iPlan CONSULT (Intl) LTD.
Innovative Spatial Use - Planning for the Future
P.O. Box 28634 - 00100 NAIROBI

ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED RESIDENTIAL APARTMENTS ON PLOT L.R. NO. NAIROBI/ BLOCK 66/6732, OFF NAIVASHA ROAD, RIRUTA AREA, DAGORETTI SOUTH SUB COUNTY, NAIROBI CITY COUNTY

COORDINATE: 1°16'45.0"S 36°44'19.4"E

PROPONENT

TG RIRUTA LIMITED

P.O.BOX 21111-00505

NAIROBI

FEBRUARY 2025

CERTIFICATION

This Environmental Impact Assessment Study report has been prepared by iPlan Consult (Int'l) LTD. (NEMA Reg. No. 7597) 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.

EIA/EA LEAD EXPERT:

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Signature……Date……

SHADACK K. MBUTA (NEMA REG. NO 6315)

PROPONENT:

For and on behalf of TG RIRUTA LIMITED

P.O.BOX 21111-00505

NAIROBI

Name……

Designation……

Signature……Date……

Disclaimer:

This Environmental Impact Assessment study Report is confidential to the TG Riruta Limited and any use of the materials hereof should be strictly in accordance with the contractual agreement between iPlan Consult (Intl) LTD and the TG Riruta Limited. It is, however, subject to conditions spelt out in the Environmental (Impact Assessment and Audit) Regulations, 2003.

EXEUTIVE SUMMARY

1.0 Introduction

Sustainability encompasses social, economic, political, and environmental aspects. Rapid urban development has often outpaced infrastructure planning, leading to uncoordinated growth and inadequate service provision. Authorities have struggled to keep up, resulting in a demand-driven rather than infrastructure-led development model, which can have negative social and environmental impacts. The Environmental Impact Assessment (EIA) process is essential for identifying potential impacts, differentiating between avoidable and unavoidable effects, and proposing mitigation measures to promote sustainable urban development. Successful mitigation requires proponent commitment, effective monitoring, and supervision to address emerging environmental concerns.

TG RIRUTA LIMITED, hereinafter referred to as the proponent, proposes to develop a multi-storey residential complex comprising a single 17-storey building with 313 residential units. The project will include two basement levels for parking, a ground floor featuring a restaurant, shops, studios, and one-bedroom units, and 1st to 13th floors consisting of standard and superior studios and one-bedroom units. The 14th-floor penthouse level will house five two-bedroom units, while the rooftop terrace will feature communal amenities. The project will integrate two lifts, a management office, lockers and storage rooms, generator and transformer rooms, borehole water supply, and dedicated access roads and driveways. The proponent has provided for driveways and parking on the basement and ground floors. The project's architectural plans have been submitted for approval to the Nairobi City County (refer to attached drawings for details).

The decision to develop this project is driven by the high demand for housing, government incentives for private sector participation, and the investment potential in the area. Riruta has witnessed a surge in similar high-density developments, leading to rising land values. Some plots in the neighborhood have already been developed into multi-dwelling units, while others retain older bungalows, maisonettes, and townhouses, all aligning with the area's zoning policies. The limited land supply and growing demand have fueled the need for high-rise housing to alleviate the housing shortage. The building design incorporates proper ventilation, natural lighting, stormwater drainage, water storage, and wastewater management, ensuring compliance with local planning and building standards. The land is legally owned by the proponent (ownership documents attached).

The project site is within a fully serviced urban area with electricity, water, sewer connections, and road access readily available. The design complies with all relevant regulatory and environmental guidelines, as discussed in this report.

Effective environmental management requires an integrated approach, considering social, demographic, economic, and political factors. This assessment study examines the project's impact on the physical environment, required infrastructure, utilities, and service installations. The terms of reference include evaluating project objectives, site suitability, baseline environmental conditions, legal requirements, technological inputs, materials, and construction processes. The study methodology involved physical site inspections, desktop research, and consultations with the proponent, project consultants, and neighboring stakeholders.

2. 0 Potential Environmental Impacts of the Proposed Project

2.1. Existing Impacts

There were no existing negative environmental impacts at the site as at the time of this study

2.2. Expected Impacts

2.2.1 Potential positive impacts (benefits)

The project is envisaged to have the following merits:

i. The project will lead to the optimal use of the land which is currently idle
ii. Provision of employment opportunities during both construction and operation phases of the project;
iii. Improved security and safety for residents in the project area
iv. Addition of modern housing stock
v. Improved infrastructure social amenities

2.2.2 Potential Negative Environmental Impacts

The project proposal has some likely adverse environmental concerns for which sufficient mitigation measures have been proposed to ensure low residual impacts as summarized below:

Table 0-2: Summary of environmental impacts and mitigation measures

Environmental Impact	Mitigation measures proposed
Storm water management	(i) Regular maintenance of storm drain infrastructure (ii) Desilting of drainage channels & and manholes prior to start of rainy seasons
Noise Pollution	(i) Schedule noisy activities during the normal working hours of between 8 am to 5 pm. 14. (ii) No work should be undertaken at night or very early in the morning (iii) Switch off idle machines and equipment (iv) Ensure machinery is well serviced to reduce the noise emitted (v) The contractor should adhere to the provision in the Environmental Management and coordination (Noise and Excessive vibration pollution) (Control regulation, 2009). (vi) Provide workers with appropriate PPEs when working in noisy environments e.g. ear plugs (vii) Construction waste is not to enter the biophysical or socio-economic environment; and (viii) Contractors to have waste management plans to mitigate potential impacts
Water management	(i) Ensure prompt repair of leaking pipes (ii) Metering of water at all consumption points (iii) Incorporate water harvesting techniques and matched storage
Sewage Wastewater management	(i) Routine inspection & maintenance of the sewer treatment plants (ii) Disposal of sludge per Hazardous waste regulations (iii) Reuse of waste water in landscaping & flush water for water cisterns
Traffic Impacts	(i) The timing of the truck arrivals and departures should largely be outside of the commuter peak periods (ii) During the construction stages, all trucks are to enter the construction site and not occupy the nearby roads with a traffic control plan (iii) Warning signs are to be placed to advice pedestrians and manage their safety when walking across the construction driveways.

