ENVIRONMENTAL IMPACT ASSESSMENT PROJECT REPORTFOR THE PROPOSED FARM EXTENSION IN PRIMAROSA FLOWERS LTD.

THIS REPORT HAS BEEN PRODUCED IN ACCORDANCE WITH THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION (AMENDMENT) ACT, 2015 AND THE ENVIRONMENTAL IMPACT ASSESSMENT AND AUDIT REGULATIONS, 2003

BY

PAUL ONANA

NEMA Reg. No. 1853

NOVEMBER 2017

CERTIFICATION

This Environmental Impact Assessment Study was commissioned by the management of Primarosa Flowers Ltd. in fulfillment of requirements of the Environmental Management and Coordination (Amendment) Act, 2015 and all applicable rules.

Occupier:

…… …….

Name of Officer Designation

……

Signature / Date / Official Stamp

Lead Expert: PAUL ONANA License No. 1853

Signature / Date

……..

NEMA Acknowledgement:

…….. ……

Name of NEMA Officer Signature / Date / Stamp

This is to certify that the environmental experts hereunder as per the requirements of the National Environment Management Authority (NEMA) Kenya carried out an Environmental Impact Assessment (EIA) for the Proposed Project and declare that the information given herein is true to the best of our knowledge.

EIA/EA EXPERTS

Name of expert	Details	Signature
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PROPONENT

Name	Contact person and telephone	Signature
PRIMAROSA FLOWERS LTD	Mr. Momanyi	
	0722821195	

ABREVIATIONS

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
Ha	Hectares
KM	Kilo Meters
KPLC	Kenya Power and Lighting Company
NEAP	National Environmental Action Plan
NEMA	National Environmental Management Agency
PPE	Personal Protective Equipment
PR	Project Report
TBD	To Be Determined
TOR	Terms of Reference

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ACKNOWLEDGEMENT

We would like to acknowledge the management of Primarosa Flowers Ltd. for providing all the necessary support to facilitate the undertaking of this EIA of the proposed farm extension in Primarosa Flowers Ltd.

We also express our gratitude to the Company's Management and staff for their cooperation and responses during on-site assessment activities at the company and the immediate neighbors consulted for their candid and invaluable comments. This goes a long way in showing a high level of commitment by Primarosa Flowers Ltd. in protecting and maintaining a healthy and sustainable environment.

Table 1: PROPONENTS INFORMATION

Name	PRIMAROSA FLOWERS LTD.
Situation of Workplace	i. County: NYANDARUA ii. Town: OL JORO OROK
Contact Details	Postal Address: 255 Code: 20302 Town: OL JORO OROK
Type of Industry	FLORICULTURE
Date of the Assessment	19TH NOVEMBER 2017
Project	FARM EXTENSION

EXECUTIVE SUMMARY

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 two projects (Green house extension and Dam 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.

The project involves the construction of 2 Damswith a capacity of 70,000 M^3 and 55,000 $M^3$and 18 greenhouses of various dimensions as highlighted in the project drawings.Environmental experts who are registered by the National Environment Management Authority (NEMA) conducted the EIA study and prepared this report for approval by the same.

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 an 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.

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CHAPTER ONE

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 g 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 project 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 developmentswas 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.

1.4METHODOLOGY 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 Primarosa Flowers Ltd 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 greenhouse extension and dam construction project at Primarosa Flowers Ltd. The general trend was that consulted persons were made to understand that the consultants were not speaking on behalf of Primarosa Flowers Ltd., 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, 2006
- OSHA 2007
- Local Government Act
- Water Act

(b) Primarosa Flowers Ltd. EHS Policy which the farm is required to comply with.

CHAPTER TWO

2.0 POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK

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 Primarosa Flowers Ltdare;

- 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 Public Health Act (Cap. 242)
- 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, 2002 (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 meters 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.

2.1 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 andrelevant 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 PollutionControl 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.

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 monthsjail 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, 2002

The new Water Act (2002) 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.

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.

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 offense 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.

2.2 INTERNATIONAL OBLIGATIONS

Kenya is party to a number of Multi-Lateral Environmental Agreements (MEAs) on environmental protection. Primarosa Flowers Ltd 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)
- 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)

2.3 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 theprincipal 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

CHAPTER THREE

3.0 BASELINE INFORMATION OF THE STUDY AREA

3.1 PHYSICAL ENVIRONMENT

3.1.1 BIO-PHYSICAL ENVIRONMENT

Primarosa Flowers Ltd is located in Nyandarua County. Nyandarua County has a total land area of 3,304km$^{2.}$ The county borders Laikipia County to the north, Nyeri and Muranga counties to the east, Kiambu County to the south and Nakuru County to the west. Nyadarua county mainly lies in the Aberdares highland comprising the Kinangop plateau, Olkalou plateau and Olkalou salient. The Aberdare ranges run across Nyandarua County. Soil types in the county are red and volcanic origin and rich in organic matter.

Nyandarua County experiences two rainy seasons per year. The long rains are typical between March and May and the short rains between September and November. The annual average rainfall is about 800mm which supports agriculture. Agriculture is important in the county as it is the main occupation of the residents and crops of this region are delivered to the nearby urban centers like Nairobi, Nakuru, Gilgil and others.

The area has a hilly topography with altitudes around 2,400meters above sea level.

The area has subtropical highland climate which is influenced by its proximity to the equator and its altitude. Mean annual rainfall is around 980mm with rain falling throughout the year and peaks in April and July/August. Two major soil types are found in the area moderately well drained, dark reddish-brown luvisols and extremely deep well drained red to reddish-brown nitisol of loam to clay loams.

3.1.2 LOCATION

Primarosa Flowers Ltd is located in about 5 KM from OlJoroOrok town in Nyandarua County along Gilgil-Nyahururu road.

3.1.3 TOPOGRAPHY AND CLIMATIC CONDITIONS

Nyandarua county mainly consists of Kinangop plateau, Olkalou/Oljorok plateau and Olkalou/OlJorok salient. There are several year round rivers; the Malewa. The EwasoNyiro, the Pesi and lake OlBolossat which is the only large water mass in the county.

From the eastern wall of the county, the Aberdare ranges have a height of 3,999m above sea level. There are steep slopes that have undergone great transformations through weathering

creating shallow valleys and gorges. The ranges drop gradually in series of faults giving way to an escarpment that has been broken into sharp valleys occasionally by change in levels of the river courses.

