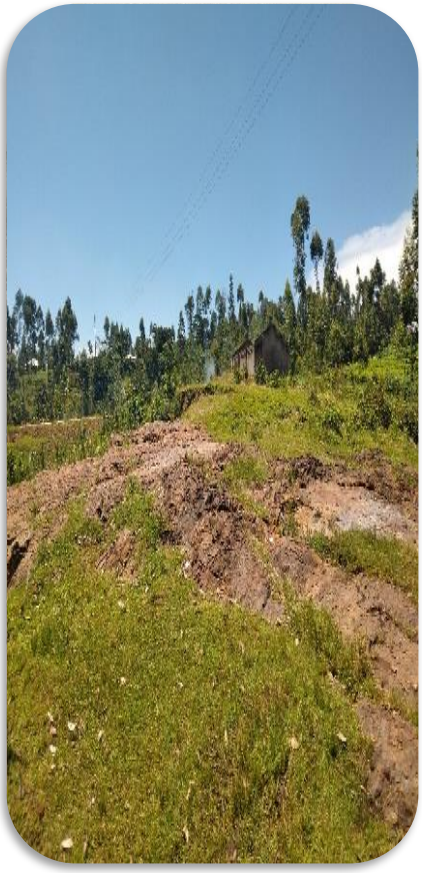
AMATSI WATER SERVICES COMPANY LIMITED

ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED HEDWE DECENTRALIZED WASTEWATER TREATMENT FACILITY (DWTF)



November, 2020

CERTIFICATION

This comprehensive EIA project report for the proposed Hedwe Decentralized Wastewater Treatment Facility is submitted in compliance with principles of sustainable development, Environment Management and Coordination Act (1999) amended 2015 and Environmental Impact Assessment and Audit Regulations (2003) amended 2019 in Legal Notice No. 31 and 32.

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ACKNOWLEDGEMENT

We would like to register our sincere appreciations to all those who made the entire Environmental and Social Impact Assessment (ESIA) study a success. In this regard we would first extend our thanks to the county Government of Vihiga, Department of Environment and Water for the support they gave us during the study period.

Our sincere appreciations finally go to Amatsi water Company Limited, the project proponent for having offered us the chance to carry out this Environmental Impact Assessment and come up with this project report.

LIST OF ABBREVIATIONS

DWF - Dry Weather Flow

DWTF – Decentralized Wastewater Treatment Facility

EIA - Environmental Impact Assessment

EA - Environmental Audit

ESIA - Environmental & Social Impact Assessment

GoK - Government of Kenya

HASP – Health and Safety Plan

IDA - International Development Association

M&E - Mechanical & Electrical

ME& F - Ministry of Environment & Forestry

MoWI – Ministry of Water and Irrigation

NEMA - National Environmental Management Authority

O&M – Operation and Maintenance

PAPs – Project Affected Persons

PPE – Personal Protective Equipment

ToR - Terms of Reference

SoK - Survey of Kenya

UBSUP - Upscale Basic Sanitation for Urban Poor

WB - World Bank

WHO – World Health Organization?

WRA - Water Resources Authority

WSB - Water Services Board

WSP - Water Service Provider

WSS - Water Supply and Sanitation

WSTF - Water Services Trust Fund

WWTP - Waste Water Treatment Plant

NON-TECHNICAL SUMMARY

Introduction

Amatsi Water Supply and Sanitation Company Limited intends to upscale basic sanitation for Mbale Town by constructing Wastewater Treatment Plant (WWTP) along Hedwe river/steam on Part of Plot LR. No.: KKAKAMEGA/KEGOYE/546

The Scope of the consultancy services covers the preparation and submission of ESIA report. The objective of this ESIA Report is to provide information on the current field environmental and socio-economic status, review and refine as necessary the methodology and the Work Plan for undertaking this work.

The ESIA experts relied on designs and information provided by the Amatsi Water Company and Vihiga County Government. This environmental report aims at addressing the basic environmental concerns that are likely to be affected by the project.

Project Justification

Most developing countries are coping with serious environmental problems. In sub-Saharan Africa, meeting basic needs such as sewer collection and treatment system is a major problem. It is worth noting that Vihiga County lacks sewer treatment plant and Mbale town being the county Headquarter requires this system to serve the growing population including the government offices.

The proposed project intends to put up a Decentralized Wastewater Treatment Facility (DWTF) along Hedwe River to Serve Mbale town. Implementation of the project is anticipated to affect certain environmental, sanitation and social settings in the project area. This includes loss of ecological services coupled with increased pollution, vegetation clearance, soil erosion, inappropriate handling of human wastes among others. This report aims at outlining the environmental and socio-economic potential impacts (positive and negative) emanating from the project implementation.

Objectives of ESIA Study

General Objective

The general objective of the ESIA study is to carry out a systematic examination of the present environmental situation within the project area to determine whether the proposed Hedwe Decentralized Wastewater Treatment Facility (DWTF) Project will impact adversely on the physical, biological, social and environmental elements within the project area.

Specific Objectives of the ESIA Study

- To highlight environmental issues of the proposed project with a view to guiding policy makers, planners, stakeholders and government agencies to help them in understanding the implications of the proposed project on environmental elements within the project area;
- To review existing legal institutional, and policy framework relevant to the proposed project;
- To find out impacts associated with implementation of the proposed project with a view to suggesting mitigation measures for the negative impacts;
- To asses and give recommendations on the various mitigation measures to be taken to reduce possible negative impacts on the proposed piece of land for development;
- Analyse occupational health and safety issues associated with the proposed project;
- Facilitating public open meetings for the stakeholders to air their views.
- Identifying and contacting the project stakeholders to seek their views on the proposed project.
- To assess the relative importance of the impacts of alternative plans, design and sites;

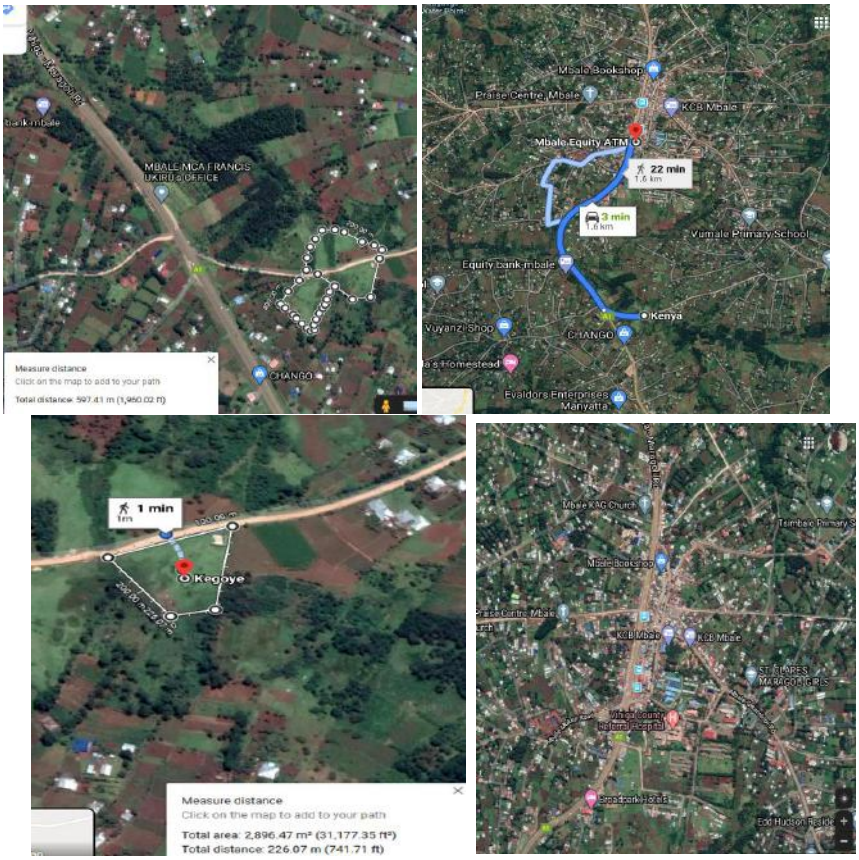
- To generate baseline data for monitoring and evaluation of how well the proposed mitigation measures are being implemented during the project operation period;
- To develop an Environmental and Social Management Plan (ESMP) to guide in decision making and for future auditing;
- To raise stakeholder awareness on potential impacts of the project on the environment with a view to making them understand the implication of the project in their environment;
- To develop an ESIA report in conformity with the EMCA 1999, Environmental (Impact Assessment and Audit) Regulations 2003 and EMCA (amendment) 2019 and legislation under it; and
- Submission of the final EIA report to NEMA and subsequent follow up to obtain relevant authorization/permit in order for the project to commence.

Scope of Works
Construction of Hedwe Wastewater Treatment Facility to serve Mbale Town residents.

Project Area Description

The project area is located off Kakamega-Kisumu road, about 2km from Mbale Police Station towards Majengo market along Hedwe river on the left hand side, at the lower side of Mbale town, in Kegoye Sub-Location, Wamuluma Location, Vihiga Sub-county and Vihiga County. The Hedwe Treatment Plant is located at GPS co-ordinates $0^0$04'26.3"N, $34^0$43'29.5"E (0.073978, 34.724867), on Part of Plot Lr. No. Kakamega/Kegoye/546 along Hedwe River.

Google map showing the location of the proposed project site



Source: Google Map.

Methodology

Following preliminary visits to the project site, the ESIA was commissioned based on documentary review, field assessments and discussions with the project beneficiaries and major stakeholders.

The field assessments involved bio-physical environment including the following activities;

- Reconnaissance visits.
- Review of the proposed project designs.
- Physical investigation of the site.
- Documentary review of the existing project.
- Socio-economic survey

Legal Framework

The ESIA experts have taken into consideration various legal requirements so as to guide the operation of various activities that are carried out on the environment. Section 58 of the EMCA, Cap 387 provides for the proper management of various environmental resources to promote their integrity and that of the people dependent upon them. In addition, there are various international multilateral agreements that seek to promote the wellbeing of the environment key among them the polluter pays principle, the Kyoto protocol, the principal of inter-generational and intra-generational equity that promotes the

sustainability of the environmental resources. Some of the national legal resolutions governing this project include: -

- The Constitution of Kenya
- The Environmental Management and Coordination Act (EMCA) Cap 387
- The Water Act (2016)
- The Environmental (Impact Assessment and Audit) Regulation (LN 101 of June 2003)
- The Conservation of Biological Diversity (BD) Regulations 2006
- Wildlife(Conservation and Management) Act 2013
- The Environmental Management and Co-ordination (Waste Management) Regulations 2006
- The Water Resources Management Rules 2007
- The Environmental Management and Coordination, (Water Quality) Regulations 2006
- The Environmental Management and Co-ordination (Wetlands, River Banks, Lake Shores and Sea shore Management) Regulations 2009
- The Occupational Safety and Health Act, (OSHA) 2007
- The Work Injury Benefits Act (WIBA) 2007 Land Laws (Amendment) Act 2016
- Land Acquisition Act, CAP 295
- The Physical and Land Use Planning Act, 2019
- The Kenya Roads Board Act
- The National Construction Authority (NCA) Act, 2011
- Traffic Act (Cap 403)
- Occupier's Liability Act Cap. 34

Public Participation and Consultations

Public consultations are useful in gathering information from the people most affected by the implementation of project, understanding the likely impacts, determining the local communities' norms, preferences and fears, proposing alternatives and designing viable and sustainable mitigation measures and compensations where due.

Potential Impacts

The project is set to have both positive and negative impacts.

(i) Potential Positive Impacts

The positive impacts associated with the proposed project include the following among others:

- Serving areas with permissible densities which do not have any sewer line***;***
- The proposed activities will avert pollution of the surface and ground water since all waste water will be adequately treated before allowing it to flow to the river.
- The proposed project will cater for projected increase in volume of waste water as a result of increased population in the future.
- Provision of employment opportunities during construction and operation phases. Labour is a must, therefore residents will have ready opportunities which shall boost their daily income.
- The proposed DWTF will protect effluent from polluting surface water given that there is no current measure in place for a number of households for filled up septic tanks and pit latrines in emptying wastes and disposal.
- The proposed project will decentralize wastewater in Mbale town and its environment which will make pollution monitoring easy.
- There shall be improved aesthetic value of the area due to cleaning up of the mess that is currently experienced in storm water drains in the area.
- Sludge from the sludge drying bed is a rich resource that can be utilized by the community around as fertilizers for the farm houses.
- If the DWTF is established, the pollution created by the current practice of wastewater discharge into the river will stop hence reduction in spread of water borne diseases.
- Quality of surface and ground water will improve on public health, and on socio-economic development of the project area, taking into consideration that there will be no discharges of untreated raw sewage into surrounding rivers.
- The public health of the community will be upgraded due to improved standard of wastewater management.

- Enhanced land use; the proposed project will put the land into a more productive use than it is now.
- Generation of revenue for both the County and National government
- Improved security in the area
- Provision of market for building materials
- Development of social amenities

(ii) Potential Negative Impacts

The key potential negative impacts and proposed mitigation measures for the proposed project are summarized in the table below:

Table 1: Summary of Key Negative Impacts and Proposed Mitigation Measures

Impact	Mitigation Measures
Vegetation Cover destruction and loss of biodiversity	• Construction activities will be limited to Project sites/routes which already exist therefore no destruction to vegetation cover
Loss of top soil	• Stock piling of top soil, construction material and wastes should be done only at designated sites approved by the supervising engineer, • Erosion prevention through berming
Waste generation and disposal	• Construction wastes (residual earth, debris and scrap materials) to be removed for safe disposal • Encourage recycling where possible (concrete debris for access road surfacing), • Contaminated organic matter in the work areas to be isolated for safe disposal • Material residuals to be disposed off in accordance with established regulations
Noise and Vibration control from plant and equipment	• The Contractor shall keep noise level within acceptable limits and construction activities shall, where possible, be confined to normal working hours in the residential areas • The Contractor must adhere to Noise Prevention and Control Rules of April 2005
Traffic management on site	• Strict use of warning signage and tapes where the trenches are open & active sites • Employ and train road safety Marshalls who will be responsible for management of traffic on site
Occupational Health and Safety	• Provide construction workers with personal protective gear (gloves, gum boots, overalls and helmets), • Provide temporary toilets and bathrooms for the construction workers at the work site • Provide onsite first aid kit accessible by the workers on need, • Isolate the site for access by the local communities during the construction for their safety and health
Spread of corona virus disease (covid-19)	• Workers should observe World Health Organization (WHO) and Ministry of Health (MoH) Covid-19 protocols

Environmental and Social Management Plan (ESMP)

The ESMP addresses concerns that are likely to arise from the project activities and recommend ways to control or mitigate against these throughout the project cycle. The contractor should prepare work plans for environmental management in line with the proposed ESMP. Amatsi Water will be responsible for reviewing the general work in accordance with the ESMP, coordinating, and monitoring the implementation of the ESMP and preparation of the environmental progress reports in collaboration with NEMA and other stakeholders.

Conclusion and Recommendations

Most of the identified adverse effects associated with the project implementation could be managed through acceptable levels of implementation of the recommended mitigation measures for the project so that the positive impacts outweigh the negative effects.

The proposed project is seen to not only bring about benefits to the local people but also bring opportunities for development in this area. To ensure the long run sustainability of the project after completion, the County government and local stakeholders should work together in addressing the environmental issues, the Contractor and the Consultant must adhere to the mitigation measures recommended under the ESMP to ensure safety of the operators and neighboring communities. Safety rules therefore have to be followed strictly to the later as outlined in the ESMP. Since the proposed DWTF will not require sewer line connections, no displacement is anticipated, the waste will be transported from sources to the plant for treatment by exhausters. The report recommends that Amatsi Water Company through EIA/EA licensed Expert carries out regular annual EA of the project as required by NEMA, avoid discharge of untreated effluent to the river and comply with the requirements of the Environment Management and Coordination (Water Quality) Regulations 2003.

The legislative framework needs to be taken into consideration during and after the project implementation.

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1 INTRODUCTION

Amatsi water Services Company (AWSCO), through the County Government of Vihiga has received funds from Water Sector Trust Fund (WSTF) to Upscale Basic Sanitation for Urban Poor (UBSUP). In this regard, AWASCO has been mandated to construct a Decentralized Wastewater Treatment Facility (DWTF). This ESIA study is therefore meant to fulfill the requirements of EMCA Cap 387.

1.1 The Proposed Project

The proposed project involves construction of a Decentralized Wastewater Treatment Facility (DWTF) along Hedwe River at Kegoye sub-location, Vihiga Sub-County, Vihiga County.

The preferred treatment system, referred to as a Decentralized Wastewater Treatment Facility (DWTF) is a small scale sewerage plant to treat faecal sludge from flush toilets and pit latrines through mechanical and biological treatment. This facility will be receiving sludge exhausted from household toilets carried by exhausters in a hygienic manner and emptied in this facility for subsequent treatment. The treatment is also foreseen to produce manure to complement agricultural efforts on food production.

The project is being fully funded by the Water Sector Trust Fund (WSTF) and implemented by Amatsi Water Services Limited a Water Service Provider (WSP) in Vihiga County at a proposed capital cost of ten million Kenyan shillings (Ksh. 10 million**)**.

The proposed site of the project is Hedwe Tea Farmers' land which has been transferred to the County Government of Vihiga for the proposed development of the DWTF to serve Mbale town.

1.2 Scope of the Services

The scope of work for construction of Hedwe Decentralized Treatment Facility include the following:

- To carry out Environmental and Social Impact Assessment based on the government of Kenya regulations and the World Bank Safeguards Operational policies,
- An assessment of positive and negative impacts,
- Prepare Environmental and Social Management Plan (ESMP).

1.3 Goals and Objectives of the Proposed Project

The main goal of the proposed project is to identify a sound and rational strategy for the development of sewerage services in Mbale town over the next twenty (20) years, that is, up to the year 2040, to improve the quality of effluent to rivers, Lake Victoria and groundwater, and to safeguard the health of the area residents.

The key objective of the proposed Development is to come up with a phased investment programme for immediate plan and recommend a treated effluent disposal / reuse strategy for Mbale Town.