	(iv) No machinery or material is to be stored on the footpath, verges, or public areas. All material handling is to be done within the site boundaries.
Occupational Health & Safety Impacts	(i) The contractor should ensure registration of all construction works by the Director, Directorate of Occupational Health and Safety Services (DOHSS) in compliance with the Buildings and Works of Construction Engineering Rules,1984; (ii) The contractor should contract a qualified Health and Safety advisor to conduct training and monitoring of construction works; (iii) The contractor should provide a standard First Aid Kit on site (iv) The Contractor should train several workers in First Aid depending on the number of workers on site as stipulated in the First Aid Rules 1977 through DOSHS-certified (v) First Training institutions e.g. Red Cross, St. John Ambulance
Air pollution	(i) Practiced dust management techniques, including watering and spraying to suppress dust (ii) Move earth and sand in covered vehicles/transport to avoid it being blown by wind increasing suspended particulate matter in the atmosphere (iii) All power plants are to be of good condition with acceptable smoke emissions (iv) Set up dust barriers/screens at strategic locations and (v) Provide and enforce the use of Personal Protective Equipment (PPE) for staff.
Water shortages	(iii) The contractor should sensitize construction workers on the importance of proper water management through clerks of works by having talks with them when doing their rounds around the site (iv) Replace or repair leaking pipes supplying water to the construction sites to minimize wastage; (v) The Contractor should ensure the provision of adequate water storage facilities on the construction site to meet project needs during periods of high demand externally and (vi) Refill storage tanks during periods of low demand
Pollution/contamination of ground & surface water	(vii) No mixing of concrete to occur on exposed / bare ground. Concrete mixing should be done on a bounded surface to avoid soil pollution and contaminating the ground and surface water; (viii) Appropriate containment structures are to be provided to store contaminated water from the construction site. The contractor should ensure this water are properly disposed of and not allowed to be drained on site (ix) The concrete batching area should be bounded to prevent contamination of soils and surface water features; (x) All fuel storage to be appropriately bunded and provided with a canopy and (xi) Ablutions for construction workers to enable proper disposal of faecal matter and avoid contamination of surface water features, which could be a cause of waterborne diseases.
Construction waste	(xii) Avoid overloading trucks and cover trucks to minimize dust and loss of load from trucks during transportation (xiii) For aggregate and sand, use water sprays or covered chutes to reduce dust emission during loading and unloading of materials from barges (xiv) Maintain mixing plants in good working condition to reduce emissions from the plant

	(xv) As far as possible, plan truck trips to material sources and to the sites during low-traffic hours; and (xvi) Implement safety procedures to reduce the potential for road accidents
Storm water management	(xvii) Validate storm water volumes from the estate to ascertain the adequacy of current storm water infrastructure (xviii) Undertake rehabilitation & maintenance of existing storm water infrastructure within the project vicinity.

Measures to prevent or minimize the negative environmental impacts and to maximize the positive ones have been provided through an Environmental Management and Monitoring Plan. The measures mainly focus on the following;

- Use of alternative materials, products, or technologies that are more environmentally sustainable
- Ensuring compliance with relevant safety, health, and environmental regulations
- Reduction of exhaust emissions through proper planning of vehicle movements and use of lead-free fuel
- Provision of adequate parking space for vehicles both during construction and operation phases
- Energy and water conservation
- Reduction of impacts of waste through minimization of waste generation, recycling, reuse, and responsible disposal.

3. Conclusion

The TG Riruta Apartments project is a strategic response to the growing demand for modern, high-density urban housing in Nairobi. Through the development of 313 residential units within a 17-storey building, the project aims to maximize land use efficiency while integrating commercial, residential, and recreational spaces. The incorporation of sustainable infrastructure, including a borehole water supply, stormwater drainage, energy-efficient systems, and waste management solutions, ensures that the development aligns with environmental sustainability goals.

While the project presents numerous socio-economic benefits, such as job creation, improved security, and enhanced urban infrastructure, potential environmental impacts have been identified and comprehensive mitigation measures have been proposed to address concerns related to stormwater management, noise pollution, air quality, occupational health and safety, and traffic impacts. The implementation of an Environmental Management and Monitoring Plan (EMMP) will be essential in ensuring compliance with local regulatory frameworks and best environmental practices.

With proper planning, commitment to mitigation strategies, and adherence to environmental and safety regulations, the TG Riruta Apartments project is expected to positively contribute to Nairobi's urban development, enhancing the livability, sustainability, and economic potential of the area.

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ACRONYMS AND ABBREVIATIONS

BS	British Standards
CPP	Consultation and Public Participation
CGL	County Government of Nairobi
CO	Carbon Monoxide
CO_2	Carbon Dioxide
DEO	Designated Environmental Officer
EIA	Environmental Impact Assessment
EA	Environmental Audit
EHS	Environmental, Health and Safety
ESMP	Environmental and Social Management Plan
EMCA	Environmental Management & Coordination Act
ERIMP	Emergency Response and Incident Management Plan
GPS	Global Positioning System
GoK	Government of Kenya
KP	Kenya Power
ISO	International Standards Organizations
NEAP	National Environmental Action Plan
SEM	Sustainable Environmental Management
Masl	Metre above sea level
NEMA	National Environmental Management Authority
NO_x	Nitrogen oxide
PPEs	Personal Protective Equipment

CHAPTER ONE: INTRODUCTION AND BACKGROUND INFORMATION

1.1 Introduction

It has now come to the attention of policy makers worldwide that the need to pursue sustainable development guided by environmental, social, cultural and ethical considerations is of significance if humanity is to survive in the ever-unpredictable climatic conditions. Out of this realization, there is a deliberate global focus on development of plans that are geared towards sustainable management of resources to maintain and improve the environmental base on which everybody depends. This will in turn allow future generations to live equally well or better than us. The goal of sustainable development can therefore, not be achieved without significant changes in the way development initiatives have been planned and implemented over the years. In order to achieve these changes, environmental protection and environmental security must be considered as essential elements of both national and international security. Kenya has made significant steps in the implementation of the environment friendly legislations, the culmination of which is the Environmental Management and Coordination Act (EMCA) 1999 (Revised 2015). EMCA 2015 makes EIA mandatory for all the projects specified in the second schedule of the Act.

