



# ENVIRONMENTAL IMPACT ASSESSMENT PROJECT REPORT FOR THE PROPOSED MAGUMU 33/KV SUBSTATION IN KINANGOP DISTRICT.



Site central point GPS coordinates = (0°52'19.83"S, 36°34'13.88"E)

**JANUARY**

**2012**

**FINAL PROJECT  
REPORT**



*Environmental and Social Impact Assessment Project Report*

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**CERTIFICATION:**

**Client:** The Kenya Power & Lighting Company Limited

**Assignment:** To carry out an Environmental Impact Assessment of the proposed Magumu 33/11kV Substation in Kinangop district.

**Project Cost:** The project cost is Kenya Shillings 110 Million (One hundred and ten million)

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## LIST OF ABBREVIATIONS

Table 1 List of Abbreviations

BOD	Biological Oxygen Demand
CBD	Convention on Biological Diversity
CO <sub>2</sub>	Carbon dioxide
CSR	Corporate Social Responsibility
DAO	District Agricultural Officer
DO	District Officer
DC	District Commissioner
EA	Environmental Audit
EHS	Environment Health and Safety
EIA	Environmental Impact Assessment
ESIA	Environmental & Social Impact Assessment
EIS	Environmental Impact Statement
EMCA	Environmental Management and Coordination Act, 1999
EMP	Environment Management Plan
ESMP	Environmental and Social Management Plan
GHGs	Green House Gases
Ha	Hectare
HVF	Heavy Vehicle Fuel
IDO	Industrial Diesel Oil
KWS	Kenya Wildlife Service
L.R	Land Registration
MOA	Ministry of Agriculture
MSDS	Material Safety Data Sheet
NEMA	National Environment Management Authority
NFPA	National Fire Protection Association
NO <sub>x</sub>	Oxides of Nitrogen
OSHA	Occupational Health and Safety Act
PM	Particulate Matter
PPE	Personal Protective Equipment
SEM	Sustainable Environmental Management
SO <sub>x</sub>	Oxides of Sulphur
STD	Sexually Transmitted Diseases

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## **EXECUTIVE SUMMARY**

### **Introduction**

In a bid to strengthen and expand the electrical infrastructure, Kenya Power desires to construct a 33/11kV substation in Magumu division of the newly created Kinangop district. The proposed project will be undertaken on private property i.e land belongs to the proponent-Kenya Power. The Magumu substation will have one 7.5 MVA transformer to step down power from 33kV to 11kV for distribution. The project site is in Bamboo sub location, Bamboo Location in Magumu division along the Fly-Over Njambini road 300 meters from Mutonyora primary school and about 500 meters from Magumu trading centre.

The project is response to high power demand, poor and unreliable supply and technical losses associated with supplying the area with long distance distribution lines. Prior to the construction of the proposed project Kenyan law (EMCA 1999) expects that the proponent carries out an Environmental and social impact assessment study with an intention of identifying negative impacts to the environment. The ESIA should also propose adequate mitigation measures to address the negative impacts. National Environmental Management Authority will then make a decision on whether the project should proceed or not based on the ESIA report.

### **Objectives of the ESIA Study**

- ✚ Conduct an Environmental & Social Impact Assessment to identify both positive and negative impacts of the proposed project and propose most appropriate interventions during construction, operation and decommissioning of the project;
- ✚ Collect baseline socio-economic data of the project area and potential impacts expected from project during construction, implementation, operation and decommissioning;
- ✚ Identify and contact stakeholders to seek their views on the proposed project;
- ✚ Develop Environmental Management Plan implementation and;
- ✚ Develop an Environmental Monitoring Program during construction and operation and present plans to minimize, mitigate, or eliminate negative effects and impacts.

### **Scope and Criteria of the Environmental & Social Impact Assessment**

The Government of Kenya policy on all new projects requires that an Environmental Impact Assessment is carried out at the planning stages of any proposed undertaking. The scope of this Environmental Impact Assessment, therefore, covers:

- ✚ The baseline environmental and Socio-economic conditions of the area,
- ✚ Description of the proposed project,
- ✚ Provisions of the relevant environmental laws,
- ✚ Public participation
- ✚ Identification and discussion of any adverse impacts to the environment anticipated from the proposed project,
- ✚ Appropriate mitigation measures,
- ✚ Development of an Environmental Management Plan.

The scope of assessment covers various activities related to; construction works of the proposed development which includes all works of civil, mechanical, electrical or other nature necessary to construction, commission and decommissioning of the project.

**Terms of reference:**

- ✚ Establish the suitability of the proposed location to construct a substation
- ✚ A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
- ✚ A description of the technology, procedures and processes to be used, in the implementation of the project.
- ✚ A description of materials to be used in the construction and implementation of the project, the products, by-products and wastes to be generated by the project.
- ✚ A description of the potentially affected environment.
- ✚ A description of environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
- ✚ To recommend a specific environmentally sound and affordable wastes' management system.
- ✚ Provide alternative technologies and processes available and reasons for preferring the chosen technology and processes.
- ✚ Analysis of alternatives including project site, design and technologies.
- ✚ Development of Environmental Management Plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.
- ✚ Provide an action plan for the prevention and management of the foreseeable hazardous activities in the cause of the project cycle.
- ✚ Propose measures to prevent health hazards and to ensure security in the working environment for the employees, residents and for the management of emergencies.
- ✚ An identification of gaps in knowledge and uncertainties which were encountered in compiling the information.

**Study Methodology**

This study was carried out through desktop studies and field investigations. The experts conducted extensive literature review relevant to this project. During the field investigation, reconnaissance survey was conducted to gather information on biophysical and socio-economic aspects of the area and its environs.

In order to address these issues the study team adopted a participatory approach where the client and the immediate surrounding communities were consulted in addition to reviews and references to sources of information including legal statutes and relevant project documents. Among the key activities undertaken during the assessment were:

- (i) Interviews and consultations with stakeholders and the immediate neighboring land users. Questionnaires were administered to obtain their honest opinion regarding the project (samples have been annexed to this report),

- (ii) Review of documents with necessary information on the proposed project, the site planning and implementation plan as well as the desired structural design.
- (iii) Physical inspections of the proposed site and photography,
- (iv) Evaluation of the activities around the site and the environmental setting of the wider area, through review of existing information, literature and physical observations.

The Environmental considerations evaluated for the proposed development include: Ecological considerations (biological diversity, sustainable use of ecological resources and ecosystem maintenance), social considerations (economic impacts, social cohesion or disruption, effects on human health, immigration or emigration, communication and effects on culture and objects of cultural value), Landscape considerations, visual impacts, compatibility with surrounding areas and amenity and land use considerations (water sources, effects of proposal on surrounding land use potentials and possibility of multiple uses).

### **Project Description**

The proposed substation will accommodate one 7.5 MVA 33/11kV transformer which will reduce the voltage from 33kV to 11kV from which point it can be delivered to various feeders and reticulated to the consumer. The proposed substation is to have an incoming 33kV line and three 11kV outgoing feeders. This will be a Turnkey type of project where the contractor will come up with the final design and construct the substation.

### **Project Justification**

Current and future demand for power calls for urgent responses in expanding the power infrastructure capacity. The proposed project is a response to ensure stable and quality power supply alongside meeting increasing power demand. The Magumu substation project is justifiable in that it will stabilize power supply, improve on distribution line security hence cushioning against losses occasioned by power failures and blackouts in Magumu. Consequently, the proposed substation comes hardy in meeting the highlighted challenge in power supply. Other benefits will accrue to the national economy in different aspects.

### **Baseline information / description of project area environment**

The proposed project is in Nyandarua south district. This district was one of the eleven districts in central province as at 2008. It bordered Nyandarua north district to the north and Nyeri and Muranga districts to the east and Kiambu east district in the south, to the west Naivasha district of the Rift Valley province. The district has a total area of 1367.2 km<sup>2</sup>. The district had a total of 1,267.2 square kilometers and a projected 310,375 persons in to 2008.

### **Position and size of the district**

The district is divided into three administrative divisions namely Kipipiri, north Kinangop and south Kinangop divisions. It had 10 locations and 34 sub locations. The district had two constituencies namely Kipipiri and Kinangop.

### **Topographic features**

The main topographical feature in Nyandarua south district is the Kinangop plateau. The plateau bears gentle slopes that are interrupted by low undulating hills. The slopes flatten to plain like features encouraging formation of marshlands and swamps. From the eastern wall of the district the Aberdares range rises up to 3,999 meters above sea level. The district has some perennial rivers which include Malewa and Wanjohi among others.

The district falls within the volcanic and fault zone which gave rise to two major landforms-the Great Rift Valley to the west and the Aberdares ranges to the east. In between the two physiographic structures lay the Kinangop plateau. There are steep slopes that have undergone transformation through weathering resulting in shallow valleys and gorges. The ranges drop gradually in series of faults giving way to an escarpment that had been broken into sharp valleys occasioned by changes in level of the river courses.

Rock formation comprises of a series of volcanic rocks that fall into three major categories i.e igneous rocks, volcanic ash and alluvium. Most rocks systems have lines of weaknesses occasioned by faulting which allows porosity and easy percolation.

The soils in the district are volcanic in origin and vary in both fertility and distribution. Shallow soils are found in hilly areas while deep well drained soils are found on the slopes and plateaus. These soils have different crop production potentials.

The district falls in the highland savannah zone, characterized by few scattered trees with expansive grass cover. In elevated areas tree cover increases forming thick forests with which undergrowth. However, most of the natural vegetation has been cleared leading to environmental degradation.

### **Climatic conditions**

The district has moderate temperatures. The highest temperatures are recorded in the month of December when the average is 21°C and the lowest temperatures is recorded in the month of July with an average of 7.1oC

The district also experiences low temperatures with adverse effects. The cold air that is generated during clear nights in the moor lands of Aberdare Ranges flows down the plateau causing night frost every month making cultivation of maize too hazardous. The

valleys west of the plateau occasionally provide outlet to the stream of cold air. The temperatures range between 1.2°C to 1°C. The low temperatures last few hours before sunshine.

The amount of rainfall in the district decreases from east to west. Rain falls in two peak seasons. Long rains start in March and end in may while short rains are received between September and December. The rainfall intensity varies according to the location. Areas near the Aberdares slopes receive sufficient rainfall with the plateau receiving scanty erratic rainfall.

### **Legal and Regulatory Framework**

Kenya has several statutes which relate to environmental matters. Most of these statutes are sector specific covering issues such as occupational health and safety, land use, public health, water quality, soil erosion, wildlife, air quality etc. Previously, environmental management activities were implemented through a variety of instruments such as policy statements, permits and licenses and sectoral laws.

There was however need for stronger enforcement machinery to achieve better standards in environmental management. The enactment of the environmental Management and Coordination Act in 1999 provided for the establishment of an appropriate legal and institutional framework for the management and protection of the environment.

Laws of particular concern to this project are:

- ✚ The Environment Management and Co-ordination Act, 1999
- ✚ Physical Planning Act, 1996
- ✚ Local Government Act (Rev. 1998)
- ✚ Public Health Act (Cap. 242)
- ✚ Energy Act of 2006
- ✚ The Standards Act Cap 496
- ✚ Land Planning Act (Cap. 303)
- ✚ Water Act, 2002
- ✚ Penal Code Act (Cap.63)
- ✚ The Wildlife Conservation and Management Act, Cap 376
- ✚ The Lakes and Rivers Act Chapter 409 Laws of Kenya:
- ✚ The Forestry Services Act, 2005
- ✚ Occupational Safety and Health Act, 2007
- ✚ Work Injury and Benefits Act, 2007
- ✚ Occupiers Liability Act (Cap. 34)
- ✚ The Traffic Act Chapter 295 Laws of Kenya
- ✚ The Public Roads and Roads of Access Act (Cap 22 Laws of Kenya)
- ✚ The Agriculture Act, Cap 318 of 1980 (revised 1986)
- ✚ Antiquities and Monuments Act, 1983 (Cap 215)
- ✚ The Registration of Titles Act Cap 281
- ✚ The Radiation Protection Act (Cap 243 Laws of Kenya)
- ✚ The Traffic Act Chapter 295 Laws of Kenya

### **Public Consultation**

Public participation is a vital requirement of law in carrying out environmental impact assessment. The purpose of public participation is to identify potentially affected

persons and allow them an opportunity to provide input and comment on the EIA process. Various stakeholders were engaged by the EIA team so that they could offer their opinion on alternatives that are to be investigated, impacts and any other information that is necessary at project planning level hence facilitating informed decision-making. In complying with the public participation process (PPP) for the EIA consultative meetings were organized to engage the public at various levels.

### **Project Potential Environmental and Social Impacts**

Through consultations and literature review the following impacts were identified;

#### **Anticipated Positive Impacts**

- + Creation of employment opportunities
- + Improved Electricity Supply
- + Provision of Market for Supply of Building Materials
- + Boosting of the informal sector
- + Compatibility with existing and proposed land uses
- + Improved Security
- + Optimal use of land
- + Improvement of local and national economy
- + Increased protection from possible lightning strikes

#### **Anticipated Negative Impacts**

- + Soil erosion
- + Contamination of soil
- + Decreased air quality due to dust emission
- + Solid waste
- + Impacts on Water Quality and Water Resources
- + Noise and vibration
- + Visual Intrusion and aesthetic impacts
- + Traffic congestion
- + Accidents as a result of increased traffic
- + Damage to roads and transport infrastructure
- + Occupational Health and safety Impacts
- + Impacts on Public Health
- + Influx of People
- + Social Vices

#### **Proposed Mitigation measures**

- + Holding of the construction area
- + During construction, any stockpiles of earth should be enclosed /covered /watered during dry or windy conditions to reduce dust emissions;
- + Construction trucks removing soil from the site, delivering dusty construction materials to the site should be covered to prevent material dust
- + Drivers shall be instructed to drive at low speeds

## *Proposed Magumu 33/11 kV substation in Kinangop district*

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- ✚ During construction, where water is available, sprinkle the construction area with water to keep dust levels down.
- ✚ Dust masks should be provided to all personnel in areas prone to dust emissions throughout the period of construction.
- ✚ Drivers of construction vehicles must be supervised so that they do not leave vehicles idling and they limit the vehicular speeds so that dust levels are lowered.
- ✚ No burning of any waste materials whatsoever should be permitted within the site during construction
- ✚ Areas cleared of vegetation at the substation site, and where no substation structures are, shall be rehabilitated by grass to prevent soil erosion. Drainages shall be constructed to control storm water.
- ✚ Noise pollution shall be mitigated by ensuring that noisy operations are done during the day only and also by properly maintaining construction machinery.
- ✚ HIV/AIDS awareness campaigns shall be carried out for employees and the surrounding members of public.
- ✚ Solid wastes generated, shall be carted away as soon as possible for appropriate disposal.
- ✚ Occupational safety measures shall be put in place, including provision of suitable and adequate personal protective clothing and equipment to construction employees.
- ✚ Scaffolding to be placed to protect the public from dust.
- ✚ Emergency response measures shall be put in place
- ✚ Only qualified authorized operational staff shall work at the substation
- ✚ Danger/Caution warning notices shall be placed appropriately
- ✚ The site shall be rehabilitated to its original state as far as is reasonably practical.
- ✚ Ensure minimum clearance distances between conductors and ground, waterways, road crossings, buildings, communication systems etc. are incorporated into design.
- ✚ Construction to proceed in the dry season if possible to minimize soil erosion.

### **Project alternatives**

There are possible alternatives available for the proposed project as follows:

- ✚ The ‘Do-nothing’ Option - based on utilizing existing facilities as it is without undertaking any new works.
- ✚ Alternative Structure Types and Designs- will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements
- ✚ Analysis of Alternative Construction Materials and Technology
- ✚ Alternative Site

### **Summary of Environmental and Social Management Plan (ESMP)**

An Environmental and Social Management Plan (ESMP) for development projects provides a logical framework within which identified negative environmental and socio-economic impacts can be mitigated and monitored. The ESMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures

and monitoring can be done. The ESMP outlined addresses the identified potential negative impacts during all project phases.

To ensure that the negative environmental impacts are controlled and mitigated effectively, a stringent and scientific management and monitoring plan has been prepared. The ESIA proposes to utilize existing structures with KPLC management, including Safety, Health and Environment (SHE) department and relevant departments responsible for ensuring that the overall environmental and social targets are achieved and that the environmental responsibilities and obligations of the ESIA are satisfied during the life of the project.

The project manager shall conduct quarterly inspections/audits to ensure that the system for implementation of the ESMP and ESMoP is operating effectively. This ESIA therefore requires that the ESMMP be integrated into the Design Report with appropriate allocation of funds in the Bills of Quantities. The contract for construction should bear clauses binding the contractor to implement impact mitigation as part of the civil works. The KPLC will mount own internal monitoring to ascertain environmental and social sensitivity at all stages of project development.

## **Conclusion and Recommendations**

### **Conclusion**

The analysis of the EIA has pointed out that the construction and operation of the proposed substation would have positive as well as negative impacts economically, socially and environmentally. An Environmental and Social Management Plan (E&SMP) outline has been developed to ensure sustainability of the project activities from construction through operation to decommissioning. The plan provides a general outlay of the activities, associated impacts, mitigation action plans and appropriate monitorable indicators.

A monitoring plan has been developed and highlights some of the environmental performance indicators that should be monitored. Monitoring creates possibilities to call to attention changes and problems in environmental quality.

From the findings of this study, the following conclusions are made:

- ✚ The proposed project will generate socio-economic benefits which would not be realized if the no development option is considered.
- ✚ Successful implementation of the proposed EMP will ensure environmental sustainability.
- ✚ The project will be designed, constructed, and operated according to the acceptable industry norms and standards.

### **Recommendations**

It is evident from this study that the construction and operation of the proposed project will bring positive effects in the project area. However, the project will also bring various negative impacts hence the need to be addressed and mitigated against.

It is strongly recommended that a concerted effort is made by the site management in particular, to implement the Environmental Management and Monitoring Plan provided herein. Diligence on the part of the contractor and proper supervision by the proponent is crucial for mitigating the predicted impacts and ensuring structural strength, safety, and efficient operation of the project. Following the commissioning of the project, annual statutory Environmental and Safety Audits must be carried out.

Considering the proposed location, construction, management, mitigation and monitoring plan that will be put in place, the project is considered important, strategic and beneficial and may be allowed to proceed.

## **CHAPTER ONE: INTRODUCTION AND PROJECT BRIEF**

### **1.1 Introduction**

Kenya Power (KP) intends to construct and commission a 33/11kV substation in Magumu division Kinangop district. This is occasioned by the increase in demand for power and expansion of the electricity infrastructure. Currently, Kenya suffers from unreliable and unstable power grid infrastructure that is unable to keep pace with a demand for electricity at 4.9% annually. Power outages are common occurrence especially within Magumu and the construction of the proposed substation will result in reliable and quality power supply for the area and its environs.

Under The Least Cost Power Development Plan 2010-2030, KPLC customer base is expected to grow by 200,000 connections every year creating an annual demand growth of about 150MW. The national economic growth for Kenya is on upward trajectory as exemplified by the economic performance of 2009 that recorded 2.6 percent. The country's economy is projected to grow between 4 percent and 5 percent for 2010-2011 financial years. Electricity is demand driven which is heavily influenced by the economic performance of the country. Consequently, there is need to plan for sufficient electricity capacity additions to meet the growth aspirations of Vision 2030.

The national energy key stakeholders, who include amongst others, the Ministry of Energy, Kenya Power, Kenya Electricity Transmission Company (KETRACO), Kenya Energy Generating Company (KenGen) and Energy Regulation Commission (ERC) have carried out the country's power-demand projections for the medium term. The results indicate a need for capacity enhancement to satisfy the projected demand.

Sustainable development requires all development activities take into account the needs of environmental conservation. The sustainability of the ecosystem requires the balance between human settlement development and the natural ecosystem, which is a symbiotic relationship. This can be achieved through careful planning and the establishment of appropriate management systems. Currently, the need to plan activities has become an essential component of the development process. Consequently a number of planning mechanisms have been put in place to ensure that minimum damage is caused to the environment. Environmental planning is also integrated with other planning processes such as physical planning, economic planning, and development planning. Environmental Impact Assessment (EIA) is considered part of Environmental planning. EIAs are undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority. In Kenya, the competent authority is the National Environment Management Authority (NEMA).

### **1.2 Project background**

Currently, national access to electricity is estimated at 29%. The Government of Kenya, as part of the 2030 Vision aims to raise access to electricity to 40% by the end of year 2020. This increased level of electrification will result in increased demand for electricity which will require major expansion in power generation and transmission infrastructure in the country.

The interconnected system has an installed capacity of 1,375 MW comprising: 757 MW of hydro; 198 MW of geothermal; 0.4 MW of wind; 279 MW of thermal; 26 MW of co-generation; and 60 MW provided by emergency diesel generators. This power is transmitted countrywide through the transmission network, which comprises of 1,323 kilometres (km) of 220 kV transmission line, 2,122 km of 132 kV transmission line and 632 km of 66 kV transmission line. Kenya is currently interconnected with Uganda through a 132 kV double circuit transmission line rated at 2x86 MVA.

The existing transmission system capacity is constrained particularly during peak hours when system voltages in parts of Nairobi, West Kenya and Mount Kenya drop below acceptable levels, causing occasional load shedding despite the availability of generation capacity. To address these constraints, Kenya Power has identified the need for a number of distribution substation projects across the country which is now at various stages of development.

Construction of a substation to serve Magumu division will significantly reduce the current high losses and poor quality of power supply by overstrained 33kV lines in the area. Furthermore, construction of a 33/11 Substation with a 33kV bus-bar opportunity for additional 33kV lines is beneficial for future expansion.

To ensure that the above project is implemented in an environmentally and socially sustainable manner, KP has engaged the services of environmental experts registered by NEMA to conduct an environmental and Social Impact Assessment ESIA for the proposed project. The ESIA was conducted in line with the Environmental Management and Coordination Act 1999, and the subsequent Kenya Gazette Supplement No. 56 of 1st June 2003.

### **1.3 Justification of the Proposed Project**

Power Load studies have shown need for capacity enhancement to ensure stable and quality power supply amid increasing power demand. The Magumu substation project is justifiable in that it will stabilize power supply, improve on distribution line security hence cushioning against losses occasioned by power failures and blackouts. The Magumu division and its environs are supplied with power from Limuru substation which results in technical losses due to long length of distribution line. Consequently, the proposed substation comes handy in meeting the highlighted challenge in power supply. The Substation needs to be as close as possible to the area it will serve to minimize on technical losses associated with long distances of distribution.

The economy will benefit both directly and indirectly as better power supply is a mover of the economy. Other benefits include Value Added Taxes (VAT) imposed on construction materials and various fees charged by different government institutions. More importantly, the design of the project is well thought out and has taken into consideration all the necessary interventions needed to mitigate negative impacts on the environment and safeguard safety of construction workers.

### **1.4 Scope and Objectives of the Study**

It is a requirement by the National Environment Management Authority (NEMA) Policy that all new undertaking that is out of character with the host environment must be subjected to an Environmental Impact Assessment (EIA) at the planning stages to ensure that potential

environmental and social impacts are taken into consideration during the design, construction, and operation and decommissioning of the project.

### **Scope**

The main objective of this assessment was to identify significant potential impacts of the project to environmental and social aspects. Further, it sought to formulate recommendations to ensure that the proposed project takes into consideration appropriate measures to mitigate any adverse impacts to the environment through all phases of its implementation.

The assessment was carried out in line with EMCA 1999 and the Environmental Impact Assessment and Audit Regulations, 2003. Further, reference to relevant sectoral legal provisions has been made to ensure compliance with them during construction, operation and decommissioning of the proposed project.

The EIA scope largely covered the following areas:

#### **Baseline Conditions:**

- Environmental setting (climate, topography, geology, hydrology, ecology, water resources sensitive areas, baseline noise levels, air quality and soil quality analysis.
- Socio-economic activities in the surrounding areas (land use, human settlements, economic activities, institutional aspects, water demand and use, health and safety, public amenities, etc.),
- Infrastructural issues (roads, water supplies, drainage systems, electricity distribution system, etc.).

#### **Legal and policy framework:**

Reference to the relevant national environmental laws, regulations and by-laws and other laws and policies to ensure compliance has been made.

#### **Interactive approach was adopted for the immediate neighbourhood in discussing relevant issues including among others:**

- Land use aspects,
- Project acceptability,
- Social, cultural and economic impacts,
- Environmental Impacts
- Physical impacts,
- Biological impacts,
- Legal Compliance.

#### **Specific objectives of the assessment:**

The specific objectives of the assessment were;

- Present an outline of the project background,
- Establish the environmental baseline conditions of the project area and review all available information and data related to the project,
- Identify key areas for environmental, health and safety concerns as well as the anticipated impacts associated with the proposed project.

- Establish a comprehensive environmental management plan covering the construction, operation and decommissioning phases of the project,
- Preparation of a comprehensive project report in accordance with the local environmental legislation and submission to NEMA for further instructions and/or approval.

### **1.5 Terms of Reference (ToR) for the EIA Process**

The EIA Experts were tasked with carrying out Environmental Impact Assessment for the proposed Magumu 33/11kV substation. The scope covered various activities related to; construction works (civil works), mechanical, electrical or other nature necessary to construct, commission and decommissioning of the project. The output of the assessment is an Environmental Impact Assessment Report which will aid NEMA in making a decision on whether to license the project or not.

The following terms of reference guided the EIA experts in conducting the assessment;

- Asses the suitability of the proposed location to construct the Magumu substation.
- A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
- A description of the technology, procedures and processes to be used, in the implementation of the project.
- A description of materials to be used in the construction and implementation of the project, the products, by-products and waste to be generated by the project.
- A description of the potentially affected environment.
- A description of environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
- Analysis of alternatives including project site, design and technologies.
- Development of an Environmental Management Plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.
- Provide an action plan for the prevention and management of the foreseeable accidents and hazardous activities in the course of project construction, operation and decommissioning.
- Propose measures to prevent health hazards and to ensure safety in the working environment for the employees and the neighbouring community.
- An identification of gaps in knowledge and uncertainties which were encountered in compiling the information.

