



**ENVIRONMENTAL IMPACT STUDY  
REPORT FOR PROPOSED DAM  
CONSTRUCTION BY AFRICALLA ON  
LR NO: 3777/218 GILGIL**

**CO-ORDINATES 1.4753° SOUTH  
LATITUDE AND 36.9620° EAST  
LONGITUDE**

**PROPONENT: AFRICALLA KENYA  
LIMITED. GILGIL**

**Kenneth Kogei-3087**

## **DOCUMENT AUTHENTICATION**

This Environmental Impact Assessment Study report has been prepared by Lead Expert Kenneth Kipkogei (NEMA Reg. No. 3087) and Associate Expert, Brian Ochieng Otieno (NEMA Reg. No 10516) in accordance with the Environmental Management and Coordination Act (EMCA) 1999 & amendments of 2015 and the Environmental Impact Assessment and Audit Regulations 2003 which requires that every development project must have an EIA report prepared for submission to the National Environmental Management Authority (NEMA). We the undersigned, certify that the particulars in this report are correct and righteous to the best of our knowledge.

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## ii. **DISCLAIMER**

This EIA Study report is strictly confidential to Africalla Kenya Limited P.O. Box 668 - 20116 Gilgil Kenya herein referred to as '**Proponent**' and any use of the materials thereof should strictly be in accordance with the agreement between the client and the EIA/EA Expert mentioned herein Lead **Expert, Kenneth Kipkogei (3087)** and **Associate Expert Brian Ochieng Otieno (10516)**. It is however, subject to conditions spelt out in the Environmental (Impact Assessment and Audit) Regulations, 2003 under the Kenya Gazette Supplement No. 56 of 13th June 2003. It provides information on the proposed project as per the time of the assessment of the proposed hotel development with support facilities.

## **ABBREVIATIONS**

CDM	Clean Development Mechanisms
EIA	Environmental Impact Assessment
EMCA, 2015	Environmental Management and Coordination Act 2015
EMMP	Environmental Monitoring and Management Plan
EMP	Environmental Management Plan
KM	Kilo Meters
KPLC	Kenya Power and Lighting Company
KSH	Kenya Shillings
L	Liters
M <sup>3</sup>	Meters Cubed
NEAP	National Environmental Action Plan
NEMA	National Environmental Management Agency
PPE	Personal Protective Equipment
SR	Study Report
TOR	Terms of Reference

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## EXECUTIVE SUMMARY

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Africalla is located in Gilgil town. Its core business is flower farming for export purposes and currently employs more than 400 Kenyans both casual and on permanent basis. The proposed project will be on Land reference No 3777/218 Gilgil. The proposed project will be part of the 80.8 acre piece of land that is owned by Africalla. The project involves the construction of a water reservoir Africalla Limited whereby it provides relevant information and environmental considerations on the project proponent's intention to seek approval from NEMA for the development of the proposed project. Environmental experts who are registered by the authority conducted the EIA study and prepared this report for approval by the same.

The demand and supply for water for expansion of agricultural production is on the rise. The demand growth corresponds to the pressing economic need to squeeze as much as possible from every acre towards meeting of as much return on investment. One way of utilizing land for this purpose is rainwater and runoff harvesting and storage and utilization of the water at all seasons of the year. Besides, the Kenya's Water Resources Authority legal regime requires a water use applicant to develop adequate storage in respect to his or her application for water use. Lands with warm climate and gentle landform fall in semi-arid terrains where the need for harvesting as much water as possible is paramount. Such land falls in Njoro Area within the floor of the Rift Valley and within the foothills of Mau Ranges.

In this regard, Africalla Kenya Limited proposes to construct a 17,000m<sup>3</sup> lagoon to harvest rain water from green houses and surface water runoff and store to ensure water supply reliability at all hydrologic events for enhanced irrigated agricultural production.

In Kenya, an EIA must be carried out prior to any project that is likely to have an impact(s) on the environment and on social and economic well-being of the community involved. The project (Water reservoir construction) to be undertaken are among such developments that require the critical and strategic assessment as stipulated in the Environmental Management and coordination (amendment) Act, 2015 and Environmental Impact Assessment and audit regulation (2003). This is done so as to ensure sustainable environmental management.

For a long time, the world over, policy makers directed all the efforts in economic development without due regard to the resource base on which the economic development depend on. As a result, there has been unprecedented environmental degradation due to lack of environmental conservation resulting to unsustainable development. More recently investors and developers, spurred on by regulators world over, have recognized the need for change in order to safeguard the environment.

In reference to the above, environmental concerns have now been integrated in the planning and implementation processes of any proposed project in Kenya. The key objective is to mitigate conflicts with the EIA to be undertaken on projects of such nature and magnitude; to enhance Sustainable Environmental Management as well as controlling and revitalizing the much degraded environment. The environmental management is coordinated by NEMA in Kenya. Pursuant to the prevailing legal requirements as envisaged in the EMCA, 2015 and to ensure

sustainable environmental management, the project proponent commissioned undertaking of the EIA study for the proposed project; and incorporated substantial environmental aspects as advised by NEMA.

**a) While Meeting with the neighbouring community and consulting other stakeholders, the discussions on the proposed project focused on but not limited to the following: Note that the meetings took place on November 2019 & February 2020 (*Questionnaires, photos, and attendance lists annexed*)**

- Potential social impacts of the project;
- Economic aspects of the project;
- Potential impacts of construction on biodiversity, especially culturally important site(s)/ plants and the indigenous knowledge of conservation;
- Potential conflicts due to project suitability vis a vis neighbouring land use practices;
- Discussion on potential impacts on animal and human health;
- Employment consideration to the local residents;
- The stakeholders support to the proposed project; and
- Cross cutting issues (gender, marginalized groups, HIV/Aids).

**b) Major Observations**

- The proposed project will be undertaken in a privately owned land.
- The project proponent is expected to apply sustainable resources use;
- There project site will be properly secured;
- The proposed project is compatible with the current land use in the locality. There exist other dams in the university and no major negative impacts have been reported.

**c) Anticipated Positive impacts**

- The farm, Africalla Kenya limited Flowers will have adequate water supply;
- Will lead to averting of property damages and losses associated with poor flood management
- Reduced flooding occasioned by run offs
- Job creation-long-term and short-term
- Proper water usage (cleaning and landscaping purposes)
- Economical whereby water costs will be reduced and the savings diverted to other priority areas.

**d) Anticipated Negative impacts**

- If waste generated will not be properly disposed there is risk of diseases to both humans living within the project influence area and animals scavenging the poorly disposed wastes;
- Possible displacement of people
- Aesthetic beauty will also be lowered by littering of wastes;
- Soil erosion during the construction works;
- Noise from construction machines and vehicles; and



- Injuries/ casualties if proper occupation health measures will not be observed among other negative impacts.

e) **Proposed Mitigation Measures:**

- Soil erosion control measures should be undertaken;
- Compensation for those who will suffer injuries; and
- The project should be reviewed from time to time identify any unforeseen impact.

f) **Recommendations from the key stakeholders**

- The project should go on;
- All relevant stakeholders should be involved all through and where the skills needed are locally available, locals should be accorded first priority.

Having considered the data collected, analysed and collated information available, it is the experts considered opinion that:

- The project **DOES NOT** pose any serious environmental concern, other than those of minor scale that accompany most development activities.
- The positive impacts of the project far **OUTWEIGH** the negative ones, which will be adequately contained by following the prescribed EMP.

As such the project could be allowed to commence, and activities be managed within the provided EMP and sound environmental management practices that are internationally recognized.

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## CHAPTER ONE

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### 1.0 INTRODUCTION

The main objective of the EIA study is to evaluate the effects/impacts of proposed development in relation to the general environmental aspects i.e. physical, biological, and socio-economic environments. It aims at influencing the protection and coexistence of the development with the surroundings as well as the compatibility of the proposed development to the area; to ensure and enhance sustainable environmental management during implementation and operational phases.

#### 1.1 SCOPE.

The scope of the assessment study covered the physical extent of the project's site and its immediate environs, construction works of the proposed development, installation of basic utilities and services as required by the physical planning act. The output of the study was the production of an EIA study report for submission to NEMA for the purposes of seeking approval and subsequent acquisition of an EIA license to proceed with the project.

#### 1.2 OBJECTIVES

The environmental Impact Assessment Study of the developments was conducted in order to:

- Determine the Impacts the project may have on the Environment.
- Assist decision makers arrive at a decision whether to grant or deny a license for the proposed project.
- Propose cost-effective mitigation measures for the significant negative impacts of the project on the environment.
- Coming up with an Environmental Management Plan (EMP) to address environmental and social impacts of the project to the affected population during construction, operational and decommissioning phases of the project.

#### 1.3 TERMS OF REFERENCE

- A critical look into project objectives.
- Assessment of the proposed location of the project.
- A concise description of the baseline information, national environmental legislative and regulatory framework, and any other relevant information related to the project.
- Evaluation of the technology, procedures and processes to be used, procedures and processes to be used in the implementation of the project.
- Evaluation of the materials to be used in the construction and implementation of the project and their extended sources.
- Description, evaluation and analysis of the foreseeable potential environmental effects of the project broadly classified into physical, ecological/biological and socio-economic aspects (direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated)
- Evaluation of waste management.

- Evaluation and analysis of alternatives including the proposed project, no project alternative, project site, design and technologies.
- An Environmental Management Plan (EMP), proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment.
- Propose measures to prevent health and safety hazards and to ensure security in the working environment for the employees and the management in case of emergencies. This encompasses prevention and management of the foreseeable accidents and during both the construction and operational phases.
- Such other matters as NEMA may require.

## **1.4 METHODOLOGY AND CRITERIA**

### **METHODOLOGY**

The E.I.A methodology involved:

- Discussions with site representatives
- Site survey and observation
- Documents and data review
- Public Consultation
- Reporting

#### **Discussions/Meeting with Site Representatives**

Opening and Closing meetings were held between the farm representatives and the auditor. The opening meeting was to brief the site representatives on the objectives and scope of the Environmental Impact Assessment Study. At the end of the site assessment, a closing meeting was held to point-out assessment findings.

#### **Site Survey and Observation**

This was done during the Africalla Kenya Limited visit. The expert was allowed to personally scrutinize, identify environmental concerns that may arise from the project, interpret the situation on the ground and make judgment.

#### **Documents and Data Review**

Literature review on relevant documentation related to the study was carried out. The proponent provided upon request, the land ownership documents, certificate of work registration, Layout plans and architectural designs of the proposed project.

#### **Public Consultation**

This was carried out to gather the opinion of the neighbors and relevant stakeholders concerning the proposed dam construction project at Africalla Kenya Flowers Limited. The general trend was that consulted persons were made to understand that the consultants were not speaking on behalf of Africalla Kenya Limited, but that the meeting was part of the data gathering process for an EIA study. Both closed and open ended questionnaires were administered to the business neighbors (*Copies attached*).

## **Reporting**

All the findings of the assessment have been documented in this report as per the provisions of NEMA stated in the Environmental Management and Coordination (Amendment) Act 2015 and as stipulated in the Legal Notice No. 101, Environmental (Impact Assessment and Audit) Regulations of 2003.

## **Criteria**

EIA Regulations stipulates the general criteria for undertaking EIA studies. The Environmental Impact Assessment criteria are further enhanced through endorsement of recent EHS and related legislations.

Subsequently, the criteria for the EIA focused on the:

- (a) Applicable Environmental Regulations which include:
  - Environmental Management and Coordination (Amendment) Act, 2015
  - Environment Management and Coordination (Environmental Impact and Assessment) Regulations, 2003
  - Environment Management and Coordination (Water Quality) Regulations, 2006
  - Environment Management and Coordination (Waste Management) Regulations, N2006
    - OSHA 2007
    - Local Government Act
    - Water Act
- (b) Africalla Kenya Limited EHS Policy which the farm is required to comply with.

## **1.5 PROJECT JUSTIFICATION**

The proposed dam is informed by the need to address perennial water supply challenges the farm has been going through as well as controlled flooding during raining seasons. Currently the farm is supplied with water harvested from the roof of the green houses and boreholes. Above all, the supply is inadequate and unreliable to meet the farm demands.

