plot 2 – other (specify)	0 – None 1 – Primary 2 – Secondary 3 – University/Tertiary Education	1 – Student 2 – Employed – 3 – Other Employment (specify)	1 – Christian 2 – Muslim 3 – Traditional 4 – Others (Specify)	1 – Bassa 2 – Kpelle 3 – Lorma 4 – Gbandi 5 – Gio 6 – Mano 7 – Kissi 8 – Gola 9 – Mandingo 10 – Vai 11 – Kru 13 – Sapo 14 – Grebo 15 – Belle 16 – Mende 17 – Dei 18 – Other (Specify)

X. Is there any member of your household in school?

Yes		No		Uncertain	

XI. If no, tick the main reason why members of your household are not in school?

1 = No children/not applicable.	
2 = High school is too far for children to travel	
3 = High school is too expensive	
4 = Children are needed to work for the household	
5 = Only have girls and they are not necessary to educate	
6= No funding to put them in School	
7 = Other (specify):	

SECTION C: LIVELIHOOD

I. Is any member of your household employed?

1). Yes		2). No	

II. Household main source of income

1) Employed (salary)	
2) Hired labor (wage)	
3) Petty Trade	
4) Business (small shop)	
5) Remittance	
6) Others (specify)	

III. What is your average income monthly?

1). < 100 USD		2). 100 -500 USD		3). 500 – 1000 USD		4) >1000 USD	

IV. How much does your household spend on the following items? (State in Liberian dollars)

A	1) Clothing (dress, shirt shoe)	
B	2) House repairs	
C	3) Health	
D	4) School	
E	5) Hired domestic help	
F	6) Transportation	
G	7) Energy	
H	8) Entertainment (events)	
I	9)Food	
J	Assets	
K	Others (specify)	

V. Household asset: Do you have any of the following available in your household in a workable condition?

Item				
Motor Car	Yes		No	
Bicycle	Yes		No	
Television	Yes		No	
Radio	Yes		No	
Sewing Machine	Yes		No	
Mobile/Cell Phone	Yes		No	
Bed with Mattress	Yes		No	
Plastic Chairs	Yes		No	
Mosquito net	Yes		No	
Solar Panel	Yes		No	
Generator	Yes		No	
Fan				
Air Conditions				
Other				

SECTION D: WATER AND SANITATION

I. Where does your household obtain water for drinking purposes?

1) Piped Borne		4) Water vendor	
2) Hand Pump		5) River	
3) Well		6) Others (specify)	

I. Is the main source of drinking water the same during the dry and rainy season?

1). Yes		2). No	

II. What is your household main source of water for general domestic use?

1) Piped Borne	
2) Hand Pump	
3) Well	
4) Water vendor	
5) River	
6) Others (specify)	

III. Is the main source of domestic water the same during the dry and rainy season?

1). Yes		2). No	

IV. If no, where is the alternative source of water during the dry season?

V. How far is the nearest water source for drinking?

1). < 5mins		2). 5-20 mins		3). >20 mins	

VI. Which of the following best describe your drinking water quality?

No.	Water Quality
1.	The water is always clean and always good for drinking

2.	The water is sometimes clean and sometimes dirty but always drinkable
3.	The water is always dirty and sometimes undrinkable
4.	The water is always dirty and needs purifications/filtration/boiling to be drinkable.
5.	The water is always dirty and undrinkable even with purification/filtration/boiling

VII. Are you willing to pay for water from LWSC?

1). Yes		2). No	

VIII. How much can your household afford to spend on water each month?

1). Less than 10 USD		2). 10 -50 USD		3). 50 – 100 USD		4) >100 USD	

IX. If you had piped borne water, how will you use it to improve your life?

_____

_____

_____

_____

X. Do you have an indoor or outdoor toilet facility?

1). Indoor		2). Outdoor	

XI. Toilet facility type

1) Flush Toilet (private)	
2) Pit Latrine (Private)	
3) Flush Toilet (Public)	
4) Pit Latrine (Public)	
5) Flying Toilet	
6) Open (None)	
7) Others (specify)	

XII. How does your household dispose of garbage?

1) Designated community waste site	
2) Burn waste	
3) Garbage collection vendor	
4) Open Disposal/ Disposal Anywhere	
5) Others (specify)	

