# ENVIRONMENTAL IMPACT ASSESSMENT FULL STUDY REPORT
## FOR
## THE PROPOSED RESIDENTIAL DEVELOPMENT & SHOPS ON PLOT L.R NO. 209/6398 LOCATED ALONG HOMBE ROAD IN PANGANI AREA, NAIROBI COUNTY.

PROPOSED PROJECT SITE

**PROPONENT**

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## DOCUMENT AUTHENTICATION

This full study report on Environmental Impact Assessment has been prepared by registered and licensed environmental experts. We the undersigned, certify that the particulars in this report are correct and righteous to the best of our knowledge.

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Director…….……..……

Signature …….……..……Date…….…..……..

**DISCLAIMER:**

This EIA Full study report is strictly confidential to CITYPARK VIEW APARTMENT LIMITED (proponent) and any use of the materials thereof should strictly be in accordance with the agreement between the proponent and the EIA/EA Firm of Experts mentioned herein (GREENDIME CONSULTANTS LTD). It is subject to conditions spelt out in the Environmental (Impact Assessment and Audit) Regulations, 2003 under the Kenya Gazette Supplement No. 56 of 13th June 2003. It provides information on the proposed project as per the time of EIA in the year 2022.

**ACKNOWLEDGEMENT**

The EIA/Audit Experts are grateful to the project proponent for commissioning us to conduct this Environment Impact Assessment Full Study in respect of the proposed Project. We would like to further acknowledge with great appreciation all those neighbors, interested parties and the public who participated in the public consultation process for their cooperation throughout the exercise.

We further acknowledge the support, either direct or indirect, from the various parties who assisted the EIA/EA experts' team towards the successful completion of this report.

## ABBREVIATIONS

| | |
|---|---|
| BS | British Standards |
| CPP | Consultation and Public Participation |
| EA | Environmental Audit |
| EHS | Environment, Occupational Health and Safety |
| EIA | Environmental Impact Assessment |
| EMCA | Environmental Management and Coordination Act, 1999 |
| EMS | Environmental Management System |
| ERP | Emergency Response Plans |
| GPS | Global Positioning System |
| KP | Kenya Power |
| ISO | International Standards Organizations |
| LR | Land Registration |
| NWSC | Nairobi Water and Sewerage Company |
| NEMA | National Environment Management Authority |
| PSP | Private Sector Participation |
| NEAP | National Environmental Action Plan |
| SEM | Sustainable Environmental Management |
| TORs | Terms of Reference |

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## EXECUTIVE SUMMARY

This Environmental Impact Assessment full study report is for the **proposed Residential Development** of 280 Units on Plot L.R No. 209/6398 located along Hombe Road in Pangani Area, Nairobi County.

The proposed development will have 5 Blocks (A to E) each with 17 levels; Each Block will have 2 Basements used for parking; Ground floor that will have Shops and Food Court, 1st -2nd Floor that will be used for Commercial Purposes and 3rd to 16th Floors that will have residential Units. The total number of typical floors with residential Units will be 14 floors per Block. Each floor per Block will have 4 Units (3&4bedrooms). Other provisions per Unit will be Lounge, bedrooms, Kitchen, DSQ and washrooms. Each Block will have two lifts and Staircases.

The roof will be made of Concrete Slab. The whole development will be connected to the existing sewer line and Storm drainage for proper effluent waste management.

The proposed development will be connected to the existing Sewer system network. The Sewer line is monitored by Nairobi Water and Sewerage Company. Solid wastes from the development will be collected by a private hired NEMA licensed solid waste collector. Water supply for the proposed development will be from Nairobi Water and Sewerage Company. The development will be connected to Kenya Power through the main power grid in the area.

The site has an existing structure that will be demolished and excavation will be done to pave way for the proposed project.

Construction materials being used are stones, cement, timber, tiles, and paints, steel among others modern materials. Also, the proponent will use the existing communication networks and the existing road networks in the town.

The need for this Environmental Impact Assessment study is to abide by the legal provisions in the Environmental Management and Coordination Act (EMCA), 1999 and the succeeding legal supplement Environmental Impact Assessment and Audit (EIA/EA) Regulations, 2003. It is under this background the proponent engaged a registered EIA/EA Experts to carry out the study and prepare this report.

The site had an old building that has since been demolished to pave way for the proposed project. There will be generation of waste materials during construction of the project. The proponent is advised to landscape the proposed development on completion so as to enhance its aesthetics value and ensure its sustainability.

Justification of these kinds of projects is shortage of decent and enough residential buildings in Nairobi town and its environs where people can live and work at the same time. The project objective is to construct a building with secured residential units. The targeted clients are people who want to live and work near town so as to get to work on time and reduce travelling costs. This will help respond to the challenges of housing that face Nairobi Area and provide income to the proponent.

On the other hand, the main EIA objective is to identify significant positive and negative environmental, social and economic impacts associated with the project. The scope of EIA study is to identify impacts likely to be caused to the environment, public health and socio-economic well-being. The methodologies for EIA study were environmental screening, environmental scoping, desktop studies, site visits and public participation and finally report writing.

The Baseline survey that includes physical, biological and socio–economic environment has also been discussed in this report. The economic recovery strategy for wealth and employment creation on the other hand aims at giving Kenyans a better deal in their lives and in their struggle to build a modern and prosperous nation.

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. 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 have been proposed and an Environmental Management Plan (EMP) formulated. The proponent is also expected to observe and implement all the recommendations in the Environmental Management Plan (EMP) and carry out annual environmental audits once the project is in operation.

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 twelve months from the day of starting its operations. This will be in compliance with the Environmental Management and Coordination Act of 1999 and the Environmental Impact Assessment and Audit regulations, 2003 and revised EMCA regulations 2015.

# CHAPTER ONE

## 1.0 INTRODUCTION.

## 1.1 Background.

The principal measure of sustainable development is that all activities which are carried out to achieve development must take into account the 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.

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 anti-development 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.

Real estate developments in Nairobi Area are growing at a fast rate. The need for more of such developments is that most people want to live and work within towns at the same. Nairobi being one of the many towns in Kenya also requires more buildings for these purposes. To meet this rising demand, most private developers are constructing apartments in the area.

In this development proposal, the proponent intends to construct a Residential apartment of 60 Units with other amenities on the above stated plot. This will provide the proponent with facilities for their use and rental purposes. It has been established that such projects have a potential of causing significant impacts on the environment. It is under this premise that the proponent deemed it necessary to carry out an Environmental Impact Assessment (EIA) for the proposed project.

Environmental Impact Assessment study for this project is carried out as per the provisions of Environmental (Impact Assessment and Audit) Regulations, 2003.

## 1.2 Justification of the Proposed Project.

The project will empower the proponent economically in the future. In recent times, real property sector has achieved a significant growth owing to the fact that many people are currently putting up residential developments to meet rising demand for such houses in Kenya in line with Vision 2030 of providing adequate housing to Kenyans.

## 1.3 Project and Environmental Impact Assessment Objectives.

The project objective is to build a residential to provide enough spaces for rental/purchase purposes to people to live in the building and at the same time have shops in the ground floor. Currently, there is a shortage of such developments in Nairobi and its environs for such functions. 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 neighbors on the impacts of the project, and
- Develop an Environmental Management Plan for the proposed project.

## 1.4 Scope of the EIA Study.

The scope of Environmental Impact Assessment includes the following:

- Identification of significant adverse impacts to the environment,
- Mitigation measures to adverse impacts.
- An Environmental Management Plan for the proposed project.
- The baseline conditions of the proposed project area,
- Relevant legislative, policy and administrative frameworks,
- Seek the Views/opinions of the public through structured questionnaires.