3.1.4 DRAINAGE AND HYDROLOGY

The county has four major rivers; Persi, EwasoNyiro, Malewa and Turasha. Malewa flows from the Abraded ranges into Naivasha in the south. EwasoNyiro drains from Bahati escarpments through Oljorok to Laikipia. Turasha flows downwards to Laikipia.

Lake OlBolossat is the only natural water mass in the county. It is fed by streams and underground water seepage from the Aberdares and Donora hills. Human activities and clearing of catchment areas for settlement has affected its natural refilling system and its existence is threatened.

3.1.5 SOIL AND GEOLOGY

The soils in the county are volcanic in origin and vary in both fertility and distribution shallow soils are formed in hilly areas while deep well drained soils are found on the slopes and plateaus. The county falls in the highland savannah zone, characterized by few scattered trees with expansive grass cover. Most of the natural vegetation has been cleared giving way to manmade environmental hazards. There are four gazette forests which have both natural and planted strips.

3.1.6 SOCIO-ECONOMIC PROFILE

3.1.6.1 Population and human settlements

According to the county development plan (2002-2008) Nyandarua County has a population size of more than 529,844 people. Out of this 270,331 are females while 259,513 are males. Female/male ratio is 104:100. The total number of youth population (15-25) is 119,930. The county has a total labour force of 267,086 people, a dependency ratio of 100:107 and a population growth rate 0f 3.3%.

3.1.6.2 Settlement and patterns

The population density in Nyandarua has been increasing in the last 40years. The density was 52 per km2 in 1969. It increased to 69 persons per km2 in1979 and then to 102 and 145 persons in 1989 and 1999 respectively.

The current settlement patterns have historical origin from colonial times. Thee pattern is dichotomous in nature that is urban and rural with difference in both economic and spatial characteristics. The rural settlements are generally homogenous and engage in primary production with agriculture as the dominant economic activity. Urban settlements are heterogeneous, densely populated and engage in non-agriculture economic activities such as commerce and industry and also service delivery.

The settlement schemes in Nyandarua County were initiated in 1960's and 1970's. One of the factors that have had a major impact in settlement development in the county is the rapidly growing population without corresponding development of off-farm economic activities opportunities. Roads network also attracts a lot of settlements along the main highways and all weather roads.

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CHAPTER FOUR

4.0 PROJECT PROCESS AND IMPLEMENTATION

The farm extension project will involve construction of 18greenhouses and construction of a 2 damswhich will be constructed based on the applicable standards. Since a lot of water can be harvested from the greenhouses, the dams will be constructed to serve as reservoirs for the harvested water. The development will be done on an area of 27 Hectares.

The constructions will as well incorporate environmental guidelines as well as health and safety measures.

4.1 CONSTRUCTION ACTIVITIES AND INPUTS

The project inputs

- Construction raw materials

  These will include polyethylene paper, insect nets, metal rods, sand, cement, water pipes and impermeable plastic material for laying on the base of the dams. 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 of the dam.
- Disposal of the resulting debris/ waste materials.

- Electrical, civil, mechanical engineering and sanitary works: to be done by professionals.
- Excavation at the greenhouse construction site.
- Fixing of the metal bars, laying of the insect nets and the polyethylene paper.

4.2 PROJECT ALTERNATIVES CONSIDERED

4.2.1 ALTERNATIVES FOR THE GREEN HOUSES

The Proposed Project Alternative

Under this alternative, the project 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 comparisons of alternatives

Under the proposed project alternative, the development would provide a standard environment for the Primarosa Flowers Ltd 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.

4.2.2ALTERNATIVES FOR THE DAM

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 in which the project 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.

The comparisons of alternatives

Under the proposed project alternative, the development would provide a standard environment for the Primarosa FlowersLtd's 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 whole project cycle, 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.

4.3 Project Description

The proponent- Primarosa Flowers Ltd- is proposing to construct a 2 dams and 18 greenhousesin its compound.The area for the extension will cover an area of 27 Hectares.The greenhouses and the dams will be distributed in the area as highlighted in the figure below.

