ENVIRONMENTAL IMPACT ASSSESSMENT STUDY REPORT FOR THE PROPOSED GOLD ELUTION AND LEACHING PLANT ON PLOT LR NO MUHURU KADEM / MACALDER / 742, NYATIKE SUB COUNTY MIGORI COUNTY.

THIS ENVIRONMENTAL IMPACT ASSESSMENT PROJECT REPORT IS SUBMITTED TO THE NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

By

PROPONENT

PEGGY GENERAL ENTERPRISES LTD

P.O Box 38153 – 00100

NAIROBI

DECLARATION

EIA/EA EXPERTS' DECLARATION

We, the undersigned experts; submit this Environmental Impact Assessment Study Report for the Proposed Gold Elution and Leaching Plant on Plot LR NO Muhuru Kadem / Macalder / 742, Nyatike Sub County, Migori County. The EIA project report has been carried out in accordance to the Environmental Management and Coordination Act, 1999 and Environmental (Impact Assessment and Audit) Regulations, 2003. All the information contained in this report is accurate to the best of our knowledge and a truthful representation of all findings relating to this project.

Details of Consulting Firm

SAFEGLOBAL CONSULTANCY FIRM *Environmental Management and Consultancy Services*  0722293312 / 0733729580 / 0705342088 Safeglobalconsultancyfirmltd@gmail.com			**NEMA REGISTRATION NO. 8462**
NAME OF EXPERTS	**NEMA REGISTRATION NUMBER**	**SIGNATURE**	**STAMP/ DATE**
Dr. Peter Oluoch Ouma	Reg. No 7872		
Mrs. Jecinter Atieno Odira	Reg. No 7759		

PROPONENT'S DECLARATION

I,……on behalf of..... submit this Environmental Impact Assessment Study Report for the proposed Gold Elution and leaching Plant within Nyatike Sub County, Migori County to NEMA in compliance with EMCA of 1999 and Environmental (Impact Assessment and Audit) Regulations, 2003. To the best of my knowledge, the information contained in this report is accurate and a truthful representation of all findings as relating to the project.

Signature. ……

Signed on this……day of……2016

ACKNOWLEDGEMENT

The EIA team would like to acknowledge the contributions and participation of various individuals and organizations towards the successful completion of the Environmental Impact Assessment Study Report. Their valuable information, comments and suggestions greatly enhanced the accuracy and usefulness of this report and their contributions is gratefully acknowledged. We have to appreciation the proponent of the proposed development Peggy General Enterprises LTD for making available the opportunity to undertake the Environmental Impact Assessment exercise that will contribute towards the licensing of the proposed Gold Elution and Leaching Plant. Secondly, our thanks also go to the architect who provided an insight of the design of the plant in form of architectural drawings and explanations. We also extend our appreciation to all the concern departmental heads within Migori County for their great contributions during the proposed development plan approvals. All the concerned stakeholders who raised their concerns that have been addressed in this report are highly appreciated. To Mr. Peter Oluoch Ouma and Jecinter Atieno Odira who either indirect or indirect participated and ensured successful completion of the project report, heartfelt thanks to you. We cannot forget to thank the neighboring community of the proposed project development for the co-operation they accorded the EIA team by accepting to be interviewed and giving their views on the proposed project in the area under consideration.

ABSTRACT

Project Description

This project involves establishment of processing plant, collection of disposed tailing from artisanal miners and processing them to extract gold from it. The project is being implemented on land parcel measuring 2.4 hectares located within a sparsely populated neighborhood and it's located on Plot LR NO Muhuru Kadem / Macalder / 742, Nyatike Sub County, Migori County. The proposed project involves construction of 2 buildings, one of which will have provisions for manager's office, secretary's office, a store, WC and shower. The second building will have provisions for laboratory, carbon chamber block, and a store and pit latrine. On processing section, the plant is designed to comprise of nine leach tanks, carbon chamber inside the laboratory block, underground mixing tank/barren tank, water reservoir tank and overhead raised water tanks that feeds leach tanks. There is a provision for a septic tank.

Background and Rationale for the EIA

This EIA report seeks an approval from the National Environmental Management Authority (NEMA) in accordance to the Environment Management and Coordination Act (EMCA) of 1999. Building and construction activities are listed in the second schedule of the Act as projects that will require EIA. The EIA Experts were assigned by the proponent to conduct an Environmental Impact Assessment for the proposed development project. Preliminary designs and site plans for proposed project have been completed. The construction will be professionally done with due regard to approved building procedures. Environmental Impact Assessment for the proposed Gold Elution and Leaching Plant within Nyatike Sub County has been prepared in accordance with the Environmental Management and Coordination Act (EMCA, 1999) and Environmental (Impact Assessment and Audit) Regulations (2003). The Act provides that a proponent of a project shall before commencing carrying out, financing, proceeding with, executing or conducting the project shall carry out or cause the (EIA) to be carried on the project and report submitted to National Environment Management Authority (NEMA). Part VI of the EIA and EA regulations, 2003 gives provisions for Environmental Impact Assessment (EIA). The Authority on satisfaction that the project may not have significant environmental impacts will allow it to continue as planned with the issuance of an EIA license.

Project Objectives

The objectives of the project are: to complete construction as per the design plans; provide a sound gold recycling plant and to promote local economy, diversify development in Nyatike Sub County.

Project cost

The project is estimated to cost Kshs**. 5,755,200.80/=.**

The Scope

The scope of this Environmental Impact Assessment covered the following: The baseline environmental conditions of the area; description of the proposed project; Provisions of the relevant environmental laws; identification, prediction and discussion of any adverse impacts to the environment anticipated from the proposed project; provision of appropriate mitigation measures and environmental management plan outline. The output of this work led to this Environmental Impact Assessment Project Report for purposes of obtaining an EIA license.

Objectives of the EIA Report

The apparent aim of this EIA was to establish the baseline conditions of the proposed site; evaluate the obtainable and the probable impacts and anticipated measures to augment the positive impacts and measures to condense the effects of the negative impacts. Other objectives considered in this project report include: To identify potential positive and negative environmental impacts of the proposed project, assess the implication of these impacts, evaluate the impact relative alternative, propose mitigation measures for the significant negative impacts, propose measures that will enhance the positive impacts and to generate baseline data for monitoring and evaluation of the mitigation measures for the proposed project.

Terms of Reference

The consultants, on behalf of the proponent, conducted the study by incorporating the following Terms of Reference (ToR): -description of the nature of the proposed extension of the project, the location of the project including the physical area that may be affected by the project's activities, the activities that shall be undertaken during the project construction, operation and decommissioning phases, The design of the project, the materials to be used, products and by-products, including waste to be generated by the project and the methods of their disposal, review relevant legal, policy and institutional framework applicable in the implementation, evaluate and analysis of alternatives, identify, predict and analyze the environmental and social impacts of the project, including seeking neighbors' and public views and concerns, evaluation of the technology, procedures and processes to be used in the implementation of the project, recommend a specific environmental sound affordable liquid and solid waste management system, the potential environmental impacts of the project and the mitigation measures to be taken during and after implementation of the project, an action plan for prevention & management of possible accidents during the project cycle, a plan to ensure the health and safety of the workers and neighboring communities, the economic and socio-cultural impacts to the local community and the nation in general, An Environmental Monitoring and Management Plan, (EMP) proposing the measures for eliminating, minimizing or mitigating adverse impact on the environment and the project budget not to mention but a few and any other information the Authority (NEMA) may require.

METHODOLOGY

Data Collection

The Consultants undertook environmental screening and scoping to avoid collecting unnecessary data. Data collection was carried out through questionnaires, observations, photography, site visits and desktop studies where necessary in the manner specified in Part V (section 31-41) of the Environmental (Impact Assessment and Audit) Regulations, 2003.

Reporting and Documentation

The Environmental Impact Assessment Study Report was compiled in accordance with the guidelines issued by NEMA for such works and was prepared and submitted by the Proponent for review and approval. The Consultants ensured constant briefing of the client during the exercise. Description plans, architectural drawings and sketches showing various activities are part of the Appendices.

Responsibilities and Undertakings

The Consultants undertook to meet all logistical costs relating to the assignment, including those of production of the report and any other relevant material. The consultants arranged for own transport and travels during the exercise. On the site of the proposed project, the Proponent provided a contact person(s) to provide information required by the consultants. The Proponent also provided site plan(s) showing buildings layout and the actual size of the site, details of raw materials, proposed process outline and anticipated by-products, future development plans, operation permits and conditions, land-ownership documents and site history. The output from the consultants includes the following:

- An Environmental Impact Assessment report comprising of an abstract, study approach, baseline conditions, anticipated impacts and proposed mitigation measures;
- An Environmental Management Plan (EMP) which also forms part of the report recommendations;

General methodology followed during the assessment was as follows:

- Environmental Screening, in which the project was identified as among those requiring Environmental Impact Assessment under schedule 2 of EMCA, 1999
- Environmental scoping that provided the key environmental issues
- Desktop studies and interviews
- Physical inspection of the site and surrounding areas
- EIA Public participation by the use of questionnaires
- Reporting

Environmental Screening

This step was applied to determine whether an Environmental Impact Assessment was required and what level of assessment was necessary. This was done in reference of requirements of EMCA, 1999, and specifically the second schedule. Issues considered included the physical location, sensitive issues and nature of anticipated impacts.

Environmental Scoping

The scoping process helped narrow the study down to the most critical issues requiring attention during the assessment. Environmental issues were categorized into physical, natural/ecological, social, economic and cultural aspects.

Desktop Review

This included documentary review on the nature of the proposed activities, project documents, designs, policy and legislative framework as well as the environmental setting of the area among others. It also included discussions with managers and design engineers as well as interviews with neighbors within the project location

Site Assessment and Public Participation

Field visits were meant for physical inspection of the site characteristics and the environmental status of the surrounding area to get the baseline conditions and determine the anticipated impacts. To make certain sufficient community involvement in the EIA process, questionnaires were administered to the

project site's neighbors within a radius of 1km and the information gathered was consequently synthesized and incorporated into the EIA project report.

Preparation of Project Report

The EIA project report was prepared by approved and registered EIA experts, who are familiar with the provisions of the Environmental Management and Coordination Act (EMCA), 1999 and other relevant regulation and laws of Kenya as indicated in the Legal framework. This report will then be submitted to National Environment Management authority (NEMA) for review.

Policy, Legal and Administrative Framework

Environmental Management and Co-ordination Act No.8 Of 1999, provides a legal and governmental framework for the management of the environmental related matters. It is the framework law on the environment, which was enacted on the 14th of January 1999 and ratified and effected in January 2002. Highest in the administration of Environmental Management and Co-Ordination Act (EMCA) is the National Environment Council (NEC), which formulates policies, set goals, and promotes environmental protection programs. The implementing organ is the National Environment Management Authority (NEMA).

The second schedule to the Act specifies the projects for which an EIA and Environmental Audit (EA) must be carried out. In this schedule, the proposed Project falls under Item 1 General (a) and (c) "an activity out of character with its surrounding" and "major changes in land use" respectively. According to section 58 of the Act, all projects listed in the second schedule of the Act must undertake an Environmental Impact Assessment, keep accurate records and make annual reports to NEMA or as NEMA may, in writing, require. The Environmental (Impact Assessment and Audit) Regulations, 2003, provide the basis for procedures for carrying out Environmental Impact Assessments (EIAs) and Environmental Audits (EAs).

In carrying out the assessment for this project, various Policy, Legal and Institution framework were reviewed and this include; Environmental policy framework, Institutional framework (National Environment Council, Mineral Act, National Environment Management Authority, Migori County Government. Director of Physical Planning, Neighborhood Associations and/or General Public) and Legal and policy framework (The Environmental Management and Coordination Act No. 8 of 1999, The Physical Planning Act (Cap 286),The Public Health Act (Cap. 242), Occupational Safety and Health Act, 2007 (Cap 514),The Building Code, The Water Act, 2002,The Penal Code (Cap. 63),Land Planning Act (Cap.303), Session Paper No. 6 of 1999 on Environment and Development, The National Environmental Action Plan (NEAP),The National Poverty Eradication Plan (NPEP),The Poverty Reduction Strategy Paper (PRSP),Kenya Vision 2030,The World Commission on Environment and Development, National Construction Authority Act, The Rio Declaration on Environment and Development),Environmental Regulations(Environmental Management and Coordination Act, 1999,Environmental Impact Assessment & Audit Regulations, Water Quality Regulations,2006,Waste Management Regulations, Noise and Excessive Vibration pollution/Control Regulations and Conservation of Biological Diversity Regulations

Analysis of Project Alternatives

The proposed project analyses of alternatives was done in terms of socio-economic implications, technology and environmental implications, the following alternatives were reviewed: No project alternatives, the proposed development alternative, alternative location, the comparison alternatives, alternative project design, analysis of alternative construction materials and technology, waste water

management alternatives and Solid waste management alternatives. After much consultations, deliberation, evaluation and analysis of possible alternatives, the proposed construction of gold recycling plant development was found to be the most viable option and consequently the best alternative.

Predicted Negative Impacts

From the universally acclaimed understanding indicates that in most cases when undertaking Environmental Impact Assessment, the main environmental concerns include the following; Noise and vibration, soil contamination, infrastructural pressure, water pollution, air pollution out of dust and smoke from machineries used during the construction, accidents, compromised quality of developments, blockage of roads during construction phase, waste disposal and health and safety concerns

Predicted Positive Impacts

Positive impacts of the proposed project on the human environment from the project include; creating creating employment for the youth during both construction and operation of the project, improve scenic beauty of the center, tourist attraction, Government Revenue through payment of relevant permits and licenses right from application fees for approvals and Promoting local business like in the quarrying industry for construction materials, cement factories among others resulting business improvement in the area and improving infrastructural amenities of the area.

Conclusion and Recommendation

The proponent of the proposed gold tailing and elution plant development is committed to ensure that the project achieves the intended objectives while conforming to national and international environmental legislations. The recommendations made in this report in the form of EMP regarding the various aspects of environment and mitigation measures to negative impacts should be given necessary attention and budget to ensure that all the operation activities within and around the premise are environmentally sound and compliant to legislative and regulatory environmental standards.

It is therefore concluded that the negative environmental impacts that will result from establishment of the proposed project are not unsympathetic and can be mitigated while the positive ones maximized as much as possible hence ensuring that the plant operations are environmentally friendly. It is this and then from these findings that the project team recommends that the project be licensed for implementation. On the potency of the aforementioned, the experts hereby recommend that the project proponent be granted the required approval and an EIA license be issued to

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LIST OF ACRONYMS

EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act, 1999
EMP	Environmental Management Plan
IEC	Information, Education And Communication
ITZR	Inter Tropical Coverage Zone
KEBS	Kenya Bureau of Standards
KFS	Kenya Forest Service
KPLC	Kenya Power and Lighting Company
NEAP	National Environmental Action Plan
NEC	National Environment Council
NEMA	National Environment Management Authority
NPEP	National Poverty Eradication Plan
OSHA	Occupational Safety and Health Act of 2007
PCC	Public Complaints Committee
PPE	Personal Protective Equipment
SOP	Standard Operating Procedures
STDs	Sexually Transmitted Diseases
T.O.R	Terms of Reference
TLV	Threshold Limit Value
WSSD	World Summit for Social Development

DEFINITION OF OPERATIONAL TERMS

Authority: National Environment Management Authority established under section 7 of the EMCA 1999.

Biological diversity: The changeability among living organisms from all sources including terrestrial ecosystems, aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, among species and of ecosystems.

Proponent: A person/institution who is proposing or executing a project, programme or an undertaking specified in the Second Schedule of the EMCA 1999.

Developer: A person who is developing a project which is subject to an Environmental Impact Assessment under the EMCA 1999.

Environment: Physical factors of the surroundings of human beings including land, water, atmosphere, climate, sound, odor, taste, the biological factors of animals and plants and social factor of aesthetics, culture and includes both the natural and the built environment.

Environmental Audit: The methodical, documented, intermittent and purposeful evaluation of how well environmental organization, management and equipment are performing (machine efficiency) in conservation or preservation of the environment.

Environmental Impact Assessment: A systematic examination conducted to determine whether or not a programme, activity or project will have any adverse impacts on the environment.

Project Includes any project, programme or policy with probability of having an impact on the environment within which it will be undertaken

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CHAPTER ONE: INTRODUCTION

1.1Nature of the Project

Cyanide Process is the most common used process for gold extraction. Various methods such as gravity concentration, flotation, panning, hydrometallurgy, cyanidation etc are available for the extraction of gold metal from its ores. Amongst these methods, cyanidation is the most common method used in the leaching of gold from the ore. This process involves the dissolution of gold containing ores in dilute cyanide solution in the presence of lime and oxygen. The proposed project is an industrial development project involving establishing a tailing, recycling and gold extraction plant. The project involves setting up a plant with stricter and infrastructures necessary for extracting gold from disposed tailings (disposed by artisanal miners) using the VAT leaching method. The proposed project involves construction of 2 buildings, one of which will have provisions for manager's office, secretary's office, a store, WC and shower. The second building will have provisions for laboratory, carbon chamber block and a store. Other provisions includes, a pit latrine, 9 leach tanks, mixing/barren tank, water reservoir tank, septic tank and installation of associated equipment`s and fencing the whole premises by perimeter wall. It involves collection of disposed tailings through purchase from the local artisanal miners, transporting them to the site and re-extracting the minerals; gold in them through static VAT leaching process. The proposed development has been approved by Migori County Control Development Officer, Deputy Director Public Health Migori County and Migori County Government Public Works Arch Ass.