### **1.6 EIA Approach**

In undertaking this assessment attention was paid to EMCA, 1999 requirements as well as the Environmental Impact Assessment and Audit Regulations, 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation

plan. The approach and methodology applied enabled collection of quality data needed for the report.

The initial stage of this assessment was project screening. Screening of the project sought to ascertain whether or not this project falls within a category that requires EIA prior to commencement. Other considerations made during this stage included a preliminary assessment of the environmental sensitivity of the proposed project site.

Project scoping was the next stage which was done to delineate project issues that required detailed analysis.

### **1.7 EIA Methodology**

The experts employed various methods to ensure relevant and adequate data was collected. The methods included;

#### **Desk study/literature review**

Available data relevant to the proposed project was gathered. The secondary data included designs, various legislations and regulations and district development plan among others. A critical literature review of the secondary data was done to establish the following:

- ✓ Legislations and institutional framework governing the proposed project
- ✓ Licenses and permits requirements
- ✓ Nature of the project
- ✓ Baseline information of the project area
- ✓ Types of waste likely to be generated.

#### **Site assessments**

A physical visit to the proposed site was done. This allowed a deeper understanding of the project area and the surrounding environment. It also provided an opportunity to identify potentially affected persons not to mention the affected environment. The site visit allowed for physical assessment of the area through observations.

#### **Data collection procedures**

Qualitative methods of data collection were largely employed. Secondary data was obtained through literature reviews. Primary data was obtained through physical observations, interviews, discussions, photography and consultations.

#### **Public Consultations**

Section 17 of the Environmental (Impact Assessment and Audit) Regulations of 2003, requires that all EIA assessment undertake Public Consultation (PC) as part of the study. The aim of the PC is to identify all stakeholders in a proposed project such as project beneficiaries and the general public and provide them an opportunity to air their opinions which should be considered during project planning, design, construction, operation and decommissioning phase. Therefore, consultations were carried out in the project area in a bid to inform the public and other interested parties on the proposed project and obtain their views on the same. The consultations also presented an opportunity for the EIA team to educate the public on environmental and safety issues related to the substation.

Public consultations were conducted through; presentations, discussions and administering of questionnaires. Key stakeholder consultation was done at the division level to allow an opportunity for expert opinion from the line government ministries.

Below is an outline of the basic EIA steps that were followed during this assessment:

#### Step 1: Project Concepts

The project details, scope, design, implementation were first analyzed.

#### Step 2: Terms of Reference (ToR)

The terms of Reference were developed guided by EMCA 1999 and The Environmental Impact Assessment/ Audit regulations 2003. Any new developments out of character with their surrounding must have an EIA undertaken; for review, Approval and Licensing by NEMA.

#### Step 3: Project Screening

Details about baseline conditions and potential environmental and social impacts were collected through desktop study, consultations, site visits, photography, and inductive methods.

#### Step 4: Identification of Potential Environmental and Social Impacts

The Potential Environmental impacts were identified, classified and magnitude determined.

#### Step 5: Impact Assessment and Consultations

The Environmental and Social Impacts were analyzed, assessed and discussed in details involving consultations with the Proponent and other stakeholders.

#### Step 6: Formulation of Mitigation measures

Mitigation measures to ameliorate or minimize the potential Environmental and Socio - economic impacts were formulated for the entire project life.

#### Step 7: Development of an Environmental & Social Management and Monitoring Plan:

An E&SMMP for the project life was developed indicating parameters to be monitored, persons responsible, timing and costs involved.

Specific issues covered in the project report include but are not limited to:

- Name of the proponent, address and contact person
- Title of the project
- Objectives and scope of the project
- Nature of the project;
- Location of the proposed project, including the physical area that may be affected by the project's activities;
- Types of activities that will be undertaken during the project construction, operation and decommissioning phases;
- Design of the project;
- Proposed Project budget;
- Materials to be used, products and by-products, including waste to be generated by the project and the method(s) of their disposal;

## Proposed Magumu 33/11 kV substation in Kinangop district

- Potential environmental impacts of the project;
- Economic and social impacts to the local community and the nation in general;
- Views of the public/potentially affected people about the project; and
- An Environmental and Social Management Plan (E&SMP) for the entire project cycle to include mitigation measures to be taken during and after implementation of the project and an action plan for the prevention and management of foreseeable accidents during the project cycle.
- An Environmental and Social Monitoring Plan (ESMP)

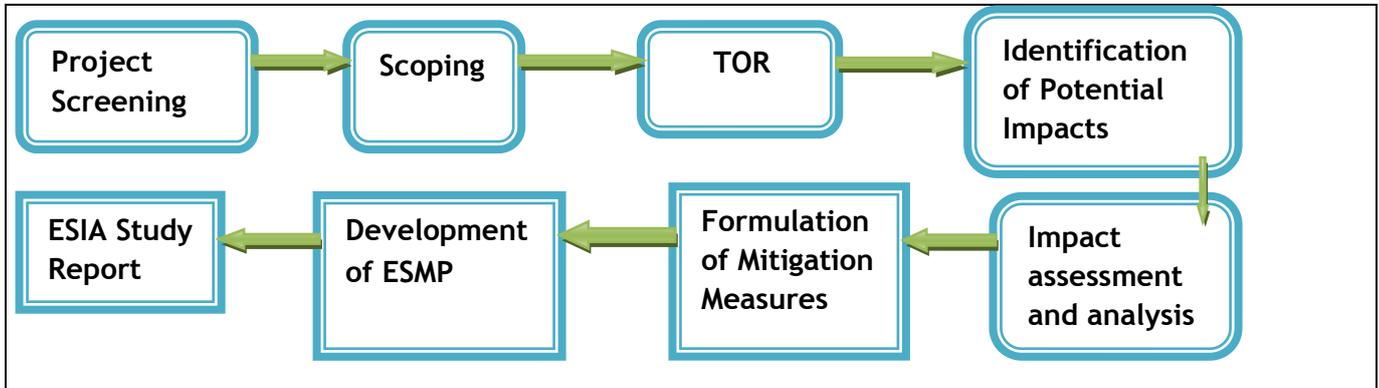


Figure 1 : Summary of EIA procedure

## CHAPTER TWO: DESCRIPTION OF THE PROPOSED PROJECT

### 2.1 Introduction

A detailed description of the proposed project in terms of the location, nature and associated aspects is presented in this chapter. In addition, project activities and materials to be used are discussed.

### 2.2 Project location and Land Ownership



**Figure 2: Google map showing project site**

*The Project site is opposite a KPLC Pole Mounted transformer about 300 meters from Mutonyoria Primary school and 600 meters from Magumu trading centre.*

*Site GPS coordinates = (0°52'19.83"S, 36°34'13.88"E)*

The proposed site where the substation will be constructed belongs to the proponent/Kenya Power. Administratively, the plot is in Rugegesi village, Bamboo sub location, Mugumu location, Magumu division of Kinangop district. Currently, the plot is furrow with no crops cultivated by the proponent.

The proposed site is classified as agricultural land. The land parcel is registered as Nyandarua/South Kinangop/1427, measuring approximately 0.607 hectares. It is registered under the proponents name i.e Kenya Power and Lighting Company Ltd property under the Registration of Titles Act (Cap. 281). Land for the proposed substation has been acquired by KPLC on a willing seller-willing buyer basis. The KPLC has also acquired a change of user for the piece of land and necessary public notification on the same.

### **2.3 Description of the project**

Kenya power desires to construct a 33/11 kV substation which will comprise one 7.5MVA transformer to step down power for distribution within Magumu division and the entire district. The specific objectives of the project include; boosting the existing load to stabilize power supply and ensure quality power for the customers not to mention meeting the increasing power demand. This will be a Turnkey type of project where the contractor will design and construct the substation.

The main objective is to construct a new 33/11kV Substation. This is to upgrade the existing power network. Specific objectives include;

- Designing and constructing of a 33/11 kV substation in compliance with electric generation regulatory authorities (ERC, Ministry of energy)
- Ensure sustainability of the project by complying with national laws especially those touching on environment

### **2.4 Project Justification**

Existing power Load studies have pointed out to the need for capacity enhancement to ensure stable and quality power supply to meet the increasing demand. The Magumu substation project is justifiable in that it will stabilize power supply, improve on distribution line security hence cushioning against losses occasioned by power failures and blackouts. The area is expecting major development projects namely a police station, hyper market and the upgrading of the health centre to level five sub district hospitals. The area is currently supplied from Limuru substation

A substation needs to be as close as possible to the area it will serve in order to minimize technical losses associated with long distances of distribution. The proponent/KPLC got a parcel of land in Magumu location off Nairobi-Naivasha road. The plot is along Njambini road about 2 km from Magumu trading centre near Mutonyora primary school. The change of use for the plot from agricultural to electrical use has been done. The commissioning of the substation will guarantee stable and quality supply of electricity to Magumu division and its environs.

### **2.5 Project Desirability**

The project is desired for the main reason of additional supply of electricity to enable many previously un-serviced households to receive electricity. Should the proposed developments not be undertaken, the risk for electrical faults and associated power outages, which are currently occurring in the area on a relatively frequent basis, will increase significantly. In addition, the ability to supply new customers would be severely limited in that it is anticipated that the demand for electricity in the study area will soon exceed the capacity of KPLC's existing 33kV electrical system. This will consequently have a significant negative impact on existing and proposed new developments in the area.

### **2.6 Technical aspects of a substation**

Basically, a sub-station is a vital component of electricity generation, transmission and distribution system. The main role of a substation is to transform voltages from high to low and vice versa, using transformers and other heavy-duty electrical switchgear. The project is

## Proposed Magumu 33/11 kV substation in Kinangop district

a step down substation i.e. 33kV to 11kV. After stepping down, electricity is fed to distribution lines running to specific geographic areas to supply customers.

The proposed 33/11 kV substation will have the following components; one 7.5MVA transformer and its bay, in-coming & out-going feeders, switch gears, bus bars, steel structures, cabling units, lightning arrestors, a parking bay, control panels and a guard house.

The substation will be fed from the existing 33 kV line running opposite the proposed site. One 7.5MVA transformer will be installed to step down power at the substation. The windings of such large transformer are immersed in transformer oil. It is a highly refined mineral oil that is stable at high temperatures and has excellent electrical insulating properties. Its functions are to insulate, suppress corona and arcing, and to serve as a coolant. Also, because it provides part of the electrical insulation between internal live parts, it must remain stable at high temperatures over an extended period.

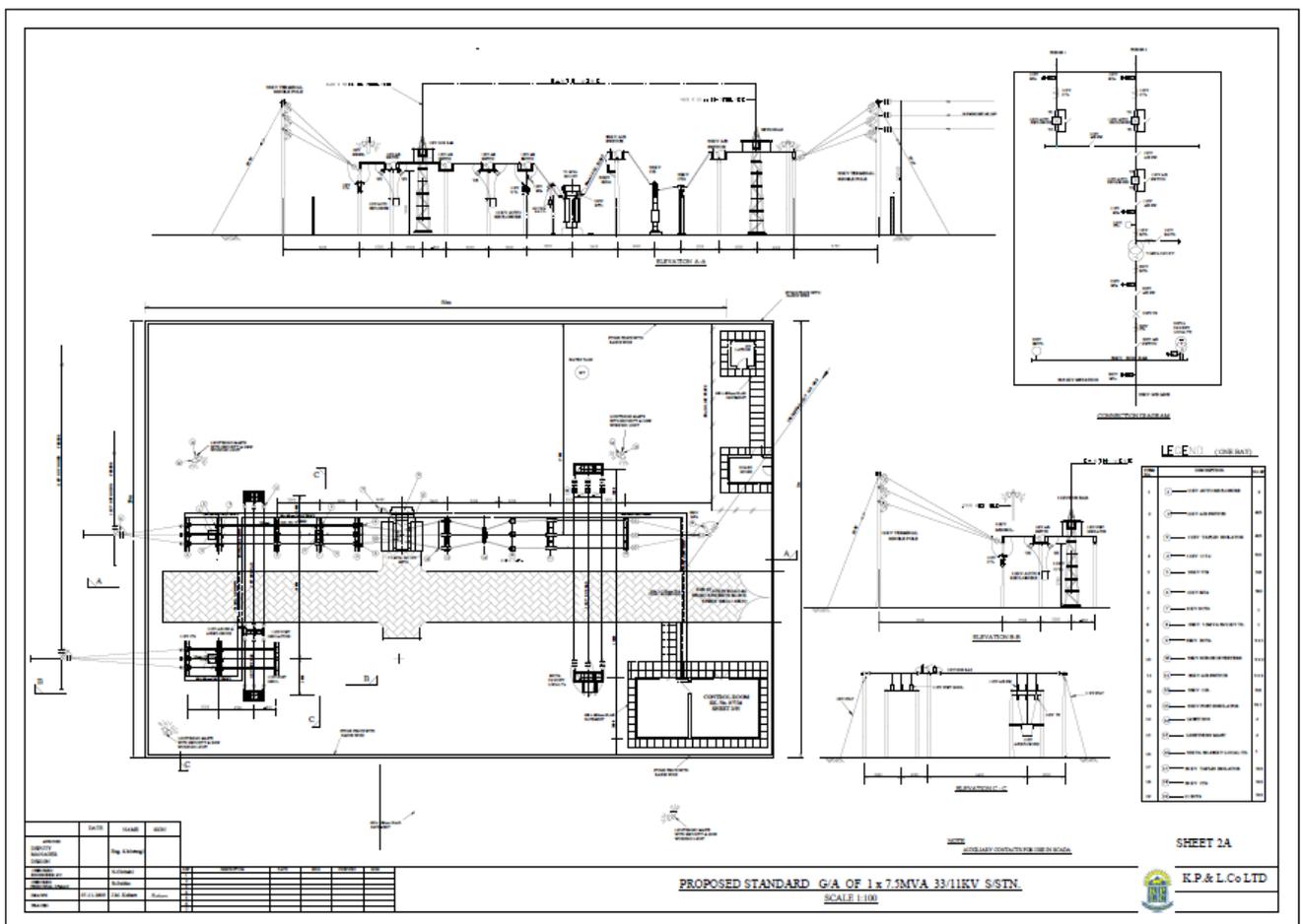


Figure 3: Design of the Substation

Associated facilities include; a small office and a control room to house the high voltage monitoring and control instrumentation and equipment. The sub-station will also be equipped with KPLC's own internal micro-wave telecommunications facilities. When operational, the sub-station will be manned on a 24-hour basis. A sentry house will also be constructed for the watchman.

### **Size**

The proposed 33/11 kV Substation will be approximately 50m x 40m in extent. KPLC have indicated that a 0.5ha site is required to accommodate the proposed substation, a turning area for the low bed vehicle which transports the transformer to the site, and the incoming and outgoing lines.

### **Electrical Infrastructure**

The proposed substation is to have an incoming 33kV, three equipped 11kV feeder bays and one spare bay for future purposes. The substation will be designed to accommodate a future 33kV feeder bay, additional transformer and two additional feeder bays. The design will incorporate allowances for the use of a mobile transformer for emergency conditions.

A standard “brick type” control room will be constructed inside the boundary of the substation yard for the protection of the line and substation equipment, as per KPLC’s standard control room layout.

In addition to the control room, the substation will also have steelwork A-frame busbar structures of approximately 12m - 13m in height for the 11kV feeder lines, and column and beam steelwork bus bar structures of approximately 12m - 13m in height for the 33kV line.

In terms of lightning protection for the substation, overhead screening will be provided by protective cones afforded by A-frame peak and lightning mast peaks. Equipment within the substation yard will be shielded by the steelwork (columns, beams and A-frames) structures and overhead steel wires. All steel work will be connected to an earth mat to prevent potentially high voltages from arising.

### **Access**

It is proposed that the substation have one access road, which will be designed according to KPLC’s standards, taking into account the Ministry of Road’s requirements. The length of the access road will be approximately 50m, while the width of the road will be determined by need, such as equipment size, whereby the maximum allowable width is 5m. The access road will also need to be able to sustain the vehicle load associated specifically with the transportation of the transformer to the site. A line of sight will need to be maintained on either side of the access road during operation. It is proposed that the access road be constructed off the Flyover-Njambini Road to the substation site.

### **Fencing and Security**

A substation is a high voltage area with potential health hazards if safety regulations and rules are not observed. Consequently, a perimeter wall will be constructed to KPLC’s standard to provide a fence that will keep off unauthorized staff from accessing the area. A gate will be constructed at the entrance to the site which will be locked at all times. The substation will be lit at night, and a photocell will be used to automatically switch on the lights at a set time each evening.

## **2.7 Project Activities**

The design and construction of the substation will be undertaken by a contractor selected through a competitive bidding process. Construction will be supervised by KPLC to make sure works are undertaken according to specifications. This is to ensure quality work is achieved.

It is anticipated that the proposed site will undergo alteration during construction to install the 7.5MVA for the 33/11 kV distribution substation and associated structures. Safety requirements and precautions, established local and international environmental protection regulations alongside company policy shall guide the contractor during construction phase.

### **Construction activities will involve the following:**

- The Contractor shall perform any site investigations in good time as may be necessary for the progress of design and construction on a sound engineering basis.
- Holding of the site with iron sheet and a stone perimeter wall will be constructed
- Ground breaking and removal of vegetation
- Leveling the ground.
- Civil works on site including construction of access road, digging foundations and concrete works
- Delivery of civil work construction materials, transformer, tools, electrical equipment to project site.
- Compaction and filling with gravel of the areas to form foundations
- Storm water drainage construction
- Construction of bund walls to hold transformer in case of accidental oil leakage
- Installation of transformers and erecting of the steel poles to support the incoming and outgoing feeders.
- Post construction clean-up, restoration and landscaping of site
- Connection of power from the existing 33kV line to the substation
- Load testing
- Remedying of defects after functional tests

During construction, the contractor shall observe safety and shall erect warning signs to warn on any potential hazards, ensure proper and efficient use of Personal Protective equipment (PPE) for all on site and observe safe work procedures.

### **Soil Excavation**

The proposed site is currently bare as it has been used for agricultural crops before it was acquired by the proponent. The area is characterized by the following vegetation species; overgrown kale. The area is mainly agricultural and the crops grown within the vicinity include; maize, beans, potatoes, kale and cabbages.

During ground breaking, excavation of the top soil shall be done to pave way for the construction. Soil excavation process shall be done with utmost care to ensure that the excavated soil is not improperly heaped or carried away by any surface flows to any nearby surface waters causing siltation. The excavated soil will be used to backfill and any remainder shall be disposed appropriately in accordance with the environmental management plan. Company safety and environmental policy and other established local environmental protection regulations/standards shall guide the contractor. This will include

safety wear at all times and the contractor will appoint a safety officer on site during all construction activities.

### **Construction Supervision**

Throughout the construction phase, close supervision shall be carried out by the proponent to ensure:

- Workers use personal protective equipment (such as hand gloves, helmets, safety shoes ear muffs, overalls and dust coats) at all times.
- Motorized equipment are checked to ensure that they are in good working condition, safe to use and produce minimal noise levels and reduced smoke emission.
- Provision of first aid kit and firefighting equipment (portable cylinders) and placement at strategic positions for access
- Proper disposal of waste material and toilet facilities are provided for construction workers
- Emergency response procedures are in place and all workers are trained in effecting them.
- Any work involving deep excavations, elevated heights and lifting heavy loads, poses a number of risks to personnel. The Contractor shall ensure that personnel are equipped with the correct protective clothing and equipment and are ready to work safely while also safeguarding the environment.

The contractor shall adhere to all requirements set by the proponent and National Environmental Management Authority (NEMA) and any other applicable legislation regarding environmental and socio - economic impacts

### **Operation Phase:**

During operation phase of the project, no unauthorized person shall access the substation. This is in line with company policy to ensure safety of staff and the public. Activities undertaken shall include

- Training of operations and maintenance personnel
- Personnel will mainly do switching
- Periodical maintenance works by authorized staff

### **Project's Decommissioning Activities**

At the decommissioning/demolition phase, the following activities will take place;

- Removal of electrical fittings, bus bars and steel poles/structures
- Removal of transformer and associated switching equipments
- Demolish and carefully handle components that contain oil like the transformer
- Ensure proper handling of the demolished materials and have an authorized and guided transportation and disposal away from human settlement, water bodies and wildlife conservation area
- Demolish and remove all the concrete works

During this phase, the proponent shall restore the host environment close to its original state.

The proponent shall submit a decommissioning plan to NEMA in good time prior to decommissioning. The decommissioning plan should include a restoration plan.

The site should be rehabilitated and restored to its former state through:

- Approved and appropriate landscaping methodology.
- Removal of any soils that may have been impacted by oils or fuels for offsite disposal (away from the project area) remediation.

## **2.8 Input Materials**

It is expected that construction of the substation will entail quality materials and procedures to ensure quality work, occupational and public safety and environmental sustainability. The following inputs will be required for construction:

- Raw construction materials e.g. sand, cement, natural building stone blocks, hard core, gravel, ballast, timber, nails, concrete among others.
- Timber (e.g. doors and frames, fixed furniture, etc.),
- Paints, solvents, white wash, etc.,
- Labour force (of both skilled and unskilled workers).
- One 7.5 MVA transformer.
- Busbars, switch gears, circuit breakers and capacitors
- Lightning arrestors and steel structure members
- Water
- Paints, solvents, white wash, etc.,

## **2.9 Cost of Proposed Project**

The estimated cost of the project is **Kshs. 110 million** to install the substation and associated structures

## **2.10 Target Group for the EIA Report**

The EIA Report will be used by different stakeholders that are involved at different phases of the project. The report presents vital information on procedures and plans to be adhered to, implementation modalities, analysis of potential environmental and social impacts and suggested mitigation measures at various stages of the project. The information will be useful in planning, implementation, management and maintenance of the substation.

The report will be useful to the following stakeholders:

- Relevant government ministries and agencies
- Affected and Interested persons;
- Engineers to be involved in supervision of the construction works.
- Contractors to be engaged in the construction works for the 7.5MVA substation;
- Staff that will be involved in the management and operation of the 7.5MVA 33/11 kV substation.
- Government regulatory agencies such as National Environment and Management Authority (NEMA) and Energy Regulatory Commission (ERC).

## **CHAPTER THREE: BASELINE INFORMATION OF THE STUDY AREA**

### **3.1 Introduction**

This chapter provides the background information of the district in terms of its administrative units, climate, settlement patterns and the major geographical features. It is worth noting that the project site is in the newly created kinangop district. This was earlier called south Kinangop division of Nyandarua south district. The baseline information is from the former Nyandarua south district development plan.

### **3.2 Administrative and political units**

Nyandarua south was one of the eleven districts in central province as at 2008. It bordered Nyandarua north district to the north and Nyeri and Muranga districts to the east and Kiambu east district in the south, to the west and Naivasha district of the Rift Valley province. The district has a total area of 1367.2 km<sup>2</sup>. The district had a total of 1,267.2 square kilometers and a projected 310,375 persons in to 2008. This translated to an average population of 227 persons per square kilometer.

### **3.3 Position and size of the district**

The district is divided into three administrative divisions namely Kipipiri, north Kinangop and south Kinangop divisions. It had 10 locations and 34 sub locations. The district had two constituencies namely Kipipiri and Kinangop. There were proposals to create Nyandarua south county council.

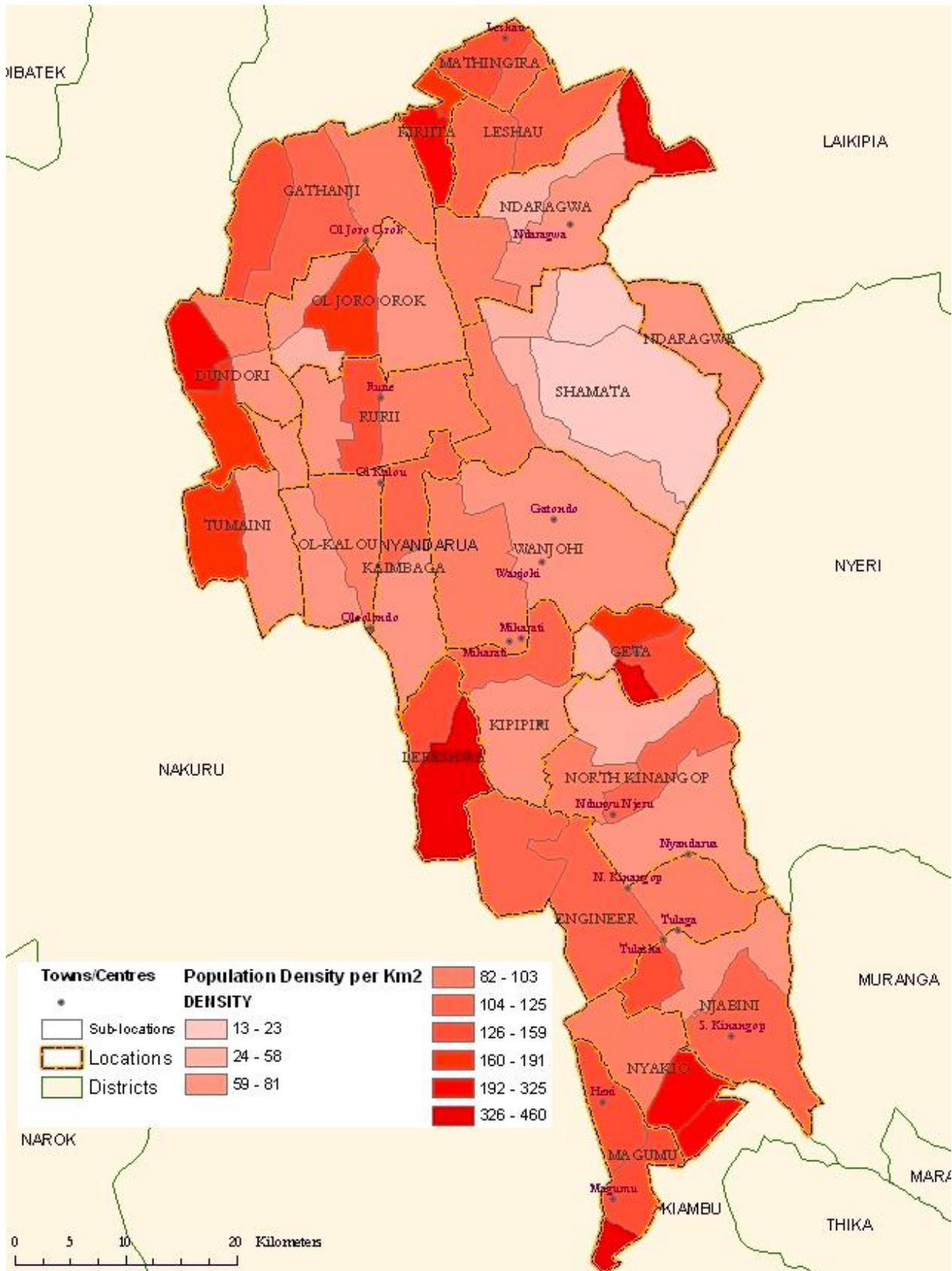
### **3.4 Settlement patterns**

The population density of the district has been steadily increasing over the past forty years. The density was 52 persons per km<sup>2</sup> in 1969 but increased to 69 persons per km<sup>2</sup> in 1979 then to 102 and 145 persons per km<sup>2</sup> in 1989 and 1999 respectively.