## 1.5 Terms of Reference.

In September, 2021 the proponent contracted EIA/EA experts to conduct an Environmental Impact Assessment study for the proposed Residential development. Terms of reference, which, defined duties of the expert were as follows:

- The proposed location of the project in terms of road description and GPS Coordinates
- The objectives of the proposed project both environmental and economic.
- A concise description of the national environmental legislative and regulatory framework, baseline information and any other relevant information related to the project
- The technology, procedures and processes to be used, in the implementation of the project
- A description of the potentially affected environment
- The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short term and long-term effects anticipated
- Alternative technologies and processes available and reasons for preferring the chosen technology and processes
- Analysis of alternatives including project site, design and technologies and the reasons for preferring the proposed site design and technologies
- An environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, time frame and responsibility to implement the measures
- Provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the course of carrying out activities or major industrial and other development projects
- The measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies.
- An identification of gaps in knowledge and uncertainties which were encountered in compiling the information.
- An economic and social analysis of the proposed project.
- An indication of whether the environment of any other state is likely to be affected and the available alternatives and mitigating measures.

## 1.6 Methodology.

### 1.6.1 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 both positive and negative on the environment and therefore the EIA process was necessary.

### 1.6.2 Environmental Scoping.

In environmental 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.
- 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.
- 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.
- Community/ Stakeholder Consultations: these will be undertaken to determine how the project will affect the local people / various stakeholders.

- 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.

### 1.6.3 Desktop Study.

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

### 1.6.4 Site Visits and Public Participation.

Field visits were initiated for physical inspections of the project site in order to gather information on the state of environment. The site was visited on 20th September, 2021. Several photos of the project site and the immediate neighboring developments were taken for inclusion in this report. The study also sought public opinion/views of neighbors, interested or affected parties of the proposed project if any through Consultation and Public Participation (CPP) exercise using Clip board questionnaires, were administered to the public and interviews held with neighbors. The questionnaires have been included in this report.

### 1.6.5 Reporting.

In the entire exercise, the proponent and EIA experts contacted each other on the progress of the study and signing of various documents. Ten copies of this report alongside a CD will be submitted to the National Environment Management Authority for review and issuance of an EIA license.

## CHAPTER TWO

### 2.0 PROJECT DESCRIPTION.

## 2.1 Location of the Project.

The proposed project will be developed on Plot L.R Nos. 209/6398 located along Hombe Road in Pangani Area, Nairobi County. The geo spatial attributes in terms of Global Positioning System (GPS) location of the proposed site are Latitude1°16'20.14"S, Longitude 36°50'31.78"E. The general area is characterized by apartments. This therefore means that the proposed project is in character with the developed and ongoing developments of apartments in Eastleigh.

**Photo 1: showing location of the proposed site along Hombe road**

## 2.2 Site Ownership.

This Site is owned by CITYPARK VIEW APARTMENT LIMITED (Title) is attached herein. The following conditions apply to the land;

- That the proponent provides adequate measures against environmental degradation.
- That the proponent is bound by any other conditions that may be imposed by the council in its by-laws.
- Plus all the special conditions outlined in the copy of attached ownership documents.
- The development Architectural drawings have been approved by the relevant departments in Nairobi Sub-County with the following conditions in mind:

- That the proponent shall adhere to the architectural and structural drawing specification as they have been approved plus all condition included in the approval letter.

- Submission of satisfactory building plans within one year and completion of construction within two years as approved.

## 2.3 Zoning Approval

The planning regulations allow for residential developments in the area where the proposed site is located. All the necessary Physical Planning regulations such as zoning, plot ratio and plot coverage's were taken into account during the design of the proposed development. The Change of User as well as the architectural designs have been approved by the County government and NMS. Attached is a set of architectural designs as required in EMCA regulations.

## 2.4 Project Design.

The proposed development will have 5 Blocks (A to E) each with 17 levels. Each Block will have 2 Basements used for parking, Ground floor that will have Shops and Food Court, 1st – 2nd Floor that will be used for Commercial Purposes and 3rd to 16th Floors that will have residential Units. The total number of typical floors with residential Units will be 14 floors per Block. Each floor per Block will have 4 Units (3&4bedrooms). Other provisions per Unit will be Lounge, bedrooms, Kitchen, DSQ and washrooms. Each Block will have two lifts and Staircases.

The roof will be made of Concrete Slab. The whole development will be connected to the existing sewer line and Storm drainage for proper effluent waste management.

The proposed development will be connected to the existing Sewer system network. The Sewer line is monitored by Nairobi Water and Sewerage Company. Solid wastes from the development will be collected by a private hired NEMA licensed solid waste collector. Water supply for the proposed development will be from Nairobi Water and Sewerage Company. The development will be connected to Kenya Power through the main power grid in the area.

## 2.7 Description of the Project's Construction Activities.

### 2.7.1 Demolitions/Excavation / Earthworks.

The site has an existing structure that will be demolished and excavated soon. Debris and excavate materials from earthworks, especially soil and stones will be used in various construction activities while those of no use will be dumped in sites approved by the Nairobi County Government.

### 2.7.2 Foundation and Masonry.

The foundation of the proposed project will result into excavations which will be done and pillars elevated that shall support floors. Thereafter masonry which entails building courses, floors, pavements, drainage systems, parking area perimeter fence will take place. Other masonry activities include stone carvings, concrete mixing, and plastering, slab construction, reinforcing walls/lintels and curing of walls.

### 2.7.3 Roofing.

The roof will be made of concrete Slab covered with water proofing agent. The whole roof design will be done as per the structural engineer's specifications. This will ensure no leakage results from the rooftop.

### 2.7.4 Electrical Works.

Electrical work during construction will involve 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.

### 2.7.5 Plumbing.

Plumbing will entail fixing pipes water pipes and conduits to the existing Sewer line network. Likewise, storm water will be channeled to a peripheral storm water drainage system as per the approved designs. Plumbing activities include metal and plastic cutting, the use of adhesives, metal grinding and wall drilling among others.

## 2.8 Staff Amenities:

### 2.8.1 Site Office

The site office will be used by the contractor and important paper work materials that will be required at the site. The developer will also put-up toilets to be used by the construction workers. All necessary paperwork plans, approvals and licenses copies shall be available in this office for inspection at any construction times.

### 2.8.2 Material Storage and Handling:

All materials to be used shall conform to the Kenya Bureau of standards requirements for quality or equal and approved. They must be stored well to avoid theft and damages. The store for hazardous materials must be under lock and key all the time and will only be accessed by authorized personnel. Materials to be stored in this store shall include samples for review by consultants and inspectors.

### 2.8.3 Bulk Construction Materials

The bulk materials to be stored on site include: sand, ballast, stones, cement, quarry chips and timber. These materials will be sourced from Nairobi County. However, to avoid material accumulation with potential for obstructing site activities, inducing safety hazards and creating a nuisance in the neighborhood, the main contractor intends to have materials delivered in small quantities.

Timber will be used mainly for roofing, formwork, ceiling, joinery and other carpentry needs. Most joinery works will be fixed at a workshop located outside the site before being delivered ready for installation. Formwork timber will be fixed at the site. Consideration will be given to the working area and material storage requirements to ensure there is no conflict with the movement of the workers.

