

**ENVIRONMENTAL SOCIAL AND IMPACT ASSESSMENT  
PROJECT REPORT FOR THE PROPOSED UPGRADING AND  
STREET LIGHTING OF KAHAWA WENDANI ROAD FROM THE  
SHOPPING CENTRE THROUGH BARINGO ROAD TO GARRISA  
AVENUE TO BUTIMINOUS STANDARDS IN RUIRU  
MUNICIPALITY, KIAMBU COUNTY.**



Site coordinates; *Latitude -0.024621, Longitude 35.956525*

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*April 2020*

**DOCUMENT CERTIFICATION**

We, the undersigned certify and submit this Environmental social and Impact Assessment Project Report for the Proposed upgrading of kahawa wendani road from the shopping centre through Baringo road to Garissa avenue to bituminous standards in ruiru municipality, Kiambu county. The project report has been carried out in accordance to the Environmental Management and Coordination Act No. 8, 1999 (*revised 2018*) and Environmental (Impact Assessment and Audit) Regulations 2003, Legal Notice No. 101 (*Amended 2009*) for submission to the National Environment Management Authority (NEMA) for Review.

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**DECLARATION BY PROJECT PROPONENT**

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## ABBREVIATIONS

EA	-	Environmental Audit
ESIA-		Environmental Social Impact Assessment
EMCA-		Environmental Management and Co-ordination Act
EMP	-	Environmental management Plan
EMS	-	Environmental Management System
MWI-		Ministry of Water & Irrigation
NEAP-		National Environmental Action Plan
NEMA-		National Environment Management Authority
NPEP-		National Poverty Eradication Plan
WASREB	-	Water Services Regulatory Board
WRA-		Water Resources Authority
KeNHA-		Kenya National Highway Authority

## **EXECUTIVE SUMMARY**

Environmental concerns have now been integrated in the planning and implementation processes of any proposed projects, to mitigate conflicts with the environment at the vicinity. In addition, it is now mandatory for projects of such nature to carry out an environmental social impact Assessment (EIA) to enhance sustainable environmental management as well as controlling and revitalizing the much-degraded environment.

The Environmental Management and Coordination Act 2018 (EMCA) requires that an Environmental Impact Assessment be carried out at the planning stages of the proposed undertaking to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation and decommissioning of such projects.

The scope of the assessment covered construction works of the proposed development which include ground preparation, road construction and drainage works. The output of this assessment is a comprehensive Environmental social Impact Assessment project report for the purposes of applying for NEMA approval and issuance of EIA license.

The EIA team adopted several approaches when carrying out the study which include:

- i. Environment screening, in which the project was identified as among those requiring environmental impact assessment under schedule 2 of EMCA, 1999 (Revised 2015)
- ii. Environmental scoping that provided the key environmental issues
- iii. Desk top studies and interviews
- iv. Physical inspection of the site and surrounding areas
- v. EIA Public participation using questionnaires and interviews and Reporting.

The EIA study findings indicated:

- i. Very few vegetation will be cleared during ground preparation to pave way for construction of the facilities.
- ii. There will be earth excavation works which will cause minor destruction of biodiversity as habitats are destroyed and dust and noise emitted from the construction activities.
- iii. Wastes generated from this project will be minimized and safely disposed as per the laid down mitigation measures in the environmental management plan (EMP).

It is anticipated that during the operational period the project will provide:

- i. Convenient easy access to the market centre and residential blocks, schools and churches within the ward
- ii. Spur economic development in kahawa wendani ward and ruiru municipality.
- iii. Create employment to the planners, contractors, consultants and residents
- iv. Presents more opportunities for improved aesthetic value.
- v. Create pathway for pedestrians
- vi. Install clearly marked bollards to protect pedestrians along the walk ways

Table 1: Potential adverse impacts anticipated

Potential impact	Recommended Mitigation Measures
Air; Pollution Dust, Exhaust emission	<ul style="list-style-type: none"> <li>• Use best management practices to minimize dust generation. These include: revegetating areas where vegetation have been removed; keep to the minimum areas where earthwork activities will take place, water down haul roads during dry weather conditions</li> <li>• Maintain heavy equipment used at the Site and waste hauling vehicles to ensure their exhaust emissions meet the emissions standards prescribed in EMC ( Air Quality) Regulations, 2014</li> </ul>

<p>Noise and vibration; Noise pollution</p>	<ul style="list-style-type: none"> <li>• Strictly adhering to designated working hours (7am to 7pm);</li> <li>• Sensitizing construction truck drivers and equipment operators to switch off idle engines;</li> <li>• By using modern, well-maintained and regularly serviced vehicles.</li> <li>• Ensuring that all generators and heavy duty equipment be insulated or placed in enclosures to minimize ambient noise levels.</li> <li>• Maintain the noise at the required decibels.</li> <li>• Introduce silencer insome of the machines</li> </ul>
<p>Traffic impacts; Congestion and accidents</p>	<ul style="list-style-type: none"> <li>• Strict traffic regulations should be put in place</li> <li>• Traffic signals posted along site access roads.</li> <li>• The signals should be in bright bold colours that can be seen from atleast 200 meters</li> </ul>
<p>Storm Water Run-off Management</p>	<ul style="list-style-type: none"> <li>• Provide proper storm water drainage for the paved roads.</li> <li>• Provide regular inspection and maintenance of the drains.</li> <li>• Provide well coverd and marked drains to ease pedestrian movement</li> </ul>
<p>Public and workers health and safety; Risks.</p>	<ul style="list-style-type: none"> <li>• Developing standard operating procedures;</li> <li>• Provide public toilets with adequate water for cleaning;</li> <li>• Implement all necessary measures to ensure health and safety of workers and the general public during operation of the project as stipulated in OSHA 2007;</li> </ul>

Cumulative impacts from this project will result to an influx of people from other locations who will have identified opportunities to set up secondary businesses including shops, hotels, filling stations etc.

The recommendations for the prevention and mitigation of adverse impacts are as follows: -

- i) All solid waste materials and debris resulting from construction activities must be disposed off at approved dumpsites.
- ii) All construction materials and especially gravel, hardcore and metal must be sourced/procured from legalized dealers.
- iii) Traffic on the road should be controlled and informed during construction works and especially when heavy machinery is turning in and out of the site. Safety signs must be placed strategically in the project area. This will ensure that no accidents are caused by the site's activities.
- iv) During construction, all loose soils must be compacted to prevent any erosion by wind or water. Other appropriate soil erosion control measures can be adapted. Any stockpiles of earth should be enclosed, covered or sprinkled with water during dry or windy conditions to minimize generation of dust particles into the air.
- v) Restoration of the worked areas should be carried out immediately by backfilling.
- vi) Drains will be properly designed, installed and regularly maintained to prevent storm water (run-off) from accumulating within the site spreading to the neighbourhood. These must effectively drain the storm water from the project area into the existing public drainage system.
- vii) Proper and regular maintenance of construction machinery and equipment will reduce emission of hazardous fumes and noise resulting from friction of rubbing metal bodies.
- viii) Workers should be provided with complete personal protective equipment (PPE) and safety gear. They should have working boots, complete overalls, helmets, gloves, earmuffs, nose masks, goggles etc.
- ix) A fully equipped first aid kit must be provided within the site.

All mitigation measures concerned with the social aspect of the project should be implemented to ensure clean and healthy environment for all people.

The project is expected to present opportunities for improved business environment since it will boost economic activities in the area. In this regard, the EIA team therefore recommends that environmental license be issued, and the project be implemented.

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## **CHAPTER ONE: PROJECT BACKGROUND**

### **1.1 Introduction: Project Background.**

EIA is a tool for a better planning, it is undertaken to check compliance with environmental policies and legislative environmental requirements in order to check risks associated with any upcoming new projects or those being altered and expose them for correction at an early stage. It provides information for periodic review and alteration of environmental management plan as necessary ensuring that environmental managements optimized at all stages of development through best practice.

EIA has now become a mandatory requirement in Kenya, most other countries and all over the world for most development activities, these countries include United Kingdom, Europe and USA (Kitetu, Ron Bisset etal 2004). It is prepared by a proponent describing a proposed development project, action or activity (or a plan policy or program) disclosing the possible, probable or certain effects of that proposal on the environment

The following ESIA project report focuses on upgrading of kahawa wendani road from the shopping centre through Baringo road to Garissa avenue to bituminous standards in ruiru municipality, Kiambu county Land use patterns of the project area are characterized small and medium size business units.

### **1.2 Principal of Environmental Impact Assessment**

Various statutes and literature e.g. the Bill of Rights in the Constitution of Kenya 2010, Millennium Development Goals, etc acknowledge the rights of every person to a clean environment and that every person has a duty to enhance and safeguard the environment. EIA is a planning tool which presents methodologies and techniques for identifying, predicting and evaluating potential environmental impacts of the projects, policies, plans and programmes in the project cycle (planning, implementation and decommissioning phases). EIA presents decision with the information necessary to determine whether a project should be implemented. In most developed countries, an EIA is ordered by law. The law prescribes that the developer, whether public or private present environmental impact assessment report to the competent authority in case the development is likely to have substantial and/or significant

impacts on the environment, be it through size, nature or location of the development. The same is a legal requirement in Kenya since the enactment of the Environment Management and Co-ordination (Amendment) Act, 2018 and Environmental Audit Assessment and Assessment Regulations 2003 (Legal Notice No. 101).

This project report was prepared to fulfil the above legal requirement in order to establish the impacts that will arise from the operations of the proposed project on the environment, as a result of its production and associated activities on the natural and social-economic environment.

### **1.3 Need for Environmental Impact Assessment**

Economic, social and environmental change is inherent to development. In order to predict environmental impacts of any development activity and to provide an opportunity to mitigate against negative impacts and enhance positive impacts, the environmental impact assessment (EIA) procedure was developed in the 1999 with three main functions to predict problems, to find ways to avoid them, and to enhance positive effects. Therefore, the EIA;

- i) Provides a unique opportunity to demonstrate ways in which the environment may be improved as part of the development process.
- ii) Predicts the conflicts and constraints between the proposed project, and its environment.
- iii) Provides an opportunity for mitigation measures to be incorporated to minimize problems.
- iv) Enables monitoring programs to be established to assess future impacts and provide data on which developers can take informed decisions to avoid environmental damage.

Kenya as a country is currently facing a great rise in roads and other infrastructural developments both in urban and rural area. While the demand for improved public transport systems has been on the rise the Kenyan government has responded by improving the road networks and associated facilities such as parking yards and drainage works. Both private and public sectors are involved in the construction industry; consequently, they have a challenge to deliver quality infrastructural services that meet the demand of the day and that of future generations.

## 1.4 Terms of Reference for the EIA Project Report

The terms of reference for the preparation of an EIA Project Report are usually but not limited to: -

- ✓ A decisive look at objectives of the project.
- ✓ The proposed location of the project site.
- ✓ Description of the baseline information, national environmental legislative and regulatory framework, and any other relevant information related to the project.
- ✓ Assessment of the technology, procedures and processes to be used, in the implementation of the project.
- ✓ Assessment of materials to be used in the construction and implementation of the project and their sources.
- ✓ Evaluation and analysis of the anticipated potential environmental effects which are categorized into physical, ecological/biological and socio-economic aspects; this can be further classified as direct, indirect, cumulative, irreversible, short-term and long-term effects.
- ✓ Evaluation of the products, by-products and wastes to be generated by the project.
- ✓ To recommend a specific environmentally sound and affordable solid waste management system
- ✓ Evaluation and analysis of alternatives including the proposed project, project alternative, project site, design and technologies.
- ✓ An Environmental Management Plan (EMP), proposing the measures for eliminating/minimizing or mitigating adverse impacts on the environment.
- ✓ Propose measures to prevent health and safety hazards and to ensure security in the working environment for the employees, residents and for the management in case of emergencies. This encompasses prevention and management of the foreseeable accidents and hazards during both the construction and occupational phases.
- ✓ Any other matters which may be required by NEMA.