In addressing this challenge the farm has contracted the services of water resources experts (engineers, hydrologists) to undertake studies on the most viable source of adequate, affordable and sustainable source of water, hence the proposed project. Ground water is also not sustainable and it is also not environmental friendly because it dries the underground (aquifer) thereby destabilizing the recharge and discharge capacity of the area. Growth and development in the farm has been limited by lack of reliable source of water. Harvesting the surface water runoff, fall within the National Water Policy to maximise harvesting of water for storage that support agricultural activities with view of creating employment opportunities.

## CHAPTER TWO

### PROJECT DESCRIPTION

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#### 2.0 Project Description

The Proposed Africalla Limited project is the owners drive to construction a lagoon for water storage. This proposed design is made to store a total of 17,000 cubic meters for general irrigation being part of the water demand for irrigated crops of yearly. This project will involve construction of auxiliary works, excavation works, embankment formation, spillway channel, spillway sill, ripraps and composition to at least 95% dry density of impermeable soil of the embankment of water for storage lagoons.

Survey and Planning

#### 2.1 The Proposed Location of the Project

Africalla is located in Gilgil town. Its core business is flower farming for export purposes and currently employs more than 400 Kenyans both casual and on permanent basis. The proposed project will be on Land reference No 3777/218 Gilgil. The proposed project will be part of the 80.8 acre piece of land that is owned by Africalla through lease agreement (*Annexed are the lease agreements*). The project lies on the Longitude 36.25 and Latitude -0.528. Attached are the dam design report for your perusal.

#### 2.2 Project design considerations for the reservoir

##### General considerations

In the realization of the designs for the proposed project, the following was considered:

1. Excavation of the site to the desired length, width, depth and elevation.
2. Construction of embankment and related facilities;
3. The construction of spillway and related facilities;
4. Construction of drains to harvest storm water and
5. Construction/installation of Pump House, pump assemblage and pipeline for transporting water to the greenhouses for irrigation

#### 2.3 Project Process and Implementation

The farm construction project will involve construction of a reservoir which will be constructed based on the applicable standards. The constructions will as well incorporate environmental guidelines as well as health and safety measures.

#### 2.4 Construction Activities and Inputs

##### The project inputs

- Construction raw materials  
These will include polyethylene paper, sand, cement, water pipes and impermeable plastic material for laying on the base of the reservoir. All these will be to the approved standards and shall be obtained from licensed dealers and especially those that have complied with the environmental management guidelines and policies.
- Construction machinery.

Include but not limited to excavators, trucks, concrete mixers and other relevant construction equipment. These will be used for the transportation of materials, and in the construction activities. Some of the machinery will use petroleum products to provide propulsion energy.

- A construction labor force of both skilled and non-skilled workers who will require services such as water supply, washing and sanitation facilities.
- Water for construction purposes. This will be obtained from the current water supply system within the farm.

### **Construction activities**

- Procurement of construction materials from approved dealers.
- Appropriate storage of the construction materials.
- Site preparation i.e. Excavation and Compaction of the embankment to prevent erosion at the reservoir site.
- Laying of the impermeable plastic paper to prevent loss of water to the soil. The paper will also ensure no underground water pollution in case the dam water will have chemicals such as fertilizers and chemicals from the greenhouses.
- Disposal of the resulting debris/ waste materials. All soil generated from excavation will be used in leveling the land adjacent to the dam.
- Civil and mechanical engineering works to be done by professionals.

### **Project Budget**

The construction estimated cost amounts to KSH 10 Million.

## **CHAPTER THREE**

### **3.0 POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK**

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According to the Kenya National Environment Action Plan (NEAP, 1994) the Government recognized the negative impacts on ecosystems emanating from economic and social development programs that disregarded environmental sustainability. Following on this, establishment of appropriate policies and legal guidelines as well as harmonization of the existing ones have been accomplished or is in the process of development. The NEAP process introduced environmental assessments and auditing in the country culminating into the enactment of the Policy on Environment and Development under the Sessional Paper No. 6 of 1999. An EA is a tool used on ongoing development projects commenced prior to the coming into force of the EIA/EA regulations and new projects undertaken after completion of an EIA. It is a legal requirement in Kenya and provided for under section 47 of EMCA 2015.

The following is a summary of some laws and regulations that protect the environment from environmental degradation. The Sectoral acts are still applicable, however, for the purpose of this report, special attention should be given to the provisions in EMCA. According to Kenya

subsidiary legislation, 2003 Part V of the EIA and EA regulations, Environmental Audit and Monitoring is mandatory. This mainly covers;

- ❖ On-going Projects commenced prior to the coming into force of these regulations; or
- ❖ New projects undertaken after completion of an Environmental Impact Assessment study report.

The policy recommends the need for enhanced re-use/recycling of residues including wastewater, use of low non-waste technologies, increased public awareness raising and appreciation of a clean environment. It also encourages participation of stakeholders in the management of wastes within their localities.

The key national laws governing the compliance for Environmental Management of Africalla Kenya Limited are;

- Environmental Management and Co-ordination(Amendment) Act, 2015
- Environmental Management and Coordination (Waste Management) Regulation, 2006.
- Environmental Management and Coordination (Water Quality) Regulation, 2006
- Environmental Management and Coordination (Controlled Substances) Regulation, 2007
- The Wildlife (Conservation and Management) Act (Cap 376)
- The Public Health Act (Cap. 242)
- Kenya Tourism Development Corporation Act (Cap. 382, Laws of Kenya)
- Tourist Industry Licensing Act (Cap.381)
- The Occupational Safety and Health Act (OSHA), 2007
- The Factories and Other Places of Work (Medical Examination Rules), 2005
- The Factories and Other Places of Work (Fire Risk Reduction Rules), 2007
- The Factories and Other Places of Work (Safety and Health Committee Rules), 2004
- The Factories and Other Places of Work (First Aid Rules), 1977
- The air quality standards by the World Health Organization (WHO) and World Bank
- The County Governments act
- The Water Act, 2016 (Cap 372) including the Water Quality Regulation (2006) and the Wetland Regulation (2009)
- Energy Act, 2006
- Energy Management Regulations (2012).
- Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009

Under the general provisions (PART I) of these rules:

Noise pollution means the emission of uncontrolled noise that is likely to cause damage to human health or damage to the environment, Excessive vibration means the presence of vibrations which:-

- Is of such intensity, duration, frequency or character as to annoy, disturb, or cause or tend to cause adverse psychological effects on persons, or to damages or tend to damage personal or real property; and
- Exceed 0.5 centimeters per second beyond any source property boundary or 30 metres from any moving source.

## **NATIONAL POLICY AND LEGAL FRAMEWORK**

Kenya Government's environmental policy aims at integrating environmental aspects into national development plans. The broad objectives of the national environmental policy include:

- ❖ Optimal use of natural land and water resources in improving the quality of human environment
- ❖ Sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations
- ❖ Conservation and management of the natural resources of Kenya including air, water, land, flora and fauna.
- ❖ Promotion of environmental conservation through the sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations
- ❖ Meeting national goals and international obligations by conserving bio-diversity, arresting desertification, mitigating effects of disasters, protecting the ozone layer and maintaining an ecological balance on earth.

### **3.1 LEGAL FRAMEWORK**

Adherence to national statutes and regulations on environmental conservation suggest that the proponent has a legal duty and social responsibility to ensure that the ongoing development safeguard the status of the environment, natural resources, public health and safety. Environmental management activities were previously implemented through a variety of instruments such as policy statements and sectoral laws as well as through permits and licenses. Most of these statutes are sector-specific, covering issues such as public health, soil erosion, protected areas, endangered species, water rights and water quality, air quality, noise and vibration, cultural, historical, scientific and archaeological sites, land use, resettlement, etc. Some of the key national laws that govern the management of environmental resources in the country are hereby discussed however it is worth noting that wherever any of the laws contradict each other, the Environmental Management and Co-ordination (Amendment) Act, 2015 prevails.

#### **Environment Management and Co-ordination (Amendment) Act, 2015**

This Act provides for the establishment of appropriate legal and institutional framework for the management of the environment and its related matters. Part II section 3 of the Environment Management and Co-ordination (Amendment) Act, 2015 states that every person in Kenya is entitled to a clean and healthy environment in accordance with the Constitution and relevant laws and has the duty to safeguard and enhance the environment. In order to partly ensure this is achieved, section 43 of the Act directs that the proponent of any project specified in the Second Schedule shall undertake a full environmental impact assessment study and submit an environmental impact assessment study report to the Authority prior to being issued with any license by the Authority. Section 47 gives provision on Environmental Auditing.



### **Environmental (Impact Assessment and Audit) Regulations, 2003**

The Regulation provides the guidelines that have been established to govern the conduct of environmental assessments and environmental audits in Kenya. The guidelines require that the EIA study be conducted in accordance with the issues and general guidelines spelt out in the Second and Third schedules. These include coverage of the issues on schedule 2 (ecological, social, landscape, land use and water considerations) and general guidelines on schedule 3 (impacts and their sources, project details, national legislation, mitigation measures, a management plan and environmental auditing schedules and procedures).

### **Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing Regulations, 2006**

The Act states that no person shall engage in any activity that may have an adverse impact on any ecosystem lead to the introduction of any exotic species, or lead to unsustainable use of natural resources, without an Environmental License issued by the Authority.

### **Wetlands, River Banks, Lake Shores and Sea Shore Management Regulation, 2009**

This Act applies to all wetlands in Kenya whether occurring in private or public land. It contains provisions for the utilization of wetland resources in a sustainable manner compatible with the continued presence of wetlands and their hydrological, ecological, social and economic functions and services.

### **Noise and Excessive Vibration Pollution Control Regulations, 2009**

These Regulations determine that no person or activity shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. In determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered:

- Time of the day;
- Proximity to residential area;
- Whether the noise is recurrent, intermittent or constant;
- The level and intensity of the noise;
- Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and,
- Whether the noise is subject to be controlled without unreasonable effort or expense to the person making the noise.

These regulations also relate noise to its vibrational effects and seek to ensure no harmful vibrations are caused by controlling the level of noise. Any person/s intending to undertake activities in which noise suspected to be injurious or endangers the comfort, repose, health or safety of others and the environment must make an application to NEMA and acquire a license subject to payment of requisite fees and meeting the license conditions.

### **Waste Management Regulations (2006)**

The Waste Management Regulations are meant to streamline the handling, transportation and disposal of various types of waste. The aim of the Waste Management Regulations is to protect

human health and the environment. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source.

### **Forest Act 2014**

The Forest Act, 2005 recognizes that forests play a vital role in the stabilization of soils and ground water, thereby supporting the conduct of reliable agricultural activity, and that they play a crucial role in protecting water catchments in Kenya and moderating climate by absorbing greenhouse gases. The Act also recognizes that forests provide the main locus of Kenya's biological diversity and a major habitat for wildlife.

Clause 21 of the Act states that all forests in Kenya other than private and local authority forests are vested in the state, subject to any rights of user in respect thereof, which by or under this act or other written law, have been on are granted to any other person.

The Act in clause 41 stated that all indigenous forests and woodlands shall be managed on a sustainable basis for purposes of conservation of water, soils and biodiversity among others. The act emphasizes in clause 45(1) that any activities within a forests area which are not included in a management plan shall only be undertaken with the consent of the Board granted in accordance with this section and 45(2) that states that the person intending to undertake any activity referred to in sub section 1 within a forest area shall apply in that behalf to the Board, and the application shall be accompanied by the results of an independent environmental impact assessment conducted in respect to the proposed activity.

### **Agriculture Act (Cap 318)**

The Agricultural Act cap 318 of the laws of Kenya seeks to promote and maintain a stable Agriculture to provide for the conservation of the soil and its fertility and to stimulate the development of Agricultural land in accordance with the accepted practices of good land management and good husbandry.

### **Air Quality Regulations, 2009**

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

### **The Constitution of Kenya, 2010**

- ❖ Article 42 states that everyone has a right to a clean and healthy environment.
- ❖ Article 69 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.
- ❖ Article 70 provides avenue for redress on infringement of the rights covered under article 42
- ❖ Article 72 provides that the Parliament shall enact legislations giving effect to the provisions of the constitution.