SECTION E: HEALTH AND VULNERABILITY

I. What is the most common health problem in your household?

1). Malaria		5). Typhoid	
2). Flu/cough		6). Chloride	
3.Stomach Ache		7). High Blood Pressure	
4). HIV/AIDS		8). Tuberculosis	

II. What is the name of the nearest health center?

III. What is the walking distance to the nearest health sector?

1). < 5mins		2). 5-20 mins		3). >20 mins	

IV. Do you usually go for treatment?

1). Yes		2). No	

V. If no, why?

1). Prefer Traditional herbs	
2). Cannot afford	
3.Too far	
4). Cultural/Religious belief	
5). Other (Specify)	

SECTION F: PERCEPTION

I. Do you have any comment about the Project?

What do you see as benefits/advantages or problems/disadvantages with the rehabilitation/revival of the Pipeline?

Advantages/Benefits	Disadvantages/Problems

General Comment

Thank You!

ANNEX 5: PUBLIC PARTICIPATION

Table 11-9: Meetings Held

Date	Persons met	Institution, contact	Met by	Main Topics / Observations
March 26, 2019	Cllr. Kula L. Jackson Commissioner, Land, Policy and Planning Mr. Romeo Clark Director of Internal Audit Division	Liberia Land Authority (LLA)	Mr. Nelson Jallah Trokon Brown Charles Dahn	• Introduction of the Project • Solicit views, comments and recommendations regarding the proposed project and get feedback on land tenure, and institutional framework regarding resettlement. • **Information received:** • Liberia Land Authority should be involved in the survey process; • Upon the completion of the report, all maps used in the study should be submitted to our office for future reference; • LLA should be directly involve in the RAP process because the act that established the entity give the power to oversee all land related matter in the Country; • The compensation process should be transparent to avoid confusion that will bring setback to the project.

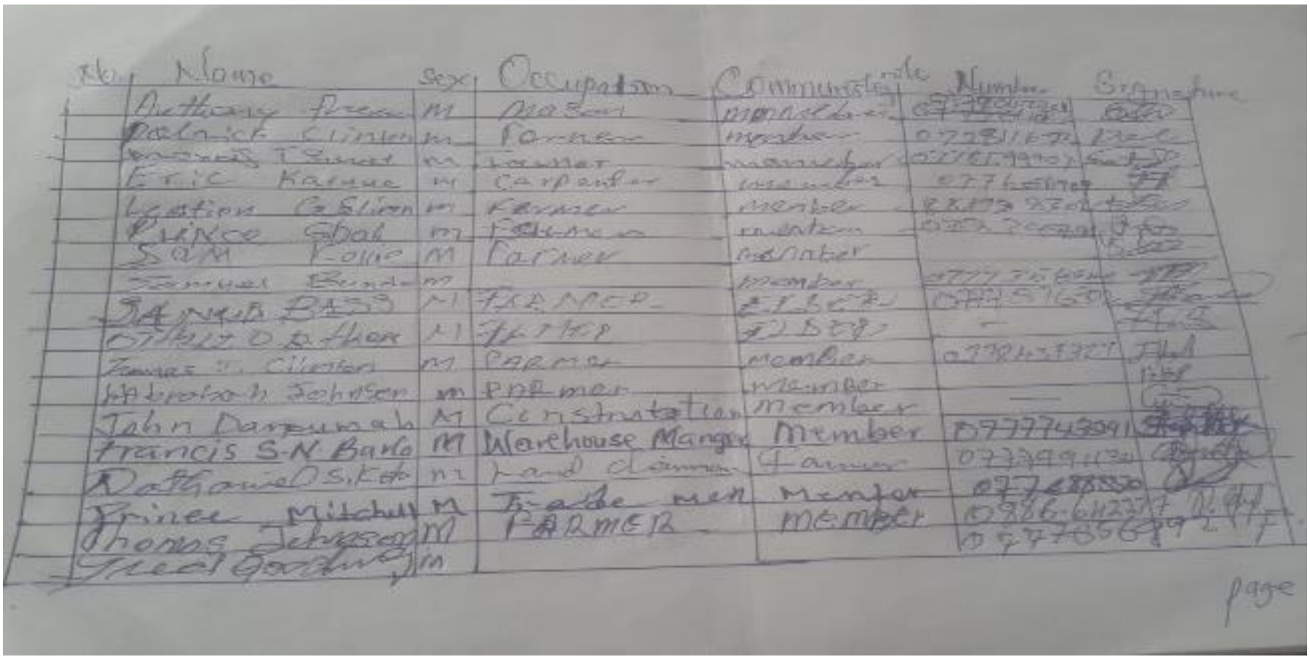
Date	Persons met	Institution, contact	Met by	Main Topics / Observations
Date: March 27, 2019	Mr. Amos F. Gborie, Deputy Director, Environmental Health Division, NPHIL	National Public Health Institute of Liberia	Mr. Nelson Jallah Trokon Brown Charles Dahn Trokon Gargar	• Introduction of the project • To solicit the view of the institution regarding the project as it relates to the relocation of graves and public health issues that may arise during the project • Discussion of the ESIA **Information received** • The entity should be involve during the enumeration exercise; • Affected graves should be properly relocated; • The traditional Council of Liberia should be involved with the relocation of graves, if traditional rituals are to be performed before removal of those graves; and • Water quality should be properly monitored during the course of the project operation.
March 28, 2019	Hon. James J. Reynolds Assistant Minister for Planning and Programming	Ministry of Public Works	Mr. Nelson Jallah Trokon Brown Charles Dahn Trokon Gargar	• Introduction of the project • Discussion of the design and the RoW • Discussion of the structures price listing and the RAP process **Information Received** • The project brief should be submitted to us for review in order to make decision. • The finalize design should be sent to us for site verification.