1.4 Objectives of ESIA Study

1.4.1 General Objective

The general objective of the ESIA study is to carry out a systematic examination of the present environmental situation within the project area to determine whether the proposed Hedwe Decentralized Wastewater Treatment Facility (DWTF) Project will impact adversely on the physical, biological, social and environmental elements within the project area.

1.4.2 Specific Objectives of the ESIA Study

- To highlight environmental issues of the proposed project with a view to guiding policy makers, planners, stakeholders and government agencies to help them in understanding the implications of the proposed project on environmental elements within the project area;
- To review existing legal institutional, and policy framework relevant to the proposed project;
- To find out impacts associated with implementation of the proposed project with a view to suggesting mitigation measures for the negative impacts;

- To asses and give recommendations on the various mitigation measures to be taken to reduce possible negative impacts on the proposed piece of land for development;
- Analyse occupational health and safety issues associated with the proposed project;
- Facilitating public open meetings for the stakeholders to air their views.
- Identifying and contacting the project stakeholders to seek their views on the proposed project.
- To assess the relative importance of the impacts of alternative plans, design and sites;
- To generate baseline data for monitoring and evaluation of how well the proposed mitigation measures are being implemented during the project operation period;
- To develop an Environmental and Social Management Plan (ESMP) to guide in decision making and for future auditing;
- To raise stakeholder awareness on potential impacts of the project on the environment with a view to making them understand the implication of the project in their environment;
- To develop an ESIA report in conformity with the EMCA 1999, Environmental (Impact Assessment and Audit) Regulations 2003 and EMCA (amendment) 2019 and legislation under it; and
- Submission of the final EIA report to NEMA and subsequent follow up to obtain relevant authorization/permit in order for the project to commence.

This Study Report, therefore, details the positive and negative effects of the development on the project environment and recommends appropriate environmental and social measures to minimize any undesirable effects resulting from the project.

1.5 Terms of Reference (ToR)

TOR were prepared for submission to NEMA for consideration and approval.
This was done and approval given with Reference number: NEMA/TOR/5/2/166

The following Terms of Reference apply to the project:

- Screening and scoping.
- Establishing the suitability of the proposed location for the proposed DWTF
- Carry out literature review.
- Carry out preliminary fieldwork.
- Undertake detailed fieldwork.
- Carry out baseline investigations and analyses.
- Hold meetings with the project proponent, other project consultants if any, relevant regulatory government bodies, and stakeholders.
- Carry out a systematic environmental assessment at the proposed project site and the surrounding area in line with established standards and laws
- Provide a description of the proposed activities throughout the entire implementation process of the project with a special focus on potential impacts to the surrounding environment and facilities.
- Develop an Environmental Management Plan and cost estimates for the proposed project.
- Produce an Environmental and Social Impact Assessment report that contain among other issues potential negative and positive impacts and recommendation of appropriate mitigation measures to minimize or prevent adverse impacts.

1.6 Methodology

The methodology used in the ESIA Study included the following.

- A site reconnaissance and visual survey to determine the baseline information of the project area.
- Reviewing and analysis of the project documents
- Discussion with the proponent and the other consultants
- Assessment of the site to detail the various existing and likely impacts.
- Assessment of health and safety issues
- Seeking public views through stakeholders' public meetings
- Proposal of mitigation measures to minimize any negative impacts.
- Preparation and submission of study report to NEMA

1.6.1 Screening

Environmental screening was applied at the preliminary stage to determine whether the proposed development required an Environmental Impact Assessment. This was done by writing a summary project report that was submitted to NEMA Vihiga County office with reference number: NEMA/SPR/VHG/5/2/073. After review of the SPR, it was recommended that the proponent undertake a comprehensive environmental assessment and write a comprehensive project report that was submitted to NEMA headquarters with reference number: NEMA/PR/5/2/23796. This report was reviewed and due to the nature of the project, it was recommended that the proponent develop TOR for for approval after which ESIA study be carried and come up with ESIA report for submission to NEMA for issuance of a license. All these was done with reference to the second schedule of EMCA (1999) and Environmental (Impact Assessment and Audit) Regulations, 2003, amended 2019.

1.6.2 Approaches to undertaking the ESIA

This ESIA Project Report has been prepared in accordance with the Environmental (Impact Assessment and Audit) Regulations of 2003. It is also guided by the general principles of green buildings. The study methodology also comprised the following activities:

- Desktop study;
- Field investigations and assessment.

1.6.2.1 Desktop Study

The desktop study involved:

- Preparation of a checklist that consisted of a simple catalogue of environmental factors, which were compared with the activities to be performed;
- Collection and review of baseline data, maps, reports and other relevant information on the existing environmental and social conditions of the project area;
- Review of existing legislation, regulation and policies relevant to the proposed project;
- Review of proposed project engineering designs and construction inputs, including anticipated technical processes.

1.6.2.2 Field investigations

Field investigations involved:

- Site walks within the project area and the neighbouring areas that are within the zone influenced by the project;
- Taking photographs of significant aspects to assist in describing the baseline environmental and social conditions of the project area and its influence zone;
- Taking of the site coordinates and the area elevation.
- Interviews with representatives of relevant key regulatory authorities within the project area and interested and affected parties mainly within the project influence zone;
- Obtaining relevant documents from the authorities such as the County Government, and key authorities within the project influence zone.
- Filling in of the questionnaires to facilitate environmental impact data collection
- The aim of the field investigations was to verify information and data collected during the desktop study and to collect any new information that may have been important in the assessment of impacts and design of mitigation measures.

1.6.2.3 Report Preparation

The ESIA study report was prepared and compiled and a draft report discussed with the proponent. Thereafter, findings of the assessment were discussed amongst the proponent, the project lead consultant and the ESIA experts. This was necessary to appreciate the various responsibilities and modalities of implementing the proposed project. The final report was then prepared and submitted to the proponent for endorsement

1.6.2.4 Report Submission

Besides the report, the prerequisite submission forms were prepared and signed by the proponent and the firm. Copies of the report were submitted for consideration as required by law.

1.7 Potential Impacts

The project has both potential positive and negative impacts.

1.7.1 Potential Positive Impacts

The positive impacts associated with the proposed project include the following among others:

- Serving areas with permissible densities which do not have any sewer line**;**
- The proposed activities will avert pollution of the surface and ground water since all waste water will be adequately treated before allowing it to flow to the river.
- The proposed project will cater for projected increase in volume of waste water as a result of increased population in the future.
- Provision of employment opportunities during construction and operation phases. Labour is a must, therefore residents will have ready opportunities which shall boost their daily income.
- The proposed DWTF will protect effluent from polluting surface water given that there is no current measure in place for a number of households for filled up septic tanks and pit latrines in emptying wastes and disposal.
- The proposed project will decentralize wastewater in Mbale town and its environment which will make pollution monitoring easy.
- There shall be improved aesthetic value of the area due to cleaning up of the mess that is currently experienced in storm water drains in the area.

- Sludge from the sludge drying bed is a rich resource that can be utilized by the community around as fertilizers for the farm houses.
- If the DWTF is established, the pollution created by the current practice of wastewater discharge into the river will stop hence reduction in spread of water borne diseases.
- Quality of surface and ground water will improve on public health, and on socio-economic development of the project area, taking into consideration that there will be no discharges of untreated raw sewage into surrounding rivers.
- The public health of the community will be upgraded due to improved standard of wastewater management.
- Enhanced land use; the proposed project will put the land into a more productive use than it is now.
- Generation of revenue for both the County government and National government
- Improved security in the area
- Provision of market for building materials
- Development of social amenities

1.7.2 Potential Negative Impacts

The following are some of the identified potential negative impacts

- Traffic Congestion on Site
- Related Oil Spills
- Soil Related Impacts
- Impact on Water Resources
- Socio-economic Impacts
- Labor influx and its impact on the social and environmental aspects
- Air Quality
- Construction Noise and vibration
- Biodiversity and Conservation Impacts
- Public Health, Safety, HIV & AIDS Impacts, and Corona virus (Covid-19) pandemic
- Lack of gender balance and equity
- Impacts on Workers' Health and Safety (Accidents and other unforeseen calamities
- Impact of Waste water and sludge
- Impacts on Incomes and Livelihoods
- Impacts on Odour, Flies and Mosquitoes
- Reduction of tree cover/ de-vegetation
- Waste generation
- Increased water demand
- Increased energy consumption

1.8 Public Consultations

Public consultations are critical in conducting an effective ESIA. The Kenyan ESIA Regulations of 2003 recommend that the client seeks the views of persons who may be affected by the project. Public consultations consisted of use of the Project Information Document (PID) and guided interviews.

1.9 Constraints and Limitations

The information presented in this report is by and large consistent with the data and information gathered through the various sources and approaches outlined above. However, just as in any studies, the exercise experienced a number of constraints and as a result, there could be some gaps of information in the report as the consultants could not exhaust the collection of all primary data.

The findings and issues advanced in this report reflect the general views and perceptions of some selected people and stakeholders; they may not cover the specific issues from some unique situations or some individuals affected by the project.

1.10 Estimated Project Cost

The estimated project cost is Kenya Shillings Ten Million (Kshs. 10,000,000).

1.12 ESIA Study Output

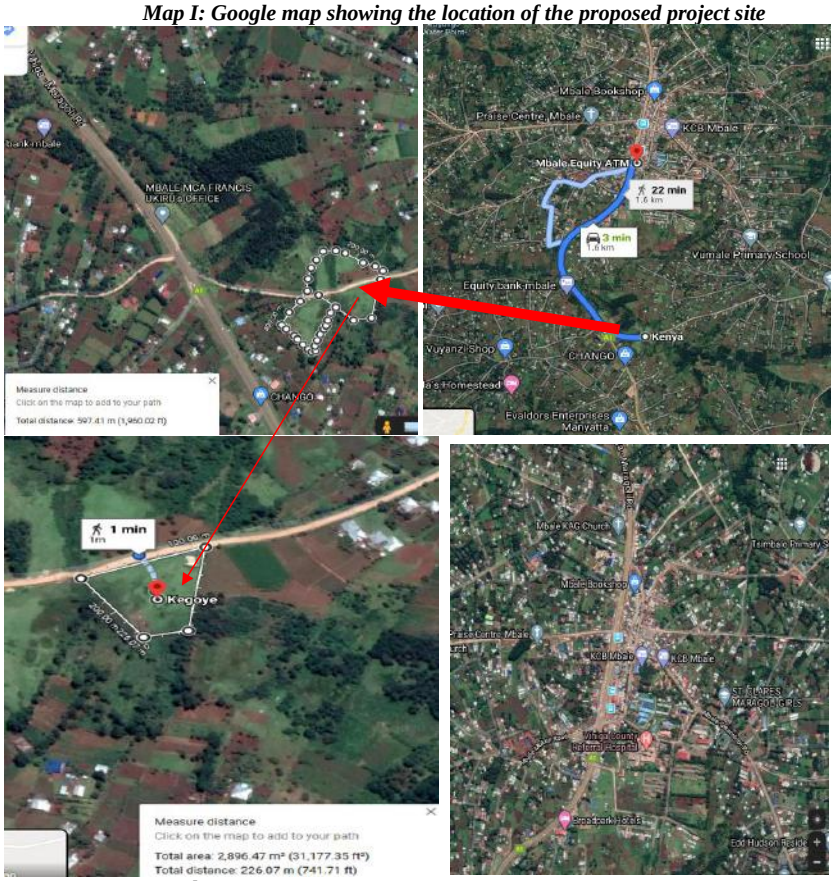
The output of the study will be the production of an ESIA Study report for submission to NEMA for review and subsequent issuance of an EIA license for the proposed project.

2. DESCRIPTION OF THE PROJECT AREA

2.1 Project Location

The project area is located off Kakamega-Kisumu road, about 2km from Mbale Police Station towards Majengo market along Hedwe river on the left hand side, at the lower side of Mbale town, in Kegoye Sub-Location, Wamuluma Location, Vihiga Sub-county and Vihiga County. The Hedwe Treatment Plant is located at GPS co-ordinates $0^{0}04'26.3"N$, $34^{0}43'29.5"E$ (0.073978, 34.724867), on Part of Plot Lr. No. Kakamega/Kegoye/546 along Hedwe River.

Map I: Google map showing the location of the proposed project site



Source: Google Map.

Photo Templates showing the proposed site

Source: Photo taken at the site

2.2 Project Overview

Mbale town is the Headquarter of Vihiga county Government and has attracted a growing number of developments. However, the town is faced with effluent management challenge. In this regard, it was surveyed and it came to a consideration after a lot of consultation with relevant stakeholders that the sanitation and hygiene of the town should meet the required standards.

The County Government of Vihiga recommended to Water Sector Trust Fund the funding of Hedwe Decentralized Wastewater Treatment Facility for Mbale town. The fund is done to Upscale Basic Sanitation for Urban Poor. The project is implemented by Amatsi Water and Sewerage Company (AWASCO) at ten million Kenyan shillings (Ksh. 10,000,000) budget.

Due to limited land space in the county and areas around Mbale town, a small scale sewerage plant to treat faecal sludge from flush toilets and pit latrines through mechanical and biological treatment was seen fit due to the available space at Hedwe. This facility will be receiving sludge exhausted from household toilets carried by exhausters in a hygienic manner for subsequent treatment. The treatment is also foreseen to produce manure to complement agricultural efforts on food production.

Amatsi Water Services Company (AWASCO) will take the full responsibility of compliance with all the relevant regulatory requirements.

2.3 The Physical Environment

2.3.1 Altitude & Climate

The altitude at the proposed project site for the treatment is 1,407 m above sea level. The area enjoys annual rainfall that ranges from 1,000 mm to 1,500 mm. This rainfall is fairly distributed throughout the year with only two months of dry spell (December through February). The two main seasons are the long rains (March through August) and the short rains (September through November). During the rainy seasons, many people in the area entirely depend on harvested rain water for most of their uses. The mean maximum varies from 22 °C in July/ August to 28 °C in March. Diurnal temperature variations are minimal.

The wider western region of Kenya experiences about 2,500 hours of bright sunshine per annum, which is equivalent to annual mean of approximately 6.8 hours of sunshine per day. July and August are characterized by cloudiness and during these months, the average daily sunshine in the region is 4 hours. The area receives Northeast and Southeast monsoons that blow very steadily but without high intensity. Both wind run and mean wind speed are at a maximum in December and remain high during January, February and March coinciding with the dry season and period of higher potential evaporation. Temperature and sunshine factors whose peaks are in March affect evaporation.

2.3.2 Geology, soils and land formation

Rocks in the project area range from early Precambrian to Quaternary. Soils are deep, well drained, red loamy soils derived from sedimentary and ballast rocks. Rocks in the project area range from early Precambrian to Quaternary. There are many granitic formations in other areas within the sub-county. Land at the proposed project site for the treatment is gently sloping. Most parts of the neighbourhood have gentle and steep slopes that are covered by vegetation that helps to prevent loss of soil and soil nutrients through soil erosion and landslides.

2.3.3 Air quality and noise levels

Air quality in the area becomes deteriorated due to the presence of dust particles and vehicle emissions in the air that are accelerated mainly by vehicles moving on Kisumu–Kakamega Road, dry and dusty roads in the rural areas. Other sources are burning of wastes, which also results in unpleasant odour. Market and trading centres such as Mbale, Majengo and Gisambai respectively are likely to suffer from air quality problems due to decomposing wastes that may be resulting from uncollected wastes and exhaust emissions from vehicles. The area has homesteads and farmlands in its neighbourhood and therefore noise standard of 85 dBA (can be transmitted up to less than 30 M) cannot be experienced during the day. However, the proposed project will not be affected by dust and noise.

2.3.4 Water resources and water quality

Due to the high rainfall throughout the year, rivers and springs are perennial. The area has a high potential for groundwater. The average depths of striking water vary depending on the geology of an area. Groundwater as a source of water for domestic and other use is fairly developed and utilized either by hand dug wells or boreholes. Hand dug wells are less reliable since water level varies with season. Boreholes are more reliable where water is struck in deep formation. In the rural areas, people access water mainly from protected springs and Streams such as Hedwe Stream. In the towns such as Mbale, people access water mainly from Amatsi Water Supply and water vendors. Some people harvest and store rain water in their homes. Amatsi Water Supply and boreholes have not been fully exploited due to financial and technical resource constraints. Streams such as Hedwe and tributaries of Itsava River are important sources of water for livestock and crop farming. Such Rivers have polluted water as this could be seen from the brown colour of the water. The pollution results from farming activities in the stream regimes, animals stepping and drinking directly from the streams and from sand harvesting activities in the streams. This calls for adequate treatment of the water before it can become potable. However, it is worth noting that the area has never been polluted from sewage.

Photo template 2: Showing River Hedwe

Source: Photo taken at the site

2.4 Socio-economic information

2.4.1 Population

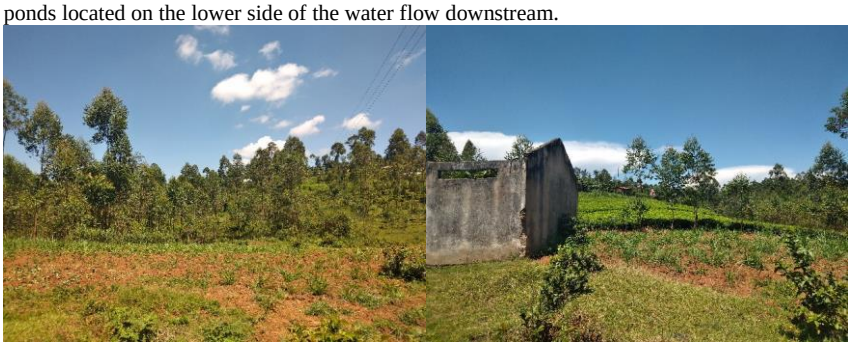
The neighbourhood of the proposed site is moderately populated. It is expected that there are more than 15,000 households within a radius of 5Km from the project area of influence. The entire area is served by either septic tanks or Pit latrines.

2.4.2 Land-use in the neighbourhood

The sites for the proposed development are in rural and sub-urban settings characterized by residential houses, intensive agriculture with crops and livestock, schools and markets. There are small-scale farms under different crops. There are gazetted access roads to the site. There are no ecologically-sensitive environments at the site or in the neighbourhood which can easily be affected by the activities of the proposed development except for the Hedwe river water. Downstream are various activities likely to be impacted on by the proposed development at its operation phase.

