

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT PROJECT STUDY REPORT
FOR THE PROPOSED INSTALLATION OF A COPPER ORE FLOTATION PLANT AND
ASSOCIATED FACILITIES LOCATED ON PART OF LAND REFERENCE NO.
NZALAE/MUTONGUNI/39 AT KAKUYUNI VILLAGE, MITHIKWANI SUB-
LOCATION, MITHIKWANI LOCATION, MATINYANI SUB-COUNTY, KITUI WEST
CONSTITUENCY, KITUI COUNTY (GPS COORDINATES: Latitude -1.251570S,
Longitude 37.774415E)**



This ESIA Project Study Report is submitted to NEMA Pursuant to the provisions of the Environmental Management and Coordination Act, CAP 387 and the Environmental (Impact Assessment and Audit) (Regulations), 2003.

PROPONENT

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APRIL, 2025

CERTIFICATION AND SUBMISSION

CONSULTANTS

The Environmental and Social Impact Assessment Project Study Report has been prepared in accordance with the EMCA Cap 387 and the Environmental (Impact Assessment and Audit) Regulations, 2003. This is for submission to the National Environment Management Authority (NEMA) for Licensing. We the undersigned, certify that to the best of our knowledge and belief that this report reflects the stakeholders' views and concerns over the proposed development.

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LIST OF ACRONYMS

DOSHS	Directorate of Occupational Safety and Health Services
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
EMCA	Environmental Management and Coordination Act
ESMM	Environmental and Social Management and Monitoring
P	Plan
ESMP	Environmental and Social Management Plan
GoK	Government of Kenya
NEMA	National Environment Management Authority
OSHA	Occupational Safety and Health Act
PPE	Personnel Protective Equipment
SDG	Sustainable Development Goal
TOR	Terms of reference
VOC	Volatile Organic Compounds
WRA	Water Resource Authority
WSP	Water Service Providers

1. EXECUTIVE SUMMARY

Archers Post Investments Limited engaged a NEMA-registered EIA/EA expert to carry out an Environmental and Social Impact Assessment (ESIA) for the proposed establishment of a **copper ore flotation plant and related infrastructure** on a portion of Land Reference No. **Nzala/Mutonguni/39, located in Kakuyuni Village, Mithikwani Sub-Location, Mithikwani Location, Matinyani Sub-County, Kitui West Constituency, Kitui County.** The Terms of Reference (TOR) for the ESIA study were prepared and submitted to the National Environment Management Authority (NEMA) on **23rd September 2024**, under reference number **NEMA/TOR/5/2/793**. Following a review and subsequent approval of the TOR, NEMA directed the proponent to undertake a comprehensive ESIA study report, in accordance with Section 58 of the Environmental Management and Coordination Act (EMCA), Cap. 387, to facilitate a detailed assessment of potential environmental and social impacts anticipated during both the construction and operational phases of the project.

The ESIA was conducted using various methodologies outlined in the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003. These included site inspections, photographic documentation, and public consultations. The project will involve the **installation of a copper ore flotation plant and supporting facilities**, including access roads, water tanks, administrative offices, sanitation units, a generator room, stockpile areas, a weighbridge, a product warehouse, security posts, workers' accommodation, fuel storage, laboratory facilities, tailings storage, and a crushing unit.

The project is expected to yield both beneficial and adverse impacts. Positively, it will promote industrial growth aligned with Kenya's Vision 2030, address national and regional copper demand, generate government revenue, create local employment opportunities, and provide income for the proponent. On the downside, environmental and social impacts are anticipated during the planning, construction, operational, and possible decommissioning stages.

In the pre-establishment and establishment phases, anticipated negative impacts include risks linked to construction material sourcing, worker health and safety, increased water usage, wastewater generation, solid waste, and air and noise pollution. Before

commencement, the proponent will obtain an extension-of-use permit from the Kitui County Government. To reduce material-related impacts, materials will be sourced from licensed suppliers in compliance with EMCA Cap. 387.

Health and safety hazards for workers and visitors such as accidents, falls, and machinery-related injuries will be mitigated by registering the site with the Directorate of Occupational Safety and Health Services (DOSHS), enforcing the use of Personal Protective Equipment (PPE), providing adequate training, and securing insurance coverage. Mobile toilets will be provided through a NEMA-licensed waste contractor to ensure sanitation compliance with the Water Quality Regulations, 2006.

Construction-related solid waste will be managed through a NEMA-approved waste handler in line with Waste Management Regulations, 2006. To minimize air and noise pollution, dust suppression measures such as water sprinkling, PPE usage, and adherence to Air Quality Regulations, 2014, and Noise and Excessive Vibration Pollution (Control) Regulations, 2009, will be implemented.

Construction activities may also lead to land degradation, landscape alteration, higher water and energy demands, surface and groundwater contamination, biodiversity loss, and road deterioration. Clearing of vegetation will disturb habitats, and where possible, existing vegetation will be retained to preserve ecosystem integrity.

To protect worker and community health, the proponent will provide proper training, ensure safe equipment use, restrict unauthorized access, and implement safety protocols as per the Occupational Safety and Health Act, 2007. Human waste will be managed via a septic system, with an **Effluent Discharge License (EDL)** obtained from NEMA. Dust emissions from operations and ore transportation will be addressed through vegetation buffers, PPE enforcement, and regular site watering.

Operational activities will generate substantial noise and vibrations. These will be mitigated through facility siting, noise mapping, earmuff usage, and compliance with noise regulations. Additionally, heavy trucks transporting ore may damage local roads; thus, axle load regulations will be strictly observed.

In case of decommissioning whether due to regulatory action, project completion, or court order key concerns will include job losses and income disruption. The proponent will

prepare a decommissioning audit report and submit it to NEMA at least three months prior to closure for approval.

Public engagement was carried out via questionnaires targeting local residents and stakeholders. All respondents supported the project, citing benefits such as job creation, income generation, business growth, improved security, and economic stimulation. The main concerns raised involved potential air and noise pollution.

In conclusion, the proposed project is viewed as a significant contributor to Kenya's economic development and aligns with national development goals under Vision 2030. The ESIA outlines a detailed environmental and social management and monitoring plan to guide the project through its lifecycle and mitigate adverse impacts.

CHAPTER ONE: INTRODUCTION

1.1 Background and rationale for an Environmental and Social Impact Assessment (ESIA)

Archers Post Investments Limited intends to develop a **copper ore flotation plant along with various supporting infrastructure** on a section of Land Reference Number Nzalae/Mutonguni/39, situated in Kakuyuni Village, Mithikwani Sub-Location, Mithikwani Location, within Matinyani Sub-County of Kitui West Constituency, Kitui County. The scope of the proposed project extends beyond the primary processing plant to include several essential auxiliary components. These include internal access roads, elevated water storage tanks, administrative and office buildings, sanitary amenities, a generator room, designated areas for stockpiling raw materials and processed products, a weighbridge for truck calibration, security installations such as a guard house, staff accommodation units, a fuel storage facility, laboratory and testing facilities, tailings management systems, and a crushing plant.

According to the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019, published under Gazette Notice No. 31, this type of development is classified under **High-Risk Project Category 9(a)**, which pertains to *“mineral and ore refining and processing activities.”* Projects in this category are considered to have potentially significant environmental and social impacts, and as such, are subject to stringent scrutiny and regulatory requirements.

In compliance with these legal and regulatory provisions, a comprehensive Environmental and Social Impact Assessment (ESIA) study has been carried out. The purpose of the ESIA is to systematically evaluate the anticipated environmental and social effects of the proposed project throughout its entire lifecycle including pre-construction, construction, operational, and potential decommissioning phases. The study identifies possible adverse impacts, proposes suitable mitigation measures, and outlines an Environmental and Social Management and Monitoring Plan (ESMMP) to ensure that the project is implemented in an environmentally sustainable and socially responsible manner.

Furthermore, the ESIA serves as a critical tool to inform the decision-making process by the National Environment Management Authority (NEMA), ensuring that the project complies with the provisions of the Environmental Management and Coordination Act (EMCA), Cap. 387, and aligns with national development goals such as those outlined in Kenya Vision 2030.

1.2 Scope of the ESIA Study

The Environmental and Social Impact Assessment (ESIA) study was undertaken to comprehensively analyze the proposed development of a copper ore flotation plant and its associated facilities. The primary objective of the study was to identify all the activities involved in the implementation of the project in order to assess both the potential positive and negative impacts and to formulate appropriate mitigation measures at an early stage. This proactive approach ensures that the benefits of the project are maximized while adverse effects on the environment and surrounding communities are minimized. The assessment involved evaluating the likely gains and losses to the local population and ecosystem, considering these in the context of the proposed mitigation strategies. The final decision on whether the project should proceed or not lies with the National Environment Management Authority (NEMA), based on the findings and recommendations of this ESIA study.

The assessment examined the potential impacts of the project during its construction, operation, and decommissioning phases. It considered how these activities would affect the physical environment, local biodiversity including flora and fauna, existing land use patterns, socio-economic dynamics, and both public and occupational health and safety. A thorough evaluation was carried out in accordance with the Environmental Management and Coordination Act (EMCA), Cap 387, and relevant regulatory frameworks. The ESIA included a review of the baseline environmental and socio-economic conditions of the project area, which served as a benchmark for identifying and predicting the potential impacts of the proposed development.

Furthermore, the study involved a detailed analysis of the project design, the specific materials and inputs to be used, and the methodologies to be employed in the execution of project activities. All foreseeable environmental impacts were assessed, and practical

mitigation measures were proposed for each. The study also reviewed the anticipated economic and social impacts on the local communities, including employment opportunities, infrastructure development, and potential disruptions to existing livelihoods. Health and safety considerations for both workers and nearby residents were carefully addressed through appropriate risk reduction strategies. To ensure long-term sustainability, an Environmental and Social Management and Monitoring Plan (ESMMP) was developed, providing a structured framework for managing, tracking, and reporting on environmental and social issues throughout the project lifecycle. This holistic approach aims to support responsible and sustainable implementation of the proposed project.

1.3 Environmental and Social Impact Assessment (ESIA) objectives

The primary aim of this Environmental and Social Impact Assessment (ESIA) study is to evaluate the potential environmental and social effects of the proposed copper ore flotation plant in accordance with the Environmental (Impact Assessment and Audit) Regulations of 2003, as well as relevant international ESIA standards and guidelines. The study involves not only a detailed assessment of environmental impacts but also a comprehensive evaluation of the social and economic aspects through a baseline survey. This includes understanding the current socio-economic and environmental conditions of the project area. The outcome of the ESIA will be compiled into a report for submission to the National Environment Management Authority (NEMA) for review and potential approval. As part of this process, an Environmental and Social Management Plan (ESMP) will be developed to guide the implementation of mitigation measures and to ensure long-term sustainability and compliance.

According to the Second Schedule of the Environmental Management and Coordination Act (EMCA), Cap 387, any project that significantly deviates from the existing character of its surroundings is required to undergo an ESIA. The fundamental purpose of the ESIA is to provide objective, evidence-based information to regulators, project proponents, the public, and other stakeholders to inform sound decision-making. This is done through a structured process aimed at achieving the following key objectives: first, to clearly define the scope of the proposed project, including identifying all project activities and their possible

interactions with both the natural and human environments.

Second, to identify and incorporate applicable national legislation and international standards and best practices into the planning and implementation stages of the project. This ensures compliance and promotes responsible development. Third, to provide a comprehensive overview of the project itself and the baseline environmental and social context in which it will be situated, enabling an informed analysis of potential effects.

Fourth, to anticipate, describe, and evaluate potential positive and negative impacts arising from project activities. This includes proposing practical and effective mitigation strategies to prevent, minimize, or compensate for significant adverse impacts, while also identifying ways to enhance potential benefits. Lastly, the ESIA sets out a structured Environmental and Social Management Plan, outlining specific mitigation and monitoring measures, responsibilities, timelines, and indicators to evaluate the effectiveness of interventions throughout the project lifecycle. This approach ensures that environmental and social considerations are not only acknowledged but are integrated into every phase of the project, from planning to decommissioning.

1.4 ESIA Guiding Principles

The Environmental and Social Impact Assessment (ESIA) conducted for the proposed project was guided by a set of fundamental principles aimed at promoting sustainable and inclusive development. These principles emphasize the need to integrate environmental and social considerations into every stage of the project's planning and implementation process.

A key guiding principle is that all development initiatives must take into account their potential environmental and social impacts to ensure that they do not compromise the well-being of people or the environment. Public involvement is also a cornerstone of the ESIA process, with stakeholder engagement encouraged throughout the project's lifecycle to foster transparency, inclusivity, and mutual understanding. This participatory approach helps to enhance local ownership of the project and contributes to its long-term sustainability.

The ESIA further respects the value of traditional knowledge and cultural practices in environmental stewardship and natural resource management, recognizing that these indigenous systems often offer practical and time-tested solutions. It also underscores the

importance of international collaboration in the responsible and equitable use of shared natural resources, promoting global environmental governance.

The study is also anchored in the principles of equity both within the current generation (intra-generational) and between present and future generations (inter-generational) ensuring that environmental benefits and burdens are fairly distributed. Additionally, the “polluter pays” principle holds that those responsible for environmental degradation should bear the cost of mitigation and restoration. Lastly, the precautionary principle advocates for proactive measures to prevent environmental harm, especially in cases where scientific certainty is lacking, thereby minimizing potential risks before they occur.

1.5 Terms of Reference

The proponent engaged the services of qualified environmental consultant to conduct a comprehensive Environmental and Social Impact Assessment (ESIA) for the proposed copper ore flotation plant and its auxiliary infrastructure. The primary objective of the consultancy assignment was to assess the potential environmental and social impacts that could arise from the construction, operation, and eventual decommissioning of the proposed project, and to develop appropriate mitigation and management measures to address those impacts.

As part of his mandate, the consultant was also tasked with compiling a detailed ESIA report, which would be submitted to the National Environment Management Authority (NEMA) for review and consideration. The purpose of this report is to inform NEMA’s decision on whether or not to approve the project based on its potential environmental and social implications.

The ESIA was carried out in strict adherence to the procedures and requirements outlined in the Environmental (Impact Assessment and Audit) Regulations of 2003. These regulations provide a legal and procedural framework for conducting environmental assessments in Kenya, ensuring that all necessary environmental safeguards are in place before a project can proceed. In addition to the statutory requirements, the consultants also followed specific terms of reference mutually agreed upon between them and the proponent.

1.6 Location of the project site

The proposed project site is within part of Land Reference No. **Nzalae/Mutonguni/39** at **Kakuyuni Village, Mithikwani Sub-Location, Mithikwani Location, Matinyani Sub-County, Kitui West Constituency, Kitui County**. Geographically the proposed project lies within GPS Coordinates: **Latitude -1.251570S, Longitude 37.774415E**. The proponent has leased the piece of land (**30 acres**) where the proposed project will be situated for a period of **10 years** from **Jacob Kitangia Mwaka** (*see attached lease agreement*).



Figure 1.1: Google map of the proposed project site

1.7 Communication and Accessibility

The proposed project site is conveniently accessible via a network of well-maintained murram (gravel) roads, which link the area to the broader regional transportation system. Specifically, a small motorable murram road serves the site, enabling the movement of construction equipment, materials, project personnel, and finished products. This ease of access is crucial not only for logistical efficiency during the construction, operational, and

decommissioning phases of the project but also for facilitating the delivery of support services and emergency response when necessary.

In terms of communication, the area is adequately covered by mobile network service providers, ensuring reliable voice and internet connectivity. This availability of mobile and digital communication infrastructure allows for seamless coordination between the project team, stakeholders, regulatory agencies, and local communities. It also supports efficient information dissemination, public participation, and timely reporting of project updates or emerging issues. The combination of good physical access and effective communication channels enhances the overall feasibility and sustainability of the proposed development.

1.8 Project design and description

The proposed development involves the establishment of a copper ore flotation plant, complete with a range of auxiliary infrastructure to support its full operational capacity. This includes the construction of essential facilities such as internal access roads for transportation within the site, elevated or ground-mounted water storage tanks to meet process and domestic water demands, administrative offices for on-site project management and coordination, and sanitary amenities to ensure hygiene and comfort for workers.

Additional components of the project comprise a generator room to provide backup power supply, a raw material stockpile area for temporary storage of incoming copper ore, a weighbridge for measuring vehicle loads, and a product stockpile warehouse for storing the processed copper concentrate. Security will be ensured through the construction of a guardhouse at the site entrance, while on-site accommodation will be provided for workers, particularly those engaged in continuous or shift-based operations.

Other key features include a fuel storage tank for equipment and vehicle fueling needs, laboratory facilities for quality control and process monitoring, tailing storage facilities (TSFs) for the safe containment and management of flotation residues, and a crushing unit to reduce the size of the raw ore before processing.

It is important to clarify that the proponent will not engage in primary mining activities at the proposed project site. Instead, the copper ore intended for processing at the flotation plant will be sourced from the proponent's own copper mining sites as well as from other

licensed mining operations within Kitui County. These external mining sites are distinct and separate from the proposed processing location at Kakuyuni Village. This clarification underscores that the core focus of the proposed project is on the processing and beneficiation of copper ore through flotation, rather than on on-site mineral extraction.

1.9 Study approach and methodology

The methods adopted for preparing the ESIA study report were guided by the Third Schedule of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003. The ESIA/EA consultant prepared Terms of Reference (TOR) as required under Regulation 11 of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003 and submitted them to NEMA for consideration and approval. The TOR referenced **NEMA/TOR/5/2/793** were approved on **25th September, 2024** and the consultants began preparation of the ESIA study report.

The focus of the ESIA study will be to:

- 1) Assess the potential impacts of the project on the total environment i.e. biophysical, economic and socio-cultural environment and make appropriate recommendations
- 2) Evaluate project alternatives
- 3) Determine the environmental baseline conditions of the area
- 4) Review available information and data.
- 5) Get opinion of all interested and affected parties
- 6) Determine the legal and policy framework which govern the operation of the project
- 7) Determine the waste management system during the operation, construction, operation and decommissioning phase of the project.
- 8) Advice on compliance to Climate Change Act 2016

Site visits were undertaken in **8th October, 2024** for purposes of area reconnaissance, assessing the baseline environmental conditions of the proposed project site and screening of environmental risks associated with the proposed development as well as the applicable environmental safeguards and standards. Environmental screening criteria were informed by the Second Schedule of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003. As per this schedule, the issues considered by the

ESIA/EA experts included ecological impacts, socioeconomic issues, landscape changes and land use character using the table 1 below.