This project report provides relevant information and environmental considerations on the project proponent's intention to seek approval from NEMA for the construction of the proposed project.



## 1.5 Objectives of the ESIA Project Report

The overall objective of this Environmental Impact Assessment project report is to ensure that environmental concerns are integrated in all developmental activities of this project. It aims at identifying the potentially effects and risks of the proposed project, evaluating and suggesting mitigation measures for the significant negative impacts through a comprehensive Environmental Management Plan.

The Environmental Impact Assessment (EIA) study was guided by the following objectives:

- To collect baseline environmental data in the study area.
- To identify and assess possible environmental impacts during the design, construction and operation of the proposed road.
- To seek views of key stakeholders on pertinent issues related to the proposed Project.
- To develop an Environmental Management Plan (EMP) indicating mitigation measures for adverse impacts and enhance beneficial effects; and
- To prepare residual impact list of those impacts that might not have any remedial measures and identify further steps towards sustainability of the Project.

## 1.6 The Project Scope

The extent of the project involves a comprehensive environmental assessment that generated environmental concerns in all phases of the project. This task involved: -

- ✓ Assessment of the potential Environmental Impacts of the project on the site and the surrounding areas.
- ✓ To identify the significance of these impacts.
- ✓ To propose the mitigation measures for the anticipated negative impacts to the environment.
- ✓ To generate baseline data for monitoring and evaluation of how well the mitigation measures are being implemented during the project cycle.
- ✓ To assess the importance of the impacts of alternative sites.
- ✓ To present information on the impacts of the alternative sites.
- ✓ A review of the environmental policy, legal and administrative framework.

- ✓ Social repercussions of the development within the locality and region.
- ✓ Development of an Environmental Management Plan with mechanisms for monitoring and evaluating the compliance and environmental performance.

## **1.7 Approach and methodology**

A multi-disciplinary approach was used in this study in order to address holistically all pertinent aspects of the proposed Project on the biophysical and socio-economic setting of the area. The key methods that were adopted in the EIA study are discussed below.

### **1.7.1 Desktop study**

A desktop study was conducted to review available published and unpublished reports and maps in order to compile relevant baseline biophysical and socio-economic information about the study area. The biophysical information was compiled on environmental aspects such as flora, fauna, conservation, topography, drainage, soils, geology, hydrogeology, climate and vegetation. The study has also relied on the surveying, hydrological and structural engineering studies and designs at the feasibility stage for the Project and other similar Projects that have already been implemented. Information on proposed infrastructure in the study area was also sought. On the socio-economic environment, the study compiled information on aspects such as population, land use, land tenure, production trends, livelihoods, leadership, etc.

### **1.7.2 Field survey**

Field visits were conducted in the study area in order to collect site-specific information on the biophysical and socio-economic environment and to crosscheck the secondary data that had been compiled during the desktop studies (*Section 1.7.1*). Environmental data were recorded, and potential impacts identified. In addition, environmental features relevant to the study were noted and photographs taken as record of key features.

### **1.7.3 Focused consultations**

Focused public consultations were undertaken. The consultations were meant to give an indication of whether the Project is welcome and the

immediate perceptions that these key stakeholders associated it with. A comprehensive list of names of those consulted has been included in the Annexes.

The objective of the Consultation and Public Participation (CPP) as required in, (Environment and Co-ordination (Amendment) Act, 2018) was to:

- a) Disseminate and inform the stakeholders about the project with special reference to its key components, location and expected impacts.
- b) Create awareness among the public on the need for the EIA for the housing project and its due process.
- c) Gather comments, concerns and suggestions of the interested and affected parties.
- d) Ensure that the concerns of the stakeholders were known to the decision-making bodies (*and the proponent*) at an early phase of project development planning.
- e) Establish a communication channel between the general public, the team of consultants and the proponent.
- f) Incorporate the information collected in the study by EIA specialists.

The purpose for such a process was to identify the positive and negative impacts and subsequently promote and mitigate them respectively. It also helped in identifying any other miscellaneous issues which may bring conflicts in case project implementation proceeds as planned.

#### **1.7.4 Impact assessment and analysis**

The assessment and analyses methodologies for EIA studies are based on multidisciplinary approaches and structured to allow for holistic study and assessment of the following key components of the environment in relation to the proposed activities, namely:

- ✓ Physical/chemical component;
- ✓ Biological/ecological component;
- ✓ Sociological/cultural component; and
- ✓ Economic/operational component.

The process was also guided by the recommendations from various legally established bodies like the Kiambu County Government,

Municipal Physical Planning office and various government ministries and agencies.

## **CHAPTER TWO: LEGISLATION AND INSTITUTIONAL FRAMEWORK**

### **2.1 Introduction**

There are several pertinent laws relating to environmental protection that are applicable to any development and that a developer will need to be aware of when embarking on a development. There are also several statutory agencies that have powers to control certain types of development that have the potential to affect the environment. They also protect the environment and natural resources and aim at promoting sound environmental management.

Environmental impact assessment is a tool for environmental conservation and has been identified as a key component in new project implementation. According to Environment Management and Co-ordination (Amendment) Act, 2018 and the Environmental (Impact Assessment and Audit) Regulations, 2003 (Legal Notice No.101), construction of roads is considered high risk projects and require an Environmental Impact Assessment project report prepared and submitted to the National Environment Management Authority (NEMA) for review and eventual licensing before the development commences.

This was necessary as many forms of developmental activities cause damage to the environment and hence the greatest challenge today is to maintain sustainable development without interfering with the environment.

### **2.2 Environmental Policy Framework**

Environmental policies cut across all sectors and government departments. As such policy formulation should be consultative steered by interdisciplinary committees. Recent policies which the government is working on include; Draft Wildlife Policy; Draft National Land Policy; and Wetlands Management and Conservation Policy among others.

#### **2.2.1 National Environmental Action Plan (NEAP).**

National Environmental Action Plan was a deliberate policy effort to integrate environmental concerns into the country's development initiatives/plans. This assumed a consultative and multi-sectoral approach. Such an approach ensured that environmental management

and the conservation becomes integral in various decision-making platforms.

As a result of its adoption and implementation, establishment of appropriate policies and legal guidelines as well as harmonization of the existing ones have been accomplished and/or are in the process of development. Under the NEAP process, Environmental Impact Assessments were introduced targeting the industrialists, business community and local authorities.

#### Relevance

The road upgrading and street lighting project will directly be added to the development initiatives.

#### ***2.2.2 National Policy on Water Resources Management and Development***

While the National Policy on Water Resources Management and Development (1999) enhances a systematic development of water facilities in all sectors for promotion of the country's socio-economic progress, it also recognizes the by-products of this process as wastewater. It, therefore, calls for development of appropriate sanitation systems to protect people's health and water resources from institutional pollution. This implies that Industrial and business development activities should be accompanied by corresponding waste management systems to handle the wastewater and other waste emanating there from. The same policy also requires that such projects undergo comprehensive EIAs that will provide suitable measures to be taken to ensure environmental resources and people's health in the immediate neighbourhood and further downstream are not negatively impacted by the emissions. As a follow-up to this, Environment Management and Co-ordination (Amendment) Act, 2018 requires annual environmental audits to be conducted in order to ensure that mitigation measures and other improvements identified during EIAs are implemented. In addition, standards and measures to prevent pollution to water resources are provided for in the Environmental Management and Coordination (Water Quality) Regulations, 2006 which is a supplementary legislation to Environment Management and Co-ordination (Amendment) Act, 2018.

### ***2.2.3 Policy paper on Environment and Development***

The key objectives of the policy include; -

- To ensure that from the onset, all development policies, programs, and projects take environmental considerations into account.
- To ensure that an independent EIA report is prepared for any industrial venture or other development before implementation.

### ***2.2.4 Vision 2030***

Vision 2030 is a government development strategy that is aimed at steering Kenya to a middle-income country by the year 2030. It is based on the 3 pillars of political, social and economic advancement and it aims to transform the economy to newly industrialized status by 2030 and achieve sustainable growth. Environmental considerations of development are contained within the social and economic pillar. On poverty reduction, the vision aims at creating opportunities for the poor by making institutions stronger.

#### **Relevance**

the project will improve the development standard of the area and increase the social economic status of people by allow faster communication and improved living standards because the streetlights will allow the operation of a twenty four hour economy.

### **2.3 Legal and Legislative Framework**

The key national laws that govern the management of environment resources in the country have been briefly discussed in the following paragraphs. Note that whatever any of the laws contradict each other, the environmental management and coordination act 1999 prevails.

### ***2.3.1 Environment Management and Co-ordination (Amendment) Act, 2018***

This project report has been undertaken in accordance with the Environment (Impact Assessment and Audit) Regulations, 2003, which operationalizes the Environment Management and Co-ordination (Amendment) Act, 2018. The report is prepared in conformity with the requirements stipulated in the Environment Management and Co-ordination (Amendment) Act, 2018 and the Environmental Impact Assessment and audit Regulations 2003, Regulation 7 (1) and the Second Schedule. 31

Part II of the said act states that every person is entitled to a clean and healthy environment and has the duty to safeguard the same. In order to achieve the goal of a clean environment for all, new projects listed under the second schedule of Environment Management and Co-ordination (Amendment) Act, 2018 shall undergo an Environmental Impact Assessment. The Environment Management and Co-ordination (Amendment) Act, 2018 provides for the establishment of an umbrella legal and institutional framework under which the environment in general is to be managed and the law is implemented by the guiding principle that every person has a right to a clean and healthy environment and can seek redress through the High court if this right has been, is likely to be or is being contravened.

Pursuant to section 25 (4) of, National Environmental Management Authority (NEMA) is required to restore degraded environmental sites using the National Environmental Restoration Fund. Currently, the restoration fund consists of 0.1 % levied from industries and other project proponents through the EIA process. Section 58 of the Act makes it mandatory for an Environmental Impact Assessment study to be carried out by proponents intending to implement projects specified in the second schedule of the Act which are likely to have a significant impact on the environment. Similarly, section 68 of the same Act requires operators of existing projects or undertakings to carry out environmental audits in order to determine the level of conformance with statements made during the EIA study. The proponent is required to submit the EIA and environmental audit reports to NEMA for review and necessary action.



Section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into aquatic environment. According to section 73 of the act, operators of projects which discharge effluent or other pollutants into the aquatic environment are required to submit to NEMA accurate information on the quantity and quality of the effluent. Section 76 provides that all effluent generated from point sources are to be discharged only into the existing sewerage system upon issuance of prescribed permit from the local authorities. The proponent is ready to seek for the prescribed permit in case of damage of the trunk sewer. Section 87 (1) makes it an offence for any person to 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.

The proponent will also ensure to safeguard the environment while implementing the project.

**Table 2: Analysis of the Project Triggers to the EMCA and Its Tools**

<i>EIA and EA Regulations</i>	<b>Triggered</b>	<b>Comments</b>
<i>Waste Management regulations</i>	Triggered	Construction likely to generate solid waste
<i>Water Quality regulations</i>	Triggered	Water for construction will be drawn from local vendors
<i>Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 Legal Notice No. 61:</i>	Triggered	Construction and operation activities likely to generate noise affecting both workers and adjoining settlements/business units
<i>Environmental Management and Coordination (Fossil Fuel Emissions) Regulations, 2006</i>	Triggered	Construction and operation machinery will be powered by fossil fuels and must adhere to these regulations

### **2.3.2 The EIA and Audit Regulations 2003, Legal Notice No. 101 (Amendment) 2009.**

**Regulation 24 – EIA license** -Environmental Impact License shall be issued after the authority approves the project under regulations 23, and shall be issued in form.