2.4.3 Agriculture

Farming is more pronounced in the area. Farmers in the area cultivate a variety of crops including Tea, Maize, sweet potatoes and Vegetables. Animals kept include poultry, cow, sheep and goats. The main cash crop in the area is tea. This is processed at Mudete Tea Factory. Farmers have put in place soil conservation measures including agroforestry that helps to prevent soil erosion. The main challenge to agriculture in the area is land fragmentation and the increasing shift in use of land from agricultural purpose to commercial purpose as the expansion of Mbale Town continue. Adjacent to the site are Fish ponds located on the lower side of the water flow downstream.



2.4.4 Business activities and employment in the area

The common businesses within the neighbourhood of the proposed sites are retail kiosks that mostly sell household goods. In Mbale Town, there are small-scale and medium-scale
business such as supermarkets, Hospitals, Hotels, Petrol Stations and Car Wash, salons, barbershops, food kiosks, retail shops, carpentry shops, motor vehicle repairs, welding, bar and restaurant, Mpesa, and Airtel Money shops. There are financial institutions such as KCB and Equity Bank within Mbale Town. These financial institutions enhance economic activities by offering credit facilities to entrepreneurs. The businesses and financial institutions provide employment opportunities in the area. Other sources of employment are academic and public institutions. Being the County Head quarter, Mbale hosts majority of Government premises.

2.4.5 Physical and social infrastructure

2.4.5.1 Transport and communication

The major road in the area are Kisumu-Kakamega Highway, Stage Maziwa – Kegoye Road. Stage Maziwa – Chambiti Road. Communications excellent for mobile reception from Safaricom, Airtel and Telkom Kenya networks.

Photo Plate 3: Showing the local road passing through the site leading to the highway

2.4.5.2 Electricity and fire safety

Kenya Power Company supplies electricity in the area. However, some institutions have opted to the installation of back-up generators to supplement this supply. CGV has a fire engine that are available to suppress large-scale fire emergencies. Fire management in institutions is ensured by installation of fire extinguishers and marking fire exit points within buildings and fire assembly points outside buildings.

A photo showing power line passing through the site

2.4.6 Health facilities and learning institutions

People in the area access private and public hospitals and clinics, which are found within the area. Vihiga County Teaching and Referral Hospital is located at Mbale and serves as a major hospital in the area. There are a number of learning institutions in the area including schools. Major schools in the area include Chambaiti primary and Secondary Schools, Kegoye Primary and Secondary Schools and other Private schools in Mbale town.

2.4.7 Solid waste management

People in the area manage solid wastes by decomposing and open burning. The County Government provides collection and transportation services. Recycling companies have contracted some people to collect wastes for recycling purposes. Such wastes that are collected for recycling purposes from residential areas include waste plastic bottles and metals. The only dumping site is in Chavakali which has not complied the requirements of EMCA.

2.4.8 Security

The site is located approximately 2 Km from Mbale police station and Mbale prisons There are a number of security firms with operations in the area. Many institutions have fenced their compounds and have

provided them with lockable gates and day and night time guards. Security lighting has been installed in many places to enhance ensure visibility and security at night.

2.4.9 Sewerage and storm water management

The area is not served by any sewer system. Therefore, flash toilets, bathrooms and sinks in buildings are connected to septic tanks and soak pits that are installed by institutions. Pit latrines form major sanitary facilities in the area. Storm drainage channels have been constructed to accommodate excess discharges. Gutters have been installed on many buildings to harvest rainwater and this reduces the amount of surface run-off from the area.

2.5 Biological environment

The ecology of the project area is very rich in flora and fauna diversity and is typical of modified equatorial-type vegetation. The area has both exotic and indigenous plants including trees, grasses, shrubs, forbs and crops. Common tree species include *Eucalyptus spp, Markhamia lutea, Cupressus lusitanica, Bischofia javonica, Spathodea nilotica, Croton megalocarpus* and *Cashuarina equisetifolia*. Fruit trees include *Psidium guajava, Persea americana and Syzygium guminii.* Shrubs include *Lantana camara, Tithonia diversifolia* and *Solanum incanum*. The area residents use trees for a number of purposes depending on the type of tree and setting. Common uses include use as ornamental trees, shade provision, boundary demarcation, fencing, medicinal trees and fruit as well as timber production. There are no wild animals except for, Birds, insects and reptiles.

3 RELEVANT POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 General Overview

According to the Kenya National Environment Action Plan (NEAP, 1994) the Government recognized the negative impacts on ecosystems emanating from industrial, economic and social development programmes that disregarded environmental sustainability. Following this, the establishment of appropriate policies and legal guidelines as well as harmonization of the existing ones have been accomplished and/or are in the process of development. The NEAP process recommended environmental assessments in the country with among the key stakeholders being industrialists, business community and local authorities. This culminated into the development of the Policy on Environment and Development under the Sessional Paper No. 6 of 1999. The development of this project is guided and governed by a number of laws, by-laws and policies.

3.2 Policy Framework

3.2.1 Sessional Paper No. 6 of 1999 on Environment and Sustainable Development

The aim of this policy is to harmonize environmental and development goals so as to ensure sustainability. The paper provides comprehensive guidelines and strategies for government action regarding environment and development. The World Commission on Environment and development (The Bruntland Commission 1987) recommends development that produces no lasting damage to the biosphere and to particular ecosystems. Economic sustainable development is that in which progress towards environmental and social sustainability occurs within available financial resources. Similarly, social sustainable development is development that maintains the cohesion of a society and its ability to help its members to work together to achieve common goals while at the same time meeting individual needs of the members.

3.2.2 Vision 2030

The Kenya Vision 2030 recognizes the importance of development infrastructure as critical for socio-economic transformation. The Infrastructure Sector aspires for a country, and the in near future counties, with infrastructural facilities that meet international standards to make Kenya a globally competitive and prosperous country.

The strategies and measures to be pursued in the medium term include; supporting the development of infrastructure initiatives around flagship projects, strengthening the institutional framework for infrastructure development, raising the efficiency and quality of infrastructure as well as increasing the pace of infrastructure projects so that they are completed as envisaged, protecting the environment as a national asset and conserving it for the benefit of the future generations and the wider international community.

The Kenya Vision 2030 like its predecessor the ERS calls for a considerable shift in the manner in which the country deploys her resources to acquire the necessary capacity and access to infrastructure services in their wealth creation.

3.2.3 Sustainable Development Goals (SDGs)

Under sustainable development Goals, 17 goals we set to be globally achieved by 2030. Under these goals.

Goal number 6: Clean water and Sanitation; the goal here is to ensure access to safe sources and sanitation for all. The goal intends to ensure access to water, sanitation and hygiene as human right is achieved by the year 2030. For this reason, it provides that no waste water resulting from human activities should be discharged into rivers, lakes, or seas without proper treatment. This is meant to reduce water scarcity as result of pollution. Proper water and sanitation is a key foundation for achieving the sustainable development goals.

***Goal Number 11: Sustainable cities and Communities*;** it recognizes the larger populations living in urban areas, to make these urban towns sustainable, safe and clean, water and sanitation facilities are required to be in proper and effective operational conditions.

Goal Number 14: Life Below Water; require sustainable utilization of the world water resources. It recognizes that water bodies are homes to a stunning variety of beautiful creatures, some which are food

to human. Hence protection of water bodies from pollution is key to achievement of the sustainable development.

Goal Number 15: Life on Land: sustainably managed land can be realized by managing forests, combat desertification, reverse and halt land degradation, halt biodiversity loss. With forest cover, livelihoods are improved, biodiversity and ecosystem services are achieved.

3.2.4 Constitution of Kenya 2010.

The Constitution underscores the right of every person to a clean and healthy environment. This includes the right to have the environment protected for the benefit of both present and future generations through legislation and other measures. It also includes the rights to have obligations relating to the environment fulfilled as stipulated in article 69 of the Constitution.
In order to address such obligations, the state shall: -

- ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources and ensure equitable sharing of the accruing benefits;
- protect genetic resources and biological diversity; eliminate processes and activities that are likely to endanger the environment, among other obligations in respect of the environment; and establish systems of environmental impact assessment, environmental audit and monitoring of the environment.

3.2.4.1 Environmental obligations and rights

Article 42 states that every person has the right to a clean and healthy environment, which includes the right; (a) to have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69; and (b) To have obligations relating to the environment fulfilled under Article 70.

Section 43 (d) every person has the right to clean and safe water in adequate quantities; Under Article 69 (1) The State shall —

a) ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
b) Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;
c) Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;
d) Encourage public participation in the management, protection and conservation of the environment;
e) Protect genetic resources and biological diversity;
f) Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;
g) Eliminate processes and activities that are likely to endanger the environment; and
h) Utilize the environment and natural resources for the benefit of the people of Kenya.

(2) Every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

70. (1) If a person alleges that a right to a clean and healthy environment recognized and protected under Article 42 has been, is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress in addition to any other legal remedies that are available in respect to the same matter.

(2) On application under clause (1), the court may make any order, or give any directions, it considers appropriate —

a) to prevent, stop or discontinue any act or omission that is harmful to the environment;
b) To compel any public officer to take measures to prevent or discontinue any act or omission that is harmful to the environment; or
c) To provide compensation for any victim of a violation of the right to a clean and healthy environment.

For the purposes of this Article, an applicant does not have to demonstrate that any person has incurred loss or suffered injury.

3.2.4.2 Classification of land

Under Article 61 (1) all land in Kenya belongs to the people of Kenya collectively as a nation, as communities and as individuals. (2) Land in Kenya is classified as public, community or private.

Under Article 62 (1) Public land is (a) land which at the effective date was unalienated government land as defined by an Act of Parliament in force at the effective date; (b) Land lawfully held, used or occupied by any State organ, except any such land that is occupied by the State organ as lessee under a private lease; (c) Land transferred to the State by way of sale, reversion or surrender; (d) Land in respect of which no individual or community ownership can be established by any legal process; (e) Land in respect of which no heir can be identified by any legal process (f) All minerals and mineral oils as defined by law; (g) government forests other than forests to which Article 63 (2)(d) (i) applies, government game reserves, water catchment areas, national parks, government animal sanctuaries, and specially protected areas; (h) All roads and thoroughfares provided for by an Act of Parliament; (i) All rivers, lakes and other water bodies as defined by an act of parliament; (j) The territorial sea, the exclusive economic zone and the sea bed; (k) The continental shelf; (l) All land between the high and low water marks; (m) Any land not classified as private or community land under this Constitution; and (n) Any other land declared to be public land by an Act of Parliament; (i) in force at the effective date; or (ii) enacted after the effective date.

(4) Public land shall not be disposed of or otherwise used except in terms of an Act of Parliament specifying the nature and terms of that disposal or use.

Section 63 (1) Community land shall vest in and be held by communities identified on the basis of ethnicity, culture or similar community of interest.

(3) Any unregistered community land shall be held in trust by county governments on behalf of the communities for which it is held.

(4) Community land shall not be disposed of or otherwise used except in terms of legislation specifying the nature and extent of the rights of members of each community individually and collectively.

64. Private land consists of; (a) registered land held by any person under any freehold tenure;
(b) Land held by any person under leasehold tenure; and
(c) Any other land declared private land under an Act of Parliament.

3.2.5 National Policy on Water Resources Management

This policy requires that development projects be subjected to comprehensive EIAs that will provide suitable measures to be taken to ensure environmental resources and people's health in the immediate neighborhood and further downstream are not negatively impacted.

The project will require water in all its extents and in large amount for construction purposes. This policy will ensure the water being utilized is discharged into the receiving water body or system in accordance with the regulation without adverse effects to the surrounding environment. Care should be taken during refilling, collecting and disposing liquid wastes. In relation to this, the National Policy on Water Resources Management and Development (Sessional Paper No. 1 of 1999) was established with an objective to preserve, conserve and protect available water resources and allocate them in a sustainable, rational and economic way. It also desires to supply water of good quality and in sufficient quantities to meet the various water needs while ensuring safe disposal of wastewater and environmental protection.

The policy focuses on streamlining provision of water for domestic use, agriculture, livestock development and industrial utilization with a view to realizing the goals of the Millennium Development Goals (MDGs) as well as Vision 2030.

3.3 Legal Framework

Kenya has approximately 77 statutes that relate to environmental concerns. Most of these statutes are sector specific, covering issues such as public health; soil erosion; protected areas; endangered species; water rights and water quality; air quality, noise and vibration; cultural, historical, scientific and archaeological sites; land use; resettlement; etc.

The key national laws that govern the management of environmental resources in the country are briefly discussed below. It is noteworthy that wherever any of the laws contradict each other, the Environmental Management and Co-ordination Act (EMCA) Cap 387 prevails.

3.3.1 The Environmental Management and Co-ordination Act (EMCA) Cap 387 and Related Regulations

The most pertinent and overriding statute that will be evoked is the Environmental Management and Coordination Act (EMCA) Cap 387. EMCA was enacted to harmonize environmental legislation previously scattered among 77 national laws. As the principal environmental legislation in Kenya, EMCA sets the legal framework for environmental management basically as follows:

Requirement for Environmental Impact Assessments for all new projects

Section 58 of EMCA requires that an Environmental Impact Assessment (EIA) study precede all development activities proposed to be implemented in Kenya. The Act further requires that EIA studies so designed, be executed in accordance with the Guidelines for Conduct of EIAs and Environmental Audits (Kenya Gazette Supplement No. 56 of 13th June 2003) as published by the National Environmental Management Authority (NEMA). It is for this reason that AMATSI instructed the consultant to carry out an environmental and social impact assessment on the project. *It is the responsibility of AMATSI ensures that for all proposed projects an environmental and social impact assessment is carried out in accordance with the requirements of EMCA Cap 387* and comply with the recommendations given by NEMA.

3.3.2 Environmental Impact Assessment and Audit Regulations 2003, Amended 2019 in Legal Notice No. 31 and 32.

These regulations stipulate how an EIA should be done and specify all the requirements. It highlights stages to be followed, information to be made available, role of every stakeholder and rules to observe during the whole EIA process. The proposed project must be constructed and operated based on these regulations. It should 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.

3.3.3 Environmental Management and Coordination Act (Water Quality Regulations), 2006 (Legal Notice 121)

Parts II, Sections 4 – 5 of these regulations as well as Part V Section 24 are of relevance to the proposed project. Section 4 states that "*Every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution*". Part V Section 24 states that "No person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive wastes, or other pollutants or permit any person to dump or discharge any such matter into water meant for fisheries, wildlife, recreational purposes or any other uses."

These Regulations provide for the protection of riparian reserves and state that "*No person shall undertake any development activity within full width of a river or a stream to a minimum of six meters and a maximum of thirty meters on either side based on the highest recorded flood leve*l."

The regulations also provide Guidelines/standards for various aspects such as water quality for discharge into the environment, water for recreating purposes, and drinking water. They also provide monitoring schedules and parameters for the same.

3.3.4 Environmental Management and Coordination Act (Waste Management Regulations), 2006 (Legal Notice 121)

The immediate relevance to proposed project is Part II, Sections 4 (1-2), 5 and 6. Section 4

(1) States that '*No person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.*' Sections 4

(2) and 6 explains that the waste generator must collect, segregate (hazardous waste from non-hazardous) and dispose waste in such a facility that shall be provided by the relevant local authority. Section 5 provides methods of cleaner production (so as to minimize waste generation) which includes the improvement of production processes through: conserving raw materials and energy.

3.3.5 Environmental Management and Coordination Act (Noise and Excessive Vibration Pollution Control Regulations, 2009)

Part II section 3 (I) of these Regulations states that: no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment and section 3 (2) states that in determining whether noise is loud, unreasonable, unnecessary or unusual.

The following factors may be considered;

- time of the day;
- proximity to residential area;
- whether the noise is recurrent, intermittent or constant;
- the level and intensity of the noise;
- whether the noise has been enhanced in level or range by any type of electronic or mechanical means and;
- whether the noise can be controlled without much effort or expense to the person making the noise.

Part II Section 4 states, "*Except as otherwise provided in these Regulations, no person shall (a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source*."

Part III, Section 11 (1) states that "*any person wishing to (a) operate or repair any machinery, motor vehicle, construction equipment or other equipment, pump, fan, air-conditioning apparatus or similar mechanical device; or (b) engage in any commercial or industrial activity, which is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels prescribed in the First Schedule to these Regulations. Any person who contravenes this Regulation commits an offence".*

Section 13 (1) states that '*except for the purposes specified in Sub-Regulation (2) hereunder, no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations.'* These purposes include emergencies, those of a domestic nature and/or public utility construction.

Section 14 relates to noise, excessive vibrations from construction, demolition, mining or quarrying sites, and states, '*where defined work of construction, demolition, mining or quarrying is to be carried out in an area, the Authority may impose requirements on how the work is to be carried out including but not limited to requirements regarding (a) machinery that may be used, and (b) the permitted levels of noise as stipulated in the Second and Third Schedules to these Regulations.'*

3.3.6 Environmental Management and Coordination (Air Quality) Regulations, 2014

The objective of these Regulations is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The general prohibitions state that no person shall cause the emission of air pollutants listed under First Schedule (Priority air pollutants) to exceed the ambient air quality levels as required stipulated under the provisions of the Seventh Schedule (Emission limits for controlled and non-controlled facilities) and Second Schedule (Ambient air quality tolerance limits).

3.3.7 The Water Act of 2016

The Act Prohibits pollution of water resources, section 15 and 58 prohibits the discharge of waste water into water resources. Section 108 of the Act prevents a license holder from polluting or degrading water resources within the license jurisdiction. Section 143 of the act prevents the discharge of effluent into

water resources in such a way that it causes pollution in the resource. Any licensee or person that pollutes the water resources is required to clean up or make good any harm identified in the order which was caused to any water resource by reason of the contravention or to remove or destroy any works, plant or machinery employed for the purposes of the contravention. Failure to clean or make good, the Water Resource Authority, Water Services Regulatory Board (Institutions established under the Act) or County Government shall take the necessary remedies to mitigate the pollution and recover the expenses through an application to the tribunal as stipulated in section 143. AMATSI Water is therefore expected to prevent pollution of the water resources and if it occurs, the company should undertake the necessary measures to mitigate the harm caused.