1.2 Background and Rationale for the EIA

Environmental Impact Assessment Study Report for the Proposed Gold Elution and Leaching Plant on Plot LR NO Muhuru Kadem / Macalder / 742, Nyatike Sub County, Migori County. Its GPS Coordinates are 0^0 99' 98" S and 34^0 32' 15" E. The proposed project site is accessible by Randienya Junction,its situated in Mikei location and its down ward of Sota SDA church. The proposed project lies in the gold rich gold belt and is estimated to contain several million tons gold. This has drawn gold exploration and mining individuals and companies since the colonial times. However, most of the mining and processing techniques employed (artisanal) over the while have been rudimentary and hence leave most of the gold intact within the gangue. This in turn has led to the accumulation of hundreds of tons of tailings rich in gold left unexploited and which continue to increase in quantity as more ore is mined by the artisan miners. The proponent of this project therefore saw this opportunity and decided to exploit it with an objective of putting up an investment that will recycle the tailing to extract the remaining gold instead of mining new ores that will contribute to environmental degradation.

It is a requirement through Section 58 (2) of the Environmental Management and Coordination Act of 1999 require that the Proponent of a project shall undertake or cause to be undertaken at his own expense an Environmental Impact Assessment Study Report before implementing the project and prepare a report thereof for submission to the National Environment Management Authority (NEMA) for review and approval and eventually issued with the license to the developer. Regulation 4 (1) of the Environmental (Impact Assessment and Audit) Regulations issued under Legal Notice No. 101 of 13th June, 2003 states that no Proponent shall implement a project likely to have a negative environmental impact, or for which an Environmental Impact Assessment is required, unless an Environmental Impact Assessment has been concluded and approved under these regulations. Pursuant to the prevailing legal requirements envisaged in the EMCA,1999 and EIA/EA Regulation mentioned above and based on the level of, extent and the potential impacts that are likely to arise from the proposed project, there was need to carry out this assessments so as to identify impacts and suggest their possible mitigation

procedures. It's with this regard that the proponent to the proposed project under consideration betrothed a team of registered EIA/EA experts from Safe Global Consultancy Firm Limited To carry out the study and prepare this report on his behalf for processing, In compliance with these legislations, and in application for an EIA license, PEGGY GENERAL ENTERPRISES LIMITED has requested for an EIA study report of the proposed project.

This assessment (EIA) seeks to evaluate the potential and predictable impacts of the proposed development on the proposed site, the surrounding community, and employees during construction, operational phases and the users of the facility during and upon its completion. The report also seeks to formulate recommendations that will assist in mitigating the possible adverse impacts and also enhanced the maximization of positive impacts for continued sustainability. Appropriate mitigation and monitoring measures should be employed as stipulated by legal provisions as a result of the nature of the tailing, which are large-scale consumers of resources and important producers of waste. In order to establish the real environmental impacts of the project, it is necessary on one hand to look at the whole of the project life cycle (construction, operation, maintenance, demolition.

1.3 Principle of Environmental Impact Assessment Consideration

The key principle of EIA are that every person is entitled to a clean and healthy environment and has a duty to enhanced and safeguard the environment. It is with this apparent logic and apparent reasons that this EIA report is compiled for submission to NEMA for the necessary documentation process and decision making. Apart from the key principle highlighted above, other principles of EIA considered in the development of this report include:

- Accounting for all environmental concerns in the proposed project activities
- Performance assessment of the proposed project which will entail; Meeting or exceeding all applicable standards and regulations for the proposed project
- Measuring and reviewing environmental performance by conducting regular internal audits during the construction phase
- Conducting public participation to get the relevant information from the involved stakeholders regarding the proposed project activities
- Recognition of social and cultural principles traditionally used in the management of the environment and natural resources
- Considerations on the emergency and contingency
- The precautionary principle in which, there is a requirements that action should be taken to prevent serious and irreversible damage.
- It is on the basis of the aforementioned principle that an Environmental Impact Assessment is considered both as a planning tool and as a decision making tool.

1.4 Rationale of the EIA Project Proposal Report

The proponent of this project is compliance with the legal requirement contained in the Environmental Management and Coordination act (EMCA) of 1999 contracted an Environmental Impact Assessment Expert to carry out an EIA project proposal report for the proposed tailing recycling (gold reprocessing) plant to be located on Plot LR NO Muhuru Kadem / Macalder / 742, Nyatike Sub County in Migori County. The exercise seeks to evaluate the potential and foreseeable impacts of the proposed project on the proposed site, the surrounding community, employees during implementation and operational phases. The purpose of the assessment is to incorporate the potential environmental (physical,

ecological and cultural/socio-economic) concerns and address them adequately at the inception (design) and operation.

The study is expected to raise both the potentially positive and negative impacts likely to emanate from the proposed project. Integrating Sustainable Environmental Management principles in the planning and implementation processes of any proposed projects is a milestone in reducing/mitigating conflicts as well as enhancing control and revitalization of the much-degraded environment.

1.5 Project Objectives

The proponent aims at establishing a tailing recycling plant as an investment to recycle tailings that are disposed by artisanal miners in Nyatike and its environ to extract the remaining gold out of it using environmentally friendly and acceptable process.

- To boost the local economy by providing employment opportunities ‘during construction and operation
- To put the plot into a more socio-economic use
- To complete the construction as designed and at the stipulated time framework of 1 year

1.6 Objective of the EIA

- Carrying out an assessment of the state of the environment of the project area with a view to avoid environmental degradation and maintenance of the proper functioning of ecological systems.
- Identify and evaluate the significant environmental impacts of the proposed project.
- To determine the compatibility of the proposed plant with the neighboring land use
- Formulation and incorporation of Environmental Management and Monitoring Plan during project implementation/construction, operation and decommissioning phases.

1.7 Scope of the EIA Report

The Environment Management and Coordination Act, 1999 requires that an EIA be conducted for all new projects, programs or activities at their planning stages to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation and decommissioning of the proposed developments. The EIA project report includes an assessment of impacts of the proposed tailing recycling plant and its associated operations. The scope of this Environmental Impact Assessment, therefore, covered but was not limited to:-

- The baseline environmental conditions of the area
- Description of the proposed project activities
- Review of relevant international and national legislations governing the developments
- Compensatory measures to take care of the significant negative impacts
- Evaluation of possible alternatives and come up with the best alternative
- Identification and discussion of potential positive and negative impacts of the proposed project on physical, social, economic and cultural environments
- Propose appropriate mitigation measures for negative impacts
- Preparation of an Environmental Management Plan (EMP) that will guide the implementations of the proposed project

1.8 Terms of Reference

The scope of the assessment study covered construction works, operations and related activities of the proposed development. The output of this work was a comprehensive EIA project report for the purposes of applying for an EIA license as required by EMCA, 1999 and its subsidiary legislations.

The EIA project identified existing and potential positive and negative environmental impacts and real concerns of the stakeholders of the proposed project site. The study also proposes possible and cost-effective mitigation measures for the negative impacts as stipulated in the Environmental Monitoring and Management Plan (EMP) proposed. The project assessment investigations and analysis of the anticipated environmental impacts of the proposed development in line with terms of reference stipulated in the Environmental (Impact and Audit) regulations 2003 and in particular part 2 S 7 (1). The consultants, on behalf of the proponent, conducted the study by incorporating but not limited to the following Terms of Reference (TOR): -

- Description of the nature of the proposed extension of the project
- The location of the project including the physical area that may be affected by the project's activities
- The activities that shall be undertaken during the project construction, operation and decommissioning phases
- The design of the project, the materials to be used, products and by-products, including waste to be generated by the project and the methods of their disposal
- To review relevant legal, policy and institutional framework applicable in the implementation of the proposed project
- Evaluation and analysis of alternatives including, the proposed project, no project alternative, project design and technology
- To propose and recommend a specific environmentally sound and affordable liquid, health care waste and other solid waste management system.
- To identify, predict and analyze the environmental and social impacts of the project, including seeking neighbors' 'and public views and concerns
- Evaluation of the technology, procedures and processes to be used, in the implementation of the project
- To recommend a specific environmental sound affordable liquid and solid waste management system.
- The potential environmental impacts of the project and the mitigation measures to be taken during and after implementation of the project
- An action plan for prevention & management of possible accidents during the project cycle
- A plan to ensure the health and safety of the workers and neighboring communities
- The economic and socio-cultural impacts to the local community and the nation in general
- An Environmental Management Plan (EMP) proposing the measures for eliminating, minimizing or mitigating adverse impact on the environment
- The project budget and any other information the Authority (NEMA) may require

1.9 Methodology

The methodology of the process which culminated to the assessment and the successive EIA study report included the following:-

Preliminary Assessment of the site where the experts visited the site to know the site location

Environmental Screening is the first step in any EIA process; it involves the determination of whether or not an EIA study is required for a particular development activity

Environmental Scoping process helped narrow the study down to the most critical issues requiring attention during the assessment and environmental issues were categorized into physical, natural/ecological, social, economic and cultural aspects. Scoping was carried out in discussions between the developer, the competent authority, relevant agencies and, ideally, the public, effective scoping enables limited resources to be allocated to best effect (i.e. through investigation of only the most significant impacts). An EIA study required for a particular development activity. Determination in the proposed project depended on the following aspects but not limited to:

- The sensitivity of the area likely to be affected
- Public health safety
- The possibility of uncertain, unique or unknown risks
- The possibility of having individually insignificant but cumulatively significant impacts
- Whether the proposed activity affects protected areas, endangered or threatened species and habitats. From the above, the proposed project was seen to require an EIA study since gold extraction and recycling activities of such magnitude are expected to give forth both negative and positive effects to the environment and ultimately contribute an increased waste generation both in the construction and operation phases. These stages also involved activities such as: Getting a comprehensive site description that includes. The soil and geology of the proposed site, water resources available on site, drainage system evident on site, climate conditions of the proposed site and its vicinity, vegetations on site, land use systems on site and its vicinity and other infrastructures at the site and justifications.

Data Collection was carried out through questionnaires, observations, photography, site visits, detailed physical inspection of the proposed site and desktop studies to determine the present and anticipated impacts of the proposed project, study of the approved technical drawings for the proposed project development and the development of a photo gallery.

C**onsultation and Public Participation** was done by interweaving neighbors' and by holding community meeting which was chaired by area Sub Chief at the proposed site, members present were interviewed and asked to administer the questionnaire, in order to get their views, expectations, projected economic and social effects regarding the proposed project activities and locations. These findings were then analyzed and incorporated in this project report.

Data Analysis and Evaluation of Alternative was done by use of checklist and the threshold limits were used in data analysis, while the technology to be employed, products mix scale of construction, potential environmental impacts, capital and operating cost, suitability under local conditions, and institutional, training, and monitoring requirements were considered in the evaluation of alternatives.

Responsibilities and Undertakings

The Consultants undertook to meet all logistical costs relating to the assignment, including those of production of the report and any other relevant material. The consultant arranged for own transport and

travels during the exercise. On the site of the proposed project, the Proponent provided a contact person(s) to provide information required by the consultant.

The Proponent also provided site plan(s) showing project layout and the actual size of the site, details of raw materials, proposed process outline and anticipated by-products, future development plans and land-ownership documents. The output from the consultants includes the following: an Environmental Impact Assessment Report comprising of an executive summary, study approach, baseline conditions, anticipated impacts and proposed mitigation measures, an Environmental Management Plan which also forms part of the report recommendations.

Preparation of Project Report

The EIA project report was prepared by approved and registered EIA experts, who are familiar with the provisions of the EMCA, 1999 and other relevant regulation and Laws of Kenya as indicated in the Legal framework.

Submission of the Project Report

This report will then be submitted to NEMA for review and if approved the proponent will be issued with the NEMA license.

1.10 Proposed Project Justification

The project will provide employment during both construction and operation phases. The proposed project will create market for goods and services especially construction input which include raw materials, it will create employment opportunity and the government will benefit in terms of revenue through taxes which will be levied on goods and services purchased during the entire project period. Many secondary businesses are also likely to come up during the construction phase especially those providing foods and beverages to the construction workers and it will put into use the economic value of unused tailing by extraction of gold.

CHAPTER TWO: DESCRIPTION OF THE PROJECT

2.1 Location and Size

Environmental Impact Assessment Study Report for the Proposed Gold Elution and Leaching Plant on Plot LR NO Muhuru Kadem / Macalder / 742, Nyatike Sub County, Migori County. Its GPS Coordinates are 0^0 99' 98" S and 34^0 32' 15" E. The proposed project site is accessible by Randienya Junction,its situated in Mikei location and its down ward of Sota SDA church. The proposed project lies in the gold rich gold belt and is estimated to contain several million tons gold.

2.2 Background and Rationale for the EIA

This EIA study report seeks an approval from the National Environmental Management Authority (NEMA) in accordance to the Environment Management and Coordination Act (EMCA) of 1999. Building and construction activities are listed in the second schedule of the Act as projects that will require EIA. The EIA Experts were assigned by the proponent to conduct an Environmental Impact Assessment for the proposed development project. Preliminary designs and site plans for proposed project have been completed. The construction will be professionally done with due regard to approved building procedures.

Environmental Impact Assessment for the proposed Gold Elution and Leaching Plant within Nyatike Sub County has been prepared in accordance with the Environmental Management and Coordination Act (EMCA, 1999) and Environmental (Impact Assessment and Audit) Regulations (2003). The Act provides that a proponent of a project shall before commencing carrying out, financing, proceeding with, executing or conducting the project shall carry out or cause the (EIA) to be carried on the project and report submitted to National Environment Management Authority (NEMA). Part VI of the EIA and EA regulations, 2003 gives provisions for Environmental Impact Assessment (EIA). The Authority on satisfaction that the project may not have significant environmental impacts will allow it to continue as planned with the issuance of an EIA license.

2.3 Site Ownership

The proprietor and proponent to the proposed Engineering project is **PEGGY GENERAL ENTERPRISES LIMITED**, it's registered under the Land Registration Act in the proponent's name. The proponent address is **P.O Box 38153 – 00100 Nairobi.**

2.4. Description of the Project Area

The project area is a mixed agricultural and sparsely populated settlement. The area is known for artisanal gold mining with centralized mining site camps and homesteads having heaps of tailings. The tailings are in most cases a menace as its disposal is a task. It is important to note that about 30% of the settlements within the project location are artisanal miners in their private lands and therefore this project will not be competing with them but complimenting them by reusing the tailings they have disposed. These tailings will be collected at a fee hence double economic benefit to the artisanal miners. The site has been on use as an agricultural land, establishment of this project will change the land use to an industrial use. The proponent must acquire Change of User

2.5 Design of the Project

This project involves establishment of processing plant, collection of disposed tailing from artisanal miners and processing them to extract gold from it. The project is being implemented on land parcel measuring 2.4 hectares located within a sparsely populated neighborhood and it's located on Plot LR NO Muhuru Kadem / Macalder / 742, Nyatike Sub County, Migori County. The proposed project involves construction of 2 buildings, one of which will have provisions for manager's office, secretary's office, a store, WC and shower. The second building will have provisions for laboratory, carbon chamber block, and a store and pit latrine. On processing section, the plant is designed to comprise of ten leach tanks, carbon chamber inside the laboratory block, underground mixing tank/barren tank, water reservoir tank and overhead raised water tanks that feeds leach tanks. There is a provision for septic tank.

2.5.1. Leach Tanks

The plant is designed to comprise of 6 on ground leach tanks. Each tank is designed to be round in shape. Each tank will be individually fed by the above ground water tanks with solutions of cyanide plus lime and individually discharged into the pregnant solution clarification holding tank. The tanks will be constructed using corrugated steel, concrete, cement and bricks. Bricks and mortar are the most commonly used materials with the inside of tanks finished with leak proof cement and fitted some form of false bottom that functions as a filter.

2.5.2. Laboratory Room

This will be a building to comprise of carbon chambers, laboratory section and a store for Chemicals and reagents. It will be a masonry building located next to leach tanks.

2.5.3. Mixing Tank/ Barren Tank

The project is designed to have a mixing tank/barren tank adjacent to the laboratory block. Solutions from the carbon chamber will be discharged into this mixing tank/barren tank where it will be mixed with lime and cyanide then pumped back to the water tank feeding leach tanks (reused). This is a well-constructed leak proof underground tank.

2.5.4 Water Tanks

The project will have three types of water tanks;

- Water reserve tank for human consumption to be located far from processing area.
- Above ground water tanks that feeds the leach tanks. These are ready made tanks. They are designated to contain solution of water, cyanide and lime for the leaching process hence will continuously feed the leach tanks with solutions as will be required by the process.
- Fresh water reservoir tank to recharge mixing/barren tank this will be an on ground masonry tank

2.5.5. Building Structures

The plant is designed to comprise of office block for project management purposes, laboratory house hosting carbon chamber and other laboratory works related to the process and collection of carbon pregnant with minerals, workers house, latrine facility and guard house at the gate. Other than the laboratory block which is a permanent building constructed out of masonry work, all other structures are temporary structures constructed out of iron sheets reinforced on timber.

The buildings will have adequate natural ventilation through provision of permanent vents, adequate natural and artificial light.

2.5.6. Storm Water Drainages

Other than the aforementioned, the site will designate an area for tailing and material storage area. This area will be provided with drainage channel that will collect storm water from this area and directs it into underground water tank for collection and reuse. Storm water from areas not exposed to processing substances e.g. tailings and water solutions will be diverted not to get into processing area to enable easy management of contaminated store water.

