ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED CONSTRUCTION OF RESIDENTIAL APARTMENTS ON PLOT L.R NO. 330/279 ALONG KINGARA ROAD, LAVINGTON AREA, NAIROBI COUNTY

Proposed Construction Site

This Environmental Impact Assessment (EIA) Project Report is submitted to Kenya National Environmental Management Authority (NEMA) in conformity with the requirements of the Environmental Management and Coordination Act, 1999 and the Environmental (Impact Assessment and Audit Regulations, 2003).

PROPONENT

NEWCOURT COMPANY LIMITED

P.O. BOX 37656- 00100,

NAIROBI.

JULY 2017

DOCUMENT AUTHENTICATION

This Environmental Impact Assessment project report has been prepared by Elizabeth W. Mutua (NEMA Expert Reg No. 8731) in accordance with the Environmental Management and Coordination Act (EMCA) 1999 and the Environmental (Impact Assessment) and Audit regulations 2003 which requires that every development project must have an EIA report prepared for submission to the National Environmental Management Authority (NEMA). We the undersigned, certify that the particulars in this report are correct and righteous to the best of our knowledge.

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Signature……Date…..……...……

PROPONENT:

NEWCOURT COMPANY LIMITED
P.O. BOX 37656- 00100,
NAIROBI.

NAME: …….

POSITION:…….

Signature…….……Date……..……

EXECUTIVE SUMMARY

The registered owners of **PLOT L.R. NO. 330/279 (Newcourt Company Limited)** that is **situated** along Kingara road approximately 100 meters from Mbaazi avenue junction intends to develop a twelve storied residential apartment with all attendant facilities such as parking and driveways. The change of use has been approved at the Nairobi City County offices.

Currently the rate of urbanization and population growth worldwide is increasing fast and with it also comes the increased demand for evangelistic nourishment and spiritual well-being for this ever swelling population, especially within the residential areas around the urban areas. Kenya's rates of urbanization are escalating and being a developing country; most of its urban population is forced to live in slums. It's in line with this thus there's need for improved provision of housing services and especially low cost housing to cater for the low and middle income earners who can't afford to build their own houses. This is a goal that is to be achieved through deliberate policies and plans that are aimed at spurring economic growth and social development.

With the ever increasing rates of urbanization and increasing population growth rates the housing sector in Kenya if not well addressed is bound to impact negatively on the environmental attributes of the project areas and its surroundings. The Kenyan government has attempted to provide decent housing to its urban population through several strategies one of which is through the private sector. This is intended to stimulate economic and social development of the residents through the provision of social amenities and services that would make life both meaningful and honorable. This Environmental Impact Assessment examined the potential positive and negative impacts of the project on the immediate surroundings with due regard to all the phases from construction, occupation and decommissioning. It encompassed all aspects pertaining to the physical, ecological, socio-cultural, health and safety conditions at the site and its environs during and after construction.

Environment, Health and Safety (EHS) section addresses environmental, health and safety concerns during projects' cycle. The main objective of the EHS on the proposed project is to develop guidelines for protecting, managing and responding, processes, situations/conditions that might compromise health, safety and security of workers and ecological wellbeing. To avoid or reduce negative environmental impacts, mitigation measures were proposed and an environmental management plan (EMP) formulated. The proponent is also expected to observe recommendations in the Environmental Management Plan (EMP) and carry out annual environmental audits once the project is in operation.

Overview of the Project

The project will include construction of three (3) blocks of twelve storied residential apartments with a total of two hundred and sixteen (216) units. The main design components of the project include, but not limited to the following:

- Upper and lower basements: each will accommodate ninety nine (99) car parking spaces.
- Lower ground floor 3 will have thirty (30) car parking spaces
- Ground floor will have 90 parking spaces
- Block A and B will have eight (8) units in each floor. These will include two (2) and three (3) bedroomed units. The total amount in two blocks will be ninety six(96)
- Block D and E will have eight (8), two (2) and three (3) bedroom units, The sum of units in the entire block will be ninety six (96)units
- Block C will have two (2) units of four (4) bedroomed units with DSQ. The entire block will have twenty four (24) units.
- lifts and lobby areas
- guard house
- Design a system of drainage for disposing of sewage, surface and silage water
- Development of a gate and a boundary wall
- Site landscaping
- Development of water channels.

Environmental Impacts and Mitigation Measures

The potential negative environmental impacts of the proposed project and possible mitigation measures are summarized below:-

Potential Negative Environmental Impacts	**Mitigation Measures**
1. Architectural incompatibility leading to distortion of neighbourhood aesthetic image	Harmonize building scale with existing development in neighbourhood. Harmonize detail, material and finishes for roofs and walls with existing development in the neighbourhood.
2.Disruption of existing natural environment and modification of micro-climate – Increased development density Increased glare/solar reflection Reduced natural ground cover Obstruction of ventilating wind Increased surface run-off	Development restricted to follow zoning policy/approved density – building line, plot coverage and plot ratio. Careful layout and orientation of buildings to respect wind and sun direction. Adequate provision of green and open space planted with grass, shrub and tree cover. Minimum use of reflective building material and finishes for roof, wall and pavement.
3.Pollution and health Hazards Dust and other construction waste Noise generation from construction	Damping down of site e.g. sprinkling water to dusty areas on construction site. Containment of noisy operation, including locating noise

activities.	operations away from sensitive neighbors. Construction work limited to day time only and take shortest time possible. The proposed church will have double wall and sound acoustics to prevent excessive noise and vibration Trees will be planted around the perimeter wall
4.Increased loading on Infrastructure services Increased vehicular and/or pedestrian traffic Increased demand on water, sanitation services etc. Increase surface runoff	Have paved local access road and walkway system Encourage rainwater harvesting Provision of increased water storage capacity Provide adequate storm water drainage system
5.Worker accidents and health infection	Employ skilled and trained workers, provide protective clothing. Prepare clear work schedule and the organization plan. Have adequate worker insurance cover Enforce occupational health and safety standards.
6.Increased social conflict	Increased Housing stock in the area and Kenya Increased economic activities –employment generation, income earnings and housing capital stock formation Encourage formation of community policing and formation of neighbouhood associations
7.security	the facility will be manned by security guards There will be 24 hrs. surveillance presence of perimeter wall
8.storm water	Construction of storm water drainage system The storm water eventually be directed

Conclusions and Recommendations

The EIA process started early in the pre-feasibility stage and environmental aspects were therefore considered during the project design stages. This proactive approach resulted in many significant environmental impacts being avoided, as the project team was able to amend design in order to manage environmental impacts, rather than manage the environmental impacts of particular designs.

In conclusion, results from EIA study show that the proposed residential apartment will not have significant impacts on the environment. Implementation of an Environmental Management Plan will assist in dealing with environmental issues during the project cycle. There are also guidelines for addressing environmental health and safety. This project is recommendable for approval by the National Environment Management Authority (NEMA) for issuance of an EIA license subject to annual environmental audits after operating for one year. This will be in compliance with the Environmental Management and Coordination Act of 1999 and the Environmental Impact Assessment and Audit regulations, 2003.

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ABBREVIATIONS:

EIA----------Environmental Impact Assessment

EMCA------- Environmental Management and Co-ordination Act

EMP ---------Environmental Management Plan

CBD - --------Central Business District

EA ---------- Environmental Audit

EHS --------- Environmental Health and Safety

HWM ---------Household Waste Management

KBS ----------Kenya Bureau of Standards

KM ---------- Kilometres

KPLC-------- Kenya Power and Lighting Company

KVA ----------Kilo Volts Amperes

NCC ---------Nairobi City County

NEC--------- National Environmental Council

NEMA ------ National Environment Management Authority

SHE -------- Safety Health and Environment

SWM -------Solid Waste Management

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TOR ------- Terms of Reference

ESIA ------- Environmental & Social Impact Assessment

UNEP ------ United Nations Environmental Programme

CHAPTER ONE: INTRODUCTION

1.1 Background and Rationale for the EIA

In recent times, real estate property sector has achieved a significant growth owing to the fact that many people are currently either putting up domestic or commercial buildings to meet rising demand for such facilities in Kenya. The central government will benefit in the form of Value Added Taxes (VAT) imposed on construction materials and various fees charged by different government institutions. More importantly, the design of the project is well thought out and has taken into consideration all the necessary interventions needed to take care for mitigation of negative impacts on the environment and safeguard safety of construction workers.

The principle measure of sustainable development is that all activities which are carried out to achieve development must take into account then needs of environmental conservation. The sustainability of the ecosystem requires the balance between human settlement development and the natural ecosystem, which is a symbiotic relationship. This can be achieved through careful planning and the establishment of appropriate management systems. In modern times, the need to plan activities has become an essential component of the development process. Consequently a number of planning mechanisms have been put in place to ensure that minimum damage is caused to the environment. Environmental planning is also integrated with other planning processes such as physical planning, economic planning, and development planning. Environmental Impact Assessment (EIA) is considered part of environmental planning. EIAs are undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority. In Kenya, the competent authority is the National Environment Management Authority (NEMA).

The project will include construction of three (3) blocks of twelve storied residential apartments with a total of two hundred and sixteen (216) units. The main design components of the project include, but not limited to the following:

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- Lower ground floor 3 will have thirty (30) car parking spaces
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block will have twenty four (24) units.

- lifts and lobby areas
- guard house
- Design a system of drainage for disposing of sewage, surface and silage water
- Development of a gate and a boundary wall
- Site landscaping
- Development of water channels.

As part of the EIA process, it is necessary to devise alternatives to avoid undesirable impacts. Besides the alternative, identification of impacts may also lead to the development of mitigation measures i.e. means of reducing the impacts. As a tool of environmental planning, EIA is therefore precautionary in nature. EIA is neither antidevelopment nor does it stop actions which impact the environment. It only requires that those impacts be considered. Most development activities impact the environment hence a "no impact" interpretation of environmental impact assessment could lead to no development. But a "considerable impact" interpretation of EIA will lead to better development. If environmental impacts are ignored, the project may not be sustainable in the long-run, in which case the money invested in it will have been wasted.

Environmental Impact Assessment studies were carried out as per the provisions of Environmental (Impact Assessment and Audit) Regulations, 2003 .This report is a product of the entire study and will be used in various decision making platforms including consideration for issuance of an EIA license by the National Environment Management Authority (NEMA) It is well known that there is a significant urban housing facilities deficit in Kenya with an estimated 100,000 housing units being required per annum just to meet the current demand over the next 10 years. Therefore this development shall be a welcome idea to help address the limitations of living space and shelter in the city and its suburbs.

1.2 Need for the project

Rapid urbanization is a trend seen across the developing world, with the fastest rates of growth seen in Sub-Saharan Africa. Much of this is due to rural urban migration of people in search of jobs and or higher education or higher standards of living. Urbanization rates in Kenya have mirrored those seen in other Africa countries and just like in other areas, the housing sector is not growing in tandem with the rates of urbanization. It must be appreciated that there is scarcity of residential premises in our urban areas. This has seen more and more residential buildings coming up to cater for the increased demand. The result of this has seen more and more single dwelling land being converted to multi dwelling residential use and most urban areas set aside/zoned for single dwelling and low rise residential developments convert to high rise Multi-family dwelling developments.

There is a glaring gap between the demand and availability of affordable modern residential facilities in various sections of Nairobi and the large metro region. This has been largely so because most of the more recent large scale developments in areas near the major towns have tended to focus more on commercial and office use developments.

1.3 National Housing Policy and Housing Needs in Kenya

In August 2003, the government of Kenya through a Sessional Paper spelt out a Housing Policy whose overall goal was to facilitate the provision of adequate shelter and healthy living environment at an affordable cost to all socio-economic groups in Kenya in order to foster sustainable human settlements. The aim is to minimize the number of citizens living in shelters that are below the habitable living conditions.