1.1 Background and rationale of the EIA project report

The proponent, in compliance with the legal requirements of the Environmental Management and Coordination Act (EMCA), 1999 (Revised 2015), conducted an Environmental Impact Assessment (EIA) for the proposed modern multi-storey residential complex comprising 313 residential units within a 17-storey high-rise building on Plot L.R No. Nairobi/Block 66/6732, off Naivasha Road, Riruta Area, Dagoretti South Sub-County, Nairobi City County. This was in a bid to find out the likely negative impacts of the proposed development to the environment and resources thereof. Of particular significance in this development are solid and liquid waste management and occupational health and safety of workers especially during construction period. These have been adequately addressed both in the report and in the structural drawings and plans

1.2 Objectives of the EIA study

The objective of the EIA project report was to carry out a systematic examination of the present environmental situation within the project area to determine whether the proposed project will have adverse environmental impacts to the surrounding area. The study included collection and analysis of environmental baseline data, identification of impacts (both positive and negative) analyses and evaluation of impacts, formulation of mitigation measures for significant negative impacts, analysis of project alternatives and development of environmental management and monitoring plans. Specifically, the study set out to achieve the following objectives:

i. To determine the compatibility of the proposed facility with the neighboring land uses and evaluate local environmental conditions.
ii. To identify and evaluate the significant environmental impacts of the proposed project with special emphasis on:
    - Waste water management
    - Water supply to the residential houses and its implication to the neighboring people and facilities

- Traffic flow along the access road
- Solid waste management
- The project's carrying capacity and how this would influence resource use within the neighborhood.

iii. To assess and analyze the environmental costs and benefits associated with the proposed project

iv. To evaluate and select the best project alternative from the various options available

v. To incorporate environmental management plans and monitoring mechanisms during implementation and operation phases of the project

1.3 Justification of the proposed project

The proponent has proposed to develop a modern multi-storey residential complex comprising 313 residential units within a 17-storey high-rise building on Plot L.R No. Nairobi/Block 66/6732, off Naivasha Road, Riruta Area, Dagoretti South Sub-County, Nairobi City County. The proposed site is located within a designated residential zone, ensuring compliance with urban planning policies. The growing population and expanding economy have increased the demand for quality housing, necessitating the development of additional residential units. Furthermore, housing is a basic need, yet its supply has consistently lagged behind demand. The project aims to bridge this gap while offering various socio-economic benefits, as detailed elsewhere in this report. The Environmental Impact Assessment (EIA) study ensures that environmental considerations are integrated into the project's planning and implementation to mitigate potential negative impacts and enhance positive outcomes. Additionally, conducting an EIA is a legal requirement for such developments under the Environmental Management and Coordination Act (EMCA), 1999 (Revised 2015). The primary objective of an EIA is to provide decision-makers, regulatory bodies, the proponent, and other stakeholders with an assessment of potential environmental, social, and economic impacts of the proposed project. This allows for informed planning and proactive mitigation measures to ensure long-term sustainability. The study identifies potential physical, ecological, and socio-economic impacts, aiming to enhance the benefits while minimizing adverse effects. Where negative impacts cannot be fully avoided, cost-effective mitigation measures will be implemented. By incorporating Sustainable Environmental Management principles throughout the project cycle, the development seeks to reduce conflicts, promote environmental conservation, and ensure responsible urban growth.

1.4 Overall objective of the project

The proposed project has the overall objective of developing a modern multi-storey residential complex comprising 313 residential units with a total floor area aligned to efficient urban housing standards. The development will feature a mix of standard and superior studio apartments, one-bedroom units, and two-bedroom penthouse units, catering to diverse housing needs. The project will also integrate commercial spaces, including a restaurant and shops, along with essential amenities such as two lifts, a rooftop terrace, a borehole water supply, parking facilities (two basement levels), a management office, storage rooms, generator and transformer rooms, and dedicated access roads.

1.5 Specific objectives of the study

The key objectives of this study include the following:

i. To determine the compatibility of the proposed facility with the local environmental setting
ii. To evaluate and select the best project alternative from the various options.
iii. To assess the environmental costs and benefits of the proposed project to the local and national economy.
iv. To identify and evaluate the significant environmental impacts of the proposed project.
v. To propose mitigation measures for the negative environmental impacts
vi. To incorporate Environmental Management Plans and monitoring mechanisms during implementation, operation and decommissioning phases of the project

1.6 Study Methodology

The purpose of conducting the EIA study was to ensure that the proposed project is environmentally sound and fits well within existing land uses. The study has described and quantified impacts associated with the proposed project on the physical environment and neighbouring populations. The activities for the EIA involved desk studies and fieldwork that included direct interviews, questionnaire administration and transect walks among other methods leading to the preparation of this Project Report . Below is a detailed description of methodology pursued during this study.

1.6.1 Desktop Review.

A comprehensive review of literature related to the proposed project and the project area was carried out. The literature included studies on physiography, geology, hydrogeology, water resources and socio-economics of the project area. Relevant policies and legislation on the housing sector and on environmental management were also reviewed. The Constitution of Kenya 2010; The Kenya Vision 2030; The Kenya National Policy on Gender and Development; Nairobi County Integrated Development Plan (2023-2027); The Kenya National Land Policy just to name a few formed the basis of legislation review. The consultant also took necessary steps to familiarize with the institutional framework and functions of key government ministries, departments and organizations such as Ministry of Public Works, Youth and Gender affairs, the national gender and equality commission among others.

1.6.2 Field Study

The field survey consisted of three elements as follows:

- Public consultation
- Observations and
- Photography.

1.6.2.1. Public Consultations

Legal Notice of 101 of June 2003 requires that all environmental and social assessment process in Kenya to incorporate Public Consultation. A requirement informed by awareness that development and implementation of projects can occasion diverse impacts on stakeholders who should consequently be informed appropriately following which they can make informed decision to the proposed development. It is also important to ensure

that all stakeholder interests are identified and incorporated in project development, implementation and operation and, against such background, consultation were undertaken far and wide both within the project area and outside with the following objectives;

- ✓ To disclose the Study to both primary, secondary and other stakeholders;
- ✓ To obtain the reaction/comments/concerns of all stakeholders so as to understand their perceived view of the proposed project and assess the extent to which their views need to be taken into account. This is important as it helps to ensure that important social issues are not overlooked and there is ownership from the communities.

Stakeholder consultations were held with community members to identify what the community perceived of the project so as to get their views and give their recommendations.