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

This is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act has the following functions among others:

- ❖ Secures safety and health for people legally in all workplaces by minimization of exposure of workers to hazards (gases, fumes & vapors, energies, dangerous machinery/equipment, temperatures, and biological agents) at their workplaces
- ❖ Prevents employment of children in workplaces where their safety and health is at risk.
- ❖ Encourages entrepreneurs to set achievable safety targets for their enterprises.
- ❖ Promotes reporting of work-place accidents, dangerous occurrences and ill health with a view to finding out their causes and preventing of similar occurrences in future.
- ❖ Promotes creation of a safety culture at workplaces through education and training in occupational safety and health.

Failure to comply with the OSHA, 2007 attracts penalties of up to KES 300,000 or 3 months jail term or both or penalties of KES 1,000,000 or 12 months jail term or both for cases where death occurs and is in consequence of the employer.

### **Water Act, 2016**

The new Water Act (2016) of the Laws of Kenya seeks to make better provisions for the conservation, control of pollution; apportionment and use of the water resources in Kenya, and for purposes they are incidental thereto and connected therewith. The Act vests ownership and control of water in government subject to any rights of user. Under this provision the responsibility to regulate access, use and control of water resources is vested in the Water Resources Management Authority (WRMA). The Water Act protects water bodies and sources from pollution and controls their use. It will ensure that the proposed project requirements can be provided by the existing water system and that the project design will work to conserve the available water both during construction and the operation phase of any project.

### **Water Resource Management Rules (2007)**

In addition to the Water Act 2002, the main document outlining the regulations is the Water Resource Management Rules (2007). The rules set out the procedures for obtaining water use permits and conditions placed on permit holders.

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

This Act provides for the impetus for a healthy environment and gives regulations to waste management, pollution and human health. This Act controls the activities of the project with regard to human health and ensures that the health of the surrounding community isn't jeopardized by the activities of the project.

Public Health Act and the *Malaria Prevention Act*, in addition to the Water Act itself. The Public Health Act has wide-ranging provisions on pollutant discharges, which are set out below. The Water

Act (General) Rules make provision for discharges in a number of respects, as follows:

Effluent shall not be returned to any body of water unless it has been purified. Further, it must not contain poisonous or injurious matter or excess silt, gravel or boulders.

- Water used for pulping, mulling or washing of coffee shall be efficiently screened.
- The regulating authority may determine the potential prejudicial effects of the pollutant discharges and order the removal already made.
- It is an offence to allow effluent discharges, either domestic or industrial, if this would harm fish, and a fish warden may order its removal. Plans for rendering such effluent innocuous shall be submitted to and approved by the enforcing authority.

### **Physical Planning Act (Cap. 286)**

The Act provides for the preparation and implementation of physical development plans and for related purposes. It gives provisions for the development of local physical development plan for guiding and coordinating development of infrastructure facilities and services within the area of authority of County, municipal and town council and for specific control of the use and development of land. The Act also promotes public participation in the preparation of plans and requires that in preparation of plans proper consideration be given to the potential for socio-economic development needs of the population, the existing planning and future transport needs, the physical factors which may influence orderly development in general and urbanization in particular, and the possible influence of future development upon natural environment. Any change of use of the actual development without authority constitutes an offence. Similarly, anyone who deposits refuse, scrap or waste materials in a designated area without the consent of the planning authority or the relevant local authority shall be guilty of an offence under the regulations. The general sentence under the regulations is a fine of not exceeding five thousand shillings or imprisonment not exceeding six months, or to both, such fine and imprisonment. This Act gives precedence for the need of undertaking an environmental impact assessment on all projects, inviting public participation and taking into account possible influence of the future development upon natural environment.

### **The penal code**

The chapter on “offences against health and convenience” contained in the penal code enacted in 1930 strictly prohibits the release of foul air into the environment which affects the health of the other person. Any person who voluntarily violates the atmosphere at any place to make it noxious to the health of persons in general, dwelling or carrying of business in the neighborhood or passing along public ways is guilty of a misdemeanor, i.e. imprisonment not exceeding two years with no option of fine.

### **Local Government Act (Cap. 265)**

This law empowers a local authority to apply through the Minister of Lands to meet its different development purposes. Such requests and purposes are deemed to be public purposes within the meaning of the Land Acquisition Act (cap 295). Such a local authority may, within such land, establish and maintain a conservation area. This project has met the above- mentioned

Acts' requirements one of which is the undertaking of this study. Others include the permits issued by the local authority.

### **3.2 INTERNATIONAL OBLIGATIONS**

Kenya is party to a number of Multi-Lateral Environmental Agreements (MEAs) on environmental protection. Africalla Kenya Limited must therefore comply with these agreements. These include;

- ❖ African Convention on the Conservation of Nature and Natural Resources, 1968(revised in 2003).
- ❖ Convention on Wetlands (Ramsar convention)1971
- ❖ UNESCO Convention Concerning the Protection of the World Culture and Natural Heritage (1972)
- ❖ Washington Convention on International Trade in Endangered Species (CITES, 1973)
- ❖ Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS 1979)
- ❖ Kyoto Protocol
- ❖ Vienna Convention For the Protection of The Ozone Layer Supplemented By The 1987 Montreal Protocol on Substances that Deplete The Ozone Layer(1985)
- ❖ Basel Convention on the Control of Trans-boundary Movement of Hazardous Wastes and Their disposal(1989)
- ❖ Bamako Convention on the Ban of the import into Africa and the Control of Trans-boundary Movement and Management of Hazardous Wastes within Africa(1991)
- ❖ Convention on Biological Diversity (1992) Biodiversity
- ❖ United Nations Framework Convention on Climate Change (UNFCCC, 1992)
- ❖ Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade(1998)

### **3.3 ADMINISTRATIVE FRAMEWORK**

#### **County Environment Committees**

County Environmental Committees also contribute to decentralized environmental management and enable the participation of local communities. These environmental committees consist of the following:

- Representatives from all the ministries;
- Representatives from local authorities within the County;
- Two representatives from Public benefit organizations involved in environmental management in the County;
- A representative of each regional development authority in the County.

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

The responsibility of NEMA is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of government in the implementation of all policies relating to the environment.

#### **Standards and Enforcement Review Committee (SERC)**

In addition to NEMA, EMCA 2015 provides for the establishment and enforcement of environmental quality standards to be set by a technical committee of NEMA known as the

SERC. A work plan was set up by SERC to include committees to draw up standards; these include the following:

- Water Quality Regulations
- Waste Management Regulations
- Controlled Substances Regulations
- Conservation of Biological Diversity
- Noise Regulations
- Air quality Regulations
- Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulation, 2009

#### **Water Resources Authority (WRA)**

Under the Water Act of 2016, the Water Resources Authority is tasked with management and regulation of all water resources in Kenya. As such, they will be key to advising NEMA and licensing of the water abstraction rights to the proponent.

## **CHAPTER FOUR**

### **4.0 BASELINE INFORMATION OF THE STUDY AREA**

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This section describes the existing air, water and geological characteristics, biological, socio-economic environment, aesthetics and cultural resources at the proposed sites and their neighborhood. The description provides the baseline upon which potential impacts of the proposed project were determined.

#### **4.0 BASELINE INFORMATION**

##### **4.1 Introduction**

This chapter has information on the location, bio- physical, socio and economic aspects of the project area. These are elaborately discussed in order to identify areas likely to be affected as a result of project activities. This study therefore considered the physical location, climatic data, geology, drainage, infrastructure, demography and socioeconomic information.

##### **4.2 Physical Environment**

###### **Climatic Conditions**

There are several geographic features in the Nakuru County namely Lake Naivasha and Lake Nakuru. These features have an adverse effect on the climatic and weather patterns experienced

in the county however climate change and global warming also affects the weather components in the region. The average altitude of the county is approximately 1850 metres above the sea level and this explains the temperature regimes experienced in the county. The average temperatures range between 10 degrees Celsius and 20 degrees Celsius, the cold season is experienced in July and August while the hot season is experienced in January and March. The rains are received in two seasons whereby the long rains are experienced in April, May and August while the short rains are experienced between October and December. The average annual rainfall is approximated to be 850mm per year and this enables the farmers in Nakuru County to practice crop farming. The predominant soil type is loam and contains all the plant nutrients required for plant growth. Due to the good soil cover in the region, soil erosion is not major problem here.

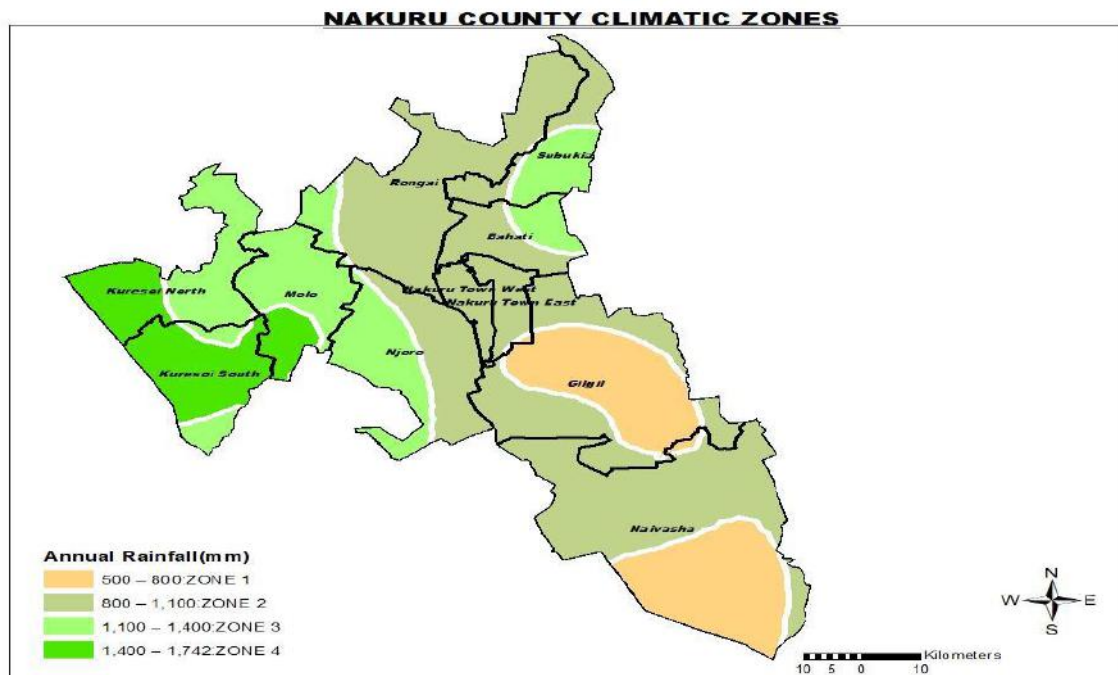
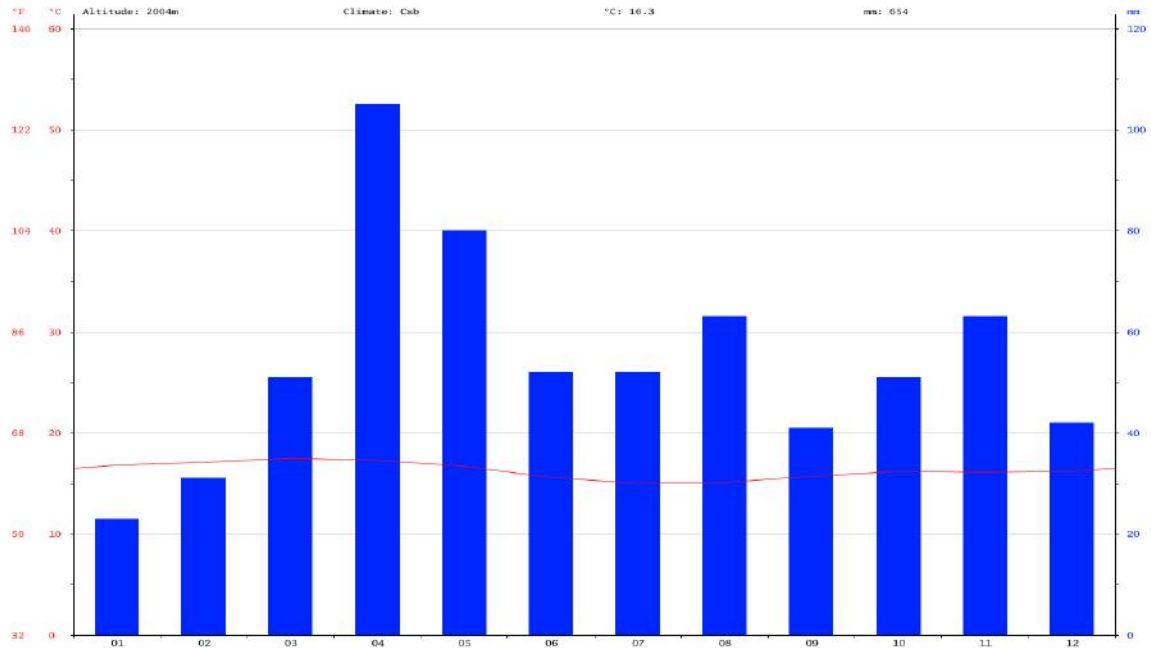


Plate 1: Map showing the agro climatic zones

## Temperature



*Plate 2: Annual Temperature distribution*

The climate is warm and temperate in Gilgil. The winters are rainier than the summers in Gilgil. This climate is considered to be Csb according to the Köppen-Geiger climate classification. The temperature here averages 16.3 °C. The rainfall here averages 654 mm.