The settlement patterns in the district have historical origin from colonial times. The pattern is dichotomous in nature i.e urban and rural with differences in both economic and spatial characteristics. The rural settlements are generally homogeneous and engage mainly in primary agricultural activities. There are a total of six trading centers and towns in the district with a sizable number of residents. These urban settlements are heterogeneous and mainly engage in agro economic activities as well as commerce, industry and services.

One of the main drivers of settlement patterns is the rapidly growing population without corresponding increase of off-farm economic opportunities. Since creation of the new district there has been evident increase in the rater of rural-urban migration. Road network also attract a lot of settlements along the main highways and along weather roads. The construction of the C69 Njabini to Ndudori road is envisaged to attract more settlements along the route and in the interior parts of the district.

Figure 4: Nyandarua south district



### **3.5 Topographic Features**

The main topographical feature in Nyandarua south district is the Kinangop plateau. The plateau bears gentle slopes that are interrupted by low undulating hills. The slopes flatten to plain like features encouraging formation of marshlands and swamps. From the eastern wall of the district the Aberdares range rises up to 3,999 meters above sea level. The district has some perennial rivers which include Malewa and Wanjohi among others. The rivers emanate from Aberdares ranges.

The district falls within the volcanic and fault zone which gave rise to two major landforms- the Great Rift Valley to the west and the Aberdares ranges to the east. In between the two physiographic structures lay the Kinangop plateau. There are steep slopes that have undergone transformation through weathering resulting in shallow valleys and gorges. The ranges drop gradually in series of faults giving way to an escarpment that had been broken into sharp valleys occasioned by changes in level of the river courses.

Rock formation comprises of a series of volcanic rocks that fall into three major categories i.e igneous rocks, volcanic ash and alluvium. Most rocks systems have lines of weaknesses occasioned by faulting which allows porosity and easy percolation.

The soils in the district are volcanic in origin and vary in both fertility and distribution. Shallow soils are found in hilly areas while deep well drained soils are found on the slopes and plateaus. These soils have different crop production potentials.

The district falls in the highland savannah zone, characterized by few scattered trees with expansive grass cover. In elevated areas tree cover increases forming thick forests with which undergrowth. However, most of the natural vegetation has been cleared leading to environmental degradation.

### **3.6 Climatic conditions**

The district has moderate temperatures. The highest temperatures are recorded in the month of December when the average is 21°C and the lowest temperatures is recorded in the month of July with an average of 7.1°C

The district also experiences low temperatures with adverse effects. The cold air that is generated during clear nights in the moor lands of Aberdare Ranges flows down the plateau causing night frost every month making cultivation of maize too hazardous. The valleys west of the plateau occasionally provide outlet to the stream of cold air. The temperatures range between 1.2°C to 1°C. The low temperatures last few hours before sunshine.

The amount of rainfall in the district decreases from east to west. Rain falls in two peak seasons. Long rains start in March and end in May while short rains are received between September and December. The rainfall intensity varies according to the location. Areas near the Aberdares slopes receive sufficient rainfall with the plateau receiving scanty erratic rainfall.

### **3.7 Population Profiles and Projections**

In 2008 the total population was 310,375 and growing at a rate of 3.3% per annum. This means the population will be 354,171 by 2012. About 75% of the population is below 30 years.

### **3.8 Agriculture and rural development sector**

The arable land in the district covers 840km<sup>2</sup>. The average farm size for the small scale farmers is 5.75 acres while the large scale farmers have 175 acres on average. The region enjoys reasonable rains making it suitable for farming apart from some periods of drought. The larger proportion of the farming area is dedicated to food crops which include potatoes, cabbages, peas, carrots among others. These crops are not exhaustively meant for domestic consumption as they also account for significant income for most of the households. Other farm produce include wheat, fruit trees and cut flowers.

Livestock farming is also a major activity in the district and the main animals reared are indigenous and exotic species of cattle and goats, sheep, rabbits and poultry. Bee keeping is also being practiced by several farmers in the region. About 0.7b is generated annually from livestock farming.

The district has a total area of 1367.2 km<sup>2</sup>. Most of the residents acquired land through settlement schemes introduced in the 1960's. Part of the area is under gazette forest land. The forestry sub sector is important in ensuring forest conservation.

### **3.9 Trade, tourism and industry sector.**

The main economic activity is primary agricultural production. This makes it ideal for agro businesses which have not been well exploited hitherto. Currently, most businesses are in wholesale and retail trade. Some processing industries that have started recently on a small scale are in yorghurt making by the Tulaga farmers dairy, honey processing and wool spinning by the Friends of Kinangop plateau.

### **3.10 Physical Infrastructure Sector**

The road infrastructure in the district is generally poor as most of the roads are earth surface. The situation is aggravated by the rains which fall in most months of the year making roads impassable. However, the roads 200 programme is making significant progress in maintaining the roads in motorable condition through gravelling and drainage forming.

More parts of the district continue to be connected to the main power supply through the rural electrification programme with priority being given to the health facilities, schools and trading centres. Most of the settlements are in the rural areas although the urban centers are growing at an increasing rate. There is need therefore for well developed town plans to align all upcoming construction with the plans.

### **3.11 Environment water and sanitation**

Environmental degradation has been identified as one of the challenges facing the district. The ministry of environment is through NEMA is following on Environmental impact assessment studies for all major project s. environmental restoration orders have also been issued where some wetlands have been encroached.

The water subsector has cascaded the national water reforms to the grass roots and the community is now more involved in management of its water resources through the Water Resources Users Associations (WRUAs). There is need however for more investment in this area to make portable water accessible to most of the households.

The Irrigation and drainage department is currently undertaking major irrigation projects in the district using water from river in the Aberdare Ranges. This is expected to help farmers realize more yield from their farms as they can cultivate all year round and even venture to the horticultural crops that have more attractive returns.

### **3.10 Socio economic assessment of the potentially affected community**

#### **Introduction**

This section gives a general description of the area neighboring the proposed site. The proposed site belongs to Kenya Power and Lighting Company, the proponent. Currently the land has overgrown kales and weeds.

#### **Methodology**

Data was collected using observation and discussions with the respondents/persons near the proposed site.

#### **Location of the proposed site**

The site is along Flyover-Njambini road about 300 km from Mutonyora primary school in Magumu area. Along the side road are different commercial entities such as shop, petrol stations, churches and schools. There is also a health centre. There are also a few agricultural activities along the road.

#### **Economic activities**

Most of the residents living along the road are farmers, business people and those in formal employment. Businesses include shops, workshops, petrol stations, hotels among others.

#### **Nature of housing**

There is different housing, majority of which are wooden and stone. Most of the wooden houses are raised from the ground as the area is prone to flooding.

#### **Main occupation**

The main occupation of the residents within the area is farming, businesses and formal employment.

**Source of water and sanitation**

The main source of water is shallow wells but there is also a community borehole which has connected its members with individual tapped water.

**Land ownership**

Land ownership is free hold. Most of the people living in the area were settled there after the 1992 clashes. On average land ownership is 2 acres. The area opposite the site has been largely divided into plots measuring 50 by 100.

**Sources of energy**

The neighbours use different sources of energy mainly electricity and paraffin for lighting. The main source energy for cooking is charcoal and wood with a few using gas.

**Proposed Developments.**

The area has been ear marked for a hyper market to be funded by World Bank. A police station is also in the pipeline while the health centre has been upgraded to a level 4 sub district hospital.

**Potential benefits of the project to the people**

The project will be done on private property so will not involve any displacement. The site is also not ecologically sensitive. The potential benefits include; quality reliable power, reduced blackouts, employment opportunities, indirect opportunities for business due to power supply, lighting of the area among others.

**Negative impacts**

The benefits anticipated notwithstanding, some negative impacts were also raised. They included; noise, dust, a strain on water infrastructure especially during construction and potential safety hazards. According to the respondents, the project should go on as most of the negative impacts are temporary and can be mitigated.

## **CHAPTER FOUR: RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORKS**

### **4.1 Introduction**

Various environmental challenges have bedeviled the country over the years. The key challenges faced include; land degradation, loss of biodiversity and habitat, human animal conflicts, land use conflicts, waste management, water management and environmental pollution. This has been occasioned by lack of awareness and inadequate information amongst the public on the consequences of their interaction with the environment alongside poor enforcement of the law.

At the global and national level, it has been established that development activities cause damage to the environment. Indeed, development projects have the potential to damage the natural resources upon which economies are based. Environmental Impact Assessment is a useful tool for protection of the environment from the negative effects of developmental activities. It is now accepted that development projects must be economically viable, socially acceptable and environmentally sound.

Kenya has several statutes which relate to environmental concerns. Most of the statutes are sector specific, covering issues such as land use, occupational health and safety, water quality, wildlife, public health, soil erosion, air quality among others.

### **4.2 Environmental Policy Framework**

The country has not managed to come up with a national environmental policy. What exist are sectoral policies addressing the environment. There is need to harmonize all the policies to come up with a national one whose primary objective is to ensure compliance and enforcement of the law. Such a policy would also harmonize all approaches towards environmental management and strengthen cross-sectoral collaboration and coordination. Consequently, the country has been guided by the legislations and regulations and the leading one being Environmental Management and Coordination Act (EMCA) of 1999.

### **4.3 Institutional Framework**

At the moment there are over twenty (20) institutions and departments which deal with environmental issues in Kenya. Some of the key institutions include the National Environmental Council (NEC), National Environment Management Authority (NEMA), the Forestry Department, Kenya Wildlife Services (KWS) and others.

In Kenya, the Environmental Management and Coordination Act (EMCA) of 1999 is the main legislation that deals with ESIA studies. The EMCA established various administrative bodies to operationalize EMCA. These include among others:

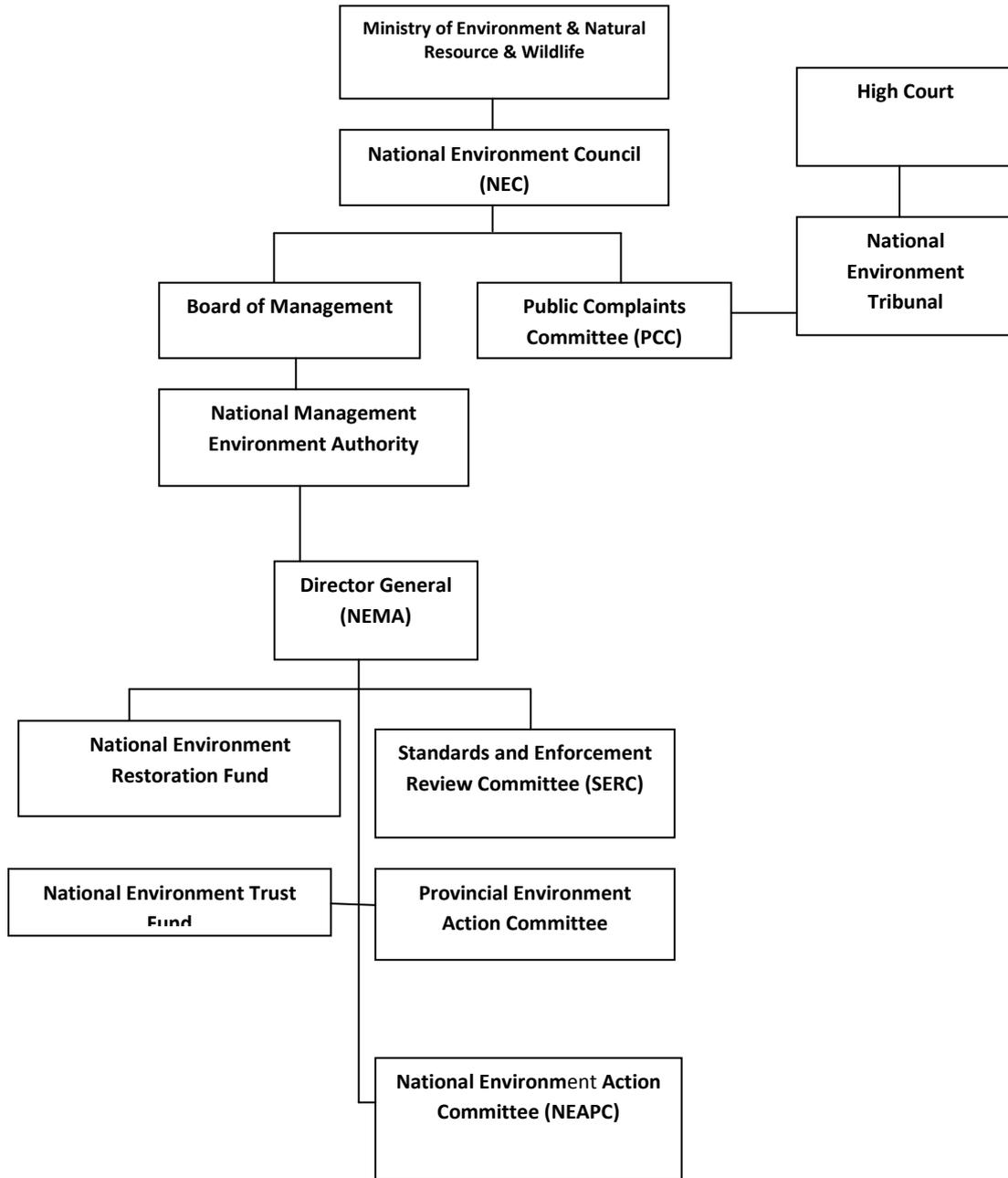


Figure 5: Institutional Framework under the EMCA

#### 4.3.1 National Environment Management Authority (NEMA)

The objective and purpose for which NEMA was established was to exercise general supervision and co-ordinate over all matters relating to the environment and to be the principal instrument of the government in the implementation of all policies relating to the environment. However, NEMA’s mandate is designated to the following committees:

#### 4.3.2 Provincial and District Environment Committees

According to EMCA, 1999 No. 8, the Minister by notice in the gazette appoints Provincial and District Environment Committees of the Authority in respect of every province and district respectively. The Provincial and District Environment Committees are responsible for the

proper management of the environment within the Province and District in respect of which they are appointed. They are also to perform such additional functions as are prescribed by the Act or as may, from time to time be assigned by the Minister by notice in the gazette. The decisions of these committees are legal and it is an offence not to implement them.

#### **4.3.3 Public Complaints Committee**

The Committee performs the following functions:

- Prepare and submit to the Council periodic reports of its activities which shall form part of the annual report on the state of the environment under section 9 (3) and
- To perform such other functions and exercise such powers as may be assigned to it by the Council
- Investigate any allegations or complaints against any person or against the authority in relation to the condition of the environment in Kenya and on its own motion, any suspected case of environmental degradation and to make a report of its findings together with its recommendations thereon to the Council.

#### **4.3.4 National Environment Action Plan Committee**

This Committee is responsible for the development of a 5-year Environment Action Plan among other things. The National Environment Action Plan shall:

- Contain an analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational and intra-generational equity.
- Contain an analysis of the Natural Resources of Kenya with an indication as to any pattern of change in their distribution and quantity over time.
- Recommend appropriate legal and fiscal incentives that may be used to encourage the business community to incorporate environmental requirements into their planning and operational processes.
- Recommend methods for building national awareness through environmental education on the importance of sustainable use of the environment and natural resources for national development.
- Set out operational guidelines for the planning and management of the environment and natural resources.
- Identify actual or likely problems as may affect the natural resources and the broader environment context in which they exist.
- Identify and appraise trends in the development of urban and rural settlements, their impact on the environment, and strategies for the amelioration of their negative impacts.
- Propose guidelines for the integration of standards of environmental protection into development planning and management.
- Identify and recommend policy and legislative approaches for preventing, controlling or mitigating specific as well as general diverse impacts on the environment.
- Prioritize areas of environmental research and outline methods of using such research findings.
- Without prejudice to the foregoing, be reviewed and modified from time to time to incorporate emerging knowledge and realities and;
- Be binding on all persons and all government departments, agencies, States Corporation or other organ of government upon adoption by the national assembly.

#### **4.3.5 Standards and Enforcement Review Committee**

This is a technical Committee responsible for environmental standards formulation methods of analysis, inspection, monitoring and technical advice on necessary mitigation measures.

#### **4.3.6 National Environment Tribunal**

This tribunal guides the handling of cases related to environmental offences in the Republic of Kenya.

#### **4.3.7 National Environment Council (NEC)**

EMCA 1999 No. 8 part III section 4 outlines the establishment of the National Environment Council (NEC). NEC is responsible for policy formulation and directions for purposes of EMCA; set national goals and objectives and determines policies and priorities for the protection of the environment and promote co-operation among public departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes.

### **4.4 Kenyan Environmental Legal Framework**

Previously, environmental management activities were implemented through a variety of instruments such as policy statements, permits and licences and sectoral laws. There was however need for a stronger enforcement machinery to achieve better standards in environmental management. The enactment of the Environmental Management and Coordination Act (EMCA) in 1999 provided for the establishment of an appropriate legal and institutional framework for the management and protection of the environment.

#### **4.4.1 The Environment Management and Co-ordination Act, 1999**

The Environmental Management and Coordination Act (EMCA) 1999 is an Act of Parliament to provide for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto.

The main objective of the Act is to:

- Provide guidelines for the establishment of an appropriate legal and institutional framework for the management of the environment in Kenya;
- Provide a framework legislation for over 77 statutes in Kenya that contain environmental provisions;
- Provide guidelines for Environmental Impact Assessment, environmental audit and monitoring, environmental quality standards and environmental protection orders.

The Act empowers the National Environment Management Authority (NEMA) to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of government in the implementation of all policies related to the environment.

Part II of the Environment Management & Coordination Act, 1999 states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. In order to partly ensure this is achieved, Part VI of the Act directs that any new programme, activity or operation should undergo Environmental Impact

Assessment and a report prepared for submission to the National Environmental Management Authority (NEMA), who in turn may issue a license as appropriate.

Part VIII section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into aquatic environment. Section 73 require that operators of projects which discharges effluent or other pollutants to submit to NEMA accurate information about the quantity and quality of the effluent. Section 74 demands that all effluent generated from point sources be discharged only into the existing sewerage system upon issuance of prescribed permit from the local authorities or from the licensee. Finally, section 75 requires that parties operating a sewerage system obtain a discharge license from NEMA to discharge any effluent or pollutant into the environment.

Section 87 Sub-section 1 states that no person shall discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any person, while section 88 provides for acquiring of a license for generation, transporting or operating waste disposal facility. According to section 89, any person who, at the commencement of this Act, owns or operates a waste disposal site or plant or generate hazardous waste, shall apply to the NEMA for a licence. Sections 90 through 100 outline more regulations on management of hazardous and toxic substances including oils, chemicals and pesticides.

Finally the Environmental Impact Assessment Guidelines require that a study be conducted in accordance with the issues and general guidelines spelt out in the Second and third schedules of the Environmental Regulations (2003). These include coverage of the issues on Schedule 2 (ecological, social, landscape, land use and water considerations) and general guidelines on Schedule 3 (impacts and their sources, project details, national legislation, mitigation measures, a management plan and environmental auditing schedules and procedures.

Under EMCA 1999 NEMA has developed regulations to establish guidelines for better management of the environment and promote sustainable development. To date, the regulations presented in the following sections have been gazetted.

**a) Environmental Impact Assessment and Audit Regulations (2003) Legal Notice No. 101**

The Environmental Impact Assessment and Audit Regulations state in Part III Rule No. 6 that an Environmental Impact Assessment study shall be conducted in accordance with the terms of reference developed.

Part III Rule 16, takes into account environmental, social, cultural, economic, and legal considerations, and shall:

- Identify the anticipated environmental impacts of the project and the scale of the impacts;
- Identify and analyze alternatives to the proposed project;
- Proposed mitigation measures to be taken during and after the implementation of the project; and

- Develop an environmental management plan with mechanisms for monitoring and evaluating the compliance and environmental performance which shall include the cost of mitigation measures and the time frame of implementing the measures

*The Proponent has commissioned the Environmental Impact Assessment study in compliance with the Act. The environmental management and monitoring plan laid out in this report shall be adhered to by the Proponent and the contractor.*

**b) Environmental Management and Coordination (Water Quality) Regulation 2006**

These regulations are described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 74, September 2006. The regulation applies to drinking water, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife and water used for any other purposes. This includes the following:

- Protection of sources of water for domestic use;
- Water for industrial use and effluent discharge;
- Water for agricultural use.

The regulations outline:

- Quality standards for various sources of domestic water;
- Quality monitoring for sources of domestic water;
- Standards for effluent discharge into the environment;
- Monitoring guide for discharge into the environment;
- Standards for effluent discharge into public sewers;
- Monitoring for discharge of treated effluent into the environment.

This Legal Notice on Water Quality provides that anyone who discharges effluent into the environment or public sewer shall be required to apply for Effluent Discharge License. The license for discharge is Ksh 5,000 while annual license fee for discharge into the environment will be Ksh. 20,000 or Ksh 100,000 depending on the facility. Non compliance with the regulations attracts a fine not exceeding Ksh 500,000 and the polluter pay principle may apply depending on the court ruling. Table 4, gives Waste Water Discharge Guidelines from NEMA

*The proponent will comply with the regulation by ensuring waste water is properly disposed through all phases of the project.*

Parameter	Units	Discharge into public sewers	Discharge into open water bodies
PH	-	6.0 - 9.0	6.0 - 9.0
BOD (5 days at 20° C) not to exceed	Mg/l	500	20
COD not to exceed	Mg/l	1000	50
Total suspended solids not to exceed	Mg/l	500	30
n-hexane extract not to exceed	Mg/l	Nil	30
Oils(mineral, animal & vegetable)	Mg/l	10	5
Total phenol not to exceed	Mg/l	10	2
Copper (Cu) not to exceed	Mg/l	1.0	0.05
Zinc (Zn) not to exceed	Mg/l	5.0	0.5
Lead (Pb) not to exceed	Mg/l	1.0	0.1
Arsenic (As) not to exceed	Mg/l	0.2	0.002
Total Mercury (Hg) not to exceed	Mg/l	0.05	0.005
Alkyl mercury not to exceed	Mg/l	0.01	0.001
PCB (Polychlorinated biphenyl) not to exceed	Mg/l	Nil	0.003
Pesticides residues not to exceed	Mg/l	Nil	0.05
Sulphates not to exceed	Mg/l	1000	500
Dissolved manganese (Mn)	Mg/l	-	1.0
Chromium (total)	Mg/l	1.0	0.1
Chloride not to exceed	Mg/l	1000	1000
Fluoride not to exceed	Mg/l	-	2.0
Coliform bacteria	-	-	1000/100ml
Free ammonia not to exceed	Mg/l	2.0	0.2
Sulphides (S) not to exceed	Mg/l	2.0	0.1
Cadmium (Cd) not to exceed	Mg/l	0.5	0.05
Cyanide (CN) total not to exceed	Mg/l	0.5	0.1
Organic phosphorous not to exceed	Mg/l	30	1.0
Chromium six (Cr 6) not to exceed	Mg/l	0.5	0.005
Total dissolved solids not to exceed	Mg/l	3000	1200
Selenium (Se) not to exceed	Mg/l	1.0	0.05
Nickel (Ni) not to exceed	Mg/l	3.0	1.0
Barium (Ba) not to exceed	Mg/l	10	2.0
Temperature not to exceed	-	+/- 2° of the ambient temperature of the sewer	+/- 2° C of ambient temperature of the water body
Oil/ grease	Mg/l	No trace	Nil/ no trace
Toxic substances	Mg/l	Nil	Nil
Odour	-	-	Not objectionable to the nose
Colour	-	-	Not objectionable to the eye or not to exceed 5 mg Pt/l

**Table 2: NEMA Waste Water Discharge Guidelines**

**C) Environmental Management and Coordination (Waste Management) Regulation 2006**

These regulations are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69, September 2006. These Regulations apply to all categories of waste as provided in the regulations. These include:

- Hazardous and toxic wastes;
- Industrial wastes;
- Biomedical wastes
- Pesticides and toxic substances;
- Radio-active substances.

The regulations outline requirements for handling, storing, transporting, and treatment/disposal of all waste categories as provided therein.

The regulation provides that a waste generator shall use cleaner production methods, segregate waste generated and the waste transporter should be licensed. The notice further states no person shall engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment licence issued by the National Environment Management Authority.

*Being an substation, the project will generate a limited amount of solid and liquid waste. Solid waste will be disposed in appropriate way to ensure it does not harm the environment.*

**a) Environmental Management and Coordination, (Conservation of Biological Diversity) (BD) Regulations 2006**

These regulations are described in Legal Notice No. 160 of the Kenya Gazette Supplement No. 84, 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.