1.6.2.2. Socio-economic survey

Stratified random sampling was used to select respondents for the survey. The social experts used Cochran's formulae to determine an appropriate sample size that will be a representation of the actual population. Cochran pointed out that if the population is finite, then the sample size can be reduced slightly. This is due to the fact that a very large population provides proportionally more information than that of a smaller population. It was proposed to use a correction formula to calculate the final sample size in this case which is given below:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Figure 1*: Cochrans formulae*

1.6.2.3 Questionnaire administration

Questionnaires were prepared and administered to various stakeholders identified at the initial stages of the study. Those interviewed provided critical insights with regard to socio-economic activities within the project area and how project activities are likely to impact on local populations

1.6.2.4. Observations

Observations was used during data collection exercise and also as a means of ascertaining some of the issues raised during the interviews. Notable issues such as economic, livelihoods and production systems, land use and settlement patterns and facilities as well as natural resources were all identified through observation and captured using camera. Relevant photographs taken at the project site have been attached to this report.

1.6.2.5. Data analysis

Quantitative data was entered into SPSS and MS Excel, they were run to obtain percentages and frequencies of most of the variables. They were then analyzed using content analysis and category building and grouping which enabled the developing of theme relevant to the objectives of the social assessment. The analysis dug into the public's perception of the project's importance, the priority of the negative and positive impacts discussed and others discussed later in this report.

1.6.8 Report writing

The EIA report was prepared and compiled as per the guidelines provided in Section 18 of the Environmental (Impact Assessment and Audit) Regulations, 2003 as well as the NEMA guidelines, 2012.

CHAPTER TWO: PROJECT DESCRIPTION

This section gives a detailed description of the proposed project design and components therein.

2.1 Nature of the project

TG RIRUTA LIMITED, hereinafter referred to as the proponent, proposes to develop a multi-storey residential The proposed development will have a total of 313 Units within 17 levels (Basement one &two, Ground floor, Typical first to thirteenth floor and a Penthouse floor. Basement one & two will be used for parking, ground floor will have a restaurant, shops, studios and one bedroom units. 1st to 13th typical floors will have studios and one bedroomed units comprising of standard and superior units. The 14th floor will be a penthouse comprising of five-two bedroomed units with associated amenities. There will also be a rooftop lounge, one borehole and two lifts. The proponent has provided for driveways and parking on the basement and ground floors.

The building design incorporates proper ventilation, natural lighting, stormwater drainage, water storage, and wastewater management, ensuring compliance with local planning and building standards. The land is legally owned by the proponent (ownership documents attached). The project site is withi a fully serviced urban area with electricity, water, sewer connections, and road access readily available. The design complies with all relevant regulatory and environmental guidelines, as discussed in this report. The master plan and detailed architectural drawings are attached (Appendix 4).

2.2 Location of the project

The proposed project site is located on Plot L.R No. Nairobi/Block 66/6732, off Naivasha Road, Riruta Area, Dagoretti South Sub-County, Nairobi City County. The geospatial coordinates of the site are Longitude 036° 44' 24.4" E and Latitude 01° 16' 45.5" S. The site is neighbored by residential and institutional facilities, with residential land use dominating the area alongside institutional uses. The primary energy source in the area is electricity from the national grid, supplemented by gas, charcoal, and firewood. Water is supplied through boreholes and the Nairobi City Water and Sewerage Company (NCWSC). The project site is accessible via a tarmac road off Naivasha Road.

Plate 1: Some general developments in the neighborhood

2.3 Site Description

The site is currently an open, uninhabited field covered with grasses that will be cleared to facilitate construction.

Plate 2: Site status

2.4 Site Ownership.

The proposed project site is located on Plot Title No. Nairobi/Block 66/6732, off Naivasha Road, Riruta Area, Dagoretti South Sub-County, Nairobi City County. The proposed designs comply with local standards for physical planning, minimum habitable rooms, basic facilities, health, and safety

requirements. The land is registered in the name of the proponent, with ownership documents attached. Similar high-rise developments have been implemented in the surrounding neighborhoods, alongside townhouses.

2.5 Proposed Project implementation (Construction)

The building will be constructed based on applicable building standards of Kenya. These include but not limited to the Building Code and the British Building Standards *BS 8110* and *BS 5950, BS4449, BS446, BS5255, BS497, BS556 etc*. The constructions will as well incorporate environmental guidelines, health and safety measures.

2.6 Construction activities and inputs

The following will be required for successful implementation of construction activities:

- The materials that shall be used will include stones, cement, sand, crushed rock (gravel/ballast), ceramic fixtures, reinforcement bars, wood/timber, glass, painting materials, plastic, electrical and mechanical fixtures. All these materials shall be obtained from licensed dealers who have complied with the environmental management guidelines and policies and approved by Kenya Bureau of Standards (KEBS).
- Several machines shall be used which will include earth moving equipment (excavators, loaders, wheel loading shovels and backhoe), material handling equipment (cranes and hoists), construction equipment (concrete mixers and vibrators) and engineering vehicles (trailers, tippers and dumpers).
- The project will also require labour forces of both skilled and non-skilled workers. The skilled personnel will include the project consultants (architects, engineers, quantity surveyors and environmental experts) and a contractor with a team of foreman, masons, plasterers, carpenters, plumbers, welders, electricians, glaziers, painters and casual labourers.
- Other construction inputs will include wastewater and sewer disposal, water services, power and electricity connectivity and supply from the main power grid or provided by generators.

2.7 Description of the Project's Construction Activities

The proponent proposes to develop a comprehensive multi-storey residential complex comprising a 17-storey building with 313 residential units and associated amenities and facilities. A structural engineer will inspect the proposed structures to ensure they are structurally sound, and architectural drawings have been prepared to illustrate the designs and layout of the project. The main construction activities will include hoarding, site clearing, excavation, building works, plumbing, interior finishes, and electrical and mechanical installations, among others. The architectural drawings for the proposed development are attached in Appendix 4. Detailed project activities are described below.

2.7.1 Pre-Construction Activities

Implementation of the project started with preliminary surveys and feasibility study to establish the viability of the proposed project. Investigations also identified all the existing legal and regulatory requirements that may affect the project at any stage of implementation.

2.7.2 Hoarding

A temporary hoarding will be put up before commencement of construction activities. This will help to protect motorists, pedestrians and passers-by from falling debris and injury. Hoarding is also a security measure to prevent theft of construction materials at the site.

2.7.3 Clearing of the Site and Excavation

Site clearance entails removal of any obstruction on the way of the intended construction activities. The clearing process will not involve the use of heavy machinery .

2.7.4 Laying out the Site

The site will then be laid out to identify the location of the proposed building on site. The corner points and edges of the proposed building units will be established accordingly. The marking out will use sticks and strings as well as chalk lines.