3.3.8 Water Rules 2002

One of the outcomes of the water sector reforms has been improved regulatory framework for water resource management and use. In addition to the Water Act 2002, the main document outlining the regulations is the Water Resource Management Rules 2005. The rules set out the procedures for obtaining water use permits and the conditions placed on permit holders.

Other sections within the rules imply that Water Resources Management Authority (WRMA) can impose water quality sampling requirements on MoWI from the water sources and impacts to the hydrology, water chemistry and river morphology downstream basin. Approval by WRMA is conferred through a Water Permit. A permit is valid for five years and must be renewed. CWSB will need to obtain a water permit for the sources from WRMA for the intended use.

Section 104 of the Water Resource Management Rules requires certain water permit holders to pay water use charges. The intention of the water use charges was to raise revenue for water resource management, raise revenue for catchment conservation activities, improve efficiency of water resource abstraction and provide a system of data collection on water resource usage.

It sets the standard procedures and rules to be followed in the utilization of water resources including abstraction controls, modes of use and responsibilities in protection of the resources, including effluent treatment standards. MoWI has a direct duty in complying with this law.

3.3.9 Land amendment laws 2016

An Act of Parliament to amend the laws relating to land to align them with the Constitution, to give effect to Articles 68(c)(i) and 67(2)(e) of the Constitution, to provide for procedures on evictions from land, and for connected purposes. It vests the responsibility to come up with land registration units with the Cabinet Secretary and not the National Land Commission (the Commission). The Cabinet Secretary is however required to consult with the Commission and the respective County Government in performing this task.

The Cabinet Secretary has been granted the power to provide policy direction regarding all classes of land in consultation with the National Land Commission (the Commission) where appropriate; the power to provide to coordinate the development and implementation of a National Land Information System in collaboration with the Commission, and the power to administer and undertake all dealings including registration of private land interests subject to the provisions on compulsory acquisition. The Cabinet Secretary is now empowered to publish guidelines on the penalties for noncompliance with the provisions of Constitution and the respective legislation.

A. Measures to facilitate the access, use and co- management of forests, water and other resources by communities who have customary rights to these recourses;
B. Procedures for the registration of natural resources in an appropriate register;
C. Procedures on the involvement of stakeholders in the management and utilization of land- based natural resources; and
D. Measures to ensure benefit sharing to the affected communities.

3.3.10 Land registration under land act, 2012

Under section 5 (1) of the land act, 2012 there shall be the following forms of land tenure-

a. Freehold;
b. Leasehold;
c. Such forms of partial interest as may be defined under this Act and other law, including but not limited to easements; and
d. Customary land rights, where consistent with the Constitution.

(2) There shall be equal recognition and enforcement of land rights arising under all tenure systems and non-discrimination in ownership of, and access to land under all tenure systems. Title to land may be acquired through;

(a) Allocation;
(b) Land adjudication process;
(c) Compulsory acquisition;
(d) Prescription;
(e) Settlement programs;
(f) Transmissions;
(g) Transfers;
(h) long term leases exceeding twenty-one years created out of private land; or
(i) Any other manner prescribed in an Act of Parliament.

Under section 8 (a), the Land Commission shall identify public land, prepare and keep a database of all public land, which shall be geo-referenced and authenticated by the statutory body responsible for survey; (d) May require the land to be used for specified purposes and subject to such conditions, covenants, encumbrances or reservations as are specified in the relevant order or other instrument.

Section 9 (1) states that any land may be converted from one category to another in accordance with the provisions of this Act or any other written law. (2) Without prejudice to the generality of subsection (1); (a) Public land may be converted to private land by alienation; (b) Subject to public needs or in the interest of defense, public safety, public order, public morality, public health, or land use planning, public land may be converted to community land; (c) Private land may be converted to public land by;

i. Compulsory acquisition;
ii. Reversion of leasehold interest to Government after the expiry of a lease; and Transfers; or
iii. Surrender.

(d) Community land may be converted to either private or public land in accordance with the law relating to community land Act 2016 enacted pursuant to Article 63(5) of the Constitution.

(2) Any substantial transaction involving the conversion of public land to private land shall require approval by the National Assembly or county assembly as the case may be.

Reservation of public land for a purpose in the public interest is still being carried out by the Commission. The Commission is however now required to do any such reservation upon the request by the National or County Government. The Land Act now also provides that such an allocation does not prevent the reserved land from being allocated or developed.

The Act has abolished the Land Compensation Fund. The object and purpose of the abolished fund was to provide compensation to any person who, as a result of the implementation of any of the provisions of the Land Act by the National Government or County Government suffered any loss or deprivation or diminution of any rights or interests in land or any injurious affection in respect of any ownership of land.

3.3.11 Land Act, No. 6 of 2012

Under section 19. (1) The Commission shall make rules and regulations for the sustainable conservation of land based natural resources. (2) Without limiting what the Commission may prescribe under subsection (1), the rules and regulations may contain;

(a) Measures to protect critical ecosystems and habitats;

(b) Incentives for communities and individuals to invest in income generating natural resource conservation programmes;

3.3.12 Land acquisition under land acts 2012

Under section 110 (1) of Land Acts 2012 Land may be acquired compulsorily under this Part if the Commission certifies, in writing, that the land is required for public purposes or in the public interest as related to and necessary for fulfillment of the stated public purpose.

Part 2 of this section states that if, after land has been compulsorily acquired the public purpose or interest justifying the compulsory acquisition fails or ceases, the Commission may offer the original owners or their successors in title pre- emptive rights to re-acquire the land, upon restitution to the acquiring authority the full amount paid as compensation.

Section 111 (1) states that if land is acquired compulsorily under this Act, just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. The commission shall make rules to regulate the assessment of just compensation.

Likewise where land is acquired compulsorily, full compensation shall be paid promptly to all persons affected in accordance to section 113 (1). (2) Subject to Article 40 (2) of the Constitution and section 122 and 128 of this Act, an award-

(a) Shall be final and conclusive evidence of-
- ❖ The size of the land to be acquired;
- ❖ The value, in the opinion of the Commission, of the land;
- ❖ The amount of the compensation payable, whether the persons interested in the land have or have not appeared at the inquiry; and

(b) Shall not be invalidated by reason only of a discrepancy which may thereafter be found to exist between the area specified in the award and the actual area of the land.

Section 124 of the Act allows for the temporary acquisition of land for public purpose or public interest; or for, the possession of the land is necessary in the interests of defense, public safety, public order, public morality, public health, urban planning, or the development or utilization of any property in such manner as to promote the public benefit; for utilization in promotion of the public good for periods not exceeding 5 years. At the expiry of the period, the Commissioner of Land shall vacate the land and undertake to restore the land to the conditions it was before as per section 125. The compensation to be paid under section 120 shall be limited to the damage done to trees, plants, growing crops and permanent improvements on the land, together with a periodical sum for diminution in the profits of the land and of adjoining land by reason of that use.

148. (1) Subject to the provisions of this section, compensation shall be payable to any person for the use of land, of which the person is in lawful or actual occupation, as a communal right of way and, with respect to a way leave, in addition to any compensation for the use of land for any damage suffered in respect of trees crops and buildings as shall, in cases of private land, be based on the value of the land as determined by a qualified valuer.

(2) Compensation relating to a way leave or communal right of way shall not be paid to a public body unless there is a demonstrable interference of the use of the land by that public body.

(3) Damage caused as a result of the creation of a way leave shall include any preliminary work undertaken in connection with surveying or determining the route of that way leave, and whether the trees, crops or buildings so damaged were included in the route of the way leave as delineated in the order of the Cabinet Secretary.

(4) The duty to pay compensation payable under this section shall lie with the State Department, county government, public authority or corporate body that applied for the public right of way and that duty shall be complied with promptly.

(5) If the person entitled to compensation under this section and the body under a duty to pay that compensation are unable to agree on the amount or method of payment of that compensation or if the person entitled to compensation is dissatisfied with the time taken to pay compensation, to make, negotiate or process an offer of compensation, that person may apply to the Court to determine the

amount and method of payment of compensation and the Court in making any award may, make any additional costs and inconvenience incurred by the person entitled to compensation .

(6) The Commission shall make Regulations prescribing the criteria to be applied in the payment of compensation under this section and to give effect to this section.

3.3.13 The Surveys Act Cap 299

This is an act of parliament that make provisions in relation to surveys and geographical names and the licensing of land surveyors. Surveyors shall carry out surveying in a manner as to ensure that surveys accords in all respect with the provisions of this Act and regulations made thereunder and shall be responsible for correctness and completeness of every survey carried out by them or under their supervision. Boundaries and bench marks for any land or holding should be shown on the map.

3.3.14 The Public Roads and Roads Access Act (Cap 399)
This is an Act of parliament that provides for public travel and access. The Act provide for the establishment, powers and functions of the Kenya Roads Board. The Board is established to oversee the road network and thereby coordinate its development, rehabilitation and maintenance including advising the Government on all matters related thereto.

During the construction phase, roads in the area, both tarmac and all weather will experience heavy traffic due to the presence of construction vehicles ferrying construction materials to the site. This therefore calls for proper maintenance of routes within the project area that are likely to experience this.

3.3.15 The Public Health Act Cap 24
The Public Health Act is the principal instrument for ensuring health and safety of the people. Its core functions include the prevention of disease, treatment and care of the sick (curative services) and control of nuisance. The Act therefore makes regulations and lays standards for a healthy living environment. It specifically deals with building, sanitation; refuse disposal, water quality for human and industrial use, vector control and Part IX section 115 of the Act states that no person/institution shall cause a nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires Local Authorities to take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 and include nuisances caused by accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin.

The project management and the contractor should emphasize on health and safety of the workers and the community at large during and after construction of the project. During construction, safety should be ensured to avoid unnecessary accidents. Skilled man power should be engaged to operate as well as maintained the machines.

3.3.16 The Physical and Land Use Planning Act, 2019
The **Physical and Land Use Planning** Act was enacted in 2019 to repeal the Cap 286 of 1996 which has been operational since 1998. The Act provides for the preparation and implementation of physical development plans and other related purposes. Its provisions apply to all parts of the country except such areas as the Minister may specify. Thus the Act directs, regulates and harmonizes development and use of land all over the country. In addition, the Act provides a vital link with the Environmental Management and Co-ordination Act.

Section 24 of the Act gives provision for the development of County physical development plan for guiding and coordinating development of infrastructure facilities and services within the area of authority of a county, municipal or town council and for specific control of the use and development of land.

Section 29 of physical Planning Act gives County government powers to prohibit and control the use of land, building, and subdivision of land, in the interest of proper and orderly development of its area. The same section also allows them to approve all development applications and grant development permissions as well as to ensure the proper execution and implications of approved physical development plans. On zoning, the act empowers them to formulate by-laws in respect of use and density of development.

Section 30 of the Act states that any person who carries out development within the county without development approval from the county Physical and Land Use Planning committee shall be guilty of an offence and the development shall be invalid. The Act also gives the County Government power to compel the developer to restore the land on which such development has taken place to its original conditions within a period of ninety days. If no action is taken, then the county government will restore the land and recover the cost incurred thereto from the developer. In addition, the same section also states that no person shall carry out development within the area of a local authority without development permission granted by the local authority.

The Act provides for the participation of the communities in the planning of their areas and accords people affected the right of appeal against adverse decisions of planning authorities. The farmers in the project area have an opportunity to plan and utilize their plots based on the advice from agro-economist and the extension officers.

It is the responsibility of **Amatsi Water and Sanitation Company** to ensure the proposed development is approved by the county Physical Planning and land use committee and public consultation before commencement of any activities at the site.

3.3.17 The County Government Act (Cap 265)

Sections 163 allows County Governments to prohibit all business, which may be or become a source of danger, discomfort, or annoyance due to their noxious nature through smoke, fumes, dust, noise, or vibrations. Section 165 allows the local authority to refuse to grant or renew any license which is empowered in this act or any other written law on the grounds that the activity does not conform to the requirements of any by-laws in force in the area of such local authority the granting of the license would be contrary to the public interest.

Section 170, allows the right of access to private property at all times by local authorities, its officers and servants for purposes of inspection, maintenance and alteration or repairs.

3.3.18 The Occupational Health and Safety Act, 2007

This is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, and provides for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act applies to all workplaces where any person is at work, whether temporarily or permanently. The Act seeks to secure the safety, health and welfare of persons at work and to protect persons other than persons at work against risks to safety and health arising out of, or in connection with, the activities of persons.

Part 9 states that the occupier or employer shall establish a health and safety committee where twenty or more people are employed and such an employee shall prepare a written statement of his general policy with respect to the safety and health at the work place. Further, the occupier shall prepare annual safety and health audits by a qualified person.

3.3.19 Limitations of Actions Act Cap 22

This Act provides for recognition of squatters and the conditions under which they would have rights for compensation for loss of land. If squatters have been in occupation of private land for over twelve (12) years, then they would have acquired rights as adverse possessors of that land as provided under the Limitation of Actions Act, Section 7. In case of any such incidents the proponent will undertake a survey and develop a Resettlement Action Plan (RAP) for those who will be affected by the proposed project.

The Proponent shall adhere to the requirements of the Act in dealing with any squatters that will be displaced by the proposed project.

3.3.20 The Building Code 2000

This by-law recognizes the Local authorities as the leading planning agencies. It compels the potential developer to submit development application for the approval. The local authorities are hence empowered to approve or disapprove any plans if they do or don't comply with the law respectively.

Any developer who intends to erect a building as herein proposed must give the respective County authority a notice of inspection before the erection of the structure. On completion of the structure, a notice of completion shall be issued by the local authority to facilitate final inspection and approval. No person therefore shall occupy a building whose certificate of completion has not been issued by the local authority.

Section 194 requires that where a sewer exists, the occupants of the nearby premises shall apply to the local authority for a permit to connect to the sewer line and that all wastewater must be discharged into the sewers. The code also prohibits construction of structures or buildings on sewer lines.

3.3.21 Environmental Management and Co-ordination (Conservation of Biological Diversity (BD)) Regulations 2006

These regulations are described in Legal Notice No. 160 of the Kenya Gazette Supplement No. 84 of December 2006. These Regulations apply to conservation of biodiversity which includes Conservation of threatened species, Inventory and monitoring of BD and protection of environmentally significant areas, access to genetic resources, benefit sharing and offences and penalties.

3.3.22 The Environmental Management and Co-ordination (Wetlands, River Banks, Lake Shores and Sea shore Management) Regulations 2009

This legislation lays emphasis on management of wetlands resources, river banks, lake shores and sea shores. The legislations provide guidelines for conservation and sustainable use of the wetlands and to promote their integrity on any project taking place on the environment. The current project when in operation will collect more water from Hedwe stream which may reduce water running downstream. It is important this legislation is clearly adhered to during the planning, construction and operation of the project.

3.3.23 The Factories and Other Places of Work (Noise Prevention and Control) Rules L.N 25 Of 2005

The subsidiary legislations make a provision for the noise levels that a worker should be subjected to at the workplace. Further, the Act provides for Noise prevention program where noise levels exceed 85 dB (A). The construction phase of the project will involve the use some noisy machines and equipment. This legislation therefore seeks to guard against harmful exposure of excessive noise levels.

3.3.24 The Work Injury Benefits Act (WIBA) 2007

This is an Act of Parliament to provide for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes. The Act provides for compensation to employees for work related injuries and diseases contracted in the course of their employment. Employees are compensated for the loss of their wage earning capacity in the work at which they were employed at the time of accident. The workers face several challenges to their health, safety and security from the equipment they use daily. The proposed activities should therefore integrate the relevant provisions while the project takes place.

3.3.25 The National Construction Authority (NCA) Act, 2011

This act was assented on 2nd December, 2011 and came into effect on 8th June 2012. The Act provides for the establishment, powers and functions of the NCA and for connected purposes. The Act is expected to bring sanity to the construction industry in Kenya by addressing the flaws experienced in the old order. The National Construction Authority is mandated to oversee the construction industry and coordinate its development.

The NCA will among other things: - i). Accredit and register contractors and regulate their professional undertakings, ii). Accredit and certify skilled construction workers and construction site supervisors, iii). Develop and publish a code of conduct for the construction industry, iv). Promote and ensure quality assurance in the construction industry, v). Encourage the standardization and improvement of construction techniques and materials. The act requires people carrying out the business of a contractor to be registered under the act. The Act clearly spells out the requirements for registration as a contractor; it defines the meaning of the term contractor as a person that carries on business as a contractor where such person, for reward or other valuable consideration, undertakes the construction, installation or erection, for any other person, of any structure situated below, on or above the ground, or other work connected therewith, or the execution, for any other person, of any alteration or otherwise to any structure or other work connected therewith, and undertakes to supply materials

It is the responsibility of the proponent to contract a registered contractor and ensure the construction site is registered by NCA. In the proposed project the contractor is expected to adhere to all the provisions of this Act in the entire project cycle and especially during the construction of the WWTP and pipe lines.

3.3.26 The HIV and AIDS Prevention and Control Act

This Act commenced in March of 2009. It is an Act of Parliament to provide measures for the prevention, management and control of HIV and AIDS, to provide for the protection and promotion of public health and for the appropriate treatment, counseling, support and care of persons infected or at risk of HIV and AIDS infection, and for connected purposes. The object and purpose of this Act is to :-

(a) Promote public awareness about the causes, modes of transmission, consequences, means of prevention and control of HIV and AIDS;

(b) Extend to every person suspected or known to be infected with HIV and AIDS full protection of his human rights and civil liberties

3.3.27The Sexual Offences Act 2014

An Act of Parliament to make provision about sexual offences, their definition, prevention and the protection of all persons from harm from unlawful sexual acts, and for connected purposes. Section 7 outlines the charges for compulsion or inducement of indecent acts. Section 11 defines the charges of engaging in indecent acts with a child or adult. Section 24 outlines sexual offences relating to positions of authority and persons in position of trust

3.3.28 People with Living Disability Act, 2012

An Act of Parliament to provide for the rights and rehabilitation of persons with disabilities; to achieve equalization of opportunities for persons with disabilities; to establish the National Council for Persons with Disabilities. Part III of the act outlines the rights and privileges of persons with disabilities Section 12 on employment states that:

i) No person shall deny a person with a disability access to opportunities for suitable employment.

ii) A qualified employee with a disability shall be subject to the same terms and conditions of employment and the same compensation, privileges, benefits, fringe benefits, incentives or allowances as qualified able-bodied employees.