Additionally, these links provide for the local enforcement of the International Convention on Biological Diversity (CBD).

*The proposed site has no rich biodiversity and there is no known rare or endangered species in the site.*

**b) Environmental Management and Coordination, (Fossil Fuel Emission Control) Regulations 2006**

These regulations are described in Legal Notice No. 131 of the Kenya Gazette Supplement No. 74, October 2006. These regulations include internal combustion engine emission standards, emission inspections, the power of emission inspectors, fuel catalyts, licensing

to treat fuel, cost of clearing pollution and partnership to control fossil fuel emissions. The fossil fuels considered are petrol, diesel, fuel oils and kerosene.

*This legislation gives caution to proponent and contractor on careless handling of fuels and possible consequences for failing to observe.*

**c) Environmental Management and Coordination, (Wetlands, Riverbanks, Lake Shores and Sea Shore Management) Regulations 2009**

These regulations are described in Legal Notice No. 19 of the Kenya Gazette Supplement No. 9, February 2009. These regulations include management of wetlands, wetland resources, river banks, lake shores and sea shores. Specific sections have requirements that apply to wetlands in Kenya either in private or public land. These regulations empower the District Environment Committee to co-ordinate, monitor and advise on all aspects of wetland resource management within the district.

*The project site is not in a wetland.*

**d) Environmental Management and Coordination, (Noise and Excessive Vibration Pollution) Regulations 2009**

These regulations are described in Legal Notice No. 31 of the Kenya Gazette Supplement No. 21, May 2009. These regulation prohibit any person from making or causing 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. It also prohibits excessive vibration which annoys, disturb, injure or endanger the comfort, repose, health or safety of others and the environment or excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source.

Part 11 section 6(1) provides that no person shall cause noise from any source which exceeds any sound level as set out in the First Schedule of the regulations.

Rules 5 and 6 of the regulations define noise levels for various types of activities that generate noise. The first schedule to the regulations defines permissible noise levels and is reproduced below.

The regulation in addition specifies that a noise license will be required during the construction and operational phase of a project if such equipment that will produce noise during these two phases will be used.

There will be need for the contractor to apply for a noise license from the NEMA during the construction phase of the project.

Zone	Sound Level limits(dBA) (leq, 14h)	Noise Rating Level (NR) (leq, 14h)			
		Day	Night	Day	night
A.	Silent Zone	40	35	30	25
B.	Places of Worship	40	35	30	25
C.	Residential:				
	Indoor	45	35	35	25
	Outdoor	50	35	40	25
D.	Mixed residential (with some commercial and places of entertainment )	55	35	50	25
E.	Commercial	60	35	55	25

**Table 3: Permissible Noise Levels**

*This regulation guides on permissible noise levels during construction, operation and decommissioning phases.*

#### **4.4.2 Public Health Act (Cap. 242)**

This is an Act of Parliament to make provisions for securing and maintaining health. Sections include those dealing with notification of infectious diseases; inspection of infected premises and examination of persons suspected to be suffering from infectious diseases; rules for prevention of diseases; venereal diseases and infection by employees, among others. The proposed project will encourage the movement of people in search of jobs and opportunities, and with this, the risk associated with spread of diseases.

Part IX, section 115, of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires that Local Authorities take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be 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 environmental management plan (EMP) advices the Proponent on safety and health aspects, potential impacts, personnel responsible for implementation and monitoring, frequency of monitoring, and estimated cost.*

#### **4.4.3 Local Government Act (Rev. 1998)**

This Act provides for the establishment of authorities for local government, to define their functions and to provide for matters connected therewith and incidental thereto. In all areas where the project shall be undertaken, the local authorities will require to be informed.

Section 160 helps local authorities ensure effective utilization of the sewages systems. Section 170, allows the right to access to private property at all times by local authorities, its officers and servants for purposes of inspection, maintenance and alteration or repairs of sewers.

The Act under section 176 gives powers to local authority to regulate sewage and drainage, fix charges for use of sewers and drains and require connecting premises to meet the related costs. According to section 174, any charges so collected shall be deemed to be charges for sanitary services and will be recoverable from the premise owner connected to the facility. Section 20 also requires that all charges due for sewage sanitary and refuse removal shall be recovered jointly and severally from the owner and occupier of the premises in respect of which the services were rendered. This in part allows for application of the “polluter-pays-principle”

Section 163 allows the County Council 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.

Part XI section 168 provides that every municipal council, town council or urban council may establish and maintain sewerage and drainage works within or without its area of jurisdiction. For purposes of the land required for such development, section 144 states in part “A local authority may, subject to the approval of the Minister, apply to the government or any other authority having power to acquire land required for purposes of any of its functions, to be acquired compulsorily for and on behalf of, and at the expense of the local authority”. The Act, however, does not indicate the repercussions of impacts on landowners.

Section 160 helps local authorities ensure effective utilization of the sewerage systems. It states in part that municipal authorities have powers to establish and maintain sanitary services for the removal and destruction of, or otherwise deal with all kinds of refuse and effluent and where such service is established, compel its use by persons to whom the service is available. However, to protect against illegal connections, section 173 states that any person who, without prior consent in writing from the council, erects a building on: excavate or opens-up: or injures or destroys any sewers, drains or pipes shall be guilty of an offence. Any demolitions and repairs thereof shall be carried out at the expense of the offender.

For maintenance of such sewerage systems, the following relevant clauses have been drawn from section 169 of the Act that reads in part “A municipal council may for purposes of carrying out any drainage or sewerage works-----”:

“-----cause such sewers, drains and pipes to be made, altered, deepened, covered, laid and maintained either within or without as may be necessary for effectively disposing of the sewage and draining of its area -----“

“-----carry such sewers, drains and pipes through, across, or under any public road, street, square or open place laid out for public road, street, square or open space without paying compensation and after giving 30 days notices in writing to the owner or occupier of the intention to do so -----“

“-----from time to time alter, enlarge, divert, discontinue, close-up or destroy any sewers, drains, or pipes under its control -----“

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. In addition, the municipal Council may establish and maintain sewage farms or disposal works, and dispose of the effluent there from, but shall not be liable for any nuisance or damage as a consequence of proper and ordinary conduct of the sewage farms or disposal works (section 171). To ensure sustainability in this regard, the local authority is empowered to make by-laws in respect of all such matters as are necessary or desirable for the maintenance of health, safety and wellbeing of the inhabitants of its area as provided for under section 201 of the Act.

To ensure sustainability in this regard, the local authority is empowered to make by-laws in respect of all such matters as are necessary or desirable for the maintenance of health, safety and wellbeing of the inhabitants of its area as provided for under section 201 of the Act.

*The Proponent shall observe the guidelines as set out in the environmental management and monitoring plan laid out in this report as well as the recommendations provided for mitigation/minimisation/avoidance of adverse impacts arising from the project activities.*

#### **4.4.4. Physical Planning Act, 1996**

The Local Authorities are empowered under section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section, therefore allows for the prohibition or control of the use and development of land and buildings in the interest of proper and orderly development of an area.

Section 24 of the Physical Planning Act gives provision for the development of local physical development plan for guiding and coordinating development of infrastructure facilities and services within the area of authority of County, municipal and town council and for specific control of the use and development of land. The plan shows the manner in which the land in the area may be used.

Section 29 of the physical Planning Act gives county councils power 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 states that any person who carries out development within an area of a local authority without development permission shall be guilty of an offence and the development shall be invalid. The act also gives the local authority 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 council 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. At the same time, sub-section 5, re-enforce it further that, no licensing authority shall grant under any written law, a license for commercial use for which no development permission had been granted by the respective local authority.

Section 36 states that if in connection with development application a local authority is of the opinion that, the proposed activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an Environmental Impact Assessment report. The Environmental Impact Assessment report must be approved by the National Environmental Management Authority (NEMA) and followed by annual environmental audits as spelled out by EMCA 1999. Section 38 states that if the local authority finds out that the development activity is not complying to all laid down regulations, the local authority may serve an enforcement notice specifying the conditions of the development permissions alleged to have been contravened and compel the developer to restore the land to its original conditions.

*The Proponent has applied for Development Permission from the local authority and has also commissioned an Environmental Impact Assessment study for approval by NEMA.*

#### **4.4.5 Land Planning Act (Cap. 303)**

Section 9 of the subsidiary legislation (The Development and Use of Land Regulations, 1961) under this Act requires that before the local authorities submit any plans to the Minister for approval, steps should be taken as may be necessary to involve the owners of any land affected by such plans.

*In complying with this Act, the proponent will submit and liaise with District planning officer for design approvals for the proposed project.*

#### **4.4.6 The Radiation Protection Act (Cap 243 Laws of Kenya)**

This is an Act of Parliament to provide for the protection of the public and radiation workers from the dangers arising from the use of devices or material capable of producing ionizing radiation and for connected purposes.

Since 1982, Kenya decided to join in the global movement for the use of nuclear energy for peaceful purposes, a movement lead by the International Atomic Energy Agency (IAEA). Most of such uses are in the fields of medicine, agriculture, energy and environmental monitoring. The dangers of injury to the public prompted the adoption of the Radiation Protection Act (Cap 243) in November 1984 to provide according to its citation, protection of the public and radiation workers from the dangers arising from the use of devices or materials capable of producing ionizing radiation and for connected purpose.

The Act prohibits the unauthorized manufacture, production, possession or use, sale, disposal, lease, loan or dealership, import, export of any irradiating device or radioactive material. All authorized buyers, sellers, users, of such device must be properly licensed. The

Act is administered by the Chief Radiation Protection Officer assisted by a Radiation Protection Board.

*The proposed project won't emit/produce ionizing radiations.*

#### **4.4.7 Energy Act of 2006**

This is an Act of Parliament passed to amend and consolidates the law relating to energy, to provide for the establishment, powers and functions of the Energy Regulatory Commission and the Rural Electrification Authority and for connected purposes.

The Energy Act of 2006 replaced the Electric Power Act of 1997 and The Petroleum Act, Cap 116. The Energy Act, amongst other issues, deals with all matters relating to all forms of energy including the generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes. The Energy Act, 2006, also established the Energy Regulatory Commission (ERC) whose mandate is to regulate all functions and players in the Energy sector. One of the duties of the ERC is to ensure compliance with Environmental, Health and Safety Standards in the Energy Sector, as empowered by Section 98 of the Energy Act, 2006.

In this respect, the following environmental issues will be considered before approval is granted:

- The need to protect and manage the environment, and conserve natural resources;
- The ability to operate in a manner designated to protect the health and safety of the project employees; the local and other potentially affected communities.

Licensing and authorization to generate and transmit electrical power must be supported by an Environmental Impact Assessment Report (EIA) approved by NEMA.

Part IV Section 80(1) provides that a person shall not conduct a business of importation, refining, exportation, whole sale, retail, storage or transportation of petroleum, except under and in accordance with the terms and conditions of a valid licence.

Part IV Section 90 (1) stipulates that a person intending to construct a pipeline, refinery, bulk storage facility or retail dispensing site shall before commencing such construction, apply in writing to the Energy Regulatory commission for a permit to do so. The application shall: specify the name and address of the proposed owner; be accompanied by three (3) copies of plans and specifications and be accompanied by an Environmental Impact Assessment (EIA) Report.

Part IV section 91(1) stipulates that the Energy Regulatory Commission shall, before issuing a permit under section 90, take into account all relevant factors including the relevant government policies and compliance with Environment Management and Coordination Act, 1999 and in particular EIA report as per Impact Assessment and Audit Regulations 2003, the Physical Planning Act, 1996 and the Local Government Act.

Part iv section 100 (1) provides that it is an offence if a person being the owner or operator of a refinery, pipeline, bulk liquefied Petroleum gas or natural gas facility, service station, filling station or storage depot, fails to institute appropriate environmental, health or safety control measures. The offence if convicted, he/she shall be liable to a fine not exceeding two million shillings or to a maximum term of imprisonment of two years, or to both.

*The proposed project will be required to follow the guidelines set out in this Act.*

#### **4.4.8 Water Act, 2002**

The Act vests the water in the State and gives the provisions for the water management, including irrigation water, pollution, drainage, flood control and abstraction. It is the main legislation governing the use of water especially through permit system.

Part II, section 18, of the Water Act 2002 provides for national monitoring and information system on water resources. Following on this, sub-section 3 allows the Water Resources Management Authority (WRMA) to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a facility operator and the information thereof furnished to the authority.

The Water Act Cap 372 vests the rights of all water to the state, and the power for the control of all body of water with the Minister, the powers is exercised through the Minister and the Director of water resources in consultation with the water catchments boards, it aims at provision of conservation of water and appointment and use of water resources.

Part II Section 18 provides for national monitoring and information systems on water resources. Following on this, Sub-section 3 allows the Water Resources Management Authority to demand from any person, specified information, documents, samples or materials on water resources. Under these rules, specific records may be required to be kept and the information thereof furnished to the authority on demand.

Section 20 of the Act requires a permit to be obtained for among others any use of water from a water resources, discharge of a pollutant into any water resource. According to section 29 of the same Act, application for such a permit shall be subject to public consultation as well as an Environmental Impact Assessment as per the Environmental Management and Coordination Act, 1999. The conditions of the permit may also be varied if the authority feels that the water so used is causing deterioration of water quality or causing shortage of water for other purposes that the authority may consider has priority. This is provided for under section 35 of the Act.

Section 73 of the Act allows a person with a license to supply water (licensee) to make regulations for purposes of protecting against degradation of sources of water which he is authorised to take. Under the Act, the licensee could be a local authority, a private Trust or an individual and the law will apply accordingly under the supervision of the Regulatory Board.

Section 76 states that no person shall discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary. The consent shall be issued on conditions including the payment rates for the discharge as may be provided under section 77 of the same Act.

*All construction, operation and decommissioning phases will take caution to contain oil spills to prevent soil and water pollution.*

#### **4.4.9 The Standards Act Cap 496**

The Act is meant to promote the standardization of the specification of commodities, and code of practice; to establish a Kenya Bureau of Standards, to define its functions and provide for its management and control.

The proponent will ensure that commodities and codes of practice utilized in the project adhere to the provisions of this Act.

*All materials and spares used to construct the office will comply with the Standardized specifications and Certification.*

#### **4.4.10 Penal Code Act (Cap.63)**

Section 191 of the penal code states that if any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same Act says a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons /institution, dwelling or business premises in the neighborhood or those passing along public way, commits an offence.

*The Proponent shall observe the guidelines as set out in the environmental management and monitoring plan laid out in this report as well as the recommendation provided for mitigation/minimisation/avoidance of adverse impacts arising from the project activities.*

#### **4.4.11 Wildlife Conservation and Management Act, Cap 376**

The Wildlife (Conservation and Management) Act, Cap 376 of 1976, as amended in 1989, covers matters relating to wildlife in Kenya including protected areas, activities within protected areas, control of hunting, import of wildlife, enforcement and administrative functions of Wildlife authorities.

This Act provides for the protection, conservation and management of wildlife in Kenya. The provisions of this Act should be applied in the management of the project.

Part III Section 13 subsection (l) stipulates that any person who not being an officer of Kenya Wildlife Service hunts any animal in a National Park shall be guilty of a forfeiture offence and liable to a fine or imprisonment. Subsection 2 of the Act likewise provides that any person who, without authorization conveys into a National Park, or being within the area thereof, in possession of, any weapon, ammunition, explosive, trap or poison, shall be guilty of a forfeiture offence

The Act provides that no person is allowed to use any aircraft, motor vehicle or mechanically propelled vessel in such a manner as to drive, stampede or unduly disturb any protected animal or game animal. Therefore it will be prudent that the construction workforce is conversant with the provisions of this Act.

*The proposed project is not located within conservation/protected area and this act will not be triggered by the project at all the stages.*

#### **4.4.12 Lakes and Rivers Act Chapter 409 Laws of Kenya:**

This Act provides for protection of rivers, lakes and associated flora and fauna. The provisions of this Act may be applied in the management of the project.

#### **4.4.13 The Forestry Services Act, 2005**

The Act led to the establishment of Kenya Forest Service which is charged with management of forests in consultation with the forest owners. The body enforces the conditions and regulations pertaining to logging, charcoal making and other forest utilization activities.

To ensure community participation in forest management, the service collaborates with other organizations and communities in the management and conservation of forests and for the utilization of the biodiversity.

Section 43 (1) provides that if mining, quarrying or any other activity carried out in the forest, where the activity concerned is likely to result in forest cover depletion, the person responsible shall undertake compulsory re-vegetation immediately upon the completion of the activity.

*The proposed project does not traverse any Gazetted forest nor any conservation area hence the Act will not be triggered but the proponent will adhere to recommendations in the EMP in regards to vegetation clearance and the provisions of this act will be observed where applicable.*

#### **4.4.14 Occupational Safety and Health Act, 2007**

This is an Act of parliament to provide for the safety, health and welfare of all workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. It applies to all workplaces where any person is at work, whether temporarily or permanently.

The purpose of the Act is to:

- Secure the safety, health and welfare of persons at work;
- Protect persons other than persons at work against safety and health arising out of, or in connection with the activities of persons at work.

*The Act provides that before any premises are occupied, or used as a workplace, a certificate of registration must be obtained from the Director of Occupational Safety and Health Services. The Act provides for the health, safety and welfare for employees at workplaces. This shall be considered at the construction, implementation and decommissioning phases of the project. The following are other provisions of the Act.*

#### **Health**

The premise must be kept clean; a premise must not be over-crowded. The circulation of fresh air must secure adequate ventilation of workrooms. There must be sufficient and suitable lighting in every part of the premise in which persons are working or passing. There should also be sufficient and suitable sanitary conveniences separate for each sex, must be

provided subject to conformity with any standards prescribed by rules. Food and drinks should not be partaken in dangerous places or workrooms. Provision of suitable protective clothing and appliances including where necessary, suitable gloves, footwear, goggles, gas masks, and head covering, and maintained for the use of workers in any process involving exposure to wet or to any injurious or offensive substances.

### **Safety**

Fencing of premises and dangerous parts of other machinery is mandatory. Training and supervision of inexperienced workers, protection of eyes with goggles or effective screens must be provided in certain specified processes. Floors, passages, gangways, stairs, and ladders must be soundly constructed and properly maintained and handrails must be provided for stairs. Special precaution against gassing is laid down for work in confined spaces where persons are liable to overcome by dangerous fumes. Air receivers and fittings must be of sound construction and properly maintained. Adequate and suitable means for extinguishing fire must be provided in addition to adequate means of escape in case of fire must be provided.

### **Welfare**

An adequate supply of both quantity and quality of wholesome drinking water must be provided. Maintenance of suitable washing facilities, accommodation for clothing not worn during working hours must be provided. Sitting facilities for all female workers whose work is done while standing should be provided to enable them take advantage of any opportunity for resting.

Every premise shall be provided with maintenance, readily accessible means for extinguishing fire and person trained in the correct use of such means shall be present during all working periods.

Regular individual examination or surveys of health conditions of industrial medicine and hygiene must be performed and the cost will be met by the employer. This will ensure that the examination can take place without any loss of earning for the employees and if possible within normal working hours.

The (OSH) Act provides for development and maintenance of an effective programme of collection, compilation and analysis of occupational safety. This will ensure that health statistics, which shall cover injuries and illness including disabling during working hours, are adhered.

*The environmental management plan (EMP) advices the Proponent on safety and health aspects, potential impacts, personnel responsible for implementation and monitoring, frequency of monitoring, and estimated cost.*

#### **4.4.15 Work Injury and Benefits Act, 2007**

This Act provides for compensation to employees for work related injuries and disease contracted in the course of their employment and for connected purposes. Key sections of the Act include the obligations of employers; right to compensation; reporting of accidents; compensation; occupational diseases; medical aid etc. *In case of any accidents or incidents during the project cycle, this Act will guide the course of action to be taken.*

#### **4.4.16 Occupiers Liability Act (Cap. 34)**

This Act provides that it's the duty of occupier of the premises owes to his visitors in respect of danger and risk due to the state of the premises or to things omitted or attributes an affliction on his/her health to a toxic materials in the premises.

#### **4.4.17 The Traffic Act Chapter 295 Laws of Kenya**

This Act consolidates the law relating to traffic on all public roads. Key sections include registration and licensing of vehicles; driving licenses; driving and other offences relating to the use of vehicles on roads; regulation of traffic; accidents; offences by drivers other than motor vehicles and other road users.

Many types of equipment and fuel shall be transported through the roads to the proposed site. Their registration and licensing will be required to follow the stipulated road regulations.

The Act also prohibits encroachment on and damage to roads including land reserved for roads. *The project will observe the provisions of the Act.*

#### **4.4.18 The Civil Aviation Act Cap 394**

Under this act, the Kenya Civil Aviation Authority (KCAA) has to authorize and approve the height of Transmission lines and masts when they are on or proximal to flight Paths so as to ensure the safety of flying aircraft.

Under Section 9 of this act, notwithstanding the provisions of any written law, or terms of any deed, grant, lease, or license concerning the use and occupation of land, the minister may, where he considers it to be necessary in the interests of air navigation, by order published in the Gazette, prohibit the erection within a declared area of any structure above height specified in the order.

Failure to adhere to the provisions of this act, one commits an offence and upon conviction shall be liable to a fine not exceeding two million shillings or to imprisonment for a term not exceeding three years or to both.

*The proposed project is not along the flight path and so this Act will not be triggered.*

#### **4.4.19 The Public Roads and Roads of Access Act (Cap 22 Laws of Kenya)**

Section 8 and 9 of the Act provides for the dedication, conversion or alignment of public travel lines including construction of access roads adjacent lands from the nearest part of a public road. Section 10 and 11 allows for notices to be served on the adjacent landowners seeking permission to construct the respective roads.

This Act consolidates the law relating to traffic on all public roads. The Act also prohibits encroachment on and damage to roads including land reserved for roads.

*The project design concept has left the required road reserves and relevant road widening surrenders. The proposed project location complies with the provision of the Act. It is not on road reserves.*

#### **4.4.20 The Agriculture Act, Cap 318 of 1980 (revised 1986)**

This Act has stated objectives to promote and sustain agricultural production, provide for conservation of the soil and its fertility, and stimulate the development of agricultural land in accordance with accepted practices of good land management and good husbandry.

*The proposed project is being done on private property and will not affect agricultural farms.*

#### **4.4.21 Antiquities and Monuments Act, 1983 (Cap 215)**

This Act aims to preserve Kenya's national heritage. Kenya is rich in its antiquities, monuments and cultural and natural sites which are spread all over the country. The National Museums is the custodian of the country's cultural heritage. Through the National Museums many of these sites are protected by law by having them gazette under the Act.

*The Act will not be triggered because there are no known monuments, cultural and natural sites at the proposed project area.*

#### **4.4.22 The Registration of Titles Act Cap 281**

This Act provides for the transfer of the land by registration of titles. Parts within the Act elaborate on mechanisms of bringing lands under the Act, and for related purposes. The Act also elaborates on the incorporation of group representatives and the administration of groups.

Section 34 of this Act states that when land is intended to be transferred or any right of way or other easement is intended to be created or transferred, the registered proprietor or, if the proprietor is of unsound mind, the guardian or other person appointed by the court to act on his/her behalf in the matter, shall execute, in original only, a transfer in form F in the First Schedule, which transfer shall, for description of the land intended to be dealt with, refer to the grant or certificate of title of the land, or shall give such description as may be sufficient to identify it, and shall contain an accurate statement of the land and easement, or the easement, intended to be transferred or created, and a memorandum of all leases, charges and other encumbrances to which the land may be subject, and of all rights-of-way, easements and privileges intended to be conveyed.

*The Act will not be applicable because the proposed site belong to the Proponent and will not involve process of land take from other parties.*

#### **4.5 World Bank /IFC Environment and Social Safeguards Policies**

The objective of the World Bank's environmental and social safeguard policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for the bank and borrower staffs in the identification, preparation, and implementation of programs and projects. Safeguard policies have often provided a platform for the participation of stakeholders in project design, and have been an important instrument for building ownership among local population.

*The Safeguard Policies aims at improving decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted.*

**Environment Assessment (Operational Policy, OP/BP 4.01)**

The objective of this policy is to ensure that Bank-financed projects are environmentally sound and sustainable, and that decision-making is improved through appropriate analysis of actions and of their likely environmental impacts. This policy is considered to be the umbrella policy for the Bank's environmental 'safeguard policies'.

*The proposed project triggers this policy because although there is justification of the proposed substation, there are environmental and social concerns associated with the construction and operation of the proposed project. The EMP should be followed as outlined to ensure protection of the environment and the public.*

**Natural Habitats (Operational Policy, OP/BP 4.04)**

This policy recognizes that the conservation of natural habitats is essential to safeguard their unique biodiversity and to maintain environmental services and products for human society and for long-term sustainable development. The Bank therefore supports the protection, management, and restoration of natural habitats in its project financing, as well as policy dialogue and economic and sector work. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. Natural habitats are land and water areas where most of the original native plant and animal species are still present. Natural habitats comprise many types of terrestrial, freshwater, coastal, and marine ecosystems. They include areas lightly modified by human activities, but retaining their ecological functions and most native species.

*The proposed project doesn't trigger this policy because the project won't cause significant conversion (loss) or degradation of natural habitats, whether directly (through construction) or indirectly (through human activities induced by the project). The area is private owned land. The substation will pose insignificant environmental impacts.*

**Indigenous Peoples (Operational Policy 4.10)**

The objective of this policy is to (i) ensure that the development process fosters full respect for the dignity, human rights, and cultural uniqueness of indigenous peoples; (ii) ensure that adverse effects during the development process are avoided, or if not feasible, ensure that these are minimized, mitigated or compensated; and (iii) ensure that indigenous peoples receive culturally appropriate, gender and inter-generationally inclusive social and economic benefits.

Physical cultural resources may be located in urban or rural settings, and may be above ground, underground, or underwater. The cultural interest may be at the local, provincial or national level, or within the international community.