Table 1: Summary of results of the screening criteria

Criteria	Results
Ecological impacts	• Vegetation clearance and excavations will occur • No endangered species of trees and plants found at the site • There are indigenous tree species at the site
Social-economic considerations	• Income to proponent and employment creation • Meeting demand for construction materials • Revenue to the government through taxes & licenses • The project compliments governments effort to attain economic pillar associated with development i.e. Vision 2030 • No cultural or heritage issues at the site
Landscape impacts	• The landscape of the area will be altered and new views created
Land uses	• Land cover is predominantly grass • The current land is farmland

1.10 Data Collection

The ESIA study employed a combination of qualitative and quantitative data collection methods. These included direct site visits and physical observations, which allowed the assessment team to gain firsthand insights into the physical characteristics of the proposed project area. Additionally, consultations with local residents and stakeholders were conducted through the administration of structured questionnaires, enabling the gathering of community perceptions, concerns, and expectations regarding the proposed development.

Moreover, a thorough literature review was undertaken. This involved the review of policy frameworks, and legal instruments pertinent to copper ore processing, environmental management, and the socio-economic context of Kitui County. The integration of these approaches ensured the collection of reliable baseline data and informed the identification of potential environmental and social impacts, which in turn guided the formulation of appropriate mitigation and enhancement measures.

CHAPTER TWO: PROPOSED PROJECT DESCRIPTION

2.1 Location of the proposed project

The proposed copper ore flotation plant will be situated on a designated portion of land referenced as **Nzala/Mutonguni/39, located in Kakuyuni Village, within Mithikwani Sub-Location, Mithikwani Location, Matinyani Sub-County, Kitui West Constituency, in Kitui County**. Archers Post Investments Limited, the project proponent, has formally secured a lease agreement for approximately **30 acres** of this parcel, with the lease tenure spanning a period of **ten (10) years**.

This site lies in a predominantly rural and sparsely populated area characterized by scattered homesteads and low-density settlement patterns. The local economy is largely driven by subsistence and small-scale commercial agriculture, focusing on crop cultivation and livestock rearing. In addition, artisanal and small-scale mining of copper ore is a common livelihood activity in the surrounding communities, reflecting the area's natural resource potential. The choice of location aligns with proximity to existing copper ore sources while minimizing disruption to densely inhabited zones. The project site is also favorable due to its relatively open space, which provides adequate room for the establishment of the proposed plant and associated infrastructure.

2.2 Components of the Proposed Project

The proposed project will comprise of the following:

- Plant area
- Administration office block
- The Open Yard
- Generator house
- Raw Material stockpile area
- Weigh Bridge
- Product Stockpile Warehouse
- Workshop
- Guard house
- Accommodation facility for workers

- Washrooms
- Fuel storage tank
- Laboratory facility
- Tailings storage facility (TSF)
- Water pond

2.2.1 Plant area

The plant area will measure **200 metres long and 150metres wide**

2.2.2 Administration office block

The project proponent proposes to put up a non-storey permanent building that will provide working space for the workforce during operation phase of the project. The administration office block will consist of **director's office, general manager's office, financial office, human resource office, commercial office, production engineer office, process engineer office, reception area, and two (2)-pool units**. The office block will also have kitchen with an open dining, sanitary facilities for both ladies and gentlemen and a boardroom

2.2.3 Open yard

The open yard will be used as a parking area for the trucks that will be delivering copper ore to the processing plant. The proponent proposes to provide the entire yard with a concrete slab. The design of the yard will incorporate concrete drainage channel complete with oil/water interceptors.

2.2.4 Generator house

The generator house will be **20 m²** and will be made of concrete blocks with ventilation around the wall.

2.2.5 Raw Material stockpile area

The raw material stockpile area will measure **80 metres long by 60 metres wide**.

2.2.6 Weigh Bridge

The weigh bridge will measure **20m²** and will be fitted in consultation with the Kenya Weights and Measures Agency. Only registered technicians will be engaged

2.2.7 Product Stockpile Warehouse

The product stockpile warehouse will be **30 metres long and 20 metres wide**. The

warehouse will be a concrete with adequate security and ventilation for storage of copper concentrates.

2.2.8 Workshop

The workshop will be a prefabricated concrete building with a spread footing design. The workshop will include **two (2) indoor mobile equipment repair bays** equipped with an **overhead travelling crane**, a **small vehicle repair bay** and **one outdoor wash bay equipped with high pressure water monitors** and a **sloped concrete pad leading to an oil or water separator**.

2.2.9 Guard house

The guard house will be **3 metres long** and **2 metres wide**.

2.2.10 Accommodation facility for workers

The accommodation facility will be **25 metres long and 8 metres wide**: This will comprise of living quarters for the workers.

2.2.11 Washrooms

The proponent intends to construct adequate toilet and washing facilities for use by the workforce during operation phase of the proposed project.

2.2.12 Fuel storage tank

The fuel storage tank will be of capacity of **33,000L** and will be above ground. The tank will be installed in a concrete bund wall and will be fitted with the necessary switch and having adequate signage around.

2.2.13 Laboratory facility

The laboratory facility will be **15 metres long and 12 metres wide** and will consist of analysis room, sample preparation room and sanitary facilities. This facility will be used for testing copper ores, waste or tailings and products (copper concentrate and cathode).

2.2.14 Tailings storage facility (TSF)

The tailing storage facility will measure **70.5 metres long and 5 metres wide**. The tailing storage facility will have **5 metres by 3metres by 1 metres** water pit to pump back water.

2.2.15 Concentrate Pond

The water pond will measure **45 metres long by 35 metres wide**.

2.3 Copper Ore Flotation Process Technology

The main aim of the copper ore floatation plant is to upgrade or concentrate copper ores from less than **2 weight % copper** to a concentrate grade of **25 - 40 weight % copper**. The copper ore floatation processing plant will have four main units namely:

- i. **Crushing unit** for reducing the particle size of the mined copper ore.
- ii. **Magnetic separation** for removing iron from the copper ore.
- iii. **Gravity concentration** for upgrading or concentrating copper to a concentrate of **25 - 30 weights %** copper without the use of chemicals.
- iv. **Froth flotation** for upgrading or concentrating copper to a concentrate of **25 - 30 weight % copper** with the use of environmentally friendly chemicals.

The full list of equipment for the entire processing plant including crushing, magnetic separation, gravity concentration and froth flotation are:

1. Primary crusher (jaw crusher)
2. Secondary crusher (jaw crusher)
3. Tertiary crusher (Impact crusher)
4. Vibratory screen
5. Conveyor belt
6. Ball Mill
7. Reagent or chemical mixing tanks
8. Flotation cells

Process flow sheet for the proposed project is shown in Figure 2.1.

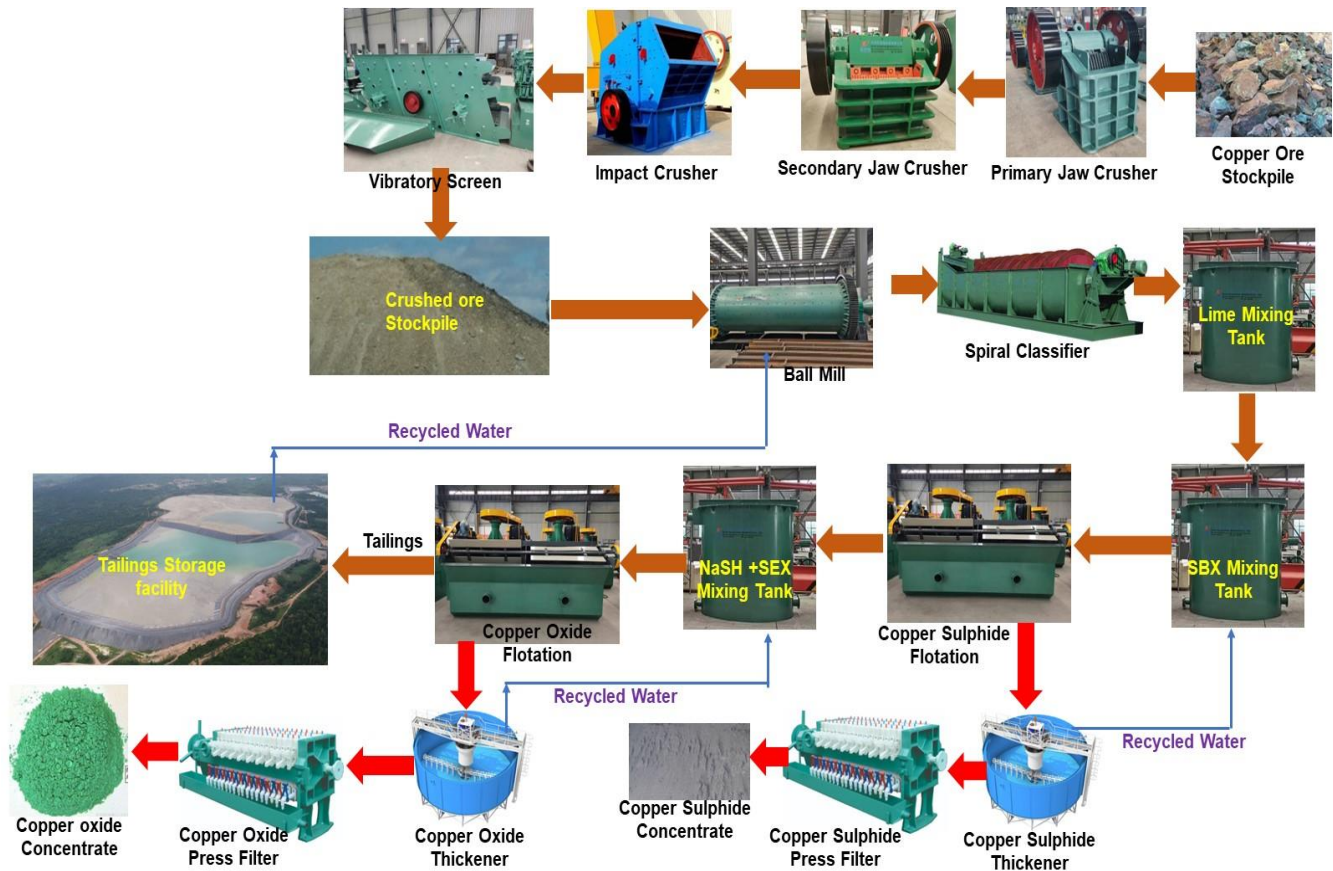


Figure 2. 1:Proposed project process flowsheet

2.3.1 Crushing Unit

Upgrading of the copper via physical or chemical means requires liberation of copper bearing minerals from the gangue minerals. As a result, the mined copper ore material from the mine will be crushed to reduce the particle size. Crushing will be done in three stages; **primary, secondary and tertiary crushing** with the purpose of increasing efficiency. Both primary and secondary crushing will be done by **jaw crushers**. The **primary jaw crusher** will have an output particle size of **40 - 60 mm** whereas the **secondary jaw crusher** will have an output particle size of **10 - 20 mm**. On the other hand, the **tertiary crusher** will have an output particle size of less than **3 mm**. The capacities of crushing system will be **15 tons per hour** so that crushing will be done for **8 hours** in a day.

Water will be sprayed above the crushers to suppress dust emission. The crushed material will be moved from the crushing section into the next stage through the **conveyor belt**. **Sprinklers** will be installed on the conveyor belt to reduce the possibility of dust emission

into the environment. The **downstream process** is wet and will not generate dust emission. Digital images for the primary and secondary jaw crushers are shown in Figures 2.2 and 2.3, respectively.



Figure 2. 2: Digital image of the primary jaw crusher from the manufacturer (Henan Fantianliang Machinery & Equipment Co., Ltd)



Figure 2. 3: Digital image of the secondary jaw crusher from the manufacturer (Henan Fantianliang Machinery & Equipment Co., Ltd)

The crushing system will incorporate a **vibratory screen** and its purpose will be to screen the poorly crushed material or oversize from the undersize. The poorly crushed material will be sent back to **the tertially crusher** using the **conveyor belt**. The undersize will be conveyed to the **stockpile for temporal storage**. Digital image of the vibratory screen is shown in Figure 2.4.



Figure 2. 4 Digital image of the vibratory screen from the manufacturer (Henan Fantianliang Machinery & Equipment Co., Ltd)

2.3.2 Concentrator or Flotation Plant

Froth flotation is a common method that is used for upgrading different types of minerals. In a principle, finely ground material is **pulped** with water to a **33 – 35 % solids slurry**. Reagents are added to the slurry which make the mineral particles attach themselves to the **air bubble**. The air bubbles carrying the mineral particles are lifted to the top and then scrapped off. The main advantages of froth flotation are as follows:

1. Low operating costs since chemicals are used at very low dosing, only a few grams of the chemicals per ton of ore material.
2. The chemicals used in the process are nontoxic.
3. The process is carried out either at natural or slightly alkaline pH and hence does not

create environmental pollution.

4. The process is very selective on the mineral of interest.

2.3.2.1 Technical Details

The concentrator will content the following units:

1. Ball mill
2. Chemical or reagent mixing tank
3. Flotation
4. Concentrate ponds
5. Tailings Management

2.3.2.1.1 Grinding

Final size reduction of the copper ore will be done in a **ball mill**. The tailings from the shaking table will be pumped to the ball mill. The ball mill will grind the material and hence liberate more copper bearing minerals. **Water** will be introduced into the ball mill so as to achieve **wet grinding**. Wet grinding will prevent dust emission into the workplace. In essence, grinding will be carried out at slurry density of **65 – 80 % solids**. The ball mill is **4.5 meters long and 1.5 meters diameter** with a **110-kilowatt motor**. Digital image of the ball mill is shown in Figure 2.5.

The discharge from the ball mill will be fed into the **spiral classifier** which will then separate the poorly ground material or coarse from fine from the fine material. The coarse material will be **circulated back** into the ball mill for **re-grind**. The fines from the spiral classifier overflow will gravitate to the **chemical mixing tank**.



Figure 2. 5: Digital image of the ball mill from the manufacturer (Henan Fantianliang Machinery & Equipment Co., Ltd)

2.3.2.1.2 Chemical Mixing Tanks

The chemical mixing tanks are for addition of **chemicals or reagents** into the **ground ore or slurry**. There will be total of **four (4) mixing tanks** each of the diameter and volume of **2 metres** and hence a volume of **2.65 cubic meters**. The tanks will be arranged as follows:

1. **Tank one** - for addition of **lime** into the material. This will bring pH of the slurry to a range of **8.5 – 9.5**. About **150 kg of lime** will be used **per day**.
2. **Tank two** - for addition of **sulphide collector (sodium butyl xanthate)** at rate of **200g**

per tonne of copper ore. Therefore, **30,000g or 30 kg** of sodium butyl xanthate will be used **per day**.

3. **Tank three** - for addition of **sodium hydrogen sulphide (NaSH)** at a rate of **1,200 g per tonne** of copper ore. As a result, **180,000 g or 180 kg** of sodium hydrogen sulphide will be used **per day**.
4. **Tank four** - for addition of **copper oxide collector** which will be **sodium ethyl xanthate (SEX)**. Oxide collector will be dosed at a rate of **600 g per tonne** of copper ore. Therefore, **90,000 g or 90 kg** of sodium ethyl xanthate will be used **per day**.

Frother used in the process is **pine oil** and will be dosed in the **second and fourth mixing tank** at a rate of **50g and 4g**, respectively, **per tonne** of copper ore such that a total of **13,500g or 13.5 kg** of pine oil will be used **per day**. Digital image of the chemical mixing tank is shown in Figure 2.6.



Figure 2. 6: Digital image of the mixing tanks from the manufacturer (Gongyi Hengchang Metallurgical Building Material Equipment Plant)

2.3.2.1.3 Flotation Cells

The reacted **copper sulphide** will be recovered from **the flotation cells**. The plant will have **forty (40) flotation cells** to allow separate recovery of **copper sulphide and oxide**. Each flotation cell will have a **volume of 1.1 cubic meters** and **5.5 kw electric motor**. Therefore, the **flotation cells** will have a total volume of **44 cubic meters**. Flotation depends on the fact that the grains of some minerals, and especially of metals, differ in the degree to which their surfaces can be wetted by a suitable solution. The **powdered product of grinding the ore** is fed into a **series of tanks** called **flotation cells** which are filled with a solution containing **various oils** capable of forming a **froth**. **Air** is sucked into **each cell**; the solution being agitated to bring **froth of bubbles** to the surface. In the case of copper minerals, the particles adhere to this froth, which is separated, whereas the great bulk of the useless material or gangue sinks to the bottom of the tanks. By varying the chemical conditions within the cells different results can be obtained, thereby making flotation highly selective in skilled hands. Digital images of the flotation cells are shown in Figure 2.7.

The flotation cells will be divided into the following sections:

1. **Rougher cells** – for primary recovery of copper from less than **2 weight % copper to 6 - 10 weight % copper**. The rougher cells will produce concentrate and tailings streams.
2. **Cleaner cells** – for further upgrading of the rougher concentrate. Cleaning is the removal of impurities, mainly **silica, dolomite, limestone** etc. from the concentrate. It will be done in two stages to allow good upgrade of copper in the final concentrate.
3. **Scavenger cells** – as name applies, the section reclaim copper that was not recovered at the rougher section. Recovery of the residual copper will be possible via extra addition of **collectors and pine oil**.



Figure 2. 7: Digital image of the flotation cells from the manufacturer (Henan Fantianliang Machinery & Equipment Co., Ltd)

2.3.2.1.4 Thickeners

Thickeners are used for separating water from solids. Therefore, the use of thickener will allow **maximum recovery of water** from the plant. In essence, the plant will have two thickeners:

1. **Copper concentrate thickener** – for recovering water from the copper sulphide concentrate.
2. **Copper oxide thickener** - for recovering water from the copper oxide concentrate.

Each thickener will be **enclosed in a bund wall** to prevent any spillage of the material to the ground.

2.4 Water demand for the froth flotation process

Total water consumption for froth flotation will be about **1.5 cubic meters per ton** of copper

ore. As a result, **225 cubic meters** of water will be required **per day**. Water will be obtained from **two (2) boreholes** which will be drilled at the site. Each borehole is expected to have a delivery rate of **2- 4 litres per second** or **7.2 - 14.4 cubic meters per hour**. It is worth noting that **60 - 70 % of the water** will be **recycled** from the tailings material and hence only **30 - 40 % of fresh water** will be required which is equivalent to **68 - 90 cubic metres per day**.