3.3.29 The National Environmental Sanitation and Hygiene Policy-July 2007

The Policy is devoted to environmental sanitation and hygiene in Kenya as a major contribution to the dignity, health, welfare, social well-being and prosperity of all Kenyan residents. The Policy recognizes that healthy and hygienic behaviour and practices begin with the individual. The implementation of the Policy will greatly increase the demand for sanitation, hygiene, food safety, improved housing, use of safe drinking water, waste management, and vector control at the household level and encourage communities to take responsibility for improving the sanitary conditions of their immediate environment. Implementing the Project will directly contribute to achievement of the Policy.

3.3.30 National Gender and Equality Commission Act 2011
The over-arching goal for NGEC is to contribute to the reduction of gender inequalities and the discrimination against all; women, men, persons with disabilities, the youth, children, the elderly, minorities and marginalized communities. This Act will be applied during hiring of workforce on site.

3.3.31 Wastewater Guidelines
Part of the project reporting involves a review of the environmental standards that provides a basis for monitoring and future audits. The table 4 below presents recommended guidelines on waste water quality for discharge into the public sewers and open water bodies.

Table 3.1: Recommended Guidelines on Waste Water Quality

Parameter	**Discharge in public Sewer**	**Discharge into Environment**
PH	6.0 – 9.0	6.0 – 9.0
BOD5 (20oC)	500	20
COD	1000	50
Suspended Solids	500	30
Detergents	30	Nil
Heavy metals(combined)	1	0.1
Oils/Grease	50	Nil
Nitrates (TN)	20	10
Phosphates (TP)	30	5
Conductivity	-	1500 us/cm
4hr PV Value	No limits	20
Faecal Coliforms Sulphates	No limits -	1000/100ml for large water bodies, otherwise <10/ml) 500
Dissolved Oxygen	No limits	2
Phenols	-	2
Cyanides	-	0.1
Chlorides	-	1000

PCB	-	0.003
Colour	No limits	5 Hazen Units
Odour	No limits	Not objectionable

3.3.32 Code of conduct and good practice

Waste water and faecal sludge operations is a professional occupation that requires education, training and experience. In this profession, staff involved in the operation of a DTF must be dedicated to the protection of public health and act skilfully and conscientiously. DTF Operators have a direct impact on the environment, the preservation and protection of which affects the quality of life for all residents.

DTF Operators, in fulfilment of their professional duties, shall:

Hold paramount the health and welfare of the public. Follow all procedures and guidelines designed to prevent pollution from occurring, strive to increase public knowledge of the faecal sludge and wastewater treatment field and its importance by leading tours of the DTF

Protect the property and the environment. Properly and conscientiously operate and maintain the DTF, Strive to maintain the aesthetic of the environment in and around the facilities

Properly and accurately complete required records be objective and trustful in data collection and reporting Acknowledge errors and do not distort or alter the facts

Follow and comply with the county and government rules and regulation. Be familiar with all details of the permit requirements that apply to the DTF and understand the consequences of violations caused by inaction or negligence

Follow health and safety measures and ensure best possible service. Always consider your personal safety, the safety of the fellow workers and that of any other person present at the DTF site while performing your duty Endeavour to increase your knowledge and skills through continuing education activities

Avoid unprofessional practices and act honourably, responsibly, ethically and lawfully so as to enhance the reputation of the profession. Accept personal responsibility for your professional actions. Do not untruthfully criticize the Water Service Provider and/or other colleagues so as to injure professional reputation or employment

4 PROJECT DESCRIPTION

4.1 The Proposed Project

The proposed project involves construction of a Decentralized Wastewater Treatment Facility (DWTF) along Hedwe River at Kegoye sub-location, Vihiga Sub-County, Vihiga.

The preferred treatment system, referred to as a Decentralized Wastewater Treatment Facility (DWTF) is a small scale sewerage plant to treat faecal sludge from flush toilets and pit latrines through mechanical and biological treatment. This facility will be receiving sludge exhausted from household toilets carried by exhausters in a hygienic manner and emptied in this facility for subsequent treatment. The treatment is also foreseen to produce manure to complement agricultural efforts on food production.

The project is being fully funded by the Water Sector Trust Fund (WSTF) and implemented by Amatsi Water Services Limited a Water Service Provider (WSP) in Vihiga County at a proposed capital cost of ten million Kenyan shillings (Ksh. 10 million**)**.

The proposed site of the project is Hedwe Tea Farmers' land which has been transferred to the County Government of Vihiga for the proposed development of the DWTF to serve Mbale town.

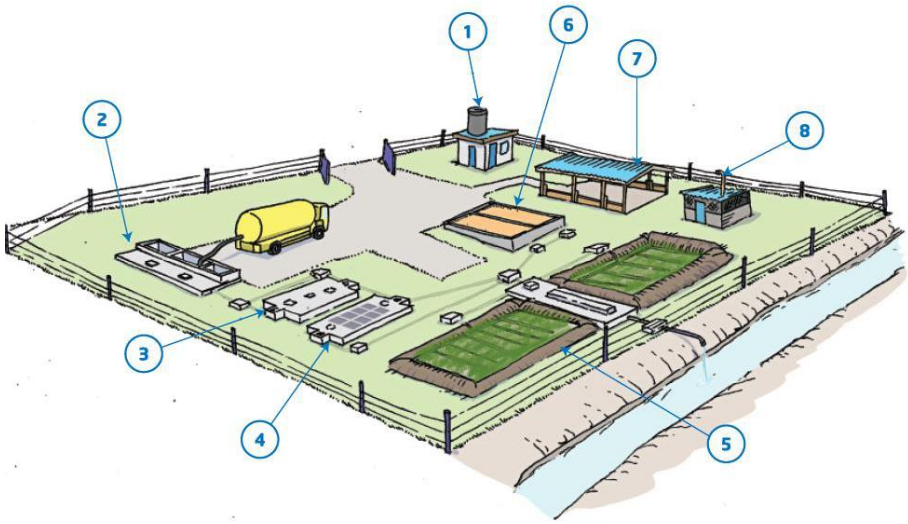
4.1.1 Summary Description of the Main Project Components

The project entails construction of receiving bay, a sludge drying bed, anaerobic reactor, twin vertical flow constructed wetlands and an incinerator and a 4M wide gravel access road.

A DN 100mm uPVC Class 41 Pipeline to discharge effluent from anaerobic reactor to vertical flow constructed wetland while approximately 40M DN 100mm uPVC Class 41 Pipeline to be used to discharge treated effluent to the river from the constructed wetlands. See the attached structural and engineering Drawings

The Hedwe DTF will have capacity of 50 m^3/day. The various stages of treatment will be as follows:

1. Operator Store
2. Receiving Bay / Balancing Tank
3. Settler
4. Anaerobic Baffled Reactor
5. Vertical Flow Constructed Wetland
6. Sludge Drying Beds
7. Composting Area
8. Waste Disposal Unit



1. The **Operation Store**: is a two room building with one main office and one washroom with hand washing facility, shower and WC. The building is used as operator's office, tool and equipment store as well as guard's house. It is supplied with water (connected to service line or supplied by water bowser) and electricity (power grid or solar). Truck drivers and all visitors should report at the OS once they have entered the DTF. At this stage the operator has the duty to register the visitor once this one has been approved access.
2. **Receiving Bay / Balancing Tank – RBBT**: is the first component of the DTF which offers preliminary treatment to the faecal sludge received. It is divided in two compartments:
   - The **Receiving Bay:** is an inlet arrangement with coarse and fine screens. The exhauster parks at the dock station and offloads its contents. The solid waste is manually removed from the screens and placed on the platforms to dry-out. Once it is dry the waste is collected in the solid waste chamber
   - The **Balancing Tank:** acts as a buffer tank. It can store up to 30 m^3 of faecal sludge. It also controls the discharge towards the rest of the DTF at a flow rate of 1 to 2m^3/h. The opening of the valve at the outlet should be regulated to allow for this flow rate. Therefore the BT can store the faecal sludge up to 24h. In case the balancing tank exceeds its capacity, an overflow pipe has been provided to discharge surplus waste water to the next module.
3. **Settler – ST:** is the second component of the DTF treatment line. It provides mechanical primary treatment which consists mainly of sedimentation and flotation of inorganic material (biological degradation of settled solids occurs partly). The ST is split into two tanks with a length ratio of 2:1. The primary tank has a T-Piece inlet to give transitional flow to prevent - disturbance of the scum. The solids and sludge settle and accumulate at the bottom while the scum (lightweight materials including paper, fats and greases) rises to the surface. A baffle wall in between the two tanks prevents the scum and sludge layer from moving into the secondary tank. Only the liquid supernatant is to pass on to the next tank. The inlet-outlet level difference is 100mm to give the required hydraulic gradient. The volume of the ST should be 65m^3 with a water depth of 2.5m. The minimum hydraulic retention time should be 48h to allow for sufficient sedimentation of inorganic solids.
4. **Anaerobic Baffled Reactor – ABR**: is the third component of the DTF treatment line. It provides biological secondary treatment consisting of biodegradation of organic material by the micro-organisms contained in the settled sludge. The ABR will be divided in 2 rows of 6 successive chambers each. Three parallel down pipes will be located at the inlet of each chamber, leading the incoming flow toward the bottom of the chamber. The inflow is forced to pass through the activated sludge where anaerobic bacteria are feeding from the organic material contained in the inflow to be treated. The inlet-outlet level difference is 150mm to ensure hydraulic gradient. The water depth is

1.85 m bringing the volume capacity to 22m3. The minimum hydraulic retention time is 12h to ensure biological degradation of organic material. The siphon unit located at the outlet of the ABR discharges the effluent towards the next module in intermittent doses of 1.5 to 2m3 leading to an average of 12 flushes per day.

5. **Vertical Flow Constructed Wetland – VFCW**: The VFCW is the last component of the DTF treatment line. It will offer the final cleaning process that improves the effluent quality before it is discharged to the receiving environment. The VFCW is a planted filter bed that acts as:
   - a filter for removing solids
   - a fixed surface upon which bacteria can attach
   - a base for the vegetation whose roots permeate the filter media and harbour variety of micro-organisms.
6. **Sludge Drying Beds – SDB:** The SDB is a treatment component that runs parallel to the main DTF treatment line. SDBs are shallow unplanted filter beds with media consisting of sand and gravel. An underdrain pipe at the bottom of the beds collects the leachate which is conveyed to the next treatment unit.
7. **Composting Area – CA**: The CA is a treatment module that runs parallel to the main DTF treatment line. The CA is an open roofed shed that is used to shelter the collected dry sludge and organic waste, and to accommodate co-composting activities. The composting shed will be equipped with a drainage channel connected to a soak away pit (for entering storm water and compost leachate) and a rain harvesting system from the two pitch roof.
   (Architectural plan is enclosed as an appendix)

5 PUBLIC / STAKEHOLDERS' ENGAGEMENT IN THE ESIA PROCESS

5.1 Introduction

Public consultation is a key component of an ESIA process, its goal is to inform the local population, statutory bodies and local organizations and interested parties about the proposed project / activity.

5.2 Public Consultation & Disclosure

Public consultation is necessary for gathering environmental data, understanding likely impacts, determining community and individual preferences, selecting project alternatives and designing viable and sustainable mitigation and compensation plans.

Public consultation in the ESIA process is undertaken during the project design, implementation and initial operation. The aim is to disseminate information to interested and affected parties (stakeholders), solicit their views and consult on sensitive issues.

Inadequate public consultation can result in significant information gaps, which could mislead environmental planners undertaking an environmental assessment. Lack of attention to communication and consultation processes can generate individual, community, or regional opposition to a project. This can ultimately be a cause of substantial delays, increased costs, and unsatisfactory compromise solutions, which could have been avoided through earlier consultation. Participation is therefore a process through which different stakeholders influence and share their views regarding development initiatives and the decisions and resources that affect them.

The Environmental Management and Coordination Act (1999) as well as the Environmental Impact Assessment and Audit Regulations (2003) set out the minimum requirements for stakeholder consultation and engagement.

The NEMA procedures and standards for conducting EIAs require stakeholder consultation to be conducted as part of the environmental assessment process. Public consultation was undertaken to disseminate information to interested and affected parties (stakeholders), to solicit their views, concerns and consult on sensitive issues.

The public consultation and disclosure programme was designed and implemented so as to foster community awareness of the proposed project, and to provide opportunities for community input and involvement. Careful attention was made to the various national and international principles/policies/guidelines (as previously noted) as they relate to consultation.

5.3 Objectives of Public Consultation

Public consultations with interested and affected parties (IAPs) were conducted with the following aims:

- Disclosure of the planned activities of the proposed Hedwe DWTF project and impacts identified through the Environmental and Social Impact Assessment;
- Provide an opportunity to record comments / opinions of affected persons / interested parties, and where possible to address these issues within the ESIA;
- To establish if the local people foresee any positive or negative environmental effects from the project and if so, how they would wish the perceived negative impacts to be addressed.
- To find out if there are issues or places of cultural/or religious importance to the local communities that could be negatively impacted upon by the proposed project and its infrastructure.
- Provide opportunity for information exchange and answer questions regarding the proposed project;

- Discuss and address areas of concern / confusion; and identify grievances from interested and affected people;
- To give stakeholders an opportunity to present their views, concerns and issues regarding the proposed development;
- Harnessing local expertise, needs and knowledge from interested and affected people;
- To receive suggestions from stakeholders on how potential negative impacts can be mitigated; and
- Respond to grievances and enquiries of affected people
- Provide clear and accurate information about the project to the stakeholders;
- Obtain the main concerns and perceptions of the stakeholders and their representatives regarding the project;
- Obtain opinions and suggestions from the stakeholders on their preferred mitigation measures;
- Identify local opinion leaders with whom further dialogue can be continued in subsequent stages of the project.

Typically, the Agenda for consultations was:

- Presentation of the proposed Hedwe DWTF project;
- Obtaining from the respondents their environmental and socio-economic concerns, and perceptions as well as suggestions/comments regarding the proposed project.

Significant impacts are defined, not necessarily in order of importance, as being those which:

- Are subject to legislative control;
- Relate to protected areas or to historically and culturally important areas;
- Are of public concern and importance;
- Are determined as such by technically competent specialists;
- Trigger subsequent secondary impacts;
- Elevate the risk to life threatening circumstances; and
- Affect sensitive environmental factors and parameters.

5.4 Public Consultation Methods

Public consultations were carried out through the following modes:

- Informal and formal interviews;
- Public hearings – holding at least three (3) public meetings in the area;
- Placing of advertisements in the mass media (placing a notice in the Kenya Gazette, placing advertisements twice weekly for two consecutive weeks in a national circulating newspaper);
- Making an announcement of the notice in both official and local languages in a radio with a nation-wide coverage for at least once a week. and
- Uploading a soft copy of the ESIA Study Report on NEMA's website for public access and review.

5.5 Stakeholder engagement

The public consultation and disclosure programme was designed and implemented so as to foster community awareness of the proposed project, and to provide opportunities for community input and involvement. Careful attention was made to the various national and international principles/policies/guidelines (as previously noted) as they relate to consultation.

5.6 Description of stakeholders

The consultation programme was developed and implemented taking into account the various areas of influence.

5.6.1 Persons or Agencies Consulted

The key issues associated with the construction of the Decentralized Wastewater Treatment Facility and related works will often relate to biodiversity, heritage, pollution, disruption of livelihoods, community safety, traffic management, communicable diseases and employment and trade opportunities.

Effort should not be spared to contact all with information on the following issues:

- Assessment of the baseline environmental and social conditions
- Consideration of feasible and environmentally & socially preferable alternatives
- Requirements under Kenya country laws and regulations, applicable international treaties and agreements
- Protection of human rights and community health, safety and security (including risks, impacts and management of project's use of security personnel)
- Protection of cultural property and heritage
- Protection and conservation of biodiversity, including endangered species and sensitive ecosystems in modified, natural and critical habitats, and identification of legally protected areas
- Impacts on affected communities, and disadvantaged or vulnerable groups
- Impacts on project affected persons, and their unique cultural systems and values Cumulative impacts of existing projects, the proposed project, and anticipated future projects
- Consultation and participation of affected parties in the design, review and implementation of the project.

5.7 Consultation and Public Participation (CPP)

5.7.1 Stakeholders' Public Meetings

Three stakeholder' public meetings have been held since inception of the proposed project.

Typically, the agenda for stakeholders' consultations was:

- presentation of the proposed project;
- Obtaining from the respondents their environmental and socio-economic concerns, and perceptions as well as suggestions/comments regarding the proposed project.

I. First Stakeholders' Meeting

The first stakeholders' meeting was held on 27th April, 2020. This meeting was for the purchase of land for the DWTF at the Chief Officer for water office at Vihiga County headquarters. Minutes of the meeting is enclosed as an appendix. The list of participants of this meeting is as in the table below.

Table 5.1: List of Participants in the 27th April 2020 Public Consultative Meeting for Land Title for DTF UBSUP Project at Chief Officer Water and Sanitation Office, Vihiga County

S/N	Name	Organization/Position
1	Dominic Luvavo	CO Water and Sanitation VCG
2	Victor Ijaika	MCA, Wamuluma Lugaga Ward
3	Collins Amuhaya	MD AWASCO
4	James Odiero	TM AWASCO
5	Julius Kebohere	O&M.O AWASCO
6	Humphrey Malavi	Lands Officer Vihiga County
7	Tufurosa Mambi	Kegoye Coffee Farmers' Rep.
8	Dominic Imbai	Kegoye Coffee Farmers' Rep.
9	Joash Bulemi	Chambiti Coffee Farmers' Rep.
10	Joseph Mahiga	Chambiti Coffee Farmers' Rep.
11	Zirah Jumba	Chambiti Coffee Farmers' Rep.

II Second Stakeholders Meeting

The second stakeholders' meeting was held on 1st October, 2020. This meeting involved key stakeholders. The meeting was held at Amatsi Water Services Company (AWASCO) boardroom. Minutes of the meeting is enclosed as an appendix.