*The policy is not triggered for this sub-project as there are no Indigenous Peoples (defined in the Project Appraisal Document for KEEP as the Sengwer, Ogiek, Waata, and Boni peoples) that are affected in the project area.*

#### **Involuntary Resettlement (Operational Policy, OP/BP 4.12)**

The objective of this policy is to (i) avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs; (ii) assist displaced persons in improving their former living standards, income earning capacity, and production levels, or at least in restoring them; (iii) encourage community participation in planning and implementing resettlement; and (iv) provide assistance to affected people regardless of the legality of land tenure.

*The policy will not be triggered because no household will have to be relocated since the substation will be constructed on the proponent's land.*

#### **Forests (Operational Policy, OP/BP 4.36)**

The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development and protect the vital local and global environmental services and values of forests. Where forest restoration and plantation development are necessary to meet these objectives, the Bank assists borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The Bank assists borrowers with the establishment of environmentally appropriate, socially beneficial and economically viable forest plantations to help meet growing demands for forest goods and services.

*This policy will not be triggered because proposed substation is not near any gazetted forest or any National Park.*

#### **4.6 International Environmental Guidelines**

Kenya is a signatory to a number of conventions on sustainable development and is a member of various bilateral and multilateral organizations. Some of the relevant International treaties and conventions include:

- Vienna Convention for the Protection of the Ozone Layer. Inter-governmental negotiations for an International agreement to phase out ozone depleting substances concluded in March 1985 with The adoption of this convention to encourage Inter-governmental co-operation on research, systematic observation of the ozone layer, monitoring of CFC production and the exchange of information;
- Montreal Protocol on Substances that Deplete the Ozone layer: Adopted in September 1987 and intended to allow the revision of phase out schedules on the basis of periodic scientific and technological assessment, the Protocol was adjusted to accelerate the phase out schedules and has since been amended to introduce other kinds of control measures and to add new controlled substances to the list;
- The Basel Convention: Sets an ultimate objective of stabilizing greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system;
- Kyoto Protocol: Drawn up in 1997, pursuant to the objectives of the United Nations Framework Convention on Climate Change, in which the developed nations agreed to limit their greenhouse gas emissions, relative to the levels emitted in 1990;

- Convention on Biological Diversity (CBD, 1992): This Convention entered into force on 29 December 1993, and its objectives are to: conserve biological diversity; use biological diversity in a sustainable fashion and share the benefits of biological diversity fairly and equitably. This Convention governs Kenya's international obligations regarding biological diversity;
- UNESCO Convention for the protection of the World Cultural and Natural Heritage (World Heritage Convention, 1972): This Convention aims to encourage the identification, protection, and preservation of Earth's cultural and natural heritage. It recognizes that nature and culture are complementary and that cultural identity is strongly related to the natural environment in which it develops;
- Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention): The Convention was signed in Iran in 1971 and came into force in 1975. It represents the first attempt to establish a legal instrument providing comprehensive protection for a particular type of ecosystem. The Ramsar parties agree to implement their planning so as to promote conservation of the wetlands included in the list. There is no Ramsar site near the proposed site.
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): This convention seeks to control the trade in species of wild animals and plants that are, or may be, threatened with extinction as a result of International trade. CITES is an important line of defense against the threat posed to diversity by invasive species.
- The Africa-Eurasia Migratory Water Bird Agreement (AEWA, 1995): The goal of the agreement is to protect migratory waterfowl by ensuring that they are protected for the entire length of their migratory routes. The list of birds protected under the AEWA Convention covers 235 species of birds.
- African Convention on Conservation of Nature and Natural Resources (1968): This Convention of the African Union is ratified by 40 African countries, including Kenya. The fundamental principle requires contracting states to adopt the measures necessary to ensure conservation, utilization and development of soil, water, flora and fauna resources in accordance with scientific principles and with due regard to the best interests of the people.

*Kenya has a duty under these multilateral agreements. The project should adhere to strict guidelines and procedures to ensure the agreements are not violated.*

## **4.6 Environmental Policy**

### **4.6.1 Sessional Paper No. 6 of 1999 on Environment and Development**

Every person in Kenya is entitled to a clean and healthy environment and has a duty to safeguard and enhance the environment. As envisioned in Sessional Paper No. 6 of 1999 on Environment and Development, Kenya should strive to move along the path of sustainable development to meet the needs of the current generation without compromising the ability of the resource base to meet those of future generations. The overall goal is hence to integrate environmental concerns into the national planning and management processes and

provide guidelines for environmentally sustainable development. The policy paper emphasizes that environmental impact assessment must be undertaken by the developer as an integral part of a project preparation. It also proposed for periodic environmental auditing to investigate if developer is fully mitigating the impacts identified in the assessment report.

#### **4.6.2 National Environmental Action Plan (NEAP)**

The NEAP for Kenya was prepared in 1994. It was a deliberate policy to integrate environmental considerations in to the country's social and economic development process. The integration was achieved through multi-sectoral approach and a comprehensive framework to ensure that environmental management and conservation of natural resources is an integral part of societal decision-making process.

## **CHAPTER FIVE: PUBLIC AND STAKEHOLDERS CONSULTATION**

### **5.1 Introduction**

In carrying out environmental impact assessment it is mandatory to carry out public participation as required by law. The EIA team undertook public stakeholder consultation (PSC) for the proposed project in accordance with the requirements for an EIA as stipulated in the EMCA, 1999 and EIA/EA Regulations 2003.

The main purpose of public participation is to identify potentially affected persons and allow them an opportunity to provide input/opinions and comment on the EIA process. It also provides a forum for creating awareness to the public and other parties on the proposed project. The opinions received on alternatives that can be investigated, impacts and any other information at project planning level facilitates informed decision-making. In complying with the public participation process (PPP) for the EIA consultative meetings were organized to engage the public at various levels.

### **5.2 Objective of Public and Stakeholders Consultation**

The objectives of public participation in the EIA process are to provide an opportunity to share information about the proposed project and receive feedback from the stakeholders and the public.

### **5.3 Sources of Information**

The main sources of information for the public participation are stakeholders and the public. Stakeholders are persons with an interest in the project such as project beneficiaries, government ministries and the general public. Public consultation was done at different levels in a bid to engage the different stakeholders appropriately. These consultations were undertaken between 28/11/2011-2/12/2011.

### **5.4 Local community and Stakeholder Consultation**

Consultations were done at two levels namely; community level and ministerial level. At the community level the EIA team liaised with the provincial administration to organize a public baraza for persons living in the sub location in which the proposed site is administratively. At this level the public and village representatives were engaged in a discussion by the EIA team. A pre-designed questionnaire was also used to gather data.

Consultations were also done with line ministries through the district officer. The D.O Magumu division mobilizes officers from line ministries who are engaged in discussions with the EIA experts. This level of consultation is crucial as it offers expert opinion from various ministries. The officers also filled questionnaires to address specific issues in their ministries that may be affected by the proposed project.

### **5.5 Comments and Responses from the consultations**

During consultations the scope of activities associated with the project were presented by EIA experts to the stakeholders and the public. The concerned were then asked to make suggestions, comments and ask questions in regard to the project. All comments received on the consultation were incorporated into the Final Impact Assessment Report.

Some of comments received from the public regarding the proposed project are listed below;

**Positive Issues**

- Improved Electricity Supply
- Employment opportunities
- Boosting of the informal sector
- Improvement of local and national economy
- Increased protection from Possible lightning strikes
- Improved Security

**Negative Issues**

- Increased dust pollution
- Increased Noise Level and Vibration
- Visual intrusion
- Accidents during Construction
- Possibility of sexually transmitted diseases
- Electrocutation

The following suggestions were raised during stakeholders' consultation meetings:

- The Proponent should ensure proper environmental management practices are put in place especially the drainage.
- Noise pollution should be controlled.
- The proponent should put up security lights
- Need scarf folding during construction to avoid excess dust to the neighbours
- Unskilled labour must be given to the locals
- Water is a problem in the area and the contractor need to explore borehole

The consultation process gave a go ahead to the proposed project provided the environmental management plan will be adhered to.

## **CHAPTER SIX: CONSIDERATION OF PROJECT ALTERNATIVES**

### **6.1 Consideration of project alternatives**

Various alternatives available for the project are discussed in this section. The following alternatives were identified and investigated during the EIA study. The various alternatives considered to date for the proposed substation project include; the “no-go / do nothing” alternative, alternative construction materials and technology, alternative substation site and alternative sources of energy.

### **6.2 Alternative Structure Types and Designs**

Overhead incoming and outgoing feeders’ power lines have been considered to be the most feasible option for the Magumu 33/11 kV substation based on the following reasons:

- Underground cabling will incur significantly higher installation and maintenance costs.
- Overhead lines are quicker and easier to repair should faults occur; and
- Relative to overhead lines, underground cables requires a larger area to be disturbed during construction and maintenance operations.

### **6.3 Analysis of Alternative Construction Materials and Technology**

The proposed substation will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that guarantees efficient use of locally available materials will be encouraged to ensure reliability in supply with minimum power loss and good design to allow efficient distribution of power.

The support structures in a substation can be wooden or steel. Because of its durability and strength, steel is the best choice and all support structures will be steel. Perimeter fence can be reinforced with wire mesh fixed to support structures that can be wooden, concrete or steel. Alternatively a stone perimeter wall can be constructed and this is the option of choice since it is more durable, offer better protection and requires less maintenance.

The design of the proposed substation will be easy to install and dismantle with minimum labour requirements and maintenance costs will be minimal.

### **6.4 Alternative Sources of Energy**

Alternative sources of energy other than relying on the KPLC's national grid were analyzed. Some of the possible options included relying on small diesel generators at household / individual level. This would lead to increased noise and emission of green house gases. Other sources of energy include Biogas and Biofuel which have not yet been fully explored towards electricity generation. Other alternatives would include use of firewood to generate energy at individual levels. It is worth noting that most of these alternatives are not sustainable and some have adverse environmental impacts like increased concentration of green house gases in the atmosphere. Other alternatives would be Generating solar power which is not yet adequately explored for commercial purposes in Kenya. Solar Power is green energy with minimal maintenance costs but it is capital intensive. Many people still opt to being connected to the National power grid for domestic and commercial purposes.

## **6.5 Alternative Substation Site**

The identification of potential substation site for the proposed Magumu 33/11 kV Substation involved site visits to the study area, preliminary site investigations and consultation by KPLC officers from different departments.

The suitability of potential substation sites identified by KPLC/SHE/Property during the initial site visits was assessed in terms of various suitability criteria and technical restrictions stipulated by KPLC, as outlined below:

- Size - potential sites need to be sufficient for the average size of a substation and associated incoming and outgoing power lines.
- Topography - consideration is given to the topography of potential sites whereby flat or gently sloping topography is preferred. An ideal gradient for the natural ground is 1:100. A gentle slope facilitates surface drainage and movement of vehicles and people on-site during construction. A steep slope requires costly leveling (cut and fill) for the construction of the substation. In addition, a steep slope inhibits movement, makes vehicle access problematic and increases the potential for environmental impacts during construction as well as operation e.g. steeper slopes have higher surface water flow rates and therefore higher erosive potential;
- Hydrology - consideration is given to the proximity of potential sites to adjacent water courses and wetlands where there may be potential impacts in terms of erosion and siltation of water courses, as well as implications associated with storm-water control at the substation;
- Geology and soils - consideration is given to the soil type present within the potential site whereby stable soil and founding conditions are preferable. Less stable soils, i.e. shallow, dispersive soils and soils with poor drainage present an erosion hazard if not managed correctly, and also require the installment of additional, costly foundation infrastructure;
- Flora and fauna - potential sites need to be assessed in terms of their ecological value at both a macro and micro scale i.e. within the site and the environment surrounding the site. Both a faunal and floral investigation may be required, with particular emphasis on ensuring the protection of endemic and red data species and their habitat, should they be present. An identified site that has a high ecological value may be excluded from the list of potential sites;
- Visibility - highly visible sites i.e. on a ridge / elevated terrain are considered less favorable in that they have a high visual impact on the surrounding landscape. Sites that are hidden or out of sight e.g. behind a hill, may be considered more suitable;
- Access - it is preferable that potential sites are located in close proximity to existing provincial roads so as to avoid the need for construction of new access roads of considerable length. Access is also important particularly as it relates to the transportation of the substation transformer to the site, which weighs approximately 38 tons and requires the use of a low-bed vehicle. As such, long access routes with sharp bends are to be avoided and the site should not be located in an area that has excessively steep inclines or declines that could hinder access, particularly during periods of heavy rainfall;
- Distance to site - it is important that the site be located strategically within the receiving area's electrical load centre;
- Adjacent land use - adjacent land use has implications for access and required clearances for the power lines extending into the substation, i.e. it is important that the land surrounding the substation is relatively clear of obstructions which might otherwise

inhibit / obstruct the path of the power lines in and out of the substation. Current and future development planning of adjacent land use should therefore also be considered; and

- Public acceptability - public acceptance criteria relate to such issues as the possible adverse impact on public health, quality of life, and local land and property values.

Based on the above-mentioned suitability criteria and technical restrictions, KPLC SHE has identified one potential site for the location of the proposed Magumu substation. There was no alternative site because the proposed site was purchased on willing seller willing buyer basis. Relocation option to a different site is an option available for the project implementation. The project proponent can look for alternative land to accommodate the scale and size of the project. However, this will be a costly venture, which takes long without a guarantee that the land would be available. It is recommendable that the proponent be allowed to install the project at the already existing site.

### **6.6 The 'Do-nothing' Option**

Magumu division is supplied with power all the way from Limuru substation. There are technical losses occasioned by long distance covered resulting in poor power supply and frequent blackouts. It is therefore imperative for KPLC to establish a new 33/11kV substation in the area to cater for existing and projected electrification load.

Should the proposed development not be undertaken, the risk for electrical faults and associated power outages, which are currently occurring in the area on a relatively frequent basis, will increase significantly. In addition, the ability to supply new customers would be severely limited in that it is anticipated that the demand for electricity in the study area will soon exceed the capacity of KPLC's existing 33/11kV electrical system. This will consequently have a significant negative impact on existing and proposed new developments in the area. The no project option will have the forgone costs and benefits including

- The targeted consumers will forgo improved electricity supply
- Generation of employment opportunities through expansion of business activities that would have been spurred by availability of electric power will not occur
- The country won't meet its energy requirement
- The objectives of the Governments efforts towards achieving Vision 2030 will not be realized.

It is thereby concluded that the 'do-nothing' option is not a viable or acceptable option, and should therefore be discouraged.

## **CHAPTER SEVEN: CONSTRUCTION MATERIALS**

### **7.1 Introduction**

This chapter outlines the resources that are required for construction and implementation of the project. Exact quantities of materials are not known at this stage of the project. Consequently, only identification and estimation of the resources required for construction and implementation of the project are provided.

The size and the composition of the workforce will be at the discretion of the contractor(s). The contractors will adhere to the Employment Act of 2007 in the recruitment and management of the employees.

### **7.2 Safety of the facility**

The project is prone to both natural and man-made disasters. It should be noted that it is difficult to prevent the occurrence of the natural disaster but the consequences could be reduced by engineering measures. Man-made disasters on the other hand are preventable. The following safety concerns will be addressed in the proposed project.

#### **Natural disasters**

In order to reduce the impacts of any potential natural disaster, the proposed project will be designed according to acceptable standards and code to reasonably withstand any impacts which may arise as a result of the worst credible seismic event.

#### **Malicious damage or theft**

The proposed project could be prone to malicious damage such as terrorist attack or theft. In order to prevent the occurrence of such events, the following measures will be taken:

- Regular monitoring and inspection of the substation and its associated infrastructure.

### **7.3 Hazard Risk Assessment**

Hazard risk assessment is one of the concerns associated with the proposed substation. The HRA will be conducted on the proposed project to determine the potential risks the project will pose in its lifecycle. The risk assessment will be done in accordance with the Occupational Safety and Health Act of 2007.

The HRA will include an emergency response procedure which will be based on the company's emergency procedures for substation and associated facilities. As a minimum requirement, the emergency management plan will cover the following aspects:

- Scope of the safety emergency plan
- Aim of the safety emergency plan
- Safety regulations
- Notification of local authorities
- Details of the project
- Emergency arrangements, procedures and plans
- Roles and responsibilities in the event of an emergency
- Evacuation of people
- The role of local communities

- Regular testing of the safety emergency plan
- The risk assessment will include as a minimum:
  - A general process of the project being investigated
  - A description of the potential major incidents associated with that type of installation and the consequences of such incidents
  - An estimation of the probability of a major incident
  - A copy of the site emergency plan
  - An estimation of the damages in the case of an explosion or fire
  - An estimation of the effects of toxic gas releases.
  - The potential effect of an incident on the project or part thereof or an adjacent project or part thereof.
  - The potential effect of a major incident on any other installations, members of the public and residential areas.
  - Meteorological tendencies
  - The suitability of existing emergency procedures for the risks identified.
  - Any requirements laid down in the OSHA 2007 and EMCA 1999.
  - Recommendations regarding any organizational measures

## **CHAPTER EIGHT: PRODUCTS, BY-PRODUCTS AND WASTE**

### **8.1 Introduction**

In this section, the products, by-products and wastes to be generated by the project are discussed. Most of these will be generated during the construction phase of the project while some will be generated during the operation and decommissioning phases.

### **8.2 Construction Phase**

The final product after construction phase is a modern substation and its associated structures.

#### **By-products**

Construction phase of the project is likely to generate the following by-products:

- Metal cuttings
- Excess construction materials
- Excavated material

#### **Waste**

At this phase the proposed project is anticipated to generate different waste such as;

#### **Domestic Waste**

The workers will not be supplied with any forms of foodstuffs. They are expected to buy or carry their own food. Plastic bags and containers which the workers will use to carry their food are expected to increase within the site and in the immediate vicinity. Other forms of waste include sanitary waste and therefore the provision of sanitary facilities is mandatory for the site construction workers.

#### **Site Construction Waste**

The project will generate waste from the site construction activities which includes:

- Dust and fumes;
- Scrap metals;
- Excavated soils and vegetation;
- Maintenance wastes;
- Packaging materials, etc.

#### **Dust**

Site excavation process will generate dust and other particulates particularly during dry weather conditions that will be released into the atmosphere.

#### **Smoke Emissions**

The site machinery, equipment and trucks used are expected to generate smoke emissions when in operation. The concentration of emissions will depend on the maintenance levels of the equipment, machinery and trucks by the Contractor.

### **8.3 Operation Phase**

#### **Products**

The primary product of the proposed project during the operational phase will be 33/11kV distribution substation.

#### **By-products**

The only byproduct anticipated during operational phase is conductor wires and scrap metals during replacement which takes several years before being replaced.

#### **Waste**

The wastes that will be generated are;

#### **Domestic Waste**

Some of the domestic waste to be generated at the facility includes waste paper and empty cans.

#### **Process waste**

No waste is anticipated from the process since the project entails substation and its associated infrastructures only.

### **8.4 Decommissioning Phase**

#### **Products and By-products**

During the decommissioning phase there will be no product. However, the By-products will include:

- Metal generated from the decommissioning of substation and associated infrastructure; and
- Foundation materials which can be donated to individuals for reuse

#### **Waste**

During the Decommissioning phase of the proposed project, several waste products are expected to be generated. These shall include:

- Dusts and fumes
- Scrap metals
- Remains of concrete from demolition of substation foundation

#### **Dust**

The activities that will occur particularly during the demolition process will generate a considerable amount of dust and other particulates that will be released into the atmosphere.

#### **Smoke Emissions**

The demolition machinery, equipment and trucks brought in by the Contractor are expected to generate smoke emissions. The concentration of emissions will depend on the maintenance levels of the equipment, machinery and trucks used by the Contractor.

## CHAPTER NINE: IDENTIFICATION AND ASSESSMENT OF POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

### 9.1 Introduction

In this chapter positive and negative impacts associated with the proposed project are identified and discussed. The impacts are identified across the three phases namely: Construction, Operational and Decommissioning. Environmental impacts from the activities that will be undertaken during the three phases of the project are discussed below.

### 9.2 Impact Identification and Assessment

Various positive and negative environmental impacts associated with the proposed project were identified through consultations and by use of experts' judgment method. The associated impact assessment tables for each impact will be categorized according to project phases, prior to and post mitigation. Effects of activities are categorized as negative impact and or positive impact. The project impacts are classified as positive or negative. Additionally, the study goes further to categorize the impacts in terms of direct or indirect, temporary or permanent, major or minor.

#### 9.2.1 Assessing significance of Impacts

The following criteria were used to assess the significance of potential impacts of the proposed project.

Table 4: Summary of magnitude of potential impacts

Magnitude of Impact	Rating
Negligible	1
Minor	2
Marginal	3
Significant	4
Catastrophic	5
Geographic Extent of Impact	Rating
<500M2	1
500m2-999m2	2
1Km2-10Km2	3
11Km2-100Km2	4
>100km2	5
Duration of Impact	Rating
< 1month	1
1- 12 months	2
13-36 months	3
37-72 months	4
>72months	5
Frequency/duration of activity	Rating
Annually or less	1
6 monthly/temporary	2
Monthly/infrequent	3
Weekly/life of operation	4
Daily / permanent	5

**Proposed Magumu 33/11 kV substation in Kinangop district**

Frequency of impact Rating	Rating
<11 events/year	1
11-50 events/year	2
51-100 events/year	3
101-200 events/year	4
>200events/year	5

**Table 5: Consequence tabulation table (Magnitude+ Geographic extent + Duration of the impact)**

Consequence (Magnitude+ Geographic extent + Duration of the impact)															
Likelihood (Frequency of Activity) frequency of impact	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	
3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	
4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	
5	10	15	20	20	30	35	40	45	50	55	60	65	70	75	
6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	
7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	
8	16	24	32	40	48	56	64	72	80	88	96	104	102	120	
9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	
10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	

**Table 6: Impacts Significance rating, value and respective colour code**

Significance rating	Value	Colour code	Negative impact Management Recommendation	Positive impact Management Recommendation
Very high	126-150		Propose mitigation measures	Maintain current management
High	100-120		Propose mitigation measures	Maintain current management
Medium high	77-105		Propose mitigation measures	Maintain current management
Low medium	52-75		Maintain current management	Improve current management
Low	20-50		Maintain current management	Improve current management
Very low	4-24		Maintain current management	Improve current management

**Potential impacts of the proposed project**

The following are the potential impacts of the proposed project:

- a) Soils and Geology
  - Increased erosion potential and sedimentation
  - Contamination of soil
  - Weakening of the geological structure
- b) Ecological
  - Impact on vegetations

- Impact on natural habitats
- c) Air quality
  - Decreased air quality due to dust emission
  - Fugitive emissions
- d) Water Resources & Water Quality
  - Strain on water resources
  - Decreased water quality due to soil erosion
- e) Noise and vibration
  - Deterioration in ambient noise quality
- f) Visual and aesthetic impacts
  - Impact on the visual landscape
  - Impact on natural environmental aesthetic
- g) Increase Traffic
  - Accidents as a result of increased traffic
  - Damage to roads and other transport infrastructure
- h) Occupational Health and safety
  - Health and safety
  - Public safety
  - Damage to the infrastructure by third party
- i) Public Health
  - Communicable disease
  - HIV & AIDS

The key impacts identified for the proposed project are highlighted according to the relevant project phases. The Experts utilized precautionary principles to establish the significance of impacts and their management and mitigation.

### **9.3 Positive Impacts of the Proposed Magumu substation**

Positive impacts associated with the proposed project during construction, operation and decommissioning phases are discussed in the following sections;

#### **Positive impacts during construction phase**

##### ***Creation of employment opportunities***

During construction, both skilled and unskilled job opportunities will be generated. Majority of the unskilled and semi skilled jobs will be taken up by the local community. Though the approximate number of workers to be employed by the proposed project is not yet known, it will contribute to easing unemployment level in the area. There will be a trickledown effect to the economy at large resulting from new income revenues and as well as services provided through this project.

### ***Provision of Market for Supply of Building Materials***

The project will require supply of building materials most of which will be sourced locally in Magumu trading centre and its environs. This provides ready market for local enterprises with such materials and boosts the economy at large.

### ***Boosting of the informal sector***

It is expected that other businesses in the informal sector will flourish. These include activities such as hotel, shops, artisan industries and food vending who will be benefiting directly from the construction, as people working there will need commodities from them. This will promote the informal sector in securing some temporary revenues and hence improved livelihoods.

### ***Compatibility with existing and proposed land uses***

The proposed project site is located along Flyover-Njambini road an area dominated by commercial activities and a few residential units. The proposed project will not conflict with the existing and perhaps future developments in the area.

### **Positive Impacts during Operation Phase**

#### ***Quality, reliable power supply***

The area will benefit from reliable quality power supply. Frequent blackouts will be a thing of the past and the increased power demands will be met. The area close to the substation will benefit from reduced impacts of lightening due to installation of lightening arrestors.

#### ***Employment creation***

Employment opportunities will also be created during the operation phase of the project. Opportunities to be created range from semi skilled to skilled jobs. These will involve security personnel, and staff in case the substation will be manned. Others include fire alarm and first aid box service providers.

#### ***Reduction of pollution associated with thermal Power Generation, kerosene and wood fuel:***

Different sources of energy are used in the area. Electricity supply will ensure less individuals use diesel generators, less reliance on kerosene, and will be an alternative to wood fuel and charcoal because of better and effective electrical appliances like cookers and electric irons. This would mean less carbon dioxide is released to the environment and destruction of forests will be reduced hence decreasing greenhouse gases

#### ***Improvement of local and national economy***

Stable and reliable power supply to small scale industries will increase business opportunities and self-employment opportunities etc. this implies improvement at the individual level and for the national economy. More customers will be connected and retail of reliable electricity by The KPLC will attract tax revenue to the country.

#### ***Education***

Stabilized power will facilitate development and equipping of laboratories in schools and Hospitals. Increased lighting creates an enabling environment for studies at school and at

homes. It will also enable setting up of Information and Communication Technology opportunities within the area.

### ***Improved Security Lighting***

With the establishment of the proposed sub-station, the level of security will be improved around the project areas. This is as a result of more security lights and security personnel being employed to guard the sub-station.