2.5 Source of the copper ore for the processing plant

The copper ore will be obtained from the mines owned by the proponent in partnership with **Mithikwani Self Help Group** in Mithikwani area and any other legal copper mine within Kitui County at a grade of less than **2 weight % copper**. The typical composition of the ore is shown in Table 2 where it can be observed that the material mainly contains **iron oxide, silica, aluminium, calcium, magnesium, titanium, and potassium oxides** which are chemically inert elements. It is worth noting that the material contains no toxic elements such as **arsenic and lead**.

Table 2: Typical composition in weight % for the copper ore

Cu	Fe ₂ O ₃	CaO	SiO ₂	K ₂ O	Al ₂ O ₃	MgO	TiO ₂	Zn	Pb	As
< 2	5 - 12	5 - 1 5	4 0 - 6 0	1 - 3	5 - 15	5 - 12	<5	< 0. 1	< 0. 1	<0.01

2.6 Products from the copper ore flotation plant

The plant is designed to treating **100 tons per day** of the copper ore feed. It is expected to be producing the following products:

1. **1 - 3 ton of copper sulphide concentrate** flotation concentrate per day at grade of more than **25 weight % copper**.
2. **5 - 7 tons of copper oxide flotation concentrate** per day at grade of more than **25 weight % copper**.
3. **90 - 120 tons** of tailings per day.

2.7 List of Chemicals to be used at the processing plant

Full list of chemicals that will be used in the process and their monthly consumption are shown in Table 3. It is worth noting that the chemicals in Table 3 are less harmful to the environment unless present in large quantity. They are used by all large companies worldwide.

Table 3: List of chemicals

S/N	Chemical Name	Monthly Consumption (kg)
1	Sodium hydrogen sulphide	5,400
2	Sodium ethyl xanthate	2,700
3	Sodium butyl xanthate	1,800
4	Pine oil	405
5	Lime	4500

2.8 Other Mine Infrastructure

2.8.1 Site Drainage

Archers Post Investments Limited will control the water from flowing all over the mine site, especially during the rainy season. To this effect, during periods of rain, there will be some surface runoff, open channel flow and standing water in low areas. Nominal grading and ditching will be adequate to maintain a well-drained site. Finish grade on the project site will be constructed to provide positive drainage away from structures. A system of ditches will route runoff around the project site and the ore stockpile, waste rock dumps, pit perimeter etc. This routing will also be done for the waste rock dump site. This way, it will be done to prevent the direct flow of water into the river system.

2.8.2 Power Supply

The primary source of power for the proposed copper ore flotation plant will be electricity supplied by the national grid. This will cater for the bulk of the energy requirements needed for the operation of various plant components, including the crushing unit, flotation

systems, laboratory equipment, and administrative facilities. To ensure uninterrupted power supply and operational continuity in the event of grid outages or voltage fluctuations, diesel-powered generators will be installed and maintained as a backup power source. This dual power arrangement is intended to enhance energy reliability and operational resilience throughout the life of the project.

2.8.3 Water Sources

Water required for the copper ore flotation and related processing activities will primarily be sourced from **two boreholes** that will be drilled within the boundaries of the proposed project site. These boreholes are intended to provide a sustainable and dedicated water supply to support the various operational needs of the plant, including ore crushing, flotation processes, dust suppression, sanitation, and general domestic use within the worker accommodation facilities.

Prior to any abstraction of groundwater, the proponent, Archers Post Investments Limited, will seek and obtain the necessary water abstraction permits from the Water Resources Authority (WRA) as per the requirements of the Water Act, 2016. The permitting process will include conducting hydrogeological investigations to determine the feasibility and sustainability of groundwater extraction, as well as ensuring compliance with national water resource management regulations.

In addition to meeting regulatory obligations, the project will adopt water-efficient technologies and implement water recycling measures within the processing circuit to minimize wastage and promote sustainable water use throughout the project's lifecycle.

2.8.4 Waste Management Facilities

The proposed copper ore flotation plant will be equipped with comprehensive waste management systems designed to handle both liquid and solid waste in an environmentally responsible manner. Given that the project site is not connected to a centralized sewerage system, the design incorporates on-site sanitation infrastructure to manage domestic wastewater and sewage generated from staff quarters, office facilities, and other operational areas.

A septic tank and soakage pit system will be constructed to handle sewage effluent. This

system will be properly engineered to ensure effective decomposition of organic matter and safe percolation of treated effluent into the surrounding soil without contaminating groundwater. To enhance structural integrity and longevity, all drainage pipes passing beneath buildings and across the site will be made of heavy-duty PVC, laid with an appropriate slope to ensure smooth flow, and encased in a 150 mm thick concrete layer for protection against external load and mechanical damage.

Furthermore, manholes located within building areas and across the yard will be fitted with heavy-duty, airtight covers to prevent odour emissions, enhance safety, and minimize the risk of stormwater infiltration or rodent entry.

In terms of solid waste management, the facility will be fitted with strategically located waste collection containers and bins that will be clearly marked and sized appropriately to handle various waste streams, including general waste, recyclables, and hazardous materials. Solid waste generated from the plant operations including packaging materials, domestic refuse, and maintenance waste will be regularly collected, sorted, and disposed of in accordance with the Environmental Management and Coordination (Waste Management) Regulations, 2006. Hazardous waste, if any, such as laboratory reagents or fuel residues, will be handled separately and disposed of through licensed hazardous waste handlers.

Overall, the project will emphasize compliance with national waste management laws and best practices to safeguard environmental and public health, while minimizing the project's ecological footprint.

2.8.5 Fuel Storage and Distribution

Diesel fuel will be delivered to the site by tanker truck. Diesel fuel requirements for the plant equipment and ancillary facilities will be supplied from a diesel fuel storage tank to be located at the proposed project site. Diesel fuel distribution will be limited to loading and unloading facilities and metering equipment at the diesel fuel tank. The details for the fuel storage facility including the design will be provided by the company that will be chosen to supply the company with fuel. It should, however, be noted that the above details will only apply at operational stage. For the construction period, diesel will be stored on temporal storage facility i.e. banded concrete place. Archers Post Investments Limited will ensure that

only 5 drums are kept onsite at any given time. This will be done to avoid accidents. Lubricants will be delivered to the site in drums. The drums will be stored in a secure area. The lubricants will be distributed to hose reels in the truck shop service bay with barrel pumps.

2.9 Project activities

Activities related to implementation of the proposed project are summarized in the following sub-sections.

2.9.1 Activities during Construction Phase

The following will be the activities to be undertaken during this phase.

- ❖ Hiring of construction workforce
- ❖ Mobilization of construction equipment to the site
- ❖ Site clearing, excavation, leveling, grading and compaction of the ground
- ❖ Delivery of construction materials to the site
- ❖ Concrete mixing
- ❖ Construction of concrete slab, bund walls, washrooms and office block
- ❖ Preparation of pipe and cable bridges/racks, service ways, ducts and trenches
- ❖ Installation of associated piping works
- ❖ Laying down of concrete storm water drainage channel incorporating oil/water interceptor.
- ❖ Plumbing works
- ❖ Constructing tailing storage facility
- ❖ Construction of administration office block
- ❖ Construction of generator house
- ❖ Construction of product stockpile warehouse
- ❖ Construction of raw material stockpile area
- ❖ Setting up the septic tank and soakage pit
- ❖ Setting up of the concrete pits
- ❖ Constructing laboratory facilities
- ❖ Setting up the froth flotation plant

- ❖ Power supply installation
- ❖ Power supply connection
- ❖ Erection of a masonry stone wall perimeter fence and
- ❖ Site finishing works including plastering, painting, decoration, grading, protection and hard landscaping.

2.9.2 Activities during Operation Phase

Activities during operation phase of the proposed project will entail the following:

- ❖ Purchase of copper ore from the licensed and legal copper mines within Kitui County.
- ❖ Delivery of copper ore to the site using trucks.
- ❖ Offloading and storage of copper ore at the raw material stockpile area
- ❖ Wet crushing of the copper ore at the crushing unit
- ❖ Grinding of the crushed copper ore for final size reduction in a ball mill
- ❖ Undertaking froth flotation for the grinded copper ore
- ❖ Storage and/or transfer of copper sulphide concentrates and copper oxide concentrates in the product stockpile warehouse
- ❖ Storage of the copper tailing (waste from the flotation plant) in the tailings storage facility
- ❖ Selling copper concentrates to the third parties

2.9.3 Activities during Decommissioning Phase

Decommissioning is the last phase of project life. It involves terminating project activities and operations and rehabilitation site to or close to its original state. The project proponent will be required to prepare a decommissioning plan on how the proposed facility would be demolished if need arises and how the site would be rehabilitated to its original state or close to original state. In decommissioning the proposed facility there are two main options that could be considered. These are:

- ❖ Either to sell the facility intact or;
- ❖ To remove all installed equipment and close operations.

In the event that operations at the facility must come to a close, then the following would be done: -

- 1) Dismantling of the equipment
- 2) Laying off employees
- 3) Removal of electrical and water infrastructure
- 4) Demolition of structures
- 5) Sampling of soils and ground water
- 6) Site rehabilitation
- 7) Disposal of land

1. Dismantling and disposal of the Equipment

The mode of equipment disposal will depend on the functionality of the equipment at the time of decommissioning. Some equipment will be sold or retained for future use. Those which will be grounded would be sold as scrap or spare parts for reuse.

2. Laying Off Employees

Employees would need to be informed in advance of the closure so as to be mentally prepared to face the new way of life. Where possible the proponent would be required to enter into a buy-off scheme with similar business establishments or if not the case, pay them their work /terminal benefits according to labour laws.

3. Emptying and Disposal of Storage Facilities

When emptying the storage facilities, caution would be taken on environmental and safety issues. Some of the facilities would be sold to other companies with similar undertakings and the remaining ones given out to local workshops.

4. Demolition of Structures on Site

The management would enter into a dialogue with the owner of the plot on which the facility is situated with a view to selling the structures to him/her. If this will not be possible then the structures including the office block, toilet, concreted yard and washrooms would be demolished. The following would be taken into consideration: -

1. All employees involved in the demolition exercise must be in proper protective gear;
2. Demolition should be done during day time only;
3. Care must be taken to avoid destruction of trees and other vegetation on site during

the exercise; and

4. Waste resulting from demolition must be disposed of at designated waste disposal sites through NEMA licensed waste handlers.

5. Site rehabilitation

Once demolition is completed, rehabilitation of affected site should be undertaken to its original state or close to original state. Site rehabilitation will include the following: -

1. Sewage facilities must be emptied first;
2. Levelling of the ground;
3. Test and analysis of soil from site before rehabilitation begins. If found to be contaminated then decontamination exercise must be carried out.
4. Re-vegetation as may be agreed upon by the land owner

6. Disposal of land

The land on which the facility will be built is leased. Therefore, once site rehabilitation is completed the land will be surrendered to the owner for a similar or different use.

2.10 Project Budget/Cost

The project cost is manageable and affordable to the proponent. The costs will mainly be in relation to hiring of necessary machinery used in construction and payment of the workers on site. **0.1%** of the total cost of the project will be paid to NEMA with a minimum of **10,000**. This has been effective since **1st June, 2022**. Therefore, a Bill of Quantities has been derived. The proposed cost of the project is estimated at **sixty-four million, eight hundred and sixty-four thousand, seven hundred and nineteen Kenya Shillings (Kshs. 64,864,719.00)**.

CHAPTER THREE: BASELINE CONDITIONS OF THE PROJECT SITE

3.1 Overview

Baseline conditions of the project site were assessed and documented for the purposes of determining the future impacts of the proposed project on the environment and the local community. This section details on the environmental, socio-economic and bio-physical characteristics of the site, and the findings of the survey which will form a basis for impact monitoring plans and improvement of the environmental and social performance of the project during implementation.

3.2 Demographics

Kitui County has a total population of **1.2 million** people as of 2024. Data from 2019 indicated that there are **262,942 households** with an average household size of **4.3 persons per household**, and a population density of **37 people per square Kilometre**. Matinyani Sub-County where the proposed project site will be located has a population of **47,810** with **23,362 males** and **24,448 females**.

3.3 Physical and Topographic Features

3.3.1 Geology and soils

The project site is overlain by red well drained sandy loam soils which have quartz and feldspar grains and felsic gravel rock fragments. The project site has a similar geology composed of high grade regional metamorphic granitoid granulites which are composed of Quartz and feldspars. The rocks have good quality engineering properties. The project site is far from any active seismicity. The site has no geological structures such as faults, joints, foliation planes which adversely affect the building structures and in conclusion the site is ideal for the proposed project development.

3.3.2 Topography

The proposed project site features an uneven terrain with a mix of gentle slopes and scattered rocky outcrops. This natural landscape will require site leveling and grading to ensure stability for construction works.

3.3.3 Climate and vegetation cover

The project area experiences a hot, dry, and semi-arid climate with consistently high

temperatures ranging from 14°C to 32°C throughout the year. Rainfall is low, erratic, and unreliable, following a bimodal pattern with short rains occurring from March to May and long rains from October to December. Annual precipitation is typically below 500mm, similar to the broader Kitui County.

Due to the arid conditions, vegetation at the site is sparse and mainly consists of drought-tolerant species such as *Commiphora baluensis*, *Acacia tortilis*, *Senna abbreviata*, and herbaceous plants like *Brachyrhiza leersioides*. The fauna includes common species such as weaver birds, snakes, and monitor lizards. Notably, there are no rare, endangered, or nuisance-prone species of flora or fauna observed at the site.

3.3.4 Water resources and local hydrogeology

Seasonal rivers and streams form a major source of water for domestic and livestock watering within the project site. Other water sources that supplement this during dry periods are sandy riverbeds, shallow wells, earth dams and boreholes. The proposed project will source water from two boreholes that will be drilled within the proposed project site.

3.3.4 Infrastructure

The proposed project site is currently accessible through an earth road, which, while usable in dry conditions, is in a deteriorated state and becomes difficult to navigate during the rainy season due to poor drainage and surface erosion. Improvement of this road will be necessary to facilitate smooth transportation of equipment, materials, and personnel, especially during the construction and operational phases of the project.

In terms of communication infrastructure, the site is well-covered by major mobile service providers, including Safaricom and Airtel, ensuring reliable mobile and internet connectivity for project operations and coordination. This will support effective communication between workers, management, and external stakeholders throughout the project lifecycle.

Although the site is not yet connected to the national electricity grid, power lines run a few kilometers from the location, making grid connection a feasible option for the primary energy supply. Backup power will be provided through diesel-powered generators to ensure continuous operations in case of outages.

Currently, the project site is undeveloped and characterized by natural vegetation, primarily consisting of grasses, shrubs, and scattered dryland trees. It borders undeveloped land, cultivated fields, and a few homesteads owned by the landowner, indicating a mix of agricultural and residential land use in the surrounding area. These conditions present a relatively low level of disruption to existing infrastructure, offering an opportunity for sustainable development of the proposed copper ore flotation plant.

3.4 Land use patterns and socio-economic activities

The land use pattern in Mithikwani area is predominantly rural, characterized by dispersed human settlements and a landscape largely utilized for subsistence-based economic activities. The primary land uses include small-scale farming, livestock rearing, and apiculture (beekeeping), which serve as the main sources of livelihood for the majority of the residents. Additionally, the area supports artisanal and small-scale mining, particularly of copper ore, which provides supplemental income to some households.

As outlined in the Kitui County Integrated Development Plan (CIDP), the project area falls within agro-ecological zone ML-4. This zone is semi-arid and supports the cultivation of drought-resistant crops such as maize, green grams (ndengu), and sorghum. These crops are mainly grown for household consumption with surplus sold in local markets. The community also engages in tree harvesting for timber and charcoal production, contributing both to income generation and environmental pressure.

Formal employment opportunities are limited and primarily found within the public sector, including the County and National governments. A smaller portion of the population is employed in private enterprises located in Kitui town and its environs. The overall employment landscape remains informal and heavily reliant on natural resource-based activities.

Socio-economically, the area experiences high levels of poverty. According to the 2016 statistics referenced in the CIDP, the absolute poverty rate in Kitui County was estimated at 47.5%, significantly higher than the national average of 36.1%. This suggests a substantial portion of the population struggles to meet basic needs, making development initiatives such as the proposed project potential catalysts for economic improvement if implemented

sustainably.

3.5 Climate Change Risk and Vulnerability

Kitui County, including Matinyani Sub-County where the proposed copper ore flotation plant will be situated is predominantly occupied by agro-pastoralist communities whose livelihoods are heavily dependent on rain-fed agriculture and livestock rearing. The region is classified as semi-arid, characterized by low and unreliable rainfall, which has increasingly become unsuitable for sustainable agricultural production due to the adverse impacts of climate change.

In recent years, climate variability has significantly undermined traditional agricultural practices, forcing local populations to adapt by diversifying into mixed farming systems. Climate resilience in the region now relies more on the combined income from both crop and livestock activities rather than from either sector alone. The county faces several recurrent and intensifying climate-related hazards that adversely affect both rural and urban populations, with the most vulnerable groups including women, youth, the elderly, low-income households, and minority groups bearing the brunt of these impacts.

3.5.1 Key Climate Hazards in Kitui County

1. Drought

Drought is the most persistent and devastating climatic hazard in the region. Its impacts include:

- Acute water scarcity for domestic, livestock, and agricultural use.
- Food insecurity due to crop failure and livestock deaths.
- Shortage of pasture and fodder for livestock.
- Escalation of human-human and human-wildlife conflicts over dwindling resources.
- Increased incidences of rural-urban migration, crime, and social issues such as early marriages and school dropouts.
- Outbreaks of climate-sensitive diseases.

2. Environmental Degradation

Driven by deforestation, poor waste management, point-source pollution, and unsustainable land use, environmental degradation results in:

- Loss of biodiversity and natural habitats.
- Drying up of rivers and other water sources.
- Decreased ecosystem services and natural resource productivity.
- Reduced aesthetic and recreational value of the environment.

3. Flash Floods

Although rainfall is generally low, intense flash floods periodically occur in lowland areas, leading to:

- Destruction of water and sanitation infrastructure.
- Damage to transportation and communication networks.
- Habitat disruption, soil erosion, and sedimentation.
- Crop destruction, livestock losses, and human fatalities.
- Increased disease outbreaks due to stagnant water and contaminated sources.

4. Extreme Temperatures

- The region experiences high temperatures year-round, with effects such as:
- Increased emergence of agricultural pests and livestock diseases.
- Reduced livestock productivity due to heat stress.
- Heightened risk of heat-related illnesses and snake bites.