**Regulation 28 – false or incorrect information** -Substantial change or modification and when project poses an environmental threat that information or data given by the licensee were false, incorrect or intended to mislead.

**Regulation 24 – Annual Environmental Audit** -Annual environmental auditing after presentation of an EIA study report shall be undertaken by the licensee to ensure the implementation of environmental management plan is audited on regular basis, an audit report submitted to NEMA annually and ensuring that the criteria to audit is based on environmental management plan developed during the EIA process or after the initial audit

**Regulation 40 - Monitoring changes after project implementation**  
Monitoring by NEMA and Lead Agencies shall be done to establish any possible changes in the environment and their possible impacts, immediate and long term effects of its operations, identify and determine parameters and measurable indicators and conduct changes that occurred after implementation. The aim of this section is to provide the Proponent and Contractors with quick reference to most critical legal and policy provisions to enable proper planning and impact assessment during project planning and implementation.

### **2.3.3 Waste Water Management: Legal Notice No. 120; Part II – Protection of Sources of Water for Domestic Use.**

The legal notice has the following provisions:

- (1) Every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of these Regulations.
- (2) No person shall throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution

All sources of water for domestic uses shall comply with the standards set out in the First Schedule of these Regulations. The proponent and project Architect as well as the Engineer have and will ensure that drainage channels are well designed during the construction phase of the project, and upon completion, the facility will be connected to the septic tank for proper management and that when the services of a trunk sewer are available in the future, the provided connection is activated.

**2.3.4 The Environmental Management and Co-ordination (Waste Management Regulations 2006): Legal Notice No. 121: Section 4-6**  
Part II of the Environmental Management and Co-ordination (Waste Management) Regulations, 2006 in Sections 4, 5 and 6:

- Prohibits the disposal of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.
- Requires that any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed off (person who is licensed to transport and dispose off) such waste in the manner provided for under these Regulations.
- Encourages the adoption of cleaner production methods in the entire project cycle.
- Hazardous wastes can only be generated when a valid Environmental Impact Assessment license has been issued by the Authority.

The proponent has been made aware of the provisions of Legal Notice No. 121, Sections 4-6 and the necessary measures have been incorporated and the outstanding interventions, owing to the stage of project development, will be implemented.

**2.3.5 The Environmental Management and Coordination Act, (Air Quality) Regulations, 2008**

The objective is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. It provides for the establishment of emission standards for various sources such as mobile sources and stationary sources. It also covers any other air pollution source as may be determined by the Minister in consultation with the Authority. Emission limits for various areas and facilities have been set.

### ***2.3.6 Water Quality Regulations, 2006, (Legal Notice No.121)***

Water quality Regulations apply to water used for domestic, industrial, agricultural and recreational purposes; water used for fisheries and wildlife purposes, and water used for any other purposes. Different standards apply to different uses. These Regulations provide for the protection of lakes, rivers, streams springs, wells and other sources. The overriding objective of the Regulations is to protect human health and the environment. Proper enforcement of the Regulations can lead to marked reduction in water-borne diseases. The Regulations provide guidelines and standards for the discharge of poisons, toxins, radioactive and other pollutants into the aquatic environment. Standards have also been set for discharge of effluent into the sewer and aquatic environment. The National Environment Management Authority regulates discharge into the aquatic environment.

### ***2.3.7 Environmental Management and Co-ordination (Noise and Excessive Vibrations Pollution) (Control) Regulations, 2009***

These regulations were published as legal Notice No. 61 being a subsidiary legislation to the Environment Management and Co-ordination (Amendment) Act, 2018. The regulations provide information on the following:

- i. Prohibition of excessive noise and vibration.
- ii. Provisions relating to noise from certain sources.
- iii. Provisions relating to licensing procedures for certain activities with a potential of emitting excessive noise and/or vibrations; and
- iv. Noise and excessive vibrations mapping.

According to Environmental Management and Co-ordination (Amendment) Act 2018, Section 101 was repealed so that the Cabinet Secretary, on the recommendation of the Authority:

- i) Recommend minimum standards for emission of noise and vibration pollution into the environment as are necessary to preserve and maintain public health and environment.
- ii) Determine criteria and procedures for the measurement of noise and vibration pollution into the environment.
- iii) Determine criteria and procedures for the measurement of sub-tonic vibrations.

- iv) Determine the standards for the emission of sub-tonic vibrations referred to above from existing and future sources.
- v) Determine noise level and noise emission standards applicable to construction sites, plants, machinery, motor vehicles aircraft, including sonic bonus, industrial and commercial activities;
- vi) Determine measure necessary to ensure the abatement and control of noise from sources referred to above; and
- vii) Issue guidelines for the abatement of unreasonable noise and vibration pollution emitted.

**Table 3: Showing the comparison between the acceptable WHO and NEMA standards**

Specific Environment	Critical Health Effects	LAeq dB(A) WHO	Time base (hours)	LAeq dB(A) NEMA	Time base (hours)
Outdoor living area	Serious annoyance	55	16	45	14
	Moderate annoyance	50	16	35	14
Indoor dwelling Inside bedroom	Speech interference	35	16	-	-
	Sleep disturbance	30	8	-	-
Outdoor bedroom	Sleep disturbance	45	8	35	-
School classroom Indoor	Speech and communication	35	During class time	Day 60	14
				Night 35	14
School playground outdoor	Annoyance External	55	During play	45	Day
Hospital, treatment room indoor	night time	30	8	-	-
	daytime	30	16	-	-
Industrial, Commercial and traffic	Hearing impairment	70	24	60	12

areas					
Ceremonies, festivals entertainment events	Hearing impairment	100	4	-	-

Noise emanating from construction machineries and workers is anticipated during construction phase of the project. Compliance to the regulation will be required throughout the project by both the contractor and the EIA expert. The noise has potential to cause nuisance to the workers and the few residences within a radius of 100m from the site

### **2.3.8 Physical Planning Act, 1996**

This is the principle Act governing land use planning in Kenya. The Physical Planning Act (Cap. 286), aimed at developing a sound spatial framework for coexistence, through plan proposals that enhance and promote integrated spatial/ physical development of socio-economic activities. Because building/construction of commercial units constitutes making of material change to land, the activity constitutes “development”, hence need to be controlled by relevant authorities. From the foregoing, the Physical Planning Act (Cap. 286) has made specific provisions in respect to the mandate of relevant authorities in the need for physical planning. The project proponent is required to acquire a Certificate of Compliance or approval letter from the relevant institutions as set out in the Act. The sole objective of the Act is to harmonize development.

The said Act section 29 empowers the local Authorities (Now County Governments) to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section allows for prohibition or control of the use and development of an area. Section 30 state that any person who carries out development without development permission will be required to restore the land to its original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective local Authority.

The proponent has already acquired the necessary approval from the department of Physical Planning.

### **2.3.9 Building Code 2000**

A person who erects a building or develops land or changes the use of a building or land, or who owns or occupies a building or land shall comply with the requirements of these by-laws. For the purpose of this by-laws and the following operations shall be deemed to be the erection of a building: -

- a) The alteration or extension of a building.
- b) The changing of the use or uses to which land or building is put.
- c) The formation or lying out of an access to a plot.

### **Relevance**

Property owners who have encroached on the road reserve will be required to demolish any extension and revert back to the appropriate position at his own cost

### **2.3.10 Water Act 2016**

The water Act, 2016 provides for the management, conservation, use and control of water resources and for acquisition and regulation of rights to use water; to provide for the regulation and management of water supply and sewerage services. Section 18 of this Act provides for national monitoring and information systems on water resources.

Following on this, sub-Section 3 mandates the Water Resources Authority to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may be required to be kept by a site operator and the information thereof furnished to the Authority.

Section 73 of the Act provides that a person who is licensed to supply water has a responsibility of safeguarding the water sources against degradation. According to section 75 (1) such a person is required to construct and maintain drains, sewers and other works for intercepting, treating or disposing off any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction. Proponent commits to control the flow of water throughout the period of construction to avoid polluting the environment and as well to construct and maintain a proper drainage system.

It is anticipated that workers on site shall be provided with clean water for drinking and other personal use during the entire phase of road construction

### ***2.3.11 Public Health Act Cap 242***

Part IX Section 115 of the Act states that no person or 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 injuries or dangerous to human health.

Environmental degradation may cause health hazard to the general public. Both solid and liquid waste should be handled professionally by approved exhausters and licensed garbage collectors.

For this project, the designs have been approved by kiambu County Government. All employees will be expected to have personal protective gear during the entire process of construction. Solid and wastewater will be handled as stipulated by provisions of the law as discussed in Section 4.2, Section 4.3 and Section 4.4.3.

### ***2.3.12 Prevention Act Cap 246***

**Section 5** – Drainage System-No operations shall obstruct flow of water into or out of any drainage. The management shall be required to maintain the drainage system within the area of the project for removal of water from any land around the project to prevent larvae breeding.

### ***2.3.13 The Penal Code Cap. 63***

**Section 191** – *Fouling water*-The proponent shall ensure that no water or any public spring or reservoir is rendered unfit for the purpose for which it was ordinarily used for by the community.

**Section 192** – *Dwellings and Neighbourhood*-The operation phases of the project shall ensure that health of persons in general dwellings or carrying on business in the neighbourhood or passing along a public facility are protected.

**Section 193** - *Offensive Trade*-The proponent shall control loud noises or offensive smells so as not to interfere with the common rights of the



people within the surrounding. This offence is punishable for common nuisance.

#### ***2.3.14 Land Control Act, Cap. 302***

The proposed project will be carried out on public land designated as road reserve. It is worth noting that the Government can compulsorily acquire private land for public interest.

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

This Act provides for the safety, health and welfare of 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. The key areas addressed by the Act include:

- General duties e.g. duties of occupiers, self-employed persons and employees.
- Enforcement of the Act e.g. powers of an occupational safety and health officer.
- Registration of workplaces.
- Health general provisions e.g. cleanliness, ventilation, lighting and sanitary conveniences, safe storage of dangerous liquids, fire safety, evacuation procedures, and precautions with respect to explosives or inflammable dust or gas
- Machinery safety e.g. safe handling of transmission machinery, hand held and portable power tools, self-acting machines, hoists and lifts, chains, ropes and lifting tackle, cranes and other lifting machines, steam boilers, air receivers, refrigeration plants and compressed air receivers.
- Chemical safety e.g. the use of material safety data sheets, control of air pollution, noise and vibration, the handling, transportation and disposal of chemicals and other hazardous substances materials.
- Welfare general provisions including supply of drinking water, washing facilities, and first aid
- Offences, penalties and legal proceedings.

Under Section 6 and Section 7 of this Act, every occupier is obliged to ensure safety, health and welfare of all persons working in his workplace. The occupier shall achieve this objective by preparing and as often as may be appropriate, revising a written statement of his general policy with respect to the safety and health at work of his employees and the organization and arrangements for the time being in force for carrying out that policy.

The proponent will ensure that there will be health and safety for workers is maintained by routinely supervising the road contractors.

The road construction components must be done to specifications to avoid accidents. All workers must always be in personal protective gear. First Aid kits must always be available at site. Injured workers must be rushed to nearby dispensaries and if need arises, referred to appropriate locations for further treatment.