Date	Persons met	Institution, contact	Met by	Main Topics / Observations
April 2, 2019	Name: Hon. Gesler E. Murray, Minister Ministry of Mines & Energy Hon. Emmanuel O. Shannon, Deputy Minister for Operation	Ministry of Mines & Energy	Mr. Nelson Jallah Trokon Brown Charles Dahn Trokon Gargar	• Introduction of the project • Discussion of the survey of the corridor • Solicit views of the Ministry regarding the project. **Information Received** The pipeline should be properly mapped to capture all areas including the affected areas.
April 3, 2019	Mr. Joe S. Morlue Operational Manager LWSC	Liberia Water and Sewer Corporation	Mr. Nelson Jallah Trokon Brown Charles Dahn Trokon Gargar	• Discussion of the project corridor RoW • Discussion of the Design • Discussion of the ESIA and RAP Process • To solicit the views of the agency as it relates to the project. **Information Received** • All PAPs should be documented properly and relevant deeds should be verified. • All compensation should be properly documented to ensure that PAPs don't come back to resettle on the compensated area • Access route should be identified for communities member to have access to the river and their lands

Date	Persons met	Institution, contact	Met by	Main Topics / Observations
Date: April 9, 2019	Mr. Ballah Y. Kezelee Community Liaison Officer Mr. B. Baccus Robert, HSE Manager Mr. Abraham L. B. Freeman, Environmental Officer	Liberia Electricity Corporation	Mr. Nelson Jallah Trokon Brown Charles Dahn Trokon Gargar	• Introduction of the Project • Introduction of the team which is carrying out the RAP and ESIA. • Explanation of ESIA **Information Received** • The team should capture all PAPs and property holders within the project area and identified the legal owner to avoid conflict. • The consultants should visit the LEC website to review pas RAP and ESIA carryon.
Date: April 10, 2019	Mr. James T. Moore Director, Marketing Department Mr. Stephen N. Teeneh Marketing Officer	Ministry of Agriculture	Mr. Nelson Jallah Trokon Brown Charles Dahn Trokon Gargar	• Introduction of the Project • Discussion on Cash Crops price listing • ESIA Discussion • To solicit the views of the agency as it relates to the project **Information Received** • There should be a plan to support sustainable farming for locals in the project area.