## Topography & Soil

The County boasts of an elaborate drainage and relief system with various inland lakes on the floor of the Rift Valley where nearly all the permanent rivers and streams in the County drain into. These rivers include river Gilgil and Makalia which drain into Lake Nakuru, Malewa which drains into Lake Naivasha and Molo River which drains into Lake Baringo among others. The topographical features provide an interesting niche for research as well great tourist attraction sites. One of the predominant features is the Hells Gate gorges in Naivasha which is part of the important tourist sites. The topography in Naivasha and Gilgil Sub-Counties is characterized by mountain ranges and savannah vegetation that supports various species of wildlife.

The County's soil pattern presents a complex distribution of three main classifications that have been influenced by climatic conditions, volcanic activities and the underlying rock type. The County is characterized with **Latosolic soils; Planosolic soils and alluvial and lacustrine deposits.**

## Physiography

The areas lies 2003.96 meters above sea level. The land undulates towards the Gilgil river that borders the farm.



### 4.3 Biological Environment

This section describes key biological elements, including the identification and distribution of dominant, rare and unique flora and faunal species within the region of concern (proposed project site and other potentially affected areas).

#### Flora

The proposed site has sparsely distributed indigenous tree species though the area is largely dominated by green houses and other farms. The tree species are not under the International Union of Conservancy of Nature (IUCN) as threatened or endangered. Some of the tree species notable in the proposed project site was the *Euphobia candelabrum*.



*Figure 1: Plant species*

#### Fauna

The site is situated within an area depicting mixed land users where human activities have altered the natural habitat over the years. Consequently, there are no major animals in the environs except birds, insects, and small rodents. Therefore there is no fauna threatened by the proposed project. The project's effect may seem insignificant to such lives but it is of great concern to the environment at large. It is expected that the area will be populated by small mammals such as mice, rats, moles and other members of the Rodent Family. Bird species were also observed at the site. None of the faunal species observed are rare or endangered.

## **4.4 Social Environment**

### **Population size and composition**

The County's population according to the 2009 National Population and Housing Census was approximately 1.6million with 804,582 males and 798,743 females. At a growth rate of 3.05 percent, the population is estimated to be at 2.1 million in 2018 whereas in 2022 the population is estimated to grow to 2.4 million people. With the rapid population growth, the County is expected to enhance its infrastructure to cater for the ever-growing population.

### **Health**

Investment in health is also key especially child and maternal health by investing in quality health infrastructure and human resources in all sub-counties. There County will invest in family planning especially for the youth and undertake awareness campaigns on the importance of family planning. The county will continue to invest in provision of quality health services by employment of more health service providers, construction of more health facilities and equipping.

### **Education**

The county government with support from stakeholders will continue to invest in early childhood development and health. This will be done through infrastructural development, employment of ECDE teachers, provision of sanitation facilities and enhance school feeding programme. The county will partner with the national government to ensure pupils have access to basic education as envisioned in the SDGs.

The continue to enhance provision of vocation training through infrastructural development as well as equipment of the vocational training centres and partnering with the private sector for internship and job placement.

## **4.5 Economic Environment**

### **Energy Access**

Electricity is the main source of energy for lighting in the County at 55.4 percent whereas firewood and charcoal are the major sources of energy for cooking at 42.6 percent and 30.7 percent respectively (KIHBS 2015-16). Electricity coverage in the County stands at 80 percent with most of these connections in urban areas. Other renewable sources like wind, solar and biogas account for less than 3 percent although there is potential of wind being used as a major source of energy in Naivasha sub-County, whereas most parts of the County receive enough sun shine throughout the year that can support the use of solar energy. The County will promote use and adoption of these renewable sources of energy.

### **Land and Land use**

Land is the main source of livelihood for many people in Nakuru County. All socio-economic activities depend largely on land hence, rights of land ownership and land use are critical in influencing growth in all sectors.



*Figure 2: Tishash Estate in Gilgil*

### **Labour force by sector**

The working-age population in 2012 (15-64 years) in the County was 968,745 accounting for 55.1 per cent of the total population of whom 484,378 are male while 484,366 are female. The primary working-age population comprises the employed and the unemployed. It is expected to increase from 968,745 persons in 2012 to 1,163,284 persons in 2018. Given a Labour force population which is more than half of the total population, selected measures to be taken to provide adequate employment opportunities include; implementation of AGPO, support to SMES growth through business incubation centres and SME loans.

### **Financial services**

Financial services in the County are offered by; banks, Micro finance institutions, mobile money agents and SACCOs that offers FOSA services.

### **4.7 Administrative and Political Environment**

The County is divided into eleven administrative Sub-Counties namely; Nakuru East, Nakuru West, Naivasha, Molo, Gilgil, Kuresoi North, Kuresoi South, Rongai, Bahati, Subukia and Gilgil.

Politically, Nakuru County is divided into 11 Constituencies namely; Nakuru Town East, Nakuru Town West, Bahati, Subukia, Rongai, Gilgil, Molo, Kuresoi South, Kuresoi North, Gilgil and Naivasha. The Total number of the County's electoral wards is 55.

## CHAPTER FIVE

### 5.0 ANALYSIS OF PROJECT ALTERNATIVES

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This section analysis the possible project alternatives from various facets applicable to the proposed project. The major aspects that will be considered for alternatives are; project site, technology scale and waste management strategies. Alternatives should be economically feasible with minimal adverse environmental impacts and time delays. Diverse alternatives to the proposed action must be included in the EIA. Alternatives may include both design and location options (Steinneman, 2000).

In most cases, the EIA process often occurs too late in decision-making to consider a full range of alternatives. This can undermine EIA goals to encourage more environmentally sound and publicly acceptable solutions. Allowing new alternatives and objectives to evolve in relation to environmental conditions, public preferences and project sustainability may be a solution to most of the environmental and socio-economic problems associated with the implementation of new projects (Anderson et al., 2003).

#### 5.1 PROJECT ALTERNATIVES CONSIDERED

##### **The Proposed Project Alternative**

Under this alternative, the study report will be presented to NEMA. This report will evaluate and examine the impacts of the project on the environment. After the evaluation, an EIA License would be issued, signifying NEMA's approval of the project's implementation. However, the development will ensure that all environmental measures are complied with during the construction period and during operation.

The alternative consists of the proponents with the inclusion of NEMA guidelines and regulations and procedures. This is as stipulated in EMCA 2015, which aims at the reduction environmental impacts associated with development.

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

Under this alternative, NEMA would decline approval of the proposed development. In addition, there would be no alternative site for the same development. This would mean that the proposed development would not take place. The socio-economic impacts resulting from the proposed project would not be realized. On the other hand, the anticipated insignificant environmental impacts resulting from the construction would not occur.

- The farm will continue to incur unnecessary costs procuring water;
- The growth of the farm will be limited by lack of adequate water resources;
- The farm will not enjoy the benefits associated with surface water resource; and

- There are many water resource uses that the farm will not exploit including floods control.

### **The comparisons of alternatives**

Under the proposed project alternative, the development would provide a standard environment for the Africalla Kenya Limited workers, occupants and visitors. This would be done with respect to the Public Health Act, OSH Act, 2007, the Local Government Act and other relevant legislation. During the construction and operation phases, the project will provide employment opportunities and create a positive impact on the economy. Provided the mitigation measures are implemented, including sound construction management practices, impacts on soils and drainage, good air and water quality are anticipated under this alternative. Commitment associated with this alternative would ensure that potential negative impacts are avoided or reduced to levels of insignificance.

## **5.2 ALTERNATIVES FOR THE RESERVOIR**

Prior to the choice of the proposed project, the following alternatives were considered and these include:

### **No Project Alternative**

This was rejected as it counters development, since the flower farm needs more water to cater for its increasing demand for the resource. In addition, the socio-economic impacts resulting from the proposed project would not be realized and the other hand, the anticipated insignificant environmental impacts resulting from the construction would not occur.

### **Exploitation of groundwater**

This is not feasible as investigations revealed that exploitation of groundwater was much expensive as compared to dam construction. In addition, the ground water will reduce faster than the rate of recharge. Therefore, use of the dam will be more logical since it will depend on harvested rain water from the green houses and storm water.

### **Reservoir Construction**

This is the proposed project alternative in which the study report will be presented to NEMA. This report will evaluate and examine the impacts of the project on the environment. After the evaluation, an EIA License would be issued, signifying NEMA's approval of the project's implementation. However, the development will ensure that all environmental measures are complied with during all stages of the project.

This option was considered the best option since it shall guarantee sustainable water supply to the flower farm, utilize rain water that would otherwise be wasted.

### **Construction Equipment**

Equipment that saves energy and water will be given first priority without compromising on cost or availability factors. As noted on the previous section, the project will entail use of locally available materials like sand, cement and ballast or similar approved materials that

would not have adverse impacts on the environment. The technology to be used is environmental friendly.

### **Solid Waste Management Alternatives**

The project might not generate a lot of wastes other than excess excavated top soil that the proponent would use for landscaping purposes. An integrated solid waste management system is recommendable. First, the proponent will give priority to reduction at source of the materials. This option will demand a solid waste management awareness programme in the management and the staff involved in implementing the project. Recycling and reuse options of the waste will be the second alternative in priority. This will call for a source separation programme to be put in place. The third priority in the hierarchy of options is combustion of the waste that is not recyclable. Finally, the proponent will need to establish agreement with the local authority to ensure regular waste removal and disposal in an environmentally-friendly manner. In this regard, a **NEMA** registered solid waste handler would have to be engaged. This is the most practical and feasible option for solid waste management considering the delineated options.

## **CHAPTER SIX**

### **6.0 PUBLIC CONSULTATION & PARTICIPATION**

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Public participation as guided by section 58(2) of EMCA 2015 involved engagement of the members of public in expression of their views about the proposed project. Public participation aims to ensure that due considerations are given public views, preferences, and concerns when decisions are made. Public participation for the proposed project was facilitated through questionnaires and focussed group discussion within the proposed project site.

Public participation is key in the EIA process. As such, timely and planned and appropriately adopted public participation programs helps in contribution of the EIA study in successful design, operation and management proposals. Specifically, public participation helped in getting information on the key impacts, potential mitigation measures, identification and selection of alternatives. Above all, it helps in ensuring that EIA process remain open and transparent.

Nearly all EIA systems make provision for some type of public involvement. This term includes public consultation (or dialogue) and public participation, which is a more interactive and intensive process of stakeholder engagement. Most EIA processes are undertaken through consultation rather than participation. At a minimum, public involvement must provide an opportunity for those directly affected by a proposal to express their views regarding the proposal and its environmental and social impacts. The purpose of public involvement is to:



- Inform the stakeholders about the proposal and its likely effects;
- Canvass their inputs, views and concerns; and
- Take account of the information and views of the public in the EIA and decision making.