Among other things, the policy aims at facilitating increased investment by the formal and informal private sector, in the provision of housing units for low and middle-income dwellers. The estimated current urban needs are 150,000 units per year, which can be achieved if the existing resources are fully utilized by the private sector with the enabling hand of the government. It is estimated that the current production of new housing in urban areas is only **20,000-30,000** units annually, giving a short fall of over **120,000** units per annum. The shortfall in housing has been met through the proliferation of squatter and informal settlements and overcrowding.

To alleviate the huge shortfall of urban housing mentioned above and to curb the mushrooming of informal settlements/slums, various interventions and strategies have to be adopted. In the Policy Paper, the government correctly accepts the fact that it cannot meet the housing shortfall on its own and that the best policy is to encourage the private sector (like the proponent) to chip in while the government provides an enabling environment for development. The government will provide an enabling environment by doing the following:

- Facilitating the supply of serviced land at affordable prices in suitable locations
- Expanding and improving infrastructure facilities and services
- Using research findings as well as innovative but cheap conventional building materials and technologies to improve production of housing units.
- Harmonizing the Banking Act, the Building Society Act, the Insurance Act and the various Acts that have so far proved to be a hindrance to the sourcing of housing finance.
- Generally easing the path of funds from the private investor/government to the development project.
- Issuing workable guidelines on Estate Management and maintenance.

The promotion of this development is therefore well within the government current and long term policies of ensuring housing for all by 2030 (Vision 2030). The housing policy does not address the demand for affordable residential houses, which are addressed by this report.

1.4 Scope of the Project

The scope of the study includes carrying out of environmental investigations in line with current provisions on environmental legislations. This has been done in line with the requirements of Environmental Management and Coordination Act (EMCA) 1999 and Environmental (Impact Assessment) and Audit regulations 2003. The report is aimed at analyzing the physical extent of the project site and its immediate environs, implementation works of the proposed development (ground preparations, foundation, walling, roofing, fixtures and fitting among other activities) and installation of key utilities and other facilities required for the project to function optimally.

1.5 Overall Objective of the Project

The primary objective of the proposed project is to develop a modern residential apartment for housing purposes.

On the other hand the EIA study objectives for the proposed project were:

- To identify environmental economic, social and health impacts,
- To solicit views/opinion of the public and neighbours on the impacts of the project, and
- Develop an Environmental Management Plan for the project.

1.6 Terms of Reference (TOR)

The TORs for this Project Report is the production of an EIA report to address the effects and impacts (Positive and Negative) of the proposed development. The EIA lead expert is under instructions from the project proponents to do a thorough environmental assessment with the aim getting approval from the National Environment Management Authority before commencement of the project.

This report addresses the following key specific objectives:

- To review existing legal and institutional framework related to the proposed project
- To collect and collate baseline information relevant to the proposed housing development
- To collect primary data through the community participatory process.
- To identify and assess positive and negative impacts of the proposed project
- To identify and analyze alternative options for the proposed project
- To develop mitigation measures and cost estimates for the negative impacts of project.
- To design an Environmental Management Plan (including cost estimates) and a monitoring framework for the environmental impact of the project.

1.7 Content of Project

The project assessment investigates and analyses the anticipated environmental impacts of the proposed development in line with the Environmental Impact Assessment and Audit regulations 2003 and in particular part II S 7[1] a-k. Consequently, the report will provide the following

- Nature of project
- The location of the project including the physical area that may be affected by the project's activities.
- The activities that shall be undertaken during the project construction operation and design of the project
- The materials to be used, products and by-product including waste to be generated by the project and the methods of disposal.
- The potential environmental impacts of the project and mitigation measures to be taken during and after the implementation of the project.
- An action plan for prevention and management of possible accidents during the project cycle
- A plan to ensure the health and safety of the workers and the neighbouring communities
- The economic and social cultural impacts to local community and the nation in general
- The project budget
- Any other information that the proponent may be requested to provide by NEMA

All these aspects will be considered accordingly. This report also seeks to ensure that all the potential environmental impacts are identified and that workable mitigation measures are adopted. The report also seeks to ensure compliance with the provision of the EMCA 1999, and Environmental (Impact Assessment and Audit) Regulations 2003 as well as other regulations. The report emphasizes the duties of the proponent and contractor during the construction phase as well as the operation phase of this project.

1.8 Methodology

1.8.1 Environmental Screening

Environmental screening was carried out to determine whether an EIA study is necessary for this project and at what level of evaluation. This took into consideration the requirements of the Environmental Management and Coordination Act (EMCA), 1999, and specifically the second schedule of the same act. From the screening process, it was understood that this project will cause significant impacts on the environment.

1.8.2 Environmental Scoping

In scoping, focus was on environmental impacts of great concern. Environmental issues were categorized into physical, natural/ecological and social, economic and cultural aspects. Impacts

were also classified as immediate and long-term impacts. This will include assessment of the proposed project in respect of but not limited to:

- Project Background: this will give the brief history of the proposed project site, the parties involved and justification of the project in terms of demand or lack of the same, the project area, relevant policy and legislation, identification of any associated project, or any planned projects including products within the region which may compete for the same resources; the project including products, by-products, processes both at implementation and operational level, resources required for successful implementation and operation of the project and the different options considered.
- The proposed project objectives; both in the short and long run; and how they are linked to the overall objectives.
- Present environmental conditions; description of the project site, ecological zoning as well as the state of the environment and its surroundings. Attempts will state if it is already suffering from degradation, causes of the original degradation if any established.
- Identification of Environmental Impacts; the report will distinguish between significant positive and negative impacts, direct and indirect impacts and immediate and long term impacts which are unavoidable and / or irreversible,
- Analysis of the alternatives to the proposed project; this will involve description of alternatives and identifying alternatives that would achieve the same objectives. Alternatives will be compared in terms of potential environmental impacts; capital and operating costs; suitability under local conditions; and institutional training and monitoring requirements.
- Community/ Stakeholder Consultations: these will be undertaken to determine how the project will affect the local people / various stakeholders.
- Cost- Benefit Analysis; to evaluate the economics of the project and establish its viability in terms of the expected environmental concerns and measures.
- Evaluation; an indication of how the information gathered will be evaluated to give optimum results;
- Development of an Environmental Management Plan (EMP); to mitigate negative impacts, recommending feasible and cost effective measures to prevent or reduce significant negative impacts to acceptable levels,
- Development of a Monitoring Plan; this will be used in monitoring the implementation of the mitigation measures and the impacts of the project during construction and operational phases, including an estimate of capital and operational costs, and Make necessary recommendations pertaining to the proposed development.

1.8.3 Desktop Study

This involved review of project documents, architectural drawings, past EIA, relevant policy, legal and institutional frameworks. Documents containing climatic, demographic and hydrological data for Nairobi City were also relied upon.

1.8.4 Site Visits and Public Participation.

Field visits were meant for physical inspections of the project site in order to gather information on the state of environment. Several photos of the project site were taken for inclusion in this report. The study also sought public opinion/views through Consultation and Public Participation (CPP) exercise. Questionnaires were administered and public meetings held with neighbours. Copies of questionnaires are attached

1.8.5 Reporting

In the entire exercise, the proponent and EIA experts contacted each other on the progress of the study and signing of various documents. The proponent will have to submit ten copies of this report alongside a CD to the National Environment Management Authority for review and issuance of an EIA license. All the materials and workmanship used in the execution of the work shall be of the best quality and description .Any material condemned by the architect shall be removed from the site at the contractors cost. Environmental concerns need to be part of the planning and development process and not an afterthought. It is therefore advisable to avoid land use conflicts with the surrounding area through the implementation of the Environmental Management Plan (EMP).

CHAPTER TWO: POLICY, LEGAL AND LEGISLATIVE FRAMEWORK

2.1 Introduction

There is a growing concern in Kenya and at global level that many forms of development activities cause damage to the environment. Development activities have the potential to damage the natural resources upon which the economies are based. Environmental and Social Impact Assessment Study is a useful tool for protection of the environment from the negative effects of developmental activities. It is now accepted that development projects must be economically viable, socially acceptable and environmentally sound.

According to Sections 58 and 138 of the Environmental Management and Coordination Act (EMCA) No. 8 of 1999 and Section 3 of the Environmental (Impact Assessment and Audit) Regulations 2003 (Legal No. 101), such like developments require an Environmental and Social Impact Assessment Study report prepared and submitted to the National Environment Management Authority (NEMA) for review and eventual Licensing before the development commences. This was necessary as many forms of developmental activities cause damage to the environment and hence the greatest challenge today is to maintain sustainable development without interfering with the environment.

Environmental Problems in Kenya

There are many environmental problems and challenges in Kenya today. Among the cardinal environmental problems include: loss of biodiversity and habitat, land degradation, land use conflicts, human animal conflicts, water management and environmental pollution. This has been aggravated by lack of awareness and inadequate information amongst the public on the consequences of their interaction with the environment.

2.2 Policy Framework

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

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

2.2.1 National Shelter Strategy to the Year 2000

Kenya adopted this strategy following the International Year of Shelter for the Homeless in 1987.This advocates for the involvement of various actors to come in and assist the government in providing housing. This took cognizance of the governments' inability to provide sufficient shelter for all its citizens. The government was to simply facilitate other actors such as developers to invest in shelter.

2.2.2 The National Poverty Eradication Plan (NPEP).

The objective NPEP is to alleviate poverty in rural and urban areas by 50 percent by the year 2015; as well as the capabilities of the poor and vulnerable groups to earn income. It also aims to narrow gender and geographical disparities and a healthy, better educated and more productive population. This plan has been prepared in line with the goals and commitments of the World Summit for the Sustainable Development (WSSD) of 1995.

2.2.3 National Policy on Water Resources Management and Development

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

In addition, the policy provides for charging levies on waste water on the basis of quantity and quality. The "polluter-pays-principle" applies in which case parties contaminating water are required to meet the appropriate cost of remediation. Consequently, to ensure water quality, the policy provides for establishment of standards to protect water bodies receiving wastewater, a process that is ongoing. The standards and measures to prevent pollution to water resources are provided for in the Environmental Management and Coordination (Water Quality) Regulations, 2006 which is a supplementary legislation to EMCA, 1999.

2.2.4 Policy Paper on Environment and Development (Sessional Paper No. 6 of 1999):

The key objectives of the Policy include: -

i. To ensure that from the onset, all development policies, programmes and projects take environmental considerations into account,
ii. To ensure that an independent environmental impact assessment (EIA) report is prepared for any industrial venture or other development before implementation,
iii. To come up with effluent treatment standards that will conform to acceptable health guidelines.

Under this paper, broad categories of development issues have been covered that require a "sustainable development" approach. These issues relate to waste management and human settlement. The policy recommends the need for enhanced re-use/recycling of residues including wastewater, use of low or 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. Regarding human settlement, the paper encourages better planning in both rural and urban areas and provision of basic needs such as water, drainage and waste disposal facilities among others.

2.3 Legal and Legislative Framework

2.3.1 Environmental Management and Coordination Act No.8 of 1999

This project report has been undertaken in accordance with the Environment (Impact Assessment and Audit) Regulations, 2003, which operationalizes the Environmental Management and Coordination Act, 1999. The report is prepared in conformity with the requirements stipulated in the Environmental Management and Coordination Act No. 8 of 1999 (EMCA) and the Environmental Impact Assessment and audit Regulations 2003, Regulation 7 (1) and the Second Schedule.

Part II of the said act states that every person is entitled to a clean and healthy environment and has the duty to safeguard the same. In order to achieve the goal of a clean environment for all, new projects listed under the second schedule of Section 58 of EMCA No. 8 of 1999 shall undergo an Environmental Impact Assessment. The Environment Management and Coordination Act (EMCA), 1999 provides for the establishment of an umbrella legal and institutional framework under which the environment in general is to be managed. EMCA is implemented by the guiding principle that every person has a right to a clean and healthy environment and can seek redress through the High court if this right has been, is likely to be or is being contravened.