Date	Persons met	Institution, contact	Met by	Main Topics / Observations
April 24, 2019	Hon. Alphanso Wallace, Deputy Executive Director for Operation Mr. Tubman T. Saywon, RAP Focal Person	Liberia Refuge Repatriation Resettlement Commission	Mr. Nelson Jallah Trokon Brown Charles Dahn Trokon Gargar	• Introduction of the Project • Discussion of the RAP and ESIA process **Information Received** • The agency should be part of all the activities regarding the project and profiling of the PAPs. • Compensation should be free and fair to avoid future disturbances.
April 26, 2019	Mr. Kawasu M. Toure Assistant Manager ESIA	Environmental Protection Agency	Mr. Nelson Jallah Trokon Brown Charles Dahn Trokon Gargar	• Introduction of the Project • Discussion of the ESIA and RAP process • Discussion of the permitting requirements and process **Information Received** The consultants should work in line with all relevant environmental guidelines and ensure that mitigation measures are put in place for all impacts relating to the project.

Harrisburg Meeting Attendance (April 19, 2019)



No.	Name	Sex	Occupation	Community role	Number	Signature
	Anthony [illegible]	M	Mason	member	[illegible]	[illegible]
	Patrick Clinton	M	Farmer	member	0779311672	[illegible]
	[illegible]	M	Farmer	member	[illegible]	[illegible]
	Eric Karnue	M	Carpenter	member	[illegible]	[illegible]
	[illegible]	M	Farmer	member	[illegible]	[illegible]
	Prince Gbah	M	Fisherman	member	[illegible]	[illegible]
	Sam Kollie	M	Farmer	member		[illegible]
	Samuel [illegible]	M		member	[illegible]	[illegible]
	[illegible] Bass	M	Farmer	Elder	[illegible]	[illegible]
	[illegible]	M	Farmer	Elder	–	[illegible]
	[illegible] Clinton	M	Farmer	member	[illegible]	[illegible]
	[illegible] Johnson	M	Farmer	member		[illegible]
	John Dampumah	M	Construction	member	—	[illegible]
	Francis S.N. Barlo	M	Warehouse Manager	Member	0777743091	[illegible]
	[illegible]	M	Land claimer	Farmer	[illegible]	[illegible]
	Prince Mitchell	M	Trade men	Mentor	[illegible]	[illegible]
	Thomas Johnson	M	FARMER	member	[illegible]	[illegible]
	[illegible]	M			[illegible]	

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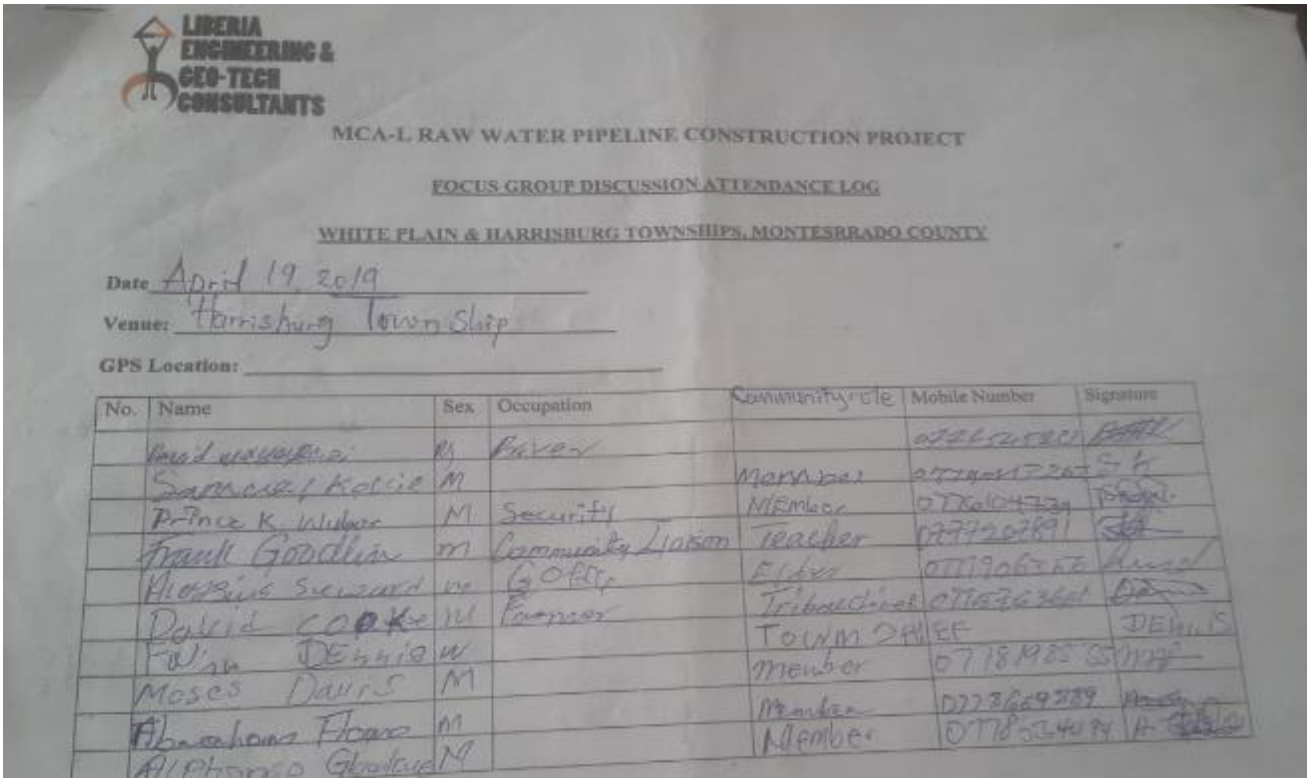