***The key objectives of public involvement were to:***

- Obtain local and traditional knowledge that may be useful for decision-making;
- Facilitate consideration of alternatives, mitigation measures and trade-offs;
- Ensure that important impacts are not overlooked and benefits are maximized;
- Reduce conflict through the early identification of contentious issues;
- Provide an opportunity for the public to influence project design in a positive manner (thereby creating a sense of ownership of the proposal);
- Improve transparency and accountability of decision-making; and
- Increase public confidence in the EIA process.

Experience indicates that public involvement in the EIA process can and does meet these aims and objectives. Many benefits are concrete, such as improvements to project design.

### **6.1 Outcome of Public Participation**

The public participation planning and meeting took place between **November, 2019 and February 2020** at the Africalla flowers' Hall. This was carried out to gather the opinion of the neighbors and relevant stakeholders concerning the proposed projects at Africalla Limited. The general trend was that consulted persons were made to understand that the consultants were not speaking on behalf of Africalla Limited, but that the meeting was part of the data gathering process for an EIA study. (*Minutes, Questionnaire, and attendance list annexed*)

Questions were asked to neighbors, customers and other relevant stakeholders surrounding and within Africalla Kenya Limited regarding their opinion on the proposed project. The feedback gotten expressed that the consulted people were in favor of the project. The consultation was done through administering of questionnaires and copies of the same are attached. The respondents were in agreement that the following would be the benefits of the project to the community

- Employment opportunities
- Creation of income for investors, contractors, professional, technicians, artisans and manual workers.
- Increase in cultural and social interactions.
- Better land utilization.
- Increased business shall be realized.
- Improvement of infrastructural systems within the neighborhood.

- Transfer of skills to the locals.
- Mass storage of water resources for irrigation.

However, the respondents were concerned with the following issues;

- The health and safety of workers may be compromised due to accidents, pollution and general disturbance.
- Increased waste materials during construction phase.
- Risk of drowning.
- Possible breeding site for mosquitoes.
- Negative effects in case of overflow during rainy seasons.
- Health and safety issues of the workers during all the stages.
- Exhaust emission.
- Oil leaks
- Waste generation.
- Impact to soil especially when laying the foundation (earthworks) of such development.
- Increased noise and vibration mostly during construction phase.
- Irrigation and soil drainage can cause soil acidification and increased PH whilst the use of chemical fertilizers and pesticides contributes to reducing soil capillarity (runoff) as well as its consistency
- Impact/pressure to the existing infrastructure i.e. water, power and drains and access roads.
- Air pollution as a result of dust particles emanating from demolition, earthworks and construction activities. Exhausts from the involved machinery will lead to increased levels of hazardous gases such as carbon dioxide and nitrogen oxides.

## **CHAPTER SEVEN**

### **DESCRIPTION OF ANTICIPATED IMPACTS AND MITIGATION MEASURES**

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#### **7.1 POTENTIAL IMPACTS FROM THE RESERVOIR CONSTRUCTION**

##### **7.1.1 CONSTRUCTION PHASE**

##### **7.1.2 Positive Impacts**

- Employment opportunities
- Creation of income for investors, contractors, professional, technicians, artisans and manual workers.
- Increase in cultural and social interactions.
- Better land utilization.
- Increased business shall be realized.



- Improvement of infrastructural systems within the neighborhood.
- Transfer of skills to the locals.
- Reuse of water resources for irrigation.

### **7.1.3 Negative Impacts**

#### **Health and Safety of Workers**

During construction there will be a risk of injuries from machines, inhalation of dust during excavation and risk of falling in the excavated area. Construction workers are likely to have injuries and hazards as the construction works unavoidably expose workers to occupational health and safety risks. The workers are also likely to be exposed to risk of accidents and injuries resulting from accidental falls and injuries from hand tools and construction equipment. In relation to public safety, the most serious threats will be on the areas with heavy plant and equipment moving in and out of the contractor's yard and at the construction site as well as construction materials storage areas. There will also be an increased risk of traffic accidents where delays and diversions are imposed or altered without adequate warning.

#### **Mitigation Measures**

- To reduce on the workers accidents and hazards, the proponent will develop and commit the contractors to Site Occupational Health and Safety rules and regulations as stipulated in the Occupational Safety and Health Act, 2007;
- All construction workers should be advised of the dangers associated with construction work;
- Workers should be provided with suitable PPE;
- Provision of adequate sanitary facilities to workers;
- Train all workers on Safety Health and Environment (SHE) with an aim of improving awareness;
- Trenches over 1.5m deep or wherever soil conditions dictate should be secured against accidental entry by workers and the public;
- Install safety signage along the work areas;
- Where construction activities interfere with the movement of traffic, the site should be signed and controlled by trained flagmen/flag women and lit by night.
- Well stocked first aid boxes should be availed in case of any incidents or accidents and a general register should be available to record such occurrences.
- The area should be fenced off to keep away unwanted persons.

#### **Generation of Waste**

Solid wastes generated during construction include papers used for packing, plastics, cuttings and trimmings of materials among others. Dumping around the site will interfere with the aesthetic status and has a direct effect on the surrounding community. Disposal of the same solid wastes offsite could also be a social inconvenience if done in the wrong places. The off-

site effects could be aesthetic, pest breeding, pollution of physical environment including water resource, invasion of scavengers and informal recycling by communities.

### **Mitigation Measures**

- Construction waste should be recycled or reused as much as possible to ensure that materials that would otherwise be disposed off as waste are diverted for productive uses;
- The Proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal;
- Minimization of solid waste during construction of the proposed Project through use of durable, long-lasting materials that will not need to be replaced often, thereby reducing the amount of construction waste generated over time;
- Skips and bins should be strategically placed within the labor campsite, if any, and construction site, they should also be adequately designed and covered as well as emptied regularly to prevent access by vermin and minimize odour;
- Measures to ensure that waste materials from the project are disposed at suitable sites will be taken. These will include engaging only reputable truckers and conducting appropriate spot checks to verify that disposals are done in accordance with the requirements of NEMA, hence the ultimate fate of the wastes should be monitored so that they are not illegally disposed of; and
- Provide portable sanitary conveniences for the construction workers for control of sewage waste. A ratio of approximately 25 workers per chemical toilet should be used. But the construction workers can also be allowed to make use of toilets the institution.

### **Increased Water Demand**

During the construction phase of the proposed project, both the construction workers and the Construction works will create demand for water in addition to the existing demand. Water will mostly be used during construction for wetting surfaces or cleaning/curing completed structures. It will also be used by the construction workers to wash and drink.

### **Mitigation Measures**

- The proponent through the contractor shall ensure that water is used efficiently at the site by sensitizing construction staff to avoid irresponsible water use;
- Any water handling equipment, facility and systems shall be appropriate for the intended usage. Water used on the construction shall reflect the level of conservation achieved by the contractors. Documentation of amounts of water used will therefore be mandatory.

### **Noise Generation**

Constructions of the proposed project will most likely result in noise emissions as a result of the machines that will be used e.g. excavation equipment and construction vehicles delivering materials to site. Noise will also be generated by construction workers. Significance of noise impacts depends on whether the project would increase noise levels above the existing ambient levels by introducing new sources of noise. Noise impacts would be considered significant if the project would result in the following:

- Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Exposure of persons to, or generation of, excessive ground-borne vibration or ground-borne noise levels;
- A substantial permanent increase in ambient noise levels (more than 3dBA) in the project vicinity above levels existing before the project; and
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing before the project.

### **Mitigation Measures**

The project proponent through the contractor shall put in place several measures that will mitigate noise pollution during the construction phase such as the following:

- Install portable barriers to shield compressors and other small stationary equipment where necessary;
- Limit pickup trucks and other small equipment to a minimum idling time and observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible;
- Provision of appropriate personnel protective equipment (PPE);
- Construct mainly during the day; and
- Consider labor based construction methodologies.
- Instruct the drivers to avoid unnecessary gunning of vehicle engines or hooting especially when passing through sensitive areas such as residential areas, wildlife areas and hospitals.
- Insulate all generators & heavy duty equipment or place them in enclosures to minimize high noise levels

### **Spread of Communicable Diseases and Other Infections**

During the construction phase there is a risk of spread of communicable diseases such as tuberculosis and pulmonary infections. Aspects of the physical environment that promote transmission of diseases include: disposal of wastes which is likely to occur during the construction phase of the project. With the influx of people during construction, there will be a likelihood of increase in diseases such as typhoid, tuberculosis, diarrheal diseases, respiratory diseases, dysentery and cholera.

### **Mitigation Measures**

- Treat affected local and migrant workers which will control the movement of disease vectors (through contaminated water and between people);
- Provision of personal hygiene facilities in good condition with adequate water supply

- Ensure awareness raising on proper sanitation and personal hygiene to promote proper health.

### **Generation of exhaust emissions**

Exhaust emissions are likely to be generated during the construction period by the various construction machinery and equipment. Motor vehicles used to mobilize the work force and materials for construction would cause a potentially significant air quality impact by emitting pollutants through gaseous exhaust emissions.

### **Mitigation Measures**

- Proper and prompt maintenance of construction plants and equipment to control emission of hazardous fumes and noise emanating from machines.
- Ensure that machines are switched off when not in use.

### **Storm water**

Storm water runoff either from the site or from the neighboring compounds may run into the site thereby causing interference to the construction operation.

### **Mitigation Measure**

- Drainage channels should be dug on the area lying on the upper side of the dam to ensure storm water does not enter the excavated area in case of rain

### **Dust emissions**

Particulate matter pollution is likely to occur during the site clearance, excavation and loading and transportation of the construction waste.

### **Mitigation Measure**

- Minimizing the number of motorized vehicles on use;
- Rehabilitate disturbed areas;
- Provide scour checks on over-15% slopes or when working in loose soils;
- Use predetermined tracks;
- Wet all active construction areas as and when necessary to reduce dust;

### **Accidental Spills and Leakages**

The principal chemicals held on the site during the construction site are likely to be vehicle fuel and greases/ oils. Spillage or escape of such compounds are likely to have an immediate impact upon the local water resources and consequently on the terrestrial and aquatic flora and fauna.

### **Mitigation Measures**

- Machines that utilize oil and petroleum products should be adequately serviced to ensure they do not leak.

- In case of any leak the affected soil should be collected and burned to get rid of the waste.
- Maintain vehicles and machineries at manufacturers specifications;

### **Enhanced erosion / changes in topography due excavation.**

The excavation works will make soil loose hence making it prone to being eroded by wind or water.

#### **Mitigation measures**

- Compacting the embankment so as to reduce chances of erosion
- The excavated soil to be deposited around the dam area also needs to be compacted to reduce erosion.
- Have soil erosion prevention mechanisms in place.

### **Increase in HIV/AIDS Prevalence and other STIs**

As the project is going to bring in a significant population of new people in the project area it is forecasted that rates of new infections will increase. This is due to the fact that the contractors, traders and workers will have money to attract women from the project area in a bid to solicit for sex, thereby creating avenues for spread of HIV/AIDS and other STIs. The most vulnerable members of the community are women as they don't have access to resources necessary for production and wealth creation, in this case land. This will further predispose them to sex pests and consequently HIV/AIDS.

#### **Mitigation measures**

It is recommended that the Resident Engineer should ensure that prevention and management of STIs occurrence as a result of social interaction between immigrant workers and local populations is conducted through:

- Education and sensitization of workers and the local communities on STIs including provision of condoms to the project team.
- The contractor has to institute HIV/AIDS awareness and prevention campaign amongst workers for the duration of the contract e.g. erect and maintain HIV/AIDS information posters at prominent locations as specified by the Resident Engineer;
- The contractor has to ensure that staff are made aware of the risks of contracting or spreading sexually transmitted diseases;
- The contractor should ensure that the project workers are sensitized on the local culture.

### **Increased pressure on infrastructure**

The project will lead to increased pressure on existing infrastructure such as roads, service lines due to the increased number of people who will be using these facilities which will directly translate into increased in volume of the relevant parameter.

#### **Mitigation Measures**

- Have designated routes for people and vehicles so as to reduce the conflict that may arise such as pressure on soil.
- Sprinkle water in the specific routes to reduce erosion and air pollution.

### **Impacts on Flora and Fauna**

There will be minimal impacts on Flora since the proposed site has only grass on it.