### 2.8.4 Potential Environmental Impacts

- Obstruction to movement by people or vehicles and machines
- Adverse effects on human health
- Surface water pollution through storm water runoff
- Loss of life and/or property
- Nuisance to neighbors and staff
- Underground water pollution through leaching

### 2.8.5 Proposed Mitigation Measures

- Provide workers with personal protective gear including gloves, respirators, safety boots and coveralls
- Provide adequate number of fire-fighting equipment
- Train staff on spill response and management
- Maintain an inventory of all materials used at the site
- Every container or package for storing hazardous waste shall be appropriately labelled
- Implement a regular servicing and inspection Programme on fire equipment
- Bulky materials to be delivered in installments and replenished according to the rate of consumption

## 2.9 Description of the Project's Operational Activities.

Completion of construction activities will be followed by occupation of the Residential by the proponent and tenants. Both solid and liquid wastes will be produced during this phase of the project. To manage solid wastes (domestic), the proponents will avail litterbins/receptacles within the compound for temporary storage. In addition, solid waste handlers will be contracted to collect and dump wastes in approved dumping sites.

### 2.9.1 Potential Negative Environmental Impacts

- Adverse human health
- Nuisance to neighbors especially in the neighboring estates.
- Aesthetic degradation to the natural environment.
- Loss of life and/or property
- Contamination of soil-loss of biodiversity
- Contamination of surface water rivers/ streams -ecological changes
- Increased pressure on existing power supply
- Damage to different equipment in the premises

### 2.9.2 Proposed Mitigation Measures

The project proponent shall implement the following health and safety measures during the operation phase of the project:

- Discharge all wastewater and sewage into the council sewerage system.
- Install in the building, appropriate fire-fighting equipment
- Ensure all fire-fighting equipment are inspected and maintained at least once in a period of one year
- Employ a security guard.
- Provide suitable solid waste containers at strategic positions
- Contract a NEMA or County offices licensed solid waste transporter to collect waste from the site for appropriate disposal at approved sites
- Maintain a file on dully filled copies of solid waste tracking documents from the waste transporter

- Maintain on site, with the security guard and the caretaker, telephone contacts for emergency public service providers including the County Council fire brigade, police 999, nearest ambulance service provider and NEMA.

## 2.10 Project's Decommissioning Activities.

During decommissioning, the building may be used for a different purpose all together or buildings, pavements, drainage systems and parking areas will be demolished in order to restore land to its original state or converted to a different use. Different kind of workers and equipment will be deployed to carry out these tasks. This will produce a lot of solid waste, which will be reused for other construction works or if not reusable, disposed of appropriately by a licensed waste disposal company.

Decommissioning will also entail restoring the project area to its original state. Activities during restoration include removal of debris, landscaping, planting of trees and removal of barriers among others. It will be upon the proponent and the contractor to ensure restoration is done in an orderly manner. Therefore, the proponent must prepare the decommissioning report and subsequently submit it to NEMA for approval.

## 2.11 Responsibilities.

### 2.11.1 Proponents' Responsibilities.

- The proponent will have to ensure that all legal provisions and standardization benchmarks are observed. In this regard, the proponent shall ensure that:
- Building materials are of high quality and from accredited dealers,
- Sanitary facilities are provided and hygiene observed,
- Avail a well-equipped First Aid tool kit,
- Ensure that any accident is well attended to and medical bills paid,

## 2.11.2 Contractors' Responsibilities.

The contractor will have the following duties:

- The contractor shall make good at his own expense any damage he may cause to public and private roads and pavements in the course of carrying out his work,
- The architect shall define the area of the site, which may be occupied by the contractor for use as storage, on the site,
- The contractor shall make his own arrangement for sanitary conveniences for his workmen,
- The contractor shall take all possible precaution to prevent nuisance, inconvenience or injury to the neighboring properties and to the public generally,

## 2.12 Infrastructural Services:

## 2.12.1 Roads and Accessibility

The proposed site is located along Eastleigh 2nd Avenue Street. The proponent will use the same road to access the proposed site.


**Photo 2: Showing status of the Road (Hombe Road) used to access the proposed site. There are development of similar character and magnitude near the proposed site.**

### 2.12.3 Sewage Disposal:

Effluent waste from the proposed project once it gets into operational phase will be directed to the existing Sewer line network. The proponent is therefore advised to adequately consult with the relevant authorities for connection. This will ensure that wastes generated during the occupation of the development are managed adequately.

### 2.12.4 Water Supply:

The development will be connected with water from Nairobi Water and Sewerage Company water supply network upon application and payment of the required fees. All plumbing work shall be carried out using galvanized steel piping of equal measures and approved whereas drainage shall be accomplished using UPVC piping. Alternatively, the proponent can sink a borehole to substantiate water supply.

### 2.12.5 Power Supply:

The development is already connected to the Kenya Power National power grid. These include some of the services that will be shared by the project within the neighboring premises. Once the development is completed, the rest of the development shall be connected to electricity.

### 2.12.6 Total Project Costs.

The estimated projects costs which will include purchase of construction materials, construction works and payments to the contractor for the proposed project is estimated to be Kshs **400 Million.**

## CHAPTER THREE

## 3.0 BASELINE INFORMATION OF THE STUDY AREA.

This Chapter describes the existing air, water and geological characteristics, biological, socio-economic environment, aesthetics and cultural resources at the proposed site and Nairobi in general The description provides the baseline on which impacts of the proposed project will be determined and predicted.

## 3.1 Biodiversity

This section has described key biological elements, including the identification and distribution of dominant, rare and unique plant and animal species within the region of concern (proposed project site and other potentially affected areas). Three categories are recognized as follows: Wildlife and Forests, community and habitat characterization and ecologically significant features.

### 3.1.1 Flora and fauna

Communities in these rivers comprise of Producers mainly; autotrophic phytoplanktons and higher Plants (macrophytes), macro-consumers such as zooplankton, Macro invertebrates like the Oligochaetes, and leeches are common highly polluted Rivers like these of Nairobi. Also present are frogs and micro-consumers chiefly bacteria, fungi, which are responsible for the degradation of the particulate or dissolved organic substances by autotrophic processes or coming from allocthonous sources.

### 3.1.2 Wetland communities:

This refers to living organisms that inhabit areas normally frequently inundated by water (or marshy areas). They comprise of flora such as reeds, water lettuce *(Pista stratiotes*), *Salvania molesta*, *Azolla* sp, *hydrilla vericillata* and cordia grass and Fauna such as insects and macro and micro invertebrates. There are no wetland communities within or near the proposed site.

### 3.1.3 Forests

When Nairobi Area was established, the landscape was a mosaic of open grassland montane closed forest and moist woodland swampy areas. The natural vegetation in the city area has thus been greatly modified. Small and steadily shrinking pockets of indigenous vegetation still remain undisturbed in parts of the Nairobi forests. The forests provide a vital carbon sink for Nairobi's industrial activities and are important as water Catchments and have great potential recreation value.

### 3.1.4 Waste management and pollution prevention:

To ensure a clean and healthy environment, waste should be managed properly. Proper waste management enhances improved sanitary conditions that are associated with a reduction of disease incidences. The existing waste management practices in the neighborhood of the proposed project site and within the Nairobi Sub-County. The proponent will connect his proposed project to the Sewerline network.

### 3.1.5 Sewage, Wastewater, domestic & trade effluent:

Wastewater and trade effluent are a potential source of heavy metals and other inorganic and organic wastes. The presence of these wastes in an aquatic ecosystem adversely affects it's biological, physical and chemical characteristics and thus the capacity to support aquatic life. For this reason, such wastes should be treated as required prior to release into environment. The proposed project will be connected to the existing public Sewer line network.

## 3.2 Water Resources:

Surface water is fresh water on earth's surface in streams, rivers, lakes, ponds, reservoirs and wetlands. Surface waters are replenished by the runoff of precipitation from land and are therefore considered a renewable resource although finite in nature.