### **2.3.16 Chiefs' Authority Act, Cap 128**

Section 10 parts (f), (g), (h), (i) and (o) of "The Chiefs' Act Cap 128" states that; any Chief may from time to time issue orders to be obeyed by the persons residing or being within the local limits of his jurisdiction for any of the following purposes;

- a) Preventing the pollution of the water in any stream, watercourse or water-hole, and preventing the obstruction of any stream or watercourse;
- b) Regulating the cutting of timber and prohibiting the wasteful destruction of trees;
- c) Preventing the spread of disease, whether of human beings or animals;
- d) Prohibiting any act or thing that may cause damage to any public road or to any work constructed or maintained for the benefit of the community; and
- e) Regulating the use of artificial water supplies constructed from public funds.

### **2.3.17 The Traffic Act Cap. 403, Revised 2010**

The traffic act governs the use of motor vehicle and the use of Kenyan road by vehicles and other road users such as pedestrians. Some of the relevant provisions by this act to this project include;

- a) Part II - Registration of Vehicles,
- b) Part III - Licensing of Vehicles (Motor vehicles and trailers to be licensed)
- c) Part IV – Driving Licences (Drivers to be licensed)
- d) Part V – Driving and other Offences Relating to the Use of Vehicles on Roads (Speed of motor vehicles.)
- e) Part VI – Regulation of Traffic (68 – Highway Code)

The contractor will be required to regulate traffic flow efficiently during the road construction until completion

## **2.4 Institutional Framework**

At present 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 Environmental Management Authority (NEMA), the Forestry Department, Kenya Wildlife Services (KWS) and others. There are also local and international NGOs involved in environmental activities that impact on the environment in one way or the other in the country.

#### ***2.4.1 National Environmental Management Authority (NEMA)***

The object and purpose for which NEMA is established is to exercise general supervision and co-ordination 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. A Director General appointed by the president heads NEMA. The Authority shall, among others:

- Co-ordinate the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations into development policies, plans, programs and projects with a view to ensuring the proper management and rational utilization of the natural resources environment on a sustainable yield basis for the improvement of the quality of human life in Kenya.
- Take stock of the natural resources in Kenya and their utilization and consultation, with the relevant lead agencies, and develop land use guidelines.
- Examine land use patterns to determine their impact on the quality and quantity of the natural resources among others.

NEMA mandate is designated to committees whose functions are briefly outlined here below.

#### ***2.4.2 County Environment Committee***

County Environment Committees are responsible for the proper management of the environment within the County in respect of which they are appointed to. 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 gazette notice. The decisions of these committees are legal, and it is an offence not to implement them.

#### ***2.4.3 Public Complaints Committee***

The Committee is charged with investigating allegations/complaints against any person or against the Authority (NEMA) in relation to the

condition of the environment and its management, Prepare and submit to the County periodic reports of its activities which shall form part of the annual report on the state of the environment, and to perform such other functions and exercise such powers as may be assigned to it by the County.

#### ***2.4.4 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: Analysis of the Natural Resources of Kenya with an indication as to any pattern of change in their distribution and quantity over time, and Analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational and intra-generational equity among other duties as the specifies.

#### ***2.4.5 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. Standards and Enforcement Review Committee consists of the members set out in the third schedule to the Environmental Management and Co-ordination Act (Amendment 2018)

#### ***2.4.6 National Environmental Tribunal***

This tribunal guides the handling of cases related to environmental offences in the Republic of Kenya. The Tribunal hears appeals against the decisions of the Authority. Any person who feels aggrieved may challenge the tribunal in the High Court.

#### **2.4.7 County Government Act 2013**

The Act requires that every County government and every urban city shall have powers-

- a) To establish and maintain sanitary services for the removal and destruction of, or otherwise dealing with, all kinds of refuse and effluent and, where any such service is established, to compel the use of such service by persons to whom the service is available.
- b) To establish and maintain one or more fire brigades and to take all necessary steps for the prevention and extinguishing of fires and to compensate the owners of property demolished or damaged for the purpose of preventing or extinguishing fires.

Section 171 of the Act provides that a county government may establish and maintain any such sewage forms or sewage disposal works either within or without its area. It is based on this Act that the proponent is determined to ensure conservation of the project site by adhering to the above act while maintaining environmental and public health safety.

#### **2.4.8 National Construction Authority (2011)**

The National Construction Authority Act, Number 41 of 2011 streamlines, overhauls and regulates the construction industry in Kenya. The industry has for many years suffered poor legislative framework and has been dominated by quacks and unqualified persons. All contractors must be registered with the Authority meaning that shoddy contractors and quacks will be locked out of the industry. It is an offence to carry out any construction work without first having been registered with the Authority. The Act contains provisions on quality and safety standards of any construction work. The Authority is also charged with passing regulations from time to time on the quality of construction offered by contractors. The Act will also play a big role in streamlining the quality of construction work within the country. The Authority has wide ranging powers including accrediting training institutions that offer courses related to construction.

#### **2.4.9 Kenya National Highway Authority**

KeNHA is an autonomous road agency, responsible for the management, development, rehabilitation and maintenance of international trunk roads linking centres of international importance and

crossing international boundaries or terminating at international ports (Class A road), national trunk roads linking internationally important centres (Class B roads), and primarily roads linking provincially important centres to each other or two higher-class roads (Class C roads).



## CHAPTER THREE: BASELINE INFORMATION

### 3.0 General Overview

Baseline information is needed on all central issues in the Environmental Assessment, considering a broad definition of the environment. Baseline information provides a reference for all assessments, for accurately predicting and for the comparison of alternatives and mitigation measures. Baseline information was collected from documents and data banks, supplemented by field studies. Baseline information entails location of the project, climate conditions, biological environment, socio and economic aspects of the project area. These are elaborately discussed in order to identify areas likely to be affected as a result of project activities. It is expected that it will provide for a benchmark for continued monitoring and assessment of the impact of the proposed development on the environment.

### 3.1 Project Site Location

The Proposed Road Works for kahawa wendani ward start from the stage on the main Thika super highway, through the shopping centre All the way to Baringo road and terminates at Garissa avenue. The road is 2.1km long.



Figure ii: Plate Showing Satellite Map of the Proposed Project Site

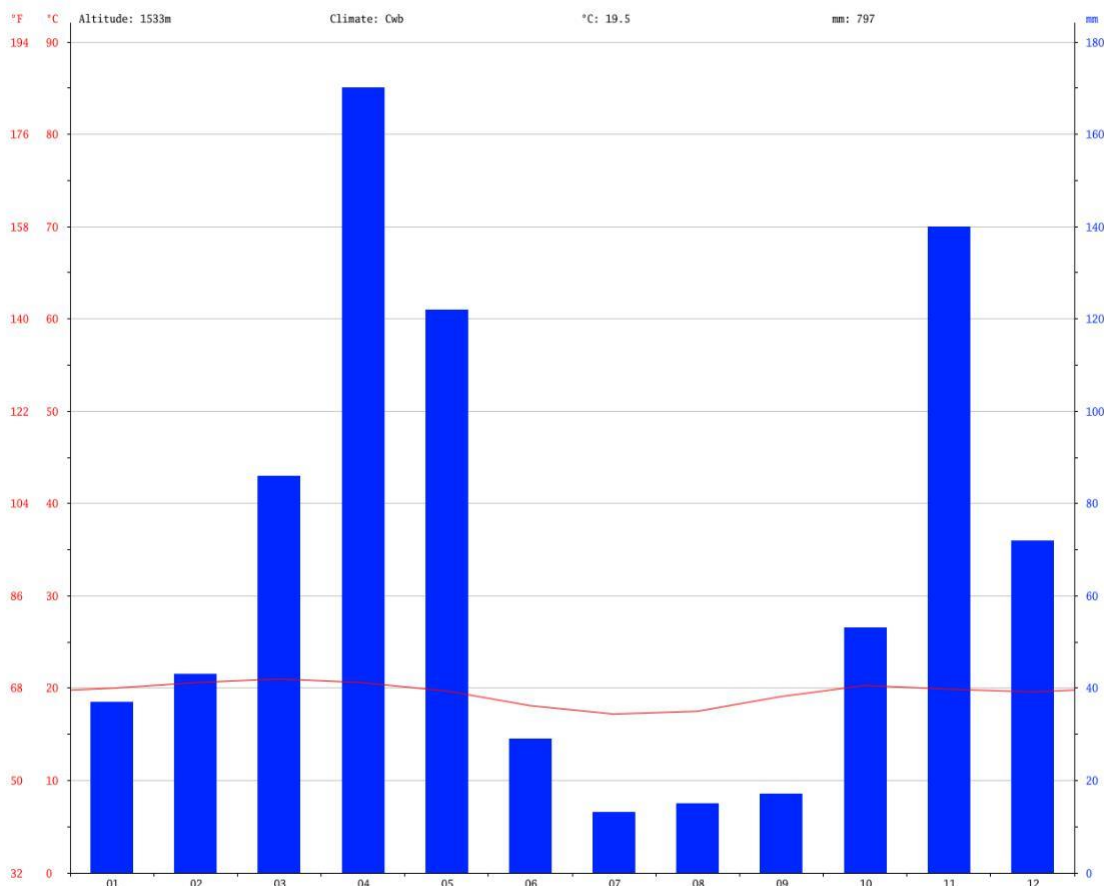
### 3.2 Infrastructure and Amenities

The area is developed with residential development within the vicinity and comparatively good transport network with road being the main mode of transport in kahawa wendani ward, within ruiru municipality. The road is largely accessible mainly because it interconnects to another ward, i.e. kahawa sukari to the west and mwiki ward to the east thus the site is easily accessible.