2.7.5 Mobilization of Building Materials

The proponent plans to source several building materials locally and expressed the confidence that the materials can be procured locally. The great emphasis laid on procurement of building materials from within the local area makes both economic and environmental senses since it reduces negative impacts of transportation of the materials to the project site through reduced distance of travel by the materials transport vehicles. Building materials are transported to the project site from their extraction, manufacture, or storage sites using transport trucks. There is adequate road linkage for the purpose of smooth transport of building materials into the project site.

2.7.6 Storage Materials

Building materials will be stored on site according to their need. Bulky materials such as rough stones, ballast, sand and steel will be carefully piled and covered on site. Materials such as cement, paints and glasses among others are to be stored in temporary storage rooms conveniently within the project site for this purpose.

2.7.7 Masonry, Concrete Work and Related Activities

The construction of the proposed residential complex will involve extensive 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 supplement by machinery such as concrete mixers.

2.7.8 Structural Steel Works

All the beams and floors shall be reinforced with steel metals to enhance the stability of the proposed building. Structural steel works will involve steel cutting, welding and erection.

2.7.9 Roofing and Sheet Metal Works

Roofing activities will include iron sheet cutting, raising the roofing materials such as structural timber to the roof and fastening the roofing materials to the roof. Proper planning and measuring must be done before procurement of the sheets to ensure not much solid waste is generated after roofing is completed.

2.7.10 Electrical Work

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

2.7.11 Plumbing

Installation of pipe work for water supply and distribution will be carried out from the existing supply and then to associated facilities. In addition, pipes will be installed to connect sanitary facilities with the existing Nairobi County sewerage system serving the area, and for drainage of storm water from the rooftop into the peripheral drainage system. Plumbing activities will include metal and plastic cutting, the use of adhesives, metal grinding and wall drilling among others.

2.7.12 Driveway and Parking Spaces

A paved driveway and walkway shall be constructed to ensure adequate circulation within the development for both pedestrians and vehicles. Adequate parking will be provided within the development in accordance to ministry of defence parking requirements.

2.7.13 Landscaping

To improve the aesthetic value or visual quality of the site once construction is complete, the proponent will carry out extensive landscaping especially at the front and rear parts of the buildings that shall involve establishment of small and attractive flower gardens. It is noteworthy that the proponent will use plant species that are available locally and fast growing for the landscaping.

2.7.14 Final Inspection

Final inspection will be undertaken to ensure that the project has been done properly and according to the terms of the contract. The inspection team will include the project proponent/client, the Architect, Engineer, Environmental Expert and the contractor or their representatives. The inspection will start at the beginning of the construction to the end and look at every detail of construction, functioning of mechanical and electrical installations etc.

2.7.15 Materials, Products and By-Products

During Construction, Operation and Decommissioning phases of the project, different types of wastes are likely to be generated. This section will look into the materials to be used, products and by-products including waste to be generated by the project and the methods of disposal. Waste will be managed and disposed of in accordance to Legal Notice 120 of 2006, Waste Regulations. In deciding the most appropriate disposal route, both environmental and economic costs and benefits need to be considered. This decision should be reached taking into account all the costs and impacts associated with waste disposal, including those associated with the movement of waste.

2.7.16 Staff Amenities:

2.7.17.1 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 Description of the Project's Operational Activities

2.8.1 Solid Waste and Wastewater Management

The developer has proposed to contract a licensed company responsible for solid waste handling for the defect period of the operational phase of the housing units. Solid waste generated within the premises during its operation phase, where it will be occupied by residents who generate household wastes in their day to day activities. These household wastes will be collected and temporarily stored in color-coded bins for each type of waste from the blocks. The segregation bins will placed along the corridors at designated points from where a NEMA licensed contracted company will be responsible for collecting and disposing off these wastes to a designated dumpsite approved by the relevant authority.

2.8.2 Cleaning

Residential tenants or owners will be responsible for cleaning their units, which will involve the use of significant amounts of water, disinfectants, and detergents.

2.8.3 General Repairs and Maintenance

Throughout the operational phase of the development project, general repairs will be carried out to ensure normal functioning of the buildings infrastructures, components and avoid any hazard, injury or accident to the occupants. Such activities will include repair of floors, repairs and maintenance of electrical gadgets and equipment, repairs of leaking water pipes, painting, maintenance of flower garden and replacement of worn out materials among others.

2.9 Project budget

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. **494,266,328.85.** Bill of quantity is attached in appendix 3.

Table 2-1 Materials, Wastes Generated and Disposal Methods

Activity	Materials to be Used	Waste/By-Products Generated	Disposal Method
Construction Phase			
Site Clearance and excavation	-Fuel -Spare parts and lubricants/oil -Machines such as excavators and trucks	-Air fumes from vehicle exhausts - Used oil - Dust - Excavated soil	-Used oil to be reused for lubricating movable parts of equipment e.g. wheelbarrows. -Excavated soil to be re-used on site for landscaping in order to restore part of the biodiversity.
Building works	- Machine cut stones - Steel - Cement - Paving slabs - Timber - Nails, Galvanized -iron sheets - Gravel, sand - Tiles - Glass etc.	- Plastic pipes - Scrap metal - Used timber - Broken tiles -Sand, cement and building stones -Packaging materials -Glass, paint.	- Excavated soil to be reused for landscaping and filling. -A licensed waste transporter to be engaged for waste transportation and disposal at approved dumpsites -Recyclable waste to be sold to recycling companies/dealers.
Electrical, Mechanical & Plumbing Works	-Cables -Plastic Pipes -Sockets/switches -Metal	-E-waste (cables, sockets, rubber) -Plumbing waste (Plastic Pipes, steel) -Metal waste	- Licensed waste transporters to dispose appropriately off-site at approved dumping sites - Recyclable waste to be sold to recycling companies/dealers
Operation Phase			
Project Operations	- Foodstuff -Cans/bottles - Paper -Batteries -Sockets -Cables	- Organic waste - Plastic containers - Waste Water -Paper waste -e-waste (damaged sockets, cables etc)	-Non-recyclable waste to be segregated and disposed of by a private contractor at approved dumpsites -Waste water to be discharged into the proposed waste water treatment plant within the site. - E-waste to be sold to recycling companies

CHAPTER THREE :PROJECT BASELINE INFORMATION/ DESCRIPTION

3.1 Introduction

This chapter gives background information that profiles the socio-economic and infrastructural information of the project area of influence. The chapter provides a description of the project baseline information in terms of its location, size, physiographic and natural conditions as well as the administrative and political units. In addition, it provides information on infrastructure and access; land and land use water and sanitation; trade, energy, housing, transport and communication, community development and social welfare.