Rivers are the main sources of surface water in Nairobi. Ground water occurrence is dependent upon geology, rainfall, weathering and recharge. The best aquifers are found when a conjunction occurs of optimum recharge (rainfall and soil permeability), storage (porous rocks) and the ease with which water

can travel, both vertically and horizontally within an *aquifer*). Nairobi upper aquifer is particularly vulnerable to pollution from human activities such as landfills and dumpsites; seepage from latrines, Sewer line networks, sewers and drains; leakage from underground storage of petroleum and chemicals; seepage of industrial effluents and infiltration from polluted streams.

## 3.3 Topography and drainage:

In Eastleigh area the 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 site of the project has a relative slope. The proponent is advised to construct a strong floor slab that is well raised to avoid any water surges to the project development.

## 3.4 Climate:

The climate of Nairobi and thus the project site is generally cold and humid in character, with seasonal cold and wet periods. Rainfall has a bi-modal distribution with long rains occurring between March and May and the short rains between October and December with a mean annual rainfall amounting to 900 mm. Temperatures are highest in the months of January to mid-march and lowest in July and August.

Since Nairobi lies close to the Equator but being 1680 m above sea level, its temperatures are altitude modified tropical, but not torrid. The mean annual is 17°C and mean daily maximum and daily minimum are 23°C and 12°C respectively. On the other hand, the mean annual rainfall is 1080 mm falling in two distinct seasons: long rains from March to May and short rains from mid-October to December.

### 3.4.1 Average Temperatures

With the exception of July and August, Nairobi has been recording mean monthly temperatures of 17°C. But, the daily range is usually high; differences between maximum and minimum daily temperatures are 10 °C in May and 15°C in February. The winds and clouds bring a cooling effect during the day with some instances recording a maximum of 15°C.

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°C and the lowest was 3.9°C.

### 3.4.2 Average Rain Amounts

Nairobi experiences a bi-modal rainfall pattern ranging from 500mm to1000mm per annum. This is due to high humilities usually experienced in the city. Most of the rainfall figures crash down in Nairobi in one major and one minor monsoon seasons respectively. The major monsoon season is experienced in the months of March, April and May, and is called the "Long Rains" by the locals. The minor monsoon seasons occur between October and December, referred as "Short Rains" period. That is the information derived from the meteorological department. With the climatic variations experienced globally, this climatic data has been changing over years.

### 3.4.3 Wind Flow

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.

### 3.4.4 Sunshine

Early mornings in Nairobi are often cloudy and cold, but the sun peeks through by mid-morning: 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 shows through the clouds. Even in August, the cloudiest month, there is an average of four hours of sunshine.

## 3.5. Geology:

The site is underlain by Cenozoic volcanic and sediments with the lavas showing an easterly flow direction away from the Great Rift Valley. The formations are quite deep, resting directly on the basement rock and are considered to be part of post-Miocene era. The volcanic are represented by thinly bedded; impermeable strata and thin flows with inter bedded sediments or tuffs.

### 3.5.1. Soils:

The soils of the site range from rocky loam soil to clay soil. Weathering has produced clay soils that reach more than 50 feet (15m) in thickness. 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.

The area is characterized by red soils which are preferred for any strong foundation in constructions. These soils are well drained and form a strong compaction when used in laying foundations of proposed projects.

## 3.6 Land use:

Land use is a primary indicator of the extent and degree of the impact man has made on the surface of the earth. It reflects political, social, and economic aspects of the intensity of human lifestyles. The relationship between land, soil, and physical conditions on the one hand and human activities on the other hand may be used to evaluate land use conditions. The land in this area is being used for Residential buildings.

## 3.7 Population

Nairobi has growing population densities in the country of up to 1,130 persons per square kilometre. There has been an increase in population which is as a result of national growth and in-migration, mostly of labor force from other parts of the country. The high population is likely to impede the provision of services like water, schools and health services unless there is corresponding increases or expansion on these facilities. At the moment there is dire need for more public schools, additional health facilities and

water supply. Since Nairobi is generally a residential cum commercial area, the proponent also proposes to build a residential area. The population is considerably increasing with many upcoming residential and commercial projects in the area.

## 3.8 Socio-economic Importance of the proposed project

In particular, the proposed project will generate the following positive socio-economic impacts:

i. 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.

ii. The proposed project will be connected to a Sewer line network mains and water supply network hence will generate revenue to the NCWSC through payment of connection and service fee.

iii. Apart from the direct employment of construction workers, the proposed project will also benefit the following categories of individuals:

- **Transporters**. Investors on lorry and trailer transport will benefit greatly from the project. This benefit will extend to vehicle dealers and manufacturers, lorry drivers and turn boys.
- **Sand Harvesters**. Locals involved in sand harvesting in sand harvesting are to be major beneficiaries' of the project. The benefit will extend to the local authority entitled to levy taxes on sand transporters.
- **Ballast Quarries**. There will be massive use of ballast. These will ensure that the Quarry owners and workers benefits greatly.
- **Cement Manufacturers**. The local cement manufacturers and their employees and shareholders are direct beneficiaries of the development. 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**. Most of the building materials to be used are locally manufactured. Relevant companies, their workers and shareholders will be direct beneficiaries of the development.

## CHAPTER FOUR

### 4.0 PROJECT ALTERNATIVES.

This section explains alternatives to construction of this Residential in terms of the site, products, materials, technology and waste management. Also, impacts of each alternative are identified, discussed and compared with those of this development proposal. With such information, reviewers have basis for decision making.

## 4.1 No Project Alternative.

This option implies that the existing situation prevail i.e. no construction/development activity to take place. This option is mostly applicable in situations where the proposed project area is in ecologically sensitive areas. The land in which the building is to be constructed is in a stable environment and therefore will not be affected by this development activity.

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.

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.

This alternative describes a situation where the proposed development fails to be implemented. In case this happens, positive impacts associated with the proposed development will not accrue to the stakeholders including the residents to be, the development consultants, contractors and suppliers of materials. However, from an environmental conservation perspective, this alternative will be beneficial in the sense that any potential negative impacts associated with the project will be avoided. The “No

Action Alternative" should not be adopted, as we need to encourage development so long as it is undertaken on a sustainable basis as per the environmental management plan developed in this report.

## 4.2 Alternatives Site.

Currently, there is no other alternative site available to the proponent for the proposed development in Eastleigh. 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 even at the cost he purchased the land for. 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 cost; 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.

## 4.3 Alternative Land Use Activities

The area is in a residential cum commercial zone. Alternative land use activities such as farming, grazing land and heavy industries will conflict with surrounding land use activities. For uniformity purposes, the proponent is interested in construction of a commercial building.

## 4.4 Alternative Construction Materials and Technology

There is a wide range of construction and furnishing materials which can be sourced locally and internationally. In this construction, certified raw materials/equipment and modern technology will be used. Also, electrical appliances that save energy will be given first priority. The concrete pillars and walls will be made using locally sourced stones, cement, sand (washed and clean), metal bars and fittings that meet the Kenya Bureau of Standards requirements.

## 4.5 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. The proponent can use the Nairobi County Council trucks to transport and dispose waste of hire private NEMA licensed solid waste collectors.

## 4.7 Alternative Access Road to the site

The proposed site is located along Eastleigh 2nd Avenue Road. The road is off Juja road. The proponent will use the same road to access the proposed site. Alternatively, he can use the Pamba road to connect to Fairview and access the site.

## 4.8 Alternative Source of Power

Currently the general area is supplied with electricity from Kenya Power. The proponent will also apply for connection once the construction of the proposed project is complete. Alternatively, the proponent can use solar power especially in lighting and heating water to reduce the costs incurred in paying for electricity bills.

## 4.9 Alternative Sources of Water Supply

The development will be connected with water from Nairobi Water and Sewerage Company. Alternatively, the proponent can sink a borehole which will then provide adequate water supply to the residents to be. Also, they can install an underground or overhead tank of adequate capacity to increase water supply to the tenants to be that can be sourced from a borehole.