The list of participants of this meeting is as in the table below.

Table 5.2: List of Participants in the 1st October, 2020 for Key Stakeholders at AWASCO Boardroom

S/N	Name	Organization/Position
1	Solomon S. Chunguli	A/Chief, Kegoye
2	Alex Onenda Alengo	A/Chief, Mbihi
3	Aggrey M. Gidoi	A/Chief, Chambiti
4	James Odiero	TM-AWASCO
5	Carolyne Eboso	Sociologist
6	Abiud Musasia	W.S.O
7	Julius Kebohere	OA$M.O
8	Lawrence Adamba	C.D
9	Kevin Madelwa	FO
10	Wasike Protus	P.O
11	Patrick Amoke	S.C.W.O
12	Erick Kaunda	S,C,W.O
13	Mercy Nekesa	EIA Expert
14	Moses Injendi	S.C.W.O
15	Peter Chogo	PHO (Luanda)
16	Joseph Chelure	PHO (Mbale)
17	Benson Adenya	S.M. Chango
18	Julius A. Tebei	EIA Lead Expert

III Third Stakeholders' Meeting

The third stakeholders' meeting was held on 8th October, 2020. This meeting involved key stakeholders and neighbours of the project. The meeting was held at Ehedwe. Minutes for the meeting is enclosed as an appendix.

The list of participants of this meeting is as in the table below.

Table 5.3 List of Members Present During the Public Meeting at Ehedwe

S/N	NAME	DESIGNITION	ORGANIZATION /RESIDENCE
1	Solomon Chunguli	A/Chief, Kegoye	OP-Administration
2	Alex Omenda	A/Chief, Mbihi	OP-Administration
3	Aggrey M. Gidoi	A/Chief, Chambiti	OP-Administration
4	Jason Kevolwe	Village Elder	Vumale
5	George Mahaya	V/Elder	Ehedwe
6	Oliver Illova	Member	Ehedwe
7	Wycliffe M. Kihali	Member	Ehedwe
8	Dominic A. Imbai	Village member	Hedwe
9	Victor Ubaga	Member	Kegoye
10	Vincent Lyanda	Member	Kegoye
11	Oliver Changa	Member	Kegoye
12	Benard Mambei	Stakeholder	Ehedwe
13	Benard Wambugu	Contractor Rep.	Maxfol
14	Josephine Amena	Member	Kegoye
15	Angelina Mabude	Villager	Kegoye
16	Joyce Kavere	Village Member	Hedwe
17	Agneda Lodenyi	Women Leader-	PAG-Church
18	Oliver Changa	Painter	Youth
19	Amina Bashiri	Villager	Ehedwe
20	Abiud Musasia	Scheme Manager	AWASCO
21	James Odiero	Technical Manager (Chairperson)	AWASCO
22	Mercy Nekesa	EIA Expert	ESIA Team
23	Carolyne Eboso	Sociologist (Secretary)	ESIA Team
24	Julius A. Tebei	EIA Lead Expert	ESIA Team

Stakeholders' discussions (Question and Answer) & Summary opinion

After the presentations from the EIA expert, the Chief led through the questions and answer sessions where the community members were given time to ask questions, give suggestions and critics where possible. The following were the issues discussed:

	QUESTIONS	**ANSWER**
1	The residents wanted to know if all the household will be connected to DTF	The facility is a decentralized and will receive waste water from toilets by exhausters.
2	Will there be smell from the waste	The facility is designed to contain smell within the anaerobic area and reduce emission of foul smell.
3	Where will manure be sold and at what cost	Manure will be sold at source and as well with affordable market price
4	Will the residents be considered for employment	The TM responded that the community will be give the first priority whenever an opportunity arises from the project
5	Will the area be connected with water	The DTF has to be connected with water and the area will not be left out when water will be connected

6	Will the County Government open up the road to the tarmac road	The TM said that he will take the matter to the department of roads and infrastructure on the issue of road
7	Will it be possible for the county to connect the area with electricity	The TM said that he will take the matter to the respective department for further inquiries
8	The coffee farmer wanted to know about the promise of the County Government on the help on utilizing the other part of land that remained	The TM said that he will take the matter to the respective department for further inquiries
9	Will the flies from the DTF affect the tea plantation	The DTF facility is a closed system and the waste water will not be exposed to flies
10	What will be done on speeding vehicles that will increase due to the project	The matter of managing traffic will be forwarded to the respective department for action and that the residents will not be adversely affected with traffic and accidents

Summary public opinion

The meeting unanimously agreed that the project should go on as planned as it will be of more benefit to the local community. They supported the project by citing that it will fill the gap of lack of sound sanitation system and which was largely lacking in the area and Mbale town.

Fig. 5.2 ESIA Lead Expert leading Stakeholders in CPP

Fig. 5.3 Project's Technical Manager addressing stakeholders

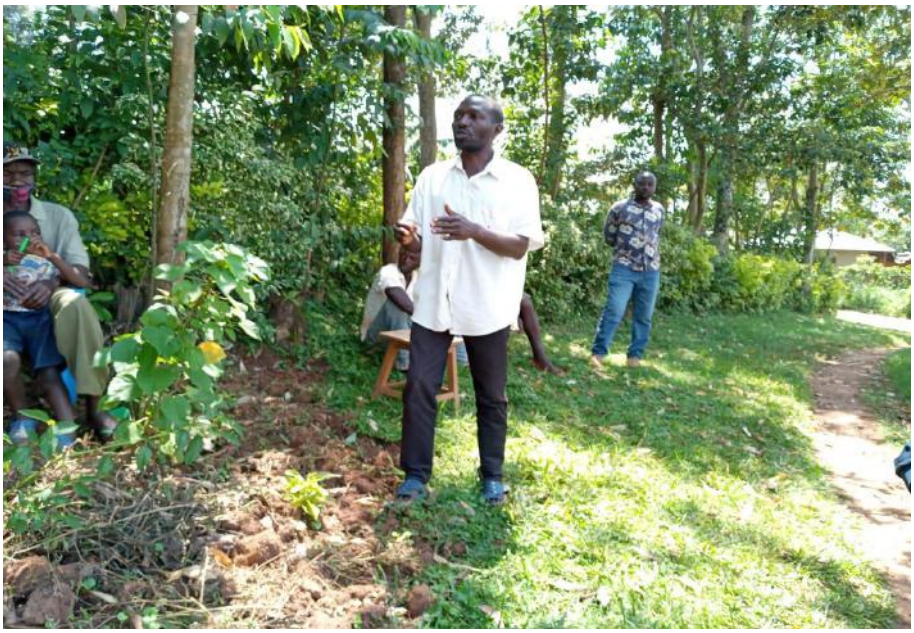


Fig 5.4 Stakeholder Member presenting his views on the proposed project

6 ANALYSIS OF PROJECT ALTERNATIVES

6.1 Introduction

This chapter seeks to identify project alternatives that can help achieve the desired objectives of the Project while at the same time causing minimal damage to the environment and the natural resource base. Other considerations include project sustainability in terms of management capabilities and technology used. The purpose of including alternative in the EIA is to identify and evaluate alternative actions that accomplish similar goals and promote sustainability development. Alternatives should be economically feasible with minimal adverse environmental impacts and time delays. Diverse alternatives to the proposed action must be included in the EIA. Alternatives may include both design and location options.

In most cases, the EIA process occurs too late in decision- making to consider a full range of alternatives. This can undermine EIA goals to encourage more environmentally sound and publically acceptable solutions. Allowing new alternatives and objectives to evolve in relation to environmental conditions and public preferences may be a solution to most of the environmental and socio-economic problems associated with the implementation of new projects.

6.2 The Project Design Alternative

Sewerage collection systems are normally designed as one of three different types:

The principal objective of wastewater treatment is generally to allow human and industrial effluents to be disposed of without danger to human health or unacceptable damage to the natural environment.

6.2.1 Conventional treatment

A centralized water treatment approach, also known as conventional treatment, uses a combined process of coagulation, flocculation, sedimentation, filtration, and disinfection. It treats water in a central location and then distributes water via dedicated distribution networks.

A centralized water treatment system can treat large volumes of water at high rates to accommodate all residential, business, and industrial uses. This approach is well developed and can effectively remove practically any range of raw water turbidity along with harmful pathogens, including bacteria, virus, and *protozoa*. However, the capital cost and operating and maintenance costs for a centralized system can be significant. It consists of water source development, construction of significant infrastructures (e.g., the treatment facility, reservoir, and water distribution main), implementation of automated monitor and control systems, and on-site operators

6.2.2 Natural biological treatment systems

Natural low-rate biological treatment systems are available for the treatment of organic wastewaters such as municipal sewage and tend to be lower in cost and less sophisticated in operation and maintenance. Although if properly designed they are more effective in removing pathogens processes, they tend to be land intensive by comparison with the Decentralized Waste water treatment Facilities

6.2.3 Decentralized Waste water Treatment System

Decentralization appears as a logical solution to tackle sustainability problems of wastewater management systems, as it focuses on the on-site treatment of wastewater and on local recycling and reuse of resources contained in domestic wastewater. Decentralized solutions in general will tend to be compatible with local water use and reuse requirements, where locally treated water could support agricultural productivity or (in more urban areas) be used as a substitute for drinking-quality supply water for compatible uses. Given the issue of land availability in Vihiga and in areas around Mbale, this alternative was found effective over the other available methods.

A part from occupying a small size of land, decentralized treatment is also cost effective compared to conventional treatment method.

6.2.4 The No Action Alternative

The no action alternative implies that the status quo is maintained. This means that there will be no interference with the environment, however, the socio-economic problems facing the residents of the project area will persist worsening the situation at the moment.

This alternative is crucial in the assessment of impact because other alternatives are weighed with reference to it. This alternative would mean that the project does not proceed. This scenario is not acceptable on either the social or environmental grounds due to this option leading to major negative impacts such as loss of productivity and reduced ability to create wealth.

The proposed project involves Operator Store – OS, Receiving Bay / Balancing Tank, Settler, Anaerobic Baffled Reactor, Vertical Flow Constructed Wetland, Sludge Drying Beds, Composting Area and Waste Disposal Unit which consist of an incinerator and in The "No Action" alternative model helps the proponent and various decision making levels to approximate the impacts of project implementation against the non-implementation thereby making the right decision regarding project implementation. Some of the specific impacts that would arise as a result of the "No Action Alternative" include:

(i) No sewer treatment plant for Mbale Town
(ii) Possible outbreak of waterborne diseases emanating from the raw sewage,
(iii) Pollution of the environment from raw sewage from filled up septic tanks or pit latrines,
(iv) contamination of aquatic environment by discharge of untreated raw sewage,
(v) Continued accumulation of persistent contaminants in the environment that would otherwise have been conveyed and treated in a central plant.

These persistent contaminants over time will surpass the toxic threshold levels and result in irreversible major environmental, social and health problems, and further reduce available freshwater and food reserves. In addition, economic gains associated with clean water and lack of diseases will deteriorate.

The effects of adopting this model largely indicate that there will be negative impacts. The growing town urgently needs a functioning sewer lines and waste water treatment plant so as to promote the fiscal outputs of the area. The 'No Action Alternative' is the least preferred option since the costs far much outweigh the benefits to be accrued.

6.3 Comparison of Alternatives

The proposed action alternative involves the construction of the project components that will trigger environmental impacts during construction. These effects will be of short duration but can adversely affect the environment if not prevented. Mitigation measures are therefore of fundamental nature to ensure that the project is environmentally friendly.

To minimize or to totally circumvent the negative environmental impacts, mitigation measures have to be implemented as well as sound construction and management practices. However, commitment related to development alternative would ensure that the potential effects are minimized to levels of insignificance as envisaged in the Environmental and Social Management Plan.

Under no action alternative, there will be no construction at all. There will be no benefits from the site and on the other hand no insignificant environmental impacts as with the current status of the environment, there are some noticeable environmental impacts e.g. soil erosion and illegal discharge of effluent during rainy hours due to lack of sewer system.

6.4 Materials to be Used, Products and by-Products and Waste Generated

The construction materials to be used will be in accordance with the engineering design of various sewer structures. The materials therefore are varied and include:

- Cement
- Building sand
- Building stones
- Ballast

- Reinforcement bars
- Pipes and fittings
- Timber

Concrete (cement, sand and ballast), building stones and steel reinforcement bars will be used in the construction of the weir. Valve chambers will also be constructed using these materials.

Pipes and fittings will be used to convey water from the intake through to the farms. The pipes will vary in size and type but most will be GI (Galvanized Iron) and uPVC for trunk sewers.

Timber will be used as shuttering material during the casting of the intake structure whereas building stones will be used in the construction of valve chambers.

Wastes to be generated during the construction phase will include wood chippings, pipe shavings and used cement bags. It is recommended that the wood shavings be composted and used as manure, while the pipe shavings and the cement bags are recycled.

7 POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS AND PROPOSED MITIGATION MEASURES

7.1 Introduction

Development of this Project is expected to cause some impacts, both positive and negative. They are generally grouped into those affecting soil, water resources, air quality, flora and fauna, community and their economic activities, aesthetics and landscape, noise and human health.

The likely environmental impacts associated with this project will arise from activities associated with the construction works as well as the operation and maintenance of the sewerage system. During Construction the impacts arising are of short duration but can pose a significant impact on the environment if remedial measures are not taken into account. Lack of effective operation and consistent maintenance of the system is likely to impact negatively on the project area and its environs.

During construction of tanks and sewage plant and the general piping system; cement, sand, ballast, gravel, timber, pipes among other materials and their joinery and fittings will be used in great quantities. Trucks and other machinery will also be used. Large skilled and unskilled labour will be employed and wastes are likely to be generated. Issues that may arise will be sanitary waste from workers, spoilt and damaged construction materials, used containers especially plastic and sand bags. Liquid wastes like oil, grease, paints, sewage sludge and other solvents, nails, timber remains, Injuries and accidents are anticipated. Decommissioning of the project may occur as a result of various factors such as lack of capital to maintain or non-compliance with approved maintenance and monitoring requirement leading to condemnation and closure. The possible negative aspects associated with construction be they environmental or socio-economic should be mitigated for.

The operations of the facility will generate both positive and negative social economic and environmental impacts. The analysis of these impacts is carried out in this section resulting in development of mitigation measures that shall enhance the positive impacts and reduce the effects of the negative impacts. The impacts from this project have been discussed as those probable during the construction, maintenance and decommissioning phases of the project. This report encourages implementation of mitigation measures that enhance positive impacts.

The possible impacts assessed cover the direct and any indirect effects and positive and negative effects during construction, operation and possible decommissioning. The likely impacts are based on the identification and prediction of the magnitude of any impact caused by the project on (i) a receptor (e.g. human beings and community facilities), or (ii) an environmental resource, and on (iii) any process which is essential to the functioning of human or natural systems. The identified impacts were classified as positive and the negative. The magnitude of each impact is described in terms of being Major negative, minor negative, major positive, minor positive or Neutral impact.

On the basis of information gathered during both the desktop and field study, the potential impacts of the proposed project are as tabulated in table below.

Table 7: Anticipated Impacts of the project

Environmental & Social Components	**Nature of Impacts (Positive/ Negative)**	**Project Phase**	**Positive**	**Negative**	**Neutral**
Bio-Physical Environment					
Land Resources	Altered topography and landscape	Preconstruction & Construction		(-)	
	Loss of vegetation	Construction			
	Soil Contamination	Construction & Operation		(-)	
	Soil Erosion	Preconstruction & Construction		(-)	
	Generation of Solid and Liquid Waste	Construction & Operation		(-)	
Solid Waste	A significant amount of solid waste will be generated through the clearing of vegetation, excavation & construction debris during construction phase. Significant amount of solid waste will be produced during the operational phase.	Construction & Operation		(-)	
Ambient Air Quality, noise pollution and excess vibrations	Noise pollution generated by construction activities, construction machinery and vehicles. Deposition of airborne road dust and airborne emissions from vehicles and Construction equipment through construction activities.	Construction & Operation		(-)	
Flora and Fauna	Change in landscape	Construction		(-)	

Environmental & Social Components	Nature of Impacts (Positive/ Negative)	Project Phase	Positive	Negative	Neutral
	Disturbance to the natural drainage system Flora destruction Loss of or disturbance to natural habitats				
Ecosystem interference	The DWTF may affect groundwater quality & quantity	Operation		(-)	
Socio-Economic Environment					
Health and Safety	Dust and airborne emissions from vehicles and construction equipment	Construction & Operation		(-)	
Security	Prevent illegal entry by unauthorized persons into the facility's compound	Operation	(++)		
Conflict with the Community	Conflict may arise with the community especially if they have not been consulted	Construction & Operation	(++)		
Employment Opportunities	These will be provided during construction and operational phases of the development thus improving living standards of the employees	Construction & Operation			

7.2 Potential Positive Impacts
The following positive impacts are anticipated during planning, construction and operation phases of the project:

i. Ecological restoration**:** Decentralized systems can reduce the discharge of pollutants and replenish aquifers, restore stream flows and habitats.
ii. The proposed activities will avert pollution of the streams, Rivers and the Lake since all waste water will be adequately treated before allowing it to flow to the streams.
iii. Community benefits: Green infrastructure has been shown to improve air quality, preserve open space, and create local jobs.
iv. Smaller area demand. DTF require small area of land making it suitable for Vihiga given that it is densely populated
v. Provision of employment opportunities during construction and operation phases- Labour is a must therefore residents will have ready opportunities which shall boost their daily income.
vi. The proposed project will be a decentralized system, it will provide an additional alternative treatment for waste in Mbale town which will make pollution monitoring easy.
vii. There shall be improved aesthetic value of the area due to cleaning up of the mess that is currently experienced in Storm water drains in the areas of blocked drains.
viii. Sludge from the DTF facility is a rich resource that can be utilized by the community around as fertilizers for the farm houses,
ix. Installation of incinerator will play a huge role in burning waste and reducing its volume and toxicity.
x. If the DTF is established, the pollution created by the current practice of wastewater discharge into the river will stop hence reduction in spread of water borne diseases.
xi. Quality of surface and ground water will improve on public health, and on socio-economic development of the project area, taking into consideration that there is high probability of disposal/discharges of untreated raw sewage into rivers.
xii. The public health of the community will be upgraded due to improved standard of wastewater management.