2.5.7. Security of the Premise

For security purposes and to avoid accidents and any animal from entering the site, the whole premise will be fenced using perimeter wall

2.6. Description of the Project Activities

2.6.1 Site Preparation

The proponent will first ensure that the project development plans has been approved by all the relevant authorities. After the construction tender shall have been awarded to the contractor who will then move to the site to prepare it for the construction works. The site is already fenced hence the contractor will put up his site office, store and erect a construction board indicating the kind of project, work and professionals involved including NEMA EIA approval license Number.

2.6.2 Sourcing and Transportation of Building Materials and Gold Recovery Materials

Building materials will be sourced and transported to the project site from their extraction, manufacturer or storage site using transportation tracks. While the sourcing of the materials will be done from Migori County and neighboring counties, great prominence will be laid on procurement of material from the local area which will make both economic and environmental safe as it will condense negative impacts of long distance transportation of materials to the project site, saving a lot of money and boosting economy of the town within which the project will be undertaken and the surrounding area. In the case scenarios where the materials needed for the project is not available from the local domain or nationally, they will be outsourced from abroad or overseas and transported to the site using the most appropriate means to reduce damages and accidents, thereby reducing losses likely to be incurred.

Gold recovery materials involved in the proposed project will include cyanide, carbon, tailings, limes and laboratory chemicals. Tailings to be used for the gold recovery process will be sourced from artisanal gold miners within the project area, an activity that will involve analyzing the amount of gold in the tailing, buying and transporting it to the site. The procurement will be in a manner that identifies the correct ownership of these tailings and price of the materials will depend on the gold values contained therein. Transportation of the tailings to the site will be done using Lorries or any other convenient and environmentally friendly means. The traveling distance will within a radius of 15 kilometres from plant site. Chemical reagents that will be transported from residence by road are activated carbon, cyanide, lime and laboratory chemical. These chemicals will be transported in their proper containers and appropriate escort will accompany them as it may be necessary.

2.6.3 Storage of Materials on Site

The proposed site has enough space for the purposes of storage of bulky construction material needed for the proposed project hence storage of bulky materials such as rough stones, ballast, sand and steel will not be of a challenge. Others will be purchased when required and stored in temporary storage structures which will be constructed within the project site for this purpose. An area near the leaching

tanks will be leveled in such a manner that tailings to be processed will be stored in the vicinity to facilitate loading into the tanks. The base at which the raw materials will be kept will have proper lining to prevent any accidental seepage of chemicals. The poisonous or corrosive reagents such as cyanide, carbon or other laboratory chemicals will be stored in the laboratory in a well secured area that is well founded to prevent accidental spillage to the environment. Other material like lime will be procured and kept in a store on site.

2.7 Description of the Project Operational Activities

The materials needed for this project are tailings, crushed ore, chemicals; cyanide, lime, carbon and any other chemical deemed necessary but legally accepted for mining activity. Other materials are water, diesel and electricity. Laboratory chemicals necessary for the sampling and analytical work will also be necessary for the project. Machinery, equipment and tools will include; - tipping truck, dump truck, water pumps, electrical fitments, wheel barrows spades, hammers, chisels and water hose pipes etc. Safety equipment will include; - fire extinguisher, safety gears for staff, PH control equipment, special purpose lab masks, complete package first aid kit, safety protective equipment's. Other inputs are work force; both skilled and unskilled, land, energy, machineries, trucks for transportation of tailings and other plant materials.

2.7.1 Gold Recovery Processes

2.7.1.1 Gold Extraction Process

It is a simple form of gold recovery by Cyanide leaching, and is called The Vat Leaching Technology (VLT). It involves no mechanical agitators and simply relies on the action of a percolating Cyanide solution to dissolve any particles of gold it comes into contact with. Once the tailings are brought to the processing site, they will be heaped at one side of the site next to the leaching tanks. The tailings will then be analyzed in the laboratory to know the mercury and gold content in them to determine the amount of lime and cyanide required in the process.

The process will start with reagents preparation that will be dissolution of cyanide into a barren tank to a 450-500ppm Cyanide solution. Then on the raw material pad, the materials will be mixed with lime that will act as an agent to raise pH that will be maintained above 11 in the leaching system. After preparation, the ore is deposited in the vat/leach tanks by conveyors or a loader or alliteratively by hand shovels. A barren solution of a 450-500ppm Cyanide solution from the solution feeder tanks will then be discharged on the ore (each tank individually fed) by a system with holed pipes. The solution is fed from the top of the leach tanks across the top of the pile for the solution to percolate down through the pile. The cyanide is left to leach the gold for up to 72 hours. The gold laden pregnant solution will drain out from the bottom of the pile to the pregnant solution tank. The solution will be read for carbon loading prior to subsequent elution and electro winning processes. During leaching, the solution is monitored for PH. balance which should be maintained at not lower than 010.5, using lime.

The completely used leached tailing will then be washed with fresh water to wash away any trace of cyanide remaining in it before it is removed from the leach tank. Water from the flashing/washing process will be discharged into the carbon chamber through the same discharged channels to undergo the same process as the gold laden pregnant solution.

It is anticipated that after the leaching process and flashing/washing of tailings with fresh water before removal from the leach tanks, there will be no trace of cyanide in the processed tailing and if there will be any it will be of low concentration and of insignificant impact to the environment since it strength is easily and quickly killed by sunrays.

2.7.1.2 Carbon Adsorption

Carbonaceous ores that allow cyanide to dissolve gold but quickly adsorb gold back onto the active carbon in the ore. Treatment processes include chlorination for carbon deactivation, roasting to burn away carbon and carbon-in-leach which introduces competing high activity carbon to preferentially adsorb gold that can be conveniently separated from the leach slurry. This area will have a number of chambers containing carbon, cylindrical in shape and conical at the bottom carbon.

The pregnant solution collected at the gold pregnant solution clarifiers and holding tank is then passed through carbon chamber for gold extraction through a process known as carbon adsorption. The solution is passed into the first column termed as the head; the tail, which overflows, from the bottom of the column will be the head of the subsequent column and so on until all gold is extracted. Once the carbon is saturated with the gold (will be determined by analyzing the content through laboratory process), the loaded carbon will be removed from the chambers and replaced with the new ones. The loaded will then be washed with fresh water then stored awaiting transportation for the "elution" or desorption of gold process.

Water used for washing the loaded carbon will be channeled back into the mixing tank for recycling and reuse purposed in the leach tanks. The elution process will be done

2.7.1.3 Recycling of Barren Solution

The barren solution from carbon chamber is drained into the mixing/barren tank (a continuous process). The barren solution in the tank will be tested of the quality and necessary adjustment done by adding the required quantity of cyanide, water and lime then pumped back to the overhead tanks feeding the leach tanks. The mixing tank will be recharged from the nearby underground fresh water reserve tank to ensure that the solution in the mixing tank and the solution pumped to the feeder tanks is of the required standard. This is a closed process cycle hence the solution is recycled throughout and no resultant water is discharged into the environment.

2.7.1.4 Processed Tailings

The proponent of this project aims at completely making use of the tailing by extracting any gold remaining in it which is 95 % recovery. Before the completely used/leached tailings are removed from the leach tanks, it will be washes/flashed with fresh water to wash away any trace of cyanide remaining in it and also open to sky for the tailings to receive adequate sunlight that will decompose any traces of cyanide remains. The tailings will be deposited on an impermeable layer of bottom lining and in a location that will ensure that it is not carried away by storm water downstream. A drainage channel will be dug around the processing area and tailing storage yard to ensure that the storm water from the section is collected in a controlled manner and discharged into a pond to be constructed on site. Since the process will have not contaminated the tailing, the tailings will be used in covering the abandoned mine holes and quarry in the project area or used economically to make construction bricks or used to reclaim degraded farms for agriculture.

2.7.1.5 Water Abstraction and Use

The project area has no permanent water source hence the proponent need to organize for a permanent source of water. It is important to note that, the plant will require little water to top up the lost water through evaporation as most of water is recycled. This lost water will time to time be replaced by water that will be sourced and stored in a tank on site to ensure that water is always available. The domestic water for consumption and other domestic purposes will be sourced and stored well to avoid contamination.

2.7.1.6 Residing

The project will source its manpower from the community and where need be from the other areas. Most casuals will be from the community while the professionals or skilled manpower if not available in the community will be sourced elsewhere. Since some operations are intensive and require close monitoring and supervision, some workers; mostly technicians who will be two in number, will be required to be on site throughout hence need for accommodation facilities for this category of workforce. As such, a building designed to be a sleeping house will be constructed. Those employees who will have been sourced from the local community will get back to their home at the end of the day.

2.8 Description of the Project Decommissioning Phase

It's imperative to note that the proponent to the said project does not whatsoever have plans in foreseeable future to demolish the gold recycling plant as in case of decommissioning the current proposed processing. But there are factors that will compel the proponent to decommission the establishment. There will include but not limited to; An order by a court of law due to non-compliance with existing Regulations, Natural calamities or Proponent deciding to do away with the premise among other factors. Otherwise the facility decommissioning will involve, In case there will be a need to decommission the whole premise, the proponent will undertake all the decommissioning activities and process that will ensure decommissioning is done in an environmentally friendly manner and the site is returned to its original state as much as possible. A decommissioning plan will be prepared and submitted to the relevant departments in for approval.

Once the decommissioning plan is approved the decommissioning activities will involve preparation of decommissioning plan three months before decommissioning, ceasing all the operation of the facility, removal of any machinery of the site and laying off employees, dismantling of all the equipment's and any other thing that can be dismantled for reuse, recycle or sale. The remaining components that cannot be dismantled will be demolished and the product; waste or materials can be reused in other projects, recycled or disposed in a legally accepted manner as shall have been indicated in the decommissioning plan. Any excavation will also be filled up. The permanent buildings may be left for the next land owner or for other purposes. Tailings shall also be removed from the site and disposed as shall have been indicated in the decommissioning plan and assessment (filling of mine holes or used brick making)

Once the entire project component will have been removed from site, activities to restore the site will be undertaken; this will include planting of fast growing trees which exist within and around the project site to compensate for the lost flora. The site will also be fenced off to protect human beings and animals from safety risks associated with the decommissioning phase. The soil layers will be segregated accordingly so as to facilitate the correct restoration profile. Since the process will have not contaminated the tailings it is advised that, the tailings be used in covering the abandoned mine holes in the project area.

2.9. Input, Product and By-Products

Input: Materials labour both skilled and unskilled and land

Product: The anticipated end product for this project is Gold loaded carbon for elusion processing to get gold.

By-products; barren water which will be recycled used tailing that may be reused in making bricks and or rehabilitation of mine holes and abandoned quarries in the area.

2.10 Time Frame

Generally it is proposed that since the project does not need a lot of structures to start, site preparation will take 6 months to set up. Operation of the site will depend on the market demand and availability of material; tailings still rich in minerals.

2.11 Estimated Project Investment Cost and NEMA EIA Submission Fee

The proposed gold recovery plant development is estimated to cost approximately Kshs 5,755,200.80 only.

2.12 Tenure and Ownership

The property is registered under the land Registration Act and the title Deed has been issued.

CHAPTER THREE: BASELINE INFORMATION OF THE STUDY AREA

3.1 Introduction

This section describes the project area's physical, biological and socio-economic environments. The project needs to put to consideration various environmental aspects as it shall make utility of the environmental resources.

3.2 Baseline Information of Migori County

Migori County is located in south western Kenya at an altitude of 1322-1550 meters above sea level. Migori County neighboring Counties are; Homa Bay County to the north, Kisii County, Narok County to the east and Republic of Tanzania to the south. Migori town is part of the business hub of the greater Nyanza region because of its strategic location and its accessibility. It is located 60 km from Kisii town and traversed by the 104.6 km (A1) that links Kenya with Tanzania through Isibania.

Migori County is now expanding rapidly because of the Central Government devolution strategy to County Governance and improvement of the road infrastructure and the expansion of the water supply capacity in the County. This has attracted investors and the previously undeveloped plots are now being developed. The climatic and physical conditions of the site where the proposed project is located compares favorably to Nyatike Sub County and that of the wider Migori County. A combination of one or more of these factors directly influence urban development, and are preconditions to the site analysis and planning.

3.3 Physiographic and Natural Conditions

The County has an altitude varying between 1140m at the shores of Lake Victoria in Nyatike Sub County to 4625m in Uriri Sub County. Undulating hills covers most of the county with a few stretches of flat land. Some of the hills found in the county include Nyakune (4625 m) and Ogengo (4300 m) in Uriri Sub County, God Kwer (1420 m) in Migori Sub County, God Kwach (1340 m) in Nyatike Sub County, Mukuro (1454 m) in Suna West Sub County, Nyabisawa (1489 m) in Suna East Sub County, Renjoka (1592m) in Kuria West Sub County, God Sibwoche (1475 m) in Uriri Sub County and Maeta (1733 m) in Kuria East Sub-county.

Agro-ecological zoning is the division of an area of land into smaller units, which have similar characteristics related to land suitability, potential production and environmental impact. The County has six agro-ecological zones ranging from Upper Midland (UM) 1-4 covering Rongo, Kehancha and Ntimaru in Rongo, Kuria East and Kuria West Sub Counties respectively to Lower Midlands (LM) 1-5 covering parts of Rongo, Suna East, Suna West and Nyatike Sub Counties.

3.4 Climatic Conditions

3.4.1 Rainfall

Just like the larger Migori County, Nyatike Sub County has an equatorial climate with the temperatures modified by Lake Victoria. Temperatures and rainfall are lower than emblematic equatorial conditions and therefore the area is classified as sub- humid with annual rainfall averaging between 700 mm and 1,800 mm. Long rains is between March and May while short rain are between September and November. Dry seasons are between December and February and June and September. The rainfall is

controlled by the movement of ITCZ (Inter Tropical Convergence Zone). There are considerable spatial variations in the area, mainly due to the location of the highlands and nearness to Lake Victoria.

3.4.2 Ambient Air Quality

Air quality has not been interfered with although there are mining activities undertaken in the area. The site of the proposed project has good air quality except for dust which would arise from the sides of the opposite road.

3.4.3 Temperature

The temperature ranges from 19.30c - 21.70c in highland but in lower parts in Nyatike division the temperature may go up to or beyond 280c with high humidity and a potential evaporation of 1800 to 2000 mm per year.

3.5 Hydrology

Migori County is located on the Southern part and near the edge of Lake Victoria and has to major rivers, River Migori and River Kuja running through its vicinity.

3.6 Geology and Soil

The geology of Migori is characterized by metamorphic rocks. These rocks are rich in gemstones like ruby, topaz, aquamarine, garnets among others. The Migori region is located on the southern part of the Nyanza rift, with the Nyanza system (2.8-3.1Ga). There are also areas of Quaternary sediments in the area and the main rock types are silts, diatomite and clay. The soils are well drained and tend to be loamy. This favors the cultivation of tobacco, sugarcane, maize, beans, coffee, groundnuts and vegetables. The proposed site however has cotton top soils.

3.7 Biodiversity

3.7.1 Flora

It's important to note that the proposed site is in Mikei location. The vegetation within the area is influenced by the hot temperature and comprises of grass and shrubs. Therefore there are no vegetations of significance that will be threatened or to be destroyed by the project.

3.7.2 Fauna

Fauna of the area comprises many varieties of domesticated animals like cattle, sheep, goat, birds, cats and dogs among others. Wild fauna include insects, birds, snakes, and rodents. However, in Migori County, it should be noted that the number and diversity of animals is limited, obviously as a result of change in land use. There are no fauna of significance within the project site that will be affected as a result of project implementation.

3.7.3 Susceptible Ecosystems or Place of Cultural Importance

The proposed project site does not have sensitive ecological units or places of cultural important in the immediate environments that will be most affected in the event the proposed project is undertaken

3.8 Land Use Activities

The proposed site is in Nyatike in agricultural zone. Among the key land use features a round the proposed site mainly includes small scale business enterprises, residential houses and church

3.9 Social and Economic Aspects

3.9.1 Population and Demography

In reference of the KEBS data, Nyatike sub-county had a statistically projected population of 144,625 people with an average population of 5 persons per household and life expectancy of about 85 years all factors kept constant. The growth of Macalder mines is one of the key influencing factors to population distribution to Nyatike Sub County. This can be accredited to the favorable climatic conditions, immediacy to Kenya Tanzania border for trade and the existence of relatively ample social amenities such as banks, housing, and health services not to mention, just but a few.

Table 1: Nyatike Sub-County Population Distribution per Ward

No.		Name	Population (2009 National Census)	Area (Sq. Km)	Description
1	1282	Kachieng'	21,775	56.00	Gunga, Raga and Sori Sub–Locations of Migori County
2	1283	Kanyasa	14,331	83.20	Otati, Alendo, Misiwi, Okayo and Ngira Sub–Locations of Migori County
3	1284	North Kadem	30,697	204.70	Magungu, Bala, Kiwiro, Okenge, Kanyuor East, Kanyuor West, Karapolo and Kakelo/Kakoth Sub–Locations of Migori County
4	1285	Macalder/ Kanyarwanda	22,691	136.40	Owich, Nyatike, Mikei, East Kanyarwanda, Central Kanyarwanda and West Kanyarwanda Sub–Locations of Migori County
5	1286	Kaler	9,775	58.70	Kiasa and Olasi Sub–Locations of Migori County
6	1287	Got Kachola	22,338	93.90	Nyandago, Bande, Amoyo, Winam and Aneko Sub–Locations of Migori County
7	1288	Muhuru	23,018	44.80	Ibencho, Winjo, Tagache, Nyankondo, Nyabomo, Sumba,Nyancha and Kithi Sub–Locations of Migori County

Source: Independent Electroral and Boundaries Commission (IEBC)

3.9.2 Economic Activities

Migori County is known to be engaging in mining activities .this activity has its epicenter in Macalder Nyatike and other surrounding areas along the beltline spreading to the neighboring county kilgoris and Tanzania respectively. In Nyatike Sub-County, there has been significant mining.