3.5.2 Climate Vulnerability Drivers in the Project Area

- Subsistence Agriculture Dependency:** The population's reliance on small-scale, rain-fed farming heightens their exposure to climate shocks.
- Crop Sensitivity:** Predominant crops such as maize, sorghum, and beans are particularly susceptible to temperature fluctuations and irregular rainfall.
- Inadequate Water Infrastructure:** Limited irrigation systems and reliance on seasonal rainfall leave the community exposed to drought and dry spells.
- Contaminated Water During Flooding:** Floods degrade water quality, increasing the risk of waterborne diseases.
- Widespread Poverty:** High poverty rates constrain local capacity to invest in adaptive measures such as drought-resistant crops, water harvesting technologies, and health services.

3.5.3 Integrating Climate Resilience Measures

In light of the identified climate vulnerabilities, the proposed project should prioritize climate resilience through the integration of water-efficient technologies, green infrastructure, and climate-smart planning. These measures will ensure not only the environmental sustainability of the project but also create long-term community co-benefits.

3.5.3.1 Water-Efficient Technologies

The project will incorporate advanced water conservation practices to optimize the use of water resources. This includes the use of water-efficient equipment and technologies such as rainwater harvesting systems, reducing reliance on external water sources and enhancing water availability during droughts. Additionally, the site will utilize a closed-loop water management system, where process water is recycled within the plant, minimizing water wastage and preserving the surrounding environment.

3.5.3.2 Green Infrastructure

The project will integrate green infrastructure elements such as permeable surfaces for stormwater management, green roofs, and tree planting along site boundaries to help mitigate the effects of soil erosion. These practices will also help improve biodiversity, enhance aesthetic values, and reduce the urban heat island effect in the area. Vegetation buffers around the site will help reduce the impact of extreme weather events, while also serving as habitats for local wildlife, promoting ecological balance and conservation.

3.5.3.3 Climate-Smart Planning

The proposed copper ore flotation plant will be designed using climate-smart principles, which include evaluating potential climate risks and adapting operations to minimize those risks. For example, designing infrastructure that is resilient to both droughts and floods and ensuring that operations remain efficient despite temperature fluctuations. The facility will also prioritize low-carbon technologies, reducing its environmental footprint and contributing to the reduction of greenhouse gas emissions in line with national and international climate commitments.

3.5.3.4 Community Co-Benefits

By incorporating climate resilience into the project design, the project will not only protect

the environment but also contribute positively to the community's adaptation to climate change. The project will create job opportunities related to climate adaptation and resilience, particularly in areas such as water management, environmental monitoring, and green infrastructure maintenance.

In conclusion, the integration of climate resilience measures in the proposed project will not only help mitigate the adverse effects of climate change but also contribute to the overall well-being and sustainability of the local community, ensuring that the project aligns with both local development goals and global environmental standards.

CHAPTER FOUR: POLICY, LEGISLATIVE AND REGULATORY FRAMEWORKS

4.1 Introduction

This section identifies the most pertinent legislation and regulations and standards governing the environmental quality, solid and liquid waste management, health and safety, protection of sensitive areas, land use control at the national and local levels and ecological and socio-economic issues.

4.2 Social Issues

There is no legal instrument in the country that addresses social issues in development interventions. However, over the years, the Kenya Government has recognized the importance of entrenching social dimensions of development in its development agenda. Notably, development initiatives are required to deliberately ensure that the marginalized and more vulnerable people in society are actively involved in development processes. Thus, the new constitution has emphasized on the need for public participation and awareness on any development initiatives.

4.3 Environmental Issues

It is the Government's policy that the rights of its citizens to clean and health environment are met. In return, every person has responsibility to protect and manage the environment. In this regard, the Government enacted the EMCA (2015) and the Environmental Impact Assessment and Audit Regulations (2003) to provide a framework law for the coordinated management of environment.

Both the EMCA and the EIA regulations require ESIA to be undertaken for certain new projects. The umbrella body administering this requirement is NEMA. The Authority has a designated Environmental Committees to oversee the implementation of the EMCA. With the observance of international laws by organizations such as the World Bank, it's now possible to factor social impacts of proposed development projects.

4.4 Applicable Laws and Regulatory Frameworks

4.4.1 Environmental Management and Co-ordination Act (EMCA amendment Act) 2015

The Environmental Management and Co-ordination EMCA 1999 was amended in 2015 to

include the provisions of the constitution and other emerging issues. It provides the Legal and Institutional framework for the management of the environment and for matters connected therewith and incidental thereto. Section 3 of the Act, provides for the entitlement of a clean and healthy environment for every citizen. It is also the duty of the citizens to safeguard and enhance the environment in accordance with the Constitution and sectoral laws. The Act is intended to ensure that our activities do not compromise the capacity of the resource base to meet the needs of the present generation as well as those of future generations.

Section 58 (2) requires the proponent of any project specified in the Second Schedule of EMCA shall undertake a full Environmental and Social Impact Assessment study and submit an environmental and social impact assessment study report to NEMA for approval prior to being issued with any license to undertake the project. Part (7) of this Section states that Environmental and Social Impact Assessment shall be conducted in accordance with the Environmental and Social Impact Assessment Regulations, Guidelines and Procedures issued under this Act.

Section 63 of the Act, provides for the environmental Impact Assessment License which states that; NEMA after being satisfied to the adequacy of an Environmental and Social Impact Assessment Study, evaluation and review report, issue an Environmental and Social Impact Assessment License on such terms and conditions or may be appropriate and necessary to facilitate Sustainable Development and sound Environmental Management. The proponent has developed this report for the issuance of the **ESIA license**.

The proposed “*froth flotation plant and associated facilities*” project is listed in **Schedule 2** of this Act and also as a high-risk project with anticipated environmental impacts implications at Construction, Operation and Decommissioning Phases. *The proponent has complied with the EMCA Act by undertaking an Environmental and Social Impact Assessment of the proposed project. The proponent will undertake annual environmental and social audit of the facility after one year of its operation.*

4.4.2 The Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019

The regulation gives a guidance on different projects based on their **risk levels** and the category of EIA to be done, under the regulation, the projects are categorized as either **low risk, medium risk or medium risk** projects. The regulation states that, every proponent undertaking a project specified in the Second Schedule of the Act as being a low-risk project or a medium risk project, shall submit to the Authority a **summary project report** of the likely environmental effect of the project.

A proponent undertaking a **high-risk project** specified in the Second Schedule of EMCA 1999 (reviewed 2015) shall submit to the Authority a **study report** of the likely environmental effect of the project. The regulation through the **Legal notice no. 31 & 32** of 2019, outlines guidance on the procedure of conducting an EIA and what is required. Under the **Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019** guidelines, gazette Notice 31, the proposed project falls under **high-risk project** category 9a - *(mineral or ores refining and processing)*. *The proponent therefore initiated a full ESIA study which was conducted based on the EIA/EA regulation of 2019.*

4.4.3 Environmental Management and Co-ordination (Water Quality) Regulations 2006

These regulations aim to ensure the sustainable management of water resources, preventing water pollution and protecting water sources such as lakes, rivers, streams, springs, and wells.

Key provisions include:

- **Regulation 4 (2):** It is an offence to discharge any liquid, solid, or gaseous substance into or near a water resource that causes pollution.
- **Regulation 6:**
 - (a) Discharge of effluent from sewage treatment, industrial, or other point sources into water bodies requires a valid effluent discharge license.
 - (b) Abstraction of groundwater or activities near water bodies that could negatively impact water quality and quantity also require an Environmental Impact Assessment

(EIA) license.

- (c) Development or cultivation within 6 to 30 meters from rivers or streams is prohibited without approval from the relevant authorities.
- **Regulation 11:** It is an offence to discharge pollutants, including poisons, toxins, or radioactive waste, into the aquatic environment unless it meets effluent discharge standards.

For the proposed project, the proponent must ensure that wastewater from the froth flotation plant and associated buildings is not discharged into nearby water sources. Additionally, the tailings storage facility should incorporate containment measures, such as double-lined tailings ponds, to prevent leakage into the soil and groundwater, complying with the regulations for water protection.

4.4.4 Environmental Management and Co-ordination (Waste Management) (Amendment) Regulations, 2025

The Environmental Management and Co-ordination (Waste Management) (Amendment) Regulations, 2025, gazetted under Legal Notice No. 24 of 2025, represent a critical enhancement to Kenya's waste management framework, formulated under Sections 92 and 147 of the Environmental Management and Co-ordination Act (EMCA), Cap 387. The amendments aim to align national waste management strategies with sustainable development, circular economy principles, and climate resilience.

Key Provisions and Requirements

1. Mandatory Source Segregation and Color-Coding of Waste

All waste generators are legally required to segregate waste at the point of generation into the following clearly marked color-coded receptacles:

- **Green Bins** – for biodegradable/organic waste.
- **Blue Bins** – for recyclable waste such as plastics, metals, and glass.
- **Black Bins** – for general or non-recyclable waste.

This system is designed to improve waste recovery, recycling efficiency, and minimize contamination of recyclable materials.

2. Licensing and Tracking of Waste Transportation

- Waste transporters must be licensed by the National Environment Management Authority (NEMA).

All transportation vehicles must:

- Be appropriately labeled to reflect the type of waste carried.
- Carry waste tracking documentation (waste tracking notes), which should be presented upon inspection by relevant enforcement authorities.

This ensures traceability and accountability in the handling and final disposal of all waste streams.

3. Cleaner Production and Waste Minimization Strategies

The amended regulations emphasize the adoption of cleaner production techniques, including:

- Efficient use and conservation of raw materials and energy.
- Avoidance of hazardous materials where alternatives exist.
- Reduction of toxic waste emissions and effluents.
- Product lifecycle analysis to support recovery, reuse, recycling, and eco-design.

This provision compels project developers to integrate waste reduction strategies at the design, operation, and decommissioning phases.

4. Enhanced Management of Hazardous and Industrial Waste

Generators of hazardous waste are mandated to:

- Conduct risk assessments and prepare waste management plans.
- Ensure safe storage using clearly labeled, leak-proof, and secured containment systems.
- Obtain a valid Environmental Impact Assessment (EIA) License for any activity that generates or handles hazardous substances.
- Utilize licensed and compliant disposal or treatment facilities.

5. Integration of Climate Resilience into Waste Management

The regulations promote climate-smart and environmentally sound waste management practices, including:

- Use of green infrastructure and waste-to-resource technologies.
- Adoption of low-emission technologies in waste handling and treatment.
- Encouragement of circular economy models, such as reuse and materials recovery, that reduce climate-related vulnerabilities and environmental burdens.

The proponent of the proposed project must fully align with these regulatory provisions by undertaking the following measures:

- Implementing Integrated Solid Waste Management (ISWM) at the project site, incorporating waste segregation, recycling, composting, and safe disposal.
- Ensuring all processed tailings and other industrial waste from mineral beneficiation processes are assessed for toxicity and managed in accordance with hazardous waste handling protocols.
- Engaging licensed NEMA waste handlers for transportation and disposal, with regular audits to ensure compliance.
- Incorporating cleaner production techniques in project design to minimize waste and maximize efficiency.
- Designing infrastructure such as tailings storage facilities with advanced containment systems (e.g., double-lined ponds) to prevent groundwater contamination.

Including climate resilience measures, such as:

- Efficient water and energy usage.
- Recycling of waste materials.
- Planning for extreme weather events that could affect waste storage or containment.

4.4.5 Environmental Management and Co-ordination (Noise and Excessive Vibrations) Regulations 2009

Part II of the general prohibition of this regulation state that except as otherwise provided for in this regulation, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. The regulation sets the levels of noise that may be provided during the day and at night as shown in Table 4.

Table 4: Noise Levels Allowed by Noise Regulations

Zone		Sound dB(A)(Level Limits $L_{eq, 14h}$)		Noise Rating Level (NR) ($L_{eq,14h}$)	
		Day	Night	Day	Night
A	Silent Zone	40	35	30	25
B	Places of worship	40	35	30	25
C	Residential: Indoor	45	35	35	25
	Outdoor	50	35	40	25
D	Mixed residential (with some commercial and places of entertainment)	55	35	50	25
E	Commercial	60	35	55	25

The proponent and his contractors will ensure noise and vibration generated from construction machinery, and crushing of copper ore will be within the limits set out in this regulation. The construction and crushing of copper ore will be done during the day. Furthermore, the contractor and their subcontractors will ensure that their equipment is serviced properly and/or use equipment that complies with the threshold noise values given above in table 4.

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

Under Section 5 of the regulations (General Prohibitions), it is unlawful for any individual or entity to engage in activities that may result in direct or indirect air pollution, whether immediately or over time. Schedule 2 outlines priority air pollutants, which include:

- Particulate matter (PM10 and PM2.5)
- Nitrogen oxides (NO_x)
- Sulphur oxides (SO_x)
- Carbon monoxide (CO)
- Volatile organic compounds (VOCs)
- Greenhouse gases (GHGs)

Additionally, **Section 9** prohibits offensive odours, and **Section 10** restricts emissions within controlled areas such as schools, hospitals, residential zones, and densely populated urban areas.

The proposed copper ore froth flotation plant is expected to contribute to air emissions through several operational activities, including:

- Crushing and grinding of copper ore, which may release particulate matter (PM) into the surrounding air.
- Froth flotation processes, which can emit VOCs and potentially odorous compounds from chemical reagents (e.g., xanthates, pine oil, and frothers).
- Diesel-powered generators and machinery, which may emit NO_x, CO, and GHGs.

If uncontrolled, these emissions may negatively impact ambient air quality and pose health risks to workers and nearby communities. The project area must, therefore, comply with the air quality thresholds set by NEMA under this regulation.

To align with these regulatory requirements, the proponent will adopt the following control measures:

- **Dust control:** Implement wet crushing and regularly sprinkle water on haul roads and ore handling areas to suppress dust.
- **Odour management:** Use enclosed reagent storage and dosing systems to prevent release of VOCs and odorous emissions.
- **Emission reduction:** Ensure all on-site diesel-powered machinery is well maintained and fitted with emission control devices.
- **Covered transport:** Use covered trucks for transporting crushed ore and tailings to prevent fugitive emissions.
- **Green buffer zones:** Establish vegetative buffers around the facility to help trap dust and improve air quality.
- **Air quality monitoring:** Install ambient air quality sensors at strategic locations to monitor levels of PM, VOCs, and other pollutants.

4.4.7 Water Act, 2016

This is an Act that replaces the old water Act of 2002. It provides for the regulation, management and development of water resources, water and sewerage services; and for other connected purposes. It is meant to align the water sector with the new Constitution's primary objective of devolution. The Act recognizes that water related functions are a shared responsibility between the national government and the County government. **Section 23(l)**

of the Water Act provides that the Authority may declare an area to be a ground water conservation area, where it is satisfied that, in any area, special measures for the conservation of ground water are necessary in the public interest for the protection of public water or water supplies used for industry, agriculture or other private purposes; the conservation of the water resources of the aquifer of the ground water resources; or ecological reasons.

Section 36 of the Water Act 2016 provides that a permit is required for any of the following purposes:

1. Any use of water from a water resource, except as provided by section 37 of the Act;
2. The drainage of any swamp or other land;
3. The discharge of a pollutant into any water resource; and
4. Any other purpose, to be carried out in or in relation to a water resource, which is
5. Prescribed by Regulations made under this Act to be a purpose for which a permit is required.

Further, Section 42(1) provides that the conditions on a permit may require that on the issue of the permit and at prescribed intervals thereafter, the permit holder shall pay charges to the Authority for the use of water in accordance with the terms of the permit and the Regulations prescribed by the Authority.

Section 37(1) provides that a permit is not required:

1. For the abstraction or use of water, without the employment of works, from any water resource for domestic purposes by any person having lawful access to the water resource;
2. For the abstraction of water in a spring which is situated wholly within the boundaries of the land owned by any one landholder and does not naturally discharge into a watercourse abutting on or extending beyond the boundaries of that land; or
3. For the storage of water in or the abstraction of water from a reservoir constructed for the purpose of such storage and which does not constitute a water course for the purposes of this Act (The Act defines a watercourse as any natural channel or

depression in which water flows regularly or intermittently).

In order to drill the two boreholes to supply water to the facility, the proponent will apply for an authorization permit from Water Resource Authority (WRA). Throughout the course of the project, the proponent will also see to it that the necessary safeguards are put in place to prevent contamination of sources of surface and subsurface water.

4.4.8 The Physical and Land Use Planning Act, 2019

The Act provides for the planning, use, regulation and development of land and for connected purposes. It was enacted to ensure that every person engaged in physical and land use planning shall promote sustainable use of land and liveable communities which integrates human needs in any locality. The Act allows the County Government to prepare a local physical and land use development plan in respect of a County, Sub-County, or unclassified urban area.

The project area, while not officially zoned, is in Kitui County's rural setup. Agriculture is the primary land use in the area. In order to comply with the provisions of this Act, the proponent initiated a change of extension from agricultural to include industrial use (copper ore flotation plant) (approved change of extension attached).

4.4.9 Mining Act, 2016 Cap 306

Part 2 of the Act specifies that a project of this nature requires a mining permit. Sections 19 and 42 provides for disclosure of information as required by the Act. Giving false or withholding information required by this Act is guilty of an offence. Section 57 (1) requires any person to apply to the Commissioner leave to lease and treat and remove any tailings. If the tailings are in private land, Section 26 requires the that the a lessee shall be liable, on demand duly made, to pay to such owner or occupier fair and reasonable compensation for any disturbance or nuisance or damage, as the case may be, according to their respective rights or interests (if any) in the property concerned.

Subsection (a) If such a person or his successor in title fails to pay compensation when demanded under subsection (1), or if an owner or occupier is dissatisfied with the compensation offered, such an owner or occupier may, within one month of such a demand having been made, refer the matter to the Court. The Act states that the holder of a permit or

license under this Act shall use the land in accordance with the terms of the permit or license and will ensure the following:

1. Sustainable use of land through restoration of abandoned mines and quarries;
2. The seepage of toxic waste into streams, rivers, lakes and wetlands is avoided;
3. Disposal of any toxic waste is done in the approved areas only;
4. Blasting and all works that cause massive vibration is properly carried out and muffled with the EMCA, 1999 (Cap. 387), Amendment 2015; and
5. Upon completion of prospecting or mining, the land in question is restored to its original status or to an acceptable and reasonable condition as close as possible to its original state.

Royalty Obligation: Holders of mining licenses are required to pay royalties to the government on minerals extracted.

Royalty Rates: The rates are determined by the Cabinet Secretary and vary depending on the type of mineral. The rates are typically expressed as a percentage of the gross sales value of the mineral.

Non-Compliance Penalties: Failure to pay royalties or submit accurate returns can result in penalties, including fines, interest on overdue amounts, and potential suspension or revocation of mining licenses.