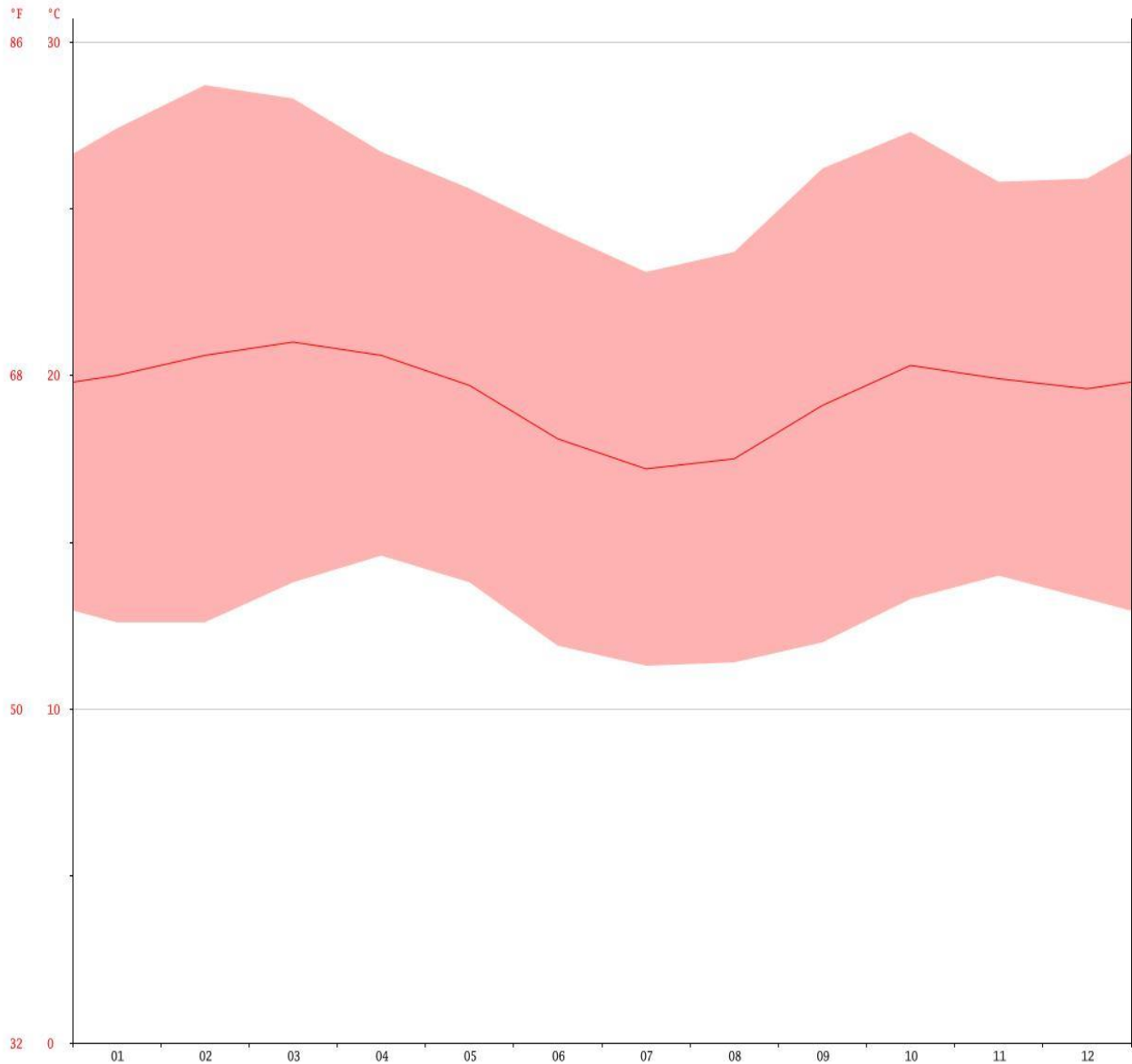
The proposed site vicinity is already served by electricity from Kenya Power and with good communication by telephone service providers. The site is served by septic tanks for sewerage disposal since it's not connected with sewer system currently.

### 3.3 Climatic conditions of ruiru municipality.

**The climate here is mild, and generally warm and temperate. When compared with winter, the summers have much more rainfall. The climate here is classified as Cwb by the Köppen-Geiger system. The temperature here averages 19.5 °C. The rainfall here averages 797 mm.**



Precipitation is the lowest in July, with an average of 13 mm. In April, the precipitation reaches its peak, with an average of 170 mm.



At an average temperature of 21.0 °C, March is the hottest month of the year. At 17.2 °C on average, July is the coldest month of the year.

**precipitation** is 157 mm. The variation in annual temperature is around 3.8 °C.

### **3.4 Socio-economic Environment**

The attributes of socio-economic environment considered in this study include land use; population and housing; employment and income, transportation, and health and safety

#### ***3.4.1 Land Use***

Land use is a primary indicator of the extent and degree of the impact man has made on the surface of the Earth. The relationship between land, soil, and physical conditions on one hand and human activities on the other hand may be used to evaluate land use conditions. The proposed project site is in kahawa wendani ward in ruiru municipality. The neighborhood of the proposed development mainly features residential developments, shopping centre, kahawa wendani municipal market and various schools and churches, making this project well viable.

#### ***3.4.2 Socio-economic Importance of the proposed project***

The proposed project is in line with the governments' development policy that aims to facilitate the attainment of adequate road networks and faster communication in the country. The project will therefore help to increase settlement in the region by investing in the construction industry; the proponent will also contribute towards the economic growth of our nation through revenue collection. In particular, the proposed project will generate the following positive socio-economic impacts:

- i. The proposed project will create job opportunities for both skilled and unskilled personnel
- ii. It will ease transportation and access to Thika road main highway, faster link for the two wards i.e. kahawa sukari and kahawa wendani wards facilities within the project vicinity.
- iii. The proposed project will enhance faster movement of goods and service to the main market and other major facilities like schools and churches.
- iv. The proposed project will indirectly contribute towards enhancement of security in the area; and

Apart from the direct employment of construction workers, the proposed project will also benefit the following categories of individuals:

- *Transporters-* Investors on lorry and trailer transport will benefit greatly from the project. This benefit will extend to vehicle dealers and manufacturers, lorry drivers and turn boys.
- *Cement Manufacturers-* The local cement manufacturers and their employees and shareholders are direct beneficiaries of the development.
- The government will also get some impressive increase in V.A.T. and other taxes levied on bitumen
- Manufacturers and dealers of other materials. Most of the building materials to be used are locally manufactured. Relevant companies, their workers and shareholders will be direct beneficiaries of the development. .
- *Ballast Quarries-* There will be massive use of ballast. These will ensure that the Quarry owners and workers benefits greatly.
- *Tar*
- *Hard core rocks*
- *Tarmac*
- *Graders*
- *Compactors*

## **4.0 PROJECT DESCRIPTION, DESIGN AND CONSTRUCTION**

The overall objective of this Project is to develop and avail a tarmac road and street lights from kahawa wendani shopping center, through Baringo road and terminating in kahawa sukari in ruiru municipality, Kiambu County. This project goes a long way in promoting the current government's development agenda of the "big four" and will also create several employments (artisans, technicians, consultants, caretakers, guards, etc.) and business opportunities (suppliers of building materials and accessories) in addition to the several positive impacts discussed in this report.

The area of the land on which this proposed development is being undertaken measures approximately two (2) km long.

### **4.2 Project design and specifications**

The design considerations for the access road incorporate aspects of modern architecture and structural considerations and the current Ministry of Roads, Public works and transport policy guidelines. The construction works incorporate all legal aspects as well as codes of practice and standards.

See plate of sample road after completion

### **4.3 Project Construction**

#### ***4.3.1 Preconstruction phase:***

This involves study of the project area, design of the construction drawings and getting approvals for the same from the respective Local authority, NEMA (the basis for this study), Physical Planning, County Lands office and any other relevant authority. Soil tests are also done at this stage, soil tests provide the bearing capacity of the soil thus determining the type of foundation to be laid.

#### ***4.3.2 Site construction***

The construction of the units will be based on applicable international building standards for road construction. Other building standards including the Building Code and the British Building Standards which include BS 8110, BS 5950, BS4449, BS4461 will be incorporated. The

constructions will as well incorporate environmental guidelines, health and safety measures (proposed in this report). The implementation activities include the following: -

- a) Site clearing and excavation -This entails removal of unwanted vegetation from the site and excavation involving much machinery.
  
- b) Civil works: These involve:
  - Procurement of construction materials from approved local dealers to help promote local industry dealers.
  - Transportation of construction materials to the site and disposal of the resulting flora waste using light machinery. The soils are stable and need not to be replaced. Soil from the excavations will be used for backfilling and landscaping.
  - Stock piling - Storage of the construction materials.
  - Disposal of the existing debris/materials and landscaping.

### **4.3.3 Construction inputs (materials and equipment)**

The project inputs include the following:

- a) *Construction inputs/raw materials*: These include i.e. sand, tar, tarmac, concrete poles cement, machine cut stones, crushed rock (gravel/ballast), steel metal bars, paint/painting materials among others. All these will be obtained from licensed dealers and especially those that have complied with the environmental management guidelines and policies.
- b) *Construction machines*: These include machinery such as trucks, concrete mixers, masonry tools, graders compactor excavators and other relevant construction equipment. These will be used for the clearing of the vegetation, transportation of raw materials and the resulting construction debris. Most of the machinery will use diesel or petrol energy as a source of power. No oil spills will be allowed during construction.
- c) *Labor force*: Both skilled and non-skilled workers will be required at all phases of the project. The labor force will require services such as energy, water supply and sanitation facilities. Large volumes of water will also be required during the civil works.

## **4.4 Project development and ancillary services**

### **4.4.1 Solid Waste**

Solid waste management will consist of dustbins stored in cubicles protected from rain and animals. The waste will then be collected by a county licensed private waste management company and be composited, palletized or re-cycled depending on the waste management strategy to be adopted in line with the Environmental Management and Co-ordination (Waste Management) Regulations, 2006.

### **4.4.2 Landscaping**

The site will be landscaped after construction, using plant species available locally. This will include establishment of flower gardens and lush grass lawns to improve the visual quality of the site where paving will not have taken space.



#### **4.4.3 Communication**

The area is well covered by communication facilities such as Safaricom, Airtel, among others. All these will facilitate communication during the implementation.

### **4.5 Project Alternatives including the proposed action**

#### **4.5.1 The Proposed Development**

This will see construction of the project as proposed by developers and outlined in the EIA document. This option has good support by people who will be affected by the implementation. Generally, it is believed that this alternative will provide positive benefit to the road users and communities around the area. This includes benefits such as employment opportunities, increased property value and hence improve living standards. The proposed project will also make a positive contribution to infrastructure, overall development, upkeep and renewal of commercial community. The project is designed and will be constructed to meet the local and international standards.

#### **4.5.2 The Proposed Development Alternative**

This EIA project report will be presented to the National Environmental Management Authority. This report has evaluated and examined the effects of the project on the environment. After the review and under the proposed development alternative, the Environmental Impact Assessment License would be issued. This way, NEMA would approve for the implementation of the project. However, the development has to ensure that all environmental measures are complied with during the construction period and during operation.

The alternative consists of the proponent's final proposal with the inclusion of the NEMA guidelines and regulations and procedures. This is as stipulated in the Environmental Management and Co-ordination (Amendment) Act, 2018, which aims at reducing environmental impacts to minimum extent practicable.

The mitigation measures include the application and/or adaptation of standard construction management practices. Conflicts arising from the foreseen negative impacts will be solved through consultation with the neighbors/members of the public; by explaining the mitigation measures

prescribed for the impacts. In addition, the mitigation measures would be appropriately designed and implemented to protect the environment and especially water, soil, drainage, flora and fauna of the area/site. The environmental statutory certificate that would be issued and the project environmental aspects included in the report would help to control damage to the environment. This is in accordance to the Environmental Management and Co-ordination (Amendment) Act, 2018.

#### ***4.5.3 Relocation Alternative***

Relocation option to a different site is an option available for the project implementation. Now, there are no alternative sites for the proposed development (i.e. the project proponent doesn't have an alternative site). This means that the proponent, through the County government of Kiambu, has to look for the land if relocation is proposed.

Currently, kahawa wendani is one of the fastest growing wards in Kenya, experiencing an influx in commercial units creating pressure on existing infrastructural units. Having looked at other alternative sites, the proponent of the projects preferred the current site because of;

- Need of access road to hospitals, schools, churches and upcoming residential apartments
- Need to create good access tarmac road for the residents of kahawa wendani road and improves drainage system
- A general need for such proposed project in the area

The recommended alternative is the proposed alternative because it recognizes the viability and need from the proposed development. It also addresses environmental issues and concerns which meets local regulatory requirements and supports local economy.

The project design and planning before the stage of implementation would call for cost already encountered the proposed development i.e. whatever has been done and paid to date would be counted as a loss to the proponent. Assuming the project will be given a positive response (after relocation) by the relevant Authorities including NEMA, it (project) would have been delayed for a long period before implementation. This would also lead to a situation like No Action Alternative (as explained below). The other consequence of this is that it would discourage both foreign and local investors especially in the

building sector. In consideration of the above concerns and assessment of the current proposed site, relocation is not a viable option.