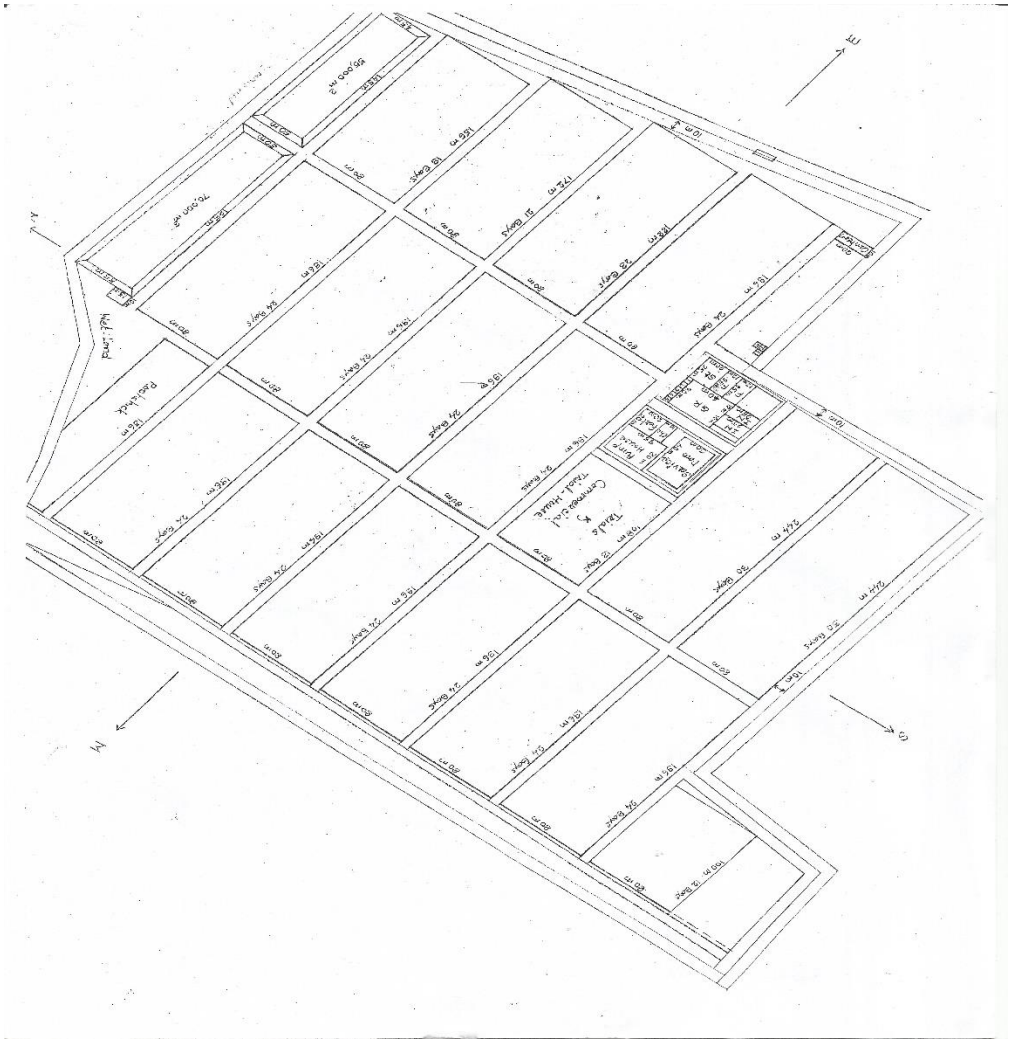


Figure1. Project Drawings

4.4 The Proposed Location of the Project

The proposed location of the two projects is within the Primarosa Flowers Ltd vicinity. The portion of land to be developed measures approximately 27 Ha. The land is leased by Primarosa flowers Ltd. The lease agreement is as annexed. The area is covered with grass and small bushes. The fauna observed on site were insects and birds. Hence, no major flora and fauna will be affected by the project activities. The type of soil is volcanic soil. Drainage issues and soil conservation will therefore be highly addressed during the planning and design of the proposed project.

CHAPTER 5

PROJECT DESIGNS

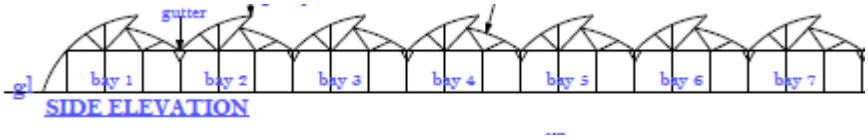
5.1Project design considerations for the green house

5.1.1General considerations

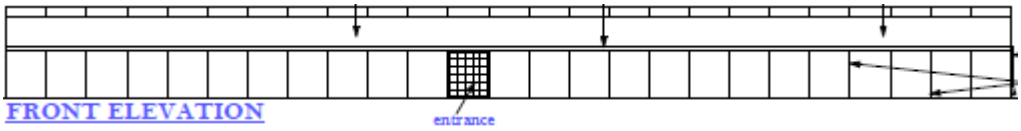
In the realization of the designs for the proposed project, the following was considered:

1. Erection of the permanent structures in relation to the approved plans, and in respect to the pre-existing drainage systems
2. Construction of proper drainage systems i.e. gutters, surface run-off and storm water channels/drains.
3. During the operation phase there will be adequate sanitary facilities to assist in the liquid waste management.

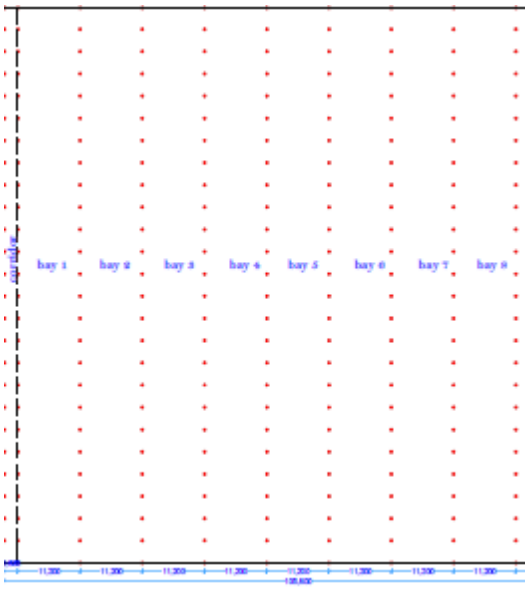
Figure 2: Layout plan of the area to be developed



Side elevation of the green houses.



Front elevation of the green houses.



Floor plan of the Green hoses.

5.1.2Technologies used in production of Roses

The flower to be grown will be roses. The firm will utilize the following technologies in production of their flowers that includes drip irrigation, fertigation system, greenhouse ventilation systems, net shading, pre-cooling, cold storage facilities, grading, banqueting, fertilizer recycling system, artificial lighting to increase day length, grading/packaging sheds and refrigerated trucks.

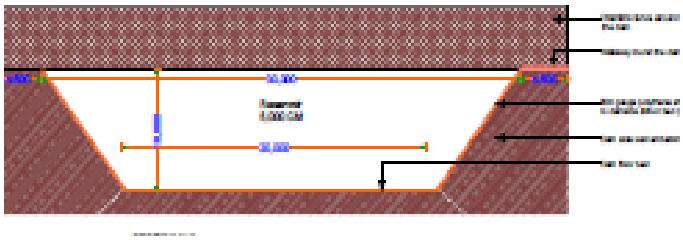
5.1.3 Project requirements during the construction phase.

Staff amenities

The project proponent shall be required to construct a site office, site toilets, and worker's changing room for the convenience and hygiene of people on site.

5.2 CONSTRUCTED DAM DESIGN

5.2.1 Dam



Design of the Dam

Project design considerations for the dam

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

5.3 Impact Assessment Project Report

"Environmental impact assessment" means a systematic examination conducted to determine whether or not a programme, activity or project will have any adverse impacts on the environment;

"Project report" means a summary statement of the likely environmental effect of a proposed development referred to in section 58;

"Proponent" means a person proposing or executing a project, programme or an undertaking specified in the Second Schedule;

5.4Part VI – environmental impact assessment

58.(1) Notwithstanding any approval, permit or license granted under this Act or any other law in force in Kenya, any person, being a proponent of a project, shall, before financing, commencing, proceeding with, carried out, executing or conducting or causing to be financed, commenced, proceeded with, carried out, executed or conducted by another person any undertaking specified in the Second Schedule to this Act, submit a project report to the Authority, in the prescribed form, giving the prescribed information and which shall be accompanied by the prescribed fee.