Pursuant to section 25 (4) of EMCA, National Environmental Management Authority (NEMA) is required to restore degraded environmental sites using the National Environmental Restoration Fund. Currently, the restoration fund consists of 0.1 % levied from industries and other project proponents through the EIA process. Section 58 of the Act makes it mandatory for an Environmental Impact Assessment study to be carried out by proponents intending to implement projects specified in the second schedule of the Act which are likely to have a significant impact

on the environment. Similarly, section 68 of the same Act requires operators of existing projects or undertakings to carry out environmental audits in order to determine the level of conformance with statements made during the EIA study. The proponent is required to submit the EIA and environmental audit reports to NEMA for review and necessary action.

Section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into aquatic environment. According to section 73 of the act, operators of projects which discharge effluent or other pollutants into the aquatic environment are required to submit to NEMA accurate information on the quantity and quality of the effluent. Section 76 provides that all effluent generated from point sources are to be discharged only into the existing sewerage system upon issuance of prescribed permit from the local authorities.

Section 87 (1) makes it an offence for any person to discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any person.

The proponent will have to ensure that environmental protection facilities or measures to prevent pollution and ecological deterioration such as sewerage connections, solid waste management plans, and landscaping and aesthetic improvement programme are implemented and maintained throughout the project cycle. In addition, the proponent will have to ensure that appropriate measures to prevent pollution of underground and surface water are implemented throughout the project cycle.

2.3.2 The Environmental Management and Co-ordination (Waste Management Regulations 2006)

Legal Notice No. 121: Section 4-6 *Part II* of the Environmental Management and Co-ordination (Waste Management) Regulations, 2006 states that:-

Section 4

1) No person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.
2) Any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed off such waste in the manner provided for under these Regulations.
3) Without prejudice to the foregoing, any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose off such waste in a designated waste disposal facility.

Section 5

(1) A waste generator shall minimize the waste generated by adopting the following cleaner production methods

a). Improvement of production process through:-

- Conserving raw materials and energy;
- Eliminating the use of toxic raw materials; and
- Reducing toxic emissions and wastes

b). monitoring the production cycle from beginning to end by:-

- Identifying and eliminating potential negative impacts of the product;
- Enabling the recovery and re-use of the product where possible;
- Reclamation and recycling

c). Incorporating environmental concerns in the design and disposal of a product.

Section 6

A waste generator shall segregate waste by separating hazardous wastes from non-hazardous waste and shall dispose of such wastes in such facility as shall be provided by the relevant local authority.

(23) No person shall engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment license issued by Authority under the provisions of the Act.

The proponent shall ensure that the main contractor adopts and implements all possible cleaner production methods during the construction phase of the project. During the construction phase of the project, the proponent shall ensure that the main contractor implements the above mentioned measures as necessary to enhance sound Environmental Management and Coordination (Noise management of waste).

2.3.3 Waste Water Management;

Legal Notice No. 120; Part II – Protection of Sources of Water for Domestic Use.

(1) Every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of these Regulations

(2) No person shall throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution

All sources of water for domestic uses shall comply with the standards set out in the First Schedule of these Regulations. The proponent and project Architect as well as engineer are urged to ensure that drainage channels are well designed during the construction phase of the project, and upon completion the entire project is supposed to be connected to the improved waste treatment plant for proper management of liquid waste.

2.3.4 Public Health Act Cap 242

Part IX section 115 of the Act states that no person or institution shall cause nuisance or condition liable to be injurious or dangerous to human health.

Section 116 requires that local Authorities take all lawful necessary and reasonable practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to injuries or dangerous to human health. The plans for the above project have been submitted for approval at Nairobi City County.

2.3.5 Physical Planning Act, 1996

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

The proposed development has applied for and granted change of use and the building plans have been submitted for approval at the Nairobi City County offices.

2.3.6 Land Planning Act Cap 303

Section 9 of the subsidiary legislation (the development and use of land Regulations 1961) under which it requires that before the local authority to submit any plans to then minister for approval, steps should be taken as may be necessary to acquire the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should be submitted, which intends to reduce conflict of interest with other socio economic activities.

2.3.7 Building Code 2000

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

a) The alteration or extension of a building.

b) The changing of the use or uses to which land or building is put.

c) The formation or lying out of an access to a plot.

Section 194 requires that where sewer exists, the occupants of the nearby premises shall apply to the local authority for permit to connect to the sewer line and all the wastewater must be discharged in to sewers. The code also prohibits construction of structures or building on sewer lines.

2.3.8 Water Act No. 8 of 2002

The water act No. 8 of 2002 provides for the management, conservation, use and control of water resources and for acquisition and regulation of rights to use water; to provide for the regulation

and management of water supply and sewerage services. Section 18 of this Act provides for national monitoring and information systems on water resources. Following on this, sub-Section 3 mandates the Water Resources Management Authority to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be availed by a site operator and the information thereof furnished to the authority.

Section 73 of the Act provides that a person who is licensed to supply water has a responsibility of safeguarding the water sources against degradation. According to section 75 (1) such a person is required to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction.

On the other hand section 76 makes it an offence for any person to discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee which should be sought by making an application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary. The consent shall be issued on conditions including payment of rates for the discharge as provided under Section 77 of the same Act.

Section 94 of the Act also makes it an offence to throw or convey or cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive or unwholesome matter or thing into or near to water resource in such a manner as to cause, or be likely to cause, pollution of the water resource.

The main contractor will be required to implement necessary measures to ensure water conservation and also to prevent potential for water contamination during the construction phase.

2.3.9 County Government Act no.17 (2012)

The Act no 17 of 2012 (revised edition 2012) provides for the establishment of authorities of the local government and to define their functions among other things. These county governments may manage and let land besides regulating and licensing trade activities including construction in their areas of jurisdiction besides provision and maintenance of roads, footways, street lighting and sewerage in their areas.

The county governments should establish and maintain sanitary services for the removal and destruction of, or otherwise deal with all kinds of refuse and effluent and where such service is established, compel its use by persons to whom the service is available.

Similarly, section 163 (e) empowers the local Authorities to prohibit businesses which by reason of smoke, fumes, chemicals, gases, dust, smell, noise , vibration or other cause , may be or become a source of danger, discomfort or annoyance to the neighbourhood, and to prescribe

conditions subject to which such business shall be carried on. It is in this vain that section 165 mandates the County to grant or to renew business licenses or to refuse the same.

In order to discharge its duties effectively, section 170 of the act allows the right of access to private property at all times by local authorities, its officers and servants for purposes of inspection, maintenance and alteration or repairs of sewers. According to section 173, any person who, without prior consent in writing from the County, erects a building on; excavate or opens-up; or injures or destroys a sewers, drains or pipes shall be guilty of an offence. Any demolitions and repairs thereof shall be carried out at the expense of the offender.

The Act, by virtue of section 176 also empowers the local authority to regulate sewerage and drainage, fix charges for use of sewers and drains and ensure that connecting premises meets the related costs.

2.3.10 The Electricity Power Act, 1997

Section 55 (1) in the execution of works in connection with the construction, modification, maintenance or operation of an electric supply line or apparatus or conductor connected thereto, every licensee shall:-

In no way injure the works, conveniences or property belonging to any such other such authority, company or person, nor obstruct or interfere with public traffic, except with the previous consent of the board.

2.3.11 The Penal Code (Cap. 63)

Section 191 of the Penal Code makes it an offence for any person or institution that voluntarily corrupts, or foils water for public springs or reservoirs rendering it less fit for its ordinary use. Similarly, section 192 of the same act prohibits making or vitiating the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighborhood or those passing along a public way.

The proponent will be required to ensure strict adherence to the Environmental Management Plan throughout the project cycle in order to mitigate against any possible negative impact.

Way leaves Act Cap 292

According to the Way leaves Act cap 292 Section 2, Private land does not include any land sold or leased under any Act dealing with Government lands. Section 3 of the Act states that the Government may carry any sewer, drain or pipeline into, though, over or under any lands whatsoever, but may not in so doing interfere with any existing building. Section 8 further states that any person who, without the consent of the Permanent Secretary to the Ministry responsible for works (which consent shall not be unreasonably withheld), causes any building to be newly erected over any sewer, drain or pipeline the property of the Government shall be guilty of an

offence and liable to a fine of one hundred and fifty shillings, and a further fine of sixty shillings for every day during which the offence is continued after written notice in that behalf from the Permanent Secretary; and the Permanent Secretary may cause any building erected in contravention of this section to be altered, demolished or otherwise dealt with as he may think fit, and may recover any expense incurred by the Government in so doing from the offender.

2.3.12 The Occupational Safety and Health 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 was published in the Kenya Gazette Supplement No. 111 (Acts No.15). It received presidential assent on 22nd October, 2007 and became operational on 26th October, 2007. The key areas addressed by the Act include:

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

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

He is also required to establish a safety and health committee at the workplace in a situation where the number of employees exceeds twenty (section 9) and to cause a thorough safety and health

audit of his workplace to be carried out at least once in every period of twelve months by a registered safety and health Advisor (Section 11). In addition, any accident, dangerous occurrence, or occupational poisoning which has occurred at the workplace needs to be reported to the occupational safety and health officer of the respective area by an employer or self-employed person (section 21).

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

To ensure machinery safety, every hoist or lift – section 63 and/or all chains, ropes and lifting tackles – section 64 (1d), shall be thoroughly examined at least once in every period of six months by a person approved by the Director of Occupational Health and Safety Services. Similarly, every steam boiler - section 67 (8) and/or steam receiver - section 68 (4) and all their fittings and/or attachments shall be thoroughly examined by an approved person at least once in every period of twelve months whereas every air receiver shall be thoroughly cleaned and examined at least once in every period of twenty four months or after any extensive repairs - section 69 (5). According to section 71 (3), every refrigeration plant capable of being entered by an employee also needs to be examined, tested and certified at least once in every period of twelve months by an approved person.

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

To promote health and safety of employees who are at risk of being exposed to chemical substances, section 84 (3) and 85 (4) requires every employer to maintain at the workplace material safety data sheets and chemical safety data sheets respectively for all chemicals and other hazardous substances in use and ensure that they are easily available to the employees.

The employers' positive contribution towards the welfare of the employees include provision and maintenance of adequate supply of wholesome drinking water - section 91 and a first aid box or

cupboard of the prescribed standard – section 95 at suitable point (s) conveniently accessible to all employees.

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

Section 101 (1). *The proponent will be required to ensure that the main contractor includes in the contract document, adequate measures to promote safety and health of workers.*

2.3.13 Trade Licensing Act (Cap 497)

Section 5 of the Act makes it mandatory for all businesses to obtain trading licenses.

2.3.14 Environmental Vibration Pollution (Control) Regulations, 2009

These regulations were published as legal Notice No. 61 being a subsidiary legislation to the Environmental Management and Co-ordination Act, 1999. The regulations provide information on the following:

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

According to regulation 3 (1), no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. Regulation 4 prohibits any person to (a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations which exceed 0.5 centimeters per second beyond any source property boundary or 30 metres from any moving source.

Regulation 5 further makes it an offence for any person to make, continue or cause to be made or continued any noise in excess of the noise levels set in the First Schedule to these Regulations, unless such noise is reasonably necessary to the preservation of life, health, safety or property.

Regulation 12 (1) makes it an offence for any person to operate a motor vehicle which- (a) produces any loud and unusual sound; and (b) exceeds 84 dB(A) when accelerating. According to sub regulation 2 of this regulation, No person shall at any time sound the horn or other warning device of a vehicle except when necessary to prevent an accident or an incident.

Regulation 13 (1) provides that except for the purposes specified in sub-Regulation (2) there under, no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations.

Registration of Titles Act Cap 281

Section 34 of this Act states that when land is intended to be transferred or any right of way or other easement is intended to be created or transferred, the registered proprietor or, if the proprietor is of unsound mind, the guardian or other person appointed by the court to act on his/her behalf in the matter, shall execute, in original only, a transfer in form F in the First Schedule, which transfer shall, for description of the land intended be dealt with, refer to the grant or certificate of title of the land, or shall give such description as may be sufficient to identify it, and shall contain an accurate statement of the land and easement, or the easement, intended to be transferred or created, and a memorandum of all leases, charges and other encumbrances to which the land may be subject, and of all rights-of-way, easements and privileges intended to be conveyed.