3.2. Topography

The general area has a gentle slope towards the north, with a steeper gradient towards the west, which significantly influences the area's drainage patterns. The proposed development site itself has a low gradient, meaning it is unlikely to significantly affect the movement of surface materials, such as soil, during earthworks.

3.3 Geology and Soils

The soils in Nairobi are mainly products of weathering and erosion of underlying volcanic rocks under relatively high temperatures, rainfall and poor drainage. Soils are predominantly red volcanic with a loam texture. These soils are non-saline .The vertisols have low profile permeability when saturated. However, they are fertile, have a high water holding capacity and require tillage practices to drain. The area has grey soil within the top 0 to 1.0m depth and weathered limestone (nodular calcium carbonate – CaCO3) within a depth of 1.0 to 2.0m and is underlain by weathered upper Athi tuffs (volcanic tuffs or building stones) at depths greater than 2.0m. In some areas, the soil is to a depth of 65cm and is above a limestone layer of 1 to 1.4m depths. The parent material comprises deep phonolitic basement system rocks of tertiary age. The project will not cause physical change to the environment because in terms of topography, slope and stability of the soils. The rocks on the other hand, comprise of a succession of lavas and Proclastics of the Cainozoic age and overlying the foundation of folded Precambrian schist's and gneisses of the Mozambique belt. The crystalline rocks are rarely exposed but occasionally fragments and found as agglomerates derived from the 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 15m in thickness in some parts of Nairobi. The soils in the proposed project area is majorly black cotton soils.

3.4 Administrative Units

Nairobi County is divided into nine sub-counties namely; Starehe, Dagoretti North, Kasarani, Makadara, Embakasi, Njiru, Dagoretti, Langata and Westlands. The project site is located within Riruta area, Dagoretti South Sub County of Nairobi County which has 3 divisions 8 locations and 16 sub-locations as shown in the Table below.

Table 3. 1: Areas of Nairobi County Administrative Units

Sub-County	Area(km²)	Divisions	No. of Locations	No. of Sub-Locations
Starehe	10.6	3	6	12
Mathare	14.7	3	9	18
Kasarani	85.7	2	11	24
Makadara	20.1	3	5	11
Embakasi	52.1	3	6	13
Njiru	156.2	3	6	10
Dagoretti	38.7	3	8	16
Langata	223.4	4	7	16
Westlands	97.6	3	6	15
Total	696.1	27	64	135

Source: Nairobi County intergrated plan 2023

3.5 Ecological Conditions

The project site is within Riruta area which is part of Nairobi County which is predominantly a terrestrial habitat that supports a diverse web of biodiversity ecosystems. It is home to about 100 species of mammals, 527 bird species and a variety of plant species. Although it is endowed with some permanent rivers, the aquatic ecosystems are largely choked by the effects of pollution from different sources. Currently, efforts are underway to ensure a sustainable clean Nairobi River Basin.

3.6 Climatic Conditions

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.

3.6.1 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.

3.6 .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.

3.6 .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.

3.6 .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

3.7 Drainage

The project site is located within Nairobi City County which lies in the Athi River Drainage Basin. The major rivers that cross the City include Nairobi, Ngong and Mathare Rivers. All these drain from the West and flow towards the Eastern direction to join River Athi downstream. As the rivers pass through the City, industrial effluents, municipal waste and siltation heavily pollute them. Nairobi River is approximately 700 m south of the proposed project site, flowing to the city center. Otherwise, Mathare River which is one of its tributaries passes right beside the land. The project area is generally flat and becomes waterlogged especially during heavy rainfall.

3.8 Water and Sanitation

3.8 .1 Water Supply

Riruta area is serviced by the Nairobi City Water and Sewerage Company (NCWSC). However, the water supply is inadequate to meet the area's current demand due to increasing urbanization and population growth. To cope, developers and residents adopt measures such as sinking boreholes and constructing underground reservoirs to store intermittent water inflows. While these measures may have been sufficient for the area's original low-density planning, rising density and water demand could make them less effective over time.

3.9. 2 Water sources

The main sources of water for the residents in the project area are from Sasumua Dam in Nyandarua, Kikuyu Springs, Ruiru Dam, Thika and Ngethu water works. Although Nairobi River is permanent, its water is unsafe for human consumption. There are residents that

use borehole water, wells, water boozers and roof catchments especially in the project area.

3.9 .3 Sanitation

Approximately 64.5% of Nairobi County's population use flush toilets as their main waste disposal method, while 32.1% rely on pit latrines. About 4.8% of the population lacks access to any form of waste disposal. Regarding garbage collection, 36.1% of communities are serviced by private firms, while another 36.1% rely on neighborhood community groups. The project area is connected to a sewer line, though access to such infrastructure may vary across the county.

3.10 Land use

Most land in the Riruta area environs is in private hands and there is very little public land available for the development of public institutions and recreation. The continuing increase in land value is encouraging sub-division and changes of user from residential to commercial or institutional use are on the rise. The planning approach taken by the physical development planners is based on the premise that the dominant land use in the area is middle-density residential. Other uses, including high density residential hotels, public purpose, educational or commercial institutions will only be permitted as required to support the dominant user. All new developments are expected to conform to environment standards that will reinforce dominant use ensure for the area and not only respect but enhances the area's natural environment and scenic beauty.

3.11 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).

3.11 .1 Flora

The general area has lots of vegetation (trees) mostly along the roads and along the boundaries including compounds. The project area has vegetation which shall be cleared to pave way to the proposed project. The site plan has made provisions for the integration of landscaping using exotic vegetation. Tree plants will be evenly distributed over the site- at the front, sides and backyard of the building structures; also along the boundary and at the entrance to the site.

3.11 .2 Fauna

There is no fauna/wildlife threatened by the development.

3.12 Roads and accessibility

The proposed project's site is located in an area served with good road network such as Naivasha road which leads to the proposed project site. The accessibility of the site will be instrumental during project implementation process and operation phase.

3.13 Energy Access

The use of various types of energy in the project area is influenced by its cost rather than access. For instance, 63.2% of the population use paraffin as cooking fuel. Other sources of energy for cooking include LPG gas (20.2%), charcoal (10.5%) and firewood (4.8%). About

68.2% of households use electricity as a means of lighting 28.8% use paraffin while 2.9% and 4.7% use grass and dry cells respectively. The project site is served by electricity from the National grid.