7.3. Potential Negative Impacts
Against the background of the above positive impacts, there will be negative impacts emanating from the construction and subsequent operation activities of the facility.

7.3.1 Planning Phase Impacts
These are commonly associated settlement of people along the sewer lines. The design engineer carried out a conclusive design that ensured a no sewer lines. All of the sewer will be exhausted from the septic tanks using exhauster truck Lorries and the solid waste is manually removed from the screens and placed on the platforms to dry-out. Once it is dry the waste will be collected in the solid waste chamber. While the sludge is pretreated before being taken to the wetlands.

Mitigation measures
Follow all procedures and guidelines designed to prevent pollution from occurring. Strive to increase public knowledge of the faecal sludge and wastewater treatment field and its importance by leading tours of the DTF.

On construction completion, all roads will be reinstated to their pre-project conditions for both people and animals. The mitigation measures for social impacts are to ensure that the affected persons' livelihood is at least maintained after implementation of the project.

7.3.2 Construction Phase Impacts
Most of the potential environmental and social impacts associated with the construction phase will be negative and temporary, and can be mitigated with the use of standard environmental management procedures. The potential social impacts or nuisance will be those typically associated with construction activities involving vehicles, equipment, and workers. The predicted impacts include the following:

1. Traffic Congestion
Traffic congestion is anticipated from site related traffic from Contractor vehicles as well as interaction with the existing road traffic in the area. This may interfere with socio-economic activities which majorly rely on the transport network affected by the construction activities. The project area is relatively next to a busy Kisumu-Kakamega Highway. The construction processes are bound to contribute to minimum traffic congestion.

Mitigation measures
The Contractor should provide temporary road signs or notices to indicate ongoing works;
Contractor to hire traffic controller to ensure no traffic build up along the roads.
The Contractor together with the Resident Engineer Should plan itineraries for site traffic on a need basis and avoid peak traffic periods;

The Contractor should effect traffic controls and cleanliness to avoid congestion and truck accidents on roads; The Resident Engineer and Contractor should choose traffic routes to reduce the impact in the neighborhood avoiding, as far as practical any sensitive areas;

For the site traffic the Contractor has to ensure that they

i. Only park in designated parking areas;
ii. Don't block pedestrian routes;
iii. Don't block traffic routes;
iv. Obey the speed limit
v. Designates loading/unloading areas.

2. Site Related Oil Spills
During construction, oil spills may result from construction site equipment and storage.

Mitigation Measures
The Contractor develop, sensitize workers and display a work instruction for oil spills and leaks from storage tanks for the construction machinery through induction and safety training;

In case of spillage the Contractor should isolate the source of oil spill and contain the spillage using sandbags, sawdust, absorbent material and/or other materials approved by the Resident Engineer;
All vehicles and equipment should be kept in good working order, serviced regularly and stored in an area approved by the Resident Engineer;

The Contractor should assemble and clearly list the relevant emergency telephone contact numbers for staff, and brief staff on the required procedures.

All vehicle works should be done in one place to avoid chances of spillage in different parts of the camp.

The Contractor is supposed to hire a licensed used oil transporter to remove the used oil from the site to avoid spills. Prior to collection the used oil should be stored well and labelled.

3. Soil-Related Impacts
All construction activities have some minor impacts on the soil. However, these are localized and restricted locally to the excavation of trenches for the sewer lines. It is expected that these impacts are also short-lived during construction and mitigation measures are recommended. The key impacts will revolve around soil erosion, contamination, disturbance of the natural soil structure, piling of soil along public access routes, improper replacement of soil to its original position, mixing of layers and compaction thus reducing the ecological function of the soil.

Mitigation Measures
The valuable top soil containing organic material, nutrients as well as seeds and the soil fauna would be excavated separately and piled in an adequate manner for re-use.

In cases where it is identified that during construction there is a danger of increased run-off or erosion of trenches, temporary drainage channels or holding ponds can be employed. After completion of the construction works, immediate restoration spreading piled top soil.

There shall be sewer connection or septic tank in the campsite to avoid direct discharge of waste water and all chemicals should be stored well to avoid spills

The contractor should develop, sensitize workers and display emergency response work instructions for accidental oil and chemical spills.

4. Impact on Water Resources

Potential environmental impacts associated with water resources include sedimentation, foreign material spills, pollution slumping and disturbance to drainage. Solid waste, if allowed to accumulate in water ways, may cause localized pooling and flooding. Improper handling of construction wastes and increased waste water production may cause pollution of the area and eventually the stream.

Mitigation Measures
Construction materials and other debris (lime, cement and fresh concrete, etc.) shall be prevented from entering existing drainage infrastructure.

Ensure protection of the stream ecosystem by proper handling of cement during civil works. There shall be sewer connection or septic tank in the campsite to avoid direct discharge of waste water

Contractor to Develop and display emergency response work instructions for accidental oil and chemical spills.

5. **Social - Economic Impacts**

During construction the project will have clear benefits with regard to local employment opportunities. The project will additionally require various skills and services which may not be available on the local level but certainly on the regional level, e.g. pipe fitters, plumbers, etc. for which appropriate personnel will be contracted.

The increase in employment will temporarily lead to an overall increase of income directly and indirectly (through increased demand of other local services). New businesses will grow such as food vending to construction workers.

Immigration of people from different regions may lead to behavioral influences and this may increase the spread of diseases such as HIV/AIDS.

Mitigation Measures

Unskilled construction and skilled (if available) labor to be hired from the local population as far as possible to minimize on influx of foreigners into the community.

Use of manual labor during trenching works where possible to ensure more employment of locals and hence ensure project support throughout the construction process.

Sensitize workers and the surrounding community on awareness, prevention and management of HIV / AIDS through staff training, awareness campaigns, multimedia, and workshops or during community Barazas and bill boards.

The contractor shall develop a code of conduct of workers and translate it to the local language. The workers should periodically be sensitized on the code of conduct

All documents shall be translated in a language understood by the locals and if possible in a disability format.

The contractor should consider skilled and unskilled people living with disability and women during employment and hire of service provision. The contractor shall develop a camp site grievance redress committee

The contractor shall undertake meetings with the local community and schools regarding labor influx to prepare them on the influx of non-locals and the likely negative impacts as well as mitigation measures.

6. Air Quality

Construction activities of materials delivery, trench excavation and construction traffic will generate a lot of noise and dust especially during the dry seasons. Vehicular traffic to the proposed site is expected to increase especially during delivery of raw materials. Vehicular traffic emissions will bring about air pollution by increasing the fossil fuel emissions into the atmosphere.

Mitigation Measures

Use protective clothing (PPEs) like helmets and dust masks on construction crew. Construction sites and transportation routes will be water-sprayed on regularly up to three times a day, especially if these sites are near sensitive receptors, such as residential areas or institutions.

All the vehicles and construction machinery should be operated in compliance with relevant vehicle emission standards and with proper maintenance to minimize air pollution.

Digging of trenches should be done manually so as to avoid too many trucks and machines in the area. The use of manual labor will also benefit the community socio-economically. Use of other dust palliative measures to reduce dust emissions

7. Construction Noise and vibration

Noise and vibration generated during construction by heavy construction machinery, such as excavators, bulldozers, concrete mixers, and transportation vehicles. Generally, construction noise exceeding a noise level of 70 decibels (dB) has significant impacts on surrounding sensitive receptors within 50m of the construction site.

Mitigation Measures
Avoid night time construction and restrict construction activities within day time from 0600 hrs. – 1700hrs.

No discretionary use of noisy machinery within 50 m of residential areas and near institutions such as schools and hospitals

Good maintenance and proper operation of construction machinery to minimize noise generation. Installation of temporary sound barriers if necessary and Selection of transport routes to minimize noise pollution in sensitive areas. Where possible, ensure non mechanized construction. This includes, employing locals during the trench excavation.

8. Biodiversity and Conservation Impacts

The project area has vegetation, thus vegetation may be affected by the proposed construction work.

Mitigation Measures
Re-plant the indigenous vegetation as much as practical once work is completed. Spare the vegetation that must not necessarily be removed such as trees.

Minimize the amount of destruction caused by machinery by promoting non-mechanized methods of construction. The contractor shall develop, sensitize workers and display work instructions for cement, concrete, oil and chemical spills.

Prior to undertaking any works in environmentally sensitive areas, the contractor shall seek approval from the relevant authorities and comply with the conditions provided.

9. Public Health, Safety, HIV & AIDS, and Corona Virus (Covid-19) Pandemic Impacts

Construction staff and the general public will be exposed to safety hazards arising from construction activities. The risk of accidents is bound to increase as a result of the construction works. The project works will expose workers to occupational risks due to handling of heavy machinery, construction noise, electromechanical works etc. Construction activities of materials delivery, trench excavation and concrete mixing and construction traffic will generate a lot of dust and this may affect the respiratory system.

Construction sites may be a source of both liquid and solid wastes. If these wastes are not well disposed these sites may become a breeding ground for disease causing pests.

At the concrete mixing plant, the exposure of human skin to cement may lead to damage of the skin. Immigration of people from different regions may lead to behavioral influences which may increase the spread of diseases such as HIV/AIDS and of late corona virus (covid-19) pandemic. Improper handling of solid wastes produced during and civil works such as spoil from excavations, scrap metal, mortar, paper, masonry chips and left-over food stuff present a public nuisance due to littering or smells from rotting. Open trenches during the project duration pose a risk to the general public as they access the different sides of the trenches.

Improved sanitation to the area will lead to improved public health and quality of life through reduced risk of waterborne and water-related diseases; and increased public satisfaction.

Mitigation Measures
Ensure that all construction machines and equipment are in good working conditions to prevent occupational hazards and establish a Health and Safety Plan (HASP) for both civil works.

Appoint a trained health and safety team for the duration of the construction work. Train at least 5 workers on basic or emergency first aid and Provide workers with appropriate personal protective equipment (PPE). Provide workers with adequate drinking water and breaks.

Work to minimize or altogether eliminate mosquito breeding sites and Provide appropriate human and solid waste disposal facilities. Provide crossing points along the trenches to allow people to maintain their normal activities, also cautionary signage should be provided along the trenches. Follow World Health Organization (WHO) and Ministry of Health regulations in controlling the spread of corona virus disease.

10. Gender Empowerment Impacts

There is need to promote gender equality in all aspects of economic development and more so in construction. Women roles in construction are mainly confined to supply of unskilled labor and vending of foodstuffs to the construction workers. Where available skilled women will be used.

Mitigation Measures

Ensure equitable distribution of employment opportunities between men and women. Provide toilets and bathrooms for both male and female workers on site

11. Impacts on Workers' Health and Safety (Accidents and other unforeseen calamities)

Accidents that happen in construction sites could be mild or fatal depending on various factors. During the implementation of the proposed project, accidents could be due to negligence on part of the workers, machine failure or breakdown or accidental falls. Cuts by machines and other tools can also occur during pipes and sewer installations. These incidents can be reduced through proper work safety procedures.

Mitigation Measures

There should be adequate PPEs to all workers and they should be worn all the time. There should be adequate provision of the requisite sanitation facilities for human waste disposal.

The workers should receive requisite training especially on the operation of the machinery and equipment and there should be adequate warning and directional signs.

Provide clean drinking water for the employees and develop a site safety action plan detailing safety equipment to be used, emergency procedures, restriction on site, frequency and personnel responsible for safety inspections and controls.

12. Impacts on fire outbreaks

During construction and implementation of the project fire outbreaks are anticipated emanating from machines, smoking and even from domestic use. Such fires may cause physical and mental damage to the workers. In order to minimize occurrence of such situations, the contractor and workers should adhere to the following mitigation measures.

Mitigation measures

Put "No Smoking Signs" in areas where inflammables are stored. Guide all workers in Safety Health and Environment (SHE) and Provide adequate firefighting equipment capable of fighting all classes of fire. Provide first Aid kit within the construction site.

Label all inflammable materials and store them appropriately. There should be adequate PPEs to all workers and should be worn all the time. Conduct regular fire-fighting drills. Develop a firefighting emergency plan and Train one member of staff on fire preparedness.

13. Impact of Waste water and sludge

Waste water types generated by the construction activities are likely to include general refuse from the work force, and chemical waste from the maintenance of construction plant and equipment. Wastes generated by the operational activities would include sludge. These wastes should be carefully handled to minimize possible outbreaks of diseases.

Mitigation Measures

Provided that these wastes are handled, transported and disposed-off using approved methods and that the recommended good site practices are strictly followed, adverse environmental impacts are not anticipated during the construction and operation phases.

To prevent potential emission of microbes during transportation, storage and handling of dewatered sewage sludge into surrounding water bodies, proper design of the STF will be conducted and the recommended "risk control measures" will be implemented.

Sludge hygienisation or disinfection procedures should be followed to reduce the content of pathogenic bacteria in the sludge as recommended by WHO.

14. Impacts on Odour, Flies and Mosquitoes

Potential odour emissions from the sewerage plant would be the main concern during the operation phase. The most common nuisances caused by poor maintenance of wastewater stabilization ponds are odour, flies and mosquitoes.

Mitigation measures

The volumetric BOD loading should lie between 100-400 g/m^3 in order to maintain anaerobic conditions and at the same time control odour release. To reduce odour, flies and mosquitoes, routine maintenance tasks must be attended to punctually.

This involves the following: -

- Removal of screenings and grit from the inlet system to reduce blockage.
- Regular cutting and disposal of grass and other herbaceous plants.
- Removal of floating scum and floating macrophytes from the pond surface.
- Removal of accumulated debris and other solids at the inlets and outlets.
- Repair of embankment which are eroded by rainfall or damaged by rodents and livestock grazing.
- Destruction and expulsion of burrowing animals and their nests in the embankment walls.
-

7.3.3 Impacts during Operation & Maintenance

During the operation of the constructed waste water treatment Plant there are substantial negative environmental and social impacts and risks are anticipated.

1. **Socio - economic potential positive or beneficial impacts**

Numerous socio-economic potential **positive or beneficial impacts** from successful implementation of the project will include:

Better access to sewerage facilities thus reduced waste water flowing freely in the residential area;

Improvements in domestic hygiene and a reduction in health risks that were associated with water borne diseases. The program will contribute to increase in local development and employment as the local population are likely to be employed during the construction phase and after construction due to maintenance;

Increase in land value due to availability of services and introduction of metering and administrative billing procedures;

The program is expected to contribute to poor communities well-being associated with improved services, stability, and health.

Employment creation will be the key positive environment impact as operation and maintenance personnel will be required for the rest of the project life.

Potential Negative impacts typically associated with operation and maintenance activities are such as:

2. Impact on Biodiversity and Conservation

During construction and rehabilitation works both flora and fauna are likely to be destroyed, injured or eliminated.

Mitigation Measures

The following measures are recommended:

- Re-plant the indigenous vegetation as much as practical once work is completed. Spare the vegetation that must not necessarily be removed such as trees.
- Minimize the amount of destruction caused by machinery by promoting non-mechanized methods of construction.

3. **Leaks and bursts**

During the project duration there may be leaks and bursts caused by various reasons such as blockages due to sand and solid waste, illegal connections, among others.

Mitigation Measures
A program of leak detection to be put in place to identify aging pipes for replacement to avoid major bursts and frequent repairs. In case of unavoidable major repairs, mitigation measures similar to those applied during construction to reduce the impacts of noise, dust, disturbance of flora and fauna.

Leaks and pipe bursts to be promptly repaired to avoid leakage of untreated waste water into the environment.

4. **Approving faecal sludge for discharge**

Waste from different sources can have widely different characteristics, which may impact upon the operation and the treatment efficiency of the DTF. Residential faecal sludge (from pit latrines or septic tanks) is relatively free of toxic chemicals and therefore is the most suitable for the DTF. Faecal sludge from restaurants may have significant quantities of fats, oil and grease.

Mitigation Measures
Since the DTF is not equipped with grease traps, this source of faecal sludge is not recommended. Faecal sludge from auto repair shops, dry cleaning establishments and hospitals may contain toxic materials that are detrimental to the treatment process by killing the living biomass responsible of the treatment. Therefore, faecal sludge from these commercial or institutional settings is to be avoided.

7.3.4 Impacts during De-commissioning
De-commissioning of the Project is not envisaged. Project components however will be rehabilitated over time having served their useful lifespan.

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

8.1 Introduction

Environmental and Social Management and Monitoring Plan (ESMMP) of a project provides a logical framework within which identified negative impacts shall be mitigated and monitored. ESMMP assigns responsibilities of actions to various actors and provides timeframe within which mitigation measures are to be carried out. The ESMMP is a vital output of an Environmental Impact Assessment as it provides a checklist of project monitoring and evaluation. It assigns responsibilities and allocates costs in prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase of the proposed project.

At completion of construction, ownership of the wastewater project will be transferred to the proponent. The proponent will be responsible to implement environmental management measures associated with operation of the wastewater project.

Tables 8.1 and 8.2 below show the environmental and social management and monitoring plan. It outlines corresponding management strategies proposed in earlier chapter that will be employed to mitigate potential adverse environmental impacts and assigns responsibility for the implementation of the mitigation measures.

Mitigation measures should be reflected in the Conditions of Contract and Bills of Quantities. It is the responsibility of the Supervising Consultant to ensure enforcement of these measures during construction.

The Project Team will comprise of the following:

5. Project Proponent
6. Project Manager/Designer/Supervising Consultant;
7. Project Engineers
8. Project Contractor(s).

Prior to mobilization, the Contractor should include all proposed mitigation and management measures in his schedule of works, and the Project Manager / Supervising Consultant should ensure that the schedule and environmental management and monitoring plan is complied with.

8.2 Responsibilities of the ESMMP

To ensure the effective development and implementation of the ESMP, it will be necessary to identify and define responsibilities and authorities with various persons and organizations that will be involved in the project. The following entities should be involved in the implementation of the ESMMP:

- Lake Victoria Water Services Board,
- The Vihiga County Water Service Board
- Amatsi water and Sanitation Company Limited
- Project manager
- Contractor
- Consultant
- County Government of Vihiga
- Public Health
- NEMA
- Residents in the project affected areas

8.3 Environmental and Social Management during Planning

This involves studying the specified environmental concerns and adopting the environmental management plan (ESMMP) to the site. The design consultant should ensure that the specified mitigation measures in the ESMMP are incorporated in the design, and tender documents.