## CHAPTER FIVE

### 5.0 POLICY, LEGISLATIVE AND INSTITUTIONAL FRAMEWORKS.

Environmental Impact Assessment is an instrument for environmental management and development control. It is now accepted that development projects must be economically viable, socially acceptable and environmentally sound. It is a condition of the Kenya Government for developers to conduct Environmental Impact Assessment (EIA) on the development Projects.

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 Notice No.101), construction of buildings require an Environmental Impact Assessment full 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.

## 5.1 Policy Framework.

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

### 5.1.1 National Shelter Strategy to the Year 2000.

Kenya adopted this strategy following the International Year of Shelter for the Homeless in 1987.These 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.

### 5.1.2 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. Since poor housing is among the indicators of poor societies, pursuits to address it build individuals capacity to relieve poverty.

### 5.1.3 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.

## 5.2 Environmental Legal Framework.

### 5.2.1 Environmental Management and Co-ordination Act No. 8 of 2003.

This EIA full study report has been undertaken in accordance with the provisions of Section 58 of Environment Management and Coordination Act, 1999 and subsequent EMCA (Environmental Impact Assessment /Environmental Audit regulations, 2003). Part II of EMCA, 1999 states that every person is entitled to a clean and healthy environment and had the duty to safeguard the same. In this regard, development proposals should not compromise the quality of the environment. Section 58 of EMCA No.8 of 1999 and EIA/EA regulations, 2003 underscore the need for environmental impact assessments for development activities such as this new housing project.

*The proponent will have to ensure that environmental protection 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.*

### 5.2.1.1 The Environmental Management and Co-ordination (Water Quality) Regulations, 2006.

These Regulations were published in the Kenya Gazette Supplement No. 68, Legislative Supplement No. 36, and Legal Notice No. 120 of 29th September, 2006. The Regulations provides for sustainable management of water resources including prevention of water pollution and protection of water sources (lakes, rivers, streams, springs, wells and other water sources).

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

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

### 5.2.1.2 The Environmental Management and Co-ordination (Waste Management) Regulations, 2006.

These Regulations were published in the Kenya Gazette Supplement No. 69, Legislative Supplement No. 37, and Legal Notice No. 121 of 29th September, 2006. The regulations provide details on management (handling, storage, transportation, treatment and disposal) of various waste streams including:

- domestic waste
- industrial waste,
- hazardous and toxic waste
- pesticides and toxic substances
- biomedical wastes and
- radioactive waste

Regulation No. 4 (1) makes it an offence for any person to dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.

Regulation 5 (1) provides categories of cleaner production methods that should be adopted by waste generators in order to minimize the amount of waste generated and they include:

i. Improvement of production process through-

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

ii. Monitoring the product 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, and
- Reclamation and recycling and

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

*The proponent shall ensure that the main contractor adopts and implements all possible cleaner production methods during the construction phase of the project.*

- The identity of the hazardous waste
- The name and address of the generator of waste
- The net contents
- The normal storage stability and methods of storage
- The name and percentage of weight of active ingredients and names and percentages of weights of other ingredients or half-life of radioactive material
- Warning or caution statements which may include any of the following as appropriate-

The words "WARNING" or "CAUTION"

Regulation 19 (1) requires every person who generates toxic or hazardous waste to treat or cause to be treated such hazardous waste.

*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 and Excessive management of waste).*

## 5.2.2 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 reasonably practicable measures to maintain their jurisdiction clean and sanitary to

prevent occurrence of nuisance or condition liable to injuries or dangerous to human health. As such, proponents and contractors of housing projects should ensure that health and safety concerns of workers, neighboring communities and occupants of the building are taken into consideration.

### 5.2.3 Physical Planning Act, 1999.

Physical Planning Act, 1999 gives the local authority power to prohibit or control development activities in their jurisdictions. Section 30 states 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.

### 5.2.4 Building Code 2000.

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 network and all the wastewater must be discharged in to sewers. The code also prohibits construction of structures or building on Sewer line network s.

*The proposed project site will be connected to an existing Sewer line network.*

### 5.2.5 Water Act, 2006.

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 kept by a site operator and the information thereof furnished to the authority.

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

### 5.2.6 Local Government Act (265).

The Act commenced on 30th April 1963 and provides for the establishment of authorities of the local government and to define their functions among other things. These local authorities 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 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.

*Effluent waste from the proposed development will be discharged into the sewer line network.*

### 5.2.7 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.*

### 5.2.8 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
- 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.

*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.*

### 5.2.9 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:

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

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.

*The project proponent will be required to comply with the above-mentioned regulations in order to promote a safe and health working environment during all Phases of the project.*

## CHAPTER SIX

### 6.0 IMPACTS IDENTIFICATION, ANALYSIS AND MITIGATION.

This chapter has identified the most anticipated impacts of the project, their analysis and mitigation measures. Construction of this domestic building will have both positive and negative impacts. They relate to activities carried out during construction, operation and decommissioning phases of the project. Mitigation measures give ways of reducing or avoiding adverse environmental impacts of the project.

## 6.1 Positive impacts.

### 6.1.1 Creation of employment opportunities.

Building and construction industry employs many Kenyans. This has a significant impact since unemployment is currently quite high in Nairobi and the country at large. Both skilled and unskilled workers will be involved in this project. On occupation people will be employed as cleaners and security personnel and in many other specialized areas within the project.

### 6.1.2 Collection of Revenue to Government.

Value Added Tax (VAT) on construction materials/ tools to be purchased, Land rates and rent fees among others will be sources of revenue for the government and its institutions. The proponent also did pay stamp duty and other taxes when purchasing the land.

### 6.1.3 Increased security at the area.

During the operation of the project, security will be enhanced in the premises through distribution of suitable security lights and presence of security guards. This will lead to improvement in the general security in the surrounding area as the plot has been empty for a long time.

### 6.1.4 Improved Infrastructure and better housing.

Project activities will lead to improvement of transport, sewerage, water supply and telecommunication networks. Finally, the main access official access road as per the plans will be opened to allow people access the site easily. Such services are a prerequisite to development in any region.

### 6.1.5 Increase in housing developments

The construction of the proposed project will lead to increased spaces for the proponent to use and for rental purposes. This will respond to the shortage of more spacious and modern houses for people in Nairobi town and its surrounding environs.

### 6.1.6 Improve the economy of Kenya

Subject to the completion of the proposed project the proponent will have paid taxes to the Kenyan government through different avenues, from the time of constructing the Residential to the time it begins its operations. This will contribute to the growth of the economy.

## 6.2 Negative Impacts.

### 6.2.1 Construction Phase.

### 6.2.1.0 Possible damage on the road

There may be possible damage on some sections of the access road while transporting materials to and from the site. With the proposed development, the proponent shall use the same road to transport materials top the site. The material transporters and the contractor are therefore expected to maintain the road as it is or mitigate any damage his works may cause to the road.

### 6.2.1.1 Dust Emissions.

The sources of dust emissions include excavation and leveling 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.

### 6.2.1.2 Exhaust Emissions.

The trucks used to transport various building materials from their sources to the project site contribute to increases in emissions of $CO_2$, $NO_2$ 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. Because large quantities of building materials are required, some of which are sourced outside Nairobi, such emissions can be enormous and may affect a wider geographical area. The impacts of such emissions can be greater in areas where the materials are sourced and at the construction site as a result of frequent gunning of vehicle engines, frequent vehicle turning and slow vehicle movement in the loading and offloading areas.