LIBERIA ENGINEERING & GEO-TECH CONSULTANTS

MCA-L RAW WATER PIPELINE CONSTRUCTION PROJECT

FOCUS GROUP DISCUSSION ATTENDANCE LOG

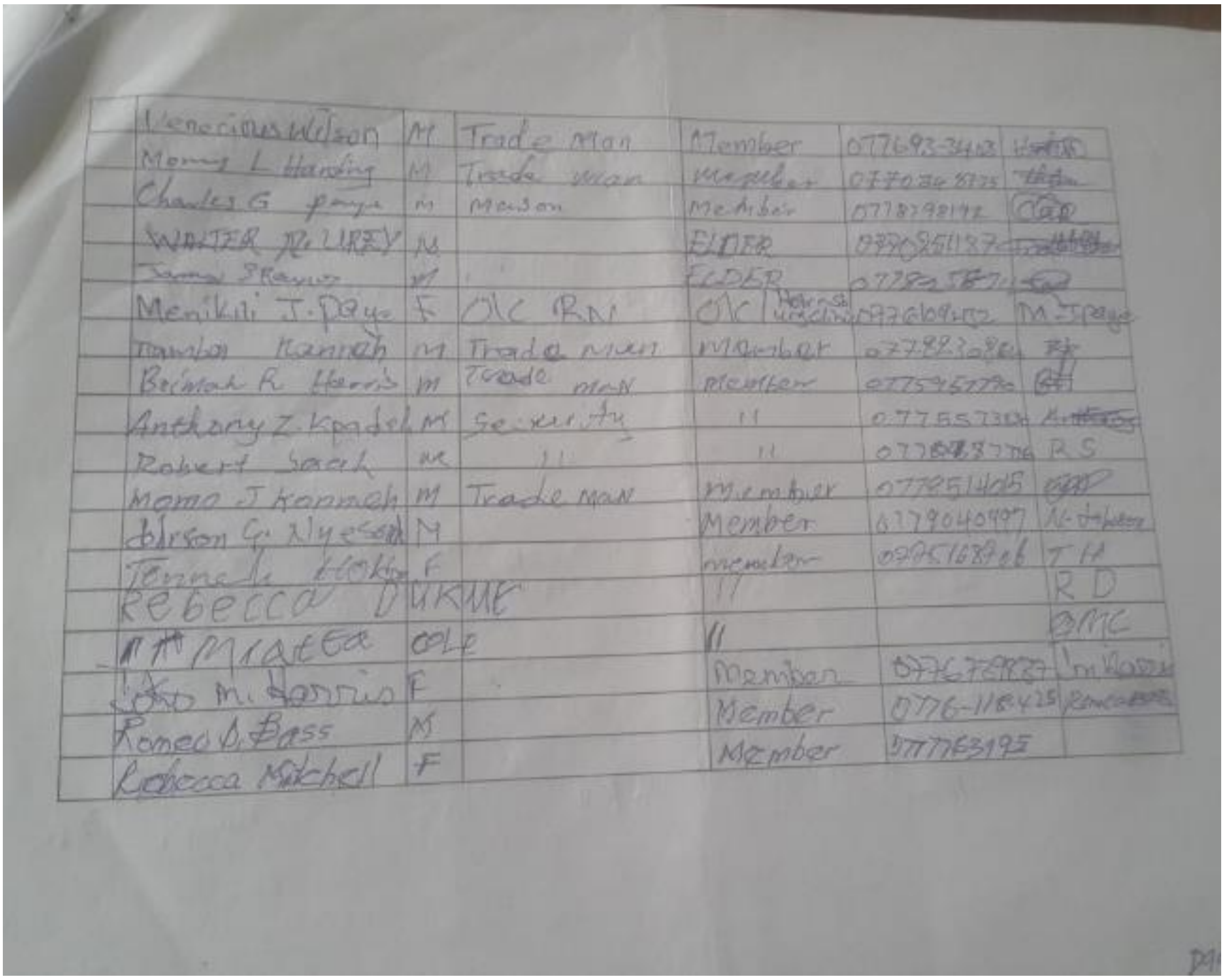
WHITE PLAIN & HARRISBURG TOWNSHIPS, MONTESRRADO COUNTY