- The proponent of a project shall undertake or cause to be undertaken at his own expense and environmental impact assessment study and prepare a report thereof where the Authority, being satisfied, after studying the project report submitted under subsection (1), that the intended project may or is likely to have or will have a significant impact on the environment, so directs.
- The environmental impact assessment study report prepared under this subsection shall be submitted to the Authority in the prescribed form, giving the prescribed information and shall be accompanied by the prescribed fee.
- The Minister may, on the advice of the Authority given after consultation with the relevant lead agencies, amend the Second Schedule to this Act by notice in the Gazette.
- Environmental Impact Assessment studies and reports required under this Act shall be conducted or prepared respectively by individual experts or a firm of experts authorized in that behalf by the Authority. The Authority shall maintain a register of all individual experts or firms of all experts duly authorized by it to conduct or prepare environmental impact assessment studies and reports respectively. The register shall be a public document and may be inspected at reasonable hours by any person on the payment of a prescribed fee.
- The Director-General may, in consultation with the Standards Enforcement and Review Committee, approve any application by an expert wishing to be authorized to undertake Environmental Impact Assessment. Such application shall be made in the prescribed manner and accompanied by any fees that may be required.

- Environmental impact assessment shall be conducted in accordance with the environmental impact assessment regulations, guidelines and procedures issued under this Act.
- The Director-General shall respond to the applications for environmental impact assessment license within six months.
- Any person who upon submitting his application does not receive any communication from the Director-General within the stipulated time may within nine months of such submission start his undertaking.

59.(1) Upon receipt of an environmental impact assessment study report from any proponent under section 58(2), the Authority shall cause to be published in each of two successive weeks in the Gazette and newspaper circulating in the area or proposed area of the project once at least in each of two successive weeks in some one and the same a notice which shall state: -

- A summary description of the project;
- the place where the project is to be carried out;
- the place where the environmental impact assessment study, evaluation or review report may be inspected; and
- a time limit of not exceeding ninety days for the submission of oral or written comments by any member of the public on the environmental impact assessment study, evaluation or review report.

(2) The Authority may, on application by any person extend the period stipulated in sub-paragraph (d) so as to afford reasonable opportunity for such person to submit oral or written comments on the environmental impact assessment report.

5.5Site Location

*Plate 1:*Proposed site for the Project

CHAPTER SIX

6.0 PUBLIC CONSULTATION

This was carried out to gather the opinion of the neighbors and relevant stakeholders concerning the proposed projects at Primarosa Flowers Ltd. The general trend was that consulted persons were made to understand that the consultants were not speaking on behalf of Primarosa Flowers Ltd., but that the meeting was part of the data gathering process for an EIA study.

Considering the benefits that neighbors have got from the flower farm, more than 95% of the respondents were in favor of the proposed project. Most people in the area are employed in Primarosa Flowers Ltd and have benefited from different projects by the farm such as the road connecting the farm to the Ol Joro Orok-Nyahururu road. The consultation was done through administering of questionnaires to the residents around the farm 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.
- Reuse 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.
- Health and safety issues of the workers during all the stages.
- Pollution of the nearby river.
- 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.

However, it was made clear that mitigation measures would be proposed to deal with all the negative issues identified.

CHAPTER SEVEN

7.0 DESCRIPTION OF ANTICIPATED IMPACTS AND MITIGATION MEASURES

POTENTIAL IMPACTS FROM THE GREEN HOUSE PROJECT

This Section identifies both positive and negative impacts associated with the proposed project. These impacts are hereby identified at three distinct phases of the project i.e. - Construction Phase, Operation Phase and Decommissioning Phase.

7.1 Construction Phase

7.1.1Positive 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.

7.1.2 NEGATIVE IMPACTS

Waste Generation

During the construction of the greenhouses different kinds of waste will be generated. Such as metal cuttings, polyethylene paper wastes, insect net wastes and soil among others. This will require a proper waste management system in order to minimize the impact of the waste on the environment.

Mitigation

Solid waste generation

- Provide solid waste handling facilities such as waste bins.
- Ensure that solid waste generated is regularly disposed of appropriately at authorized dumping sites.

- Ensure that the waste is managed efficiently through recycling, reuse and proper disposal procedures.

Loss of Biodiversity

To create space for the construction of the green houses, grass and trees will be cleared. This will affect the environment negatively since most organisms will lose their habitats. These include, insects, birds etc.

Mitigation.

After the construction activities, re vegetating of the area should be done. However, most of the trees that will be cut are Eucalyptus trees and this will be an advantage since the tree species takes a lot of water.

Increased energy Demand

During the construction Phase of the project, Electricity will be used for welding, metal cutting/grinding and provision of light. Diesel will run material transport vehicles and building equipment/machinery.

Mitigation Measures

- Minimize energy consumption by switching off electrical equipment, appliances and lights when not being used.
- Monitor energy use during the construction of the project and set targets for efficient energy use.

Health and safety impacts

Minimization of health and safety impacts by implement all necessary measures to ensure health and safety of the workers and the general public during construction of the project as stipulated in OSHA, 2007.

Mitigation Measures

- Implement all necessary measures to ensure health and safety of the workers and the general public during construction phase as stipulated in OSHA, 2007.
- PPEs should be provided.
- First Aid boxes be provided and trained first aiders be available in case of an accident.
- Have a general register for recording of accidents and incidents.

General safety and security of the premises and surrounding areas

Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises.

Mitigation Measures

Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises.

Oil spills and leaks-these are prevalent in such construction activities and in areas where petroleum products are used. Such products contain damaging elements to the environment since they contain traces of heavy metals such as lead and mercury among others.

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.

Exhaust fumes -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.

Dust emission- Particulate matter pollution is likely to occur during the site clearance, excavation and loading and transportation of the construction waste. . The proposed project site is rural and contained within land occupied by the applicant. For these reasons there is NO risk of dust nuisance from this project and NO special dust control measures are needed on site.

Mitigation Measure

- Workers need to be in their respective PPEs during working hours.
- Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles.
- Avoid excavation works during extremely dry weather if possible.