The proponent has fulfilled the requirement of leasing the land from the landowner where he is going to do construct copper froth flotation plant and associated facilities, (Lease documents are attached in this document). The Proponent will rehabilitate the affected areas after the proposed project activities.

4.4.10 Public Health Act 1986 (Cap. 242) Revised 2012

The Public Health Act outlines how different aspects of a project have to be undertaken to ensure the safety and health of users and neighbours. The Act gives guidelines on construction, maintenance and inspection of drainage system, septic tanks or latrines. Part IX, section 115 of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires that County Authorities take all lawful, necessary and reasonably practicable measures to maintain their

jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health.

Section 118 Such nuisances as waste pipes, sewers, drainers or refuse pits in such state, situated or constructed as in the opinion of the Medical Officer of Health to be offensive or injurious to health. Any noxious matter or waste water flowing or discharged from any premises into the public street or into the gutter or side channel or watercourse, irrigation channel, or bed not approved for discharge is also deemed as nuisance. Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin.

Under this Act the proponent will adapt practicable measure to prevent injurious and nuisance conditions on the project site. The proponent will ensure the latrines are provided at the site and cleanliness maintained. Human food and water will be stored separately with copper ore processing chemicals to avoid contamination.

4.4.11 Employment Act, Cap 226

Employment Act, Chapter 226 and the Regulation of Wages and Condition of Employment Act Chapter 229 of the Laws of Kenya deal with employee rights. The Employment Act fixes minimum standards of employment, while regulation of wages and conditions of Employment Act creates wages fixing institutions like the wages board and councils to continuously review the human standards of employment on a sector basis. These Acts effectively deal with issues such as prohibition of forced labour, child labour, and discrimination in employment as provided for in the respective International Labour Organizations conventions which Kenya has since ratified.

The proponent shall comply with all the provisions of the Act among which include: prohibiting child labour, equal employment opportunity from people from different segments of the society and creation of a good working environment for the employees.

4.4.12 The Occupational Safety and Health Act (OSHA) 2007

This is an act of Parliament to provide 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 Act was

published in the Kenya Gazette Supplement No. 111 (Acts No.15). It received presidential assent on 22nd October, 2007 and became operational on 26th October, 2007.

The key areas addressed by the Act include:

General duties including duties of occupiers, self-employed persons and employees

1. Enforcement of the act including powers of an occupational safety and health officer
Registration of workplaces
2. Health General Provisions including cleanliness, ventilation, lighting and sanitary conveniences
3. Machinery safety including safe handling of transmission machinery, hand held and portable power tools, self-acting machines, hoists and lifts, chains, ropes & lifting tackle, cranes and other lifting machines, steam boilers, air receivers, refrigeration plants and compressed air receiver
4. Safety General Provisions including safe storage of dangerous liquids, fire safety, evacuation procedures, precautions with respect to explosives or inflammable dust or gas
5. Chemical safety including 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
6. Welfare general provisions including supply of drinking water, washing facilities, and first aid
7. Offences, penalties and legal proceedings

Under section 6 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 (Section 7). According to section 44, potential occupiers are required to obtain a registration certificate from the Director for all premises intended for use as workplaces. Such places shall be maintained in a clean state during the operation phase (section 47).

In relation to fire safety, section 78 (3) requires spillage or leaks of any flammable liquid to be contained or immediately drained off to a suitable container or to a safe place, or otherwise treated to make it safe. Furthermore, a clear and bold notice indicating that smoking is prohibited should be conspicuously displayed in any place in which explosive, highly flammable or highly combustible substances, are manufactured, used, handled or stored-section 78 (5). In addition, necessary precautions for dealing with fire incidents should be implemented including provision of means for extinguishing fire and means for escape, in case of fire, for the persons employed in any workplace or workroom – section 81. As far as disaster preparedness and emergency response program is concerned, section 82 (1) makes it a mandatory requirement for every occupier of a workplace to design evacuation procedures to be used during any emergency situation and to have them tested at regular intervals.

The employers' positive contribution towards the welfare of the employees include provision and maintenance of adequate supply of wholesome drinking water - section 91 and a first aid box or cupboard of the prescribed standard – section 95 at suitable point (s) conveniently accessible to all employees.

Other precautionary measures include: issuance of a permit to work to any employee, likely to be exposed to hazardous work processes or hazardous working environment, including such work processes as the maintenance and repair of boilers, dock work, confined spaces, and the maintenance of machinery and equipment, electrical energy installations, indicating the necessary precautions to be taken – section 96 (1); provision and maintenance for the use of employees, adequate, effective and suitable protective clothing including suitable gloves, footwear, goggle and head coverings in any workplace where employees are likely to be exposed to wet, injurious or offensive substance – section 101 (1).

Throughout the whole project, the contractor(s) and the proponent will guarantee the health and safety of everyone who works at the site. In addition, they shall be accountable for any additional violations of this Act. The ESMP offered provides fundamental guidelines for handling health and safety-related matters.

4.4.13 Work Injury Compensation Benefit Act (WIBA), 2007

This Act provides for compensation for employees on work related injuries and diseases contacted in the course of employment and for connected purposes. The Act includes compulsory insurance for employees. The Act defines an employee as any worker on contract of service with employer. According to this Act, an employee who is involved in an accident resulting in the employee's disablement or death is subject to the provisions of this Act, and entitled to the benefits provided for under the Act. Subsection 3 of section 10 of the Act however states that no employee shall be entitled to compensation if an accident, not resulting in serious disablement or death, is caused by the deliberate and willful misconduct of the employee.

Section 12 of the act stipulates that if an employee is injured in an occupational accident or contracts an occupational disease while the employee, with the consent of the employer, is engaged in any organized first aid, ambulance or rescue work, or firefighting or other emergency services, the accident or disease is for the purpose of this Act, deemed to have arisen out of an in the course of the employee's employment.

A written or verbal notice of any accident shall be given by or on behalf of the employee concerned to the employer and a copy to the Director of occupational health and Safety within twenty-four hours of its occurrence in case of fatal accident. A right to benefits in accordance with this Act shall lapse if the accident is not reported to the employer within twelve months after the date of such accident. However, it shall not bar compensation if it is proved that the employer had knowledge of the accident from any other source.

Section 30 of the Act states that compensation for permanent disablement shall be calculated on the basis of ninety-six months earnings subject to the minimum and maximum amounts determined by the minister after consultation with the board. In case of a fatal accident compensation shall be paid to the dependants of the employee in accordance with the set provisions in the third schedule. The employer shall further be liable to pay reasonable expenses for the funeral of the deceased employee subject to the maximum amount determined by the minister, after consultation with the National council for occupational Health and Safety. *The proponent will put in place the precautionary measures to ensure*

accidents that can be preventable do not happen at the project site. However, in case of an accident, the proponent will comply with the stipulations in the Act. Those working in risky sites should be insured.

4.4.14 The Penal Code (Cap. 63)

The chapter on "Offences against Health and Conveniences" contained in the Penal Code enacted in 1930, section 191 strictly prohibits the release of foul air into the environment, which affects the health of other persons, it also states that if any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. **Section 192**, any person who voluntarily violates the atmosphere at any place, to make it noxious to health of persons in general dwellings or carrying out business in the neighbourhood or passing along public ways is guilty of misdemeanor, i.e., imprisonment not exceeding two years with no option of fine.

Under this code, any person who for the purpose of trade or otherwise makes loud noise or offensive awful smell in such places and circumstances as to annoy any considerable number of persons in the exercise of their rights, commits an offence, and is liable to be punished for a common nuisance, i.e., imprisonment not exceeding one year with no option of a fine. *The proponent will ensure strict adherence to the Environmental and Social Management Plan throughout the project cycle in order to mitigate against any possible negative impacts that are related to the provisions of this Act.*

4.4.15 Sustainable Waste Management Act, 2022

Sub-section 12 (1) states that all public and private sector entities shall segregate nonhazardous waste into organic and non-organic fractions. Sub-section 12 (2) requires the segregated waste to be placed in properly labelled and colour coded receptacles, bins, containers, and bags.

At each collection station, the proponent will supply branded trash collection bins so that wastes can be sorted according to the proper categories, such as organic, non-organic, hazardous, etc.

4.4.16 Climate Change Act, 2016 (Cap. 378A), amended in 2023

The Act provide for a regulatory framework for enhanced response to climate change; to

provide for mechanism and measures to achieve low carbon climate development, enhance climate change resilience and for sustainable development of Kenya. Under Section 20 (i.e., Integration of climate change risk), the Authority (NEMA) is required to integrate climate risk and vulnerability assessment into all forms of assessment, and for that purpose liaise with relevant lead agencies for their technical advice.

In accordance with the Act and NEMA's guidelines, the ESIA study integrated a Climate Change Risks and Vulnerability Assessment and integrated its conclusions into this ESIA report. In addition, as a proactive step towards resolving climate-related issues, the Proponent promises to put the mitigation strategies suggested in the assessment report into action.

4.4.17 County Government Act 2012

This Act makes provisions for county governments' powers, functions and responsibilities to deliver services and for connected purposes. Part VIII of the act on Citizen Participation (87) (b) emphasizes on the right of citizens to participate to any development projects prior to their implementation. section 135 (1) states that the Cabinet Secretary may make regulations for the better carrying out of the purposes and provisions of this Act and such Regulations may be made in respect of all county governments and further units of decentralization generally or for any class of county governments and further units of decentralization comply to the set regulations and by laws. This is the primary law governing the development of counties and thereby will be vital during implementation of the proposed project. *All organs established under this law in Kitui County will be consulted and approvals sought from the relevant authorities in relation to the proposed project.*

4.4.18 Environment and Land Court Act, Cap 12a, 2015

An Act of Parliament to give effect to Article 162 (2)(b) of the Constitution; to establish a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land, and make provision for its jurisdiction functions and powers, and for connected purposes. Any person aggrieved by a decision or order of the Tribunal may within thirty days of such decision or order, appeal against such decision or

order to the Environment and Land Court. The jurisdiction of the Environment and Land Court is provided under section 13 of the Act. The Court has original and appellate jurisdiction to hear and determine all disputes in accordance with Article 162(2) (b) of the Constitution and with the provisions of Act or any other written law relating to environment and land.

In exercise of its jurisdiction under Article 162 (2) (b) of the Constitution, the Court has power to hear and determine disputes relating to environment and land, including disputes relating to environmental planning and protection, trade, climate issues, land use planning, title, tenure, boundaries, rates, rents, valuations, mining, minerals and other natural resources or disputes relating to compulsory acquisition of land. Section 13 (2) - The Court has jurisdiction to deal with disputes relating to land administration and management. The court is also empowered to hear cases relating to public, private and community land and contracts, choses in action or other instruments granting any enforceable interests in land.

In this regard one will say that all disputes relating securities and in particular any dispute dealing with the statutory power of sale by financial institutions. Further the Act states that the court has jurisdiction to hear any other dispute relating to environment and land. *The proponent will use this court to resolve any disputes that may arise about the environment or land.*

4.5 Institutional Framework

4.5.1 EMCA Institutions

In order to make the Act operational, the EMCA (1999) Revised in 2015 has established various Institutional structures for sustainable management of the environment and natural resources. Those relevant to this project include:

1. National Environment Management Authority (NEMA)

NEMA is the organ that has been established to exercise general supervision and coordination over all matters relating to the environment in Kenya. Further NEMA is the Government's principal instrument in the implementation of all policies relating to the environment. NEMA administers the EIA/EA on behalf of the Cabinet Secretary responsible for the environment. EIA/EA is applicable to both public and private sector development

projects and programmes. NEMA also provides a framework for dispute resolution.

2. National Environnement Tribunal (NET)

Part XII Section 125 (1) of the Act establishes NET to review administrative decisions made by NEMA relating to issuance, revocation or denial of license and conditions of license. It also provides legal opinion to NEMA on complex matters where the Authority seeks such advice. In addition, the Tribunal has powers to change or give an order and direction regarding environmental issues in dispute.

3. County Environment Committee

Kitui County Environment Committee appointed by the Governor by notice in the Gazette whose membership consists of;

1. The member of the county executive committee in charge of environmental matters who shall be the chairperson;
2. An officer of the Authority whose area of jurisdiction falls wholly or partially within the county who shall be the Secretary to the County Environmental Committee
3. One representative for each of the Ministries responsible for the matters specified in the First Schedule at the county level;
4. Two representatives of farmers or pastoralists within the county;
5. Two representatives of the business community operating within the concerned county appointed by the governor;
6. Two representatives of the public benefits organizations engaged in environmental management programmes within the county appointed in consultation with the National Federation of Public Benefit Organizations; and
7. A representative of every regional development authority whose area of jurisdiction falls wholly or partially within the county.

The Governor makes this appoint in consultation with the relevant county organs that are in charge environment and also ensure:

- i. Equal opportunities for persons with disabilities and other marginalized groups; and
- ii. That not more than two-thirds of the members are of the same gender.

The County Environment Committee is responsible for the proper management of the environment within the county among other duties. It therefore also monitors the activities of the proposed project to ensure the protection of the environment

4.5.2 Other Key stakeholders for the project

4.5.2.1 Project Proponent

All project proponents must comply with the following administrative requirements:

1. The projects to be subjected to EIA/EA are specified in the second schedule of the Environmental Management and Coordination Act. Besides the scheduled activities, the Act empowers the Cabinet Secretary to prescribe for EIA/EA appraisal of any other activity, which in his view carries significant environmental impacts.
2. A scheduled activity cannot receive the necessary authorization from NEMA to proceed or continue operating, until all EIA/EA requirements have been fulfilled and accepted by NEMA and its lead agencies.
3. EIA/EA licenses are granted when NEMA and the Cabinet Secretary are satisfied that EIA has been satisfactorily conducted and realistic and achievable Environmental Management Plan of an activity has been sufficiently developed.
4. All formal submissions under the EIA guidelines are made to NEMA. NEMA keeps a register of all projects and programmes currently being appraised under the EIA/EA guidelines.
5. The undertaking of all EIA/EA and subsequent reporting are the responsibility of the project proponent. NEMA on behalf of the Government, provide the procedures and technical advice to project proponents on how to comply with the EIA/EA requirements.
6. The EIA/EA studies are carried out by experts or teams of experts recognized and registered by NEMA.
7. Implement the Environmental and Social Management Plan (ESMP) in consultations with other relevant institutions.

4.5.2.2 Devolved System under the Constitution

The promulgated Constitution has put in place roles and responsibilities of both National

and County Governments, including public participation. At the local level, the County has greater role in controlling the resources while the public have a right to a clean and healthy environment including benefit sharing of the local resources. The County has provided required licenses and will monitor that the proponents comply with all the regulations. The proponent through corporate responsibility will ensure that local communities also share in the benefits which include access to water and power.

4.5.2.3 Environment and Land Court

The Environment and Land Court shall determine disputes on the leased land if any.

4.5.2.4 Ministry of Mining, Blue Economy and Maritime Affairs

The Ministry of Mining, Blue Economy and Maritime Affairs is responsible for formulation and articulation of mining policies through which it provides an enabling environment for all stakeholders. The ministry is the principle authority to advise the government on all mining activities. It will therefore monitor and ensure that the proposed project complies with the provisions of the Mining Act. The proposed project will have to obtain approvals from the Ministry of Mining, Blue Economy and Maritime Affairs and comply with the ministry requirements.

4.5.2.5 Land Control Board

The Proponent has reached an agreement to lease land from the owner. The proponent has to make sure it does not breach any part of Land Control Act during the land leasing process.

4.5.2.6 Multi Stakeholder Monitoring Committee

It is hereby recommended that a multi stakeholder monitoring committee be established to ensure the implementation of the ESMP as stated in this EIA project Report.

CHAPTER FIVE: ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 Overview

The proposed project will have both socio-economic benefits and associated negative environmental impacts. The purpose of the EIA process is to therefore systematically assess the value of the benefits against the environmental concerns and provide measures to avoid preventor reduce the magnitude of the impacts. The mitigation measures are based on the underlying principle of EIA that everyone is entitled to a clean and healthy environment and a duty to enhance and safeguard the environment.

5.2 Positive impacts of the proposed project

The following are the positive impacts of the proposed development.

5.2.1 Simulation of industrial development coherent with Kenya's Vision 2030

The project ensures industrialization and development through the utilization of the country's mineral resources to catalyze diversified industrial development. This is in line with the Kenya Vision 2030 which aims at harnessing the mineral resources for industrial development and transforming Kenya into a newly industrializing middle-income country.

5.2.2 Mitigating national and regional demand for metallic products

The establishment of the facility will increase production of copper which will help mitigate the deficit in national and regional demand as well as provide adequate raw materials for infrastructural industries.

5.2.3 Creation of employment opportunities

This proposed project will provide short term and long-term employment opportunities for various experts and person(s) that will be hired during the planning and implementation activities. This will include both skilled and unskilled personnel especially from the local population. Hence, the experts and the local community members will derive income from the project.

5.2.4 Source of revenue to the government

Both the County and National government will generate revenue in form of taxes generated during the acquisition of licenses and operations of the facility and also PAYE remitted from

the employees' salaries.

5.2.5 Source of income to the proponent

The proposed facility through its operations will accrue income to the proponent enabling expansion of business and creating more employment opportunities for Kenyans.

5.3 Negative environmental impacts

Alongside the project benefits, there will be potential negative environmental impacts at the three phases of the project cycle. These are pre-establishment and establishment, operational and possible decommissioning phases. The proceeding sections discuss each of these phases' impact on the environmental and the livelihoods of the local community.

5.3.1 Pre-establishment phase

5.3.1.1 Change in land use

The proposed project had in the past used as an agricultural land. However, the proponent proposes to set up a copper ore flotation plant and associated facilities which is inconsistent with the current land use.

Mitigation measure

- ❖ The proponent has applied and obtained an extension of agricultural use to include industrial use (*copper ore flotation plant*) from the County Government of Kitui-department of lands, housing and urban development.

5.3.1.2 Environmental risks of obtaining raw materials

Installation of the equipment's and other construction activities will require raw materials such as aggregate, cement and sand among others which will be sourced from the environment. These materials will have an impact at their points of origin.

Mitigation measures

- ❖ Procure quantities that are sufficient for the intended works and recycle as far as practical to curtail wastage.
- ❖ Source raw materials from sites that are licensed as per the Environmental Management and Coordination Act Cap. 387 Laws of Kenya.

5.3.1.3 Occupational safety and health

The workforce and visitors to the site will be exposed to potential health and safety risks

such as injuries that may result from accidental falls and the use of construction tools and equipment with a potential to cause injury, permanent disability or death. Further, workers may be exposed to high noise levels and dust which may cause health problems.