Date April 19, 2019

Venue: Harrisburg Town Ship

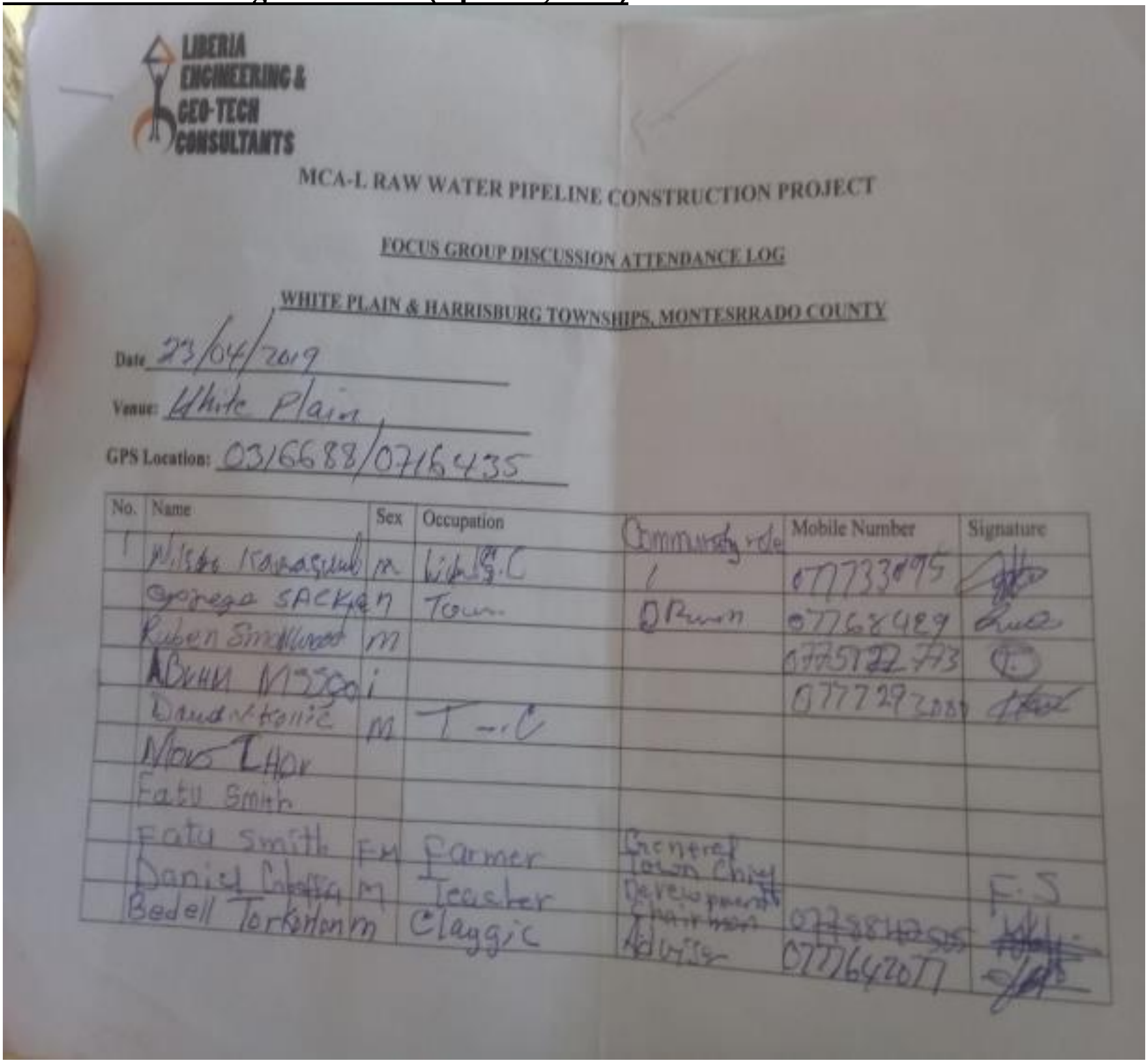
GPS Location:

No.	Name	Sex	Occupation	Community role	Mobile Number	Signature
	[illegible]	M	Driver		[illegible]	[illegible]
	Samuel Kollie	M		Member	[illegible]	[illegible]
	Prince K. Wilson	M	Security	Member	[illegible]	[illegible]
	Frank Goodlin	M	Community Liaison	Teacher	[illegible]	[illegible]
	[illegible]	M	G.O.[illegible]	Elder	[illegible]	[illegible]
	David Cooke	M	Farmer	Tribal chief	[illegible]	[illegible]
	[illegible] Dennis	W		Town Chief		DENNIS
	Moses Davis	M		member	0718 1985	[illegible]
	Abraham [illegible]	M		Member	0773669389	[illegible]
	Alphonso [illegible]	M		Member	[illegible]	[illegible]



	Venecious Wilson	M	Trade Man	Member	077693-3413	[illegible]
	Momo L Harding	M	Trade man	Member	0770348775	[illegible]
	Charles G Paye	M	Mason	Member	0778798192	[illegible]
	WALTER M. UREY	M		ELDER	0770851137	[illegible]
	James S Kanu	M		ELDER	07782-5871	[illegible]
	Menikili J. Paye	F	O/C RM	O/C Harris' Wellness	0776609402	M. J Paye
	Tamba Kanneh	M	Trade man	Member	0778230861	[illegible]
	Beimah R Harris	M	Trade man	Member	0775957790	[illegible]
	Anthony Z. Kpadeh	M	Security	"	0775573304	[illegible]
	Robert Sarah	M	"	"	0770837776	R S
	Momo J Kanneh	M	Trade man	Member	0778514105	[illegible]
	Nelson G. Nyesuah	M		Member	0779040997	N. [illegible]
	Tennah Hokai	F		member	0775168806	T H
	Rebecca Dukue			"		R D
	Miatta Cole			"		MC
	[illegible] M. Harris	F		Member	0776789827	[illegible]
	Romeo D. Bass	M		Member	0776-118425	[illegible]
	Rebecca Mitchell	F		Member	0777763195	

White Plain Meeting Attendance (April 23, 2019)