#### ***4.5.4 The No Action Alternative***

The No Action Alternative in respect to the proposed project implies that the status quo is maintained. This option is most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will, however, involve several losses to the project proponent. The property will remain under-utilized. The No Project Option is the least preferred from the socio-economic and partly environmental since if the project is not done:

- i) The economic benefits especially during construction i.e. provision of jobs for skilled and non-skilled workers will not be realized.
- ii) There will be no generation of income by the proponent nor the Government.
- iii) The social-economic status of Kenyans and local people would remain unchanged.
- iv) The local skills would remain under-utilized.
- v) No employment opportunities will be created for Kenyans who will work in the project area.
- vi) Discouragement for investors to produce this level of standard and affordable developments.

From the analysis above, it becomes apparent that the No Project Alternative is not the appropriate alternative to the local people, Kenyans, and the Government of Kenya.

## **4.6 Public Participation**

### ***4.6.1 Introduction***

The welfare of human societies and the quality of life is directly linked to sustainable use of natural resources. The Kenya government has enshrined the need for human societies' involvement in project development in the Constitution. This has been set out in the EMCA, 1999 and Environmental (Impact and Audit) Regulations, 2003.

Community consultation and participation ensures that communities and stakeholders are part and parcel of the proposed developments and in so doing assures the sustainable use of resources. It has also been demonstrated successfully that projects that go through this process will

acquire high level of acceptance and accrue benefits to a wider section of the society.

Public consultations form a useful component for gathering, understanding and establishing likely impacts of projects, determining community and individual preferences and selecting alternatives. Furthermore, through public participation, it is possible to enhance project designs and ensure sustainability of the projects.

#### **4.6.2 Objectives**

The main objectives of the public consultation process were as follows to:

- Inform the public of the details of the proposed Project construction;
- Collect views on the likely positive and negative impacts anticipated by the local residents and how these can be overcome; and
- Build community accord and acceptance of the proposed project.

Public participation for the proposed development was conducted through direct interviews and questionnaires.

#### **4.6.3 Consultation Records**

Appendix 3, present the information on the public consultations undertaken during the EIA for the proposed project. This information includes the names of individuals and other entities issued with questionnaires.

#### **4.6.4 Outcome of Consultations**

The prominent issues arising from the consultations are discussed below and have been also addressed at appropriate sections in the mitigations and Environmental Management Plans (EMP's).

#### **General Anticipated Benefits by Community Members**

The following benefits are anticipated by the community members consulted from the proposed project construction and operation:

- The proposed project will be a source of income to the people as it will promote local businesses
- Provide employment directly and indirectly to the people

- Enhance road safety and ensure proper drainage within kahawa wendani ward
- Gains to both local and national economy i.e. ready market for local materials e.g. cement, nails from local hardware shops as well taxation purchase of locally manufactured items like, street lamps (VAT and licenses that benefit the national economy).

### **Community Anticipated Negative Environmental Effects**

The negative impacts anticipated by the consulted community members include the following:

- Noise pollution during transportation of materials and construction.
- Air pollution during construction
- Potential for accidents occurrence during construction

## CHAPTER FIVE: POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

### 5.1 Identification of impacts

#### 5.1.1 Existing impacts.

There are no existing environmental concerns on the proposed project site and the surrounding area. The site has no vegetation of value; only grass covering the site will be cleared for the new development.

#### 5.1.2 Anticipated impacts.

Impacts can either be positive or negative, direct or indirect. The magnitude of each impact is described in terms of being significant, minor or negligible, temporary or permanent, long-term or short-term, specific/localized or widespread and reversible or irreversible. In order to accurately identify the environmental impacts, the following environmental issues were considered pertinent and important for the coverage based on considerations of physical and natural environments, social welfare, economic and cultural environments.

#### a) Physical Environment

- Water quality aspects for both surface water sources like piped water, storm water, and other related aspects
- Soil conditions, soil contamination and landscape alterations/degradation associated with the proposed project.
- Drainage patterns especially in relation to wastewater effluents channelled into the drainage ditches.
- Air quality aspects especially atmospheric emissions and related discharges from machinery like diesel run engines etc.
- Noise and vibration (sonic factors) where applicable

#### b) Social welfare, economic and cultural environment

- Notable changes in land use systems and the general land utilization types where applicable.
- Implications on the employees, visitors and public health, safety and related hazards/risks such as HIV/AIDS, consumption of contaminated intravenous infusions products due to disease outbreaks, sanitary facilities, etc.
- Aesthetic, landscape alterations and changes to infrastructural facilities, among others.

- Effects associated with the operation activities and related handling and disposal of wastes generated during the operations.
- Effects associated with income generation opportunities created by the project due to its operations.

## **5.2 Positive impacts of the proposed project (economic and social benefits)**

### ***5.2.1 Land Values***

The opening up of the area will increase the rush for the plots by developers and will consequently increase the land values in the surrounding area and in the neighbourhood due to the potential high returns after development and also the increase in new comers to the area. This will lead to attraction of middle-income groups with improved economic status.

### ***5.2.2 Employment***

The project provides direct and indirect job opportunities to a significant number of the population thus reducing the unemployment and, in the process, provide livelihood.

### ***5.2.3 Promotion of development***

The project has the potential to influence the commercial trends in the area in various ways and in the long run the multiplier effect will lead to development and reduction of poverty. The proposed project contributes in overcoming the challenges of today's life including strategies for alleviating poverty and promoting sustainable development.

### ***5.2.4 Economic returns and promotion of secondary business***

Economic-investment by the proponent shall increase wealth. The project shall also create market for goods and services and especially construction inputs which include raw materials, construction machinery and labour. Many secondary businesses are also likely to spring up during the construction phase especially those providing foods and beverages to the construction workers. Other businesses (shops) will also come up in the neighbourhood when the project is complete that will be serving the estate residents.

### ***5.2.5 Promotion of social cohesion***

The development brings together people with diverse traditions and culture. It will lead to promotion of cultural integration.

### ***5.2.6 Creation of market for goods and services and secondary businesses***

The proposed project shall consume various materials during construction such as stones, cement, sand, various professionals have and shall continue giving their services during both the construction and operational phases and thus making livelihoods. Those doing commercial activities in the neighbourhood shall also have their market widened by the occupants and workers.

## **5.3 Predicted negative impacts and potential mitigating measures**

There are a few negative impacts anticipated from the proposed project, these negative impacts however are not major enough to cause any major impact to the environment. They are also few compared to the anticipated positive impacts. The anticipated negative impacts include: -

### ***5.3.1 Soil erosion***

This is loss of the top-most soft material on the earth surface (soil) down - slope or transportation by the use of machinery or other equipment including animals. Soil movement is common in construction activities. This mostly happens during the site clearing and excavation. This also exposes the underlying material to more dangers of degeneration by erosion agents. Uncontrolled soil erosion can have adverse effects on the local water bodies such as sedimentation, introduction of nutrients into the water bodies, de-coloration of water affecting the penetration of sunlight into the water.

In this case, soil erosion will not be a major environmental impact especially when the project is over since there will hardly be open areas. However, during site clearing and construction phases, there is likely to be some limited movement of soil materials from the site since the land is quite flat. This may not cause any significant impact but some mitigation measures are proposed.

### **Potential mitigation measures**

- Unnecessary movement of soil materials from the site should be avoided.
- Open areas should be paved after the completion of the project.



- Suitable and well-managed vegetation need to be introduced to generate surface covers on the open areas; to control soil movement by erosion agents i.e. water, animals and wind.
- Storm water drainage channel to discharge water to safe areas need to be provided. Such channels need to be regularly maintained and repaired to avoid blockages of culverts. Point water discharges usually have pronounced effect to soil erosion.

### **5.3.2 Limited water resources, supply and use**

Water to the proposed project is expected to be sourced from the river within the vicinity. To avoid causing strain to the water supply, the proponent intends to provide storage in water tanks.

#### **Potential mitigation measures**

- Encourage water reuse/recycling wherever possible.
- Purchase water from certified clean water vendors for drinking during the project construction.

### **5.3.3 Surface water drainage**

As rain falls on a certain area, part of the rainwater is lost through evaporation in the air or percolation into the ground while the remaining overflows on the surface as storm water. The runoff from catchments is largely influenced by the size of the catchments, topography, the imperviousness of the surface (i.e. roof, road surface etc) and open surface.

With the flat terrain, the drainage of the storm water will be greatly compromised especially if it rains, since storm water drainage channels will not be present during construction.

#### **Potential Mitigation Measures**

- During construction, the designs should ensure that surface flow is drained suitably into the existing road drainage and water courses. There should be no flooding within the site at all.
- Drainage channels should be provided within the site and should be covered with suitable and approved materials. They must be installed as provided for in the approved plans and designs.
- The channels should be designed with regards to the peak volumes i.e. periods or seasons when there is high intensity of rainfall. They should never at any time be blocked or full; say due to the resulting heavy downpours

- The drainage channels must ensure the safe final disposal of runoff surface water and must be self-cleaning i.e. should have suitable gradient.

### **5.3.4 Noise and vibration**

Noise is unwanted sound that can affect job performance, safety, and health. Psychological effects of noise include annoyance and disruption of concentration. Physical effects include loss of hearing, pain, nausea, and interference with communications when the exposure is severe.

Construction activities will generate noise and hence affecting the immediate environment; i.e. other operations in the nearby areas. Such noise will emanate from the construction machinery and equipment i.e. concrete mixers, trucks and other vehicles accessing the site. It will also affect small animals and bird life. Production machines generate/produce a lot of noise. Hearing protection is thus essential when noise exposures cannot be controlled at their source.

#### **Potential mitigation measures**

- The activities will be limited to working hours between, 8.00 am and 5.00 pm.
- Contactor has to ensure all machinery are properly greased and oiled to reduce friction and possible noise pollution.
- There should be no unnecessary hooting of the involved machinery and vehicles.
- Workers should be provided with relevant personal protective equipment/ materials such as earmuffs and earplugs when operating noisy machinery and when in noisy environment. These provide a physical barrier that reduces inner ear noise levels and prevent hearing loss from occurring.
- Noise measurements should be taken at different intervals during the project cycle

### **5.3.5 Solid Waste**

Construction activities results into increased solid wastes within the sites. Such waste materials include excavated soil, stones, construction debris, wood, broken glasses, containers, rods of metal, etc.

The problem of dealing with refuse resolves itself into four parts: storage, collection, transportation and disposal.

#### **Potential mitigation measures**

- The contractor or proponent should work hand in hand with county registered, private refuse handlers, environmental experts and other County government authorities to facilitate proper waste handling, and disposal from the site as per the prevailing regulatory provisions. All wastes must be taken to the approved dumpsites. The wastes should be properly segregated and separated to encourage recycling of some useful waste materials; i.e. some excavated stone materials can be used as backfills.
- The first action should be reduction of waste at source and all employees and other visitors be encouraged and sensitized on reduction or waste.
- Train or educate the involved stakeholders on the importance and means of waste (garbage) management and handling especially during operation.

### **5.3.6 Ecological impacts: Flora and Fauna**

Vegetation has a great effect on the general and localized environment and normally can modify microclimate. Usually, the flora creates a good environment for habitats thus the two may go together more often than not. In consequence, de-vegetation may result to negative effects on the fauna.

Singly, the proposed project may appear of no significant impact but the cumulative effect in concert with other current and future projects are capable of significant and serious effects including but not limited to soil erosion, decrease in air purifiers (carbon sinks) and thus contribution to global warming etc. As earlier indicated, currently the project area was covered with grass vegetation and weeds. However, there may be some temporary and permanent disturbances to insects that inhabit the grass/weeds.

#### **Potential mitigation measures**

- Avoid unnecessary clearing of vegetation by conserving vegetation in the sections not being affected by development
- Landscape and plant vegetation in all open areas after the completion of the project and manage the introduced vegetation on completion of the development to restore or improve the site.