### 6.2.1.3 Solid Waste Generation

Solid waste will be generated at the site during construction of the building. Such waste will consist of metal cuttings, rejected materials, surplus materials, surplus soil, 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.

### 6.2.1.4 Soil Erosion.

Excavation works can lead to increase soil erosion at the project site and release of sediments into the drainage systems. Uncontrolled soil erosion can have adverse effects on the local water bodies. The proponent has though elected a strong foundation that will prevent the occurrence of such erosions.

### 6.2.1.5 Generation of Noise and Vibrations.

There will be generation of noise though minimal from the vehicles transporting materials, constructions and machineries used in the construction process. The proponent shall ensure that all NEMA regarding exercise noise and vibrations are controlled considerably.

### 6.2.2 Environmental Impacts during Operation Phase.

#### 6.2.2.1 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 food remains, plastics, old clothes, metal, textile and organic wastes. Such wastes can cause blockage to drainage systems, choking of water bodies and negative impacts on animal health. Some of these waste materials especially the plastics/polythenes which are not biodegradable may cause long-term injurious effects to the environment.

#### 6.2.2.2 Waste Waters/ Effluence.

Liquid wastes will originate from kitchen, bathroom, toilets and washing operations. Those from the kitchen will be composed of fats, oil and grease while waste water from bathroom and washing will have a lot of detergents.

#### 6.2.2.3 Increased Storm Water Flow.

The building roofs and pavements will lead to increased volume and velocity of storm water or run-off flowing across the area covered by the houses. This will lead to increased amounts of storm water entering the drainage systems, resulting in overflow and damage to such systems in addition to increased erosion or water logging in the neighboring areas.

#### 6.2.2.4 Energy Consumption.

During occupation, the tenants will use electricity for lighting, cooking, running of air conditioning equipment and other similar activities. Since electricity generation involves utilization of natural resources, excessive electricity consumption will strain the resources and negatively impact on their sustainability.

## 6.3 Emergency Response Plans – ERPs

Emergencies and disasters are a reality of everyday life. Most people do not know what to do if an emergency occurred while on the job. In addition, they do not know what actions to take if a co-worker was seriously injured, a fire ignited, or a structure collapsed. Too many lives are lost and property is damaged because no one is prepared to properly react when immediate decisions and actions counted. Workers/people must therefore be sensitized and prepared on how to react. Such swift decisions and actions come in handy mostly during operation phase since there is likelihood of occurrence of hazards.

## 6.4 Mitigation Measures.

Mitigation measures in this subsection are for the identified negative environmental impacts of the proposed project. They help in reducing or averting on the environment and promote sound environmental management. Also, they are aimed at protecting public health during construction, operation and occupation phases of the project.

### 6.4.1 Mitigation of Construction Phase Impacts.

#### 6.4.1.1 Surface Drainage.

The drainage of the general site is necessary to enhance effective flow of the surface run-off expected from impermeable areas within the site. To manage this drainage channels will be dug and directed to the main channel.

Paving of the sidewalks, parking and other open areas shall be done using pervious materials i.e. concrete blocks to encourage water percolation thus reducing run-off volume.

#### 6.4.1.2 Proper landscaping.

From the site visit currently the plot has existing houses that will be demolished to pave way for the proposed project. It is recommended that after the construction stage the area surrounding the building be landscaped appropriately to beautify the proposed project's surroundings.

### 6.4.1.3 Managing of Construction Wastes.

The proponent is urged to 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.

### 6.4.1.4 Management of Air Pollution.

There will emanate minimal air pollution due to combustion of fossil fuels expected from construction machinery. The works will also generate some dust that may have direct negative impact to the quality of air during construction. Measures will be:

- Provision of Full Protective Gear for Workers
- Workers shall also be sensitized on hazards encountered in such work environment and shall undergo regular health check-ups. Besides, dust emissions shall be controlled through regular cleaning or sprinkling of water to suppress dust.
- The following rules will be observed to avoid accidents both during construction and occupation of the building:
- Ensure that the operational manuals are available and accessible for every equipment/machinery. Safety will be enhanced through educating and sensitizing workers on job related hazards and how to overcome them.

### 6.4.1.5 Noise and Vibration minimization.

Noise and vibration should be minimized at the project site and surrounding areas through sensitization of construction truck drivers to switch off vehicle engines while offloading materials. In addition, they should be advised to avoid gunning of vehicle engines. It is recommended that all generators and heavy-duty equipment be insulated or placed in enclosures to minimize ambient noise levels.

## 6.4.2 Mitigation of negative Impacts during Operation Phase.

### 6.4.2.1 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. In addition, the proponent will ensure that, such disposed regularly and appropriately. It is recommended that the proponent puts in place measures to ensure that the occupants of the houses manage their waste efficiently through recycling, reuse and proper disposal procedures by hiring a NEMA licensed solid waste collector.

### 6.4.2.2 Water Conservation.

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. Rainwater shall be harvested and stored in tanks for future use.

### 6.4.2.3 Fire Hazards.

Hazards like fire outbreaks usually occur due to negligence e.g. poor handling of electricity systems, faulty electrical equipment, and carelessness. It is important to consider prepare one for such emergencies. In this regard, the design of the project has provided and recommended implementation of fire-fighting measures and control facilities. This includes the following:

- Install an automatic fire alarm system for the entire development.
- Provide enough 30m hose reel around the property.
- Allow for 500 litres fire reserve water tank attached with an automatic booster pump for hose reel.
- Provide enough 9 kg dry powder fire extinguisher for the property.
- Provide enough 9 kg $CO_2$ fire extinguisher for the property.
- Provide appropriate Fire Hydrant Ring main with suitable Outlet Points.
- Provide fire hydrants

## CHAPTER SEVEN

### 7.0 CONSULTATION AND PUBLIC PARTICIPATION (CPP).

In order to ensure that the proposed development is in harmony in the area, immediate neighbors to the proposed project site, stakeholders and the public were interviewed using clip questionnaires and meetings with a view to seeking their comments on the potential impacts of the proposed project to environment and socio-economic wellbeing of the society. The consultant used both clipboard questionnaires and semi structured interviews. The Interviews were carried out on 19th April, 2021

## 7.1 Analysis of the comments of the people interviewed

### 7.1.1 Employment Opportunities.

The persons interviewed were positive that during its construction, the project will create numerous employment opportunities for the local residents many of whom being the jobless youth. Most of these will be on construction activities, garbage collection and security provision.

### 7.1.2 Improved Security and business opportunities.

According to most respondents, completion of the project will boost trading activities and at the same time improve security. Tenants or new owners through purchase of the completed Units will create customer pool to small scale traders. Security will be enhanced as a result of security lights put in place by the proponent.

### 7.1.3 Generation of Noise and Vibration.

There was concern over the possibility of high noise and vibration levels in the project site as a result of excavation and construction works. The source of noise pollution includes transport vehicles, construction machinery and metal grinding and cutting equipment. Excavations will cause vibrations. The proponent should follow the provided mitigation measures to minimize noises and vibrations during construction of the proposed project.

## 7.14 Dust Generation.

Concern was raised over the heavy transport trucks that will be turning around the project site while delivering construction materials. 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.

## 7.1.5 Environmental Aesthetics.

It was seen that the aesthetics of the area would be affected negatively during construction. The proponent should ensure high hygiene standards within the premise and surrounding areas during construction. More so via the prescribed EMP, the proponent shall put in place several measures aimed at ensuring high standards of hygiene.