3.9.3 Sites of Cultural Value

The project area has no site of cultural value for the community hence the project is not likely to interfere with any place of cultural importance to the residents.

3.10 Environmental Sampling

There was no environmental sampling undertaken to establish water, air and soil quality. The proposed project is basically gold recycling plant.

3.11 Infrastructural Facilities and Services

3.11.1 Water Supply

The site is served by sourced water from Migori as the main water source.

3.11.2 Roads and Accessibility

There is easy accessibility to the project site.

3.11.3 Network Communication

The area of proposed project site is covered by communication facilities, landline and mobile telephone services. Communication network is being provided by Safaricom, Airtile /Yu and Orange service network providers

3.11.4 Energy

The project neighbors and the existing facilities within the project site are already connected to the power from KPLC LTD; this is evident enough that electricity/ power supply will not be a challenging factor during the construction and operational phase of the project considered herein

CHAPTER FOUR: LEGISLATIVE, POLICY AND INSTITUTIONAL FRAMEWORK

4.1 Introduction

Most of the environmental problems in Kenya and in the world have been attributed to been as a result anthropogenic activities which are not in harmony to the natural environments and lack of awareness. Among the cardinal environmental problems include: climate change, deforestation, loss of biodiversity and habitats, land degradation, land use conflicts, human animal conflicts, water management and environmental pollution. Development activities have the potential to damage the natural resources upon which the economies are based. Measures have been established to ensure development projects must be economically viable, socially acceptable and environmentally sound. Among these measures is EIA process. EIA is a useful tool for protection of the environment since it predicts potential impacts of the development and proposes mitigation measures of the negative impacts as a way to reconciling the activity with the natural environment. EIA ensures that new developments are environmentally sound thus promoting sustainability. EIA process incorporates examining the legal and institutional frameworks that are relevant to the proposed project. Presently environmental legislation in Kenya is provided in more than 77 statutes. In order to provide a structured approach to environment issues and management, EMCA was enacted on 14th January, 2000 as a legal approach that contains provisions for environmental management of proposed and ongoing projects in Kenya.

According to Sections 58 and 138 of the Environmental Management and Coordination Act (EMCA) No. 8 of 1999 and Section 3 of the Environmental (Impact Assessment and Audit) Regulations 2003 (Legal No. 101), the proposed project require an Environmental Impact Assessment project/study report prepared and submitted to the National Environment Management Authority (NEMA) for review and eventual Licensing before the development commences. This is necessary as many forms of developmental activities cause damage to the environment and hence the greatest challenge today is to maintain economic development without interfering adversely with the environment. In conducting this Environmental Impact Assessment, various Acts of parliament and legislations were reviewed and discussed as follows:

4.2 Environmental Policy Framework

Environmental Impact Assessment (EIA) critically examines the effects of a project on the environment. An EIA identifies both positive and negative impacts of any proposed development activity or project, how it affects people, their property and the environment. EIA also identifies measures to mitigate the negative impacts, while maximizing on the positive ones. EIA is basically a preventive process. It seeks to minimize adverse impacts on the environment and reduces risks. If a proper EIA is carried out, then the safety of the environment can be guaranteed at all stages of project planning, design, construction, operation, monitoring and evaluation as well as decommissioning. The assessment is required at all stages of project development with a view to ensuring environmentally sound development for both existing and proposed public and private sector development ventures. The National EIA regulations were issued in accordance with the provisions of Environmental Management and Coordination Act (EMCA) of 1999. The EIA Regulations must be administered, taking into cognizance provisions of EMCA 1999 and other relevant national laws.

4.3 Institutional Framework

Environmental Management and Co-ordination Act No. 8 of 1999, provides a legal and institutional framework for the management of environment related matters in Kenya. It is the framework law on environment, which was enacted on the 14th of January 1999 and commenced in January 2002. Top

most in the administration of EMCA is National Environment Council (NEC), which formulates policies, set goals, and promotes environmental protection programs. The implementing organ is National Environment Management Authority (NEMA). EMCA comprises of parts that cover all aspects of the environment. At present there are over twenty (20) institutions and departments which deal with environmental issues in Kenya. Some of the key institutions include the National Environmental Council (NEC), National Environment Management Authority (NEMA), Kenya Forest Service (KFS), and Kenya Wildlife Service among others.

4.3.1 National Environment Council

EMCA 1999 part iii section 4 outlines the establishment of the National Environment Council (NEC). NEC is responsible for policy formulation and directions for purposes of EMCA, setting national goals and objectives and determining policies and priorities for the protection of the environment, and promoting co-operation among public departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programs.

4.3.2 National Environment Management Authority

In 2002 the Government created the National Environment Management Authority (NEMA) as the supreme regulatory and advisory body on environmental management in Kenya. NEMA is required to coordinate and supervise the various environmental management activities being undertaken by statutory organs with a view to promoting their integration into development policies, programmes, plans and projects that provide sustainable development and a safe and healthy environment for all Kenyans.

The key functions of NEMA through the National Environment Council include

Responsibility for policy formulation and direction for the purposes of the Act, setting national goals and objectives and determining policies and priorities for the protection of the environment; promotion of cooperation among public departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes, and performing such other functions as are assigned by the Act.

NEMA will remain in charge of coordinating all activities related to environmental management in the project area, such as enforcement of Environmental Impact Assessments, as well as Environmental Audits. Regulations 31 to 41 provides for environmental auditing and monitoring and sets out procedures of conducting both self-auditing and control auditing and will be required by the Environment Management Authority NEMA.

4.3.3 The Constitution of Kenya, 2010

The Constitution of Kenya is the supreme law of the Republic and binds all persons and all state organ at all levels of government. It provides a broad framework regulating all existence and development aspects of interest to the people of Kenya, and along which all national and sectoral legislative documents are drawn. Article 42 of the chapter 4, *The Bill Of Rights*, confers to every person the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative measures, particularly those contemplated in Article 69, and to have obligations relating to the environment fulfilled under Article 70.

Part 2 of Chapter 5 of the constitution directs focus on the environment and natural resources. It provides a clear outline of the state's obligation with respect to the environment. It also states that every person has a duty to cooperate with state organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

Compliance

*The proponent of this project will ensure that every activity of the project must be in tandem with the state's vision for the national environment as well as adherence to the right of every individual to a clean and healthy environment, protect and conserve the environment and ensure ecologically sustainable development and use of national resources. This is be achieved by developing a clearly spelt out environmental management plan to curb probable adverse effects to the environment hence the Environmental Impact Assessment and also adherence to all legislative framework in Kenya and internationally***.**

4.3.4 Neighborhood Associations and/or General Public

The proposed gold elution and leaching plant development project is likely to attract the interests of the area's neighborhood association(s)/general public. An extensive public participation process therefore will form a major component of the study. From the foregoing, particular reference is made to Section 17 of the Environmental (Impact Assessment and Audit) Regulations, 2003, which states that: The Proponent shall in consultation with the authority seek the views of persons who may be affected by the project.....”

The above expression clearly underscores the concept of "participatory environmental planning and management" in the context of urban development.

4.4 Legal and Policy Framework

There are several pieces of legislation and policy documents related to this kind of development in Kenya. These include, but are not limited to the Physical Planning Act (Cap. 286), the Penal Code (Cap 63), the Environmental Management and Coordination Act (No. 8 of 1999), the Public Health Act (Cap. 242), the Local Government Act (Cap.265), the Building Code, the Factories and Places of Work Act (Cap. 514), Sessional Paper No. 9 of 1999 on Environment and Development, National Environmental Action Plan (NEAP), Millennium Declaration and Brundtland Commission Report ("Our Common Future") of 1987.

The relevance of the aforementioned legislations as well as policy papers (national and international) and institutional framework related to the proposed development are discussed in the following sections.

4.4.1 The Environmental Management and Coordination Act No. 8 of 1999

The Environmental Management and Coordination Act (EMCA) of 1999, and its addendum Environmental (Impact Assessment and Audit) Regulations of 2003 provides for the establishment of an appropriate legal and institutional framework for the management of the environment in Kenya.

The Act introduces two important aspects of urban environmental management, which are directly related to the proposed project: Environmental Impact Assessment (EIA) and Environmental Audit (EA). Section 58 (1) has underscored that any person being a Proponent of a project, shall, before financing, commencing or proceeding, submit an EIA report to the National Environmental Management Authority (NEMA) of Kenya.

Section 68 (1) gives NEMA the mandate for carrying out all environmental audits of all activities that are likely to have significant impacts on the environment. It authorizes environmental inspectors, as

appointed by NEMA to enter any development and determine how far the activities carried out conform to statements in the EIA study.

Part VIII, section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into the aquatic environment. Section 73 requires that operators of projects which discharge effluent or other pollutants submit to NEMA accurate information about the quantities and quality of the effluent. Section 74 demands that all effluent generated from point sources are discharged only into the existing sewerage system upon issuance of prescribed permit from the Local Authorities.

4.4.2 The Physical Planning Act (Cap 286)

The Physical Planning Act (Cap 286), which came into effect on 29th October 1998, aimed at developing a sound spatial framework for co-existence, through plan proposals that enhance and promote integrated spatial/physical development of socio-economic activities. Because building/construction of the proposed project constitutes making of material change to land, the activity constitutes "development". It hence needs to be controlled by local authorities. From the foregoing, the Physical Planning Act (Cap. 286) has made specific provisions in respect to the mandate of local authorities in the need for physical planning. As concerns city, municipal, town and urban councils:

Section 24 (3) provides that the Director may prepare a local physical development plan for the general purpose of guiding and coordinating development of infrastructure facilities and services for an area referred to in subsection (1), and for the specific control of the use and development of land or for the provision of any land in such area for public purposes.

According to **Section 33** of the Physical Planning Regulations .The land or the proposed project or structure is not used for any purpose, which might be calculated to depreciate the value of neighbouring property or interfere with convenience or comfort of neighbouring occupants

Any other physical planning issue. Section 36 of the Act (Cap. 286) further compels that if in connection with a development application, a local authority is of the opinion that proposals for industrial location, or any other development activities (such as building developments) will have injurious impact on the environment, the applicant will be required to submit together with application an Environmental Impact Assessment report. The above provision compares well to **Section 29 (a),** which confers upon local authorities the powers to prohibit or control the use and development of land and buildings in the interests of proper and orderly development of its area, Section 30 states that any person who carries out development without development permission will be required to restore the land to its original condition.

Compliance

The proponent will need to comply with the local land use zonation both in the design of the project and location. The proponent have obtained Change of User from the office Physical Planner, Migori County Government (see the attached copy).

4.4.3 The Mining Act Cap 306, 1940 (Revise in 1987) and mining Bill of 2014

This is an ACT of parliament that gives effects to Articles 60, 62 (1) (f) 66 (2), 69 and 71 of the Constitution in so far as they apply to minerals; provide for prospecting, mining, processing, refining treatment, transport and any dealings in minerals and for related purposes. All prospecting and mining activities in Kenya are currently regulated under the Mining Act Cap. 306 of the Laws of Kenya which

is currently being reviewed. The Mining Bill if enacted into law it will replace the Mining Act of 1940, the Trading in Unwrought Precious Metal Act and Diamond Industry Protection Act. The Bill was introduced in the National Assembly of Kenya on 17th March 2014.

Compliance to this provision

In order for one to prospect, mine or deal on any mineral in Kenya, he or she has to fulfil all the requirements stipulated in the said Act or the bill once in force. The proponent will acquire all relevant licenses, permits and consents as will be required by the Act / Bill. The proponent will also be required to report to the mining and geology department to report and give a brief on the activities of the plant.

4.4.4 Physical Planning Act (Cap 286)

The Physical Planning Act (Cap 286) established the office of the Director of Physical Planning. The duties of the Director of Physical Planning shall include the following:

- Formulate national, regional and local physical development policies, guidelines and strategies;
- Be responsible for the preparation of all regional, local and national physical development plans;
- From time to time, initiate, undertake or direct studies and research into matters concerning physical planning;
- Advise the Commissioner of Lands and local authorities on the most appropriate use of land including management such as change of user, extension of user, extension of leases, subdivision of land, and amalgamation of land, and
- Require local authorities to ensure proper execution of physical development control and preservation orders.

4.4.5 The Public Health Act (Cap. 242)

The Public Health Act is the principle instrument for ensuring the health and safety of the people. Its core function is the prevention of disease, treatment and care of the sick (curative services) and control of nuisance. The Act therefore makes regulations and lays standards for a healthy living environment. **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.

Compliance

Under this Act the proponent will be required to adapt practicable measure to prevent injurious and nuisance conditions on the project site. The nuisances will include noxious matter or water as will or may be generated from the facility. To achieve this, systems on the management of both solid and liquid waste (effluent) will be adopted as proposed in the report, maintain the land and put measures to prevent activities that would be a nuisance and injuries to the public.

4.4.6 Occupational Safety and Health Act, 2007 (Cap 514)

This Act makes provision for the health, safety and welfare of persons employed in all places of work. The provision requires that all practicable measures to be taken protect persons employed in a factory from dust, fumes or impurities originating from any process within the facility. The provisions of the Act are also relevant to the management of hazardous and non-hazardous wastes, which may arise at a project site.

Compliance

The proponent will ensure

- *That she acquires occupational health and safety license*
- *Compliance to all the provision of the Act*
- *Prevention of accidents at the workplace and provision of Personal Protective Equipment to all workers and ensuring their use.*
- *That the management must keep a general register of all persons within the facility all day.*

4.4.7 The Water Act, 2002

The Water Act (2002) provides for management, conservation, use and control of water resources. The sections of the Water Act (2002) that are relevant to this kind of development are: **Section 2(1)** defines "pollution" in relation to water resources to mean any direct or indirect alteration of the water resources so as to make it less fit for any beneficial purpose for which it is or may reasonably be expected to be used, or harmful or potentially harmful to:

- The welfare, health and safety of human beings
- Any aquatic or non-aquatic life or property or
- The environment.

Part II, section 18, of the Water Act 2002 provides for national monitoring and information system on water resources. Following on this sub section 3 allows the Water Resources Management Authority to demand from any person or institution, specified information, documents, samples or materials on water resources, under this rule, specific records may be required to be kept by facility operator and the information thereof furnished to the Authority. Pollution of any water course is an offence and the Act also prohibits whoever throws, conveys, cause or permits throwing of rubbish, dirt, refuse, effluent, trade waste to anybody of water. It enhances the Ministry's capacity to enforce the Act by reviewing the water user fees. **Section 76** states that no person shall discharge any trade effluent from trade premises into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of effluent, maximum quality anticipated, flow rate of the effluent and any other information deemed necessary. The consent shall be issued on conditions including payment of rates for discharge as may be provided under **section 77** of the same Act.

Section 94 (1) states that no person shall, without authority under the Act:

"it is an offence to willingly obstruct, interfere with, divert or obstruct water from any watercourse or any water resource or negligently allow any such obstruction, interference, diversion or abstraction or, Throw or convey or cause or permit to be thrown or conveyed any rubbish, dirt, refuse, effluent, trade waste or other offensive or wholesome matter or thing into or near any water resource, in such manner as to cause pollution of water resource." **Section 94 (2),** underscores that, "a person who contravenes the above section shall be guilty of an offence."

Compliance

The proponent shall comply with the rules and regulations as relates to water provided by the Water Act.

4.4.8 The Water Act Cap 372

The Water Act Cap 372 vests the right of all water to the state, and the power for the control of all body of water with the Minister, the power is exercised through the Minister and the Director of water resources in consultation with the water catchments boards, it aims at among others:

1. Provision of conservation of water and
2. Appointment and use of water resources

Compliance

The proponent will ensure that appropriate measures to prevent pollution of underground and surface water sources are implemented throughout the project cycle

4.4.9 Land Planning Act (Cap.303)

This is the overall planning law for land covering both the agricultural and construction environment. Under this Act, all developments or change in the land use in any area are subject to approval by the planning authority. **Section 9** of the subsidiary legislation (the Development and Use of Land Regulation, 1961) under this Act requires that before the local authorities approves any physical plan; steps should be taken as may be necessary to ensure that owners of any land affected by such plans submit their particulars, comments and objections to the authority. This is intended to reduce conflict with the interest such as settlements and other social and economic activities.

Compliance

The land is under private tenure system however, the proponent has bought the land from the owner, the proponent and the company will ensure that they comply with all the requirements of the Act.

4.4.10 National Construction Authority Act, 2011

Section 31 of this Act explains the imposition of levy (1) The Minister may, by notice in the Gazette, impose a levy to be known as the construction levy on construction work carried out by persons registered under this Act. (2) The levy shall be in an amount not exceeding an equivalent of 0.5%, of the value of any contract whose value exceeds five million shillings. (3) The Minister may make regulations prescribing the manner of payment of the levy.