Noise Production and Control – main items of equipment in the proposed project that could give rise to the generation of noise; excavating machine, welding appliances and vehicles transporting the building materials. The drive systems will produce noise typical of electric motors and gears, which, due to its frequency content is easily attenuated by ~ 30dB by a typical acoustic enclosure. The proposed project site is contained within land occupied by the applicant so the risk of attenuated noise nuisance at the site boundary is LOW. If noise levels at the site boundary are measured as being unacceptable typical acoustic enclosures could be fitted to the offending stirrer(s) to achieve acceptable noise levels.

7.2 OPERATIONAL PHASE

7.2.1 Positive Impacts

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.
- Increase in the government revenue.
- Reuse of water resources for irrigation.

7.2.2 NEGATIVE IMPACTS

Water Consumption

The completed greenhouses will lead to an increase in water demand to be used for irrigating the horticultural plants. Water will be needed for the regular watering, mixing of chemicals, cleaning and consumption by employees working in the greenhouses.

Mitigation:

Minimize water consumption and ensure more efficient and safe water use

- Promptly detect and repair water pipe and tank leaks
- Ensure taps are not running when not in use
- Install water conserving taps that turn-off automatically when water is not being used.
- Install a discharge meter at water outlets to determine and monitor total water usage.
- The workers in the greenhouses need be sensitized to use water efficiently.

Waste Management

During the operation of the greenhouses different kinds of waste will be generated. This will mainly include organic waste from the plant remains and chemical waste through the spraying of the plants. This will require a proper waste management system in order to minimize the impact of the waste on the environment.

Mitigation

Solid waste generation

- Provide solid waste handling facilities such as waste bins
- Ensure that solid waste generated in the greenhouses is regularly disposed of appropriately at authorized dumping sites.
- Ensure that the waste is managed efficiently through recycling, reuse and proper disposal procedures

Minimize risks of sewage release into environment

- Conduct regular inspections for drainage pipe blockages or damages and fix appropriately
- Ensure regular monitoring of the sewage discharged from the project to ensure that the stipulated sewage/effluent discharge rules and standards are not violated

- Incorporation of collective liquid waste management. The project is designed such that there will be provision of a designated spot for the waste water which is well protected from rain and animals. This wastes will thus be channeled to the dam through drainage channel from the site in bulk and as one unit such that the careless disposal and hence proliferation of wastes within the surrounding areas will be curbed.

Increased energy Demand

During the operational Phase of the project, more energy will be needed more especially for lighting. As a result, the company will have to pay more electricity bills.

Mitigation Measures

- Minimize energy consumption by switching off electrical equipment, appliances and lights when not being used.
- Monitor energy use during the operation of the project and set targets for efficient energy use.
- Investing in solar energy as an environmental best practice so that the company saves on electricity bills.

Pollution

Activities such as adding of fertilizers and pest and weed control will lead to pollution of the soil, Water bodies that are nearby and ground water.

Mitigation Measures

- Polyculture. Research has proved that, growing different kinds of plants in one piece of land reduces the susceptibility of pests and herbs. For instance, Planting of different varieties of flowers or herbs will see to it that less chemicals are used for pest or weed control.
- Crop rotation
- Introduction of Biological pest control, such as Pheromones. Entomopathogenic fungi. Bacteria and viruses. The release of other organisms, such as natural pest predators and parasites. Genetic engineering practices, such as insect breeding interference.

- Introduction of trap crops, which attract pests away from the valuable crops(Flowers and Herbs)
- Organic farming such as use of manure is highly encouraged to reduce chances of soil contamination.

Minimization of health and safety impacts by implement all necessary measures to ensure health and safety of the workers and the general public during operation of the project as stipulated in OSHA, 2007.

Mitigation Measures

Implement all necessary measures to ensure health and safety of the workers and the general public during operation of the project as stipulated in OSHA, 2007.

General safety and security of the premises and surrounding areas

Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises.

Mitigation Measures

Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises.

7.3 DECOMMISSIONING PHASE

7.3.1 Positive impacts

Rehabilitation

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

Employment Opportunities

For demolition to take place properly and in good time, several people will be involved. As a result, several employment opportunities will be created for the demolition staff during the demolition phase of the proposed project.

Revenue Generation

Useful materials such as metal frames can be recovered and sold thereby generating revenue. The materials can also be reused in other projects and as a result saving on the cost that would otherwise be used to purchase these materials.

7.3.2 Negative Impacts

Noise and Vibration

The demolition 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 demolishing the proposed project.

Mitigation Measures

- Such noise emissions should be minimized as much as possible from the source point while workers should be provided with appropriate personal protective wear especially if the levels exceed 85dB for a continuous eight hours exposure.
- Ensure that machines are switched off when not in use.

Solid Waste Generation

Demolition of the building and related infrastructure will result in large quantities of solid waste. The waste will contain the materials used in construction including concrete, metal, drywall, wood, etc. Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment.

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 demolition works. This will affect demolition staff as well as the neighboring residents.

Mitigation Measure

- Workers need to be in their respective PPEs during working hours.
- Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles.
- Avoid excavation works during extremely dry weather if possible.

CHAPTER EIGHT

8.0 DESCRIPTION OF ANTICIPATED IMPACTS AND MITIGATION MEASURES

POTENTIAL IMPACTS FROM THE DAM PROJECT

This Section identifies both positive and negative impacts associated with the proposed project. These impacts are hereby identified at three distinct phases of the project i.e. - Construction Phase, Operation Phase and Decommissioning Phase.

8.1 CONSTRUCTION PHASE

8.1.1Positive 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.
- Rain water harvesting for irrigation.

8.1.2 Negative Impacts

8.1.2.1 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.

Mitigation Measures

- Workers should be provided with full personal protective equipment (PPE) to beef up their health and safety standards.
- 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.

8.1.2.2 Generation of Waste

During excavation, a lot of soil will be excavated. Some of the excavation material will be rendered unusable and thus will have to be disposed of. This also applies to some of the soil/rocks which may not be reusable after excavation processes are complete. All these materials need to be collected, transported and disposed of appropriately in approved designated areas. It is encouraged that other alternative uses of these materials should be found.

MitigationMeasures

- The soil generated will be used to level the area of land around the dam as well as landscaping some areas in the farm.
- Waste bins need to be provided for collection of wastes such as cement packaging bags.

8.1.2.3Noise pollution

The construction works on site will most likely have noise emission due to the moving machines and other normal construction activities. This may prove to be a potential source of disturbance to the surrounding neighbors and a health hazard to the workers themselves.