### **Positive Impacts during Decommissioning Phase**

#### ***Site Rehabilitation:***

After decommissioning of the proposed project, rehabilitation of the project site will be carried out to restore it to its original status or to a better state than it was originally. This will include replacement of topsoil and re-vegetation which will lead to restoration of the visual, vegetative and aesthetic state of the site.

#### ***Employment Opportunities***

During demolition, unskilled, semiskilled and skilled employment activities will be available to the public. Other staff will be employed to do landscaping and re-vegetation of the site.

## **9.4 Identification of Negative Project Impacts and Mitigation Measures**

This section identifies and discusses the project's negative impacts and the populations that will be affected. The project does not anticipate adverse impacts due to its size and nature. In deed the project is in line with the current developments in the area. The negative impacts are discussed below.

### **9.4.1 Soils and Geology**

#### ***Soil erosion impact from vegetation clearance***

Construction of the project can potentially exacerbate soil erosion. During excavation loose soil may be blown away by the wind or washed off in case of heavy rains. The project site has small portions with grass and little vegetation clearance will take place.

#### ***Contamination of soil***

The potential sources of soil contamination during construction phase are oil /fuel leaks or spills from machinery used in site preparation such as trucks used in transporting construction materials. Depending on the size and source of the spill, liquid and gaseous state, petroleum hydrocarbons may remain mobile for long periods of time, threatening to pollute groundwater.

During operation phase soil contamination is not anticipated because of the presence of the concrete paved surface which will prevent any potential contaminant from reaching the subsurface layers and is thus not assessed.

During decommissioning phase, soil contamination could occur especially with the use of machinery in demolition of the facility.

### **Proposed Mitigation Measures**

- The contractor should ensure monitoring of areas of exposed soil during periods of heavy rainfall throughout the construction phase of the project to ensure that any incidents of erosion are quickly controlled.
- The contractor should ensure recovery of exposed soils with grass and other ground cover as soon as possible.
- The contractor should ensure that construction related impacts like erosion and cut slope destabilizing should be addressed through landscaping and grassing, carting away and proper disposal of construction materials.
- The contractor should ensure that recommended compaction of spoil areas is undertaken and effective drainage of spoil sites in order to avoid land instability in form of soil subsidence, slip and mass movement.
- The contractor should ensure landscaping of the completed site.
- Areas compacted by vehicles during site preparation and construction should be scarified (ripped) by the contractor in order to allow penetration of plant roots and the re growth of the natural vegetation
- The contractor should ensure waste water generated is discharged or drained into approved drainage facilities
- The contractor should ensure planting and irrigation of cut and fill slopes as well as installation of erosion control and drainage devices that comply with the requirements of Factories (Building Operations and Works of Engineering Construction) Rules 1984
- Proper drainage channels and leveling especially of the access road to reduce run-off velocity and increase infiltration of rain water into the soil. Proper compaction will also be done along the access road.
- Re-vegetate exposed areas around the site so as to mitigate erosion of soil by storm water runoff. Minimization of disturbances and scarification of the surface should be observed to reduce erosion impacts.

#### **9.4.2 Air quality**

##### ***Decreased air quality due to dust emission***

During construction phase, potential dust pollution will emanate from site preparation activities such as excavation particularly if it takes place during dry weather conditions. Dust emissions might impact on the visibility of the nearby roads consequently impacting on traffic safety. Air emission from construction machinery, including dust, is regarded as a nuisance when it reduces visibility and is aesthetically displeasing. This is expected during construction works. Dust will be generated from construction earthworks, transportation activities and aggregate mixing.

Dust emission is not anticipated during operation phase because the site surface will be concrete paved and hence limited or no generation of dust.

During decommissioning phase, dust emission would be generated from debris and soil resulting from demolition process.

##### ***Fugitive emissions***

During demolition, construction and decommissioning phases, fugitive emissions are expected from the diesel operated construction machinery and vehicles.

## **Proposed Mitigation Measures for Air Quality**

### ***Dust Emissions***

- During demolition and construction, the debris and stockpiles of earth should be enclosed /covered/watered during dry or windy conditions to reduce dust emissions. The debris should be disposed in appropriate areas approved by NEMA.
- Construction trucks moving materials to site, delivering sand and cement to the site should be covered to prevent material dust emissions into the surrounding areas;
- During construction, where necessary, sprinkle loose surface earth areas with water to keep dust levels down.
- Scarf folding should be done to minimize dust emissions
- Masks should be provided to all personnel in areas prone to dust emissions during construction.
- Drivers of construction vehicles must be sensitized so that they do not leave vehicles idling, and they limit their speeds so that dust levels are lowered.
- Maintain all machinery and equipment in good working order to ensure minimum emissions including carbon monoxide, NO<sub>x</sub>, SO<sub>x</sub> and suspended particulate matter;
- High levels of dust concentration resulting from demolition or dismantling works will be minimized as follows:
  - Watering all active demolition areas as and when necessary.
  - Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.
  - Apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved parking areas and staging areas at demolition sites.

### ***Fugitive Emissions***

- It is the responsibility of the contractor to ensure that the construction machinery and equipment are appropriate and fit to prevent fugitive emissions, as per national standards or international practices. The contractor shall ensure the regular maintenance of this equipment.
- A maintenance plan for the construction machinery and vehicles shall be implemented to prevent excessive emissions during the construction phase of the project.
- Vehicle idling time shall be minimized
- Equipment shall be properly serviced and maintained
- Emissions of other contaminants (NO<sub>x</sub>, CO<sub>2</sub>, SO<sub>x</sub>, and diesel related PM<sub>10</sub>) that would occur from Vehicle exhaust emissions could be reduced by maintaining vehicles in good state of service, fuel and lubricants to be of standardized quality and sourced from approved suppliers.

This will also be achieved through proper planning of transportation of materials to be used during construction of the project to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road.

### **9.4.3 Pollution from Waste generation**

All phases of the project will result in solid waste although of different amounts. Solid waste is anticipated to be produced during site preparation, electromechanical and civil works such as demolition debris, spoil from excavations, scrap metal, mortar, wood, paper, masonry chips and left over food stuff. Effects of mismanaged waste include:

- Creation of breeding grounds for vermin like rats and cockroaches
- Public nuisance due to littering or smell from rotting
- Contamination of soils and water courses

Construction material waste will include:

- Earthworks
- Waste paper
- Cuttings from vegetation
- Redundant sections of pre stressed concrete
- Excavated soil

Several wastes will be generated throughout the project cycle. During construction phase, waste will be generated from demolition, construction activities, domestic waste from construction teams, waste oil and lubricants, containers of used construction materials, parts generated from vehicle and machinery maintenance.

During operation phase, waste to be generated includes domestic and paper waste generated by staff, components/parts of the facility's infrastructure being removed during replacement.

During decommissioning phase, the main waste generated will be demolition parts of the facility which include; concrete boulders, scrap metals, plastics and rubber among others.

#### **Proposed Mitigation Measures**

- Adherence to site waste management plan by the contractor
- Demolition debris be disposed appropriately
- Developer and contractor should ensure that spoil from excavations is arranged according to the various soil layers. This soil can then be returned during landscaping and the rehabilitation, in the correct order which they were removed that is top soil last;
- Separation of hazardous waste from non- hazardous. Hazardous wastes included waste contaminated with petroleum product. Waste should then be handled, collected, transported and disposed according to the Environmental Management and coordination (waste management) regulations of 2006.
- For waste handling the contractor should provide litter collection facilities such as bins
- The contractor should comply with the requirement of OSHA ACT 2007 and Building rules on storage of construction materials
- Effectively remove food packaging to appropriate disposal points.
- Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time

#### **9.4.4 Impacts on Water Quality and Water Resources**

Construction activities will result in soil exposure which can be easily eroded through the action of both wind and water which in turn can lead to siltation / sedimentation of down slope watercourses. Waste from cement can also result in the pollution of watercourses. Seepage from spilled fuels and oils and leaking machinery can also negatively impact on adjacent surface water courses which could lead to the potential contamination of groundwater.

Impacts on water quality during operation of the project are not anticipated because waste water will be channel appropriately. As the construction activities are small-scale and will occur on a once-off basis over a short duration, and due to the localized area of impact, the overall significance of the construction related impacts on water quality is considered to be **low**, provided the necessary mitigation / management measures are implemented.

### **Proposed Mitigation Measures**

Appropriate measures shall be instituted to minimize erosion and sediment transport, especially during construction activities. These measures should include:

- ✚ Limiting areas cleared of vegetation, stabilizing the soils on the sloppy areas with stone pitching and planting of grass.
- ✚ Appropriate remedial measures shall be implemented by the contractor in the event of erosion resulting in the sedimentation of surrounding areas after due consideration of the costs and benefits of such removal activity.
- ✚ Infrastructure shall be designed to ensure that contaminated run-off does not reach watercourses. In the event of an oil spill the procedures contained in the emergency response plan will come into effect.
- ✚ A surface monitoring system, including flows and water quality, shall be established and implemented for the duration of the operation of the facility.
- ✚ Vehicle maintenance and service should be done away from project site in approved garages or service stations to avoid any possible oil and fuel spills that could contaminate soils and possibly ground water quality.
- ✚ Construction materials containing fine particles e.g. aggregates will be stored in an enclosure away from water bodies to ensure that sediment laden water does not drain into water courses.
- ✚ Ensure that potential sources of petro-chemical pollution are handled in such a way to reduce chances of spills and leaks.
- ✚ Contractor to make suitable arrangements for water requirements and to provide alternative supply to any users affected by contractor's abstraction of local water source.
- ✚ Unchannelled flow of water at the site during construction should be controlled to avoid soil erosion;
- ✚ Storage areas that contain hazardous substances should be bunded with an approved impermeable liner and size of storage areas should be kept to a minimal working area to prevent seepage into the ground and water sources;
- ✚ The excavation and use of rubbish pits during construction should be strictly prohibited. A waste disposal area should be designated within the active construction area and this should be equipped with suitable containers i.e. skips or bins of sufficient capacity and designed to contain and prevent refuse from being blown by wind, thereby preventing the potential pollution of surface water and surrounding areas by litter;
- ✚ Care should be taken during concrete pouring activities to ensure there is no pollution of surface water and the surrounding areas during the undertaking of this activity;
- ✚ Areas contaminated by spilled concrete and / or fuels and oils leaking from vehicles and machinery should be cleaned immediately.

### **9.4.5 Noise and vibration**

Construction activities will definitely result in noise pollution and may be a nuisance and a disturbance to neighboring communities and local fauna. This impact will be temporary and

can be minimized by adopting appropriate mitigation measures including maintaining equipment and vehicles to manufacturer's standards and limiting operating times to daylight hours.

In addition, machineries and construction vehicles will generate noise of varying magnitudes. From the prediction of the specialist study on ambient noise quality measurements, the traffic noise that will be emitted by traffic accessing the proposed project site during construction, operational and decommissioning phases is expected to have an adverse impact on ambient noise. The level of traffic noise will increase depending on the traffic volume. General guide indicates that an increase of 20% in traffic volume approximates to a noise level increase of around 1 dB, while a doubling of traffic volume results in a noise level increase of about 3 dB. It is however, worth noting that the level of noise is attenuated with increase in distance from the source and thus the sites/objects in close proximity to the source will receive more noise in comparison to those at remote location.

During operation phase noise generation will be minimal or negligible.

As will be the case with the construction phase, the sources of noise during decommissioning phase, will be mainly machinery and vehicles used in demolition of the facility and removing the materials from the site.

#### **Proposed Mitigation Measures for Noise and Vibration**

Proposed mitigation measures aims to ensure that noise generated by construction and operation activities is kept to minimum and adheres to relevant noise standards. The noise management plan includes the following:

- ✚ Install portable barriers to shield compactors and other small stationary equipment where necessary.
- ✚ Use of noise-suppression techniques to minimize the impact of temporary construction noise at the project site.
- ✚ Use equipment designed with noise control elements.
- ✚ Co-ordinate with relevant agencies regarding all construction.
- ✚ Control the project area to avoid unnecessary access by idlers
- ✚ Limit vehicles to minimum idling time and observe a common-sense approach to vehicle use, and encourage drivers to switch off vehicle engines whenever possible.
- ✚ Set and observe speed limits and avoid raving of Engines
- ✚ The Contractor shall ensure that construction activities are limited to working hours (i.e. between 8am and 5pm daily) from Monday to Saturday, or as required in terms of legislation.
- ✚ Compliance with the recently issued Noise and Vibration Regulations of 2009 is expected at all the phases of the project.

#### **9.4.6 Visual Intrusion and aesthetic impacts**

The overall aesthetic effect of the project will be negligible. Visual intrusion caused by the construction of the substation may cause alteration to the natural scenery of the project area. However, considering the low level of substation structures, it is expected that it is going to be insignificant. The tall steel structures may seem out of proportion and not compatible with rural and agricultural landscapes. Some people may find substation structures bordering their property particularly disruptive to scenic views. Some people however, do not notice substation structures or do not find them objectionable from an

aesthetic perspective. To some, the substation and its utilities may be viewed as part of the infrastructure necessary to sustain our everyday lives and activities. To others, the substation may be viewed in a positive light because it represents economic development.

Aesthetic impacts depend on:

- The physical relationship of the viewer and the substation (distance and sight)
- The activity of the viewer (living in the area, driving through or sightseeing)
  - stands out or blends in

A substation can affect aesthetics by:

- Removing a resource, such as clearing fences that provide visual relief in a flat landscape;
- Degrading the surrounding environment (intruding on the view of landscape)
- Enhancing a resource (evoking an image of economic strength in a developing business or industrial area)

Due to the fact that the substation will become a permanent feature of the landscape the duration of impacts will be long-term. However, as the proposed substation site is located within an area of both agricultural and urban area with subsistence crops and commercial buildings, it is anticipated that the proposed development will not contribute to the devaluation of adjacent properties.

#### **Impacts of construction material sourcing (e.g. quarrying)**

Earth materials needed for construction (e.g. concrete, sand, aggregate) is anticipated to be obtained from quarry and mining operations. Conscious or unwitting purchase of these materials from unlicensed operations indirectly supports, encourages and promotes environmental degradation at the illegal quarry sites and causes medium to long term negative impacts at source, including landslides.

#### **Proposed Mitigation Measures**

- ✚ The contractor sources materials from an approved site
- ✚ The sources of all construction materials should be from approved sources; for example hardcore for building should be obtained from bona fide commercial quarries.
- ✚ Building materials such as sand, ballast and hard core will be sourced from NEMA approved sites.
- ✚ Proponent and contractor will ensure accurate budgeting and estimation of actual construction requirement to ensure that materials are not extracted or purchased in excessive quantities.
- ✚ In addition to the above measures, the proponent shall consider reuse of construction materials where possible.

#### **9.4.7 Traffic congestion / Road Wear/Tear**

##### **Transportation and Traffic Safety**

The proposed site is well served with road network. Therefore, the existing roads will be used to gain access to the proposed site. These roads are not in very good condition and are frequently utilized by public services and private vehicles. However, the frequent passage of light and heavy vehicles accessing the site while construction is in progress may generate noise as well as cause damage to existing roads, traffic congestion and potential injury to vehicles and pedestrians.

The primary impacts related to traffic during construction are:

#### **Increased Traffic**

Temporary and minor disruptions to traffic movement and increased safety concerns of local inhabitants and workers during construction of the substation as a result of increased traffic movements, particularly from large construction/transport trucks.

#### **Accidents as a result of increased traffic**

At construction phase, construction vehicles used in transportation of materials and workers will contribute to increase in traffic on the nearby roads. Because of traffic jam some motorists might be tempted to break the traffic rules and in the process cause accidents. While during operation phase, no traffic impacts are anticipated.

#### **Damage to roads and transport infrastructure**

Damage to the nearby roads is likely during construction phase due to movement of heavy machinery, equipment and components into the project site.

Such impacts are associated with demolition and construction of the proposed project and are not anticipated during the operational phase.

#### **Proposed Mitigation Measures**

- ✚ Proponent and contractor should choose traffic routes to reduce the impact in the neighbourhood avoiding, as far as practical any sensitive areas
- ✚ Ensure due regard of drivers to traffic regulations and insist at all times that courtesy be shown to other road users

Where traffic is anticipated, the contractor in close consultation with proponent should ensure:

- Effecting of traffic routes depending on delivery and dispatch to reduce the congestion impact in the neighborhood.
- Choice of routes depending on delivery and dispatch to reduce the congestion impact in the neighborhood
- Employment of a road safety officer to oversee implementation of the traffic controls
- Regular maintenance of delivery and dispatch trucks.

#### **9.4.8 Occupational Health and safety Impacts**

The development of the proposed facility will involve a number of activities that pose potential health and safety risks to the workers which include excavation, stripping conductors and backfilling. Risk of accidents and incidents will be heightened with the construction activities. Construction workers will be in direct contact with heavy machinery and equipment. These operations require the use of hoists, heavy duty equipment, machinery and vehicles. Apart from the regular training on health and safety, staff working on substation should be sensitized on the work within the ecological and social areas.

#### **Health and Safety Impacts**

##### **Aspects and Impacts**

The health and safety of construction personnel may be placed at risk as a result of the use of heavy machinery to construct the required substation infrastructure. There may be injury to people /

animals accessing the site i.e. falling into foundation excavations. In addition, there is the potential for loitering and / or attempted theft of construction machinery and equipment present onsite during the construction period.

The primary impacts on health and safety during construction are therefore:

- Injury to people resulting from the use of machinery and equipment;
- Injury to people and animals accessing the site; and
- Increase in crime.

Such impacts are associated with construction. During operation, there is minimal risk of electrocution occasioned by failure to observe safety rules while in the substation. This is mainly to staff as a substation is a no access zone for the public.

#### **9.4.9 Impacts on Public Health**

This section examines the concerns for public health related to HIV/AIDS and other communicable and sexually transmitted diseases (STDs), and exposure to electric and magnetic fields (EMFs)

##### **HIV/AIDS**

HIV/AIDS has been declared a national disaster. It has been observed that construction works and projects are a conduit for transmission of the disease through sexual interactions between project staff and local communities.

The contractor will transport workers to active construction sites each day from the nearest urban centres. No camps will be used that might attract concentration of prostitutes. The contractor will, as part of each workers initial orientation and ongoing education, provide public education information about HIV/AIDS transmission and prevention measures.

##### **Influx of People**

Temporary influx of skilled labour during construction of the project and their interaction with locals can cause tensions as well as opportunities for the spread of socially communicable diseases. These affects can be managed by appropriate ongoing consultation with local communities throughout project construction as well as informing workers on local cultural sensitivities and health matters.

##### **Social Vices**

Construction activities will attract an influx of people to the project area. This may lead to social vices like drug abuse, spread of diseases like HIV and may pose security concerns. Sensitization and awareness creation need to be done before and during the construction works.

##### **Proposed Mitigation Measures**

The contractor should undertake an initial awareness training session prior to any work commencing onsite, where the target audience is all the project personnel. The training should include but not be limited to the following:

- Understanding the importance of and the reasons why the environment must be protected;

- Basic awareness and understanding of the key environmental features of the work site and environs
- Ways to minimize identified environmental Impacts
- Relevant requirements of the Environmental Management Plan (EMP) and Waste Management Plan (WMP) provided in this report.
- Health risks pertinent to the site, including prevention of communication diseases;
- Prevention and handling of fire.

### **9.5 Contractor code of Conduct**

The contractor should submit method statements covering the procedures for the main activities which could generate emergency situations through accidents or neglect of responsibilities.

These situations include, but not limited to:

- Accidents at the work place
- Accidental fires
- Accidental leaks and spillages
- Vehicle and plant accidents

These conditions focus on safety of operations but not provide for environmental awareness creation.

### **9.6 Cumulative Impacts**

Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past present or reasonably foreseeable future activities. This section provides a description and analysis of the potential cumulative effects of the 33/11 kV Substation project and considers the effects of any such changes on:

- The biophysical environment; and
- Socio-economic conditions.

#### **Cumulative Impact Analysis**

For the most part, cumulative impacts or aspects thereof are too uncertain to be quantifiable, due to mainly lack of data availability and accuracy. This is particularly true of cumulative impacts arising from potential or future projects, the design or details of which may not be finalized or available and the direct and indirect impacts of which have not yet been assessed. Given the limited detail available regarding such future developments, the analysis that follows is necessarily of a generic nature and focuses on key issues and sensitivities for the project and how these might be influenced by cumulative impacts with other activities. In most cases, only qualitative assessments of cumulative impacts are possible.

#### **Cumulative Biophysical Impact**

The potential cumulative impact associated with the substation is the potential loss of biodiversity through a decrease in vegetation and faunal habitat. A decrease in avifauna as a result of the operation of the facility may also occur. The development of the 33/11kV will not exacerbate the loss of biodiversity through the direct loss of natural vegetation because the site has been under cultivation. However with the implementation of the proposed

mitigation recommendations the cumulative impact on flora and fauna is anticipated to below.

**Cumulative Socio-Economic Impact**

The proposed substation development has the potential for positive cumulative socio-economic impacts. The construction of the substation will provide an additional supply of electricity to Magumu area. This dedicated, additional supply of electricity will enable many previously un-serviced households to receive electricity, thereby improving the standard of living for the people within the surrounding rural area. The power outages, which are currently occurring in the area on a relatively frequent basis, will also decrease accordingly.

*Summary of the identified impacts in terms of Significance of the Proposed Project are presented in table 7 while the summary of impacts in terms of whether they are positive or negative; direct or indirect; major or Minor and Temporary or permanent are presented in table 8.*

**Table 7: Present a Summary of Significance of the Identified Impacts of the Proposed Project**

**Significance of Impacts**

IMPACT	SIGNIFICANCE RATING					
	Construction Phase		Operation Phase		Decommissioning phase	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
<b>Soil and Geology</b>						
Increase in erosion potential and sedimentation	Medium negative impact	Very low negative impact	Not anticipated	Not anticipated	Very low negative impact	Very low negative impact
Contamination of soil	Very low negative impact	Very low negative impact	Not anticipated	Not anticipated	Very low negative impact	Very low negative impact
Weakening of the geological stability	Very low negative impact	Very low negative impact	Not anticipated	Not anticipated	Very low negative impact	Very low negative impact
<b>Ecology</b>						
Impact on terrestrial ecology	Medium low negative impact	Very low negative impact	Very low negative impact	Very low negative impact	Not anticipated	Not anticipated
Forest and vegetation clearance	low negative impact	Very low negative impact	Not anticipated	Not anticipated	Not anticipated	Not anticipated
Impact on Aquatic environment	Not anticipated	Not anticipated	Not anticipated	Not anticipated	Not anticipated	Not anticipated
<b>Air quality</b>						
Decrease air quality due to dust	Low negative impact	Very low negative impact	Not anticipated	Not anticipated	Low negative impact	Very low negative impact
Fugitive emissions	Low negative impact	Very low negative impact	Not anticipated	Not anticipated	Low negative impact	Very low negative impact
<b>Waste generation</b>						

**Proposed Magumu 33/11 kV substation in Kinangop district**

IMPACT	SIGNIFICANCE RATING					
	Construction Phase		Operation Phase		Decommissioning phase	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
Pollution from waste generation	Low negative impact	Very low negative impact	Very low negative impact	Very low negative impact	Very low negative impact	Very low negative impact
<b>Water quality</b>						
Decreased water quality	Very low negative impact					
<b>Noise and vibration</b>						
Deterioration in ambient noise quality	low negative impact	Very low negative impact	Not anticipated	Not anticipated	Low negative impact	Very low negative impact
<b>Visual impacts</b>						
Impact on visual landscape	Very low negative impact	Not anticipated	Not anticipated			
<b>Socio-economic</b>						
Creation of employment	Low positive impact	High positive impact	Low positive impact	Medium positive impact	Low positive impact	Not anticipated
Gains in the Local and National Economy	Low positive impact	High positive impact	Medium positive impact	Medium positive impact	Negative Impact	Low Negative Impact
Provision of Market for Supply of Building Materials	Low positive impact	High positive impact	Not anticipated	Not anticipated	Not anticipated	Not anticipated
Informal Sectors Benefits	Low positive impact	Low positive impact	Not anticipated	Not anticipated	Not anticipated	Not anticipated
Loss of livelihood	Negative impact	Very low negative impact	Not anticipated	Not anticipated	Not anticipated	Not anticipated
Influx of people	Low negative impact	Very low negative impact	Not anticipated	Not anticipated	Not anticipated	Not anticipated
<b>Traffic impacts</b>						
Accidents as a result of increased traffic	Low negative impact	Very low negative impact	Very low negative impact	Very low negative impact	Not anticipated	Not anticipated
Damage to roads and transport infrastructure	Very low negative impact	Very low negative impact	Not anticipated	Not anticipated	Not anticipated	Not anticipated
<b>Health and Safety</b>						

**Proposed Magumu 33/11 kV substation in Kinangop district**

IMPACT	SIGNIFICANCE RATING					
	Construction Phase		Operation Phase		Decommissioning phase	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
Occupational Health and safety	Low negative impact	Very low negative impact	Very low negative impact	Very low negative impact	Low negative impact	Very low negative impact
Public safety	Not anticipated	Not anticipated	Low negative impact	Very low negative impact	Not anticipated	Not anticipated
Electromagnetic Fields	Not anticipated	Not anticipated	Very low negative impact	Very low negative impact	Not anticipated	Not anticipated
HIV & AIDS	Low negative impact	Very low Negative impact	Not anticipated	Not anticipated	Low negative impact	Very low Negative impact
Impacts on Wetlands	Low negative impact	Very low Negative	Not anticipated	Not anticipated	Low negative impact	Very low Negative impact
Hazardous Materials	Low negative impact	Very low Negative impact	Not anticipated	Not anticipated	Low negative impact	Very low Negative impact

**Table 8: Summary of Project Potential Impacts in all aspects**

Environmental & Social Impact	Positive/Negative	Direct/Indirect	Temporary/Permanent	Major/Minor	Occurrence		
					Construction	Operation	Decommissioning
Employment Opportunities	Positive	Direct & Indirect	Permanent/Temporary	Major	✓	✓	✓
Gains in the Local and National Economy	Positive	Direct	Permanent	Major	✓	✓	x
Provision of Market for Supply of Building Materials	Positive	Direct	Temporary	Major	✓	x	x
Informal Sectors Benefits	Positive	Direct & Indirect	Temporary	Minor	✓	x	✓
Increase in electricity supply	Positive	Direct	Permanent	Major	x	✓	x
Visual and aesthetic impacts	Negative	Direct	Permanent	Major	✓	✓	x
Impacts of terrestrial ecology (on farm private forest) Destruction of existing vegetation)	Negative	Direct	Permanent	Major	✓	✓	✓
Public health (Possible Exposure of Workers to Diseases)	Negative	Direct	Permanent	Major	✓	✓	✓
Social impacts	Negative	Direct	Permanent	Major	✓	-	-

**Proposed Magumu 33/11 kV substation in Kinangop district**

Environmental & Social Impact	Positive/ Negative	Direct/ Indirect	Temporary/ Permanent	Major/ Minor	Occurrence		
					Construction	Operation	Decommissioning
Generation of Exhaust Emissions	Negative	Direct	Temporary	Minor	✓	x	✓
Dust Emissions	Negative	Direct	Temporary	Minor	✓	x	✓
Water quality	Negative	Direct	Temporary	Minor	✓	x	✓
Occupational Health and Safety (Workers accidents and hazards)	Negative	Direct	Permanent	Minor	✓	✓	✓
Earth and construction material sourcing	Negative	Direct	Temporary	Minor	✓	x	x
Waste Generation and management	Negative	Direct	Temporary	Minor	✓	x	✓
Soil Erosion impacts from vegetation clearance	Negative	Direct	Permanent	Minor	✓	x	✓
Hazardous Materials	Negative	Direct	Temporary	Minor	✓	x	✓
Air and noise impacts	Negative	Direct	Temporary	Minor	✓	x	x
Fire Outbreaks	Negative	Direct	Temporary	Minor	✓	✓	✓
Impacts on avifauna (Aircraft Accidents )	Negative	Direct & Indirect	Permanent	Minor	x	✓	x
Change in Land use patterns	Negative	Direct	Permanent	Minor	✓	✓	✓
Fugitive Emissions	Negative	Direct	Temporary	Minor	✓	x	✓
Traffic congestion / road wear and tear	Negative	Direct	Temporary	Minor	✓	x	x
Fuel & chemical storage	Negative	Direct	Temporary	Minor	✓	x	x

**Environmental Management Plan**

Through this EIA report an EMP is prepared and proposed as a master plan to ensure proper environmental management and protection. The EMP specifies the methods and procedures for managing the environmental aspects of the proposed development. Monitoring requirements are also detailed within the EMP, particularly for those environmental aspects that give rise to potentially significant impacts.