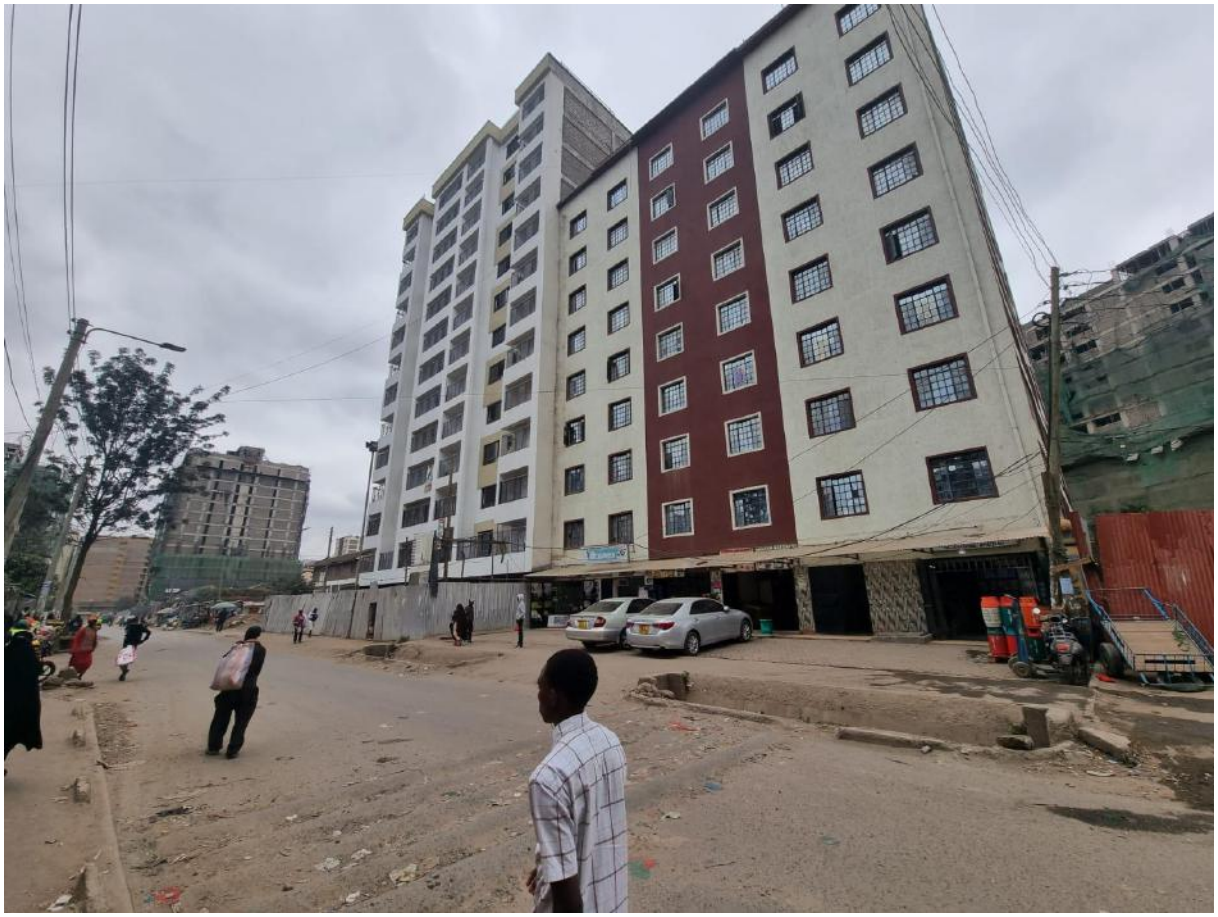

**Photo 3: Showing other apartments along Hombe Road already constructed and those under construction**

## CHAPTER EIGHT

### 8.0 ENVIRONMENT, HEALTH AND SAFETY (EHS).

Environment, Health and Safety (EHS) is concerned with state of working environment, tools / equipment and the biotic environment. It is an essential tool in determining the EIA study. 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 well-being. It aims at:

- Avoiding occupational injuries especially during construction,
- Providing safe and healthy working environment for workers
- Limiting loss or damage to ecological resources, and
- Promoting environmental sustainability.

## 8.1 Guidelines for EHS.

In order to effectively achieve EHS goals, the company and its workers will do the following:

- Commit itself to the promoting and maintaining high levels of safety and health standards
- Ensure that project activities protect the environment and natural resources
- Be vigilant and track significant changes occurring to the environment and ecosystem health for prompt actions
- 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.

## 8.2 Obligations in Environment, Health and Safety.

The contractor will ensure that:

- Safe means of entry and exit exist 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.

## CHAPTER NINE

### 9.0 ENVIRONMENTAL MANAGEMENT/MONITORING PLAN.

Construction of this nature and similar buildings do have significant environmental impacts. Therefore, it is important that adverse impacts are reduced/ averted and positive ones maximized. In this regard the EIA Expert developed an Environmental Management Plan (EMP) to aid the proponent in managing significant environmental impacts associated with the project.

The EMP has been developed to provide a basis for an Environmental Management System (EMS; ISO 14001 principles) for the project. It is noteworthy that key factors and processes may change through the life of the project and considerable provisions have been made such dynamics. As such, the EMP will be subject to a regular regime of periodic review.

Table 2&3 illustrates how EMP shall operate during construction, occupation and decommissioning phases of the project. The tables contain environmental impacts, mitigation measures, responsibilities and monetary aspects of the project cycle. Information in this EMP will be used in future annual audits to verify if projected impacts were realized and the manner in which they were managed.

## 9.1 Environmental Management Plan.

All the information pertaining to Environmental Management Plan is elaborated in table below. It contains objectives, activities, costs, mitigation measures and responsibilities during construction, operational and decommissioning phases.

## Table 2: Environmental Management Plan for Construction and Operation Phases

| Environmental Impacts | Mitigation Measures | Responsible | Time Frame | Cost Estimates |
|---|---|---|---|---|
| Sound and Vibrations pollution from construction machinery and vehicle movements. | Workers are encouraged to behave in an orderly manner.<br>Vehicles to move at low speeds.<br>Exposed workers will be provided with protective gear (noise muffs)<br>Grade sites to beneficial levels to be maintained and compensate appropriately the existing topography;<br>Maintain the cleanliness of the proposed development and its environs. | Contractor<br>Proponent | Continuous on all phases of the project | Kshs.350,000= |
| Any possible Dust and particulate emissions | Workers to be provided with protective gear.<br>Observe EMCA (Air Quality Regulations, 2008).<br>Pursue good practices in energy use during operations and sensitize staff<br>Provide appropriate personnel protective equipment to site workers<br>Ensure that the manuals of operations are followed to the latter to avoid possible accidents | Contractor<br>Drivers | During construction phase | Ksh.305,000= |
| Effluent/waste waters | Ensure connection to Sewer line network has no spillage.<br>Dig drainage channels for water runoff<br>Ensure that the rubbish bins are emptied whenever its full | Contractor<br>Proponent | Continuous all phases | Kshs.1,140,000= per quarter |

| | | | | |
|---|---|---|---|---|
| Vegetation Regeneration | -Do landscaping on completion of the proposed project<br>-Plant pot ornamental trees round the compound to improve the aesthetic appeal of the building | Proponent<br>Contractor | After the construction phase | Kshs. 215, 000/= |
| Liquid and Solid waste generated | -Ensure that all solid wastes are collected and segregated<br>-Reuse those materials that can be reused<br>-Contact a licensed solid waste transported to collect solid materials leakages and/or spillages<br>-Ensure there is no leakage on the connection to the sewer line network.<br>-Minimize waste at source by clear and harmonized procurement materials | Proponent<br>Contractor | Throughout the construction phase. | Kshs. 820, 000/= |
| Fire hazards | -Ensure fire extinguishers are stationed in visible places.<br>-Security personnel and occupants to be trained in fire fighting skills.<br>-Drilling exercise to be conducted regularly.<br>-Train some of the premises maintainers' team on how to use the fire-fighting equipment. | Proponent | Servicing of fire extinguishers in every 6 months | Ksh.760,000/= per 6 months |
| Health and Safety Concerns | -Provide personnel and passers-by signage and warnings traffic control signs and warning<br>-Provide for appropriate signage and warnings at work sites<br>-Provide appropriate personnel Protective Equipment (PPE) to site workers<br>-Provide for First Aid facilities as per the OSHA, 2007 | Proponent<br>Contractor | Continuous | Kshs.950,000/= |
| Environmental Auditing | -Must be done annually to assess the efficacy of the | Proponent | Annually | Kshs 270,000/= |