8.4 Environmental Management during Construction

Environmental due diligence should be incorporated into the project implementation as follows:

- Control of health and safety risks of the contractor's workmanship;
- Prevention of negative environmental impacts during construction;
- Control of the residual risk of accidental environmental damage.
- Training and awareness creation on all environmental issues;

As part of the construction progress reports, environmental considerations should be covered and progress indicated on the implementation of mitigation measures, as outlined in the EMP.
Upon completion, all temporary buildings, including concrete footings, formwork and slabs, all construction materials and debris will be removed from the site and the area constructed as per the decommissioning stage requirements.
Construction aspects to be monitored will include, but will not be limited to the following issues:

- Construction of intake works
- All erosion and sediment control;
- Handling of hazardous materials as part of construction activities;
- Movement of machinery;
- Occupational health and safety;
- Collection and disposal of wastes;
- Management of pollution incidents.

8.5 Environmental Management during Commissioning and Operation

8.5.1 Management of the Project

During the commissioning and operation of the development, environmental due diligence will be incorporated into the management procedures to minimize any negative environmental impacts. The management of the project will have the primary responsibility for environmental health and safety issues.

Environmental Audit should be carried out annually to ascertain the status of the environment based on the baseline information presented in the EIA. The management of the project therefore will have to engage an Environmental Auditor or an Audit Firm to carry out the exercise.

The commissioning and operation risks to be monitored will include, but will not be limited to the following issues:

- Waste handling and disposal;
- Noise management;
- Operation and maintenance;
- Occupational health and safety.
- Societal conflicts of interests.

The following activities will be undertaken after completion of the construction phase:

- Close-down audit to verify that the proposed mitigation measures have been implemented;
- Inclusion of an environmental monitoring and management programme for maintenance.
- All technical information on materials used, saving and environmental performance should be outlined and highlighted during hand-over. These will be incorporated into the environmental management plan for the schemes' intake works and the entire system.

8.5.2 Maintenance of the Project

It should be demonstrated that all facilities comply with the standards as set out in the tender documents and technical specification. Furthermore, repair materials are available in the event that a replacement or maintenance works are required. The maintenance team will develop a programme of regular maintenance and ensure that the relevant skills are always available.

8.6 Interventions for management of the proposed project

8.6.1 Engineering interventions

- Incorporate environmental impact considerations in the design, construction and operation.
- Improve maintenance of the wastewater infrastructure
- Construct drainage facilities

Table 8.1: Construction Phase: Environmental and Social Management and Monitoring Plan

Activity	**Associated Impacts**	**Impact Levels**	**Applicable regulation and standards**	**Management Actions**	**Frequency**	**Target Areas & Responsibilities**	**Monitoring Indicator**	**Approximated Budget**
- Seeking approvals from NEMA for EIA and Approval of plans from County Government, NCA and WRA	- Delay in implementation of the Project due to objections and stop orders	Low	EIA Regulations 2003 NCA Act 2011 Public Health Act Water Act 2016	- The Contractor shall ensure that all pertinent permits, certificates and licences have been obtained prior to any activities commencing on site and are strictly enforced/ adhered to; - The Contractor shall maintain a database of all pertinent permits and licences required for the contract as a whole and for pertinent activities for the duration of the contract	- Once at the initial stages	All the Project Lots Responsibility AMATSI & Contractor	Number of approvals / permits issued	330,000
- Construction campsites	- Environmental degradation risks	Medium	- A complete campsite	- Isolate through fencing the camp sites from access by the public for their safety - Preferably to be located on land	- Through out the construction period	Campsites Responsibility Contractor(s)	- Number of public outcry due to accidents	Ksh. 500,000

				already cleared land wherever possible - The Contractor's Camp layout shall take into account availability of access for deliveries and services and any future works				
- Earth moving and Excavations (Vegetation clearance, channelling and site preparations)	- Health and Safety risks - Air pollution - Social nuisance	Medium	Air quality Regulations 2014 OSHA 2007, Public Health Act	- Provide notices, signage & information to the public for their safety at all locations - Install barriers along walkways, crossings and public places affected by the works for public safety - Where there is potential for nuisance from dust generation, ensure earth moving is under dump conditions (consider watering where necessary) - Inform immediate communities or stakeholders of the activities.	- Through out the construction period	-All work areas Responsibility Contractor(s)	- Accidents Occurrence incidences - Cases of respiratory complication at nearby health centre	Kshs. 200,000

	- Vegetation Cover destruction - Loss of biodiversity	Low	Conservation of Biological Diversity(CBD) Regulations 2006	- Construction activities will be limited to Project sites/routes which already exist therefore no destruction to vegetation cover	- Through out the construction period	- All work areas Responsibility Contractor(s)	- Soil erosion extend and intensity on site - pH	- No direct cost
	- Loss of top soil	low	Soils report	- Stock piling of top soil, construction material and wastes should be done only at designated sites approved by the supervising engineer, - erosion prevention through berming of loose soil sites should be done in all areas susceptible to agents of erosion	- Through out the construction period	- All work areas Responsibility Contractor(s)		
	- Disruption of amenities causing inconveniences to the community	Medium		- Notify other services providers and Open small sections that can be reinstated within the shortest period to avoid public disruption - Mark the lines to avoid conflicts with other activities	- Through out the project cycle	Civil works areas Responsibility Contractor(s) Supervision	- Number of complaints from community due to lack of certain services	- No direct cost

	- Public Health and safety risks - Worker Occupational safety risks	High	OSHA 2007 Public Health Act	- Notify public the intent to cut sections of the road for safety precautions - Provide signage and safety information in all work areas - Ensure compliance by workers with safety safeguards including the OHS, provision of - safety gear (PPEs) and enforcement of application	- throughout the project period	Civil works areas Responsibility Contractor(s) Supervision	Accidents occurrence incidences	Kshs. 500,000
Concrete / cement batching plant	- Risks associated with water resource pollution, noise and vibration and air pollution from dust this could lead to respiratory problems	High	NEMA regulations on Noise, Air Quality and Water Quality Water Act 2016 and water rules 2007 Public Health Act	- Where required, a Concrete batching plant shall be located more than 20m from the nearest stream/river channel; - Top soil removed from the batching plant site and stockpiled - Contaminated storm water and wastewater runoff from the batching area and aggregate stock piles shall not be permitted to	- Through out the construction phase	Concrete / cement batching plant Responsibility Contractor(s) Supervision	Number of incidence of Environment pollution around the plant	Kshs 550,000

				enter streams but shall directed to a pit where the water can soak away - Suitable screening and containment shall be in place to prevent windblown contamination associated with any bulk cement silos, loading and batching - Cleaning of equipment and flushing of mixers shall not resulting pollution of the surrounding environment				
Materials sourcing, from burrow pits and quarries delivery and storage	Environmental and Safety risks associated with burrowing and opening up of new quarry sites	High	NEMA regulations	- The Contractor will be responsible for ensuring that appropriate authorisation to use the proposed borrows pits and quarries from NEMA have been obtained before commencing activities - Topsoil shall be stripped prior to removal of borrow	- During construction period	Burrow Pits and Quarry Site <u>Responsibility</u> Contractor(s)	- Environmental status of reinstated burrow pits - Complains from the community on burrow pits and material transportation - Restoration or improvement order from NEMA	Kshs. 500,000

				and stockpiled onsite. This soil shall be replaced on the disturbed once the operation of the borrow site or quarry is complete - Construction material sources should be environmentally sustainable (approved) - Delivery routes and modes of transport should be approved - Material storage on site not to be internal or external nuisance				
Waste generation and disposal	Risks of contaminating surface and underground water resources	High	NEMA regulations on water Quality and Waste management WRA Regulations one of water resources Public Health Act	- Construction wastes (residual earth, debris and scrap materials) to be removed for safe disposal - Encourage recycling where possible (concrete debris for access road surfacing), - Contaminated organic matter in the work areas to be	-	Construction areas <u>Responsibility</u> Contractor(s) Supervision	- Number of complaints from community not happy with waste management of the contractor	Kshs. 500,000

				isolated for safe disposal - Material residuals to be disposed off in accordance with established regulations				
Occupational Health and Safety	Risks of Accidents, Injuries or death of workers or community member	High	OSHA 2007 & Public Health Act	- Provide construction workers with personal protective gear (gloves, gum boots, overalls and helmets), - Provide temporary toilets and bathrooms for the construction workers at the work sites - Provide onsite first aid kit accessible by the workers on need, - Isolate the site for access by the local communities during the construction for their safety and health - Contractor to provide a Healthy and Safety Plan prior to the commencement of	- Through out the construction Phase	All work areas Responsibility Contractor(s) Supervision	Accidents occurrence incidences	KShs. 0.3M

				works to be approved by the resident engineer.				
	Spread of corona virus disease (covid-19)	High	WHO and MoH Protocols on Covid-19 Pandemic	- Workers should strictly observe World Health Organization (WHO) and Ministry of Health (MoH) Covid-19 protocols	- All project phases	All work areas Responsibility Contractor(s) Supervision	Covid-19 related symptoms and diagnosis	0.2M
Noise and Vibration control from plant and equipment	Risk to health and safety of community and workers	Medium	Noise and excessive vibrations regulations 2009	- The Contractor shall keep noise level within acceptable limits and construction activities shall, where possible, be confined to normal working hours in the residential areas - hospitals and other noise sensitive areas shall be notified by the Contractor at least 5 days before construction is due to commence in their vicinity - Any complaints received by the Contractor regarding noise will be recorded and	- Through out the construct ion phase	civil works areas and access roads Responsibility Contractor(s) Supervision engineer	Reported complaints from neighbour community and institutions	No direct cost

				communicated to the RE - The Contractor must adhere to Noise Prevention and Control Rules of April 2005				
Traffic management on site	Risks of Accidents, Injuries or death of workers or community member	Medium	Traffic Act	- Strict use of warning signage and tapes where the trenches are open & active sites Employ and train road safety Marshalls who will be responsible for management of traffic on site - Contractor to provide a traffic management plan during construction to be approved by the resident engineer	- Through out the project cycle	Contractor(s) Supervision engineer		

Table 8.2: Operational Phase: Environmental and Social Management and Monitoring Plan

Issues	Action required	Frequency	Responsibility	Applicable regulation and standards	Regulating institution	Approximated Budget
- Accidental discharge of untreated sewer into the surface water due high volume of effluent into the wetland	- Controlling the Volume of effluent entering the wetlands and the anaerobic reactor. - Water quality monitoring sensor - Avoid entry of Storm water into the ponds - Keep Records on the quality entering the pond and after treatment at the discharge point - Employ qualified chemist and water engineers	Daily Monitoring	- The plant operator - Proponent	- Water Act 2016 - Water Quality regulations 2006 - Public health Act	- NEMA - WRA - County government	Kshs 0.8M annually
- Potential Odour emissions from the sewerage plant would be the main concern during the operation phase. The most common nuisances caused by poor maintenance of DTF facilities are odour, flies and mosquitoes.	- The volumetric BOD loading should lie between 100-400 g/m^3 in order to maintain anaerobic conditions and at the same time control odour release. - To reduce odour, flies and mosquitoes, routine maintenance tasks must be attended to punctually. This involves the following: - - Removal of screenings and grit from the inlet system to reduce blockage. - Regular cutting and disposal of grass and other herbaceous plants. - Removal of floating scum and floating macrophytes from the pond surface. - Removal of accumulated debris and other solids at the inlets and outlets. - Fencing of the site from access by unauthorized persons	Daily Monitoring	Plant operator Proponent	- Water Act 2016 - Water Quality regulations 2006 - Public health Act		

Commented [u1]: DTF facilities not ponds

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	- Repair of embankment which are eroded by rainfall or damaged by rodents and livestock grazing. - Destruction and expulsion of burrowing animals and their nests in the embankment walls					

Table 8.3: Decommissioning Flow Chart

The Project has been designed to operate effectively for over 20years. If the infrastructure will be required to be overhauled, then the following steps should be considered in order to undertake the procedure in a structured manner with minimum impact to both human and natural environment as illustrated in **Table 8.3** below.

	Action	**Actor**
Step 1	**Initiation** - Development of an Objective Worksheet and checklist incorporating references, legal and policies undertake decommissioning audit	Proponent
Step 2	**Prepare Road Map for Decommissioning Design** - Conduct design review to validate elements of the design and ensure design features are incorporated in the decommissioning design. Public consultations	Proponent
Step 3	**Prepare and Award Contract** - Prepare a contract that incorporates validated Project information and award to a Contractor as per the Procurement rules.	Proponent
Step 4	**Execute Decommission Works** - Implement design elements and criteria on the Project in accordance with specifications and drawings. Inspect during decommissioning and at Project completion to ensure that all design elements are implemented according to design specifications.	Contractor
Step 5	**Commissioning Environmental Management Plan Six months prior to decommissioning works**	Contractor
Step 6	**Non-Conformance, Corrective/Preventive Action** - Determine root cause - Propose corrective measures - ropose future preventive measures.	Contractor

8.7 Monitoring Activities

8.7.1 General

Environmental monitoring is envisioned as an important process in project management. It reveals changes and trends brought about by presence and operations of a project. Such information will be useful in the formulation of sustainable project management, operation strategies and action plans.

The basic activities for a sound monitoring programme should at least include the following parameters:

(a) collection and analysis of relevant environmental data of the project area;

(b) preparation of periodical reports on the environmental status of the project area and liaison with other agents and stakeholders;

(c) identification of unexpected environmental impacts;

(d) formulation of counter-measures to mitigate against the unexpected negative impacts.

8.7.2 Environmental Monitoring During Construction

Environmental due diligence should be incorporated into the project implementation as follows:

- control of health and safety risks of the contractor's work force;
- prevention of negative environmental impacts during construction;
- control of the residual risk of accidental environmental damage;

- Training and awareness creation on all environmental issues.

As part of the construction progress reports, environmental considerations should be covered and progress indicated on the implementation of mitigation measures, as outlined in the EMMP.

Upon completion, all temporary buildings, all construction materials and debris will be removed from the site and the area rehabilitated as per the requirements.

Construction aspects to be monitored will include, but will not be limited to the following issues:

- soil erosion and sediment control;
- handling of hazardous materials as part of construction activities;
- movement of machinery;
- occupational health and safety;
- collection and disposal of wastes;
- management of pollution incidents.

All relevant technical information, indicating that the construction was undertaken in compliance with the set design standards and noting any deviations, as well as environmental conservation measures undertaken should be provided to the property owner.

All technical information on materials used, saving and environmental performance should be outlined and highlighted during hand-over. These will be incorporated into the environmental management and monitoring plan for the wastewater Project.

8.7.3 Environmental Monitoring During Commissioning and Operation

a. Management of the Project

During the commissioning and operation of the development, an environmental monitoring plan should be incorporated in the system to minimize any negative environmental impacts. The management of the project will have the sole responsibility of ensuring environmental health and safety issues are adhered to.

The risks to be monitored will include, but not limited to the following issues:

- waste handling and disposal;
- noise pollution control;
- operation and maintenance;
- occupational health and safety.

The following activities will be undertaken after completion of the construction phase:

- close-down audit to verify that the proposed mitigation measures have been implemented;
- inclusion of an environmental monitoring and management programme for maintenance.

b. Maintenance

It should be demonstrated that all facilities comply with the standards as will be set out in the tender document and technical specification. The construction team will develop a programme of regular maintenance and ensure that the relevant skills are always available.

Annual environmental Audits will be carried out and submitted to NEMA in Compliance with the requirements of environmental Impact Assessment and Audit Regulations 2003.

The proponent will have to apply for Effluent Discharge License from NEMA as Prescribed in Water Quality Regulations 2006

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

The project upon completion would realize several positive impacts, most significant of which being reduction of public health hazard as result of improved drainage and sewerage conditions in the service area. The project has been planned in full cognizance of the requirements of the Mbale Town where it is to be implemented and all standard planning considerations have been taken into account and given the attention they deserve. The following conclusions were arrived at:

- The project does not pose any serious environmental concern, other than those mentioned with their mitigation measures;
- The positive environmental impacts the project will realize far out-scales the negative ones, which can be contained by following the prescribed ESMMP;

9.2 Recommendations

This environmental examination process therefore establishes a negative determination of the impacts on the environment and hence recommends that the proposed construction works be implemented with full adherence of the Environmental and Social Monitoring and Management Plan

Having considered the information collected, collated and analyzed through field study and literature review, the following recommendations were arrived at:

- The project proponent should commence the project immediately once this report is approved;
- Ensure that worker's occupational health and safety standards are maintained through capacity building, proper training, providing protective clothing and managing their residential camps up to the required health standards;
- The local community should be sensitized to abate stealing of pipes and metals of the sewerage system, and;
- Once the project is complete, there is a need to develop plans to recycle waste for power production;
- The design should ensure comprehensive waste water treatment to allowable limits by NEMA and WHO standards and public health Guidelines, before releasing into the river;
- Involvement of all relevant stakeholders is proposed throughout the process to ensure project acceptability;
- All construction waste will be properly disposed off in a timely manner, the excavated material wherever possible will be used as raw material for a range of activities, such as road repair or construction, and for use as building material e.g. stones;
- Annual environmental audits should be carried out on the project in order to ensure compliance of the project with the mitigation measures outlined in the Environmental and Social Management Plan (ESMMP);
- There is need to have all the safety measures put in place so as to promote the well-being of the workers especially at the construction phase and the pipe laying phases.
- The contractor tasked with carrying out the sewerage construction should use the local labour during the project cycle to empower the communities financially and also build their capacity in their general maintenance. These personnel should be trained to effectively manage the project once construction is completed.

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APPENDICES

Appendix 1 Copy of Current EIA/EA Expert Practicing License

Appendix 2 Copies of Land Ownership Documents

Appendix 3 Evidence of Stakeholders' Participation in EIA Process

Appendix 4 Copy of Architectural Drawings for the Proposed Project

Appendix 5 Water Test Analysis from Ehedwe River/Stream (baseline for monitoring activities)