Mitigation Measures

- Such noise emissions should be minimized as much as possible from the source point while workers should be provided with appropriate personal protective wear especially if the levels exceed 85dB for a continuous eight hours exposure.
- Ensure that machines are switched off when not in use.

8.1.2.4 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.

8.1.2.5 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 if the dam to ensure storm water does not enter the excavated area in case of rain

8.1.2.6 Dust emissions

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

Mitigation Measure

- Workers need to be in their respective PPEs during working hours.
- Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles.
- Avoid excavation works during extremely dry weather if possible.

8.1.2.7Oil leaks and spills

These are prevalent in such construction activities and in areas where petroleum products are used. Such products contain detrimental elements to the environment since they contain traces of heavy metals such as lead, mercury and sulphur among others.

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.

8.1.2.8 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

8.1.2.9 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 reduce the conflict that may arise such as pressure on soil.
- Sprinkle water in the specific routes to reduce erosion and air pollution.

8.1.2.10 Impacts on Flora and Fauna

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

8.2 OPERATIONAL PHASE

8.2.1Positive Impacts

- Employment opportunities.
- Increased production for the company due to availability of more water for irrigation.
- Opportunity for fish farming.

8.2.3Negative Impacts and Mitigation Measures

8.2.3.4 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.

8.2.3.5 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.

8.2.3.6 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.

8.2.3.7 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.
- Have floaters available in case of accidental entry into the dam

8.2.3.8 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.

8.2.3.9 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.

8.2.3.10 Siltation

When it rains the run-off will contain particles of soil etc. 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.

8.2.3.11 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. However once the dam is full and the excess water is released, it should be collected at a common point to be tested before being released to the immediate environment. If the water will be found to contain such parameters such as pH, color, odour, suspended solids etc that are not up to required standards, it should be treated before release.

8.3 DECOMMISSIONING PHASE

At the end of the design life, the dam shall be decommissioned and abandoned. A comprehensive plan shall be prepared for the restoration and subsequent protection of the land.

8.3.1 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.

8.3.2 Negative Impacts and Mitigation Measures

8.3.2.1 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.

8.3.2.2 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.

8.3.2.3 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 respirators to counter the effect of dust.

CHAPTER NINE

9.0 ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS

TABLE 3: ENVIRONNMENTALMANAGEMENT PLAN DURING CONSTRUCTION OF THE DAMS

Expected Negative Impacts	Mitigation Measure	Responsibility	Time Frame	Cost
Health and Safetyof Workers	• Workers should be provided with full personal protective equipment (PPE) to beef up their health and safety standards.	Contractor/ Primarosa Flowers Limited's Management	Throughout the Construction Period	5,000
	• 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.	Contractor/ Primarosa Flowers Limited's Management	Throughout the Construction Period	5,000
	• The area should be fenced off to keep away unwanted persons.	Contractor/ Primarosa Flowers Limited's Management	Throughout the Construction Period	20,000
Generation of Waste	• The soil generated will be used to level the area of land around the dam as well as landscaping some areas in the farm. • Waste bins need to be provided for collection of wastes such as cement packaging bags.	Contractor/ Primarosa Flowers Limited's Management Contractor/ Primarosa Flowers Limited's Management	Throughout the Construction Period One-off	None

Noise Pollution	• 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.	Contractor/ Primarosa Flowers Limited's Management	Throughout the Construction Period	None
	• Ensure that machines are switched off when not in use.	Contractor/ Primarosa Flowers Limited's Management	Throughout the Construction Period	None
Generation of exhaust emissions	• Proper and prompt maintenance of construction plants and equipment to control emission of hazardous fumes and noise emanating from machines.	Contractor/ Primarosa Flowers Limited's Management	Throughout the Construction Period	5,000 per Month
	• Ensure that machines are switched off when not in use.	Contractor/ Primarosa Flowers Limited's Management		None
Storm water	• Drainage channels should be dug on the area lying on the upper side if the dam to ensure storm water does not enter the excavated area in case of rain	Civil Engineer Mechanical engineer and Primarosa Flowers Limited's Management	2 Months	5,000

Dust emissions	• Workers need to be in their respective PPEs during working hours.	Contractor/ Primarosa Flowers Limited's Management	2 Months	TBD
	• Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles.	Contractor/ Primarosa Flowers Limited's Management	Throughout the Construction Period	2,000 per Month
	• Avoid excavation works during extremely dry weather if possible.	Contractor/ Primarosa Flowers Limited's Management	Throughout the Construction Period	None
Oil spills and Leaks	• Machines that utilize oil and petroleum products should be adequately serviced to ensure they do not leak.	Contractor/ Primarosa Flowers Limited's Management	Throughout the Construction Period	5,000 per month
	• In case of any leak the affected soil should be collected and burned to get rid of the waste.	Contractor/ Primarosa Flowers Limited's Management		None
Enhanced erosion / changes in topography due excavation.	• Have soil erosion prevention mechanisms in place, such as compaction of soilon the base of the reservoir and its embankment to reduce chances of erosion.	Contractor/ Primarosa Flowers Limited's Management	1 Month	None
Increased pressure on infrastructure	• Have designated routes for vehicles and human in the site to avoid the conflict that is likely to arise.	Contractor/ Primarosa Flowers Limited's Management	1 Month	None

TABLE 4: ENVIRONNMENTAL MANAGEMENT PLAN DURING OPERATION OF THE DAMS

Expected Negative Impacts	Mitigation Measure	Responsibility	Time Frame	Cost
Breeding Site for Mosquitoes	• Monitor and control the possible creation of mosquito breeding site.	Primarosa Flowers Limited's Management	Throughout the operation Period	TBD
Accumulation of Aerobic and Anaerobic Waste.	• Ensure no wastes enter the dam especially due to run-off by having a point to sieve all incoming wastes.	Primarosa Flowers Limited's Management	Throughout the operation Period	TBD
	• Wastes that find their way in the dam should be removed.	Primarosa Flowers Limited's Management	Continuous	TBD
Soil Erosion	• Ensure that the dam has a spillway/Outlet to drain excess water especially during rain seasons so that the embankment is not tempered with as well as the immediate environment.	Primarosa Flowers Limited's Management	2 Months	None
Risk of Drowning	• Fencing off the dam to ensure it is only accessible to the required personnel.	Primarosa Flowers Limited's Management	2 Months	50,000
	• Put warning signs (written in English and Kiswahili languages) at strategic sites. • Have floaters near the area.	Primarosa Flowers Limited's Management. Primarosa Flowers Limited's	One-Off Throughout the operation Period	None TBD