Mitigation measures

- ❖ Register the site as a work place with the Directorate of Occupational Safety and Health Services(DOSHS)
- ❖ Provide adequate and appropriate PPE and enforce their use
- ❖ Provide employees with correct tools and equipment for the jobs assigned and train on their use
- ❖ Obtain insurance cover for the workers at the site
- ❖ Provide first aid services and an emergency vehicle at the site
- ❖ Regulate the entry of visitors to the site by deploying adequate security measures
- ❖ Ensure moving parts of machines and sharp surfaces are securely protected with guards to avoid unnecessary contacts and injuries during construction phase
- ❖ Comply with the provisions of the Occupational Safety and Health Act 2007

5.3.1.4 Water demand and effluent generation

The construction activities will utilize substantial quantities of water for mixing and casting concrete, drinking and sanitation purposes which will lead to an increased demand for water. Water will be sourced from a borehole that will be sunk in the proposed project site and 70% of domestic water use will generate effluent.

Mitigation measure

- ❖ Procure and deliver to the site mobile toilets from a NEMA licensed waste contractor for use by the workers during the construction phase of the project cycle
- ❖ Comply with the Environmental Management and Coordination (Water Quality) Regulations, 2006

5.3.1.5 Solid waste generation

The workforce at the site and activities undertaken during site preparation and construction of auxiliary facilities are expected to generate significant quantities of solid waste such as cuttings, plastic materials and rejected materials among others. The proponent will therefore

ensure proper management of solid waste to avoid potential risks associated with poor disposal.

Mitigation measures

- ❖ Procure and strategically place adequate solid waste collection bins with a capacity for segregation within the construction site
- ❖ Create awareness on best waste management practices among the workers i.e. on the process of solid waste collection, segregation and proper disposal
- ❖ Procure a sizeable central solid waste collection bin with chambers to accommodate separated waste
- ❖ Procure the services of a NEMA licensed waste handler to dispose the solid waste
- ❖ Comply with the Environmental Management and Coordination (Waste Management) Regulations, 2006

5.3.1.6 Air pollution

Sources of air pollution during the construction activities and installation of the plant will result mainly from excavation works, mixing of aggregates and from movement of vehicles carrying construction materials. If generated in large quantities, dust may present a respiratory hazard, cause eye irritation or visual intrusion. It will potentially affect the workers, visitors to the project site and the neighbors if it is in excess of 100 µg/m³.

Mitigation measures

- ❖ Restricting the speed of trucks and other vehicles accessing the project site to 40km/hr
- ❖ Sprinkling water on excavation areas
- ❖ Provision and enforcement of appropriate PPE to workers such as dust masks
- ❖ Develop and implement an air quality monitoring plan to ensure compliance with the limits set under Schedule 1 of the Environmental Management and Coordination (Air Quality) Regulations, 2014

5.3.1.7 Noise pollution

Noise and vibration emanating from vehicle accessing the site, excavation works and machinery operations may be a concern during operations at the site. Noise may lead to hearing impairments which will reduce the workmanship of the employees and also affect their finances due to treatment and medication. Construction sites such as the proposed project which are near residential areas can only emit noise levels of up to **60 dB(A)** during the **day** and **35dB (A)** during the **night** as per the Second Schedule of the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009. Some of the project activities such as use of heavy machinery and equipment may produce noise levels which are above these limits and are a health hazard. While the noise at this stage is inevitable its impact can be mitigated in the following ways

Mitigation measures

- ❖ Provision and enforcement of appropriate PPE to workers such as ear muffs
- ❖ Truck drivers will be sensitized to avoid unnecessary hooting or running of vehicle engines
- ❖ Minimizing the frequency of transport of construction materials
- ❖ Compliance to the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009

5.3.2 Operational phase impacts

5.3.2.1 Land degradation

This mainly results from stripping of the topsoil and excavation. This will tamper with the soil structure exposing the site to possible soil erosion as well as interrupting the continuity of open space.

Mitigation measures

- ❖ Restore the affected areas through planting of indigenous plant species which create a stable final landform with acceptable post- mining land use capability

5.3.2.2 Removal and disposal of mine overburden

Establishment of the project will result in generation of overburden comprised of top soils, vegetation and rock rubble. If inappropriately disposed, the overburden becomes an

eyesore apart from harboring insects and disease-causing vectors.

Mitigation measure

- ❖ Reusing overburden as backfilling material during site rehabilitation and restoration

5.3.2.3 Effects on landscape and visual intrusions

Stockpiles have a negative effect on the landscape by causing visual intrusion.

Mitigation measures

- ❖ Take into consideration the existing landforms and vegetative cover in sitting before excavation
- ❖ Locate stockpiles, overburden, & haul routes away from sensitive landscape& visual receptors

5.3.2.4 Impact on biodiversity

Sections of the proposed site will be cleared to pave way for excavation. Excavation activities to set up the proposed project will disrupt the macro habitat and the species they support. There are species that are resistant to such disturbances while others are adversely affected to the extent of completely disappearing from the area. Endemic plant and animal species are most affected since they are very sensitive and they require specific environmental conditions, even the slightest disruption of their habitats can result in extinction or put them at high risk of being wiped out.

Dust produced will also have physical effects on the surrounding vegetation such as blocking and damaging internal structures hence impacting on their physiological activities. Vegetation provide habitat for organisms. They also protect ground surface from wind and water erosion and stabilizes other physical environmental attributes such as microclimate, water and soil moisture regimes which in turn influence organisms' abundance.

Mitigation measures

- ❖ Retain vegetation cover where possible within the site
- ❖ plant appropriate indigenous trees or approved exoticones in collaboration with the Kenya Forest Service

5.3.2.5 Occupational health and safety

Copper ore processing activities pose potential threats to the health and safety of workers on

site. This may be in the form of dust from crushing works, fumes from machinery and vehicles accessing the site, accidents from machinery and equipment.

Mitigation measures

- ❖ Register the site as a workplace with the Directorate of Occupational Health and Safety
- ❖ Provide adequate training to staff on health and safety
- ❖ Provide and enforce appropriate PPE among workers and visitors to the site
- ❖ Provide a fully equipped first aid box, first aid services and emergency vehicle at the site
- ❖ Provide the correct equipment to employees for the jobs assigned and trained on their use
- ❖ Designate a fire assembly point within the facility
- ❖ Set-up a fire safety plan for the facility
- ❖ Regulate access to the site by deploying adequate security measures and fencing where appropriate to protect workers, local community members and livestock from potential accidents
- ❖ Ensure compliance with the provisions of the Occupational Safety and Health Act, 2007

5.3.2.6 Water demand and effluent generation

The proposed project will exert pressure on water for washing of vehicles and machinery, sanitation purposes, dust suppression and general housekeeping around the area during operations. 70% of the domestic water use will be generated as effluent while the rest will seep into the ground areas within the site. Effluent generated will need to be disposed off appropriately.

Mitigation measures

- ❖ Install septic tank to manage effluent
- ❖ Undertake quarterly analysis of the effluent
- ❖ Compliance with Environmental Management and Coordination (Water Quality) Regulations, 2006

5.3.2.7 Energy demand

The operations of the proposed project will increase the demand on energy for running the machinery and equipment and for lighting and powering of electrical appliances. Energy supply for development will be obtained from generators and solar systems.

Mitigation measure

- ❖ Maintenance of machinery and equipment in a serviceable and good working order to maximize their efficiency on fuel

5.3.2.8 Solid waste generation

The facility will generate solid waste mostly in form of oil and grease containers used for maintenance of machinery and overburden among others. These have a potential of pollution if not disposed of appropriately. The proponent will therefore ensure proper management of solid waste during the operation of the facility through the following measures.

Mitigation measures

- ❖ Procure and strategically place adequate solid waste collection bins with a capacity for segregation within the site
- ❖ Create awareness on best waste management practices among the workers i.e. on the process of solid waste collection, segregation and proper disposal
- ❖ Procure a sizeable central solid waste collection bin with chambers to accommodate separated waste
- ❖ Procure the services of a NEMA licensed waste handler to dispose the solid waste
- ❖ Complying with the Environmental Management and Coordination (Waste Management) Regulations, 2006

5.3.2.9 Air pollution

Dust from construction activities is a major source of air pollution. Which requires soil to be removed which eventually causes the particles to become airborne through road traffic and wind erosion. The unrefined particles can be composed of toxic materials and ultimately affect the human health causing respiratory diseases. Crushing of the boulders will also produce lots of dust. In addition, fumes and hydrocarbons produced by the heavy commercial vehicles and heavy machinery may lead to respiratory complications.

Mitigation measures

- ❖ Sprinkling water at the site to suppress dust
- ❖ Provision and enforcement of appropriate PPE to workers such as dust masks
- ❖ Retaining existing vegetation in areas which are not earmarked for the proposed project as dust screens and a buffer zone between the project site and the settlements
- ❖ Develop and implement an air quality monitoring plan to ensure compliance with the limits set under Schedule 1 of the Environmental Management and Coordination (Air Quality) Regulations, 2014

5.3.2.10 Noise pollution

The proposed project involves several activities that generate significant amount of noise. These include use of powered machineries to transport the aggregates and processing plants that will crush and grade the materials. Excessive vibrations are mainly crushing of the boulders is a nuisance and cause further disturbance to the environment.

Mitigation measures

- ❖ Use buffer zones by locating noise generating machinery and equipment away from settlements
- ❖ Provide and enforce the use of earmuffs to all workers and visitors accessing noisy areas of the facility
- ❖ Conduct noise mapping to inform mitigation measures
- ❖ Comply with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009

5.3.2.11 Ground and surface water pollution

The proposed project activities present potential ground and surface water pollution. The hydrogeology regime will be affected by the distinct aspects of copper ore processing and associated activities which will result in groundwater pollution. Surface water pollution can be caused by acid mine drainage and loading of Sediment, debris and impurities from soil erosion or surface runoff.

Mitigation measures

- ❖ Secure the site with an impermeable boundary wall to ensure that the mining tailings and overburden are contained within the site

- ❖ Maintain maximum existing vegetation coverage and plant more trees along the boundarywall to act as buffers

5.3.2.12 Impact of heavy trucks on roads

Once the facility begins operations, there will be heavy commercial vehicles ferrying aggregates from different areas to the facility. Overloaded trucks may cause damage on the roads. To mitigate this impact the proponent and truck drivers will adhere to the axle load limits set by the Kenya Roads Board.

5.3.3 Decommissioning phase impacts

The lifespan of the proposed project dependent on the quantities of the copper ore deposit, and financial sustainability of the business. Other circumstances that may warrant decommissioning include withdrawal or expiry of licenses issued by government agencies, closure by government agencies, court orders and natural calamities. The proponent will prepare and submit a due diligence decommissioning audit report to NEMA for approval at least three (3) months in advance. The impact at this phase will include the following:

5.3.3.1 Creation of an ecologically vulnerable land

At this phase, destruction of various fauna and flora at the site is evident. Excavation will tamper with the soil structure exposing the site to possible soil erosion.

Mitigation measures

- ❖ Promote re-vegetation through the encouragement of the natural process of secondary succession

5.3.3.2 Economic decline

Employment opportunities and the County and National economic gain from the investment activity will be lost in the event of decommissioning of the proposed project.

Mitigation measures

- ❖ Train employees on alternative livelihoods prior to decommissioning
- ❖ Pay terminal benefits to all employees
- ❖ Comply with the Labor laws

5.3.3.3 Insecurity

Insecurity will result from the site when it's abandoned succeeding the decommissioning.

Unoccupied structures within the site will act as criminal dens and the security boost that had been provided by the facility to the local community would be lost.

Mitigation measure

- ❖ The proponent will contract a reputable security firm to man the site.

5.3.3.4 Safety and health risks

Any remaining structures will collapse. There will be environmental hazards stemming from the exposed left-over substances which may cause soil and water contamination and/or generate noxious odor. Possible dust emission and accidents during rehabilitation of the site could also pose a health and safety hazard to workers and general public.

Mitigation measures

- ❖ Ensure the process of rehabilitation is supervised by competent personnel
- ❖ Install signage to warn person(s) of the ongoing activities
- ❖ Provide adequate and appropriate PPE and enforce their use
- ❖ Ensure first aid kit are be available on site
- ❖ Ensure workers are given the correct hand tools and equipment for the jobs assigned

5.3.3.5 Waste generation

Demolition activities will result in generation of both solid waste and effluent. The main sources of solid waste will include demolition waste from the auxiliary facilities. Effluent generated will also need to be disposed of appropriately.

Mitigation measures

- ❖ Contract a licensed construction company to carry out demolitions
- ❖ Reuse and recycle demolition waste and equipment as far as practical
- ❖ Contract a NEMA licensed waste handler to handle and dispose both solid waste and effluent generated

5.4 Impact analysis

Potential project impacts are predicted and quantified to the extent possible. The magnitude of impacts on resources such as water and air or receptors such as people, communities, wildlife species and habitats is defined. Magnitude is a function of the following impact characteristics;

1. Type of impact (direct, indirect, and induced)
2. Size, scale or intensity of impact
3. Nature of the change compared to baseline conditions (what is affected and how)
4. Geographical extent and distribution (e.g. local, regional, international)
5. Duration and/or frequency (e.g. temporary, short-term, long term, permanent)

Magnitude describes the actual change that is predicted to occur in the resource or receptor. It takes into account all the various impact characteristics in order to determine whether an impact is **negligible** or **significant**. Some impacts can result in changes to the environment that may be **immeasurable, undetectable or within the range of normal natural variation**. Such changes can be regarded as essentially **having no impact** and are characterized as having a **negligible magnitude**.

The levels of impacts are defined using the following terms

- A. Negligible impact (very low) ...0...** - Where a resource or receptor would not be affected by a particular activity or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background variations.
- B. Less than significant impact (Low)...1...** - Is a minor impact where a resource or receptor would experience a noticeable effect but the impact magnitude is sufficiently low (with or without mitigation) and /or the resource or receptor is of low sensitivity. In either case, a less than significant impact must be sufficiently below applicable standard threshold limits.
- C. Potentially significant impact (moderate)...2...** - A moderate impact that meets applicable standards but comes near the threshold limit. The emphasis for such moderate impacts is to demonstrate that the impact has been reduced to a level that is as minor as reasonably practicable so that the impact does not exceed standard threshold limits.
- D. Significant impact (high)....3...** - One where an applicable standard threshold limit would or could be exceeded, or if a highly valued or very scarce resource would be substantially affected

All the Environmental impacts have been **weighted to be of moderate magnitude**.

5.5 Rehabilitation Plan

Rehabilitation will involve the following:

- Re-profiling-reinstate soils to a more stable landform
- Re-vegetation-The re-vegetation of the site will involve direct seeding of native species. This species selection is guided by soil conditions, micro-climate and aspect of the new land form.

CHAPTER SIX: PUBLIC CONSULTATION AND PARTICIPATION

6.1 Public Participation

Public consultation is a cornerstone of sustainable project development and an integral part of the Environmental and Social Impact Assessment (ESIA) process. It provides a platform for open dialogue between the project proponents and the affected or interested communities. The consultation process not only complies with statutory requirements under EMCA Cap 387 and the Environmental (Impact Assessment and Audit) Regulations, 2003, but also fosters transparency, promotes local ownership, enhances project legitimacy, and helps anticipate and address potential environmental and social concerns.

For the proposed installation of a copper ore flotation plant and associated facilities, located on Part of Land Reference No. Nzalae/Mutonguni/39 in Kakuyuni Village, Mithikwani Sub-location, Mithikwani Location, Matinyani Sub- County, Kitui West Constituency, Kitui County, a structured and participatory consultation process was undertaken to capture the community's input and enhance project design.

6.2 Objectives of the Public Consultation

The consultation process was guided by the following key objectives:

1. **Information Sharing:** To disseminate relevant, timely, and accurate information about the proposed project including its purpose, components, expected outputs, and timelines.
2. **Awareness Creation:** To sensitize the community about potential environmental, social, health, and safety impacts, both positive and adverse.
3. **Stakeholder Engagement:** To encourage local stakeholders to voice their opinions, fears, expectations, and suggestions in a transparent environment.
4. **Consensus Building:** To promote mutual understanding and reduce resistance by addressing community concerns at the earliest stages.
5. **Compliance Assurance:** To meet national environmental legal frameworks and international best practices for environmental governance.
6. **Feedback Integration:** To ensure that inputs from the public are adequately

considered in developing mitigation measures and the Environmental and Social Management Plan (ESMP).

6.3 Methodology of Consultation

A public baraza (community meeting) was held at the proposed site on **15th October 2024**, with the participation of community members, opinion leaders, the Regional Mining Officer, Assistant County Commissioner, NG-CDF Chairman, area MCA, Area Chiefs, Assistant Chiefs, Village Administrators, elders, women's representatives, youth leaders, local administration officials, and representatives of the project proponent.

Key steps in the consultation process included;

- **Advance Mobilization:** Community sensitization was conducted through the area Chief and Village Elders, who used local networks and public announcements to invite participants.
- **Presentation of Project Overview:** The Lead Environmental Expert presented the project concept, technology to be used, anticipated environmental and social impacts, and proposed mitigation measures.
- **Interactive Dialogue:** An open forum followed where attendees raised questions and voiced concerns about various aspects of the project.
- **Questionnaire Distribution:** Structured questionnaires were issued to all willing participants to capture more detailed feedback. This method helped reach individuals who may have been shy to speak publicly or preferred written responses.

Attendance Overview

- **Total Participants:** 387
- **Men:** 183
- **Women:** 204
- **Questionnaires Completed:** 103

This method ensured that both vocal and silent voices within the community were captured, enhancing the legitimacy of the engagement process.

6.4 Issues Raised and Responses Provided

Below is a summary of the key concerns raised during the consultation and the corresponding responses provided by the proponent and environmental expert

Issue/Concern	Stakeholder Feedback	Response
Air Pollution	Community members expressed concerns over dust generation during rock crushing, truck movements, and general site activities, which could affect air quality and respiratory health.	The proponent committed to implementing a Dust Control Management Plan, which includes the use of wet suppression systems (regular sprinkling of access roads), vegetative barriers around the site, enclosed conveyors for material handling, and scheduling truck movements during off-peak times to minimize dust dispersion. Regular air quality monitoring will be conducted.
Water Contamination	There was apprehension about pollution of local rivers, streams, and groundwater due to chemical use and discharge of untreated effluent from processing activities.	The project will adopt a Closed-Loop Water Recycling System to ensure minimal discharge into the environment. Sedimentation ponds will allow natural settling of solids, while all drainage systems will be lined to prevent seepage. Strict effluent quality monitoring and emergency spill response plans will be instituted to protect water resources.
Noise and Vibration	Residents raised concerns about noise pollution and ground vibrations arising from the operation of machinery, trucks,	To mitigate these impacts, the crusher, ball mill, and machinery will be fitted with

	the copper ore crusher, and the ball mill, which could disrupt local community activities and affect peaceful living conditions.	silencers, sound-proof enclosures will be installed where practical, and truck speeds will be strictly regulated within the project area. Operational hours will be limited to daytime (8:00 am - 5:00 pm) to minimize disturbance during sensitive periods. Regular noise and vibration monitoring will be conducted to ensure adherence to set environmental standards, with adjustments to mitigation measures based on monitoring outcomes. Ongoing communication with the local community will also be prioritized to address any emerging concerns.
Employment Opportunities	Youth leaders and women's representatives called for local employment prioritization, with particular emphasis on engaging women and marginalized groups.	The proponent pledged to prioritize hiring local residents for both skilled and unskilled positions. Furthermore, capacity-building programs such as vocational training, technical workshops, and apprenticeship opportunities will be offered to empower the local workforce and build long-term skills.