The EMP includes all mitigation measures required to address the environmental impacts identified for this project. The Final EMP will be submitted to the NEMA for inclusion of any mitigatory and / or management measures in their notice of environmental authorization.

## CHAPTER TEN: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

### 10.1 Introduction

An Environmental and Social Management Plan (ESMP) for development projects provides a logical framework within which identified negative environmental and socio-economic impacts can be mitigated and monitored. Further, the ESMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done. ESMP is a vital output of an EIA as it provides a checklist for project monitoring and evaluation. The ESMP addresses the identified potential negative impacts and mitigation measures of the proposed substation during construction, operational and decommissioning phases, based on the Chapter of Environmental Impacts and Mitigation Measures of the expected Negative Impacts.

This chapter presents the environmental and social management plan (ESMP) for the proposed project. The ESMP specifies the mitigation and management measures which the Proponent will undertake and shows how the Project will mobilize organizational capacity and resources to implement these measures. The ESMP covers information on the management and/or mitigation measures that will be taken into consideration to address impacts in respect of the following project phases: design, construction, operation and decommissioning. **Table 9** presents the mitigation measures for the potential impacts of the proposed project.

### 10.2 Approach to Environmental Impact Management

Kenya power's SHE department will be responsible for the proposed ESMP. However, it will have links with other departments such as operation and maintenance. **Table 10** presents the range of approaches that will be used to manage potential impacts of the proposed project.

#### 10.2.1 Overview

The environment, health and safety management cycle has five broad components:

- Policy
- Planning and design
- Project implementation (covering the construction and operation phases);
- Checking and corrective action; and
- Management review

The ESMP of the proposed project covers the planning and design, construction, operation and decommissioning phases.

#### 10.2.2 Proponent's EHS Policy

The Proponent has SHE policy for managing their SHE aspects of their operations: the policy underscores that the Proponent is committed to creation of a conducive, health, safe and eco-friendly working environment. The policy further states that in order to achieve the stated objective, the proponent shall:

- Implement sound, cohesive EHS standards throughout all their business cycles and ensure these are observed by all managers and employees.
- Comply with all relevant EHS legislation

- Plan and prepare for all conceivable emergencies and disasters related to their businesses and work environment
- Strive to continually improve in their EHS management through well defined training and audit procedures
- Follow best practice in EHS compliance with an aim to be industry leaders
- Require all their business partners to manage their own EHS in line with their policy

### **10.2.3 Planning and Design**

Planning and design is necessary to ensure that mitigation and impact management can be effectively implemented in the context of the relevant EHS policies. Planning involves the following activities:

- Identifying and defining the various environmental aspects and related potential positive and negative impacts that can result from the company's activities
- Establishing a procedure to identify legal and other requirements to which the organization is subject
- Identifying and defining appropriate mitigation and management measures, including those reinforcing positive impacts.
- Establishing and maintaining documented, scheduled environmental objectives and targets at each relevant function and level within the organization.
- Environmental aspects and potential impacts will emanate from the following project related activities:
- Site preparation; excavation, stripping

The potential impacts of the proposed project have been discussed in chapter 9 of this Project Report. The mitigation measures provided in this ESMP are geared towards addressing the anticipated adverse impacts. There is clear division of responsibility between the design team responsible for the planning of the facility and the contractor responsible for building it. The proposed facility will be built in accordance with the nationally and internationally recognized standards. The Proponent will comply with several code of practice which includes: KEBS, BS, IP, API and NFPA.

The potential environmental impacts of the proposed facility which could arise with mitigation during construction, operation and decommissioning phases include the following:

- Impacts on soils and Geology
- Impacts on ecology (terrestrial and aquatic)
- Air pollution from dust and incidents
- Water pollution through erosion
- Visual impacts
- Socio-economic impacts
- Impact on traffic
- Impacts on human health and safety

### **10.2.3 Management of Impacts during Construction Phase**

The EMP will put in place measures to avoid and mitigate impacts and optimize benefits arising from activities during construction phase of the project. The principal focus of project management for construction phase will include:

- Personnel and contractor management
- Conduct onsite management

- Landowner relations
- Maintenance of complaints register
- Emergency preparedness; and
- Management and mitigation of impacts such as noise, dust, safety and pollution

Assignment of responsibility and contractor management is important during the construction and operation phase. The contractor will be held to the highest EHS performance requirements to ensure they meet national and international standards.

#### **10.2.4 Management of Impacts during Operation Phase**

The operation phase of the proposed project will be mainly power supply.

For the purpose of the EMP there are three principal mechanisms for the implementation of management and mitigation measures:

- Facilities -these can be either specific facilities that have a dedicated EHS management functions or additions to facilities that are central to the proposed project activity.
- Procedures-in a similar vein, procedures can be stand-alone procedures with a dedicated EHS function (such as a waste management procedure) or can be a modification to an existing activity process to affect the EHS management.
- Assignment of responsibility and contractor management -this is important when the contractor will be used on an ongoing basis for a range of maintenance and other functions. The contractor will be held to the same EHS performance requirements that govern KPLC.

The mechanisms for effecting the ESMP requirements are collectively called 'operational controls'. Such operational controls require that a responsible party, a budget and in implementation schedule are specified and allocated, to further enable and facilitate implementation. In addition, roles and responsibilities need to be defined for the ESMP.

These roles include dedicated EHS management roles as well as the EHS responsibilities of other company personnel (ultimately all personnel will have an EHS role). To facilitate coordinated and purposeful implementation, the ESMP management and mitigation measures are grouped in programmes and plans.

#### **Checking and Corrective Action**

Checking and if necessary implementing corrective action, form the fourth component of the EMP management cycle. They ensure that:

- The required ESMP management activities are being implemented; and
- The desired outcomes are being achieved.

As such this component includes four key activities. These are

- Monitoring selected environmental quality variables as defined in the objectives and targets.
- Ongoing inspections of the operational controls and general state of the operations.
- Internal audits to assess the robustness of the ESMP or to focus on a particular performance issue.
- External audits to provide independent verification of the efficacy of the ESMP.

### **Monitoring**

The environmental variables that are to be monitored are described in the description of the baseline environment in this report. Monitoring results must be structured and presented for review on an ongoing basis so that if objectives and targets are not met, corrective action can be taken.

### **Inspections: Construction Phase**

An ongoing but pragmatic inspections regime will be developed that allows for potential EHS transgressions to be identified proactively, so that mitigation can be quickly and effectively implemented.

### **Internal and External Audits**

Where the monitoring data and the inspection reports highlights problems, an internal audit can be used to ascertain the source of the problem and to define action to prevent its recurrence. The three key areas for audit are facilities (are they operating properly?), project procedures (are they properly designed and implemented?) and finally, and perhaps most importantly Contractor's EHS performance.

### **Corrective Action**

There are several mechanisms for implementing corrective action, both during the construction and operational phases. The main mechanisms to address transgressions include verbal instruction (in the event of minor transgressions from established procedure, usually following a site inspection); written instruction (identifying source/s of problems, usually following an audit) and contract notice (following possible breach of contract).

### **Reporting**

The findings of all of the above will be structured into instructive reporting that provides information to all required parties on EHS performance, together with clearly defined corrective action where this seem to be required. Both the monitoring and inspections are reported on continuously. Within the reporting structure it is necessary to create a review function that continuously assesses the reporting and prescribes any necessary corrective action. Reporting will include the provision of information on the EHS performance to external stakeholders and surrounding communities.

### **Management Review**

The final component of the EMP management cycle is a formal management review that takes place at defined intervals both during the construction and operational phases. The purpose of the management review is for senior project management to review the environmental management performance during the preceding period and to propose measures for improving that performance in the spirit of continuous improvement.

### **Liaison**

Throughout the project, ongoing liaison will be maintained with authorities and communities alike to ensure the following:

- Advance warning of any project activities that may have some adverse impact on surrounding communities, e.g. clearing of construction site, excavations; and
- Ongoing feedback on the environment performance of the project.

### **10.3 Impact Mitigation and Management**

The section presents mitigation and management measures for the identified potential impacts of the proposed project. The section also provides description of the management plans and programmes within which management and mitigation measures will be implemented. The actions and activities for decommissioning phase are dealt with in the rehabilitation and closure plan which also addresses the mitigation measures that will be ongoing once operations have ceased.

#### **10.3.1 Impacts and mitigation/ management measures**

**Table 10.1** presents the EMP for the proposed project. It covers on the proposed management and mitigation measures for the identified impacts. This addresses the dual objective of the EMP, namely to fully disclose the commitments undertaken by KPLC, and to provide managers and staff of KPLC with a clear framework for EMP implementation.

In addition, the EMP provides a schedule for the implementation of management/mitigation activities, sub-divided by project phase. The schedule shows at a glance, the timing of the many actions required under the EMP. It is particularly useful where management/mitigation measures extend across phases.

#### **10.3.2 Management Plans**

This section presents the plans for managing the identified impacts. It is worth noting that the use of management plans to manage the impacts is necessitated by the fact that most of the mitigation measures cannot be implemented as discrete, isolated actions because there are spatial, temporal and casual interactions among impacts. The plans recommended for managing the potential impacts of the proposed project include:

- Soil conservation management plan
- Water quality management plan
- Air quality management plan
- Noise management plan

The implementation of the EMP is also linked to a series of comprehensive management plans. Management and mitigation measures should be in compliance with legislative requirements. Where no legal guidance is provided, industry and/or international good practices should be applied as far as is practicable.

#### **Soil Conservation Management Plan**

The aim of soil conservation plan is to conserve soil for rehabilitation. The plan will include the following requirements:

- Only minimum area required for infrastructure shall be cleared of vegetation
- Measures shall be taken to ensure that topsoil and subsoil excavated from the construction site is properly managed. These measures are contained in the construction environmental management plan.
- A minimum amount of storm water will be allowed to flow on to the site, and control measures to meet industry norms and standards will be implemented to ensure that storm water damage is avoided and minimized.
- Topsoil shall not be disturbed more than is absolutely necessary on the construction site, and should be used for backfilling as much as possible.

- Denuded areas shall be surfaced as soon as feasible after construction, where clearing or use has been temporarily used for construction.

### **Water Management Plan**

The aim of this plan is to ensure that water quality is conserved throughout the project phases. The plan includes the following:

#### **Surface Water**

The Proponent needs to comply with the relevant EHS legislations in executing the proposed project. Some of the legislations that cover water management include: Legal Notice No. 121 of 2006, EMCA 1999, and Water Act, 2002.

- Measures shall be instituted to minimize erosion and sediment transport, especially during construction activities. These measures should include: limiting areas cleared of vegetation, stabilizing the soils on the sloppy areas with stone pitching and planting of grass.
- Remedial measures shall be implemented by the Contractor in the event of erosion resulting in the sedimentation of surrounding areas after due consideration of the costs and benefits of such removal activity.
- Infrastructure shall be designed to ensure that contaminated run-off does not reach watercourses. In the event of an oil spill the procedures contained in the emergency response plan will come into effect.
- A surface monitoring system, including flows and water quality, shall be established and implemented for the duration of the operation of the facility.

#### **Effluent management**

Provision shall be made for suitable sewage facilities for construction workers.

#### **Air quality management plan**

The aim of this plan is to ensure that air quality is maintained through construction, as well as operation phases. The air quality management plan includes the following:

#### **Dust management**

- Dust abatement measures shall be implemented to control dust generated by construction activities. Refer to the construction control plan and construction management plan.
- A complaints register and protocol will be drawn up as a means for surrounding landowners, residents and public residents to voice their issues and concerns, particularly those relating to the nuisance effects of dust. The register will be set up prior to the commencement of construction activities. These public complaints should be responded to as a matter of urgency and where possible, measures taken to minimize the cause of dust.

#### **Emissions**

- The contractor shall ensure that the construction machinery and equipment are appropriate and fit to prevent fugitive emissions, as per national standards or international practices. The Proponent shall ensure the regular maintenance of this equipment.
- A maintenance plan for the construction machinery and vehicles shall be implemented to prevent excessive emissions during the construction phase of the project.

### **Noise management plan**

The plan aims to ensure that noise generated by construction and operation activities is kept to a minimum and adheres to relevant noise standards. The noise management programme includes the following:

- The Contractor shall ensure that construction activities are limited to working hours (i.e. between 6.00 a.m to 6.00 pm from Monday to Saturday, or as required in terms of legislation and/or negotiated with local landowners.
- Noise generating equipment will be designed to control and dampen noise emissions, and will be located at a distance far enough from the nearest noise sensitive development, to ensure that the increase in ambient noise level will comply with NEMA standards.
- Landowners, residents and public shall be able to register their complaints and concerns about noise through complaints register set up prior to the commencement of construction activities. These public complaints should be responded to as a matter of urgency and where possible measures must be taken to minimize the noise

### **Construction Management Plan**

The construction management plan for the proposed project shall include the following:

#### **Management of fuels and other hazardous materials**

- The contractor shall comply with all applicable laws, regulations, permit and approval conditions and requirements relevant to the storage, use, and proper disposal of hazardous materials.
- The Contractor shall manage all hazardous materials and waste in a safe and responsible manner, and shall prevent contamination of soils, pollution of water and/or harm to people or animals as a result of the use of these materials.
- The Contractor shall prepare a hazardous materials and waste management plan for inclusion in the site specific environmental plan to be submitted to the Proponent prior to establishment on site. The plan shall include, but not limited to, measures to prevent: (a) contamination of soils; (b) pollution of water; (c) safe siting and storage; (d) containment of lubricants and waste oil during maintenance of vehicles; and (e) tampering with fuel tanks.
- The contractor shall ensure oil spills/leaks are prevented or minimized. This can be achieved through: instructing employees to be sensitive on spills; regular auditing to verify that no leaking or defective equipment is brought/used onsite.
- The Contractor shall ensure that fueling and repairs are carried out by trained personnel familiar with spill containment and clean-up procedures.
- The Contractor shall ensure that all the employees working onsite are trained on good housekeeping practices

#### **Management of the construction site**

- The contractor shall prevent littering and the random discard of any solid waste on or around the construction site
- The contractor shall manage hazardous waste
- The Contractor to determine safe travelling speeds for the construction period and ensure that restrictions are enforced.

### **Emergency Preparedness**

- The Contractor shall develop an emergency plan that will enable rapid and effective response to all types of environmental emergencies in accordance with recognized national and international standards. The emergency plan shall include establishment of a network of communication between the Contractor and emergency services including police, ambulance services, and fire brigades among others.
- The Contractor shall test emergency preparedness with drill operations and shall review drills, conduct mock emergencies and remedy shortcomings to ensure a high level of emergency readiness to deal with environmental and third party incidents.

### **Fire Prevention and management**

- The Contractor shall take all necessary precautions to prevent fires caused either deliberately or accidentally during construction process.
- The Contractor shall prepare a fire prevention and fire emergency plan as a part of the Environmental Plan to be submitted to KPLC.
- The Contractor shall provide adequate fire fighting appliances at specified localities on the worksite to meet any emergency resulting from ignition of a fire.

### **Neighboring land owner and occupier relations**

- The Contractor shall respect the property and rights of neighboring landowners and occupiers at all times and shall treat all persons with deliberate courtesy.
- The Contractor shall respect any special agreements between the Proponent and the neighbors

### **Complaints register**

The Contractor shall establish and maintain a register for periodic review by the Proponent that logs all the complaints raised by the neighbors or the general public about construction activities. The register shall be regularly updated and records maintained including the name of the complainant, his/her domicile and contact details, the nature of the complaint and any action taken to rectify the problem.

### **Health management**

- The Contractor shall comply with all relevant legislative requirements governing worker health and safety (e.g. OSHA 2007 and its subsidiary legislations).
- The Contractor shall prepare and implement a programme to minimize diseases likely to be contracted by the construction workers as a result of the proposed project such as HIV & AIDs.

### **Construction Control Plan (CCP)**

The CCP for the proposed project shall cover the following:

#### **Control of access**

The contractor shall ensure that the construction site is accessed by authorized persons only.

### **Control of topsoil and subsoil**

- Topsoil excavated from the site shall be stored appropriately and protected from direct wind.
- Topsoil shall be protected from any contaminant that might impact on vegetation.
- The Contractor shall temporarily stockpile topsoil in a location that will minimize any loss due to erosion or mixing with other material.
- The Contractor shall ensure that topsoil is stockpiled in a manner and for a period of time that does not result in deterioration in its plant support capacity.

### **Control of material supply and burrow areas**

- Sourcing of materials needed for construction shall be from licensed mines and /or quarries from Magumu area and its environs.
- The contractor shall comply with relevant legislations in instances where materials are to be obtained from a new burrow area
- The contractor shall prepare a method statement including plans, detailing the expected quantity of excavation, temporary and permanent drainage control, the final contouring of the burrow pit and the proposed method of rehabilitation.

### **Rehabilitation**

- Once construction is complete, the contractor shall clear the site of construction materials and dispose wastes in appropriate disposal sites.
- All temporary works on the construction site shall be removed. Further, grass shall be grown on the sloppy areas where retaining wall will not be constructed to control soil erosion

### **Labour and Human Resources Plan**

In designing the labour and human resources plan Contractor shall:

- Comply with the provisions of Employment Act, 2007
- Give priority to qualified local people when hiring employees.

### **Workplace Health and Safety Plan**

The workplace health and safety plan to be implemented by the Contractor and KPLC shall include the following key measures:

- All relevant national legislation, including the OSHA 2007 and related regulations, shall be adhered to ensure that health and safety of proximate communities and the public at large are not threatened during construction and operational phases of the Project.
- The Proponent shall ensure workplace health and safety during the operational phase of the project
- Health and safety performance will be continuously monitored and procedures reviewed with the aim of eliminating risk as far as reasonably practicable.

### **Community health and safety plan**

The community health and safety plan to be implemented by the Contractor and KPLC shall include:

- Adherence to OSHA 2007 Act and its subsidiary legislations to ensure that health and safety of immediate neighbors and the public is not threatened.

- The Contractor to ensure that construction work is undertaken in manner not likely pose risks to community health and safety.
- The Proponent to undertake an independent quantitative risk assessment prior to operation of the facility. The findings of this assessment will inform the development of an emergency safety plan the Contractor and KPLC to create awareness among the neighbors on the community safety procedures

### **Emergency Management and Response Plan**

The Proponent shall rollout and implement their documented emergency response plan at the completed footprint. The EMRP shall include:

#### **Emergency management planning**

The components of the EMRP shall include:

- a) Structure and operation of the emergency management team
- b) Establishment of an emergency management centre
- c) Information retained by the emergency management team
- d) Incidents requiring activation of the plan
- e) Incident severity classification
- f) Process to be followed in the event of an emergency

Information pertaining to emergency management shall be reported through the SHE reporting process

- A quantitative risk assessment report will be compiled by an independent company prior to commissioning of the facility.

### **Emergency Response Plan**

KPLC will compile a comprehensive Safety Emergency Management Plan (SEMP) for the facility.

The SEMP will cover the following aspects:

- a) Kenya's Safety regulations
- b) Scope of the SEMP
- c) Notification of local authorities
- d) Details of the facility's system
- e) Aim of the SEMP
- f) Objectives of SEMP
- g) Roles and responsibilities in the event of an emergency
- h) Information requirements in the event of an emergency
- i) Evacuation of people
- j) The role of local communities\
- k) Regular testing of the SEMP
- l) Planning for the eventuality of failure on the facility
- m) Causes of the facility's failure
- n) Probability of facility's failure
- o) Size and duration of the facility
- p) Hazards and effects of facility's failure
- q) Hazard range and emergency planning distances
- r) Anticipation of worst credible incidents

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**Table 9: Environmental Management Plan during CONSTRUCTION PHASE of the proposed Magumu Substation**

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
<b>1. Minimize extraction site impacts and ensure efficient use of raw materials in construction</b>				
<b>Demand of Raw material</b>	1. Building materials to be sourced from local suppliers who use environmentally friendly processes in their operations.	Resident Project Manager & Contractor	Throughout construction period	0
	2. Accurate budgeting and estimation of actual construction materials to avoid wastage.	Resident Project Manager & Contractor	Throughout construction period	0
	3. Proper storage to ensure minimal damage or loss of materials at the construction site.	Resident Project Manager & Contractor	Throughout construction period	0
	4. Use at least 5%-10% recycled refurbished or salvaged materials to reduce the use of raw materials and divert material from landfills.	Resident Project Manager & Contractor	Throughout construction period	0
<b>2. Minimize vegetation disturbance at and or around construction site</b>				
<b>Vegetation disturbance</b>	1. Ensure proper demarcation and delineation of the project area to be affected by construction works.	Contractor, Resident Project Manager	1 month	0
	2. Specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage.	Civil Engineer and Resident Project Manager	2 months	1,000
	3. Designate access routes and parking within the site.	Civil Engineer and Resident Project Manager	1 month	5,000

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	4. Introduction of vegetation (trees, shrubs and grass) on open spaces and around the project site and their maintenance.	Architect & Landscape specialist	Once	10,000
	5. Landscaping to help in re-vegetation of part of the project area after construction.	Architect & Landscape specialist	2 months	10,000
<b>3. Reduce storm-water, runoff and soil erosion</b>				
<b>Increased storm water, runoff and soil erosion</b>	1. Rain water harvesting to acquire water for use and avoid surface runoff.	Contractor	Once	10,000
	2. A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure will be designed.	Contractor	1 month	
	3. Soil erosion control measures such as levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil.	Contractor	1 months	
	4. Ensure that construction vehicles are restricted to use existing graded roads	Contractor	Throughout construction period	
	5. Ensure that any compacted areas are ripped to reduce run-off.	Contractor	2 months	

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	6. Site excavation works to be planned such that a section is completed and rehabilitated before another section begins.	Contractor and proponent supervision engineer	Throughout construction period	5,000 per unit
	7. Interconnected open drains will be provided on site.	Contractor	Throughout construction period	5,000 per unit
	9. Construction of water storage tanks to collect storm water for substation uses.	Contractor	Throughout construction period	
<b>4. Minimize solid waste generation and ensure efficient solid waste management during construction</b>				
<b>Increased solid waste generation</b>	1. Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Reduction at source 2. Recycling 3. Reusing 4. Incineration 5. Sanitary land filling.	Resident Project Manager & Contractor	Throughout construction period	15,000
	2. Accurate estimation of the dimensions and quantities of materials required.	Resident Project Manager & Contractor	One-off	0
	3. Use durable materials that will not need often replacement.	Resident Project Manager & Contractor	Throughout construction period	0
	4. Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to elements	Contractor	One-off	0

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	5. Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste	Resident Project Manager & Contractor	Throughout construction period	0
	6. Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at site	Contractor	Throughout construction period	0
	7. Dispose waste more responsibly by contracting a registered waste handler who will dispose the wastes at designated sites or landfills only.	Contractor	Throughout construction period	0
	8. Waste collection bins to be provided at designated points on site	Contractor	Throughout construction period	0
<b>5. Air Pollution</b>				
<b>Dust emission</b>	1. Ensure strict enforcement of on-site speed limit regulations	Resident Project Manager & Contractor	Throughout construction period	0
	2. Sprinkle water on graded access routes when necessary to reduce dust	Contractor	Throughout construction period	
	3. Personal Protective equipment to be provided to employees and worn	Contractor	Throughout construction period	
<b>Exhaust emission</b>	1. Vehicle idling time shall be minimized	Contractor	Throughout construction period	0

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	2. Ensure construction vehicles are properly maintained	Contractor	Throughout construction period	0
	3. Sensitize truck drivers to avoid unnecessary running engines of stationary vehicles	Contractor	Throughout construction period	0
<b>7. Minimization of Noise and Vibration</b>				
<b>Noise and vibration</b>	1. Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Contractor	Throughout construction period	Routine site operation
	2. Sensitize construction drivers to avoid running of vehicle engines or hooting	Contractor	Throughout construction period	Routine site operation
	3. Ensure that construction machinery are kept in good condition to reduce noise generation	Contractor	Throughout construction period	
	4. Ensure that all generators and heavy duty equipment are insulated or placed in enclosures (containers) to minimize ambient noise levels.	Contractor	Throughout construction period	
	5. The noisy construction works will entirely be planned to be during day time when most of the neighbours will be at work.	Resident Project Manager & all site foreman	Throughout construction period	0
<b>8 Minimization of Energy Consumption</b>				
<b>Increased energy consumption</b>	1. Ensure electrical equipment, appliances and lights are switched off when not being used	Contractor	Throughout construction period	0

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	2. Install energy saving bulbs/tubes at all lighting points instead of incandescent bulbs which consume higher electric energy	Contractor	Throughout construction period	0
	3. Plan well for transportation of materials to ensure that fossil fuels (diesel, transformer oil, petrol) are not consumed in excessive amounts	Contractor	Throughout construction period	0
	4. Monitor energy use during construction and set targets for reduction of energy use.	Contractor	Throughout construction period	0
<b>9. Minimize water consumption and ensure more efficient and safe water use</b>				
<b>Increased Water Demand</b>	1. Water to be brought in using water boozers	Contractor	Throughout construction period	0
	2. Harness rainwater for construction and watering grass	Contractor	Throughout construction period	0
	3. Install water conserving taps that turn-off automatically when water is not being used	Contractor	One-off	40% more than price of ordinary taps
	5. Promote recycling and reuse of water as much as possible	Contractor	Throughout construction period	0
	6. Install a discharge meter at water outlets to determine and monitor total water usage	Contractor	One-off	3,000

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	7. Promptly detect and repair of water pipe and tank leaks	Contractor	Throughout construction period	1,000 per month
	8. Sensitize construction workers to conserve water at all times	Contractor	Throughout construction period	0
	9. Ensure taps are not running when not in use	Resident Project Manager & Contractor	Throughout construction period	0
<b>10. Minimize release of liquid effluent</b>				
Generation of wastewater	1. Provide means for handling sewage generated at the construction site	Contractor	One-off	0
	2. Conduct regular checks for sewage pipe blockages or damages since such vices can lead to release of the effluent into land and water bodies	Contractor	Throughout construction period	2,000/month
	3. Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated	Contractor	Throughout construction period	0
<b>11. Minimize occupational health and safety risks</b>				
Statutory Requirements	Ensure compliance with The OSHA (Building Operations and Works of Engineering Construction Rules), L.N. 40 of 1984	Contractor	During the construction period	0

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Worksite Safety and Health Hazards to employees	Ensure compliance with the Occupational Safety and Health Act (OSHA) 2007 provisions e.g. employees to be provided with appropriate PPE	Contractor	One-off	50,000
<b>12. Minimize Oil Spills</b>				
Oil spills Hazards	Install oil trapping equipments in areas when there is a likelihood of oil spillage such as during the maintenance of construction equipments. Soil in such an area will be well protected from contamination	Contractor	Continuous	50,000

### **Operational Phase EMP**

The objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the operational phase of proposed project are outlined in this section.