Compliance

The proponent will be required to comply with the requirement of this Act.

4.4.11 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 voluntary 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 neighborhood 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.

Compliance

The proponent will be required to ensure strict adherence to the Environmental Management Plan throughout the project cycle in order to mitigate against any possible negative impacts that are related to the provisions of this Act air pollution. The proponent and the company management are also required to adhere to the provisions of the penal code to steer from criminal liability.

4.4.11 Occupiers Liability Act Cap 34

This is an Act of parliament to amend the law as to liability of occupiers and others for injury or damage resulting to person or goods lawfully on land or property from dangers due to the state of the property or to things done omitted to be done there.

Compliance

The proponent and the management of the company will ensure that:

- *Measures are in place to company employees and everyone lawfully within the premise*
- *The company and everyone lawfully in the company need to be insured*

4.4.12 County Government by Laws Bills

Project will operates within Migori County thus under jurisdiction of Migori County Government by laws. The government operates by laws to govern all aspects of management. It is also liberty to use the various pieces of legislation to enforce conservation and pollution control within the County.

Compliance

The proponent shall ensure that the facility is in compliance to all by laws and bills enacted and those to be enacted by the Migori County Government (County Assembly). This includes getting business permits and paying relevant fees to the county government.

4.5 Other National and International Legislative Framework Related to this Project

4.5.1 Sessional Paper No. 6 of 1999 on Environment and Development

Every person in Kenya is entitled to a clean and healthy environment and has a duty to safeguard and enhance the environment (Kenya, 1999). As envisioned in Sessional Paper No. 6 of 1999 on Environment and Development, Kenya should strive to move along the path of sustainable development to meet the needs of the current generation without compromising the ability of the resource base to meet those of future generations. The overall goal is hence to integrate environmental concerns into the national planning and management process and provide guidelines for environmentally sustainable development (Kenya, 1999).The policy paper emphasized Environmental Impact Assessments must be undertaken by the developers as an integral part of project preparation. It also proposed for periodic environmental auditing to investigate whether the developer is fully mitigating the impacts identified in the assessment report.

4.5.2 The National Environmental Action Plan (NEAP)

The NEAP for Kenya was first prepared in 1994 and fifteen years down the line, in 2009, a second edition was prepared. It is a deliberate policy to integrate environmental considerations into the country's social and economic development process. Integration as achieved through multi-sectorial

approach to develop a comprehensive framework to ensure that environmental management and conservation of natural resources is an integral part of societal decision-making processes.

4.5.3 Kenya Vision 2030

This is Kenya's economic blueprint covering the periods 2008-2030. It aims to transform Kenya into a newly industrializing middle-income country by providing high quality life to all citizens by the year 2030. It outlines specific environmental management strategies among them to harmonize environment-related laws for better environmental planning and governance.

4.5.4 The Rio Declaration on Environment and Development

Agenda 21 - a programme of action for sustainable development worldwide, the Rio Declaration on Environment and Development was adopted by more than 178 governments at the United Nations Conference on Environment and Development, known as the Earth Summit, held in Rio de Janeiro, Brazil, 3rd -14th June 1992.

Principle No. 10 of the Declaration underscored that Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided. The foregoing discussion is relevant to the proposed development because EMCA demands that the public must be involved before any development project that is likely to have adverse impacts on the environment is implemented by a Proponent. The Act has further established a Public Complaints Committee (PCC) where issues raised by the public in regard to any proposed development can be addressed.

Compliance

The proponent has prepared the Environment Impact Assessment for the project. The report outlines the methods that will be used by the project to re-use and recycle of waste including waste water, use of low non waste technologies, increased public awareness and appreciation of clean environment.

4.6 Environmental Regulations

4.6.1 Environmental Management and Coordination Act, 1999

EMCA No. 8 of 1999 provides a legal and institutional framework for the management of the environmental related matters. The Act establishes NEMA; a body corporate for coordinating environmental matters in the country thus it is an implementing organ of the provisions of EMCA, 1999. According to section 68 (1) of EMCA, 1999, NEMA is responsible for carrying out Environmental Audit of all activities that are likely to have significant effect on the environment. An environmental inspector appointed under this Act may enter any land or premises for the purposes of determining how far the activities carried out on that land or premises conform to the statements made in the environmental audit study report issued in respect of that land. The owner of premises or the operator of a project should take all reasonable measures to mitigate any undesirable effects not contemplated in the Environmental Impact Assessment Project Report submitted under section 58 (2) of EMCA, 1999. Subsequent legislations prepared under EMCA 1999 were also reviewed.

Compliance

All the chapters 1 to 13 apply to the proposed project at one stage or the other and therefore the project proponent is required to understand and conform with the Act accordingly. Environmental Management and Coordination Act 1999 provide a legal and institutional framework for the management of the environmental related matters. This report has been written pursuant to section 58 (1) of this Act. EMCA has set out regulations for regulations for managing the environment which include the following:

4.6.1.1 Environmental Impact Assessment & Audit Regulations, 2003

The EIA / EA Regulations are meant to ensure the implementation of Section. 58 of EMCA. It makes it illegal for anyone to undertake development without an EIA license and stipulates the ways in which environmental experts should conduct the EIA/EA reports in to the requirement stated. To ensure the Regulations 31 to 41 provides for Environmental Auditing and Monitoring and sets out procedures of conducting both self-Auditing and Control Auditing and will be required by the Environment Management Authority NEMA. Regulation 31 (3) states that the Authority shall require the proponent to undertake, in the case of an ongoing project, an Environmental Impact Assessment study followed by subsequent Environmental Control Audit studies as may be necessary at such times as shall be agreed upon by the Authority and the proponent; and an Environmental Impact Assessment study to provide baseline information upon which subsequent Environmental Control Audit studies shall be based.

Compliance

The proponent will undertake Environmental Impact Assessment and submit it to NEMA for approval before commencing the project. The proponent will ensure compliance to provision of this Environmental Impact Assessment.

4.6.1.2 Water Quality Regulations, 2006

Water quality regulations were gazette as a legislative supplement to mainly address the challenges of pollution of water source and conservation. It consists of VI parts and eleven schedules dealing with protection of water sources for domestic use to miscellaneous provision. Effluent discharge and water for industrial use are dealt with under part III which sets out the following:

- Standard for discharge into the environment
- Standard for discharge monitoring and
- Application for effluent discharge license

The Regulation provides for sustainable management of water resources including prevention of water pollution and protection of water sources.

Compliance

The proponent will mostly pay attention to part III 4 that states: (1) every person shall refrain from any act which directly or indirect causes, or might cause immediate or subsequent water pollution, and it shall be immaterial whether or not water resource was polluted before the enactment of the Act
No 4 (2) for any person to throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it as to cause pollution.

12 (1) that states " Every local authority or person operating a sewage system or owner or operator of any trade or industrial undertaking issued with an effluent discharge license as stipulated under the Act shall comply with the standards set out in Third Schedule to these Regulation".

Regulation 11 states that no person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit any person to dump or discharge such matter

into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards set out in these Regulations.

No.14 (1) requires every licensed person generating and discharge into the environment to carry out daily effluent discharge quality and quantity monitoring and to submit quarterly records of such monitoring to the Authority or its designated representatives.

Regulation 16 gives provision for the application for an effluent discharge license under the Act shall be in the Form A of Seventh Schedule and accompanied by the prescribed fee as set out in Eleventh Schedule to these Regulations.

The facility will involve the use of water and generation of waste water and therefore since the water will be recycled and reused the management of the premise will ensure that no contaminated water will be discharged or allowed to flow into the environment. In case there will be a need to do so, it will be ensured that the effluent meets the standards set under Schedule III and will obtain an effluent discharged license from NEMA before any discharge.

4.6.1.3 Wetlands, Riverbanks, Lakeshore and Seashore Management Regulations, 2006

PART III - Management of Rivers Banks, Lake Shores and Sea Shore General Principles 17. The following principles shall be observed in the management and conservation of river banks, lake shores and the seashore;

(a)The resource on river banks, lake shores and the sea shore shall be utilized in a sustainable manner.

(b) Environmental Impact Assessment as required under the Act shall be mandatory for all major activities on the river banks, lake shores and the seashore.

(c) Special measures, including prevention of soil erosion, siltation and water pollution are essential for the protection of river banks, lake shores and the seashore.

4.6.1.4 Waste Management Regulations, 2006

The waste Management Regulation are meant to streamline the handling, transportation and disposal of various types of waste. The aim of Waste Management Regulation is to protect human health and the environment. The regulation place emphasis on waste minimization, cleaner production and segregation of waste at source. The proponent should minimize the waste he generates by adopting the 3R principle of Reduce, Reuse and Recycle and incorporation environmental concerns in the design and disposal of a product. Regulation No 4 (1) makes it an offence for any person to dispose of any waste on public highway, street, road, recreational area or in any public place except in a designated waste receptacle. Regulation 5 (1) provides categories of cleaner production methods that should be adopted by waste generators in order to minimize the amount of waste generated and they include:

- Improvement of production process through
- Conserving raw materials and energy
- Eliminating the use of toxic raw materials and waste
- Reducing toxic emissions and waste
- Monitoring the product cycle from beginning to end by
- Identifying and eliminating potential negative impacts of the products
- Enabling the recovery and re-use of the product where possible ,and
- Reclamation and recycling
- Incorporation environmental concerns in the design and disposal of a product

Compliance

The provision of this Act shall be considered and adhered to during the construction, implementation and decommissioning phases of the project. The proponent shall also observe the guidelines as set out in the environmental plan laid out in report as well as the recommendation provided for mitigation, minimization, and avoidance of adverse impacts arising from the project activities. The proponent will ensure that relevance documents like waste transportation license, tracking documents, permit to dispose waste at the intended disposal site amongst other are in place.

4.6.1.5 Noise and Excessive Vibration pollution/Control Regulations, 2009

The regulation seeks to control noise and vibration pollution generated from various sources .Regulation 13 prohibits any person from carrying out construction activities at night, if such activities are likely to generate noise above the levels set under second schedule of these regulations. Regulation 14(3) requires that any person carrying out construction, demolition, mining or quarrying work shall ensure that the vibration levels do not exceed 0.5 centimeters per second beyond any source property boundary or 30 meters from any moving source. Regulation 15 requires that any person intending to carry out construction, demolition, mining, or quarrying work shall carry out an EIA.

Compliance

Though the plant is not anticipated to undertake activities that may generator noise, the proponent will ensure compliance with the set noise levels limits for the site during construction an operation phases. The contractor should ensure that employees are not exposed to noise levels above 85dB (A) and in such cases provide suitable personnel protection equipment (ear protective devices)The proponent is required not to engage on activities that will lead to generation of noise without a license from relevant office.

4.6.1.6 Conservation of Biological Diversity Regulations, 2006

These regulation are described in Legal Notice No.160 of the Kenya Gazette Supplement No 84 of December, 2006.These Regulation apply to conservation of biodiversity which includes conservation of threatened species, inventory and monitoring of Biological Diversity and protection of environmentally significant areas, access to generic and resources, benefit sharing and offences and penalties.

4.6.1.7 Air Quality Regulations, 2008

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

Compliance

The contractor, proponent and management of the facility shall implement the measures provided in the EMMP to prevent air pollution especially during construction, operation and decommissioning phases of the project.

CHAPTER FIVE: ANALYSIS OF PROJECT ALTERNATIVES

5.0 Introduction

This section analyses the project alternatives in terms of socio-economic implications, technology and environmental implications.

5.1 No Project Alternatives

The No Project Alternative option in respect to the proposed project implies that the status quo be maintained and no development goes on. This option is a suitable alternative from an extreme environmental perspective as it ensure maintaining the site in its previous natural condition such a scenario has serious economic implications to the Proponent. The No Project Option is the last preferred from the socio-economic perspective. This option however involve several losses not only to the project proponent but to the public, the economic status of Kenyans and local people would remain unchanged, local skills would remain under-utilized, no employment opportunities would be created for Kenyans who would work in the proposed project area, no incentive for investors, development of infrastructural facilities would not be undertaken and its set back to vision 2030. With the gaps existing in artisanal mining where the artisanal miners use improper mining thereby not extracting whole of Gold in the Ore, the proponent show it wise to invest in this make use of the tailing which as per studies conducted in the area indicated that there is a lot of un- extracted gold. The proponent option is the most suitable option as he had done Cost Benefit Analysis of the proposed project. From the analysis above, it becomes apparent that the *No Project alternative* is favourable to the Proponent, investors, local population, boost the development of the area, enhanced better gold extraction techniques and also it safeguards the environment. This option is best adopted more so if the project site is ecologically fragile.

5.2 Alternative Location

Relocation option to a different site is an option available for the project implementation. This is a project which requires a big parcel of land of which the proponent has achieved. This could be to promote the integrity of the environment. At the moment there is no alternative site for the proposed development (i.e. the project proponent does not have an alternative site). This means that the proponent has to look for the land if relocation is proposed and land is not available and if available will be too expensive for the proponent to realize his dream. Looking for land to accommodate the scale and size of the project and completing the official transactions on it may take a long period. In addition, it is not a guarantee that such land will be available. It is also worth noting that the said project is in character with the surrounding, the project site is not within any critical ecological ecosystem, the area is sparsely populated, not under any dispute and the proposed activity will not affect the surrounding community and environment.

5.3 The Comparison of Alternatives

Under the proposed development alternative, the project would provide gold recovery plant, more business opportunities and would provide employment directly and indirectly to the Kenya population. It would provide jobs for workers during construction. Under the No Action Alternative, there would be no development whatsoever. There would be no increased benefits from the site neither would there be the insignificant environmental impacts. Provided the mitigation measures are implemented, including sound construction management practices, impacts on soils and drainage, air and water quality are

anticipated. Commitment associated with this alternative would ensure that potential negative impacts are avoided or reduced to levels of significance.

5.4 Alternative Project Design

This involves considering alternative designs for gold recovery designs. Such alternatives should work towards making the project safer and more environment friendly as compared to the forfeited project design. The proposed project design is the best option.

5.5 Analysis of Alternative Project Technology

5.5.1 Extraction of gold:

Although new processes are being proposed on a regular basis, there have in fact been no dramatic changes in the metallurgical techniques for gold extraction since the introduction of the cyanide process cyanide leaching or cyanidation. The major categories of commercially viable recovery processes include the following:

- Amalgamation (with mercury)
- Gravity Concentration (using jogs, tables, spirals, Reichert cone, moving belt separator, etc.)
- Flotation (as free particles or contained in base metal sulfide concentrates)
- Pyrometallurgy (in the smelting and refining of base metal ores and concentrates)
- Hydrometallurgy (direct cyanidation, cyanidation with carbon adsorption, heap-leach and Chlorination-leach)
- Refractory ore processing
- Alternative lixiviants

5.5.1.1 Amalgamation

This is an ancient process which involves the alloying of the gold particles with metallic mercury to form amalgam and then the separation of the gold from the mercury by heating in retorts until the mercury is distilled off. The method is used for the treatment of coarser, This process is strongly out of favor with the major mining companies, due to the extremely toxic nature and the processes inferior performance when compared to the available alternatives. The process is still used extensively by artesian mines in third world countries and at small mines, due to its simplicity.

5.5.1.2 Gravity Concentration

Gravity concentration processes rely on the principal that gold contained within an ore body is higher in specific gravity than the host rocks that contain the gold. Elemental gold has a specific gravity of 19. 3 and typical ore has a specific gravity of about 2.6. All gravity concentration devices create movement between the gold and host rock particles in a manner to separate the heavy pieces from the lighter pieces of material. Panning is probably the oldest technique used for the recovery of gold. Panning is a type of gravity concentration used by prospectors for the recovery of gold from river beds. It concentrates the heavy gold particles at the bottom of the pan while the light gangue is washed off on top.

5.5.1.3 Flotation

The flotation process consists of producing a mineral concentrate through the use of chemical Conditioning agents followed by intense agitation and air sparging of the agitated ore slurry to produce

mineral rich foam concentrate. The process is said to have been invented by a miner who watched the process happening while washing dirty work clothing in his home washing machine.

Specific chemicals are added to either float (foam off) specific minerals or to depress the flotation of products being subjected to additional flotation steps to increase product purity. The flotation process in general does not float free gold particles but is particularly effective when gold is associated with sulfide minerals such as pyrites. In a typical pyrytic gold ore, the gold is encapsulated within an iron sulfide crystal structure. Highly oxidized ores generally do not respond well to flotation. Advantages of the flotation process are that gold values are generally liberated at a fairly coarse particle size (28 mesh) which means that ore grinding costs are minimized. The reagents used for flotation are generally not toxic, which means that tailings disposal costs are low.

Flotation will frequently be used when gold is recovered in conjunction with other metals such as copper, lead, or zinc. Flotation concentrates are usually sent to an off-site smelting facility for recovery of gold and base metals. Cyanide leaching is frequently used in conjunction with flotation. Cyanidation of flotation concentrates or flotation tailings is done depending upon the specific mineralogy and flow sheet economics.

5.5.1.4 Cyanide Process

It is the most common used process for gold extraction. This process involves the dissolution of gold from the ground ore in a dilute cyanide solution (usually NaCN or KCN) in the presence of lime and oxygen according to the reactions optimum cyanide concentration (about 0.05% NaCN), clean gold particles dissolve at a rate of 3.25 mg per sq cm per hour. Therefore, coarse gold particles (larger than 100 mesh) are usually removed by gravity concentration methods before cyanidation. In general, cyanidation process consists of percolation or agitation leaching of gold ores with dilute cyanide solution, generally less than 0.3 percent sodium cyanide. In plant practice the addition of lime to a cyanide pulp is universal to prevent hydrolysis and to neutralize any acidic constituents present in the ore. Additional advantages of lime addition include decomposition of bicarbonates in mill water, improvement in settling rate in counter current decantation thickeners and improvement in extraction rates for certain types of ores.