2.4 Other relevant Provisions

The following are the relevant environmental treaties to which Kenya is signatory in order of ratification:

- Montreal Protocol on Substances that Deplete the Ozone Layer (1987) ratified 9 November 1988
- United Nations Convention to Combat Desertification (1994), ratified 12 June 1994
- United Nations Framework Convention on Climate Change (1992), ratified 30 August 1994
- Convention on Biological Diversity (1992), ratified 11 September 1994
- Bamako Convention (1991), ratified 17 December 2003
- Kyoto Protocol (2004), ratified 25 February 2005

2.5 Institutional Framework

At present there are over twenty (20) institutions and departments which deal with environmental issues in Kenya. Some of the key institutions include the National Environmental Council (NEC), National Environmental Management Authority (NEMA), the Forestry Department, Kenya

Wildlife Services (KWS) and others. There are also local and international NGOs involved in environmental activities that impact on the environment in one way or the other in the country.

2.5.1 National Environmental Management Authority (NEMA)

The object and purpose for which NEMA is established is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of the government in the implementation of all policies relating to the environment. A Director General appointed by the president heads NEMA. The Authority shall, among others:

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

2.5.2 County Environment Committee

County Environment Committees are responsible for the proper management of the environment within the County in respect of which they are appointed to. They are also to perform such additional functions as are prescribed by the Act or as may, from time to time be assigned by the Minister by gazette notice. The decisions of these committees are legal and it is an offence not to implement them.

2.5.3 Nairobi City County

This is a local authority that is charged with regulating developments within the city. NCC approves developments, inspects building during constructions, issues permits and necessary licences including hoarding, advertisement, waste disposal and business licenses.

2.5.4 Public Complaints Committee

The Committee is charged with the following functions:

Investigating allegations/ complaints against any person or against the Authority (NEMA) in relation to the condition of the environment and its management, Prepare and submit to the County periodic reports of its activities which shall form part of the annual report on the state of the environment, and to perform such other functions and excise such powers as may be assigned to it by the County.

2.5.5 National Environment Action Plan Committee

This Committee is responsible for the development of a 5-year Environment Action plan among other things. The National Environment Action Plan shall contain:

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

2.5.6 Standards and Enforcement Review Committee

This is a technical Committee responsible for environmental standards formulation methods of analysis, inspection, monitoring and technical advice on necessary mitigation measures. Standards and Enforcement Review Committee consists of the members set out in the third schedule to the Environmental Management and Co-ordination Act

2.5.7 National Environmental Tribunal

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

CHAPTER THREE: DESCRIPTION OF THE PROJECT

3.1 Introduction and project objectives

The motivation for establishment of the project is the existing high demand for affordable houses in Nairobi City County and the larger Nairobi Metropolitan region. The conceived project is designed to be within character of the current housing trend of the project area, where a survey revealed that apartments are common.

The project will include construction of three (3) blocks of twelve storied residential apartments with a total of two hundred and sixteen (216) units. The main design components of the project include, but not limited to the following:

- Upper and lower basements: each will accommodate ninety nine (99) car parking spaces.
- Lower ground floor 3 will have thirty (30) car parking spaces
- Ground floor will have 90 parking spaces
- Block A and B will have eight (8) units in each floor. These will include two (2) and three (3) bedroomed units. The total amount in two blocks will be ninety six(96)
- Block D and E will have eight (8), two (2) and three (3) bedroom units, The sum of units in the entire block will be ninety six (96)units
- Block C will have two (2) units of four (4) bedroomed units with DSQ. The entire block will have twenty four (24) units.
- lifts and lobby areas
- guard house
- Design a system of drainage for disposing of sewage, surface and silage water
- Development of a gate and a boundary wall
- Site landscaping
- Development of water channels.

3.2 Project location and plot size

The property under reference is Plot **L.R No. 330/279** is **situated** along King'ara road in Lavington area, Nairobi City County. It is registered under **Newcourt Company Limited (copy of allotment letter attached)**

3.3 Infrastructure

The development will have a comprehensive and robust infrastructure including access roads, parking areas, water storage, electricity distribution and waste disposal mechanism.

3.3.1 Electrical system

There will be connection to the existing electricity main line of the Kenya Power and Lighting Company, which will be used in all phases of the project. The necessary guidelines and precautionary measures relating to the use of electricity shall be adhered to.

3.3.2 Water Reticulation system

Water from NCWSC line will be used during construction and operation phases. More over there will be water storage tanks to increase water supply to various components of the houses.

3.3.3 Sewerage

Waste water will be disposed off through a sewer system

3.3.4 Solid Waste

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

3.3.5 Security

There will be the main entrance for easy security operations around the compound a boundary wall connected with security alarms, entry control, and quick response systems will be used within the project area.

3.3.6 Fire safety

The development provides for fire fighting facilities such as fire extinguishers in the form of hydrants and carbon dioxide gas extinguishers. Fire breaks have also been provided for.

3.3.7 Perimeter Fence

A concrete perimeter wall will be erected around the project site.

3.3.8 Landscaping

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

3.3.9 Buildings Construction

The technology used in the design and construction of the Houses will be based on international standards, which have been customized by various housing units in Kenya. The buildings will be constructed as per the respective structural engineer's detail as provided for in the drawings presented in the Appendix. Basically, the building structures will consist of concrete appropriately reinforced with metal (steel and iron). The roof will consist of structural timber and steel members and roofing tiles. The buildings will be provided with a well-designed concrete staircase for every house.

The buildings will be provided with facilities for drainage of storm water from the roof through peripheral drainage systems into the drainage channels provided and out into the natural drainage channel/system. Drainage pipes will be of the PVC type and will be laid under the buildings and the driveway encased in concrete. This is a sparsely build area and such no need for public drainage channel. The buildings will have adequate natural ventilation through provision of permanent vents in all habitable rooms, adequate natural and artificial light, piped water stored in above ground water tanks and fire fighting facilities.

3.4 Description of the Project's Construction Activities

3.4.1 Pre-construction Investigations

The implementation of the project's design and construction phase will start with thorough investigation of the site's biological and physical resources in order to minimize any unforeseen adverse impacts during the project cycle.

3.4.2 Sourcing and Transportation of Building Materials

Building materials will be transported to the project site from their extraction, manufacture, or storage sites using transport trucks. The building materials to be used in construction of the project will be sourced from Nairobi and neighbouring areas such as Athi River, Kajiado and Juja. Greater emphasis will be laid on procurement of building materials from within the local area, which will make both economic and environmental sense as it will reduce negative impacts of transportation of the materials to the project site through reduced distance of travel by the materials transport vehicles.

3.4.3 Clearance of Vegetation.

The site has plenty of vegetation that has been maintained since the land has not been developed. However some of these trees which fall within construction site will be trimmed and others uprooted to give way for the proposed houses. In order to safeguard the micro climate of the area, the developer is advised to plant new trees that will be compatible with the new building. This will be done in form of landscaped garden, and flower gardens around the compound.

3.4.4 Storage of Materials

Building materials will be stored on site. Bulky materials such as rough stones, ballast, sand and steel will be carefully piled on site. To avoid piling large quantities of materials on site, the proponent will order bulky materials such as sand, gravel and stones in bits. Materials such as cement, paints and glasses among others will be stored in temporary storage structures, which will be constructed within the project site for this purpose.

3.4.5 Excavation and Foundation Works

The soil cover in the proposed area is thin and the rocks are exposed to the surface in some areas. However this shall be excavated and disposed off in approved sites (preferably exhausted quarries).

Masonry, Concrete Work and Related Activities

The construction of the building walls, foundations, floors, pavements, drainage systems, perimeter fence and parking area among other components of the project will involve a lot of masonry work and related activities. General masonry and related activities will include stone shaping, concrete mixing, plastering, slab construction, construction of foundations, and erection of building walls and curing of fresh concrete surfaces. These activities are known to be labour intensive and will be supplemented by machinery such as concrete mixers.

3.4.6 Structural Steel Works

The building will be reinforced with structural steel for stability. Structural steel works will involve steel cutting, welding and erection.

3.4.7 Roofing and Sheet Metal Works

Roofing activities will include sheet metal cutting, raising the roofing materials such as clay roofing tiles and structural timber to the roof and fastening the roofing materials to the roof.

3.4.8 Electrical Work

Electrical work during construction of the premises will include installation of electrical gadgets and appliances including electrical cables, lighting apparatus, sockets etc. In addition, there will be other activities involving the use of electricity such as welding and metal cutting.

3.4.9 Plumbing

Installation of pipe-work for water supply and distribution will be carried out within the entire building. In addition, pipe-work will be done to connect sewage from the premises to the waste water treatment plant

3.4.10 Landscaping

To improve the aesthetic value or visual quality of the site once construction ceases, the proponent will carry out landscaping. This will include establishment of flower gardens and lush grass lawns where applicable and will involve replenishment of the topsoil. It is noteworthy that the proponent will use plant species that are available locally preferably indigenous ones for landscaping.

3.5 Description of the Project's Operational Activities

3.5.1 Residence

A number of families (about two hundred families) will reside within the project site once its construction is complete. Several domestic activities such as cooking, washing, use of vehicles, and leisure and recreational activities will thus accompany residence. In addition, there will be production of domestic and sanitary wastes.

3.5.2 Solid Waste

The proponent will provide facilities for handling solid waste generated within the facility. These will include dust bins/skips for temporarily holding waste within the premises before final disposal at the designated dumping site.

3.5.3 Waste Water and storm water Management

Sewage generated from each house/unit will be discharged into the sewer line

3.5.4 Solid Waste Generated

Large amounts of solid waste will be generated during construction of the project. These will include metal cuttings, rejected materials, surplus materials, surplus oil, excavated materials, paper bags, empty cartons, empty paint and solvent containers, broken glass among others. The proponent will take steps to minimize the generation of such waste and to ensure proper disposal procedures.

A lot of domestic waste such as waste from foodstuffs, empty plastic containers, cartons, etc will be generated during the operational phase of the project. The proponent will be responsible for waste management within the Housing Project and will put in place measures such as provision of waste handling facilities and ensuring prompt and regular waste disposal. On decommissioning, large quantities of solid waste will be generated from demolition works and equipment dismantling. The proponent will provide measures for recycling, reuse or disposal of such wastes.

3.6 Public participation

Public participation basically involves engaging members of the public to express their views about a certain project. Public participation tries to ensure that due consideration will be given to public values, concerns and preferences when decisions are made. Public participation in this

project was facilitated through a planned baraza, interviews with the project proponent and questionnaires issued to the neighbors of the facility.

Public involvement is a fundamental principle of the EIA process. Timely, well planned and appropriately implemented public involvement programmes will contribute to EIA studies and to the successful design, implementation, operation and management of proposals. Specifically public involvement is a valuable source of information on key impacts, potential mitigation measures and the identification and selection of alternatives. It also ensures the EIA process is open, transparent and robust, characterized by defensible analysis.

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

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

The key objectives of public involvement are to:

- obtain local and traditional knowledge that may be useful for decision-making;
- facilitate consideration of alternatives, mitigation measures and tradeoffs;
- ensure that important impacts are not overlooked and benefits are maximized;
- reduce conflict through the early identification of contentious issues;
- provide an opportunity for the public to influence project design in a positive manner (thereby creating a sense of ownership of the proposal);
- improve transparency and accountability of decision-making; and
- Increase public confidence in the EIA process.

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

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CHAPTER FOUR: BASELINE INFORMATION OF THE STUDY AREA

4.1 Introduction

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

4.2 Location of the project

The proposed project site is located on plot L.R NO. **330/279. It lies** opposite Geko carwash 100 metres from Mbaazi Avenue and king'ara road junction towards Nakumatt Junction.