### **5.3.7 Fire incidences**

Fire outbreaks are common in Kenya and they usually subject detrimental effects to the environment. Fire causes both economic and social drawbacks. There are operations that are prone to such outbreaks at site e.g. smoking, carelessness, etc. It is therefore always important to consider the issue of fire.

#### **Potential mitigation measures**

- Recommended Firefighting equipment such as fire extinguishers in the form of hydrants and carbon dioxide gas extinguishers to be included during construction process.
- Preparedness: Periodic training during the project construction stage to be conducted through the Fire Department at located in ruiru municipality.

#### **5.3.8 Insecurity and theft**

Security is a prerequisite for any development. During construction, security is very important in any site. This ensures that materials are in order. It also controls movement within the site especially for the intruders who might be injured by the materials and other hazardous features available within the site. The area is well covered with communication facilities, which facilitate security to large extents.

After the project is over, security guards and facilities should be provided. The issue has been catered for in the project design.

#### **Potential mitigation measures**

- Contractor should provide adequate security during the construction period when there are no works on the site.

#### **5.3.9 Risk of sickness, accidents and injuries during construction and occupation**

During construction, there will be increased dust, air and noise pollution. These are considered as negative impacts. The residents and workforce involved will be more subjected to these environmental hazards. Food for the construction workforce is usually provided by mobile vendors most of which operates without health licenses. This can compromise the health of the workers especially if such foodstuffs are prepared in unhygienic conditions.

Because of the intensive engineering and construction activities, construction workers will be exposed to risks of accidents and injuries.

Such injuries can result from injuries from hand tools and construction equipment among others.

### **Potential mitigation measures**

- All workers should be provided with full protective gear. These include working boots, safety harness, overalls, helmets, goggles, masks and gloves.
- People preparing food for the workers on site should be monitored to ensure that food is hygienically prepared.
- A first aid kit should be provided within the site. This should be fully equipped at all times, site workers should also be trained on basic First Aid Skills.
- Some tasks require one to be in very good health, workers should be subjected to medical examinations before starting work. This will ensure that only medically fit persons are engaged for such tasks.
- The site workers should be warned of drugs and alcohol since they might affect their concentration at work causing accidents.
- Sanitary facilities should be provided on site during construction and should be kept clean at all times.
- Injured workers must be rushed to nearby dispensaries/clinics/hospitals and if need arises, referred to appropriate locations for further treatment

### **5.3.10 Dust and gas emissions**

The construction activities on the site will result to increased dust and gas emissions. Some Construction machinery and trucks generate hazardous exhaust fumes such as Carbon Oxides (CO<sub>2</sub>), Sulphur Oxides (SO<sub>2</sub>) and Nitrogen Oxides (NO<sub>2</sub>). Dust, as caused by vibrations of machines and vehicle movement suspends in the air mostly during dry spells. Such dust and gases have direct negative impact to the quality of air.

### **Potential mitigation measures**

- Provide protective equipment and materials and clothing such as nose masks and goggles

- Regular and prompt maintenance of construction machinery and equipment. This will minimize production of hazardous gases.
- Areas generating dust particles should be sprinkled with water to reduce dust blowing out over the area and should be enclosed where possible to mitigate effects of wind on them.
- Workers should go for regular health check-ups to ascertain their health standards and should be encouraged to take milk regularly as this will control the level of congestion of dust in their chests.
- The generator exhaust should be directed away from the facility to avoid smoke clouding.

### *5.3.11 Traffic density*

Heavy traffic will be generated during the construction phase; this will be caused by construction trucks ferrying materials and equipment to the site. Stringent measures should be adapted to minimize or avert any vehicular congestion which may occur.

#### **Potential mitigation measures**

- The traffic should be controlled during implementation and operation phases and mostly when large trucks for delivery of materials, this will control or prevent accidents.
- Transportation of materials should be done between 8.00 am - 5.00 pm and on the weekends only when the vehicles are few.
- The acceleration and deceleration lanes getting in and out of the facility should be wide enough and with no obstruction to avoid any vehicular snarl up.
- Signs of 'MEN AT WORK' or 'HEAVY VEHICLES TURNING' should be placed on the side of the road to warn incoming vehicles in very bright colors that can be seen from a distance by pedestrians and motorists at all times.

### *5.3.12 Oil leaks and spills*

Oil spills are prevalent in construction sites. Though this may not be common, it is wise to control and observe the little leaks and spills that will occur especially during maintenance of the involved machinery and vehicles. Bitumen tanks, fuel for project road vehicles should be having proper storage to avoid soil and water contamination and pollution. To this effect, oil and fuel containers should be stored within a well-

designed area, preferably with a concrete floor to avoid contamination. The contractor should also acquire waste oil transportation license from NEMA and NEMA registered waste oil dealers in accordance Environmental Management and Co-ordination (Waste Management) Regulations 2006. Solid waste (including construction debris), oil and other wastes should be disposed of in accordance with NEMA's Waste Management Regulations.

#### **Potential mitigation measures**

- All machinery should be keenly observed not to leak oils on the ground. This can be ensured through regular maintenance of the construction machines and equipment.
- Maintenance should be carried out in a well-designed and protected area and where oils/grease is completely restrained from reaching the ground. Such areas should be covered to avoid storm from carrying away oils into the soil/water systems.
- All oils/grease and materials should be stored in a site's store which is usually located in the contractor's yard/site office.

#### ***5.3.13 Delays and/or forced termination of the project***

Incomplete projects are common. The causes for this are numerous and may include inadequate funds, change of priorities, and inaccuracies during feasibility and design phases, failure to adhere to standards and/or legal provisions, disputes, etc. These factors may lead to unnecessary delays and sometimes forced termination of projects.

#### **Potential mitigation measures**

- *Funding*: the proponent should explore all possible funding sources including seeking for loans from reputable banks.
- *Change of priorities*: the proponent should focus on this project and stick to the project schedule.
- *Inaccuracies during feasibility and design phases*: the proponent has engaged competent Architects, Material/Structural Engineers, Quantity Surveyors, Environmentalists and is keen in utilizing the services of competent personalities as the project is implemented.
- *Standards and legal provisions*: this report is a testimony that the project proponent is not interested with short-cuts but adheres to the stipulated standards and legal provisions; and

- *Disputes:* these should be avoided as much as possible. In the event that they occur, the relevant arms of government should be used for their resolution.

#### **5.3.14 Occupational health and Safety**

During construction phase, accidents, occupational diseases, ill health and damage to property can occur if precautionary measures are not taken. Some of the precautionary measures are described below.

##### **Personal Protective Equipment (PPE)**

- Use of appropriate PPE (gloves and protective boots) to be mandatory for all site workers during construction period.
- Workers to be trained on proper use of personal protective equipment (PPE) regardless of their prior working experience elsewhere.
- Workers to be informed and sensitized on the relevance of using PPE.
- First Aid Boxes to be provided with necessary medicines and equipment.
- Construction working team to have at least one trained First Aider.

#### **5.3.15 Machinery Safety**

- All machines and equipment used should be in good working condition. Safeguards should be provided for each machine or equipment to be used.
- All portable tools and appliances in use should be in good condition.
- All the safety conditions and instructions issued regarding machines and equipment's used should be clear to the workers.
- Construction sections with running machines should be protected from general public to avoid accidents or unnecessary interference with the working procedures. Some of the protective measures that should be taken are:
  - Road sections under construction to be out of bound for unauthorized persons, drivers, job seekers, food vendors, children, idlers, etc.



### **5.3.16 Road Safety**

Accidents of various sorts are likely to occur if specific safety measures are not taken. Accidents can happen to the drivers and pedestrians and to livestock as well. They can be mitigated through:

- Vehicles to travel at specified speed limit which should not be exceeded.
- Clear speed limit signs to be placed at specified places within the road.
- Erection of speed bumps

### **5.4 Site decommissioning phase**

No project will exist forever, at some point the road will be rerouted and the route it had occupied be restored to its original form. This exercise will have some impacts to the environment. The following takes place during decommissioning: -

- All foundations must be removed and recycled, reused or disposed of at a licensed disposal site
- Where recycling/reuse of the implements, structures and other demolition waste is not possible, the material should be taken to a licensed waste disposal site.
- Implement an appropriate re-vegetation programs to restore the site to its original status
- Consider use of indigenous plant species in re-vegetation.
- Trees should be planted at suitable locations to interrupt slight lines (screen planting), between the adjacent areas and the development.

The above activities will also have some impacts to the environment, this will involve:

- Production of solid waste.
- Pollution of air with dust particles.
- Likely spillage of fuel, oil and grease.
- Vibration caused by the site construction equipment and machines e.g. excavator machines.

## 5.5 Summary recommendations on mitigation measures

Recommendation for the preventive and mitigation of adverse impacts is presented here below:

- i) The contractor will ensure that the development has been approved by relevant regulatory departments. The proponent should therefore follow guidelines as set by the government to safeguard EMP principles during the construction and operation phases of the proposed project.
- ii) It is important that warning information signage is erected strategically at the site. This will indicate the operation hours and works are likely to start and completed. The signage will be positioned in a way that both pedestrians and motorist will see.
- iii) All solid waste and debris resulting from the construction activities must be disposed off at approved dumpsites.
- iv) All construction materials to include, sand, gravel, hardcore, metals, treatment chemicals must be sourced from known and approved dealers or manufacturers who have environment sign of quality.
- v) Ensure that construction activities must be undertaken only during the day i.e. 0800 hours to 1700 hours. This will minimize anticipated disturbance and nuisance to the residents of adjacent properties and the general public.
- vi) Traffic along nearby roads should be controlled and informed during construction hours especially of heavy turning Lorries and plant in and out. This will minimize potential accidents from unsuspecting motorists.
- vii) The contractor will ensure that loose soils must be covered to prevent erosion. Other soil erosion preventive measures including watering during dry season to prevent wind erosion will be implemented. Any stockpiles of earth will be enclosed or covered to reduce dust to the neighbors.
- viii) Once earth works have been done, restoration of the worked areas should be carried out immediately through backfilling by experienced landscape experts. This will include planting trees and grass, flowers etc.

- ix) Drainage system will be properly designed, installed, and regularly maintained to prevent storm water runoff.
- x) Used and new oils from the motor vehicles and plant will be handled and stored properly. Due care on leakages and accidental spills will be taken.
- xi) Workers should be provided with complete personal protective equipment (PPE) and safety gear like, safety boots, overalls, gloves, helmets, ear plugs and muffs, goggles etc. A fully equipped first aid kit must be within reach.
- xii) The contractor must have workman compensation cover. He or she must comply with Workman compensation Act as well as other ordinances that apply to the workers. Where the workers have a union, the Collective Bargaining Agreement (CBA) shall be observed.
- xiii) Due diligence should be exercised by the contractor or the project agent during the construction phase to safeguard and ensure that all the mitigation measures are adhered to the later.

## **CHAPTER SIX: ENVIRONMENTAL MANAGEMENT**

### **PLAN 6.1 Introduction**

The Environmental Management Plan (EMP) covers the design, construction, operational and maintenance phases of each project component. The EMP identifies the key environmental issues across the project and provides strategies and plans for managing them effectively. It also defines the legal requirements for the project and identifies the regulatory permits and licences required for construction activities.

Environmental Management plan includes monitoring which involves measurement of relevant parameters, at a level of details accurate enough, to distinguish the anticipated changes. Monitoring aims at determining the effectiveness of actions to improve environmental quality. The environmental management and monitoring plans have been developed and out lined to bring home the key finding of the environmental impact assessment; recommending necessary mitigation actions, defining roles, monitor able indicators and estimated cost.