5.5.1.5 Heap Leaching

Heap leaching was introduced in the 1970's as a means to drastically reduce gold recovery costs. This process has literally made many mines by taking low grade geological resources and transforming them to the proven ore category. Ore grades as low as 0.01 oz Au per ton have been economically processed by heap leaching. Heap leaching involves placing crushed or run of mine ore in a pile built upon an impervious liner. Cyanide solution is distributed across the top of the pile and the solution percolates down through the pile and leaches out the gold. The gold laden pregnant solution drains out from the

bottom of the pile and is collected for gold recovery by either carbon adsorption or zinc precipitation. The barren solution is then recycled to the pile.

Heap leaching generally requires 60 to 90 days for processing ore that could be leached in 24 hours in a conventional agitated leach process. Gold recovery is typically 60-80% as compared with 85-95% in an agitated leach plant. Even with this inferior performance, the process has found wide favor, due to the vastly reduced processing costs compared with agitated leaching.

5.5.2 Gold Recovery from Solution

The common processes for recovery of the solubilized gold from solution are (certain processes may be precluded from use by technical factors)

- Carbon Adsorption
- Merrill-Crowe process
- Electrowinning
- Ion-exchange/Solvent Extraction

CHAPTER SIX: CONSULTATION AND PUBLIC PARTICIPATION

6.0 Introduction

Public consultation in the EIA process is undertaken during the project design, implementation and initial operation. The aim is to disseminate information to interested parties, solicit their views and consult on sensitive issues. Pursuant to the provisions of the Environmental Impact Assessment and Environmental Audit Regulations, carrying out of EIAs requires seeking of views of stakeholders in relation to the activities and operations of the proposed project. Public Participation enables the evaluation of the public and neighbours views.

6.1 The Objectives of Public Participation and Consultation Process

The aim was to inform stakeholders, publicize the project, gain local views and concerns and take account of public inputs. The process of consultation and public participation was also aimed at obtaining local knowledge, increasing public confidence and reducing conflicts with regard to the proposed project. Public participation during the EIA process took the form of administration of questionnaires to seek views neighbours surrounding the proposed project site and community meeting was held at the proposed site chaired by area sub chief. To ask the stakeholders and public about problems they anticipate with the proposed project and how these problems can be mitigated. It is an important part of the EIA as it helps identify various concerns which should be addressed at the initial stages of implementation processes.

6.2 Methodology

The Environmental Impact Assessment team utilized various data collection procedures during the EIA process. The primary and secondary data collection methods used included; Key Informant Interviews, Questionnaires, Physical Site Inspection and photography and review of existing policies, laws and regulations reports regarding town's developments, environment and occupational health and safety. Both participatory and analytical tools were applied to ensure the inclusion of the opinions of all stakeholders, while conducting the EIA, the experts widely consulted and involved various project stakeholders and members of the public. The first consultation took place on 9th October, 2017 between the EIA expert and the proponent. The issues discussed in this first consultative meeting included plans and designs, relevant approvals, land ownership and the proposed project budget (BoQ).The second exercise was conducted by a team of experienced registered environmental experts and the neighbouring community/ public as they were the possible receptors of the adverse impacts. The objectives of the consultations include:-

- To disseminate and inform stakeholders about the proposed project with special reference to its key components, location and expected impacts.
- To ensure their concerns were known to the management at the early phase of project development planning.

This was done on, 10th October, 2017 through administering of questionnaire forms by interviewing the neighbours surrounding the proposed site. They were interviewed to ascertain their response to specific questions concerning possible environmental, social, health and safety as well economic impacts of the proposed project.

6.2.1 Physical Site Inspection and photography

Field observations formed an integral part of the study as the experts gathered considerable information through observations. This involved visiting the site of the proposed project and making observations on

the status of the site and its neighbourhood. Observations that included photography were also used as a tool for verifying the facts that were gathered through interviews and questionnaires.

6.2.2 Key Informants Interviews

These were interviews with the project proponent and contractors to establish baseline information.

6.3 Analysis of Responses

Employment opportunities

Majority of the respondents alluded that the project will create employment opportunities in all the phases but more so during construction phase.

- **Disposal of wastes**

Some respondents indicated that project may become offensive if environmental requirements such disposal of liquid waste and solid waste from the recycling plants are not adhered to.

- **Noise pollution**

Few respondents observed that there will be the problem of noise pollution during the construction phase of leaching plant which will need to be mitigated properly.

- **Increased revenue to the government**

The government will benefit in terms of revenue through taxes which will be levied on goods and services purchased during the project construction period and licensing of the recycling plant by the county government will generate revenue to the county government.

CHAPTER SEVEN: IDENTIFICATION OF THE POTENTIALLY AFFECTED ENVIRONMENTAL COMPONENTS

Environmental components that are potentially affected by the proposed project include the following:

7.1 Air

The project has the potential to cause air pollution in the form of dust emitted from tailing, vehicles and other dusty operations. Smoke from diesel-operated construction machinery is also a potential cause of air pollution.

7.2 Soil

Construction processes have invasive effect on the soils and surface geology of the area. During excavation for leaching tanks, there is removal of soil and stones. This affects the geological integrity of the area under construction. Excavation also breaks the soil structure, which predisposes soil to agents of denudation. Compaction of soil also affects soil aeration and drainage.

7.3 Landscape

Construction will alter the morphology and aesthetic aspect of the landscape.

7.4 Vegetation

The proposed project site is not rich in vegetation cover, dominated only by grass.

7.5 Habitat

Though on a micro-scale, soil disturbance shall destroy habitats for burrowing organisms such as ants and beetles. Vegetation clearance will always interfere with habitats of certain bird species and butterflies that live among them.

7.6 Water

If soil, construction debris and waste from the facility is not properly contained and disposed of, it has the potential to contaminate water sources mainly through erosion and could also potentially contaminate water sources and courses.

7.7 Socio-Economic Environment

Various aspects of the local and regional socio-economic environment will be affected by the project, both positively and negatively. This is positively in terms of employment opportunities, improved security. Other socio-economic components affected by the project are increased demand for water and other public utilities including electricity and public transportation.

CHAPTER EIGHT: POTENTIAL IMPACTS AND MITIGATION MEASURES

8.0 Introduction

This Section identifies both positive and negative impacts associated with the proposed project. The impacts are hereby identified in three distinct phases of the project cycle i.e. Construction, Operation and Decommissioning Phases. The following issues of soil degradation, air quality, noise, oil wastes, water resources, public comfort, traffic, solid and liquid waste management, drainage, terrestrial ecology, visual landscape, occupational health and safety and energy. Most of these key issues were identified during the scoping exercise and are clearly elaborated.

Receptors of Impacts : Human Environment, Physical Environment and Biological Environment

8.1 Positive Impacts

These projects will relief the community the burden of disposing the used tails which has currently becomes a menace in the area.

- It will put the land into good use; project site and those lands that were occupied with tailing.
- Reduce contamination of water and land currently caused incompletely proved tailing that contain mercury.
- The proponent will boost artisanal mining of gold hence will boost the development and economy of in terms of exportation of its minerals resources.
- Create job for community during construction and operational phases as many of them will be employed to work for the plant. This will provide them with a source of incomes hence they can get money for their lively hood, children school fees and other development needs.
- Create business opportunity for small scale food venders and other product that will be sell in them to workers.
- Conserve environment through scooping the tailing left on surfaces by the small scale miners within the projects area.
- The project will impart modern, efficient, cost effective environmental friendly mineral extraction and process methodologies for purpose of value addition.
- The company will also participate in corporate social responsibility program hence benefitting the community.
- it is also an investment for the proponent hence income generating facility for the proponent

8.2 Negative Impacts and Mitigation Measures

The anticipated negative impacts are hereby addressed in this section and recommended mitigation measures provided.

8 .2.1 Negative Impacts and Mitigation Measures during Construction Phase

During this phase, the main negative impacts on the biophysical and human environment are as discussed below

Noise and Vibration

Setting up to the plant will generate minimal noise which will also have minimal effect. Those likely to be affected are construction workers on site but not neighbors as they are far from the site and sparsely populated

Potential Mitigation Measures

- In order to meet noise level requirements, the works will be equipped with standard noise attenuation features.
- Inform neighborhood of any abnormal noise generating construction activities to minimize disruption to local residents.
- The contraction shall comply with the Environmental Management and Coordination (noise and excessive vibration pollution control) regulation of 2009 where he will ensure that only noise permitted level of 75dB (A) is emitted.
- No discretionary use of noisy machinery ;
- No construction work at night.

Air Pollution

Excavation for the foundation works, underground tanks, and use of cements on site and movement of vehicles on site may lead to generation of dust. However due to the construction works and related activities on site, it is anticipated that generation of dust will be minimal.

Potential Mitigation Measures

Personal protective equipment (PPE) such as dust masks must be worn in the immediate vicinity of the operations during construction.

- Slow down speed of vehicle on site and access road to the site to minimize dust generation.
- The stockpiles of the earth generated during construction works should be suppressed by spraying water or water based mixtures.

Loose Soil and Soil Erosion

The project will generate substantial quantities of loose soil at the construction site. The source of loose soil will be form excavation work to level the site, for below ground tanks and foundation works. Loose soil generate during excavation works may lead to increased soil erosion and dust at the project site and neighborhood. This may lead to release of sediment into surface water drainages within the project area hence siltation and water pollution. Uncontrolled soil erosion can have adverse effect on thee nearing river.

Potential Mitigation Measures

- The loosened soil will be used in the foundation floor, leveling the ground and landscaping. It will be well contained to ensure it is not curried by storm water or wind hence causing erosion;
- Otherwise it will be disposed of immediately it is generated

Solid Waste/Debris

Solid waste will be generated at the site during the construction works. Such waste will consist of metal cutting, rejected materials, surplus material, surplus spoil, excavated materials, paper bags, solvent containers, among others. Such waste can be injurious to the environment through blockage of drainage system, chocking of water bodies, injurious to human and animals' health. This may be accentuated by the fact that some waste contains hazardous substance such as paint, metal cutting, and plastics containers are not biodegradable and can have long-term and cumulative effect on environment. Refuse generated by construction workers, construction spoil materials, and other solid waste could have adverse impacts on the surrounding environment if not well managed.

Potential Mitigation Measures

- Use of durable, long-lasting materials that will not need to be replaced often, thereby reducing the amount of construction waste generated over time.
- Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements.
- Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials.
- Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste.
- Use of construction materials containing recycled content when possible and in accordance with accepted standards.
- Construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal.
- The remaining waste (expected to be minimal) will be disposed at the waste disposal site.

Fauna and Flora

The project area has no fauna, however, there domesticated animals within the project area which includes: cattle, dogs, birds, cats' e.t.c there are no wild animals other than other rodent, insect, birds and snakes though not on the project site.

Potential Mitigation Measures

It will be ensured that project area to be affected by the construction works is demarcated. This will be aimed at ensuring that any disturbance to flora and fauna is restricted to the actual project area and avoid spillover effects on the neighboring areas. This is also to keep animals away from the site.

- Re-vegetation of some of the disturbed areas by the contractor and proponent shall be ensured.
- Plant tree along the fence and some within the compound as boundary, shade and ornamental trees and shrubs.
- It shall be ensured that at least 10% of the compound ground cover is vegetated.

Occupation Health and Safety Risks

This project will involve construction activities and therefore construction workers and neighboring community will be exposed to risks of accident and injuries. Transportation of materials to the site by transporting vehicles, flying and falling objects may cause accidents and injuries to the neighbors and construction workers. Dust generated at the site due to presence of loose soil, movement of vehicles on the site and project area/neighborhood, dust from cement, and non-use of protection devices may lead to health risk like chest and breathing problems to the construction workers and neighboring communities.

Potential Mitigation Measures

Safety of Workers at the Construction Site

The level of implementation of occupation health and safety consideration at the workplace should begin with the deliberate effort by the contractor and the proponent to protect the employees at the construction site. In this regard this proposal makes the following recommendations;

- Provision of appropriate and adequate personal protective equipment (PPE) to employees,
- Enforcement and proper use of PPE by all construction workers,
- Provision of appropriate tools, equipment and machinery in sound working conditions to employees to avoid accidents,

- Develop clear policies on treatment of injured personnel,
- Provide insurance cover to workers on site,
- Reduce employees' exposure to dust and noise at the workplace.

The following shall also be adhered to;

- It will be the responsibility of the contractor to ensure that adequate first-aid services are provided to the employees at all times.
- The site shall be enclosed with gates, access doors and fastenings for proper execution of the work while protecting the public.
- All the construction workers and everyone at the site will be provided with personal protective equipment's (PPEs) which must be used at all time on site.
- Reducing vehicle speed on proper area site, use signs and marks to control traffic on site.
- The contractor shall insure all his workers.
- Before the work begins every day, the contractor/foreman shall instruct all the workers on safety and health issues at work place so that they can avoid occurrence of any accident to the workers and public.
- Construction warning signs be put in place to warn the public to avoid construction site.
- The contractor must be committed to adherence to the occupational health and safety rules and regulations stipulated in occupational safety and health Act, 2007;

Water Use

The construction activities will require water for the construction works and other related use on site which will be sourced.

Potential Mitigation Measures

- The construction shall ensure that water is used efficiently and reused where necessary at the site by sensitizing construction staff to avoid irresponsible water usage.
- Harvest rain water to compliment.

Extraction and Use of Building Materials

Buildings materials such as hardcore, bricks, building stones, ballast, cement, rough stones, and sand required for construction of the Centre will be obtained from quarries, hardware, shops, and sand harvesters who extract such materials from natural sources such as river banks and lake shores. Since substantial quantities of the materials will be required for construction of the building. The availability and sustainability of such resources at the extraction site will be negatively affected as they are not renewable in the short term. In addition, the site from which the material will be extracted may be significantly affected in several ways including landscape change, displacement of organisms and vegetation, poor visual quality and opening of depressions on the surface leading to several human and fauna health impacts. Excessive use of timber will lead to deforestation and or reduction of vegetation cover at their source.

Potential Mitigation Measures

- The proponent will source building materials such as sand, ballast and hard core from registered quarry and sand mining firms, whose projects have undergone satisfactory Environmental Impact Assessment/Audit and received NEMA approval. Since such firms are expected to apply acceptable environmental performance standards, the negative impacts of their activities at the extraction sites arena well mitigated.

- The proponent will only order for what is required through accurate budgeting and estimation of actual construction requirements. This will ensure that materials are not extracted or purchased in excessive quantities.
- The proponent will ensure that wastage, damage or loss (through run-off, wind, etc.) of materials at the construction site is kept minimal, as these would lead to additional demand for and extraction or purchase materials.
- The proponent shall consider reuse of building materials and use of recycled building materials. This will lead to reduction in amount of raw materials extracted from natural resources as well as reducing impacts the extraction sites.

Exhaust Emissions

Construction work will require transportation trucks to transport construction materials to the site. These trucks and other fossil fuel using machineries will contribute to increase in emission of CO_2, NO_2, and the particulates along the way as a result of fuel combustion. Such emissions can lead to several environmental impacts including global warming and health impacts. Because large amounts of building materials will be required, some of which will be sourced outside Migori County. Such emission can be enormous and may affect a wider geographical area.

Potential Mitigation Measures

- All machinery and equipment should be maintained in good working order to ensure minimum emission including carbon monoxide, oxides of nitrogen and Sulphur, as well as suspended particulate matter.
- In addition truck drivers will be sensitized to avoid unnecessary racing of vehicles engines at loading/offloading areas, and to switch off engine. Prompt maintenance of vehicles drivers.
- Proper planning of transportation of materials and waste to ensure that vehicle fill are increased in order to reduce the number of trips done or the number of vehicles on the road.

Traffic

During construction phase the road to the site will serve additional traffic transporting materials to site and those visiting the site for various reasons

Potential Mitigation Measures

- Sensitize the drivers to control and reduce speed of vehicles on the road
- Use construction and warning signs to warn the public on the traffic
- Only needed vehicles will be mobilized to site. Those that are not temporarily in need shall be kept off from the project site and area.

Sewage from Construction Personnel

The contractor will put up a temporary pit latrine for the construction workers. This latrine will be renovated to be used during the project operation phase

8.2.2. Negative Impacts and Mitigation Measures during Project Operation

Change of Land Use and Ecosystem

The site has been on use as an agricultural land, establishment of this project will change the land use to an industrial use. The proponent has acquired Change of User.

Potential Mitigation Measures

- The proponent has acquired change of use from agriculture to mini industry
- The proponent to sources employees from the neighbourhood hence they will commute from their homes to the plant. The professional employees not from the area to be given accommodation inside the plant premise.

Water Abstraction

The project intend to source water for its industrial operation. Domestic water will be sourced from Migori town and water spring in the area and ferried by water tanker to the site where it will be stored in a tank meant for domestic use only.

It is important to note that, the project will not consume a lot of water for its industrial use as water within the system is not discharged into the environment but recycled

Potential Mitigation Measures

- Measure to conserve and avoid misuse of water.
- Reuse and recycle water
- Ensure rain water harvesting through roof catchment and storm water runoff collection
- The project shall not abstract water for industrial use from spring or shallow wells in the area.