Proposed construction site

4.3 Climatic Conditions

At 1,795 meters (5,889 ft) above sea level, Nairobi enjoys a moderate climate. Under the Köppen climate classification, Nairobi has a Subtropical highland climate. The altitude makes for some chilly evenings, especially in the June/July season when the temperature can drop to 10 °C (50 °F). There are two rainy seasons but rainfall can be moderate. The cloudiest part of the year is just after the first rainy season, when, until September, conditions are usually overcast with drizzle. Temperature fluctuates between 15oC and 32oC in most areas. Areas to the north and west of the city center (CBD) tend to enjoy cooler temperatures and are relatively wet while dry conditions prevail the further to the east and south.

4.3.1 Temperatures

The sunniest and warmest part of the year is from December to March, when temperatures average the mid-twenties during the day. The mean maximum temperature for this period is 24 °C (75 °F).The minimum temperature also remains low during cloudy nights, usually hovering around 8 °C and at times reaching 6°C. Clear skies in January and February also bring colder nights. The highest temperature ever registered in Nairobi was 32.8 degrees Celsius and the lowest was 3.9 degrees Celsius. The mean maximum temperature for this period is 24 °C (75 °F).

4.3.2 Rainfall

There are two rainy seasons but rainfall can+ be moderate. The cloudiest part of the year is just after the first rainy season, when, until September, conditions are usually overcast with drizzle. Mean annual rainfall range is 500-1000mm/year. Relative humidity mean values range from 70 to 80%. Temperature fluctuates between 15oC and 32oC in most areas. Areas to the north and west of the city center (CBD) tend to enjoy cooler temperatures and are relatively wet while dry conditions prevail the further to the east and south.

4.3.3 Wind Flows

The lower winds throughout the year are of the easterly type. Between October and April they shift to the northeast while as from May to September they move to the southeast .Prior to the "Long Rain" season strong winds prevail with an average speed of 22.5 Miles/hour. The rest of the year has wind speed varying from 10 to 15 Miles/hour. However, during night, the winds are usually calm.

4.3.4 Sunshine.

Early mornings in Nairobi in general are often cloudy, but the sun peeks through by midmorning. Throughout the year, there is an average of seven hours of sunshine per day. Thirty percent more sunlight reaches the ground during the afternoon than in the morning. Of course, there is more sun shine during the summer months, when the sun is more overhead in the southern hemisphere. Infrequently during the rainy season the sun never show through the clouds. Even in August, the cloudiest month, there is an average of four hours of sunshine.

4.4 Topography and Drainage

Nairobi's main drainage follows the regional slope of the volcanic rocks towards the east, while subsidiary internal drainage into the Rift region is confined to the western part. The lava plains east of the line Ruiru-Nairobi-Ngong are underlain by a succession of lava flows alternating with lakebeds, streams deposits, tuffs and volcanic ash. These plains, comprising mainly the Athi

plains and the northern section of the Kapiti plain, extend westwards, rising from 4900 feet (1493 m) at the Athi River to 6000 feet (1829 m) in the faulted region near Ngong. The lava plains are crisscrossed with steep-walled gullies and canyon-like gorges, such as those along the Mbagathi valley. Further east this valley widens slightly where soft material is being actively eroded (Saggerson, 1991) The Kirichwa Valley Tuffs lying to the east of the highway function like a sponge and the contact between them and the underlying impermeable phonolite thus forms a perfect aquifer so much so that a number of channels containing water occur beneath Athi River region. The site of the project slopes gently t and therefore the drainage system is favoured.

4.5 Hydrogeology and Soils

In general groundwater in volcanic rocks is limited to fractures and erosion levels within the volcanic succession. Fresh lavas are usually not water bearing because of their massive and impervious nature. The most significant aquifer system west of the project area is the Upper Athi Series aquifer system. This is the main aquifer for boreholes in Nairobi and Kiambu areas and is composed of tuffs, lakebeds and sediments. Other aquifers in this area are found in the weathered inter-lava layers and in fractured zones.

The rocks in the Nairobi area mainly comprise a succession of lavas and Pyroclastics of the Cainozoic age and overlying the foundation of folded Precambrian schist's and gneisses of the Mozambique belt (Saggerson, 1991) .The crystalline rocks are rarely exposed but occasionally fragments are found as agglomerates derived from former Ngong volcano. The soils of the Nairobi area are products of weathering of mainly volcanic rocks.Weathering has produced red soils that reach more than 50 feet (15m) in thickness (Saggerson, 1991). A number of subdivisions are recognized in the Nairobi area according to drainage, climatic regions and slopes, and other categories have been introduced for lithosols and regosols.

4.6 Biological Environment

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

4.6.1 Flora

Natural vegetation in Nairobi has been cleared to pave way for the establishment of both residential and commercial developments. The natural vegetation in the area has thus been greatly modified. However, the site has various vegetation cover such as mature trees, shrubs and grass.

Vegetation on site

Immediate plot under construction

4.6.2 Fauna

The site is situated within in a piece where human activities have altered the natural habitat for animals over the years.

The project's effect may seem insignificant to such lives but it is of great concern to the environment at large. It is expected that the area is populated by small mammals such as mice, rats, moles and other members of the Rodent Family. Bird species were also observed at the site. None of the faunal species observed are rare or endangered.

4.7 Socio-economic Environment

Kenya's real gross domestic product (GDP) grew by 5 .8per cent in 2005 against a revised growth of 4 .9 percent in 2004 (CBS 2006).The major growth sectors were agriculture and forestry; transport and communications; manufacturing; and wholesale and retail trade. Economic growth is expected to be sustained in 2006. Nairobi is a major contributor to Kenya's economy: it generates over 45 per cent of GDP, employs 25 per cent of Kenyans and 43 per cent of the country's urban workers (UN-Habitat 2006).The paradox is that the financial capacity of the Nairobi City County is extremely limited, largely because of poor resource management and a weak revenue collection system. As a result, there is a 200 per cent shortfall between the revenue collected per capita ($7 on average) and per capita expenditure ($21) (UN Habitat 2006)

4.7.1 Land use:

Urban land use refers to spatial distribution of social and economic activities. Accordingly, an up-to-date land use inventory is frequently required to facilitate urban planning and growth patterns as well as monitoring of urban expansion. A study by the Department of Resource Surveys and Remote Sensing (DRSRS 1994) identified eight major land-use classes in Nairobi. These include Residential use Industrial, commercial and service centres, Infrastructure land use, Recreational areas, urban agriculture as well as Water bodies and riverine areas.

4.7.2 Economic Activity:

The economy and the environment are closely linked, as natural resources are the basis of production, manufacturing and waste disposal. Environmental resources such as forests, water and land have a vital role to play in boosting economic growth and reducing poverty. While it may be argued that economic growth brings many benefits to people, the attendant pollution loading and resource depletion poses great risks to human health and the environment. If not managed properly this may even jeopardize the viability of the economic activities being supported. Nairobi is a major contributor to Kenya's economy: it generates over 45 per cent of GDP, employs 25 per cent of Kenyans and 43 per cent of the country's urban workers (UN-Habitat 2006).The paradox is that the financial capacity of the Nairobi City County is extremely limited, largely because of poor resource management and a weak revenue collection system. As a result, there is a 200 per cent shortfall between the revenue collected per capita ($7 on average) and per capita expenditure ($21) (UN Habitat 2006).

4.7.3 Employment Trend

As Nairobi's population increases, so does the demand for jobs. Currently, 56 .6 per cent of women and 68 .6 per cent of men aged between 15 and 50 are economically active (CBS et al. 2004).Between 1989 and 1997, the combined formal and informal sector employment growth in Nairobi was 2 .3 per cent per annum, less than half that of the rate of population growth (Post

Buckley International Inc.1998).It is estimated that about 500,000 people join the labour force annually. Most of these are unable to secure employment and thus remain unemployed or end up in traditional agriculture and in the informal sector (Odhiambo and Manda 2003). The 1997–1998 labour force survey showed that 9 per cent of people in Nairobi were employed and 24 per cent unemployed (CBS 2003b).

4.7.4 Socio-economic Importance of the proposed project

The proposed project is in line with the governments' housing policy that aims to facilitate the attainment of adequate shelter and healthy living environment to all socioeconomic groups in Kenya. The project will therefore help to increase settlement in the region by investing in the construction industry; the proponent will also contribute towards the economic growth of our nation through revenue collection. In particular, the proposed project will generate the following positive socio-economic impacts:

1. The proponent will sell/rent the residential development to the public. The proposed project will therefore serve as a source of income to the proponent thereby improving their living standards
2. During the operation phase of the project, the proponent will be required to pay tax to the government hence contributing to the economic growth of our nation
3. The proposed project will indirectly contribute towards enhancement of security in the neighbourhood of the area
4. The proposed project will generate revenue to the County through payment of connection and service fee.

Apart from the direct employment of construction workers, the proposed project will also benefit the following categories of individuals: Transporters, Cement Manufacturers, The government will also get some impressive increase in V.A.T. and other taxes levied on cement, Manufacturers and dealers of other building materials. Sand harvesters. Locals involved in sand harvesting in sand harvesting are to be major beneficiaries' of the project. Ballast Quarries.

4.8 Water Resources

Although Nairobi relies mainly on surface water supplies, the sources of these supplies lie outside the city. The surface streams, though numerous, are heavily contaminated by domestic and industrial effluents and solid wastes. Naturally rivers are expected to cleanse themselves as they move downwards, but this is not the case with the Nairobi River and its tributaries, because there are many sources of organic pollution along the river.

Water will be supplied by NAWSCO and supplemented by an existing borehole on site

4.9 Waste Management.

Waste management is a growing problem in Nairobi. Increasing urbanization, rural-urban migration, rising standards of living and rapid development associated with population growth have resulted in increased solid waste generation by industrial, domestic and other activities. The increase in solid waste generation has not been accompanied by an equivalent increase in the capacity of the relevant urban authorities to deal with this problem. Only about 40 per cent of the waste generated in Nairobi is collected by the Nairobi City County, the private sector collects about 20 per cent and the balance is left uncollected, or is disposed of through other means, including by burning, dumping in pits and other unauthorised places, or is collected by the numerous nongovernmental organizations, community-based groups and other ad hoc or voluntary groups (Ikiara 2006). It is estimated that there are at least 60 private companies engaged in solid waste collection services in the city (JICA 1998 in UNEP/NEMA 2005).The existing waste management practices in the neighbourhood of the proposed project site and within the Nairobi City County in general include:

Though some areas of the City of Nairobi are sewered; others are not. The project site has a conventional sewer to dispose of waste water. It is envisaged that a lot of solid waste will be generated during and after construction (Occupation). Solid and liquid wastes should not be mixed together. In addition solid wastes should be sorted out depending on their nature e.g. biodegradable from non-biodegradable, reusable from recyclable, metallic from plastic and toxic from nontoxic prior to disposal.

NEMA, in line with the Environmental Management and Coordination (Waste Management) Regulations, 2006 requires all solid waste (unless the generator opts to recycle) to be dumped at approved sites. The neighborhood of the proposed site relies on private garbage collectors to dispose of solid waste. The Proponent will be required to contract a licensed solid waste transporter to collect and transport solid waste from the site for dumping at approved sites.

CHAPTER FIVE: IMPACT ASSESSMENT METHODOLOGY & ANALYSIS OF ALTERNATIVES

5.1 Introduction

This chapter will describe the impact assessment methodology to be used for this project. The methodology has been developed by the consultant and aims to provide a relatively objective approach for the assessment of potential impacts.

5.2 Methodology

To ensure a direct comparison between various impacts, standard rating scales have been defined for assessing and quantifying the identified impacts. This is necessary since impacts have a number of parameters that need to be assessed. Five factors need to be considered when assessing the significance of impacts, namely:

1. Relationship of the impact to **temporal** scales – the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
2. Relationship of the impact to **spatial** scales – the spatial scale defines the physical extent of the impact.
3. The severity of the impact – the **severity/beneficial** scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party. The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word 'mitigation' means not just 'compensation', but also the ideas of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.
4. The **likelihood** of the impact occurring – the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

Each criterion is ranked with scores assigned to determine the overall **significance** of an activity. The criterion is then considered in two categories, viz.