CHAPTER FOUR: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 Introduction

It is a requirement under the Environmental Management and Coordination Act No. 8 of 1999 (Amendments, 2015)/ Cap 387 and Environmental (Impact Assessment and Audit) Regulations 2003; (Amendments, 2018) to carry out an Environmental Impact Assessments (EIA) as per Section 58 of the EMCA for all projects in the second schedule. Section 18 of the regulations sets out the information to be captured in the EIA report. The institution charged with overseeing the implementation of Cap 387 is the National Environment Management Authority (NEMA). The policy frameworks under which activities such as the one being proposed here fall include Environment and Development Policy, National Policy on Water Resources Management and Development (Sessional Paper No.1 of 1999), Public Health and Sanitation Policy, Economic Recovery for Wealth and Employment Creation Strategy, Kenya Vision 2030 etc have been discussed in this section.

4.2 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.

4.2.1 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.

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

4.2.3 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.

There are a number of applicable legal frameworks that have direct bearing on the optimum operation of the proposed project. They include the following:

Table 4. 1: Relevant legal framework to the proposed project

Act	Requirements	Relevance to the proposed project
The Water Act	This Act prohibits the pollution of water. Part II, section 3 states:" Every water resource is hereby vested in the State subject to any rights of user granted by or under this Act or any other written law". Under Section 5, the right to the use of water from any water resource is vested in the minister for the time being in charge of water resources except to the extent that it is alienated by or under the Act or any other written law. Consequently, a water permit must be obtained before using any water resource.	Water is significant to the general operation of the project. The proponent should therefore comply with this Act through observation of requirements and stipulations of various sections of the Act applicable to the operation of the proposed project. The proponent, is expected to comply with Section 94 (1b) which stipulates that no person shall 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 any water resource in such manner as to cause, or be likely to cause, pollution of the water resource .
The Physical Planning Cap 286	Physical planning Act makes provision for development control. Persons wishing to undertake developments must apply for and obtain consent from local authority. The planning authority when considering a planning application shall have regard, *inter alia,* to the health, amenities and convenience of the community generally and the proper planning and density of development and use of the land in the area. Conditions imposed in granting consent to a planning application may require or prohibit specified activity. They may also require the applicant to enter into an undertaking to observe the conditions imposed and to furnish security to this end.	The proponent should comply with Part V Section 29 (c) on approval of development application and grant of development permission by applying for development permission from the local planning authority. The proponent should also respect provisions of this Act with regard to any future improvements/alterations by seeking services of a Physical Planner in compliance with provisions of this Act.
Environment Management and	Section 58(1) of the Act states "Notwithstanding any approval, permit or license granted under this Act or	Environmental Management and Coordination Act provide a legal and institutional framework for the

Coordination Act, 1999 (Revised 2015)	any other law in force in Kenya, any person, being a proponent of a project, shall, before financing, commencing, proceeding with, carrying out, executing or conducting or causing to be financed, commenced, proceeded with, carried out, executed or conducted by another person any undertaking specified in the Second Schedule to this Act, submit a project report to the Authority, in the prescribed form, giving the prescribed information and which shall be accompanied by the prescribed fee.	management of the environmental related matters. This report has been prepared pursuant to section 58 (1) of this Act. The proponent is expected to comply with Part II on General principles by ensuring that environmental conservation and protection are given the priority they deserve throughout project's life span. Other sections that the proponent should comply with include Part VII Section 72 (1) on water quality standards, Section 78 on air quality standards, Section 86 on standards for waste, and Section 101 on standards for noise. These should be done by avoiding acts of pollution of water; air; ensuring that proper infrastructure for solid waste management is developed and noise levels especially during construction period are within regulatory limits stipulated in the Noise and Excessive Vibrations Pollution (Control) Regulations 2009.
Environmental (Impact Assessment and Audit) Regulations 2003.	These regulations stipulate how an EIA project report should be prepared and specifies all the requirements that must be complied with. It highlights the stages to be followed, information to be made available, role of every stakeholder and rules to be observed during the whole EIA project report making process	The proposed project will be planned, designed, constructed and operated based on these regulations. It shall also be maintained and guided by the same regulations and an environmental audit study will be done periodically to monitor compliance with the set environmental standards.
Occupiers' Liability Act Cap 34	Under Section 3 of the Act, an occupier of premises owes the common duty of care to all his visitors, except in certain restrictions, modifications or exclusion to a visitor by agreement. The common duty of care is defined, as the duty to take care as in all circumstances of the case is reasonable to see that the visitor will be reasonably safe in using the premises.	The proponent and contractor should put in place measures to ensure that safety of workers and visitors to the facility are guaranteed both during construction and operation phases of the project.

EMCA (Plastics Bags Control and Management) Regulations, 2018	These regulations are to ensure a clean and healthy environment through prevention of pollution caused by plastic bags and promotion of alternative biodegradable packaging materials. No person shall manufacture, import, export, use or offer for sale plastic carrier or flat bags.	The proponent shall be required to make an application for permission to manufacture, import or use the said bags.
The Energy Act 2019	Under section 148 of the act, a person who wishes to carry out electrical installation work must be licensed as an electrical contractor by the Authority (The Energy and Petroleum Regulatory Authority). Section 149 further prescribes the requirements of persons who wish to be certified as electrical installation workers. Section 153 and 154 requires that the amount of electrical energy supplied to the consumer shall be ascertained by the use of approved meters by Kenya Bureau of Standards (KBS). Part IV Section 75 provides for the development and use of renewable energy technologies, including charcoal, fuelwood, solar, wind, tidal waves, hydropower, biogas and municipal waste etc.	The proponent should engage contractors and electricians that are qualified and duly certified by the authority for all electrical work within the housing development. The contractor should ensure that electrical energy supplied is metered as required by the act. Alternative renewable energy sources should be explored and adopted as an alternative to electric energy .
National Construction Authority (NCA) Regulations 2014	Part II – Contractor must be registered by NCA and with the Association of contractors, employ qualified persons. Part IV- All construction works or projects whether in private or public must be registered with NCA as soon as the tender for construction is awarded Part V – all construction workers and site supervisors must be accredited and certified under the NCA Regulations 2014.	It is the duty of the proponent to ensure that the contractor is registered by the authority and that all the skilled construction workers and site supervisors are registered, certified and accredited by NCA. All the provisions of the regulations must be followed to ensure the safety and the quality of construction work