Liquid Waste (Sewage) Waste Water

The project is expected to serve a number of people on site more so employees. This will lead to increased demand for sanitation and sewage disposal. If this population is not provided with adequate and proper sanitary facility they may be force to defecate in the bush. The waste may be carried away to the river polluting the river and causing water borne diseases. This may be worse during those times of outbreak in communicable diseases like cholera. Improper construction of sanitary facility may also lead to contamination of underground water within the project area.

Potential Mitigation Measures

- the proponent will construct adequate VIP ablution block on site
- provide hand washing facility at ablution block
- ensure the ablution blocks are always maintained in good conditions structurally and in terms of cleanliness
- When full it shall be adequately treated and exhausted by NEMA licensed liquid waste collector.

Air Quality/Dust Emissions

The activities have the potential to generate dust mainly from transportation of tailings from their source to the processing plant. This mainly happens if the transportation vehicle is not covered hence the tailing particles are carried away by wind hence air impairment. All the roads of the area are earthen hence an additional of vehicles on road by this project will increase dust generation. The leaching and precipitation processes may lead to release of chemical fumes into the environment. These fumes may be inhaled by those at the site hence affecting their health.

Impacts resulting from air quality degradation can include those related to health (although these are typically linked to occupational rather environmental exposure), visual intrusion and, most commonly, nuisance for surround communities.

Potential Mitigation Measures

- Tailings will be transported using a truck from points of acquisition to the processing site through the road which will be used by the truck; it will be applied with dust suppressants such as water.
- All the tailing transportation vehicles will be covered
- Constant sprinkling of water to the bare areas to make soil particles remain intact hence reducing impact generated by wind
- There is need to locate dust and fume generating activities where prevailing winds will blow it away from the premise and neighbouring settlement
- Introduce vegetation to the bare areas and maintaining them through watering to grow fast as the activity continues. This will act as air/wind break and cleaner.
- Every person working on site must wear a nose mask
- Processing environment will be maintained in basic condition to avoid evolvement of HCN gas which is poison, to achieve this, the plant will use lime to suppress cyanide from being emitted as a fume into the environment. Monitoring will be undertaken throughout the operation to ensure that the PH is maintained.
- The cyanide fumes/ smell that may be emitted from the top of the leach tanks (since they are open) will be minimal; not more than 5ppm, and therefore it will naturally be killed by sun ray hence harmless.
- Re-processed tailings will be flashed/ washed with clean water containing neutralizing agents (lime) twice before it is removed from the leach tanks. This is to clean and neutralize any trace of cyanide that might remain in it so that once the tailing is disposed; it doesn't end up generating any fume/odour.
- The area is sparsely populated and therefore those at a risk to be affected by air impairment (if any) will be employees and therefore every person working on site should wear nose masks.

Landscape and Visual Intrusion Effect

Heaping of tailing on site for recycling and after recycling will have a negative effect on landscape by causing visual intrusion.

Potential Mitigation Measures

- the retention of existing features, including trees will help to substantially reduce adverse effects and ensuring a protective fencing, to avoid damaging these features hedge grow should be allowed to grow in height to increase their potential to screen.

- The stockpiles tailing wastes will be reduced to reasonable height below the skyline by reusing it in making appropriate by-products or reclaiming abandoned mines and quarry in the area. Before disposal it will be ensured that it is free of any harmful chemical.

- Site plant and soil stockpiles etc. will be located away from sensitive landscape and visual receptor areas.

Noise and Vibration

Noise will emanates from plant operations mostly from tailings transportation vehicles and running of the stand by generator. It is however, expected that activities like ore crushing will not be undertaken on

site hence the operation of the plant will generate minimal noise. There settlement within the neighbourhood is sparsely populated hence any noise on site may only affect construction workers.

Potential Mitigation Measures

- Noise generating activity (if any) shall be strictly limited to daytime i.e. between 6.30AM to 6.30 PM.
- The facility management should regularly conduct noise assessment studies and keep records of the assessment.
- Conduct noise measuring to determine levels and extent of harmful noise and provide PPE (hearing protection) to persons who must operate within or visit the identified high noise areas;
- Inform neighbourhood of any abnormal noise generating activities to minimize disruption to local residents.
- Sensitization of truck drivers to switch off vehicle engines while offloading materials and to avoid unnecessary gunning of vehicle engines or hooting.
- The contractor shall comply with the Environmental Management and Co-ordination (Noise and Excessive vibration pollution Control) Regulations of 2009 where he will ensure that only noise permitted level of 75dB (A) is emitted.
- No noise generation activity at night without noise license.
- No in discriminatory use of noise generating equipment, machineries or activities.
- Connect the facility to electricity to avoid noise always generated by the generator every night.

Occupational Health and Safety.

Attention must be focused on health of employees, and the neighbourhood in order to attain a level of health condition that permits them to lead a healthy, socially and economically productive life. Operations of the plant may pose health and safety risks to the employees and the surrounding community. These may arise from lack of use of protective gears/gadgets, fall into tanks, dust, noise, accidents from machinery and equipment. In this regard;

Potential Mitigation Measures

- Workers will be provided with PPE's such as safety foot wears, dust masks, gas masks, gumboots, gloves and respirators where appropriate and they be trained on their use.
- Medical examination before, during and after employment for employees will be ensured.
- Health and safety plan for the facility developed and refresher training of employees on first aid and safety procedures shall be conducted periodically.
- Working equipments and their postures shall be user friendly.
- Training staffs and workers on the nature of the environment they are working in and ensure awareness program concerning the effect of dust, noise, chemicals and other gaseous emissions to human health.
- Leaching tanks, barren tanks and laboratory area shall be enclosed to prevent accidents that may result from unauthorized persons entering the area.
- The consumable water shall be treated before it is supplied for consumption and its location must be far from the processing area to prevent contamination by harmful chemicals.
- There shall be speed control bumps on the road linked to the site to the main road to control speed hence limit potential accidents to animals and people.

- Well stocked first aid kits should be provided on site and somebody trained on its use be employed to take care of minor injury cases.
- Incidences and accidents records should be kept on any occurrence in the site and the company should develop an effective emergency response plan and enlighten the staff on safety measures and procedures through training and strict adherence to factories and other places of work act and all the occupational health and safety rules and regulations.
- Before the work begins every day, the proponent shall ensure that workers and everybody on site are instructed on safety and health issues at the work place so that they can avoid occurrence of any accident to the workers and the public.
- Hygienic conditions at work place will be maintained and enforced.
- Health and safety regulations that comply with the 'mining (safe working and occupational health) regulations, will be instituted and enforced on site.
- Efficient working procedures during operation activities will be implemented as a way of minimizing near miss and incidence on the site.
- Acquired immune deficiency syndrome HIV/AIDS awareness programs are going to be instituted according to the needs assessment due to influx of job seekers.

Solid Waste

Different types of solid wastes from the site will be generated throughout the plant operational phase. These will include office waste, used chemical container and bags, destroyed / broken by-products made from tailings and worn out tools among others.

Potential Mitigation Measures

- Adapt sound on site waste management system to ensure proper solid collection, containment and disposal.
- The plant management should consider entering into formal and structured contracts with respective handlers of the different solid wastes more so used chemical containers and bags.
- Refuse handlers should also be required to declare the destination of the wastes removed from the premises.
- Waste materials should be segregated/separated i.e. hazardous wastes, scrap metals, wood, non-biodegradable, tins and cans etc. and disposed as appropriate in legal manner.
- Non-harmful chemical containers and bags can be reused for other purposes.

Water Quality/Pollution

If the processed and unprocessed tailings are not properly contained, they may be carried by storm water downstream. Unprocessed tailing will dispose both silt and mercury into water thereby affecting aquatic life. The barren water from the leaching ponds and carbon chamber contains cyanide and lime which if not well contained may leak or spill hence carried by storm water to river hence causes death to plant and animals on its way.

It is important to note that, this kind of process will not lead to contamination of tailings hence an environmentally friendly process.

Potential Mitigation Measures

- Tailings shall be held on locations of the site not susceptible to storm water runoff awaiting reuse or collection for disposal.

- No direct washing of tailings, ore or any other thing in a manner that may lead to water pollution.

- All water from the leaching process and tailing washing will be discharged to the mixing/barren tank for recycling and reuse in the leaching process hence will not be released into the environment.
- Storm water from the processing section and tailing storage area will be controlled by having a drainage channels all round the place such that all the storm water from this section is collected and discharged into a pond where it will be monitored for quality. This water will be treated and then pumped back into feeder tanks for reuse in the leaching process.
- The tailing storage area will be provided with a base with lining or concreted to prevent percolation of the leachate from the tailings into the soil. This is to prevent soil and underground water contamination.
- The premise will be fenced and reinforced with chain link or iron sheets to prevent animals from entering the premise and drinking contaminated water.
- Tailings completely leached will be flashed/ washed with fresh water to wash away/ leach cyanide out of the tailings before it is removed from the leach tanks. Water from this washing process will be discharged into the carbon chamber to follow the same process as the pregnant leach solution hence recycled for reuse.
- Chemicals to be used will be issued by superintendent who is knowledgeable enough and experienced in handling of poisonous industrial chemicals without causing spillage to the environment.
- Transportation of chemical reagents will be done in accordance with the requirement provided by the environmental authority.
- Leaching tanks have been designed to offer safe leaching practices without any solutions overflowing. Leaking proof cement will be applied in the internal part of the tank walls. Tanks will be built out of bricks and reinforced with iron bars to minimize risk of collapse.

HIV/AIDS

A place where many people meet, there is a tendency of people socializing to an extent of having sex with people who are not their marital partners. This may lead to transmission of HIV/AIDS virus.

Potential Mitigation Measures

The following mitigation measures are recommended to control the spread of HIV/AIDS and other STDs. Develop HIV/AIDS awareness programs or initiatives to target the construction workers, institutional communities and the general members of the community, particularly the youth; with the objective of reducing the risks of exposure and the spread of HIV virus in the project area. Measures recommended for implementation to enable reduce the spread of the virus include the following;

- Programs should be developed for sensitizing the local community and project workers on HIV/AIDS and/or other sexually transmitted diseases (STDs). Develop appropriate training and awareness materials for information, education and communication (EIC) on HIV/AIDS.
- Collaborate with other players on HIV/AIDS
- Have programs that will distribute condoms to workers

Energy Consumption

During operation, the facility will require energy mainly for lighting and running electrical appliances. The site is currently not connected to the KPLC grid hence the proponent has planned to use generator for a start then later connect to the KPLC grid. This generator will be run by diesel hence it will emit carbon into the atmosphere contributing to the increase of global warming gases.

Potential Mitigation Measures

- Use of energy saving bulbs
- Switching of unnecessary light
- Servicing the generator and other energy consuming/utilizing equipment's regularly
- Connect the premise to KPLC grid
- Use solar lighting system more so at night in security light

Fire Outbreak

Improper plumbing (fitting electricity line and cables), storage of flammable/explosive products; processing chemicals and mechanical failure of the standby generator are potential sources of fire outbreak. Fire outbreak may destroy properties, can cause injuries like burns to human or can lead to death of persons within the plant.

Potential Mitigation Measures

- Firefighting equipments (fire extinguishers and fire blankets) and first aid boxes shall be installed for readiness to any fire outbreak. These extinguishers shall be purchased from a vendor specializing in marketing this type of equipment.
- In addition; fire brigade inlet, emergency lighting system, smoke and heat detector shall be provided.
- Emergency/fire exit doors shall be put in place
- A dedicated water storage tank on the roof space shall be provided for the hose reel system and a hobby automatic booster pump complete with pressure vessel and pressure switch shall also be in place. Fire hydrants will be serviced on a water recirculation of 100mm diameter G.I piping class "B" with 2 no fire hydrants.
- Exit signs to be installed above all external doors and passages
- All doors must be opening outward
- Designated fire assembly
- Installation of alarms, with switches at accessible locations for activation in case of fire emergencies
- Posting fire response manual where they are easily readable by everyone in the site.
- Availability of emergence contact telephone list is amongst precautionary measures that will be adopted by the proponent
- Any reactive or explosive chemical shall be stored in a manner it will not lead to cause of fire

8.2.3. Other recommendations

Storage of Reagents

Storage for chemical reagents areas will be properly laid out to avoid contamination, accidents and will be isolated from materials that cannot be kept together with. Poisonous or corrosive

reagents such as cyanide, acids and other chemicals will be stored in a well secured area that is well founded to prevent accidental spillage to the environment. Safety material datasheet and reagents issues and storage protocol will be put in place and adhered to. And the company shall have a qualified person who will be handling chemicals at the plant. There must be proof to show his qualification and competence.

Soil Contamination

An area near the leaching tanks will be leveled in such a way that tailings to be processed will be stored in the vicinity to facilitate loading into the tanks. The base at which the raw materials will be kept will have proper lining to prevent any accidental seepage of chemicals into the soil.

Leaching Section

All the leach tanks will be constructed in the same area, this is for proper handling and safeguarding since this is where chemical cyanide can come into contact with humans and/or other animal if care is not taken. This area will be isolated from other sections, guarded by watch men at all times.

Classification Section

Classification section consists of a tank(s) that will be collecting pregnant solution from the leaching tanks. These tanks will be constructed in the surrounding area where the leaching tanks will be in order to facilitate solution flowing from the leaching tanks and to keep security at a maximum.

Carbon Chambers

This area in a similar manner will require special and timely monitoring as there is also potential for accidentally chemical spillage that may cause accidents to individuals or environment.

Laboratory

A small analytical laboratory will be put in place for analytical tests to be carried out on site. In this laboratory quality of tailings to be purchased in terms of gold grade will be established, pregnant solution from the leaching system and cyanide solutions will be tested to determine the concentrations. PH monitoring test will be done in the same laboratory. The laboratory will be located in the neighborhood with the leaching, carbon loading and classification areas as an environmental protection strategy.

Tailing Disposal

All the tailings obtained from the leaching system will be of no more value to the proponent but need to be properly disposed off as they may contain chemicals that can harm humans, livestock and the environmental in general.

To ensure that these tailings are free from cyanide, tailings completely leached will be flushed /rinsed with fresh water to wash away/leach cyanide out of the tailings before the tailings are removed from the leach tanks. This will be done using the same system used to apply the cyanide solution to the leach tanks. The system will be disconnected from the solution source and connected to a fresh water source from which water will be pumped to the leach tank to flush out/leach out the cyanide. To completely remove the cyanide, tailings will be flushed with water four times. A treatment will then follow where a cyanide neutralization solution containing hydrogen peroxide will be applied (mixed with water then flushed). The tailing will be analyzed to determine and ensure complete flush out and neutralization of cyanide. It is only

after ensuring that the tailings are free of cyanide that it will be removed from the leaching tanks.

Once removed from the leach tanks it will be deposited in a location that will ensure that it is not carried away by storm water downstream. The area will be open to sky to allow it receive adequate sunlight that will decompose any traces of cyanide that may have accidentally remained. A drainage channel will be put around the processing area and tailing storage yard to ensure that the storm water from the section is collected in a controlled manner and discharged into a pond to be constructed on site for the containment and management of this water. This water will be pumped into the leaching system for use. Since the tailing will have been completely washed of cyanide, the tailings will later be used in covering the abandoned mine holes in the project area as there are numerous abandoned mine that have continuously posed safety risk to the community and their livestock. It may also be used in making bricks.

Monitoring of Plant Operations

Close monitoring of all movements of equipment, site personnel and workers will be carried out so as to minimize unauthorized activities in any part of the project area.

- Only frequently inspected road-worthy vehicles and well-trained drivers will be permitted.
- access to the site and use of road
- Only designated roads for transport (from tailing source and to the site) will be used in order to avoid creating new routes unnecessarily which may accelerate loss of some flora and fauna. Animal found crossing roads will be given right of way to protect them.
- any loss of life (both human and animal), environmental degradation, loss of vegetation and any other impact that will occur as a result of the project negligence and failure of mitigation will attract legal measures as per the constitution of Kenya 2010 and EMCA-amended 2015.

8.3. Annual Audit (Environmental Operation Survey)

In order to sustain a healthy environment in the project area and its environs, the proponent shall undertake to monitor the quality of the environment as a routine practice. Monitoring shall involve measurements, observations, evaluations, assessment and reporting through an annual Environmental Audit.

8.4 Negative Impacts and Mitigation Measures during Decommissioning Phase

A third phase of the project i.e. decommissioning is possible. A number of factors may contribute to the need for decommissioning including. An order by a court of law or government due to non-compliance with existing regulations. Proponent deciding to do away with the plant based on his reasons. According to EMCA 1999, all project sites have to be restored to levels they were in before the project at their decommissioning phase. In case there will be a need to decommissioning the whole project, the project will undertake all the decommissioning activities and process that will ensure decommissioning is done in an environmentally friendly manner and the site is returned to its original state as much as practicable.

Decommissioning Phase Positive Impacts

Income to Hired Workers

Besides the consultants who would undertake a decommissioning assessment, those hired to carry out the actual demolition will also earn an income.

Recovery of Construction Material

Upon demolition re-usable construction materials will be recovered. These can be used in other constructions and thus reduce the pressure on environmental resources.

Negative Impacts

Economic deadline; the proponent will also suffer huge losses. Workers will lose jobs.

Solid wastes; decommissioning activities are associated with the production of solid wastes and rumble.