- Effect of the activity and the likelihood of the impact.

The total scores recorded for the effect and likelihood are then read off the matrix presented to determine the overall significance of the impact.

- The overall significance is either negative or positive.

5.3 Analysis of Alternatives

5.3.1 The No Action Alternative

The No Action Alternative in respect to the proposed project implies that the status quo is maintained i.e. no construction/development activity to take place. This option is most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. However, the need for such development is high and the anticipated insignificance environmental impacts resulting from construction have already been experienced. This option will however, involve several losses both to the project proponent/land owner and the Kenya society and Government. The property will remain under-utilized or neglected. The No Project Option is the least preferred from the socio-economic and partly environmental perspective since if the project is not done: -

- ❖ The economic benefits especially during constriction i.e. provision of jobs for skilled and non-skilled workers will not be realized.
- ❖ There will be no generation of income by the developer and the Government.
- ❖ The social-economic status of Kenyans and local people would remain unchanged.
- ❖ availability of modern middle class housing
- ❖ The local skills would remain under utilized
- ❖ No employment opportunities will be created for Kenyans who will work in the project.
- ❖ Discouragement for investors to produce this level of standard and affordable developments.

5.3.2 The relocation Alternative

Relocation option to a different site is an option available for the project implementation. At the moment, there are no alternative sites for the proposed development (i.e. the project proponent doesn't have an alternative site). This means that the proponent has to look for the land if relocation is proposed. Looking for the land to accommodate the scale and size of the project and completing official transaction on it may take a long period. In addition, it is not a guarantee that such land would be available. It's also worth noting that the said project is already underway in terms of seeking development approvals in various government departments.

The project proponent would spend another long period of time on design and approvals of the plans by the relevant government departments. The project design and planning before the stage of implementation would call for costs; already incurred in the proposed development i.e. whatever has been done and paid to date would be counted as a loss to the proponent. In consideration of the above concerns and assessment of the current proposed site, relocation is not a viable option.

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

5.3.3 Alternative Land Use Activities

The area is in a residential zone i.e. used for residence. Alternative land use activities such as farming, grazing land and car repairs will conflict with surrounding land use activities. For uniformity purposes, the proponent is interested in construction of residential houses similar both in form and character to what is existing in the neighbourhood.

5.3.4 Solid Waste Management Alternatives.

Throughout construction, the project will produce wastes such as soil, wood chips, metal scraps and paper wrappings among other. Wastes to be generated during operation phase are mainly domestic in nature. The Proponent is expected to observe EMCA (Waste Management Regulations, 2006). Priority will be given to reduction of wastes, recycling, and reuse. This will minimize environmental pollution.

5.3.5 Project Design

This Environmental Impact Assessment Project Report is based on information and consultations with the project proponent, the Architect and details contained in the architectural plans and drawings of the project. (***Please see copies of Architectural Plans***). The project will entail construction of residential apartments.

CHAPTER SIX: POTENTIAL ENVIRONMENTAL IMPACTS

6.1 Introduction

This chapter outlines the potential negative and positive impacts that will be associated with the housing project. The impacts will be related to activities to be carried out during construction of the project. The operational phase impacts of the project will be associated with the activities carried out by the residents which will mainly be domestic. In addition, closure and decommissioning phase impacts of the project are also highlighted. The impacts of the housing project during its life cycle stages (construction, operation and decommissioning) can be categorized into: impacts on the biophysical environment; health and safety impacts; and socio-economic impacts. Construction of the proposed residential development is likely to present several environmental impacts. These can be either positive or negative.

6.2 Anticipated Environmental Impacts

During the field survey, key impacts both positive and negative relating to the proposed residential development was identified. They were obtained by making physical observations at the project site as well as existing land use in the neighbourhood.

6.3 Positive Environmental Impacts of Construction Activities

6.3.1 Creation of Employment Opportunities

Several employment opportunities will be created for construction workers during the construction phase of the project. This will be a significant impact since unemployment is currently quite high in the country at large.

6.3.2 Provision of Market for Supply of Building Materials

The project will require supply of large quantities of building materials most, of which will be sourced locally. This provides ready market for building material suppliers such as quarrying companies, hardware shops and individuals with such materials.

6.3.3 Increased Business Opportunities

The large number of project staff required will provide ready market for various goods and services, leading to several business opportunities for small-scale traders such as food vendors around the construction site.

6.3.4 Individual Investment

Economically, the project will be an investment to the proponent. The proposed project once complete can also be used as a collateral asset.

6.3.5 Optimal Use of Land

The residential development leads to optimal use of land. Considering the scarcity of serviced land in Nairobi, the project enhances the returns on the limited land space in the city.

6.3.6 Revenue to Government.

Value Added Tax (VAT) on construction materials/ tools to be purchased among others will be sources of revenue for the government and its institutions.

6.3.7 Enhanced Security.

During the operation of the project, security will be enhanced in the premise and the houses through distribution of suitable security lights and presence of a security guard. This will lead to improvement in the general security in the surrounding area.

6.3.8 Improved Infrastructure.

Project activities will lead to improvement of transport, sewerage, water supply and telecommunication networks. Such services are a prerequisite to development in any region.

6.4 Negative Environmental Impacts of Construction Activities

6.4.1 Extraction and Use of Building Materials

Building materials such as hard core, ballast, cement, rough stone and sand required for construction of the housing project will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as rivers and land. Since substantial quantities of these materials will be required for construction of the buildings, the availability and sustainability of such resources at the extraction sites will be negatively affected, as they are not renewable in the short term. In addition, the sites from which the materials will be extracted may be significantly affected in several ways including landscape changes, displacement of animals and vegetation, poor visual quality and opening of depressions on the surface leading to several human and animal health impacts.

6.4.2 Dust Emissions

During construction, the project will generate substantial quantities of dust at the construction site and its surrounding. The sources of dust emissions will include site preparation and levelling

works, and to a small extent, transport vehicles delivering building materials. Emission of large quantities of dust may lead to significant impacts on construction workers and the local residents, which will be accentuated during dry weather conditions.

6.4.3 Exhaust Emissions.

The trucks used to transport various building materials from their sources to the project site contribute to increases in emissions of CO2, NO2 and fine particulate along the way as a result of diesel combustion. Such emissions can lead to several environmental impacts including global warming and health impacts.

6.4.4 Traffic flow during construction

There is a likelihood of increase in traffic on road adjacent to the site during construction. The trucks used to transport various building materials from their sources to the project site will contribute to increases in emissions of CO_2, NO_x and fine particulate along the way as a result of diesel combustion. Such emissions can lead to several environmental impacts including global warming and health impacts.

6.4.5 Noise and Vibration

The construction works, delivery of building materials by heavy trucks and the use of machinery/equipment including bulldozers, generators, metal grinders and concrete mixers will contribute high levels of noise and vibration within the construction site and the surrounding area. Elevated noise levels within the site can affect project workers and the residents, passers-by and other persons in within the vicinity of the project site.

6.4.6 Risks of Accidents and Injuries to Workers

Because of the intensive engineering and construction activities including erection and fastening of roofing materials, metal grinding and cutting, concrete work, steel erection and welding among others, construction workers will be exposed to risks of accidents and injuries. Such injuries can result from accidental falls from high elevations, injuries from hand tools and construction equipment cuts from sharp edges of metal sheets and collapse of building sections among others.

6.4.7 Solid Waste Generation

Large quantities of solid waste (soil) will be generated as a result of excavation of the site. In addition, additional solid waste will be generated at the site during construction of the building and related infrastructure. Such waste will consist of metal cuttings, rejected materials, surplus materials, surplus oil, excavated materials, paper bags, empty cartons, empty paint and solvent

containers, broken glass among others. Such solid waste materials can be injurious to the environment through blockage of drainage systems, choking of water bodies and negative impacts on human and animal health. This may be accentuated by the fact that some of the waste materials contain hazardous substances such as paints, cement, adhesives and cleaning solvents, while some of the waste materials including metal cuttings and plastic containers are not biodegradable and can have long-term and cumulative effects on the environment.

6.4.8 Energy Consumption

The project will consume fossil fuels (mainly diesel) to run transport vehicles and construction machinery. Fossil energy is non-renewable and its excessive use may have serious environmental implications on its availability, price and sustainability. The project will also use electricity supplied by supplied by Kenya Power & Lighting Company (KPLC) Ltd.

6.4.9 Water Use

The construction activities will require large quantities of water. Water will mainly be used for concrete mixing, curing, sanitary and washing purposes. Excessive water use may negatively impact on the water source and its sustainability.

6.5 Positive Environmental Impacts of Operational Activities

6.5.1 Provision of Housing Facilities

The project will provide modern Houses with new and state of the art infrastructure to Nairobi residents. This impact will be significant since Nairobi is currently experiencing a shortage of Housing facilities for its residents.

6.5.2 Employment Opportunities

Some people will be employed by the project as management agents, caretakers, cleaners, security personnel and technicians.

6.5.3 Revenue to National and County Governments

Through payment of relevant taxes, rates and fees to the government and the local authority, the housing project will contribute towards the national and local revenue earnings.

6.5.4 Improved Security

Security will be ensured around the Houses through distribution of suitable security lights and presence of 24-hour security guards. In addition, CCTV cameras will be installed in every corner of the facility.

6.6 Negative Environmental Impacts of Operational Activities

6.6.1 Solid Waste Generation

The project is expected to generate enormous amounts of solid waste during its operation phase. The bulk of the solid waste generated during the operation of the project will consist of paper, plastic, glass, metal, textile and organic wastes. Such wastes can be injurious to the environment through blockage of drainage systems, choking of water bodies and negative impacts on animal health.

6.6.2 Energy Consumption

During operation, the family units will use a lot of electrical energy mainly for domestic purposes including lighting, cooking, running of air conditioning equipment, running of refrigeration systems, pumping water into reservoirs. Since electricity generation involves utilization of natural resources, excessive electricity consumption will strain the resources and negatively impact on their sustainability.

6.6.3 Water Use

The domestic activities during the operation phase of the project will involve the use of large quantities of water.

6.7 Negative Environmental Impacts of Decommissioning Activities

6.7.1 Solid Waste

Demolition of the project small buildings 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, glass, paints, adhesives, sealants and fasteners. 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.

6.7.2 Noise and Vibration

The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas.

6.8 Positive Environmental Impacts of Decommissioning Activities

6.8.1 Rehabilitation

Upon decommissioning the project, rehabilitation of the project site will be carried out to restore the site to acceptable status. This will include replacement of topsoil and re-vegetation that will lead to improved visual quality of the area.

6.8.2 Employment Opportunities

Several employment opportunities will be created for demolition staff.

CHAPTER SEVEN: IMPACTS MITIGATION MEASURES

7.1 Introduction

This chapter highlights the necessary mitigation measures that will be adopted to prevent or minimize significant negative environmental, health and safety impacts associated with the activities of the project during its construction, operation and decommissioning phases. Allocation of responsibilities, time frame and estimated costs for implementation of these measures are presented in the environmental management programme (EMP) in Chapter 8.

7.2 Mitigation of Construction Phase Impacts

7.2.1. Efficient sourcing and Use of Raw Materials

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

To reduce the negative impacts on availability and sustainability of the materials, the proponent will only order for what will be required through accurate budgeting and estimation of actual construction requirements. This will ensure that materials are not extracted or purchased in excessive quantities. Moreover, the proponent will ensure that wastage, damage or loss (through run-off, wind, etc) of materials at the construction site is kept minimal, as these would lead to additional demand for and extraction or purchase materials.

In addition to the above measures, the proponent shall consider reuse of building materials and use of recycled building materials. This will lead to reduction in the amount of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.