		Management		
Opportunistic growth of aquatic macrophytes.	• Monitor for any unusual floral species.	Primarosa Flowers Limited's Management	Throughout the operation Period	None
	• Remove such species when seen.	Primarosa Flowers Limited's Management	Throughout the operation Period	None
Increased pressure on infrastructure	• Have designated routes for vehicles and human in the site to avoid the conflict that is likely to arise.	Primarosa Flowers Limited's Management	2 Months	None
Health and Safety of workers	• Workers should be provided with full personal protective equipment (PPE) to beef up their health and safety standards.	Primarosa Flowers Limited's Management	Throughout the operation Period	TBD
	• 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.	Primarosa Flowers Limited's Management	Throughout the operation Period	2,000
Siltation	• The drains leading to the direction of the dam are cemented so that no soil is carried with it.	The Civil Engineer and Primarosa Flowers Limited's Management.		TBD

	• Soil that would be deposited in the dam should be removed.	Primarosa Flowers Limited's Management.	Continuous	TBD
Impacts on Hydrology	• Have a common point to collect excess water from the dam so that it is tested and treated before being released to the river	Primarosa Flowers Limited's Management.	Throughout the operation Period	TBD

TABLE 5: ENVIRONNMENTAL MANAGEMENT PLAN DURING DECCOMMISSIONING OF THE DAMS.

Expected Negative Impacts	Mitigation Measure	Responsibility	Time Frame	Cost
Noise and Vibration	• Ensure the workers are in their PPEs to reduce effects of noise to their health.	Contractor/Primarosa Flowers Limited's Management	Continuous	TBD
	• Switch of Machines when not in use.	Contractor/Primarosa Flowers Limited's Management	Continuous	None
Solid Waste Generation	• Waste that will be recovered need to be reused since it will comprise of plastic and metal waste from the fencing wire.	Contractor/Primarosa Flowers Limited's Management	One-off	None
Dust	• The workers should be provided with respirators to counter the effect of dust.	Contractor/Primarosa Flowers Limited's Management	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/Primarosa Flowers Limited's Management	Throughout the Cycle	TBD
	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.	Contractor/ Primarosa Flowers Limited's Management	Throughout the Cycle	
Rehabilitation of the project site.	Implement an appropriate re-vegetation programme to restore the site to its original status	Contractor/Primarosa Flowers Limited's Management		TBD

	and Consider use of indigenous plant species in re-vegetation			
	Trees should be planted at suitable locations so as to interrupt slight lines (screen planting), between the adjacent residential area and the development.	Contractor/Primarosa Flowers Limited's Management		TBD

CHAPTER TEN

10.0 ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS

TABLE 6: ENVIRONNMENTAL MANAGEMENT PLAN DURING CONSTRUCTION OF THE GREEN HOUSES

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Minimize extraction site impacts and ensure efficient use of raw materials in construction				
High demand of raw materials	1. Source building materials from local suppliers who use environmentally friendly processes in their operations.	Proponent & Contractor	Throughout construction period	TBD
	2. Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered.	Proponent & Contractor	Throughout construction period	TBD
	3. Ensure that damage or loss of materials at the construction site is kept minimal through proper storage.	Proponent & Contractor	Throughout construction period	None
	4. Use at least 5%-10% recycled, refurbished or salvaged materials to reduce the use of raw materials and divert material from landfills	Proponent & Contractor	Throughout construction period	None
2. Reduce storm-water, runoff and soil erosion				

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Increased storm water, runoff and soil erosion	1. Surface runoff and roof water shall be channeled into storm water drains.	The Civil Engineer, Mechanical Engineer and Proponent	2 months	None
3. Minimize solid waste generation and ensure efficient solid waste management during construction				
Solid waste	1. Through accurate estimation of the sizes and quantities of materials required, order materials in the sizes and quantities they will be needed, rather than cutting them to size, or having large quantities of residual materials.	Proponent & Contractor	One-off	None
	2. Ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed of.	Proponent & Contractor	One-off	None
	3. Ensure that damaged or wasted construction materials including doors, plumbing and lighting fixtures will be recovered for refurbishing and use in other projects	Proponent & Contractor	One-off	None

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	4. Donate recyclable/reusable or residual materials to local community groups, institutions and individual local residents or home owners.	Proponent & Contractor	One-off	None
	5. Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time	Proponent & Contractor	Throughout construction period	None
	6.Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements	Proponent & Contractor	One-off	4,000
	7. Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste	Proponent & Contractor	Throughout construction period	None
4. Reduce dust emissions				
Dust emission	1. Ensure strict enforcement of on-site speed limit regulations	Proponent & Contractor	Throughout construction period	None
	2. Avoid excavation works in extremely dry weathers if possible	Proponent & Contractor	Throughout construction period	6,000 per month

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	3. Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles	Proponent & Contractor	Throughout construction period	
	4. Personal Protective equipment to be worn	Proponent	Throughout construction period	
	5.construction materials on site to be covered to prevent to be blown off by wind	Contractor	Throughout construction period	
5. Minimization of exhaust emissions				
Exhaust emission	1. Vehicle idling time shall be minimized	Proponent & Contractor	Throughout construction period	None
	2. Alternatively fuelled construction equipment shall be used where feasible equipment shall be properly tuned and maintained	Proponent & Contractor	Throughout construction period	None
	3. Sensitize truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, and to switch off or keep vehicle engines at these points	Proponent & Contractor	Throughout construction period	None

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
6. Minimization of Noise and Vibration				
Noise and vibration	1. Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Proponent & Contractor	Throughout construction period	None
	2. Sensitize construction drivers to avoid gunning of vehicle engines or unnecessary hooting	Proponent & Contractor	Throughout construction period	None
	3. Ensure that construction machinery are kept in good condition to reduce noise generation	Proponent & Contractor	Throughout construction period	None
	4. Ensure that all generators and heavy duty equipment are insulated or placed in enclosures to minimize ambient noise levels.	Proponent & Contractor	Throughout construction period	1,000
7. Minimization of Energy Consumption				
Increased energy consumption	1.Ensure electrical equipment, appliances and lights are switched off when not being used	Proponent & Contractor	Throughout construction period	None