LIBERIA ENGINEERING & GEO-TECH CONSULTANTS

MCA-L RAW WATER PIPELINE CONSTRUCTION PROJECT

FOCUS GROUP DISCUSSION ATTENDANCE LOG

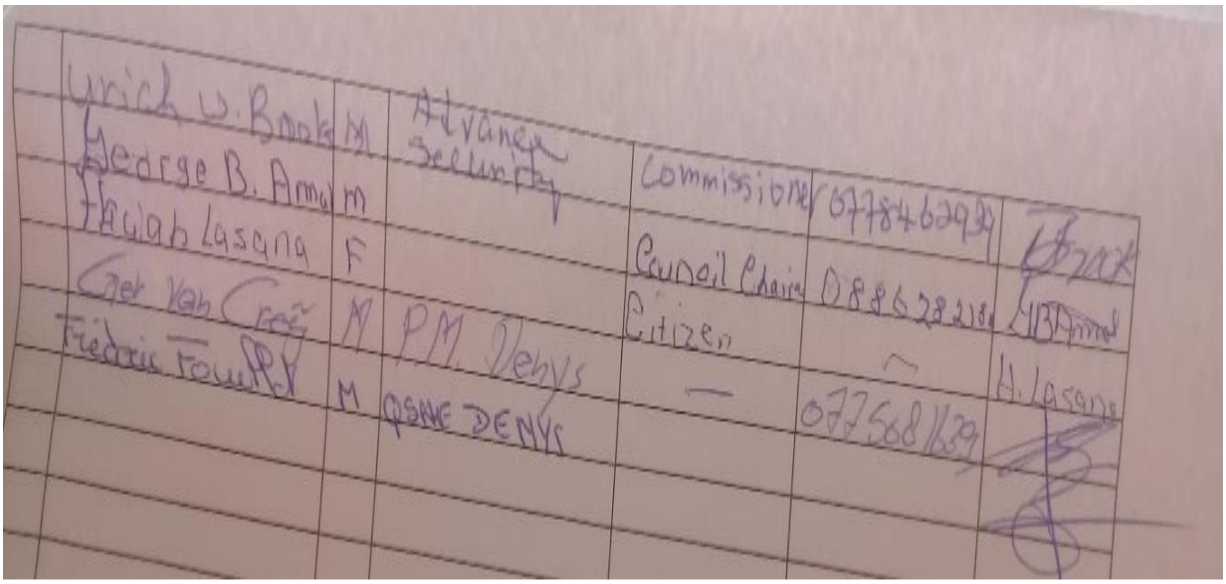
WHITE PLAIN & HARRISBURG TOWNSHIPS, MONTESRRADO COUNTY

Date: 23/04/2019

Venue: White Plain

GPS Location: 0316688/0716435

No.	Name	Sex	Occupation	Community role	Mobile Number	Signature
1	Wilson Kamara	m	[illegible]	/	077733075	[signature]
	George Sackie	m	Tow.	D Rum	07768489	[signature]
	Ruben Smith	m			0775722773	[signature]
	Abraham Massa	i			0777292080	[signature]
	David Kollie	M	T.C			
	Moses Thor					
	Fatu Smith					
	Fatu Smith	FM	Farmer	General Town Chief		
	Daniel Cole	M	Teacher	Development Chairman		F.S
	Bedell Torkolon	m	Clergic	Advise	0778814505 / 0777642077	[signature]



	Urich W. Brook	M	Advance Security			
	George B. Amm	m		Commissioner	0778462939	[signature]
	Hawah Lasana	F		Council Chair	0886282138	[signature]
	Geert Van Craeg	M	PM Denys	Citizen	~	H. Lasana
	Frédéric Foucart	M	QSHE DENYS	—	0775681639	[signature]

ANNEX 6: PICTURES

	Picture 1: *Grave identified in December Town GPS Coordinates: (29N UTM 0316073/0716396)*
	Picture 2: *An affected property owner*
	Picture 3: *Charcoal Production activity along the project corridor*

Picture 4:

Sand mining practice by locals within the project area

Picture 5:

Affected grave along ROUTE 2

Picture 6:

LEG ESIA Team with locals

	Picture 1: Consultation with the Commissioner of Harrisburg Township
	Picture 2: Household Interview with Local resident in December Town, Harrisburg Township
	Picture 3: Consultation with the commissioner of White Plains

Farmland observed along the proposed transmission route	***Site Assessment***	***Pile Wood for Charcoal Production A livelihood wood activities for Some PACs***
		
Partial View of Vegetation along the project area	***Slash and burn farming practice by PACs***	***Graveyard located in close proximity to the proposed pipeline route***
		
Partial View of the old pipeline transmission route	***Wayduo Stream located in close proximity to the anticipated project route***	***Site clearing for pipeline passage***
		

Inspection of the anticipated pipeline transmission corridor