7.2.2. Minimization of Run-off

The proponent will put in place some measures aimed at minimizing soil erosion and associated sediment release from the project site. These measures will include terracing and levelling the project site to reduce run-off velocity and increase infiltration of rainwater into the soil. In addition, construction vehicles will be restricted to designated areas to avoid soil compaction within the project site, while any compacted areas will be ripped to reduce run-off.

7.2.3. Minimization of Construction Waste

It is recommended that demolition and construction waste be recycled or reused to ensure that materials that would otherwise be disposed off as waste are diverted for productive uses. In this

regard, the proponent is committed to ensuring that construction materials left over at the end of construction will be used in other projects rather than being disposed of. In addition, damaged or wasted construction materials including cabinets, doors, plumbing and lighting fixtures, marbles and glass will be recovered for refurbishing and use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents or homeowners. The proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal.

It is further recommended that the proponent should consider the use of recycled or refurbished construction materials. Purchasing and using once-used or recovered construction materials will lead to financial savings and reduction of the amount of construction debris disposed of as waste. Additional recommendations for minimization of solid waste during construction of the project include:-

I. 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
II. Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements
III. Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials
IV. Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste
V. Use of construction materials containing recycled content when possible and in accordance with accepted standards.

7.2.4. Reduction of Dust Generation and Emission

Dust emission during construction will be minimized through strict enforcement of onsite speed controls as well as limiting unnecessary traffic within the project site. In addition, it is recommended that excavation works be carried out in wet weather; and traffic routes on site be sprinkled with water regularly to reduce amount of dust generated by the construction trucks.

7.2.5. Minimization of impacts on traffic flow

The proponent will put in place measures to address such concerns by ensuring that construction vehicles preferably deliver materials during off-peak hours when traffic volume is low. There will also be provision for caution signs on the access road to alert users on construction activities in progress in order to prevent occurrence of accidents. This will be achieved through proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road. In addition truck drivers will be

sensitized to avoid unnecessary racing of vehicle engines at loading/offloading areas, and to switch off or keep vehicle engines at these points.

7.2.6. Minimization of Noise and Vibration

Noise and vibration will be minimized in the project site and surrounding areas through sensitization of construction truck drivers to switch off vehicle engines while offloading materials. In addition, they will be instructed to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, schools and hospitals. In addition, construction machinery shall be kept in good condition to reduce noise generation. It is recommended that all generators and heavy-duty equipment be insulated or placed in enclosures to minimize ambient noise levels.

7.2.7. Health and safety of Workers on site

The proponent is committed to adherence to the occupational health and safety rules and regulations stipulated in Occupational Health and Safety Act (Cap 514). In this regard, the proponent is committed to provision of appropriate personal protective equipment such as gloves; helmets, overall as well as ensuring a safe and healthy environment for construction workers by providing sanitary facilities (toilets) and portable water .

7.2.8. Reduction of Energy Consumption

The proponent shall ensure responsible electricity use at the construction site through sensitization of staff to conserve electricity by switching off electrical equipment or appliances when they are not being used.

In addition, proper planning of transportation of materials will ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts. Complementary to these measures, the proponent shall monitor energy use during construction and set targets for reduction of energy use.

7.2.9. Minimization of Water Use

The proponent shall ensure that water is used efficiently at the site by sensitizing construction staff to avoid irresponsible water usage.

7.3 Mitigation of Operation Phase Impacts

7.3.1 Ensuring Efficient Solid Waste Management

The proponent will be responsible for efficient management of solid waste generated by the project during its operation. In this regard, the proponent will provide waste handling facilities such as waste bins and skips for temporarily holding domestic waste generated at the site. In

addition, the proponent will ensure that such disposed of regularly and appropriately. It is recommended that the proponent put in place measures to ensure that the occupants of the Houses manage their waste efficiently through recycling, reuse and proper disposal procedures.

7.3.2 Minimization of Sewage Release

The proponent will ensure that there are adequate means for handling the large quantities of sewage generated by the Houses being directed to the existing sewer line.

7.3.3 Ensure Efficient Energy Consumption

The proponent plans to install an energy-efficient lighting system for the project. This will contribute immensely to energy saving during the operational phase of the project. In addition, occupants of the Houses will be sensitized to ensure energy efficiency in their domestic operations.

7.3.4 Ensure Efficient Water Use

The proponent will install water-conserving automatic taps and toilets. Moreover, any water leaks through damaged pipes and faulty taps will be fixed promptly by qualified staff. In addition, the occupants of the Houses will be sensitized to use water efficiently.

7.4 Mitigation of Decommissioning Phase Impacts

7.4.1 Efficient Solid Waste Management

Solid waste resulting from demolition or dismantling works will be managed as previously described.

7.4.2 Reduction of Dust Concentration

High levels of dust concentration resulting from demolition or dismantling works will be minimized as described in Section 7.2.4.

7.4.3 Minimization of Noise and Vibration

Significant impacts on the acoustic environment will be mitigated as described above.

CHAPTER EIGHT: ENVIRONMENTAL MANAGEMENT PLAN

8.1 Introduction

Integrating environmental issues in business management, such as those related to real estate development is that it increases efficiency while enhancing the project proponent financial and environmental management. Environmental planning and management as a concept seeks to improve and protect environmental quality for both the project site and the neighbourhood through segregation of activities that are environmentally incompatible. Environmental planning and management integrates land use structure, social systems, regulatory law, environmental awareness and ethics.

Environmental management plan (EMP) for development projects such as the proposed residential development is aimed at providing a logical framework within which identified negative environmental impacts can be mitigated and monitored. In addition, EMP assigns responsibilities for action to various actors, and provides time frame within which mitigation measures can be done.

EMP is a vital output for an environmental impact assessment as it provides a checklist for project monitoring and evaluation. A number of mitigation measures are already incorporated into the project design.

8.2 Environmental Monitoring and Evaluation

Environmental monitoring and evaluation are essential in the project lifespan as they are conducted to establish if the project implementation has complied with the set environmental management standards as articulated in the Environmental Management and Coordination Act (EMCA) No. 8 of 1999, and its attendant Environmental (Impact Assessment and Audit) Regulations, 2003.

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

- Disruption of natural environment and modification of microclimate
- Air and noise pollution
- Proliferation of kiosks
- Workers accidents and health infections during construction process
- Proliferation of uncollected wastes

TABLE 8.1: ENVIRONMENTAL MANAGEMENT PLAN IMPLIMENTATION PHASE

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES)	MONITORING MEASURES
Commissioning of the Construction Works	- Site hand-over and Ground breaking	Project team (Lead Consultant/Architect, contractor Proponent)	Part of/Covered in the Project Cost	Presence of the project Team
Securing the Construction Site	- Construction of Perimeter Wall and Hoarding	Contractor	Part of/Covered in the Project Cost	Presence of Perimeter Fence
Security for Construction Material	- Construction of Site Stores - Construction materials to be delivered in small quantities to minimize storage problems	Contractor	500,000	Presence of Site store
Extraction and Use of Building Materials	- Availability and sustainability of the extraction sites as they are non-renewable in the short term - Landscape changes e.g. displacement of animals and vegetation, poor visual quality and opening of depressions on the surface	Contractor/Proponent/project team	Part of/Covered in the Project Cost	Material site rehabilitation
Collapse of Building during Construction	- Ensuring Building Strength and stability - Use of appropriate construction materials and reinforcements as per specifications - Ensuring building components are as per designs - Proper supervision - Ensure proper timelines are followed e.g. curing time	Contractor/project team	Part of/Covered in the Project Cost	Presence of the project Team

Disturbance of Traffic flow during construction Construction phases	- Proper signage - Awareness creation - Education to truck drivers - dropping of materials during off-peak hours	Contractor/Project team and general public	850,000	- Presence of Security - Presence of warning signs
ENVIRONMENTAL IMPACT	**MITIGATION MEASURES**	**RESPONSIBILITY**	**COST (KES)**	**MONITORING MEASURES**
Soil Excavation leading to site disturbance	- Excavate only areas to be affected by buildings - Dumping of excess excavated materials to sites designated by NEMA and County Authority - Restoration of sites Excavated	Contractor	1200,000	Landscaping after completion of construction
Soil Erosion	- Create and Maintain soil traps and embankments. - Landscaping after completion of construction	Contractor/Proponent Architect/Site engineer Landscape Architect	700,000	Lack/Absence of Soil Erosion
Noise Pollution and Vibration	- Ensure use of serviced and greased equipment - Switch off engines not in use - Construction work to be confined to between 8am to 5pm - Ensure use of earmuffs by machine operators	Proponent and Contractor	Part of Routine operation procedure	Lack of complaints
Air Quality	- Water sprinkling of driveways or the use of biodegradable hydrant eg Terrasorb polymer will reduce dust emission during construction - Ensure servicing of vehicles regularly	Proponent and Contractor	Part of Routine operation procedure	- Lack of complaints - Workers wearing protective clothing and earmuffs
Risks of Accidents and Injuries to Workers	- Education and awareness to all construction workers - Ensure use of appropriate personal protective clothing - Provide First Aid Kits on site - Ensuring Building Strength and stability - Proper supervision	Proponent Contractor	Part of Routine operation procedure	- Presence of well-equipped First Aid kit - Presence of Security Guards on site - Presence of a register on the site
Health and Safety	- Provide First Aid Kits on site - Proper signage and warning to public of heavy vehicle turning - Ensuring Building Strength and stability	Proponent Contractor	Part of Routine operation procedure	- Presence of well-equipped First Aid kit - Presence of Security Guards on site

	- Provide clean water and food to the workers - The contractor to abide by all construction conditions especially clause B12 which stipulates health safety and workforce welfare			- Presence of a register on the site
ENVIRONMENTAL IMPACT	**MITIGATION MEASURES**	**RESPONSIBILITY**	**COST (KES)**	**MONITORING MEASURES**
Solid Waste Generation	- Ensure waste materials are disposed of on County Authorities and NEMA approved sites - Ensure re-use of materials that can be re-used - Use of the 3rs – Reduce, Re-use, Re-cycle	Proponent Contractor	900,000	- Absence of Solid waste on the site
Energy Consumption	- Use electricity sparingly since high consumption of electricity negatively impacts on these natural resources and their sustainability - Use of Standby Generators	Proponent Contractor	700,000	- Presence of KPLC power lines - Presence of Generators
Excessive Water Use	- Excessive water use may negatively impact on the water source and its sustainability	Proponent Contractor	500,000	- Presence of NCWSC water lines - Metering of water - Storage tanks
OCCUPATION PHASE				
Architectural incompatibility leading to distortion of neighbourhood aesthetic image	- Harmonize building scale with existing developments in neighbourhood. - Harmonize detail, material and finishes for roofs and walls with existing development in the neighbourhood.	Architect Proponent Contractor	Part of/Covered in the Project Cost	- Compatibility with the neighbourhood
Solid Waste Generation and Management	- Regular inspection and maintenance of the waste disposal systems during operation phase - Establish a collective waste disposal and management system	Proponent Estate Managers	900,000	- Presence of NEMA registered waste management companies - Presence of waste

	- Provide waste disposal bins to each house well protected from adverse weather and animals - Ensure waste materials are disposed of on County Authorities and NEMA approved sites - Use of the 3rs – Reduce, Re-use, Re-cycle			handling bins - Absence of wastes
Liquid Waste Generation and Management	- Regular inspection and maintenance of the waste disposal systems during the operation phase - Connection to sewer system	Proponent Estate Managers	800,000	- Conventional sewer line and or septic tank - Presence of waste handling bins - Absence of wastes
ENVIRONMENTAL IMPACT	**MITIGATION MEASURES**	**RESPONSIBILITY**	**COST (KES)**	**MONITORING MEASURES**
Increased loading on Infrastructure services - Increased vehicular and/or pedestrian traffic - Increased demand on water, sanitation services	- Have paved local access road and walkway system - Encourage rainwater harvesting - Designing the site entrance to ease traffic that may occur when cars are entering /leaving the site - Provision of increased water storage capacity - Provide adequate storm water drainage system	Contractor Proponent Estate Managers	900,000	- Absence of run-off - Presence of good roads - Pavements and drainage channels
Traffic	- Provide adequate parking facilities within the project site - Designing the site entrance to ease traffic that may occur when cars are entering /leaving the site	Contractor/Proponent Residents	Routine operation procedure	- Presence of amble parking in the premises
Increased social conflict	- Increased Housing stock in the area and Kenya - Increased economic activities –employment generation, income earnings and housing capital stock formation - Encourage formation of community policing and formation of neihgbouhood associations	Contractor Proponent Neighbourhood associations		
Storm Water impacts	- Provide roof gutters to collect and direct roof water to drains	Proponent Contractor	1,500,000	Absence of Flooding and dampness in the