### **6.2 Environmental Monitoring and Evaluation**

Environmental monitoring and evaluation are essential in the project lifespan as they are conducted to establish if the project implementation has complied with the set environmental management standards as articulated in the Environmental Management and Coordination (Amendment) Act, 2018 and its attendant Environmental (Impact Assessment and Audit) Regulations, 2003.

In the context of the proposed project, design has made provisions for an elaborate operational monitoring framework for the following, among others:

- Air and noise pollution
- Health and safety issues
- Solid and liquid waste management
- Dust and gas emissions
- Traffic density
- Delays and/or forced termination of the project
- Fire incidences
- Insecurity

**Table 4: Environmental Management Plan - Construction Phase**

<b>Expected Negative Impacts</b>	<b>Recommended Mitigation Measures</b>	<b>Responsible Party</b>	<b>Time Frame</b>	<b>Approx. Cost (Ksh)</b>
<b>1.Minimize vegetation disturbance at and/or around construction site</b>				
<b>Vegetation disturbance</b>	Ensure proper demarcation and delineation of the project area to be affected by construction works.	Contractor	1 month	55,000
<b>2.Reduce storm-water, runoff and soil erosion</b>				
<b>Increased storm water, runoff and soil erosion</b>	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 Open drains all interconnected will be provided on site	Contractor	Construction period	80,000
<b>3.Minimize solid waste generation and ensure efficient solid waste management during construction</b>				
<b>Increased solid waste generation</b>	Use of an integrated solid waste management system i.e. through a hierarchy of options:	Contractor	Construction period	150,000

	<p>1. Source reduction                  2. Recycling Composting and reuse                  3. Combustion                  4. Sanitary land filling</p>			
	<p>Through accurate estimation of the sizes and quantities of materials required, order materials in the sizes and quantities they will be needed rather than cutting them to size, or having large quantities of residual materials</p>	Contractor	One-off	10000
	<p>Ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed of.</p>	Contractor	One-off	-
	<p>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</p>	Contractor	Construction period	-
	<p>Provide facilities for proper handling and storage of construction materials to reduce the</p>	Contractor	One-off	99,000

	amount of waste caused by damage or exposure to the elements			
	Re-use packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at the site	Contractor	Construction period	
	Dispose waste more responsibly by dumping at designated dumping sites or landfills only.	Contractor	Construction period	50,000/month
	Waste collection bins to be provided at designated points on site	Contractor	Construction period	35,000
	Private waste disposal company to be contracted to transport and dispose the solid waste from site	Contractor	Construction period	60,000
<b>4.Minimize dust emissions</b>				
<b>Dust emission</b>	Ensure strict enforcement of on-site speed limit regulations	Contractor	Construction period	96,000

	Avoid excavation works in extremely dry weathers or sprinkle water periodically water to minimize dust.	Contractor	Construction period	
	Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles	Contractor	Construction period	
	Personal Protective equipment to be worn	Contractor	Construction period	
<b>5.Minimization of exhaust emissions</b>				
<b>Exhaust emission</b>	Vehicle idling time shall be minimized	Contractor	Construction period	10000
	Alternatively, fuelled construction equipment shall be used where feasible equipment shall be properly tuned and maintained	Contractor	Construction period	10000
	Sensitize truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, and to	Contractor	Construction period	10000



	switch off or keep vehicle engines at these points			
<b>6.Minimization of noise and vibration</b>				
<b>Noise and vibration</b>	Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Contractor	Construction period	5,000
	Sensitize construction drivers to avoid running of vehicle engines or hooting unnecessarily	Contractor	Construction period	
	Ensure that construction machinery are kept in good condition to reduce noise generation	Contractor	Construction period	26,000
	Ensure that all generators and heavy-duty equipment are insulated or placed in enclosures to minimize ambient noise levels	Contractor	Construction period	40,000
	The noisy construction works will entirely be planned to be during daytime when most of the neighbours will be at work	Contractor	Construction period	

<b>7.Minimization of energy consumption</b>				
	Ensure planning of transportation of materials to ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts	Contractor	Construction period	12,000
	Monitor energy use during construction and set targets for reduction of energy use.	Contractor	Construction period	5,000
<b>8.Minimize water consumption and ensure more efficient and safe water use</b>				
<b>High water demand</b>	Promote recycling and reuse of water as much as possible	Contractor	Construction period	25,000
	Sensitize staff to conserve water by avoiding unnecessary water use	Contractor	Construction period	2,500
<b>9.Liquid waste management</b>				
<b>10.Minimize occupational health and safety risks</b>				
<b>Incidents, accidents and dangerous occurrences.</b>	Ensure that provisions for reporting incidents, accidents and dangerous occurrences during construction using prescribed forms obtainable from the local	Contractor	Continuous	100,000 per month

	Occupational Health and Safety Office (OHSO) are in place.			
	Enforcing adherence to safety procedures and preparing contingency plan for accident response in addition safety education and training shall be emphasized.	Contractor & Safety Officer	Continuous	84,400
<b>Insurance</b>	Ensure that the employees are insured as per statutory requirements (third party and workman's compensation)	Contractor	Annually	–
<b>Safety, health and environment (SHE) policy</b>	Develop, document and display prominently an appropriate SHE policy for construction works	Contractor	One-off	20,500
<b>Machinery/equipment safety</b>	Ensure that machinery, equipment, personal protective equipment, appliances and hand tools used in construction do comply with the prescribed safety and health	Contractor	One-off	40,000

	standards and be appropriately installed maintained and safeguarded			
	All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury	Contractor	One-off	–
	Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/operations	Contractor	Continuous	5,000 per Training. (minimum training sessions are six)
<b>Storage of materials</b>	Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse	Contractor	Continuous	18,000
<b>First Aid</b>	Well stocked first aid box which is easily available and accessible should be provided within the workplace	Contractor	One-off	15,800

	Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body.		One-off	10,000
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**Table 5: Environmental Management Plan - Operation Phase**

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Approx. Cost (Ksh)
<b>1. Minimization of solid waste generation and ensuring more efficient solid waste management</b>				
<b>Solid waste generation</b>	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.	Contractor	continuous	40,000 per Month
	Ensure that solid waste generated is regularly disposed off appropriately at authorized dumping sites	Contractor	Continuous	15,000 per Month
	Comply with the provisions of Environmental Management and Coordination (Solid Waste) Regulations 2006	Contractor	Continuous	50,000
<b>2. Minimize risks of liquid waste release into environment</b>				

<b>Liquid waste (Storm water) release into the environment</b>	Provide adequate and safe means of handling storm water at the project area by directing it into the existing drainage channel	Contractor	One Off	-
	Conduct regular inspections for blockages or damages and fix appropriately	Contractor	Continuous	5000 per Inspection
	Ensure regular monitoring of the waste water discharged from the project area to ensure that the stipulated effluent discharge rules and standards are not violated.	Contractor & Kiambu County Government	Continuous	5000 per parameter
	Comply with the provisions of Environmental Management and Coordination (Water Quality) Regulations 2006	Contractor & NEMA	Continuous	-
<b>3. Minimization of health and safety impacts</b>				
	Provide adequate and safe means of handling storm water at the project area by directing it into the existing drainage channel	Contractor	One Off	-
	Implement all necessary measures to ensure health and safety of workers, road users and the general public during operation of the parking spaces as stipulated in the	Contractor & NEMA	Continuous	-

Occupational Safety and Health Act,2007			
<b>4. Ensure the general safety and security of the project facility and surrounding areas</b>			
Ensure the general safety and security at all times by adequate lighting within and around the parking area	Contractor & Kiambu County Government	Continuous	30,000 per Month
<b>5. Ensure environmental compliance</b>			
Undertake annual environmental audit within 12 months after operation commences as required by law	EIA/EA Expert	2 months after operation commences	90,000

**Table 6: Environmental Management Plan - Decommissioning Phase**

<b>Expected Negative Impacts</b>	<b>Recommended Measures</b>	<b>Responsibility</b>	<b>Time Frame</b>	<b>Costs (KSh)</b>
Presence of scraps and other debris on site	Disposal locations will be selected by the contractor based on the properties of the particular waste stream. Where recycling/reuse of the machinery, equipment, implements, structures, tools and other waste is not possible, the	Contractor, Proponent/property manager	One off	50,000



	materials should be disposed to approved dumpsites			
Demolition waste Management	Use of an appropriate waste management system: recycling; reuse; combustion and sanitary land filling	Site Manager	During demolition	0
	All material from demolished buildings, equipment's and all movable items should be removed and recycled/ re-used as much as possible	Site Manger	During demolition	0
	Material to be moved should be handled by a licensed waste handler and taken to an authorized site.	Site Manger	During demolition	Various
Rehabilitation of Project site	Implement an appropriate re-vegetation	Site Manager	During rehabilitation	20,000

	programme to restore the site to its original status		/ after demolition	
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N/B

The implementation of the environmental social monitoring plan is under the direct supervision of the environmental and social safe guard officers.

## **CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION**

### **7.1 Conclusion**

From EIA studies, the proposed project is associated with both positive and negative impacts during construction, operation and decommissioning phases of the project. The proponent and contactor are advised to implement Environmental Management Plan to reduce adverse impacts and boost good environmental practices. Guidelines on environment, health and safety must also be followed in order to reduce incidences of accidents, health problems and compromise to environmental wellbeing.

### **7.2. Recommendations**

This study is recommendable and should be approved by NEMA for issuance of an EIA License and further subjected to annual environmental audits after the proposed project has been completed and operation commenced. This will be following the Environmental Management and Coordination Act of 2018 and the Environmental Impact Assessment and Audit regulations, 2003. Above all the proponent should carry out Environmental Audit 12 months after the project is completed.

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

- i. All solid waste materials and debris resulting from construction activities must be disposed off at approved dumpsites.
- ii. All construction materials and especially gravel, hardcore and metal must be sourced/procured from legalized local dealers.
- iii. Traffic leading to the site should be controlled and informed during construction and especially when heavy trucks are turning in and out of the site. This will ensure that no accidents are caused by the site's activities.
- iv. During construction, all loose soils must be compacted to prevent any erosion by wind or water. Other appropriate soil erosion control measures can be adapted. Any stockpiles of earth should be enclosed, covered or sprinkled with water during dry or windy conditions to minimize generation of dust particles into the air.

- v. Restoration of the worked areas should be carried out immediately by backfilling, professional landscaping/levelling and planting of low grass in open areas) and flowers.
- vi. Drains will be properly designed, installed and regularly maintained to prevent storm water (run-off) from accumulating within the site spreading to the neighbourhood. These must effectively drain the storm water from the project area into the existing public drainage system.
- vii. Proper and regular maintenance of construction machinery and equipment will reduce emission of hazardous fumes and noise resulting from friction of rubbing metal bodies.
- viii. Workers should be provided with complete personal protective equipment (PPE) and safety gear. They should have working boots, complete overalls, helmets, gloves, earmuffs, nose masks, goggles etc.
- ix. A fully equipped first aid kit must be provided within the site.
- x. The contractor must provide adequate security during the construction period and especially during the night when there are no construction activities.

## REFERENCES

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9. GOK (2003), The Environmental (Impact Assessment & Audit) regulations; Kenya Gazette Supplement No. 9 and Kenya Gazette Supplement No. 75 of 14<sup>th</sup> September 2003. March 2004.

## **ANNEXES**

- i. Project Designs
- ii. Public Participation Questionnaires
- iii. EIA expert License.
- iv. Bill of quantities