Health and Safety	Concerns were raised about the potential for occupational accidents, chemical exposure, and health risks for both workers and neighboring communities.	A Comprehensive Health, Safety, and Environment (HSE) Plan will be implemented, including mandatory issuance of PPE, regular medical checkups, installation of first-aid centers on-site, and emergency evacuation drills. Workers will undergo intensive HSE induction and refresher training
Fire Risk	Fear of fire hazards stemming from electrical faults, fuel storage, and plant operations was expressed.	The project will ensure the installation of automatic fire detection and suppression systems, strategically located fire extinguishers, sand buckets, and trained firefighting teams. Regular fire drills and inspections will be conducted, and emergency fire response protocols will be displayed across the site.
Infrastructure Pressure	Stakeholders were worried about the wear and tear of local roads due to increased heavy truck traffic, leading to potential road damage and accidents.	The proponent will work closely with the County Government of Kitui to upgrade and maintain local access roads. Traffic management plans, including scheduled truck movement, load control, and regular maintenance, will be enforced to minimize road deterioration. Truck drivers

		will undergo road safety training.
Land and Resource Use	Concerns were raised regarding the potential for future land encroachment, loss of community land, and displacement risks.	The project is committed to operating strictly within legally designated and registered project boundaries. There will be no forced displacement or land grabbing. Clear land tenure documentation will be maintained and made available to the public for transparency.
Chemical Handling and Storage	Fears about improper storage of flotation chemicals (like xanthates, frothers) leading to spills, leaks, or accidental releases harmful to people and environment.	All flotation reagents will be stored in properly designed, ventilated, and labeled chemical storage facilities. Secondary containment systems will be installed to prevent leaks, with regular inspections and emergency response plans in place.
Tailings Management	Concerns about potential failure of tailings ponds or leakage of contaminated slurry into the surrounding environment.	The project will construct engineered tailings ponds with proper lining and embankments. Regular structural monitoring and maintenance will be conducted. A Tailings Management Plan (TMP) will be developed, including emergency preparedness measures.
Energy	Some stakeholders inquired about the high	The project will implement

Consumption and Sustainability	energy demands of the plant and its sustainability practices.	energy-efficient technologies and consider renewable energy integration where feasible. Energy audits will be performed periodically to optimize consumption and promote sustainability.
Impact on Local Biodiversity	Environmentalists raised concerns about potential impacts on local flora and fauna due to site clearing and water usage.	A Biodiversity Management Plan (BMP) will be developed. Buffer zones around sensitive habitats will be maintained, indigenous vegetation will be restored post-construction, and water conservation measures will be applied.
Visual Impact and Landscape Alteration	Community members were concerned about changes in the natural landscape and visual intrusion caused by industrial structures.	Site layout will be designed to minimize visual intrusion through strategic siting and natural screening (vegetative planting). Restoration landscaping will be done post-project.

6.5 Community Feedback Summary

The community response to the proposed copper ore flotation plant was generally positive, with numerous stakeholders expressing appreciation for the project's early-stage consultations and inclusive engagement approach. Participants welcomed the development, recognizing its potential to bring transformative benefits to the local area. Key positive expectations highlighted included:

- **Improved Livelihoods:** Community members anticipated that the project would create direct and indirect employment opportunities for skilled, semi-skilled, and unskilled workers. The presence of the plant would also stimulate ancillary businesses such as food supply, transport, and other services, improving household

incomes.

- **Economic Development:** Stakeholders recognized that the establishment of the copper ore flotation plant would stimulate broader economic activity in a region historically characterized by underdevelopment, limited investment, and low formal employment rates.
- **Infrastructure Enhancement:** The community welcomed the prospect of improved infrastructure, particularly road upgrades, which would facilitate better access to markets, healthcare facilities, and educational institutions. Access to water and electricity in adjacent communities could also improve as a result of project-related investments.
- **Support for Artisanal Miners and Small-Scale Suppliers:** The project was seen as an opportunity to provide a formal, stable market for artisanal miners and small-scale suppliers, thereby supporting the transition towards safer and more sustainable mining practices.
- **Promotion of Local Industrialization:** Community members were enthusiastic about the role the project could play in promoting local value addition, mineral beneficiation, and reducing dependency on raw mineral exports.

Despite the broad support, the community also emphasized several important expectations and conditions critical to maintaining their support for the project. These included:

- **Environmental Protection and Monitoring:** Participants stressed the need for regular, transparent environmental monitoring particularly relating to air quality, water resources, noise levels, and waste management with findings shared openly with the community.
- **Continued Stakeholder Engagement:** The community requested that consultations should not end with project approval but continue throughout the construction, operation, and closure phases. They recommended quarterly engagement meetings and the formation of community liaison committees.
- **Local Content Maximization:** Residents advocated for the prioritization of local employment, local procurement of goods and services, and support for local

enterprise development. They called for fair labor practices, equal opportunity hiring, and the inclusion of marginalized groups such as women, youth, and persons with disabilities.

- **Corporate Social Responsibility (CSR) Initiatives:** Community members urged the proponent to invest meaningfully in CSR programs focusing on priority areas such as healthcare improvement, access to clean water, educational support (e.g., scholarships and school infrastructure), and climate resilience initiatives, such as community tree planting and water harvesting projects.

In response, the proponent reaffirmed his commitment to addressing all concerns raised. Specific undertakings included:

- Establishing a Grievance Redress Mechanism (GRM) accessible to all community members, ensuring that complaints and concerns are promptly recorded, investigated, and resolved transparently and fairly;
- Incorporating community inputs into the project's Environmental and Social Management Plan (ESMP);
- Ensuring regular public disclosure of monitoring reports;
- Setting up a dedicated Community Liaison Office staffed with trained personnel to facilitate two-way communication between the project and the local population;
- Developing a CSR Strategy in collaboration with community leaders to prioritize and implement impactful social investment projects.

The following photos provide visual documentation of the public consultation meeting held for the proposed copper ore flotation plant;



Plate 6. 1: Community members keenly following the public participation proceedings at the proposed copper ore flotation plant site (Source: Survey, 2024)



Plate 6. 2: Opinion Leaders, Regional Mining Officer, Area MCA, Local Administration Officials, and other stakeholders during the public participation meeting for the proposed copper ore flotation plant (Source: Survey, 2024)



Plate 6. 3: Assistant County Commissioner-Matinyani Sub-County, Mr. Masinde, chairing and addressing participants during the public participation exercise (Source: Survey, 2024)



Plate 6. 4: Mithikwani Area Chief, Ms. Joyce addressing the participants during public participation Exercise (Source: Survey, 2024)



Plate 6. 5: Mithikwani Village Administrator, addressing participants during public participation exercise (Source: Survey, 2024)



Plate 6. 6: Regional Mining Officer, Kitui and Makueni Counties, addressing the participants during public participation exercise (Source: Survey, 2024)



Plate 6. 7: Kitui County Government geologists, Mr. Loki and Ms. Lilian addressing the participants during the public participation exercise (Source: Survey, 2024)



Plate 6. 8: Hon. Paul Maluki (MCA-Kwa Mutonga/Kithumula ward) addressing the participants during public participation exercise (Source: Survey, 2024)



Plate 6. 9: Community members including youth, women and opinion leaders giving their views on the proposed copper froth flotation plant during the public participation exercise (Source: Survey, 2024)



Plate 6. 10: NEMA registered ESIA/EA lead Expert, Mr.Kinyili, listening to and addressing participants during public participation exercise (Source: Survey, 2024)



Plate 6. 11: Project Proponent, Mr. Omar addressing the participants during the public participation exercise (Source: Survey, 2024)

CHAPTER SEVEN: ANALYSIS OF PROJECT ALTERNATIVES

7.1 Overview

The environmental and social management plans proposed for the entire project cycle are considered adequate to mitigate the identified potential negative environmental and social impacts. However, it is important to analyze the possible alternatives to the project to inform decision making by relevant government agencies and improve the environmental performance of the project. For the proposed project, four alternatives are feasible as follows;

1. The 'No Project' alternative
2. The 'Yes Project' alternative
3. Alternative site
4. Alternative project
5. The 'No Project' alternative

7.2 The 'No Project' alternative

Under this alternative, the proposed installation of a copper ore flotation plant and associated facilities would not proceed. The site would remain in its current undeveloped state, and there would be no disturbance to the local environment or surrounding communities. This option is often considered the most effective mitigation measure for avoiding negative environmental and social impacts, such as land degradation, dust emissions, water resource use, and potential impacts on local biodiversity.

However, this alternative would also mean forfeiting the anticipated positive impacts of the project. These include the stimulation of industrial growth in Kitui County in line with Kenya's Vision 2030, increased production and value addition of copper ore, creation of both direct and indirect employment opportunities, and generation of substantial revenue for both the proponent and the Government of Kenya through taxes and royalties. Furthermore, associated socio-economic benefits, such as improved local infrastructure and skills development, would not be realized.

Given that the potential environmental and social impacts of the proposed project can be effectively mitigated through the measures outlined in the Environmental and Social Management Plan (ESMP), the 'No Project' alternative is therefore **not considered a viable**

or desirable option.

7.3 The 'Yes Project' alternative

This alternative considers that the proposed installation of the copper ore flotation plant and associated facilities will proceed as planned. It represents the most beneficial option in terms of maximizing socio-economic gains while ensuring that potential adverse environmental impacts are mitigated to acceptable levels.

Implementation of the project will lead to increased value addition of locally sourced copper ore, supporting Kenya's industrialization agenda and enhancing Kitui County's contribution to the national economy. The project will create employment opportunities during both the construction and operational phases, promote skills development, stimulate local businesses, and contribute to poverty reduction. In addition, it will strengthen the industrial profile of Kitui County and improve its development ranking, positioning it as a key mining hub in Kenya.

Given the proponent's commitment to implementing robust environmental safeguards and the potential to achieve a balance between economic growth and environmental stewardship, the 'Yes Project' alternative is **considered the most viable and preferable** option.

7.4 Alternative site

An alternative site for the proposed copper ore flotation plant and associated facilities could be considered if environmental assessments indicated that the current location posed significant, unmanageable risks to the environment or local communities. However, the site selected for the proposed project is strategically advantageous, being close to the copper ore sources, thereby reducing transportation costs and associated emissions.

Comprehensive environmental assessments have indicated that the potential impacts at the proposed site can be effectively managed through appropriate mitigation measures. These include dust suppression techniques, efficient water management, habitat conservation measures, and community engagement programs. Given the feasibility of managing the environmental impacts and the economic advantages of the current site, relocating the project is neither practical nor economically justifiable. Therefore, the alternative site option

is **not considered viable**.

7.5 Alternative project

In the event that the proposed installation of the copper ore flotation plant is deemed unfeasible, alternative projects such as agricultural developments, residential facilities, or other forms of light industry could be considered for the site.

However, given the area's mineral resource endowment, pursuing alternative land uses would not capitalize on the site's natural comparative advantage. Developing a copper ore flotation plant aligns better with the region's potential, contributes more substantially to the local and national economy, and supports Kenya's broader strategic goals under Vision 2030. Additionally, the project's economic viability has been thoroughly assessed and confirmed to be strong compared to other potential land uses.

Consequently, while alternative projects are theoretically possible, they are **not considered viable** when compared to the socio-economic and strategic benefits associated with the proposed copper ore flotation plant and associated facilities.

7.6 Alternative Technology

This alternative considers adopting different technologies for copper ore processing compared to the originally proposed flotation method. Alternative technologies could include:

- **Heap Leaching:** Involves piling crushed ore and applying chemicals to dissolve the copper.
- **Solvent Extraction and Electrowinning (SX/EW):** Suitable for oxide ores, extracting copper directly through leaching and electrochemical processes.

However, flotation is more appropriate for the type of sulfide copper ores available in the project area, offering higher recovery rates and better economic returns. Additionally, alternative technologies like heap leaching may pose greater long-term environmental risks (e.g., chemical leakage). Therefore, alternative processing technologies are considered less viable compared to the proposed flotation technology.

7.8 Alternative Flotation Plant Design

Under this alternative, the same technology (flotation) would be used but different plant designs would be considered to optimize environmental and economic outcomes. Design variations might include:

- **Modular or semi-mobile plants:** Allowing relocation if necessary.
- **Dry tailings disposal:** Instead of wet tailings dams, to reduce water use and potential for tailings dam failures.
- **Zero-discharge systems:** Recycling all process water to eliminate wastewater discharge.

While more advanced designs could reduce the project's environmental footprint, they could also involve significantly higher capital costs. The selected design balances efficiency, cost, and environmental performance. Nevertheless, continuous improvement through best available technologies will be encouraged.

CHAPTER EIGHT: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Introduction

This Environmental and Social Management Plan (ESMP) provides a logical framework within which the negative environmental and social impacts identified during the ESIA study can be mitigated and any beneficial environment effects can be enhanced. Monitoring and management practices as well as cost estimates included as applicable. Responsibilities and time frames for the implementation of the various aspects of the ESMP will be identified.

The actions have been grouped according to the various phases of the project cycle i.e. Planning, Construction, Operation, and Decommissioning. This categorization shall improve the implementation of the suggested mitigation measures throughout the project cycle. Each phase has a distinct set of activities that will need to be undertaken.

8.2 ESMP for Planning Phase

The planning phase involved all the steps to be followed by the proponent before the start of the proposed development. These include the approvals from all the relevant authorities such as the County Government of Kitui, Ministry of Mining and NEMA. The ESMP for planning phase provides a set of actions that the proponent needs to implement before the commencement of the construction and development of the structures and the plant phase. Foremost, the ESMP requires that the proponent should have applied for and obtained all the requisite approvals and procedures before the actual implementation of the project. The following are some of the activities carried out including the actors at the planning phase.

Table 5: ESMP for planning stage

Environmental/Social	Proposed Mitigation	Responsible	Monitoring	Estimated	Frequency of
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Impact	Measures and Aspects for Monitoring	Actors	Mechanism	Cost (Ksh.)	Monitoring
Uncontrolled and incompatible development that is out of character with the surroundings	Plan and obtain development permission from all relevant authorities, including NEMA, County Government of Kitui, and other sectoral regulators; Ensure conformity with land use plans and zoning regulations	Proponent; Registered Physical Planner; Architect	Review of project approvals; Routine inspections by authorities	120,000	Random
Lack of Environmental Awareness on the Proposed Project	Install informative signage at the project entry; Disseminate key environmental and social information to workers and visitors; Conduct briefings and awareness sessions	Proponent; County Government of Kitui; NEMA	Routine inspections; Verification of presence of information boards, public notices	150,000	Random
Uncontrolled construction contrary to approved plans and poor workmanship	Appointment of a qualified and licensed Project Manager and Contractor; Ensure strict adherence to approved designs and construction	Proponent; Project Manager	Verification of contractor credentials; Routine site inspections	450,000	Routine

	specifications				
Mismanagement of site operations contrary to conditions of approval	Appoint a competent Project Manager and Clerk of Works to oversee compliance with all statutory approvals and permit conditions; Enforce proper site management practices	Proponent; Project Manager; Clerk of Works	Site inspections; Compliance audits	230,000	Routine
Vulnerability to accidents and hazards during project implementation	Obtain comprehensive insurance cover for all construction activities, including Workmen's Compensation for workers and third-party liability	Proponent	Verification of insurance policies and certificates; Inspections	300,000	Once before construction starts

8.3 ESMP for Construction Phase

The phase includes the construction of the proposed copper ore froth processing plant. This will be done in accordance with the project design and plan. A contractor will conduct the works with supervision and oversight from the proponent. The Construction Environmental and Social Management Plan below indicates the likely environmental impacts, which were anticipated from the project, and it indicates ways of mitigating them.