| | | | | |
|---|---|---|---|---|
| | development and how waste is being managed, the environmental status of the constructed development, security situation, health and safety of the occupants and employees among other parameters. The report will be submitted to NEMA to determine the level of compliance with EMCA regulations and implementation of this EMP. | Environmental Experts | commencing after 12 months of Occupation | Kshs 35,000/= |
| Security | -Guarding of the estate by reputable security firm.<br>-No outsiders should access the property without permission from the proponent.<br>- Partnership with the neighbours to promote serenity in the area and conserve the environment. | Proponent<br>Contractor | Construction and Operational period | Kshs 175,000/= |
| Traffic flow | -Adequate road warning signs to traffic regulations<br>-Erect speed pumps.<br>-Liaise closely with other development partners and government and council's departments to upgrade the existing road networks. | Proponent<br>Contractor | Through out the construction phase | Kshs. 140, 000/= |
| Oil leaks & spills | -Use well serviced machinery to minimize grease/oil leaks<br>-No servicing of the machinery at the site | Contractor & transporters | Construction phase | Kshs 268,000/= |
| Increased demand for electricity | -Energy conservation measures to be practiced<br>-Energy saving bulbs to be used in the houses<br>-Lights to be switched off when not in use<br>-Provide alternative source of power e.g. solar panels | Contractor, tenants and the building Care taker | Throughout the occupational period | Kshs 589, 000/= |

## 9.2 Decommissioning Phase.

## Table 3: Environmental Management/Monitoring Plan for the Decommissioning Phase

| Recommended Mitigation Measures | Responsible Party | Time Frame |
|---|---|---|
| All buildings, machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused a far as possible | Contractor<br>Proponent | Immediately |
| All foundations must be removed and recycled, reused or disposed of at a licensed disposal site | | Immediately |
| Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should take to a licensed waste disposal site | Contractor<br>Proponent | Immediately |
| Donate reusable demolition waste to charitable organizations, individuals and institutions | Contractor<br>Proponent | Immediately |
| Implement an appropriate re-vegetation programme to restore the site to its original status | Contractor<br>Proponent | Immediately |
| Consider use of indigenous grass and trees species in vegetation so as to improve the aesthetics of the development. This will compensate for the lost vegetation during the construction of the project. | Contractor<br>Proponent | Immediately |

Monitoring will be aimed at improving the management of the project. There will be periodic visits to the project site in order to observe and assess activities on the site and changes on the environment. A checklist for monitoring will include, among others, the state of the environment, land use activities; variations in project plan, adherence to provisions in EMP.

## CHAPTER TEN

## 10.0 CONCLUSION AND RECOMMENDATIONS.

From EIA study, it is clear that this proposed residential project is associated with both positive and negative impacts during construction, operation and decommissioning phases of the project. The proponent and contactor are advised to implement Environmental Management Plan (chapter 9) so as to reduce adverse impacts and boost good environmental practices. Guidelines on environment, health and safety must also be followed in order to reduce incidences of accidents, health problems and compromise to environmental well being.

### 10.1 CONCLUSION

This Environmental Impact Assessment report is recommendable and should be approved by NEMA for issuance of an EIA approval and license subject to annual environmental audits after the Residential has been completed and operation commenced. 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.

### 10.2 RECOMMENDATIONS.

The recommendations for the prevention and mitigation of adverse impacts are as follows;

- It is important that informative signs (bill board) be erected at the site. These should indicate the operation hours and when works are likely to be started and completed. List of all Engineers, Contractor, details of the proposed project and all the Approval Reference Numbers/Details.

- All solid waste materials and debris resulting from construction activities must be disposed off at approved dumpsites. The wastes should be properly segregated and separated to encourage recycling of some useful waste materials; i.e. some excavated stone materials can be used as backfills.

- All construction materials and especially sand, gravel, hardcore and wood must be sourced/procured from legalized dealers.

- Construction activities must be undertaken only during the day i.e. between 0800 hours to 1700 hours. This will minimize disturbance to the general public within the proximity of the site/project especially the nearby residents.

- Drains will be properly designed, installed and regularly maintained to prevent storm water (run-off) from accumulating within the site spreading to the neighborhood.

- Proper and regular maintenance of construction machinery and equipment will reduce emission of hazardous fumes and noise resulting from friction of rubbing metal bodies.

- Heavy construction activities should be limited (or avoided) during the rainy season to minimize the chances of soil degradation (soil erosion).

- Maintenance activities must be carried out in service bay to reduce chances of oils or grease or other maintenance materials, from coming into contact with environment (water or soil). Wastewater from such areas must be refrained from coming into contact with solid mass or water bodies as it contains oil/grease spills.

- Sewerage system connection must be properly designed within the site/office and effectively connected to the existing sewerline network. Design specifications must be followed during installation. Standard cleanliness and waste disposal facilities at construction site and during occupation must be maintained.
- Workers should be provided with complete personal protective equipment (PPE) and safety gear. They should have working boots, complete overalls, helmets, gloves, earmuffs, nose masks, goggles etc. A fully equipped first aid kit must be provided within the site.

- The contractor must have workmen's compensation cover; the contractor is required to comply with workmen's compensation Act as well as other relevant ordinance, regulations and Union Agreement.
- The contractor must provide adequate security during the construction period and especially during the night when there are no construction activities.

- A complete fire fighting system must be provided after completion of the project. The equipment is clearly provided in the design plan, and in the report. This must be installed or provided at strategic points.

- The Proponent is advised to ensure he carries out an Annual Environmental Audit as per the EMCA regulations and the report submitted to NEMA for evaluation on the level of compliance and efficacy of the measures in place with and around the proposed project.

## REFERENCES


1. Kenya gazette supplement number 68. *Environmental Management and Co-ordination (Water Quality) Regulations 2006*. Government Printer, Nairobi

2. Kenya gazette supplement Acts 2000, *Environmental Management and Coordination Act Number 8 of 1999*. Government Printer, Nairobi

3. Kenya gazette supplement Acts *Building Code 2000*. Government Printer, Nairobi

4. Kenya gazette supplement Acts *Local Authority Act (Cap. 265)*. Government Printer, Nairobi

5. Kenya gazette supplement Acts *Public Health Act (CAP. 242)*. Government Printer, Nairobi

6. Kenya gazette supplement number 56. *Environmental Impact Assessment and Audit Regulations 2003*. Government Printer, Nairobi

7. Ministry of Planning and National Development. *Nairobi District Development Plan (2004-2008).* Government Printer, Nairobi

8. Kenya gazette supplement number 69. *Environmental Management and Co-ordination (Waste Management) Regulations 2006*. Government Printer, Nairobi

## APPENDICES

I. Copy of Land Ownership (Title Deed)

II. Copy of Approved Architectural Design

III. Copy of Certificate of Incorporation

IV. Copy of KRA PIN

V. Copy of List of Meeting Held

VI. Copies of filled questionnaires

VII. Copy of Firm of Expert's current practising NEMA license.

VIII. Copy of Lead Expert's current practising NEMA license.