### **Archaeological and Other Cultural Properties**

From the field studies, there are no known impacts on archaeologically protected monuments and cultural properties in the proposed project area. Should any archeological or culturally important artefact be discovered during the construction process, the contractor should develop and implement a chance find procedure that should be approved by National Museum of Kenya.

### **Disposal of Spoil**

Project construction will involve earthworks and excavation. This will result in the generation of some spoil materials. But there will be little carting away of excavated material. The soils may affect the surrounding environment if not adequately disposed.

### **Mitigation Measures**

- Maximizing the re-use of excavated materials in the works as far as feasible to ensure that no permanent spoil dumps are created;
- Properly disposing off the spoil in an area identified by the design team and approved by the confirmed land owners as well as by NEMA; and
- Care should be taken to avoid spoil location in land that could otherwise be used for productive purposes

### **Traffic Impacts**

Vehicular accidents are likely to occur where there are no stringent measures put in place. Therefore, it advisable that applicable measures be put in place

### **Mitigation measures**

- The contractor shall take all possible precaution to safe guard the safety of wheeled traffic and pedestrian.
- Ensure strict enforcement of on and off -site speed limits as well as limiting unnecessary traffic within the project site
- Provide parking areas for the trucks.
- Provide entry and exit points into the site.
- Erect proper warning signs at a safe distance on the access roads to warn motorist of heavy vehicles turning.
- Ensure trucks do not damage the road structures and drainage systems.
- Ensure only serviceable trucks are used during transportation hence less break downs.
- Ensure that transportation of the materials take the shortest period possible.

- Transport most of the materials during off peak hours when the traffic is low

**General considerations during construction that will reduce negative impacts during operation of the dam.**

- **Sedimentation** - to reduce siltation, silt traps should be constructed to ensure deposition occurs before reaching the water dam. The silt traps will reduce velocity of surface runoff and thus minimize erosion of topsoil and consequently avert possible gully formation around the catchment.
- **Inlet** - The inlets should be well placed and linked to the catchment drainage system to be able to bring the maximum available run-off into the water dam. Inlets should be cleaned regularly, be able to direct all the water from the catchments area while silt traps facilitate deposition of silt away from the water pan during the rainy seasons which means that the silt traps can then be target for maintenance (de-silting) instead of the whole the water dam.
- **Spillway** – provide spillway channel for excess water to flow behind the silt trap and provide a masonry sill at the off-take point to prevent erosion.
- **Excavation work:** Either human labour or mechanical power can be utilized. Excavated material should be placed on leeward side such that wind does not blow cuttings back into the water dam.
- **Side slopes:** Upon excavation of the reservoir, provide side slopes of 1:2.5 to 1:3 to Facilitate ease of access in to the water pan and prevent accident for people and livestock.
- **Bed slope:** the water pan bed should have a slope of 5% from inlet to the embankment to provide non eroding flow of water. The water dam bed is usually compacted upon completion to reduce seepage.
- **De-silting** of water pans must ensure it is done only to original depths so as not to interfere with the water pan base which has been compacted earlier and thus increase seepage.
- **Infiltration well** – Provide infiltration well by installing horizontal collectors buried in a gravel envelope; wells be at least 2m below the water pan bed.
- **Fencing** – provide live fence using fast growing plants around the dam

## **7.2 OPERATIONAL PHASE**

### **7.2.1 Positive Impacts**

- Employment opportunities.
- Increased production for the company due to availability of more water for irrigation.
- Opportunity for fish farming.
- By supplying the farm adequate water, the farm management will make savings that will be diverted to other development projects;
- Watering landscaped areas and using retained water for cleaning purposes would reduce costs on water expenditures;
- Retained water would be used in further construction works therefore reducing construction costs and reducing pressure on available water resources;

- Reduced soil erosion by constructing drains
- Increasing the value of land near the dam, because of all the above benefits.

## **7.2.2 Negative Impacts and Mitigation Measures**

### **Breeding Site for Mosquitoes**

During operation of the dam, there is a possibility of mosquitoes breeding in some parts of the dam.

#### **Mitigation Measures**

- Monitor and control the possible creation of mosquito breeding site.

### **Accumulation of Aerobic and Anaerobic Waste.**

Wastes would find their way in the dam either through run-off or by being carelessly dumped. Aerobic wastes would undergo decomposition and trigger growth of algae and loss of dissolved oxygen in the dam which would not favor fish farming. Anaerobic wastes will accumulate in the dam and occupy space that would otherwise be occupied by water.

#### **Mitigation Measures**

- Ensure no wastes enter the dam especially due to run-off by having a point to sieve all incoming wastes.
- Wastes that find their way in the dam should be removed.

### **Soil Erosion**

During rain seasons, water will flow towards the direction of the dam considering the gradient of the area. If water overflows from the dam, it may erode the embankment and the adjacent area.

- Ensure that the dam has a spillway/Outlet to drain excess water especially during rain seasons so that the embankment is not tempered with.

### **Risk of Drowning**

During the operational stage of the dam, if the area is left accessible to everyone, it would pose a risk of someone falling in it or acts of suicide.

- Fencing off the dam to ensure it is only accessible to the required personnel.
- Put warning signs (written in English and Kiswahili languages) at strategic sites

### **Opportunistic growth of aquatic macrophytes**

Some plants may grow in the dam and can either be on the surface or submerged. They would include water lily etc. Such plants are important in removing nitrates and phosphates in water.



However, in this case, if at all the water has such wastes due to surface run-off from greenhouses, the water can still be reused since its only purpose is irrigation.

#### **Mitigation measures**

- Monitor for any unusual floral species.
- Remove such species when seen.

#### **Increased pressure on infrastructure**

The project will lead to increased pressure on existing infrastructure such as roads, service lines etc. due to the increased number of people who will be using these facilities which will directly translate into increased in volume of the relevant parameter.

#### **Mitigation Measures**

- Have designated routes for people and vehicles so as to harmonize the conflict that may arise.

#### **Siltation**

When it rains the run-off will contain particles of soil. There is therefore a need for having a mechanism of removing such sediments before entering the dam so that no space in the dam will be occupied by unwanted material other than water.

#### **Impacts on Hydrology**

There will be minimal impacts on ground water since an impermeable plastic paper will be laid at the base and embankment of the earth dam to prevent water loss to the ground. There should be periodical testing of waters to determine parameters such as pH, color, odour, and suspended solids etc that are up to required standards.

#### **Oil and grease spillage in to the dam**

During operation of the dam, there is a possibility of oil and grease spill in to the reservoir in case there is no designated area of servicing and maintaining farm machinery

#### **Mitigation Measures**

- All servicing and maintenance of farm machinery must be done at the designated garage and oil interceptors provided to minimize the occurrence of such accidental spills

#### **Solid Waste management**

Wastes in the farm may find its way into the water reservoir. Therefore, proper waste management methods must be developed and be adhered to.

#### **Mitigation measures**

- Provide proper waste handling facilities such as waste storage chamber /receptacles for temporarily holding solid waste generated.
- Contract a NEMA licensed waste company for proper waste disposal
- Raise awareness among workers about waste management
- Dispose waste more responsibly by dumping at designated sites only

#### **Over flowing of the dam during rainy season.**

Based on height and storage, the dam may have significant risks in case of an overflow of water. However, amid to have a proactive approach to deter occurrence of negative effects, the following are measures that can be incorporated.

### **Mitigation measures**

- The spillway should be regularly checked to ensure that it can accommodate the Probable Maximum Flood (PMF) flow within the available 1m free board without spilling at other parts of the dam structure
- Regular monitoring of water levels to ensure that levels are controllable.
- To reduce siltation, silt traps should be maintained to ensure deposition of sediments occurs before reaching the water dam. The silt traps will reduce velocity of surface runoff and thus minimize erosion of topsoil and consequently avert possible gully formation around the catchment.
- Inlets should be cleaned regularly, be able to direct all the water from the catchments area while silt traps facilitate deposition of silt away from the water pan during the rainy seasons which means that the silt traps can then be target for maintenance (de-silting) instead of the whole the water dam.
- Maintaining of the fences around the dam to reduce exposure to person at all times.
- Other measures shall be considered during construction phase to avert any possible negative impacts in case of an overflow of the dam as discussed earlier.

### **Liquid waste management**

Liquid waste from farm operations, including waste from washrooms, may find their way directly into the dam. The following measures should be held to uphold proper waste management.

### **Mitigation measures**

- Ensure proper maintenance of the septic tank and a wetland.
- Ensure that sewage pipes are not blocked or damaged since such vices can lead to release of the effluent, resulting in land (soil) and water pollution
- use licensed exhausters to periodically empty the septic tank

## **7.3 DECOMMISSIONING PHASE**

Decommissioning is an important phase in the project cycle and comes last to wind up the operational activities of a particular project. It refers to the final disposal of the project and associated materials at the expiry of the project lifespan. If such a stage is reached, the proponent needs to remove all materials resulting from the demolition/ decommissioning from the site. The following should be undertaken to restore the environment:

- Remove all underground facilities from the site
- The site should be well landscaped by flattening the mounds of soil and planting indigenous trees and flowers
- All the equipment should be removed from the site

- Fence and signpost unsafe areas until natural

### 7.3.1 Positive impacts

- Employment opportunities
- Revenue Generation from of sale of recovered material such as the impermeable paper.
- Reuse of the pumping machine which see the company saving on resources.

### 7.3.2 Negative Impacts and Mitigation Measures

#### Noise and Vibration

The refilling works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas. This will be as a result of the noise and vibration that will be experienced as a result of depositing the soil in the dam and compacting the soil.

#### Mitigation Measures

- Ensure the workers are in their PPEs to reduce effects of noise to their health.

#### Solid Waste Generation

Demolition of the wire fence will result in large quantities of solid waste. Other waste will include the impermeable paper laid at the base of the dam.

#### Mitigation measures

- A comprehensive waste management plan shall be put in place during this phase. The plan shall, as much as possible utilize the principle of waste reduction, reuse, recycling, and recovery.

#### Dust

Large quantities of dust will be generated during refilling of the dam. This will affect the workers as well as the neighboring residents.

#### Mitigation measures

- The workers should be provided with PPEs to counter the effect of dust.

## 7.4 IMPACT IDENTIFICATION CHECKLIST

The checklists below were used to identify possible impacts from the project development and the matrix to determine the significance of each identified impacts.

Possible Impacts	Developmental Phases			
	Design	Construction	Operation	Decommissioning
Surface and Ground		✓	✓	✓
water quality				
Hydrology & Drainage		✓	✓	✓
Air quality		✓	✓	✓
Climate			✓	✓
Noise		✓		✓
Physiography		✓	✓	✓
Soil and Geology		✓	✓	✓

Biodiversity		✓	✓	✓
Socioeconomic effects		✓	✓	✓
Health & Safety	✓	✓	✓	✓
Waste generation	✓	✓	✓	✓
Other impacts	✓	✓	✓	✓

### 7.5 IMPACT SIGNIFICANCE MATRIX

The weightings of significance within the table below range from 0-3 (denoted by number of stars) whereby “0” represents no significance; “1” represents low significance; “2” means there will be some significant effect and “3” represent high environmental significance. It also conveys the negative impacts of the project activities against identified environmental attributes.