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	2. Install energy saving fluorescent tubes at all lighting points instead of bulbs which consume higher electric energy	Proponent & Contractor	Throughout construction period	4,000
8. Minimize water consumption and ensure more efficient and safe water use				
High Water Demand	1. Promptly detect and repair of water pipe and tank leaks	Proponent	Continuous	1,000/monthly
	2. Ensure taps are not running when not in use	Proponent	Continuous	None
	3. Install a discharge meter at water outlets to determine and monitor total water usage	Proponent	One-off	1,000
	4.proper recycling of water from other uses for sprinkling dusty pavements	Contractor	Continuous	None
9. Minimize occupational health and safety risks				
	▪ Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises.	Proponent	Continuous	20,000

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	▪ Construction of a perimeter wall around the project area	Contractor	On commencement	40,000
Personal Protective Gear (PPG)	• Suitable overalls, safety footwear, dust masks, gas masks, respirators, gloves, ear protection equipment etc should be made available and construction personnel must be trained to use the equipment	Proponent & Contractor	Once off	20,000
Health and safety impacts	• Implement all necessary measures to ensure health and safety of workers and the general public during operation of the project as stipulated in OSHA, 2007	Proponent	Continuous	None
First Aid	• Well stocked first aid box which is easily available and accessible should be provided within the premises	Proponent & Contractor	One-off	5,000
	• Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body.	Proponent & Contractor	One-off	10,000
	• Have a General Register to record any accidents or Incidents.	Proponent & Contractor	One-off	None
Fire protection	• Firefighting equipment such as fire extinguishers should be provided at strategic locations such as stores and construction areas.	Proponent & Contractor	One-off	20,000

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	• Regular inspection and servicing of the equipment must be undertaken by a reputable service provider and records of such inspections maintained	Proponent & Contractor	Every 3 months	10,000
	• Fire escape routes and assembly point to be marked	Proponent & Contactor	Continuous	5, 000
	• Signs such as "NO SMOKING" must be prominently displayed within the premises, especially in parts where inflammable materials are stored	Proponent & Contractor	One-off	2,000
Oil Wastes	• Proper handling, storage and disposal of lubricant containers and such other wastes • Maintenance of construction vehicles should be carried out in the contractors' yard. • Maintain plant and equipment to avoid leaks.	Contractor	Continuous	40,000

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TABLE 7: ENVIRONMENTAL MANAGEMENT PLAN FOR THE OPERATION OF GREEN HOUSES

Expected Negative impact	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Minimization of solid waste generation and ensuring more efficient solid waste management				
Solid waste generation	1. Provide solid waste handling facilities such as waste bins.	Proponent/Tenants	One-off	2,000
	2. Ensure that solid waste generated in the greenhouses is regularly disposed of appropriately at authorized dumping sites.	Proponent/Tenants	Continuous	4,000/month
	3. Ensure that the waste is managed efficiently through recycling, reuse and proper disposal procedures.	Proponent/Tenants	Continuous	None
2. Minimize risks of sewage release into environment				
Sewage disposal	1. Conduct regular inspections for drainage pipe blockages or damages and fix appropriately	Proponent & Contractor	Continuous	500 per inspection

Expected Negative impact	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	2. Ensure regular monitoring of the sewage discharged from the project to ensure that the stipulated sewage/effluent discharge rules and standards are not violated	Proponent/Tenants	Continuous	500/parameter
3. Minimize energy consumption				
Energy Resource Utilization	1. Switch off electrical equipment, appliances and lights when not being used	Proponent/Tenants	Continuous	None
	2. Monitor energy use during the operation of the project and set targets for efficient energy use	Proponent/Tenants	Continuous	2,000/month
4. Minimize water consumption and ensure more efficient and safe water use				
Water consumption	1. Promptly detect and repair water pipe and tank leaks	Proponent	Continuous	1,000/month
	3. Ensure taps are not running when not in use	Proponent	Continuous	None
	4. Install water conserving taps that turn-off automatically when water is not being used	Proponent	One-off	10-40 % higher than ordinary taps

Expected Negative impact	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	5. Install a discharge meter at water outlets to determine and monitor total water usage	Proponent	One-off	2,000
5. Minimization of health and safety impacts				
1. Implement all necessary measures to ensure health and safety of the workers and the general public during operation of the project as stipulated in OSHA, 2007		Proponent/Tenants	Continuous	None
6. Ensure the general safety and security of the premises and surrounding areas				
1. Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises.		Proponent/Tenants	Continuous	10,000/month
7. Ensure no over use of Chemical fertilizers and Pesticides				
The use of Biological Pest control and Manure is highly encouraged to reduce chances of soil contamination		Proponent	Continous	TBD

TABLE 8: ENVIRONNMENTALMANAGEMENT PLAN DURING DECCOMMISSIONING OF THE GREENHOUSES

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Primarosa Flowers Ltd	Responsible Party	Time Frame	Cost (Ksh)
1. Demolition waste management			
1. All buildings, machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible	Contractor, Proponent	One-off	TBD
2. All foundations must be removed and recycled, reused or disposed of at a licensed disposal site	Contractor, Proponent	One-off	TBD
3. Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site	Contractor, Proponent	One-off	TBD

4. Donate reusable demolition waste to charitable organizations, individuals and institutions	Contractor, Proponent	One-off	None
2. Rehabilitation of project site			
1. Implement an appropriate re-vegetation programme to restore the site to its original status	Contractor, Proponent	One-off	TBD
2. Consider use of indigenous plant species in re-vegetation	Contractor, Proponent	One-off	TBD
3. Trees should be planted at suitable locations so as to interrupt slight lines (screen planting), between the adjacent residential area and the development.	Contractor, Proponent	Once-off	TBD

CHAPTER ELEVEN

11.0 RECOMMENDATION AND CONCLUSION

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 positiveand 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.

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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.

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CHAPTER TWELVE

12.0 REFERENCES

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 of
10. Primarosa Flowers Ltd. - policies and documents relating to safety, health and environment.

ANNEXES

1. Evidence of Public Participation
2. Land Ownership Documents
4. Site Layout plans
5. Project Designs
6. EIA Expert License.
7. Certificate of Workplace Registration

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