Table 6: Environmental and Social Management Plan (ESMP) for the Construction Phase

Environmental/Social Impact	Proposed Mitigation Measures and Aspects for Monitoring	Responsible Actors	Monitoring Mechanism	Estimated Cost (Ksh.)	Frequency of Monitoring
Noise and Vibration	- Equip workers with standard noise attenuation PPE (e.g., earmuffs, earplugs). - Inform nearby residents in advance of noisy activities. - Comply with Environmental Management and Coordination (Noise and Excessive Vibration Pollution) Regulations, 2009. - Avoid discretionary use of noisy machinery. - Restrict construction activities to daytime hours only.	Contractor, Workers	Routine inspection; Noise level measurements if necessary	20,000	Daily
Air Pollution and Dust Emissions	- Dust suppression using water sprays. - Provide dust masks	Contractor	Site inspections; Dust complaints log	10,000	Weekly

	to all workers. - Limit speed of vehicles on-site. - Cover trucks carrying loose materials. - Regularly service construction equipment.				
Solid Waste Generation	- Provide waste bins on site. - Segregate waste (hazardous, recyclable, organic). - Recycle materials where possible. - Appoint a licensed waste collector for disposal.	Contractor, Workers	Routine waste tracking and inspections	20,000	Daily
Vegetation Loss and Site Disturbance	-Demarcate construction zone to minimize disturbance. - Landscape and plant trees after construction (min 10% green cover). -Use indigenous species for	Contractor, Proponent	Vegetation surveys; Photo documentation	20,000	One-off; Follow-up quarterly

	landscaping.				
Health and Safety Risks	- Fully fence site and control access. - Provide all workers with PPE (helmets, boots, gloves, reflective jackets). - Daily safety briefings (Toolbox Talks). - Have well-stocked First Aid kits on site. - Place warning signs and emergency contacts. - Build adequate sanitation facilities (toilets, washing areas).	Contractor, Proponent	Routine inspections; Incident/accident records	60,000	Daily
Water Use and Management	- Promote water conservation. - Install water-saving devices. - Reuse water where possible (e.g., for dust suppression). - Train workers on responsible water use.	Contractor	Water consumption tracking	50,000	Weekly
Energy Use and	- Use energy-efficient	Contractor	Monthly audits;	Nil	Monthly

Efficiency	- machinery. - Switch off unused equipment. - Optimize transportation schedules. - Maintain energy-use logs.		Routine inspections		
Soil Erosion and Sedimentation	- Install sediment control devices (silt fences, bunds). - Stabilize exposed soil immediately after works. - Carry out construction during dry seasons where possible. - Protect drainage channels from blockage.	Contractor	Visual inspections post-rainfall	30,000	Weekly; After heavy rains
Traffic and Road Safety	- Prepare traffic management plan. - Place visible warning signs near the site. - Enforce low speed limits on-site. - Appoint flag persons	Contractor, Proponent	Routine inspections; Traffic incident records	40,000	Weekly

	where needed. - Schedule material deliveries during off-peak hours.				
Employment Opportunities	- Prioritize hiring of local workers. - Ensure fair and transparent recruitment. - Provide equal opportunity without discrimination. - Train unskilled workers in safety and basic construction skills.	Contractor, Proponent	Employment records; Worker interviews	30,000	Monthly
Gender Equality and Vulnerable Groups Inclusion	- Promote participation of women and youth. - Ensure gender-sensitive recruitment processes. - Provide separate sanitation facilities for male and female workers. - Zero tolerance to harassment on site.	Contractor, Proponent	Gender-disaggregated employment data; Grievance records	20,000	Monthly

Community Relations	- Establish a grievance redress mechanism. - Engage the community regularly through meetings and information sharing. - Inform residents of project timelines and activities. - Respond promptly to complaints.	Contractor, Proponent	Complaints register; Community feedback reports	30,000	Monthly
Workers' Rights and Welfare	- Ensure contracts clearly outline workers' rights. - Allow workers' associations/unions. - Provide channels to report grievances. - Avoid child labour and forced labour.	Contractor	Workers' interviews; Compliance checks	20,000	Quarterly
Site Security and Theft Risk	- Hire licensed security guards. - Install perimeter lighting. - Log all visitors and vehicles accessing site. - Report suspicious activities immediately.	Contractor, Proponent	Security audits; Incident reports	45,000	Daily

8.4 ESMP for Operation Phase

The phase included the operation of the Facility. The Operation Environmental and Social Management Plan below indicates the likely environmental and social impacts, which were anticipated from the project, and it indicates ways of mitigating them.

Table 7: ESMP for Operation Phase

Environmental/Social Impact	Proposed Mitigation Measures and Aspects for Monitoring	Responsible Actors	Monitoring Mechanism	Estimated Cost (Ksh.)	Frequency of Monitoring
Air Pollution (Dust and Fumes)	- Cover all trucks transporting copper ore. - Undertake wet crushing and wet grinding to minimize dust. - Install localized fume extraction systems in processing areas. - Establish vegetative windbreaks around facility. - Ensure all workers	Project Management	Routine Inspection; Air quality monitoring reports	120,000	Weekly

	wear respiratory PPE (nose masks). - Regularly maintain and clean dust control equipment. - Monitor air quality regularly inside and outside premises.				
Occupational Health and Safety (OHS) Risks	- Daily pre-work briefings on safety. - Provide and enforce proper use of PPE (helmets, gloves, respirators, boots). - Install fire extinguishers, fire hydrants, and sprinklers. - Provide First Aid kits and employ trained First Aiders. - Keep an updated accident/incident logbook. - Regularly service machinery and equipment. - Enclose processing	Project Management, Workers	Routine Inspection; Training Records; Incident Reports	300,000	Daily

	units (e.g., leach tanks, laboratories). - Develop and practice an Emergency Response Plan. - Conduct regular fire and evacuation drills. - Install clear safety signage. - Implement a fatigue management policy for shift workers. - Train workers on HIV/AIDS, alcohol, and drug abuse awareness. - Provide clean drinking water away from contaminated zones. - Install speed bumps on site access roads. - Ensure ergonomic working conditions (reduce repetitive strain). - Comply strictly				
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	with the Factories Act and OSHA 2007.				
Waste Generation and Management	- Segregate waste at source (hazardous, non-hazardous, recyclables). - Reuse process by-products where feasible. - Employ licensed waste contractors for safe disposal. - Establish waste transfer stations within site. - Implement a "zero waste to landfill" goal. - Conduct worker training on waste minimization and proper handling.	Project Management	Site inspection; Waste tracking forms	50,000	Daily
Energy Consumption	- Install energy-saving lighting (LEDs). - Conduct energy audits periodically. - Switch off idle	Project Management	Security incident reports; Patrol logs	300,000	Daily

	equipment and lighting. - Maintain generator efficiency. - Explore renewable energy options (solar lighting, hybrid systems). - Train staff on energy conservation practices.				
Site Security	- Hire licensed security personnel. - Install CCTV surveillance. - Maintain fenced perimeter with controlled access. - Implement visitor logging and verification procedures. - Conduct regular night patrols. - Sensitize community on security collaboration.	Project Management	Security incident reports; Patrol logs	300,000	Daily

Environmental Audits and Compliance	- Carry out annual environmental audits (EA) by a NEMA-licensed expert. - Monitor and assess noise, air, waste, water quality, and safety standards. - Implement audit recommendations promptly. - Submit annual audit reports to NEMA.	Proponent, Contractor, NEMA	Audit reports; Monitoring records	300,000 Annually	Annual; Random checks
HIV/AIDS, STIs, and Social Health	- Implement workplace HIV/AIDS programs. - Conduct awareness campaigns for workers and surrounding communities. - Distribute free condoms on-site. - Collaborate with County Health Department and NGOs. - Establish peer	Project Management, County Government of Kitui	Health and Training Reports; Peer Educator Reports	50,000	Quarterly; Random

		educator groups within the workforce. - Provide Voluntary Counseling and Testing (VCT) opportunities. - Include gender-specific approaches for women workers. - Incorporate reproductive health education.				
Community and Relations	Safety	- Establish Grievance Redress Mechanism (GRM). - Inform the local community about operational hazards (dust, truck movements). - Prioritize hiring local residents. - Support local social projects (e.g., water, education). - Regularly engage the community on project updates and	Project Management	Community meeting minutes; Grievance logs	50,000	Quarterly

	safety. - Provide emergency hotline to community in case of incidents.				
Water Resource Management	- Install flow meters for monitoring water use. - Promote rainwater harvesting. - Recycle process water where possible. - Protect water sources from contamination (oil, chemicals, waste). - Conduct regular water quality tests.	Project Management	Water testing reports; Water usage records	70,000	Quarterly
Noise Pollution	- Maintain noise levels within NEMA limits. - Enclose noisy machinery. - Schedule high-noise activities during daytime. - Provide ear protection for workers in high-noise	Project Management	Spot noise measurements; Worker feedback	40,000	Quarterly

	zones. - Regular maintenance of moving parts.				
Labour Rights and Welfare	- Issue formal contracts to all employees. - Ensure fair wages and timely payment. - No discrimination in hiring or working conditions. - Allow workers to form associations and report grievances freely. - No child labour or forced labour. - Provide decent rest areas and sanitation facilities.	Project Management, Workers	HR records; Worker satisfaction surveys	30,000	Quarterly
Hazardous Material Handling (Sodium hydrogen sulphide, Sodium ethyl xanthate, Sodium butyl xanthate, Pine oil,	- Provide specialized training on chemical handling and storage. - Label all hazardous substances clearly. - Store chemicals in ventilated, weather-	Project Management Workers Environmental Health and Safety Officer	Routine inspections Emergency preparedness drills Chemical inventory	400,000	Daily inspections and Quarterly comprehensive audits

Lime)	proof facilities with secondary containment - Maintain and update Material Safety Data Sheets (MSDS) onsite. - Provide appropriate PPE (chemical-resistant gloves, aprons, goggles, respirators). - Install emergency spill response kits near chemical handling and storage areas. - Conduct regular drills on spill response and emergency procedures. - Ensure proper ventilation in chemical use areas. - Monitor chemical containers for leaks, corrosion, and		audits		
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	deterioration. - Properly dispose of chemical containers and residues per hazardous waste regulations. - Keep updated chemical inventory and monitor chemical usage. - Prohibit smoking and ignition sources near chemical areas. - Install eye-wash stations and emergency showers near chemical handling points. - Sensitize staff on health and environmental risks associated with the chemicals. - Comply with NEMA guidelines and international hazardous chemical management				
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	standards.				
Greenhouse Gas (GHG) Emissions	- Minimize generator usage by optimizing power supply. - Implement a GHG emissions monitoring plan. - Promote tree planting and carbon offset initiatives. - Use fuel-efficient machinery and vehicles.	Project Management	Emissions tracking reports; Carbon offset documentation	100,000	Annually
Climate Change Adaptation and Mitigation	- Implement water and energy conservation measures. - Promote reforestation or tree planting programs. - Monitor carbon footprint of operations. - Adopt cleaner production technologies where feasible.	Project Management	Energy and water audit reports; Carbon footprint reports	120,000	Annually
Land Use Change and	- Strictly confine	Project	Site inspection	50,000	Semi-annually

Encroachment	activities within approved project area. - Respect buffer zones and property boundaries. - Obtain proper land use approvals before any expansion.	Management, Surveyors	reports; Boundary verification		
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8.5 ESMP for Decommissioning Phase

This will be the final stage of the project; the phase will take place after the proposed project operations have taken place and the ore has been depleted. Decommissioning will involve demolishing the structures and rehabilitating the land to its original position.

Table 8: ESMP for decommissioning phase

Environmental/Social Impact	Proposed Mitigation Measures and Aspects for Monitoring	Responsible Actors	Frequency of monitoring	Estimated Cost (Ksh.)
Planning for Decommissioning	- Notify all relevant authorities and stakeholders in advance. - Develop and submit a detailed Decommissioning Plan for approval. - Conduct a decommissioning Environmental Audit as required by EMCA (1999)	Proponent	3 months before Decommissioning	150,000

	and its regulations. - Inform all employees about timelines and procedures.			
Removal of Structures	- Dismantle structures systematically. - Maximize reuse/recycling. - Debris removal schedule.	Proponent, Decommissioning Contractor	One-off	250,000
Demolition and Other Decommissioning-Related Wastes	- Segregate, transport, and dispose waste properly. - Maintain waste disposal records. - Comply with environmental regulations.	Proponent, Decommissioning Contractor	One-off	200,000
Covering/Filling of Excavations on Site	- Backfill excavations with clean material. - Compact filled areas. - Grade for drainage.	Decommissioning Contractor	One-off	180,000
Public Health Concerns	- Provide PPE to workers. - Maintain First Aid kits. - Disconnect utilities. - Daily safety checks and fencing.	Decommissioning Contractor	Daily during Decommissioning	120,000
Rehabilitation of Project Site (Vegetation, Erosion Control)	- Landscaping and grading. - Soil stabilization and planting native species.	Decommissioning Contractor	Monthly for 6 months post-decommissioning	300,000

	- Erosion monitoring.			
Air Pollution (Dust Emissions During Demolition)	- Sprinkle water. - Cover trucks. - Use dust suppressants.	Decommissioning Contractor	Daily during Decommissioning	70,000
Noise and Vibrations	- Limit noisy work to daytime. - Use noise-suppressed equipment. - Provide ear protection.	Decommissioning Contractor	Weekly	50,000
Occupational Health and Safety (OHS) Risks	- Conduct OHS training. - Daily safety briefings. - Maintain incident logs.	Decommissioning Contractor	Daily	100,000
Visual Intrusion and Aesthetic Impact	- Clear debris. - Landscape and green the area. - Remove temporary structures.	Decommissioning Contractor	One-off	150,000
Socioeconomic Impacts (Loss of Employment)	- Notify workers in time. - Counseling and job search support. - Link with NGOs for retraining programs.	Proponent, HR Department	Once before Decommissioning Completion	80,000
Site Handover/Closure Audit	- Conduct final Environmental Audit. - Submit closure report. - Obtain closure certificate.	Proponent, Independent Environmental Auditor	After completion of decommissioning	180,000

8.6 Possible displacement and relocation of people

The land identified for the proposed facility has been **leased voluntarily** from a willing landowner, following mutual agreement and consent. As a result, **no** physical displacement or relocation of people has occurred during the land acquisition process. Furthermore, no communities, households, or individuals have been negatively impacted through involuntary resettlement.

Nevertheless, continuous monitoring will be conducted throughout the project lifecycle to ensure that no indirect displacement or access restrictions arise as a result of project activities, particularly during construction and operational phases. Any emerging issues relating to land use, community access, or economic displacement will be addressed promptly in accordance with the mitigation measures outlined in the Environmental and Social Management Plan (ESMP) and relevant national laws and international safeguard standards, such as the World Bank's Environmental and Social Standards (ESS5 on Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement).

CHAPTER NINE: CONCLUSION AND RECOMMENDATIONS

9.1 Conclusion

The proposed project has undergone a comprehensive Environmental and Social Impact Assessment (ESIA) process as required by the Environmental Management and Coordination Act (EMCA), Cap 387, and its subsidiary regulations. The assessment has identified both the potential positive and negative impacts associated with the construction, operation, and decommissioning phases of the project.

The findings demonstrate that the project is socially acceptable, economically beneficial, and environmentally feasible provided that the recommended mitigation measures are fully implemented. Key positive outcomes of the project include:

- Creation of employment opportunities for both skilled and unskilled workers, boosting local livelihoods.
- Improved economic development through infrastructure investment and associated services.
- Technology and skills transfer to the local community through capacity building and on-the-job training.
- Enhanced local business opportunities through supply and service contracts.

While some potential environmental and social impacts were identified such as dust emissions, noise pollution, waste generation, occupational health and safety risks, and community health concerns these can be effectively managed, minimized, or mitigated through the adoption of the Environmental and Social Management Plan (ESMP) provided.

The project's design incorporates best available environmental management practices and promotes resource efficiency, pollution prevention, and stakeholder engagement. Furthermore, the project proponent has demonstrated commitment to ensuring compliance with national legislation, international environmental standards, and community development principles.

Given the planned mitigation strategies, monitoring programs, and the proponent's demonstrated environmental and social responsibility, the project is not expected to result in significant adverse irreversible impacts on the environment or neighboring communities. On

the contrary, the project is anticipated to contribute positively to the local economy, infrastructure development, and social well-being.

Therefore, the project is recommended for environmental licensing and approval by the relevant authorities, subject to the strict adherence to the ESMP, compliance with all statutory and regulatory requirements, and continuous engagement with stakeholders throughout its lifecycle.

9.2 Recommendations

In light of the findings from the Environmental and Social Impact Assessment (ESIA) and the anticipated impacts during the project's construction, operational, and decommissioning phases, the following recommendations are proposed to ensure the project's sustainability and compliance:

1. Full Implementation of the Environmental and Social Management Plan (ESMP):

The proponent must ensure that all proposed mitigation measures outlined in the ESMP are strictly implemented throughout the project's lifecycle. Regular updates and reviews of the ESMP should be conducted to address any emerging environmental or social risks.

2. Compliance with Legal and Regulatory Requirements:

The project must comply with all applicable national environmental laws, including the Environmental Management and Coordination Act (EMCA), Cap 387, Occupational Safety and Health Act (OSHA) 2007, Water Act 2016, and any other relevant statutes and guidelines issued by regulatory authorities such as NEMA.

3. Engagement of Qualified Environmental, Health, and Safety Personnel:

The proponent should engage experienced Environmental, Health, and Safety (EHS) officers to oversee daily environmental management, occupational health and safety practices, and compliance monitoring.

4. Stakeholder Engagement and Community Involvement:

Continuous engagement with stakeholders including local communities, government agencies, and non-governmental organizations should be maintained. Regular information sharing, grievance redress mechanisms, and community feedback forums should be held to foster transparency, trust, and good relations.

5. Capacity Building and Training:

Regular training sessions on environmental management, occupational health and safety, hazardous materials handling, HIV/AIDS awareness, and emergency response should be provided to all employees, contractors, and subcontractors.

6. Monitoring and Reporting:

A detailed monitoring program must be established to track the implementation of mitigation measures. Environmental and social performance should be periodically reviewed through internal audits and third-party assessments. Annual environmental audit (EA) reports must be submitted to NEMA as per legal requirements.

7. Adoption of Cleaner Production Techniques:

The proponent is encouraged to incorporate energy-efficient technologies, water conservation measures, pollution prevention techniques, and waste reduction initiatives to promote sustainability and minimize environmental footprint.

8. Emergency Preparedness and Response:

A robust Emergency Response Plan must be developed, tested regularly through drills, and updated based on lessons learned. This plan should cover potential fire outbreaks, chemical spills, accidents, and community evacuation procedures if needed.

9. Rehabilitation and Restoration During Decommissioning:

At the end of the project's life, the site must be decommissioned responsibly. Proper rehabilitation measures such as backfilling of excavations, landscaping, re-vegetation, and waste clearance should be undertaken to restore the area to its natural or economically beneficial state.

10. Promotion of Social Responsibility Initiatives:

The project proponent should actively support community development initiatives such as provision of clean water, support for education, healthcare programs, and local infrastructure development as part of corporate social responsibility (CSR).

On the basis of a firm commitment by the proponent to implement all proposed mitigation measures and to adhere to the Environmental and Social Management Plan (ESMP), it is

recommended that the project be granted an Environmental Impact Assessment (EIA) License pursuant to the Environmental Management and Coordination Act (EMCA) Cap. 387 of the Laws of Kenya and the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003.

REFERENCES

1. Kenya, Republic of (1962) The Penal Code (Cap. 63)
2. Kenya, Republic of (1968) The Building Code 9.
3. Kenya, Republic of (1968) The Local Government Act (Cap. 265)
4. Kenya, Republic of (1972) The Public Health Act (Cap. 242)
5. Kenya, Republic of (1982) The Factories and Other Places of Work Act (Cap. 514)
6. Kenya, Republic of (1994) The National Environmental Action Plan (NEAP)
7. Kenya, Republic of (1999) Sessional Paper No. 6 of 1999 on Environment and Development
8. Republic of Kenya (2003), Legal Notice No. 101: The Environmental (Impact Assessment and Audit) Regulations, 2003.

APPENDICES

1. Certificate of Incorporation for Archers Post Investments Limited
2. K.R.A PIN Certificate for Archers Post Investments Limited
3. Land ownership documents
4. Approval of the scoping report and Terms of Reference for the study
5. Consultation questionnaires
6. Expert's Practicing Licenses for EIA