Environmental Issues	Potential Adverse Effects				Cumulative Effects			
	Design	Construction	Operation	Decommissioning	Past	Present	Future	Cumulative
Soil		3	1	3		-		
Flora		2	0	0	-	-	-	-
Fauna		1	0	3	-	-	-	-
Air quality		3	0	3		-		
Micro-climate		0	2	0	-	-	-	-
Human	0	0	0	0	-	-	+	+
Water Availability		2	0	2		-	+	+
Noise		3	0	3	-	-	-	-
Physiography		3	0	3	-	-	+	+

#### KEY

Sign

**0**

**1**

**2**

**3**

-

+

Value

Not significant

Low significance

Medium Significance

High significance

Zero Occurrence

Beneficial Occurrence

## 7.6 ENVIRONMENT IMPACTS MAGNITUDE

Based upon the predictions of impacts identified and assessed with the help of the checklist developed for the proposed project, environmental scenario without the project was juxtaposed with that of the project and the results were reported in table below:

Environmental Units Parameter	Without project	With project Net	Net change	Magnitude
Crops	Nil	Nil	Nil	Zero
Trees/Shrubs	Nil	Negative	Small	Low
Land Use	Nil	Positive	High	High
Wildlife (Insects and other lower organism)	Nil	Negative	Small	Low
Aquatic organism	Nil	Positive	High	High
Species diversity	Nil	Negative	Small	Low
Water Quality	Nil	Positive	High	High
Air Quality	Nil	Negative	Low	Low
Noise levels	Nil	Negative	Low	Low
Land dereliction	Nil	Negative	Low	Low
Soil erosion	Nil	Negative	Low	Low
Economic benefits	Nil	Positive	High	High
Eutrophication	Nil	Negative	Low	Low
Health and safety	Nil	Positive	High	High

## CHAPTER EIGHT

### **8.0 ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS**

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A number of activities have to be carried out during the various phases of the project to ensure adequate environmental and social impact management. These include, but are not limited, to the following:

#### **8.1. Project Preparation**

- Collection of baseline data for monitoring purposes (e.g. vegetation type, ambient noise);
- Training of the relevant university management staff in environmental management;
- Verification of design details.
- Preparation of an occupational safety and health manual for use during project construction, operation and decommissioning.

#### **8.2. Construction**

- Incorporation of mitigation measures;
- Enforcement of occupational safety and health requirements (conditions at the Contractor's Yard, materials storage, condition of equipment, protective clothing, etc.);
- Collection of data on noise and vibration levels;
- Disposal of construction solid, liquid and sanitary wastes in an acceptable manner and in conformance with regulations;
- Training the Contractor's workforce in environmental and social awareness and responsibility (including STD/HIV/AIDS awareness); and
- Liaison with local administration and community leaders in matters of disturbance to the public, security issues, and other matters arising from the project.

#### **8.3. Operation**

Maintenance, calibration and checking of all equipment as specified in respective manuals or regulations; Monitoring leakages and spills; Collection of data on water (surface and ground), and noise and vibration levels, to be used for analysis and remediation where necessary; Disposal of solid and sanitary wastes in an acceptable manner and in conformance with regulations; Compliance with occupational safety and health manual to be prepared by project proponent/ management during the project preparation phase; and Environmental performance reporting (based on evaluation of data collected, investigations, etc.

The table below represents environmental management and monitoring plan. It describes how each of the main mitigation measures proposed should be implemented, how frequently, and who should be responsible during and after construction. Monitoring indicators and means of monitoring have also been included in the table. It is imperative that this Environmental Project Report is made available to the contractor at the tendering stage so that they can appreciate what is involved in implementing proposed mitigation measures and will be able to include mitigation measures in the bills of quantities.

Prior to mobilization, the Contractor should also prepare his own EMP for review by the Supervising Engineer. In his schedule of works, the Contractor must include all proposed mitigation measures, and the Supervising Engineer should ensure that the schedule and environmental management/monitoring plans are complied with. This will also lend a sense of ownership to the Contractor, in addition to instilling in him/ her, a thorough understanding of the pertinent issues.

The responsibility for supervision of the implementation of all the proposed mitigation measures during construction and the defects liability period will lie with the Supervising Engineer, while the Contractor will be responsible for day to day operational matters of construction, which will include implementation of mitigation measures that he is responsible for.

After the defects liability period, responsibility for the operation and maintenance of the facility will rest with the property owner. The table also presents an estimate of the costs of environmental management and mitigation.

**TABLE 8: ENVIRONMENTAL MANAGEMENT PLAN DURING CONSTRUCTION OF RESERVOIR**

<b>Expected Negative Impacts</b>	<b>Mitigation Measure</b>	<b>Responsibility</b>	<b>Time Frame</b>	<b>Cost</b>
Health and Safety of Workers	<ul style="list-style-type: none"> <li>Workers should be provided with full personal protective equipment (PPE) to beef up their health and safety standards.</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	5,000
	<ul style="list-style-type: none"> <li>Where construction activities interfere with the movement of traffic, the site should be signed and controlled by trained flagmen/flag women and lit by night.</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	TBD
	<ul style="list-style-type: none"> <li>Well stocked first aid boxes should be availed in case of any incidents or accidents and a general register should be available to record such occurrences.</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	5,000
	<ul style="list-style-type: none"> <li>The area should be fenced off to keep away unwanted persons.</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	20,000



	<ul style="list-style-type: none"> <li>• Install safety signage along the work areas;</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	5,000
Generation of Waste	<ul style="list-style-type: none"> <li>• The soil generated will be used to level the area of land around the dam as well as landscaping some areas in the farm.</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	TBD
	<ul style="list-style-type: none"> <li>• Waste bins need to be provided for collection of wastes such as cement packaging bags.</li> </ul>	Contractor/ Proponent	One-off	TBD
	<ul style="list-style-type: none"> <li>• Construction waste should be recycled or reused as much as possible to ensure that materials that would otherwise be disposed off as waste are diverted for productive uses;</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	TBD
	<ul style="list-style-type: none"> <li>• The Proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that there is minimal residual amount of construction materials.</li> </ul>	Contractor/ Proponent		
	<ul style="list-style-type: none"> <li>• Minimization of solid waste during construction of the proposed Project through use of durable, long-lasting materials that will not need to be replaced often, thereby reducing the amount of construction waste generated over time;</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	TBD
	<ul style="list-style-type: none"> <li>• Measures to ensure that waste materials from the project are disposed at suitable sites will be taken.</li> </ul>			

These will include engaging only reputable truckers and conducting appropriate spot checks to verify that disposals are done in accordance with the requirements of NEMA.

- Provide portable sanitary conveniences for the construction workers for control of sewage waste.

Contractor/  
Proponent

Throughout the  
Construction Period      TBD

Contractor/  
Proponent

Throughout the  
Construction Period      TBD

Throughout the  
Construction Period      TBD

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Noise Pollution	<ul style="list-style-type: none"> <li>Such noise emissions should be minimized as much as possible from the source point while workers should be provided with appropriate personal protective equipment especially if the levels exceed 85dB for a continuous eight hours exposure.</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	TBD
	<ul style="list-style-type: none"> <li>Install portable barriers to shield compressors and other small stationary equipment where necessary;</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	TBD
	<ul style="list-style-type: none"> <li>Instruct the drivers to avoid unnecessary gunning of vehicle engines or hooting especially when passing through sensitive areas such as residential areas, wildlife areas and hospitals.</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	-
	<ul style="list-style-type: none"> <li>Ensure that machines are switched off when not in use.</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	-
Generation of exhaust emissions	<ul style="list-style-type: none"> <li>Proper and prompt maintenance of construction plants and equipment to control emission of hazardous fumes and noise emanating from machines.</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	5,000 per Month

	<ul style="list-style-type: none"> <li>Ensure that machines are switched off when not in use.</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	-
Storm water	<ul style="list-style-type: none"> <li>Drainage channels should be dug on the area lying on the upper side of the dam to ensure storm water does not enter the excavated area in case of rain</li> </ul>	Civil Engineer /Mechanical engineer and Proponent	2 Months	5,000
Dust emissions	<ul style="list-style-type: none"> <li>Workers need to be in their respective PPEs during working hours.</li> </ul>	Contractor/ Proponent	2 Months	-
	<ul style="list-style-type: none"> <li>Use predetermined tracks where feasible and rehabilitate disturbed areas;</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	-
	<ul style="list-style-type: none"> <li>Provide scour checks on over-15% slopes or when working in loose soils;</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	TBD
	<ul style="list-style-type: none"> <li>Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	2,000 per Month
	<ul style="list-style-type: none"> <li>Avoid excavation works during extremely dry weather if possible.</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	-

Oil spills and Leaks	<ul style="list-style-type: none"> <li>Machines that utilize oil and petroleum products should be adequately serviced to ensure they do not leak.</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	5,000 per month
	<ul style="list-style-type: none"> <li>In case of any leak the affected soil should be collected and burned to get rid of the waste.</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	-
Enhanced erosion / changes in topography due excavation.	<ul style="list-style-type: none"> <li>Have soil erosion prevention mechanisms in place, such as compaction of soil on the base of the reservoir and its embankment to reduce chances of erosion.</li> </ul>	Contractor/ Proponent	1 Month	-
Increased pressure on infrastructure	<ul style="list-style-type: none"> <li>Have designated routes for vehicles and human in the site to avoid the conflict that is likely to arise.</li> </ul>	Contractor/ Proponent	1 Month	-
Increase in HIV/AIDS Prevalence and other STIs	<ul style="list-style-type: none"> <li>Education and sensitization of workers on HIV/AIDS and STIs including provision of condoms to the project team.</li> <li>The contractor has to institute HIV/AIDS awareness and prevention campaign amongst workers for the duration of the contract e.g. erect and maintain</li> </ul>			

	HIV/AIDS information posters at prominent locations as specified by the Resident Engineer;	Contractor	Throughout the Construction Period	TBD
Disposal of spoil	<ul style="list-style-type: none"> <li>The contractor has to ensure that staff are made aware of the risks of contracting or spreading sexually transmitted diseases;</li> <li>The contractor should ensure that the project workers are sensitized on the local culture.</li> </ul>			
	<ul style="list-style-type: none"> <li>Maximizing the re-use of excavated materials in the works as far as feasible to ensure that no permanent spoil dumps are created;</li> </ul>	Contractor/ Proponent	Throughout the Construction Period	-
	<ul style="list-style-type: none"> <li>Properly disposing off the spoil in an area identified by the design team and approved by the confirmed land owners as well as by NEMA</li> </ul>	Contractor/ Proponent		
	<ul style="list-style-type: none"> <li>Care should be taken to avoid spoil location in land that could otherwise be used for productive purposes</li> </ul>	Contractor/ Proponent	Throughout the construction period	TBD
			Throughout the construction period	-
Traffic Impacts	<ul style="list-style-type: none"> <li>The contractor shall take all possible precaution to safe guard the safety of wheeled traffic and pedestrian.</li> </ul>			

Emergency/ hazard response/ preparedness plan

- Ensure strict enforcement of on and off -site speed limits as well as limiting unnecessary traffic within the project site
- Provide parking areas for the trucks.
- Provide entry and exit points into the site.
- Erect proper warning signs at a safe distance on the access roads to warn motorists of heavy vehicles turning.
- Ensure trucks do not damage the road structures and drainage systems.
- Ensure only serviceable trucks are used during transportation hence less break downs.
- Ensure that transportation of the materials take the shortest period possible.
- Transport most of the materials during off peak hours when the traffic is low
- There must be a well-designed and documented emergency preparedness plans including fire emergency procedures.
- signage around the farm warning the staff of possible danger and educate them on how to respond to emergencies

Contractor/  
Proponent

Throughout the  
Construction Period

TBD

Contractor

Throughout the  
Construction Period

TBD

**TABLE7: ENVIRONMENTAL MANAGEMENT PLAN DURING OPERATIONAL OF THE RESERVOIR**

<b>Expected Negative Impacts</b>	<b>Mitigation Measure</b>	<b>Responsibility</b>	<b>Time Frame</b>	<b>Cost</b>
Breeding Site for Mosquitoes	<ul style="list-style-type: none"> <li>• Monitor and control the possible creation of mosquito breeding site.</li> </ul>	Proponent	Throughout the operation Period	-
Accumulation of Aerobic and Anaerobic Waste.	<ul style="list-style-type: none"> <li>• Ensure no wastes enter the dam especially due to run-off by having a point to sieve all incoming wastes.</li> </ul>	Proponent	Throughout the operation Period	-
	<ul style="list-style-type: none"> <li>• Wastes that find their way in the dam should be removed.</li> </ul>	Proponent	Continuous	-
Risk of Drowning	<ul style="list-style-type: none"> <li>• Fencing off the dam to ensure it is only accessible to the required personnel.</li> </ul>	Proponent	2 Months	50,000
	<ul style="list-style-type: none"> <li>• Put warning signs (written in English and Kiswahili languages) at strategic sites.</li> </ul>	Proponent	One-Off	-
Opportunistic growth of aquatic macrophytes.	<ul style="list-style-type: none"> <li>• Monitor for any unusual floral species.</li> </ul>	Proponent	Throughout the operation Period	-



<p>Overflowing of the dam during rainy seasons</p> <ul style="list-style-type: none"> <li>• The spillway should be regularly checked to ensure that it can accommodate the Probable Maximum Flood (PMF) flow within the available 1m free board without spilling at other parts of the dam structure</li> <li>• Regular monitoring of water levels to ensure that levels are controllable.</li> <li>• To reduce siltation, silt traps should be maintained to ensure deposition of sediments occurs before reaching the water dam. The silt traps will reduce velocity of surface runoff and thus minimize erosion of topsoil and consequently avert possible gully formation around the catchment.</li> <li>• Inlets should be cleaned regularly, be able to direct all the water from the catchments area while silt traps facilitate deposition of silt away from the water pan during the rainy seasons which means that the silt traps can then be target for maintenance (de-silting) instead of the whole the water dam.</li> <li>• Maintaining of the fences around the dam to reduce exposure to person at all times</li> </ul>	Proponent /contractor	Throughout the operation Period	TBD
	Proponent		-
	Proponent	Throughout the operation Period	
	Proponent	Throughout the operation Period	TBD
	Proponent		TBD

- Other measures shall be considered during construction phase to avert any possible negative impacts in case of an overflow of the dam during its operation as discussed earlier.