**Table 10** indicates the operational phase EMP.

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Table 10: Environmental management Plan for the OPERATIONAL PHASE of the proposed Magumu 33/11kV.

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
<b>1. Minimization of solid waste generation and ensuring more efficient solid waste management</b>				
Solid waste generation	1. Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Composting and reuse 4. Combustion 5. Sanitary land filling.	Proponent	Throughout operation period	Operations and maintenance budget.
	2. Provide solid waste handling facilities such as rubbish bins	Proponent	One-off	5,000
	3. Ensure that solid wastes generated at the substation are regularly disposed of appropriately at authorized disposal sites	Proponent	Continuous	15,000/month
<b>2. Ensuring Efficient Liquid waste management</b>				
	1. Paving of substation surface to reduce spilled liquid waste from reaching sub-surface	Proponent and contractor	During Construction	Part of construction cost
	2. Provide means for handling sewage generated e.g use of septic tanks	Proponent Contractor	During construction	Part of construction cost
<b>3. Minimise risks of sewage release into environment</b>				
Release of sewage into the environment	1. No sewage should be released to the environment.	Proponent	One-off	Part of maintenance budget.

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	2. Conduct regular inspections for sewage pipe blockages or damages and fix appropriately	Proponent	During entire operation period	500 per inspection
<b>4. Minimize energy consumption</b>				
<b>High demand for energy</b>	1. Switch off electrical equipment, appliances and lights when not being used	Engineer in charge of substations	Continuous	0
	2. Install occupation sensing lighting at various locations such as storage areas which are not in use all the time	Engineer in charge of substations	One-off	10-40 % higher than ordinary lighting
	3. Install energy saving fluorescent tubes at all lighting points within the substation instead of bulbs which consume higher electric energy	Engineer in charge of substations	One-off	10-40% higher than ordinary lighting
	4. Monitor energy use during the operation of the project and set targets for efficient energy use	Engineer in charge of substations	Continuous	0
	5. Sensitize the substation workers to use energy efficiently	Engineer in charge of substations	Continuous	0
<b>5. Minimize water consumption and ensure more efficient and safe water use</b>				
<b>High water demand</b>	1. Promptly detect and repair of water pipe and tank leaks	Administration department	Continuous	Maintenance budget

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	2. Staff and stakeholders to be sensitized on water conservation techniques.	Engineer in charge of substations	Continuous	0
	3. Ensure taps are not running when not in use	Engineer in charge of substations and staff	Continuous	0
	4. Install water conserving taps that turn-off when water is not being used	Proponent	One-off	40% more than ordinary taps
	5. Install a discharge meter at water outlets to determine and monitor total water usage	Engineer in charge of substations	One-off	Part of construction budget
	6. Create water conservation awareness	Engineer in charge of substations	Continuous	0
<b>6. Minimization of health and safety impacts</b>				
Increased health and safety impacts	Implement all necessary measures to ensure health and safety of the staff and the general public during operation of the proposed substation as stipulated in the Occupational Safety and Health Act, 2007	Proponent (SHE Department)	Continuous	Operations and maintenance budget
<b>7. Ensure the general safety and security of the proposed Magumu substation in Magumu and surrounding areas</b>				
<b>8. Increased general safety and security impacts</b>	Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the substation.	Engineer in charge of substations	Continuous	Operations and maintenance budget

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<b>9. Air pollution</b>	1. Enforce low speed limits for vehicles coming to the substation	Engineer in charge of substations	Continuous	
<b>10.Minimization of fire risks</b>	1.Installation of fire fighting equipments	Regional manager and SHE manager	In design and Continuous during operation	200,000
	2.Development of fire evaluation plan			
	3.Training of staff in fire management			
<b>12.Worksite Safety and Health Hazards to employees</b>	Ensure compliance with the Occupational Safety and Health Act (OSHA) 2007 provisions e.g. employees to be provided with appropriate PPE and training on safety	Engineer in charge of substations and SHE manager	Continuous	In training budgets

### **Decommissioning Phase EMP**

In addition to the mitigation measures provided in the above two tables, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the proposed substation have been implemented and there is need for phasing out. The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the substation are outlined in the **Table 11**.

**Table 11: Environmental management Plan for the DECOMMISSIONING PHASE of the proposed 33/11kV Magumu substation.**

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
<b>1. Demolition waste management</b>				
Demolition waste	1. Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Reusing 4. Combustion 5. Sanitary land filling.	Contractor	One-off	Demolition/contractor budget
	2. All machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible or they be taken to a licensed waste disposal site	Resident Project Manager & Contractor	One-off	0
<b>2. Rehabilitation of project site</b>				
Vegetation disturbance	1. Implement an appropriate re-vegetation programme to restore the site to its original status	Contractor	One-off	Demolition budget
	2. Consider use of indigenous plant species in re-vegetation	Resident Project Manager & Contractor	One-off	Demolition budget
<b>3.Minimization of Generation of Dust</b>				
Generation of dust	1. Watering all active demolition areas as and when necessary to lay off dust.		During Decommissioning	Demolition budget

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	<p>2. Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.</p> <p>3. Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at demolition sites.</p>	Resident Project Manager & Contractor		
<b>4. Reduction of Noise and vibrations</b>				
Increase noise and vibration	1. Install portable barriers to shield compressors and other small stationary equipment where necessary.	Resident Project Manager & Contractor	During Decommissioning	To be determined
	2. Demolish mainly during the day. The time that most of the neighbours are out working.			
	3. Co-ordinate with relevant agencies regarding all substation construction activities in the residential areas.			

## 10.4 Environmental and Social Monitoring Plan (ESMP)

### Introduction

Monitoring is a key aspect of any project. The proposed project will be subjected to monitoring i.e routine monitoring against standards or performance criteria; and periodic review or evaluation. During construction phase, the proponent will monitor the contractor's activities in order to verify that the management measures/procedures/specifications are implemented as contained in the EMP. Compliance will mean that the Contractor is fulfilling their contractual obligation.

During operation phase, the proponent will monitor facility's operations to ensure compliance with management measures in the EMP and operation procedures. As part of this monitoring, the Proponent will undertake statutory initial environmental audit as required by the EIA/EA Regulations, 2003 and subsequent annual self environmental audits.

The environmental and social parameters monitoring procedures and techniques for the proposed project are summarized in table 12.

**Table 12: Environmental and Social Monitoring Plan (ESMP)**

Potential Environmental /Social impact	Parameter to be monitored	Timing	Cost	Responsibility
Noise	Measure the Noise Level within the Project area	Construction, Operation	Included in contract and Operating costs	Proponent and Contractor
Vegetation and Habitat Loss	Quantify the weight of cleared Vegetation	During Construction	Included in the Contract	Contractor
Soil erosion	Assess size of rills or Gulleys forming from accelerated run off from compacted areas	During construction phase	Included in contract	Contractor
Increased water Demand	Record amount of Litres used	During Construction	Included in the Construction and demolition costs.	Proponent and Contractor
	Record any leakages	During	-	Contractor

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Potential Environmental /Social impact	Parameter to be monitored	Timing	Cost	Responsibility
Oil Spills	from vehicles coming to site. Record all accidental spills and number of litres	construction, operation		and proponent
Fire hazards	Record any Fire incidences and investigate possible causes	Throughout project cycle	In Contract	Proponent and Contractor
Occupational Health and Safety Issues	Record any accidents and Possible hazard scenarios	Construction and operation	Included in Contract	The Contractor and proponent

### **10.5 Rehabilitation and Decommissioning Management Plan**

The rehabilitation and decommissioning management plan include the following:

#### **Planning for closure**

- a) The proponent shall develop rehabilitation and decommissioning plan in conjunction with relevant stakeholders at least one year before actual demolition.
- b) The proponent shall investigate practical options for closure of the project and submit a report to relevant authorities NEMA included.
- c) The proponent to explore options of re-use and recycling of the demolished materials.

#### **Decommissioning**

- a) The Proponent shall take into consideration the health and safety of personnel, contractors, neighbors and the public during the planning and implementation of the demolition process.
- b) The Proponent shall undertake a further survey to identify any contaminated areas and remediate them accordingly.

#### **Post Closure**

The Proponent shall ensure that the facility's site is free of impacts associated with the abandonment/closure.

The Proponent shall develop, rollout and implement a monitoring plan that includes:

- a) Monitoring of the rehabilitated site to confirm whether progress is satisfactory.
- b) Outline of how land improvement and future land use will be affected by the past operation and decommissioning of the project.

**Table 13: Environmental management/monitoring Plan for the decommissioning phase of Project**

Expected Negative Impacts	Recommended Measures	Mitigation	Responsible Party	Time Frame	Estm. Cost (Ksh)
<b>1. Demolition waste management</b>					
Demolition waste	1. Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Reusing 4. Combustion 5. Sanitary land-filling.		Project proponent & Contractor	One-off	500,000
	2. All machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible or they be taken to a licensed waste disposal site		Project proponent & Contractor	One-off	500,000
<b>2. Rehabilitation of project site</b>					
Vegetation disturbance	1. Implement an appropriate re-vegetation programme to restore the site to its original status		Project proponent & Contractor	One-off	100,000
	2. Consider use of indigenous plant species in re-vegetation		Project proponent & Contractor	One-off	50,000

**CHAPTER ELEVEN: ASSUMPTIONS, UNCERTAINTIES ENCOUNTERED AND GAPS IN KNOWLEDGE.**

**11.1 Introduction**

The following assumptions were made in preparing this EIA

- Technical data and information provided by the proponent and the specialists are accurate and up-to-date
- The project will be designed in such a manner as to minimize risks from external factors which could threaten the integrity of the facility such as: risks from landslides and other natural calamities
- Measures will be put in place to minimize threats or damage from third parties e.g. terrorist attack
- The Proponent and the Contractor will implement the measures in the proposed ESMP
- The public involvement process has been sufficiently effective in identifying the critical issues that needed to be addressed
- The Proponent will undertake monitoring to track the implementation of the ESMP to ensure that management measures are effective to avoid, minimize and mitigate impacts and that corrective action will be undertaken to address shortcomings and/or non-performances.

**11.2 Uncertainty and Difficulties in Compiling Information**

Uncertainty arises from a variety of aspects in any development, and for this particular assessment they may emanate from the following:

- Changes that may occur in baseline conditions, due to external factors over the lifetime of the project;
- Uncertainty related to proponent's policy initiatives that might influence the assessment of future baseline and post-development conditions;
- Uncertainty in design information which should be dealt with by the definition of design parameters for the development by the Contractor and Proponent; and
- Uncertainty in relation to project planning and implementation as the detailed program and means of construction may be influenced by the choice of contractor and the detailed design of the development.

The difficulties in compiling the information for this assessment report have related principally to the above sources of uncertainty. To obviate these difficulties the lead Expert has used his past experience wherever possible and consultation with Proponents having similar projects to gauge and recommend appropriate mitigation measures in this study report.

### **11.3 Gaps in Knowledge**

This assessment does not consider how the present global meltdown/ economic recession and donor funding may affect the construction and management of the proposed project.

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## CHAPTER TWELVE: CONCLUSIONS AND RECOMMENDATIONS

### 12.1 Conclusion

Findings of the EIA study indicate that, the construction and operation of the proposed project would have positive impacts to the proponent and Kenyan society at large. The impacts will include; reliable quality power supply, employment to local community members, increase in the national/local investment and increase in government revenue. However, despite the outlined positive impacts, the proposed development will cause some negative impacts such as; noise pollution, dust generation, soil erosion, oil spills, solid waste generation, occupational hazards among others.

An Environmental and Socio Management Plan (E&SMP) has been developed to ensure sustainability of the project activities from construction through operation to decommissioning. The plan outlines project activities, associated impacts, mitigation measures and indicators to be monitored. Implementation timeframes and responsibilities are defined, and where practical, the cost estimates for recommended measures are also provided.

Monitoring helps in identifying changes or impacts that occur to the environment due to project activities. It involves continuous review of operational and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified.

From the findings of this study, the following conclusions are made:

- The proposed project will generate socio-economic benefits which would not be realized if the no development option is considered.
- The potential adverse impacts associated with the proposed project are possible to mitigate successfully. The impacts before implementation of mitigation measures are assessed as very low to medium low and the ratings are expected to improve further with the implementation of the proposed mitigation measures
- The project will be designed, constructed, and operated according to the acceptable industry norms and standards. Successful implementation of the proposed EMP will ensure environmental sustainability.
- The impacts that will be adverse will be temporary during the construction phase and can be managed to acceptable levels with the implementation of the mitigation measures for the project

The proposed project design will adhere to all the applicable laws and procedures. The project associated infrastructures will be constructed to the required planning/architectural/structural designs and standards. During project implementation, operation and decommissioning stages sustainable environmental

management (SEM) would be ensured; avoiding excess use of natural resources, conserving nature sensitively and guaranteeing a respectful and fair treatment of all people working on the project, general public at the vicinity and the expected beneficiaries of the project.

In line with the proposed mitigation measures, the proposed project is beneficial to the proponent, consumers and the economy at large.

## **12.2 Recommendations**

Flowing from the study, it is evident that the construction and operation of the proposed project will bring positive impacts including, creation of employment opportunities, gains in the local and national economy, better power supply, provision of market for supply of building materials, informal sectors benefits, Increase in revenue, improvement in the quality of life for the workers and residents, optimal use of land and improved security.

The positive impacts notwithstanding, the project will bring various negative impacts hence the need to address and mitigate them.

The study recommends a concerted effort between the proponent and the contractor in implementing the Environmental Management and Monitoring Plan provided herein. Following the commissioning of the project, statutory Environmental and Safety Audits must be carried out in compliance with the national legal requirements, and the environmental performance of the site operations should be evaluated against the recommended measures and targets laid out in this report.

Considering the proposed location, construction, management, mitigation and monitoring plan that will be put in place, the project is considered important, strategic and beneficial and may be allowed to proceed.

Recommendations for the prevention and mitigation of adverse impacts are as follows:

- Construction activities must be undertaken only during the day i.e. between 0600 hours to 1800 hours.
- All solid waste materials and debris resulting from the project must be disposed off at approved dumpsites.
- The proponent and contractor should follow the guidelines as set by relevant authorities to safeguard and envisage environmental management principles during installation, operation and decommissioning of the project.
- Maintenance activities for vehicles must be carried out in service bays and garages off site to reduce chances of oils or grease or other maintenance materials, from coming into contact with environment (water or soil).
- Ensure proper water usage during construction phase.
- Proper and regular maintenance of construction machinery and equipment to reduce emission of hazardous fumes and noise resulting from friction of rubbing

metal bodies. Maintenance should be conducted in a designated area and in a manner not to interfere with the environment.

- Workers must be provided with complete protective and safety gear. They must have working boots, complete overalls, helmets, gloves, earmuffs, nose-masks, goggles etc.
- Fully equipped first aid kits must be provided within the site.
- Undertake Environmental Audits annually or as prescribed by the Authority during the operational phase

The study recommends implementation of this project and directs the proponent to adhere to all the proposed mitigation measures outlined and other relevant guidelines and legislation governing; labor force management, public and occupational, health and safety, management of hazardous and contaminating material and management of wastes.

Diligence on the part of the contractor and proper supervision by the proponent is crucial for mitigating the predicted impacts and ensuring structural strength, safety, and efficient operation of the project.

### **12.3 Authorization Opinion**

NEMA requires the environmental practitioner to provide an opinion as to whether the activity should or should not be authorized. The expert is reticent to venture such an opinion since we are not an elected entity mandated to make decisions on behalf of authority. Nevertheless, a qualified opinion is ventured and in this regard the Lead expert believes that sufficient information is available for NEMA to make a decision. The fundamental decision is whether to allow development which brings socio-economic advantages and is consistent with planning and certain development and social responsibility and upliftment of policies, but which may impact on an area as a result of loss of biodiversity. If NEMA authorizes the proposed development, NEMA must also decide whether all the components of the applicant's preferred alternatives are acceptable. The Lead Expert believes that the EIA assessment has shown that the applicant's preferred alternative and technological alternatives are generally acceptable. The EIA has also assisted in the identification of essential mitigation measures that will mitigate the impacts associated with these components to acceptable limits.

In conclusion, the expert is of the opinion that on purely 'environmental' grounds (i.e. the project's potential socio-economic and biophysical implications) the application as it is currently articulated in the applicant's proposal should be **approved** provided the essential mitigation measures are implemented. It is in the opinion of the Environmental expert that the anticipated negative impacts can readily and effectively be mitigated and on the whole the proposed project does not pose any significant threat to the Environment and may be licensed to proceed.

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**ANNEXES**

**Annex 1: Copy of Land Ownership Documents and sketch map**

**Annex 2: Change of use**

**Annex 3: Substation designs and layout**

**Annex 4: Minutes of key Stakeholders Consultative Meetings Held In Project area  
-Magumu division**

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**Date 29/12/2011**

**Venue: District Officer's Office**

**Agenda: Stakeholder Consultation for Environmental Impact Assessment for 33/11 kV Substation.**

The D.O was called to order at 10.45 a. m meeting was called to order by the District officer. The meeting kicked off with a word of prayer by one of the stakeholders.

The District officer welcomed the heads of departments and all in attendance and requested for a brief session of self introductions. She then invited the team leader of the EIA team to explain the meeting agenda. Simon Mwangangi the team leader and Registered Lead Expert with NEMA explained the proposed project and the reason for the consultations with heads of departments and other stakeholders.

The team leader explained that due to increase in activity in Magumu division and its environs coupled with the length of distribution lines from Limuru and current and proposed developments in the area. This has resulted to KPLC moving with speed to ensure there will enough and sufficient power supply in the area. He further reiterated that the size of the project will involve development of 33/11kV substation it is a requirement that EIA has to be carried out for such projects and detailed and all inclusive stakeholder consultations has to be carried. The stakeholders were then invited to give their views, suggestions and ask questions.

The stakeholders applauded the idea of consultation and the company's intention to boost power in the area noting that Magumu is among the fastest growing towns.

***Views from stakeholders and District Technical Officers***

The district officer noted that wide consultation was key in project acceptance as it allows different parties a chance to air their views. She requested a detail explanation of a substation. The team leader explained further on the same after which the members were given an opportunity to give comments.

**Question 1:** How will safety of workers and public be ensured during construction on site given that the substation is next to busy road?

## *Proposed 33/11kV substation in Kinangop District*

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**Answer.** The constructor will have clear instruction on observing working clearance during construction and scaffolding of site will be done. Safety issues will also be addressed through the environmental management plan

**Question 2: Does a substation have electromagnetic fields (EMF) and what are the effects on the people?**

**Answer.** EMF weakens with distance and height. These will be observed through height of the steel poles from the ground. The substation is also a no access area for the public.

**Question 3: In case there are settlements on proposed site what will happen?**

**Answer.** There are no settlements on proposed land. Much of the land is furrow with overgrown kale.

**Question 4: The area has a challenge in terms of water as much of water is from shallow wells do you have water on site.**

**Answer.** There is no water at site but the neighbor has an abandoned water borehole. The contractor can explore the borehole option or bring water to site. The contractor will be informed on the water situation during pre bid visits.

**Question 5: Is the project beginning any time soon?**

**Answer.** Construction of the project will wait licensing by NEMA.

**Question 6: What is the benefit to us and our people?**

**Answer.** Reliable and quality power supply. The centres are also growing and with planned development demand for power will increase. There will also be job opportunities.

**Question 7: Have you informed the communities on the proposed development?**

**Answer.** We have planned for a meeting through the office of the assistant chief, on Wednesday this week

The meeting ended at 1.15pm with a word of prayer.

List of attendance is attached below.

**Annex 5: Minutes Public Consultative Meetings Held at the Project site in Bamboo sub location.**

**Date 30/12/2011**

**Venue: Project site**

**Agenda: Public Consultation for Environmental Impact Assessment for 33/11 kV Substation.**

The meeting began by a word of prayer from one of the community members at 10.25 a.m

The assistant chief of Bamboo sub location welcomed all in attendance and requested them to participate fully during the meeting. She then called on the EIA team to explain the agenda of the meeting in details. Simon Mwangangi (environmentalist) labored on explaining the EIA process and the role of consultations before construction decisions are made. He explained the need for the project and the type of substation and associated structures to be constructed. Further, he noted the potential impacts of the project and mitigation measures that would be put in place.

Positive impacts of the project discussed included; increased supply of electricity, direct and indirect skilled and non-skilled employment opportunities, gains in the local and national economy, increase in government revenue, provision of market for supply of construction materials, informal sectors benefits among others e.t.c. Anticipated negative impacts will include: soil erosion due to vegetation clearance, dust, solid waste, noise, visual intrusion and aesthetic impacts, impacts of construction material sourcing(e.g. quarrying), occupational health and safety impacts, hazardous waste materials and stress on local infrastructure.

Most of the negative impacts will occur during construction and so are temporary. However, the proponent would provide mitigation measures for the negative impacts through and Environmental and social management plan.

**Question and answer/suggestions session**

**Question 1: how many transformers are you installing?**

**Answer: one transformer rated at 7.5MVA.**

**Question 2: What benefit is the project to the local community?**

### *Proposed 33/11kV substation in Kinangop District*

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Answer: the project is in a bid to boost power supply in the area and avoid interruptions. During constructions there will be employment opportunities that the people will take advantage of.

**Question 3:** Who owns the site where the project will be constructed?

Answer: The land on which the substation will be built belongs to the KPLC and acquisition of the land has already taken place. Legal documents are available.

**Question 4:** How sure are we that the contractor will employ local people? The project might suffer opposition from the locals

**Answer:** the contractor has an obligation to employ the locals especially on unskilled and semi skilled jobs. In case the contractor does not adhere the locals can raise complain through the assistant chief's office to our office.

Conclusion: those in attendance supported the project with the condition of putting in place mitigation measures.

List of members in attendance is attached.

The meeting ended at 12.10 p.m

**Annex 6: Sample of stakeholder and Public Consultation Questionnaires used during the public consultations exercise**

**Annex 7: Photo plate**



Proposed site



Key stakeholders meeting



Business near the site



Business near the site



Public baraza



Key stakeholders meeting

Annex 8: Lead Experts Practicing License

FORM 7

(r.15(2))

Application Reference No: **0097**  
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is licenced to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts).....

..... **LEAD** .....  
in accordance with the provisions of the Environmental Management and Coordination Act.

Dated this .....**31ST**.....Day .....**JAN**.....of 20..**11**.....

Signature.....

(Seal)



Director General  
The National Environment Management Authority

**Conditions of Licence**

1. This licence expires on 31st December, 20.....!!.....