	- The proponent has designed storm water drainage channels and submitted them to the county for approval			building
Disruption of existing natural environment and modification of micro-climate – - Increased development density - Increased glare/solar reflection - Reduced natural ground cover/surface run-off	- Development restricted to follow zoning policy/approved density – building line, plot coverage and plot ratio. - Careful layout and orientation of buildings to respect wind and sun direction. - Adequate provision of green and open space planted with grass, shrub and tree cover. - Minimum use of reflective building material and finishes for roof, wall and pavement.	Project team (Contractor Proponent, Architect or Lead Consultant, etc)	1,000,000	Proper orientation Planted trees/Landscaping
ENVIRONMENTAL IMPACT	**MITIGATION MEASURES**	**RESPONSIBILITY**	**COST (KES)**	**MONITORING MEASURES**
Insecurity	- Ensure secure perimeter wall where applicable - Have a single entry point that is manned 24 hours - Presence of CCTV cameras	Contractor, Proponent Neighbourhood associations Estate Managers	900,000	Presence of perimeter wall Presence of day and night security guards
DECOMMISSIONING PHASE				
Building Safety	Assess the condition of buildings to ascertain usefulness	Engineer/Proponent	1,500,000	Engineer and Tests on the building
Land and Building use	Ascertain the Planning development policy	County Authority Physical Planner	1,000,000	Consultants present
Accidents/Injuries	Securing the Site by fencing off	Contractor/Proponent	900,000	Presence of perimeter fence
Un-disconnected Services e.g. Power, Water, telephone, sewer etc	Ensure disconnection of all services Remove all surface and underground cables and wiring	Contractor	900,000	Absence of cabling
Solid Waste Generation	- Ensure waste materials are disposed of on	Proponent/Contractor	800,000	Absence of Debris

(demolition waste)	County Authorities and NEMA approved sites - Ensure re-use of materials that can be re-used -Use of the 3rs – Reduce, Re-use, Re-cycle			
Noise and Vibration	- Ensure use of serviced equipment - Switch off engines not in use - Demolition work to be confined to between 8am to 5pm - Ensure use of earmuffs by workers	Proponent/Contractor	1,200,000	Lack of complaints from the neighbours

CHAPTER NINE: ENVIRONMENTAL HEALTH AND SAFETY (EHS)

9.1 EHS Management and Administration

The EHS is a broader and holistic aspect of protecting the worker, the workplace, the tools / equipments and the biotic environment. It is an essential tool in determining the EIA study. The objective of the EHS on the proposed project is to develop rules that will regulate environmentally instigated diseases and occupational safety measures during construction and the operation phases of the proposed project by:

- Avoidance of injuries
- Provision of safe and healthy working environment for workers comfort so as to enhance maximum output.
- Control of losses and damages to plants, machines, equipment and other products.
- Enhance environmental sustainability through developing sound conservation measures.

9.2 Policy, Administrative and Legislative Framework

It is the primary responsibility of the contractor to promote a safe and healthy environment at the workplace and within the neighborhood in which the proposed project will be constructed by implementing effective systems to prevent occupational diseases and ill-health, and to prevent damage to property. The EHS Management Plan when completed will be used as a tool and a checklist by the contracted engineers in planning and development of the construction of this project.

9.3 Organization and implementation of the EHS Management Plan

The contactor shall use the EHS plan at the proposed project site both during construction and operation. The engineer will use it during construction phase with the assistance of an EHS consultant who shall enforce its provision throughout the life of the project.

9.4 The Guiding Principles to be adopted by the contractor

The company will be guided by the following principle: -

- It will be a conscious organization committed to the promotion and maintenance of high standards of health and safety for its employees, the neighboring population and the public at large.
- Ensuring that EHS activities are implemented to protect the environment and prevent pollution.

- Management shall demonstrate commitment and exercise constant vigilance in order to provide employees, neighbors of the project and the environment, with the greatest safeguards relating to EHS.
- Employees will be expected to take personal responsibility for their safety, safety of colleagues and of the general public as it relates to the EHS management plan.

9.5 EHS management strategy to be adopted by the contractor

The following strategies will be adopted to achieve the above objectives:

- Create an Environment Health and Safety Management committee and incorporate EHS as an effective structure at various levels and units to manage and oversee EHS programs in all construction and operation phases of the project
- Maintain an effective reporting procedure for all accidents.
- Provide appropriate tools and protective devices for the success of the project.
- Encourage, motivate, reward and support employees to take personal initiatives and commitment on EHS.

9.6 Safety Agenda for both the proponent and contractor

There will be a permanent EHS agenda during construction.

(a) Contractors

The EHS management plan code of practice shall be applicable to the contractors working in the premises, and shall be read and signed. It shall be incorporated into the contract to perform work. This should also remind the contractor of his/her;

- Legal requirements.
- Statutory obligations.
- Obligation to lay-down a system for reporting accidents
- Responsibility to ensure that his/her employees are supplied with personal protective equipment and where applicable as per the EHS management plan for the whole project.
- Responsibilities as it relates to contracting an EHS consultant in liaison with the proponent
- Obligation to ensure that he obtains detail of jobs and areas where permit-to-work must be issued

(b) All residents' and workers' responsibility

- Know the location of all safety equipment, and learn to use them efficiently

9.7 Safety requirement at the project site during construction and operation Period

(a) The contractor

The contractor will ensure that:

- Safe means of entry and exit at the proposed project site.
- Ensure adequate briefing of job at hand on the safe system of work before commencement of work.
- The EHS coordinator must be in attendance at all times throughout the duration of the project.
- The EHS consultant must maintain constant assessment of the risk involved as the work progresses
- A safety harness must be worn before entry into all confined spaces
- An EHS consultant must be posted at the entrance at the project site to monitor progress and safety of the persons working at the construction site.

(b) The Traffic / Drivers

Within the construction premises, the following traffic rules will be observed: -

- Observe speed limits and all other signs and obey traffic rules.
- Use the vehicle for the purpose to which it is intended only.

c) Fire hazard at the construction site,

Workers at the site shall ensure that: -

- Oxy-acetylene cylinders are not contaminated with grease or oil.
- Oxy-acetylene cylinders are not subjected to direct sunlight or heat.
- Oxy-acetylene cylinders are not to be used or stored standing in a vertical position.
- When in use, ensure the inclination should never be over 30° from the vertical.

9.8 Welding at the construction site

It is the responsibility of the contractor during construction to: -

- Ensure that welding clamp is fixed such that no current passes through any moving parts of any machine.
- Ensure that all welding clamps are in good operating condition and conduct current without arcing at the point of contact.

- Ensure that welding clamps are free from any contact with explosive vapors i.e. Oil spillage, Fuel tanks, Coal dusts and miscellaneous combustible material (e.g. Cotton rags filter bags, rubber belting, and wood shavings).
- Ensure that any slag or molten metal arising from welding activities does not start up fires by:

✓ Clearing combustible material to a distance of at least 3 meters away from the working area or covering area with metal or asbestos sheet.

✓ Appropriate fire extinguisher is to be kept available for immediate use at all times

9.9 Emergency procedure during construction and operation

An emergency situation means:

- Unforeseen happening resulting in serious or fatal injury to employed persons or the neighbouring communities.
- Fire or explosion.
- Natural catastrophe.

In the event of such an emergency during construction, the workers shall:

- Alert other persons exposed to danger.
- Inform the EHS coordinator.
- Do a quick assessment on the nature of emergency.
- Call for ambulance on standby.
- When emergency is over the EHS coordinator shall notify the workers by putting a message: "ALL CLEAR"

In the event of such an emergency during operation the workers shall: -

- Alert other persons exposed to danger.
- Ring the nearest police station
- Call for ambulance.

CHAPTER TEN: DECOMMISSIONING

10.1 Introduction

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

- Remove all underground facilities from the site
- The site should be well landscaped by flattening the mounds of soil and
- Planting indigenous trees and flowers
- All the equipment should be removed from the site
- Fence and signpost unsafe areas until natural stabilization occurs
- Backfill surface openings if practical

The table below shows the proposed decommissioning plan:

Table 10.1. EMP for Decommissioning

Expected Negative Impacts	**Recommended Measures**	**Responsible Party**	Time Frame	Cost (KShs)
1. Construction Machinery/Structure & Wastes				
Scraps material and other debris	Use of an integrated solid waste management system i.e. through a hierarchy of options. Wastes generated as a result of facility decommissioning activities will be characterized in compliance with standard waste management procedures. The contractor will select disposal locations and the County based on the properties of the particular waste generated.	Project Manager & Contractor	During decommissioning	2,800,000
	All buildings, machinery, equipment, structures and partitions that will not be used for other purposes should be removed and reused or rather sold/given to scrap material dealers.	Project Manager & Contractor	During decommissioning	-
	Where recycling/reuse of the machinery, equipment, structures and other waste materials is not possible the materials should be taken to approved dumpsites.	Project Manager & Contractor	During decommissioning	-
Rehabilitation of project site				
Vegetation disturbance Land deformation: soil erosion, drainage problems	-Implement an appropriate re-vegetation programme to restore the site to its original status. -During the vegetation period, appropriate surface water runoff controls will be taken to prevent surface erosion; -Monitoring and inspection of the area for indications of erosion will be conducted and appropriate measures taken to correct any	Project Manager & Contractor	During decommissioning	3,000,000

	occurrences; -Fencing and signs restricting access will be posted to minimize disturbance to newly-vegetated areas;			
Social- Economic impacts				
-Loss of income -Loss of housing facilities	The safety of the workers should surpass all other objectives in the decommissioning project. -Adapt a project – completion policy; identifying key issues to be considered. -Compensate and suitably recommend the workers to help in seeking opportunities elsewhere.	Project Manager & Contractor	During decommissioning	1,700,000

CHAPTER ELEVEN: CONCLUSION AND RECOMMENDATIONS

11.1 Conclusions

From the foregoing analysis, the social and economic rating for this project is highly positive. Evaluation of alternatives has already shown that options are limited and costly. Already the proponent has sunk a substantial amount of money in the project up to design stage. Further delay of the project is denying all stakeholders the anticipated benefits of the investment. However, redesigning or relocation will lead to loss of time and money that is already tied in the preliminary costs of the project. The project does not pose any serious and negative environmental impacts. Adequate mitigation measures have been proposed to address any of the negative impacts arising from the project. The project will boost the diminishing housing supply in the country and more in urban areas.

During the preparation of this report for the proposed development it is observed and established that most of the negative impacts on the environment are rated low and short term with no significant effect. The positive impacts are highly rated and will benefit all stakeholders and the residents at large. The project proponents have proposed to adhere to prudent implementation of the environmental management plan as advised by the expert. They are obtaining all necessary permits and licenses from the relevant authorities and have qualified and adequate personnel to do the project as proposed. They have proposed adequate safety and health mitigation measures as part of the relevant statutory requirements

11.2 Recommendations

This study is recommendable and should be approved by NEMA for issuance of an EIA license subject to annual environmental audits after it has been completed and occupied. This will be in compliance with the Environmental Management and Coordination Act of 1999 and the Environmental Impact Assessment and Audit regulations, 2003. Above all the proponent should carry out Environmental Audit 12 months after the project is completed.

They should therefore be licensed to implement this project subject to adherence to the environmental management plan proposed in this report and the statutory requirements.

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