Throughout the operation Period

TBD

Throughout the operation Period

Increased pressure on infrastructure • Have designated routes for vehicles and human in the site to avoid the conflict that is likely to arise. Proponent

2 Months

-

Liquid waste management • Ensure proper maintenance of the septic tank and a wetland. Proponent

Throughout operation period

-

	<ul style="list-style-type: none"> <li>• Ensure that sewage pipes are not blocked or damaged since such vices can lead to release of the effluent, resulting in land (soil) and water pollution</li> <li>• use licensed exhausters to periodically empty the septic tank</li> </ul>			
Health and Safety of workers	<ul style="list-style-type: none"> <li>• Workers should be provided with full personal protective equipment (PPE) to beef up their health and safety standards.</li> </ul>	Proponent	Throughout the operation Period	TBD
	<ul style="list-style-type: none"> <li>• Well stocked first aid boxes should be availed in case of any incidents or accidents and a general register should be available to record such occurrences.</li> </ul>	Proponent	Throughout the operation Period	2,000
Siltation	<ul style="list-style-type: none"> <li>• The drainage that shall be cemented during construction period should be maintained to ensure so that no soil is carried with it.</li> </ul>	The Civil Engineer and Proponent .	Throughout the operation Period	TBD
	<ul style="list-style-type: none"> <li>• Soil that would be deposited in the dam should be removed.</li> </ul>	Proponent	Continuous	
Impacts on Hydrology	<ul style="list-style-type: none"> <li>• Have a common point to collect water for periodical testing in the dam.</li> </ul>	Proponent .	Throughout the operation Period	TBD

Oil and grease spillage in to the dam	<ul style="list-style-type: none"> <li>• All servicing and maintenance of farm machinery must be done at the designated garage and oil interceptors provided to minimize the occurrence of such accidental spills</li> </ul>	Proponent .	Throughout the operation Period	TBD
Chemical fertilizers handling	<ul style="list-style-type: none"> <li>• These need to be applied in the required quantities and at the appropriate time to reduce the amounts that seep into the soil and potentially to nearby water bodies</li> </ul>	Proponent .	Throughout the operation Period	TBD
Efficient waste management	<ul style="list-style-type: none"> <li>• Provide proper waste handling facilities such as waste storage chamber /receptacles for temporarily holding solid waste generated.</li> <li>• Contract a NEMA licensed waste company for proper waste disposal</li> <li>• Raise awareness among workers about waste management</li> <li>• Dispose waste more responsibly by dumping at designated sites only</li> </ul>	Proponent .	Throughout the operation Period	TBD

**TABLE 8: ENVIRONMENTAL MANAGEMENT PLAN DURING DECOMMISSIONING OF THE RESERVOIR.**

<b>Expected Negative Impacts</b>	<b>Mitigation Measure</b>	<b>Responsibility</b>	<b>Time Frame</b>	<b>Cost</b>
Noise and Vibration	<ul style="list-style-type: none"> <li>Ensure the workers are in their PPEs to reduce effects of noise to their health.</li> </ul>	Contractor/ Proponent	Continuous	TBD
	<ul style="list-style-type: none"> <li>Switch of Machines when not in use.</li> </ul>	Contractor/ Proponent	Continuous	-
Solid Waste Generation	<ul style="list-style-type: none"> <li>Waste that will be recovered need to be reused since it will comprise of plastic and metal waste from the fencing wire.</li> </ul>	Contractor/ Proponent	One-off	TBD
Dust	<ul style="list-style-type: none"> <li>The workers should be provided with respirators to counter the effect of dust.</li> </ul>	Contractor/ Proponent	Continuous	TBD
Health and Safety of workers	Workers should be provided with full personal protective equipment (PPE) to beef up their health and safety standards.	Contractor/ Proponent	Throughout the Cycle	

TBD

Well stocked first aid boxes should be available in case of any incidents or accidents and a general register should be available to record such occurrences.

Contractor/  
Proponent

Throughout the  
Cycle

Rehabilitation of  
the project site.

Implement an appropriate re-vegetation programme to restore the site to its original status and Consider use of indigenous plant species in re-vegetation

Contractor/  
Proponent

To Be Advised

TBD

Trees should be planted at suitable locations so as to interrupt sight lines (screen planting), between the adjacent residential area and the development.

Contractor/  
Proponent

To Be Advised

TBD

## CHAPTER SEVEN

### 7.0 CONCLUSION AND RECCOMENDATION

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The development of new projects is now preceded by critical analysis and assessment of the proposed activities through the conduct of an EIA, as required by NEMA. An EIA identifies both positive and negative impacts of the proposed development towards the environment and community, and provides easing methods for the latter.

The analysis of this report has evidenced that the implementation and operation phases of the proposed project will have positive impacts to the proponent and the community at large. These impacts will include creation of jobs and business opportunities, compliance with the Public Health Act and Local Government Act and general development of the site. However, there are some environmental concerns associated with this development such as increased pressure on existing infrastructure (water, drainage system, etc.), interference with air and soil quality mostly during the construction phase, increased solid waste generation, among others. The report has therefore included a comprehensive EMMP to mitigate these impacts effectively. The strategy will ensure sustainable execution of the proposed activities and protection of the environment and the community.

The expert's recommendation is that the project should be subjected to the outlined mitigation measures and they should be strictly adhered to. The project proponent shall work closely with NEMA, the County government and the general public to achieve these goals and embrace clean production/development mechanisms (CDM) in the aim of realizing the 2030 agenda on Sustainable development.

On the basis of the mitigation measures developed, the project will have no adverse effects to the environment and on social welfare of the surrounding community. The licensing authority is therefore urged to issue a license for the commencement of the project.

## CHAPTER NINE

### 9.0 REFERENCES

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1. Republic of Kenya (2015), The Environmental Management and Coordination (Amendment) Act
2. Republic of Kenya (2003), The Environmental (Impact Assessment and Audit) Regulations
3. Republic of Kenya (2009), Wetlands, River Banks, Lake Shores and Sea Shore Management Regulation.
4. Republic of Kenya (2010), The Constitution of Kenya.
5. Republic of Kenya (2009), The Noise and Excessive Vibration Pollution Regulations.
6. Republic of Kenya (2005), The Noise Prevention and Control Rules.
7. Republic of Kenya (2007), The Occupational Safety and Health Act.
8. Republic of Kenya (2006), The Waste Management Regulations
9. Republic of Kenya (2006), The Water Quality Regulations.



## CHAPTER TEN

### ANNEXES

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1. Evidence of Public Participation
2. Land Ownership Documents
3. Architectural Designs.
4. Site Layout plans
5. EIA Expert License.
6. Certificate of Incorporation
7. Hydrogeological survey report
8. Tax registration certificate

**MINUTES OF PUBLIC FORUM MEETING FOR THE AFRICALLA KENYA LIMITED  
DAM PROJECT HELD ON NOVEMBER, 2019 AT AFRICALLA FARM LIMITED,  
GILGIL**

**PRESENT**

See the attached list.

**AGENDA**

- 1) Introduction
- 2) Purpose of the meeting
- 3) Presentation
- 4) Discussion, concerns and address
- 5) Way forward
- 6) Closing remarks

**Minute 01: Introduction.**

The area local chief called the meeting to order at 11:30 A.M. After a word of prayer, there was a brief self-introduction of the team as well as the Africalla Kenya Limited and EIA consultants.

**Minute 02: Purpose of the meeting.**

The E.I.A Team explained that the purpose of the meeting was to inform the community about the project EIA so that they can identify key issues and provides them with an opportunity to raise additional issues or concerns on the proposed project

**Minute 03: Presentation on project description.**

The project team leader explained to the members present how the project would benefit them and also outlined the scope of his participation and his terms of reference. He welcomed the members of the community to be part of the development by contributing their views and feelings about it. He highlighted that the whole project would come with the following four components:

- Dam
- Irrigation of flower
- Catchment area conservation

It was emphasized that the project is very beneficial to the community since it will control perennial runoff caused by flash floods, increase employment opportunity through increased flower farming activities, reduce water losses through surface run off, as well as long term recharge of the aquifers.

**Minute 04: Presentation by the EIA consultants.**

The EIA team emphasized that the need to conduct a study was to establish possible areas where the local community could benefit on the project construction and operation phases while assessing possible positive and negative impacts. The EIA team emphasized on the importance of public participation at this stage of the project.

The following highlights were particularly reaffirmed:

- The local community would be completely involved in the study
- Explore the possible areas of community involvement in the project.
- Study will explore all possible impacts by the project
- The report shall present all mitigation measures for the impacts.

The consultant also pointed out some of the positive impacts from the project which includes employment opportunities for local community members, food security, and economic gains from agricultural investments mainly flower farming. He also pointed out to the community the negative impacts of the project that include possible relocation from their homes.

**Minute 05: Comments, Community Concerns and Address.**

Members of the community present thanked the EIA team for organizing the meeting prior to commencement of the project. They argued that the meeting provided an opportunity for them to interact with the organization and to understand their processes better. They further argued that they owed it to the future generation to ensure that activities within the environment are those that protect the needs of both the present and future generation.

Various members of the local community and stakeholders welcomed the intended project in that it would enhance the region economically and they as well identified the following project benefits:

- Increased water supply during drought for flower farming
- Employment opportunities for the locals during construction and operation phases
- Control perennial flash floods during the rainy seasons
- Preserve groundwater because they may not need to boreholes for water

- May assist neighbouring communities with water for livestock during rainy seasons
- Rainwater harvesting thus reduce losses due to surface runoffs.

The locals however raised some issues that required clarification on the following.

Concern	Response
1 Noise during Construction	Construction to be confined between 8 am and 5 pm during weekdays. They further recommended that all the construction materials to be well serviced to increase their efficiency and reduce instances of noise pollution
2 Improper dumping of wastes during construction	They informed the meeting that materials such as boulders from excavations maybe used to construct fortified walls of the dam. Materials that are not reusable to be disposed in NEMA accredited sites.
3 Increased Mosquito breeding sites and population	The proponent was advice to adhere to the Public Health Act and the <i>Malaria Prevention Act</i> to ensure that mosquitoes a breeding areas are significantly minimized.
4 Work related accidents	The proponent was advised to ensure that the contractors adhere to Health and Safety policies in order to minimize instances of work related accidents
5 Blasting of rocks may blast homes	Proper geodetic survey to be conducted at the proposed project sits to identify any fault line that may affect neighboring households.

**Minute 06: Way forward.**

The Africalla Kenya Limited team assured the community that they would involve them at all levels of the project and that they would document their concerns in the EIA report which would enable them to be addressed.

All community members in attendance agreed that the project is more beneficial to them for social and economic transformation through creation of sustainable livelihoods through increased flower

farming and thus a decision was made on a public consultation forum at the Africalla Kenya Limited premises to continue with the project implementation.

**Minute 07: Adjournment.**

There being no other business, the meeting was adjourned at 2:30 pm with a word.

*Compiled by:*

*EIA Consultant team*