Insecurity; insecurity may result from being abandoned following the decommissioning. Unoccupied structures within the site may act as a den for criminals, and the security booth that had been provided by residents living within the development would be lost. Insecurity might rob the neighbor's bread winners through attacks by the gangs, loss of property and also risk to children.

Safety risks; decommissioning of projects would normally be accompanied by safety risks from any leftover structures, uncovered excavation and structures that may collapse and injure passer-by if left on site for a long time. Children may fall in the excavations while plying thereby causing deaths. There may also be environmental hazards from exposed left over substances which may cause soil and water contamination or generate noxious odor which can result to diseases.

Potential Mitigation Measures

Decommissioning plan; decommissioning plan will be prepared and submitted to NEMA, county government, mining and geology department for approval three months before decommissioning.

Removal of tailings on site; it will be ensured that all the tailings brought on site will have been processed. The processed tailings will be removed from site and reused for any other purposes deemed appropriate or to reclaim abandoned mines.

Efficient solid waste management; waste will be generated as a result of demolition work and dismantling of structures on site. Some of the solid waste generated during decommissioning phase will either be reused for other construction works or disposed of appropriately. Once all the waste resulting from demolition and dismantling works is removed from the site, the site will be restored through replenishment of the top soil and re-vegetation using indigenous plant species and other fast growing tree species.

- Reduction of dust concentration and minimization of noise as earlier described.
- Ensure safety of the public, construction workers and premises within the project neighbourhood.

Information; inform workers in good time to prepare them psychologically and look for alternative job opportunities.

Restoration of the site. Once the entire project component shall have been removed from site, activities to restore the site will be undertaken. This is to return the site to its initial state or nearest to its original state. This will include planting of fast growing trees which exist within and around the project site to compensate for the lost flora. The soil layers will be ripped of so as to facilitate the correct restoration profile.

CHAPTER NINE: ENVIRONMENTAL MONITORING AND MANAGEMENT PLAN

In order to mitigate the negative environmental and social impacts arising from the project under pertinence, and to factor into this, the environmental management into all level of this project entirely, an Environmental Management Plan (EMP) has been developed here under. The EMP provides a structure for monitoring the mitigation of negative environmental impacts. While specifying mitigation measures for negative environmental impacts, the EMP assign responsibilities, gives cost estimates for mitigation options and as well as points out monitoring indicators. The EMP also specifies time frames within which mitigation measures are to be monitored. The EMP will be used to as checklist in future Environmental Audits. It is imperative that this project report is made available to the relevant project team members and stakeholders.

It's of great relevance to observe that various measures have been incorporated by the project proponent during designing and construction levels of the project span. The EMP here under contains those mitigation measures for project impacts at construction, operation and decommissioning phases of the project.

Table 2: Environmental Management Plan during Construction Phase

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
Noise and vibration	L	• Equip workers with standard noise attenuation features • Inform neighbours of any abnormal sound and response measures • Compliance with noise and excessive vibration regulation • No discretionary use of noisy machineries • No construction work at night	Contractor, workers	Inspection	10,000
Air pollution and dust	L	• Provision of PPE`s which must be worn • Suppression of stockpile by spraying water • Reduce speed of vehicle on site & on road linked to the site	contractor	Routine inspection	10,000
Solid waste	M	• Use of durable long lasting materials • Provide facilities of proper handling of waste on site • Perishable materials should be purchased only when needed • Use building materials with minimal packaging • Carefully budget for construction	contractor and his workers	Routine inspection	Per contract sum

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
		material • Remaining waste shall be disposed as appropriate			
Vegetation and fauna on site(shrubs ,short grass)	L	• Demarcate project area to be affected by the construction works to restrict disturbance to actual project area • Re-vegetate disturbed area through a proper landscaping & planting trees along the fence and in compound once the construction is complete (at least 10% of site be vegetated) • Location of project plant & components in area with least vegetation	Contractor and proponent	Observation of the ground vegetation cover	20,000
Health and safety risk	L	• Site shall be fenced and security services provided on site • Construction workers , visitors and everyone on site shall wear PPE`s • Reduce employees` exposure to dust and noise at the workplace • Have a well stocked /equipped first aid box on site Close supervision of work • Construction of pit latrine for workers Instruct the workers on safety and	contractor	Routine inspection	60,000

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
		health issues before the work begins every morning • Construction of waning signs shall be in place to warn public to avoid construction site • Adherence to standard operational procedures and emergency procedures • Project vehicles to observe speed limits • Safety slogans should be strategically posted as a reminder to employees			
Generation of loose soil Water use	M	• Excavated earth shall be held on location of the site not susceptible to storm water • Will be used in the foundation floor , leveling the ground and landscaping	Contractor and his workers	Inspection	50,000
	L	• Ensure efficient use of water and reuse where necessary • Construction workers shall be sensitized to avoid irresponsible water use • Harvest rain water	Contractor and his workers	Routine Inspection	

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
Increased traffic may lead to accident	M	• Drivers to reduce speed of vehicle on the road • Use construction and warning signs to warn the public on the traffic • Only needed vehicles will b mobilized to the site	contractor	Routine inspection and maintenance	1,000
Energy use	L	• Ensure responsible energy use by switching off energy consuming Equipment or appliances when they are not in use • Planning of transportation schedule • Monitor energy use	Contractor and his workers	Routine inspection and maintenance	Nil
Toilet facility	L	• Construction of a pit latrine for workers on site	contractor		10,000
Sewage	M	• Construct a VIP ablution block • Provide hand washing facility in all ablution blocks • Ensure the ablution blocks are always maintained in good conditions structurally and hygienically • When full ensure they are exhausted by a NEMA licensed liquid waste collector	Project management	Routine inspection and maintenance	Contract sum 5,000 Per contract sum

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
Water use	M	• Source industrial water from the nearby water source if any • Reuse and recycle water to minimize water abstraction • Rain water harvesting through roof catchment to supplement pumped water • Recycle water more so that from leaching process • Sinking a shallow well for domestic water • Collect water from river Migori using tankers during dry season	Project management	Routine inspection and maintenance	100,000
Change of ecosystem and land use	L	• Source employees from the area who will be commuting from their homes. Only technicians to be source from elsewhere and be provided with accommodation within the premise • Controlled development to ensure least disturbed ecosystem and ensure at least 10% ground vegetation coverage • Plant trees to replace those cleared during construction • Apply for change of use	Project management	Routine inspection and maintenance	100,000

Table 3: Environmental Management Plan during Operation Phase

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
Air pollution from dust and fumes	H	• Tailing transportation vehicles shall be covered • Tailing will be transported using a dump tank • Suppress dust within the project site • Locate dust and fume generating activities where prevailing winds will blow it away from the premise and neighbouring settlement. • Every person working on the site must wear nose masks. • Introduce vegetation on bare grounds along the fence to act as windbreakers and air cleaner • Regular maintenance of all equipment`s on site to reduce emissions of noxious gases • Lime will be used to suppress emission of cyanide gas • PH will be monitored and maintained in basic condition (PH>=10) throughout to	Project management	Inspection Routine maintenance	120,000

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
		suppress and avoid evolvement of HCN gas which is poison • Tailing will be washed with fresh water before they are removed from the leaching tanks after leaching			
Occupational health and safety	H	• Provide scaffolding to facilitate safe operations at high level • Every person on site must wear appropriate and adequate PPE`S relevant to where they work • Sensitize and train workers on nature of environment they are working in, occupational health and safety • Firefighting equipment be provided and strategically placed • Provision of a fully stock first aid box and a person trained on its application be employed • Incidence and accident record shall be kept • Only frequently inspected road-worthy vehicles and well-trained drivers will be permitted • Develop an emergency response plan	Proponents/ workers	(c) Inspection (o) Routine maintenance	300,000

Environmental Social Impact	Level of Impact L- low M-Medium H- high	Proposed Mitigation	Responsibility	Monitoring Means	Estimated Cost
		and enlighten the staff on safety measures and procedures through training • Strict adherence to factory and other places of work Act and all occupational health and safety rules and regulation • Instruct all workers on safety health issues every day before work begins • Provide right tools, operations, instructions & manuals during work/operation phase • Engage the services of qualified personnel in the processing • Processing area (barren tanks, laboratory &leach tank areas shall be enclosed) • Sensitize staff on social/health issues such as drugs and HIV/AIDS • Ensure machinery and equipment`s servicing and maintenance as per schedules and legal requirements • Medical examination of employees before, during and after their employment will be ensured			

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
		• Working equipment`s and their postures shall be user friendly • Put speed control bumps on the road linked to the site to the main road to control speed • Hygienic conditions at work will be maintained and enforced • Working procedures be implemented to minimize near miss and incidence • Water for consumption be provided for employees and it be located far from processing area to prevent its contamination • An antidote chemical to be in place on site to be used in case of any accidental poisoning			
Noise and vibration	L	• Establish inspection program for equipment to ensure they generate no noise during their use • Noise generating activities be strictly limited to day time i.e. between 6.30 AM to 6.30 PM • Regularly conduct noise assessment and keep records	Project management	Inspection Routine maintenance	30,000

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
		• Inform neighbours on abnormal noise for them to be prepared • Ear protection to those working in noisy areas • Comply with noise regulations			
Waste generation and management	M	• Adapt on site sound waste management system to ensure proper solid disposal and collection facilities • Disposal of the waste shall be appropriately without compromising the environment and community in the recipient area • Segregation of waste before disposal • Reuse of waste material where possible	Project management	Routine inspection	50,000
Visual intrusion effect	H	• Retain existing features like trees • Wherever possible, haul routes, soil tailing etc should be located away from sensitive landscape and visual receptors areas • Tailing wastes will be reused and some used to claim abandoned mine holes hence reduction in heap	Project management	Routine inspection	-

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
Water pollution	H	• The premise will be fenced using chain link to prevent animals from entering and drinking contaminated water • Tailing will be held on locations not susceptible to storm water runoff • Drainage will be constructed all round the processing and tailing storage area to collect storm water to a pond for quality monitoring and subsequent reuse in leaching process • All water from leaching process will be reused (it is a close circuit process) • Tailing storage area shall be concreted/provided with lining to prevent leaching in to the soil • No direct washing of tailings, ore or any other thing that may lead to water pollution • Tailings will be washed /flashed with fresh water before disposed from the leach tanks • Water from the tailing washing/flashing will be directed to the barren /mixing tank for reuse	Project management	Quality of water	250,000

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
Exhaust Emissions from project Vehicles and generator		• Compliance with water quality regulation • No solid matter or other pollutant shall be discharged in to open drainage to the river • Oil containing waste shall be collected and disposed appropriately • Transportation of chemical reagents will be done in accordance with the requirement provided by the EMCA-1999 • Leaching tanks have been designed to be leak and overflow proof and also to ensure stability not to collapse			
	L	• Recondition engine exhaust systems (machineries) • Engine tune-up	Project management		
		• Establish inspection program for equipments • Proper servicing • Use of lead and sulphur free fuel		Inspection routine maintenance	
Oil pollution/spill	L	• Obtain spill control kit • Proper storage, handling and disposal of	Project management	Inspection observation	60,000

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
control		new oil and used oil wastes • Repair of plant vehicles be done at the public garage not on site			
Fire protection	L	• Fire fighting equipments to be in place • These fire extinguishers should be strategically placed for ease and quick accessibility • Fire brigade inlet, emergency lighting system, smoke and heat detector shall be provided • Emergency /fire exit doors shall be put in place (laboratory) • A dedicated water storage tank for hose reel to be in place • Exit signs to be installed above all external doors and passages • Designate fire assembly point • Installation of alarms, with switches at accessible locations for activation in case of fire emergencies • Posting fire response manual where they are easily readable by everyone in the building • Availability of emergency contact	Project management	Inspection observation	120,000

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
		telephone list is amongst precautionary measures that will be adopted by the proponent			
Vegetation	M	• Landscaping and planting vegetation in disturbed areas • Planting of trees within and outside processing area • Maintenance of vegetation within the premise to a ground cover of at least 10% • Only designated roads for transport will be used in order to avoid new routes unnecessarily which may accelerate loss of some flora and fauna	Project management	Observation	10,000
security	M	• Provide security guards and facilities during the entire project cycle • The premise will be fenced and security personnel put in place	Project management	Observation	300,000
Energy consumption	M	• Use of energy saving bulbs • Switching off unnecessary light • Servicing the generator and other energy consuming /utilizing	Project management		100,000

Environmental Social Impact	Level of Impact L- low M-Medium H- high	Proposed Mitigation	Responsibility	Monitoring Means	Estimated Cost
		equipment`s regularly • Using alternative sources of energy especially renewable ones such as solar in lighting should be considered • Connect facility to KPLC power grid			
HIV/AIDS	M	• Develop programmes to sensitizing the community and workers on HIV/AIDS and /or other sexually transmitted diseases(STDs) • Develop appropriate training and awareness materials for Information, Education and Communication (IEC) on HIV/AIDS • Identify other players (local CBOs, NGOs and government organizations)on HIV/AIDS for enhanced collaboration • Have programmes that will distribute condoms to the workers and the community	project management		30,000
	L	• Both genders to be given equal job opportunities • Both genders to be appropriately represented in any information and	project management	Observation	Per subject budget

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
Gender		consultative meeting • Equal payment • Flexible working hours to take account of multiple roles of women and cultural norms • Separate toilet and accommodation facilities be provided			
Storage of reagents	L	• Storage for chemical reagents areas will be properly laid out to avoid contamination, accidents and will be isolated from material that cannot be kept together with • Poisonous/corrosive reagents such as cyanide, acids and other chemicals will be stored in a well secured area that is well founded to prevent accidental spillage to the environment and / or theft • Safety material datasheet and reagents issues and storage protocol will be put in place and adhered to	Project management		

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
Tailings disposal	M	• Tailing will be washed/flashed with water before removed from leach tanks • Before removal it will be ensured that it is free of any cyanide • Once safe, it will be removed and heaped on an impermeable layer of bottom lining • The area will be open to sky for the tailings to receive adequate sunlight that will decompose any traces of cyanide remaining • Tailings will then be used to fill abandoned mines, making bricks	Project management	Sampling nearby underground water source	100,000
Monitoring of plant operation		• Close monitoring of all movements of equipment. site personnel and workers will be carried out so as to minimize unauthorized activities in any part of the project area	Project management	Observation	Nil

Environmental Social Impact	**Level of Impact L- low M-Medium H- high**	**Proposed Mitigation**	**Responsibility**	**Monitoring Means**	**Estimated Cost**
Sustainability of the project		• Undertaking initial environmental audit and subsequent annual audits • Compliance to all legislative frame work in Kenya and internationally that are relevant for the operation of this project • Have an employee who will be in charge of the implementations of this report, other environmental ,occupational health and safety issues	Project management	In possession of required licenses and documents	100,000

Table 4: Environmental Management Plan for the Decommissioning Phase

ACTIVITY/ISSUE	ACTION REQUIRED	RESPONSIBLE PARTY	FREQUENCY
planning decommissioning	Inform the relevant authorities and employees on decommissioning and submit a decommissioning plan for approval	The proponent	3 months before Decommissioning
Removal of structures	All structures that will not be used for other purposes must be removed and recycled as much as possible or disposed	The proponent Decommissioning Contractor	One off
Demolition and other decommissioning related wastes	• Where recycling/reuse of the equipment and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site • Disposing shall be in accordance with the environmental legislation on waste management	The proponent Decommissioning Contractor	One off
Covering/filling of excavations on site	All excavations shall be refilled with processed tailings	Decommissioning contractor	One off
Public health concerns	• Provide suitable PPE`S to workers • Provide first Aid Kit • Promote & maintain a safe work place • Dismantle all electrical connections • Check potential hazards and risks to workers and the public • Fence off all dangerous areas	Decommissioning contractor	One off

	• Enclosing the site during demolition		
Restoration of the site	• Restoration of the site by planting indigenous trees and grass • Planting of fast growing trees which exist within and around the project site will also be recommended to compensate for the lost of fauna during site preparation • All the tailings must be removed on site. they will be used in filling abandoned mine holes ,making bricks or disposed as will be appropriate as per the decommissioning	Decommissioning contractor and the proponent	On e off

CHAPTER TEN: CONCLUSIONS AND RECOMMENDATIONS

The proposed project has been assessed with an objective to determine the possible socio- economic and environmental positive and negative impacts it is likely to have on environment and to determine appropriate mitigation measures. The proposed project will have numerous positive impacts some of which include creation of employment, improved infrastructure, increased revenue among others detailed in the report. Despite being a potential source of negative environmental impact as outlined in the EMP.However, can be mitigated. The proponent of the proposed project shall be committed to putting in place several measures to mitigate the negative environmental, occupational safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the proponent shall focus on implementing the measures outlined in the EMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern the establishment and operation of such projects. It is also recommended that the positive impacts that emanate from such activities shall be enhanced as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards. Given the foregoing considerations ranging from socio-economic, environmental as well as policy considerations, it's expected that the project will go a long way in ensuring better and quality service delivery to the public in an environmental friendly manner and it is our considerable opinion that the proposed development is a timely venture. This proposal is therefore hereby submitted for scrutiny and possible approval to facilitate the inception of the project.

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LIST OF APPENDICES

Appendix 1: Photo Gallery

Plate 1: The Leaching Tanks

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Plate 3 : Proposed Project Site

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Appendix 4: Copy of the EIA Expert's Registration Certificates

Appendix 5: Proof of Ownership

Appendix 6: Certificate of Change of land Use