The Work Injury Compensation Benefit Act 2007	Part III of the act stipulates the right to compensation to employees who get injured, diseased or die at the work place. All accidents should be reported by the employer to the relevant authorities. Occupational diseases are defined and compensation criteria described under the Act. The Act includes compulsory insurance for employees. Part VII gives details on medical aid to injured or diseased workers	All workers contracted during the project implementation phase are entitled to medical and life insurance as required by the act. Accidents occurring at the work place should be reported to the Directorate of Occupational Health as the Act stipulates. Appropriate medical aid should be given to those injured at site at prescribed medical facilities.
Sustainable Waste Management Act 2022	Section 12.(1) of the Act requires all public and private sector entities to segregate non-hazardous waste into organic and non-organic fractions. (2) The segregated to be placed in properly labeled and colour coded receptacles, (3) All waste service providers shall collect, handle and transport segregated waste as provided for under this A ct. (4) Hazardous waste will be handled and managed as prescribed by the EMCA Act, 1999 and any other relevant written law . 13. (1) Every producer shall bear extended producer responsibility obligations to reduce pollution and environmental impacts of the products they introduce into the Kenyan market and waste arising therefrom. Section 19(1) stipulates that any private entity shall prepare a three year waste management plan and submit an annual monitoring report to the Authority	The contractor and the proponent shall comply to all the requirements of the Act and ensure that waste properly managed including the extended producer responsibility for the wastes arising out of the products they manufacture
The Constitution of Kenya, 2010	Article 42 of chapter four, *The Bill Of Rights*, confers to every person the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations Part 1 of chapter 5 dwells on land, outlining the principles informing land policy, and natural	In conformity with the Constitution of Kenya, every activity undertaken within shall adhere to the right of every individual to a clean and healthy environment. The proposed project utilizes sensitive components of the physical and natural environment hence need for a clearly spelt out environmental management plan to curb probable adverse effects to the environment.

	resources. It provides a clear outline of the state's obligation with respect to the environment.	
Vision 2030 Kenya	The Vision 2030 Medium Term Plan 2018-2022 states that the Kenya Government aims at Investment in security in terms of improving welfare and housing for National Police Service and other agencies.	The construction of this residential complex will support the vision of providing adequate housing for city dwellers.
The Penal Code Cap 63	Chapter XVII on "Nuisances and offences against health and convenience" contained in the penal code strictly prohibits the release of foul air into the environment which affects the health of the persons. It states "Any person who voluntarily vitiates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the neighbourhood or passing along a public way is guilty of a misdemeanor".	The proponent should comply with the provisions of the Code prohibiting fouling of water (Section 191) and fouling of air (Section 192) by ensuring that construction and operation processes are carried out in environmentally sound manner. Noise, air and water pollution should be avoided throughout the lifespan of the project through institution of the necessary mitigative measures to take care of the same and carrying out periodic monitoring of noise and emission levels especially during construction phase.
The Public Health Act Cap 242	Part IV of this act has provisions for maintaining and securing health. It defines what environmental nuisance is.	Various health hazards are likely to emanate from the proposed project's activities such as workplace accidents. Health issues will therefore be integrated into the project to ensure environmental health is maintained. The proponent should comply with this Act by implementing the various provisions of Part IV on Prevention and Suppression of infectious diseases by ensuring that the premises are cleaned regularly and disinfected appropriately. The proponent should also put in place measures to mitigate all forms of nuisance in compliance with Part IX Sections 115 and 118 of the Act. In this regard, noise level, water quality and, air quality should be maintained at stipulated levels during both construction and operation periods. Solid waste should also be managed in compliance with provisions of this Act.

Occupational Health and Safety Act of 2007 Cap 514	The Act makes provision for the health, safety and welfare of persons employed in factories and other places of work. The provision requires that all practicable measures be taken to protect persons employed in places of work from any injury. The Act provides that all measures should be taken to ensure safety, health and welfare of all the stakeholders in the work place.	The contractor should commit to continuously improve the safety and health standards at the construction site making safety concern everyone's responsibility. The contractor should formulate safety rules which all employees must comply with. The rules should be developed to focus attention on common causes of accidents and ill health associated with operations of construction sites. More importantly, the contractor should put in place emergency response plan, warning signs, firefighting equipment, electrical safety provisions, machinery safety provisions, lighting provisions and construction safety provisions all aimed at ensuring occupational health and safety at the work place.
Noise and Excessive Vibration Pollution (Control) Regulations of 2008. Legal Notice No. 61	Under Part II, section 3 on 'General prohibitions', the Regulations provide that 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. In determining whether noise is loud, unreasonable, unnecessary or unusual; various factors including time of the day; proximity to residential area; whether the noise is recurrent, intermittent or constant; and the level and intensity of the noise among others may be considered. Any person who contravenes the provisions of this Regulation commits an offence.	The proponent and his agents should comply with these regulations by ensuring that noise levels at the construction site do not exceed those stipulated in the First Schedule of the regulations. Where the levels are exceeded, mitigative measures including wearing ear protection and carrying out construction activities during daytime should be put in place.
Environmental Management and Co-Ordination (Waste Management) Regulations 2006	These Regulations apply to all categories of waste including solid waste, industrial waste, hazardous waste, pesticides and toxic substances, biomedical wastes and radioactive substances Part II of the Regulations prescribes responsibility of waste generators. It states that no person shall dispose of any waste on a public highway, street,	The proponent and his agents should comply with this regulation by obeying stipulations of the general provisions of the regulations including responsibility of waste generators and segregation of waste by generator. The Proponent and his agents should engage licensed solid waste handler to dispose of solid waste generated at the premises during construction. At operation phase,

	road, recreational area or in any public place except in a designated waste receptacle. The regulations also require any person whose activities generate waste to collect, segregate and dispose or cause to be disposed of such waste in the manner provided for under the Regulations. The Regulations also provide for any person who owns or controls a facility or premises which generates waste to minimize the waste generated by adopting cleaner production principles which includes among others: improvement of production process through conservation of raw materials and energy; eliminating the use of toxic raw materials within such time as may be prescribed by the Authority and reducing toxic emissions and wastes, monitoring the product cycle from beginning to end	the tenants should be encouraged to contract services of a licensed solid waste handler in compliance with provisions of this legislation.

CHAPTER FIVE: ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 Introduction

This chapter presents the assessment of the issues likely to emanate from implementation of the proposed project and associated infrastructure. For each issue, the analysis is based on its nature, the predicted impact, extent, duration, intensity, probability, and the stakeholders and/or values affected. In accordance with best practice, the analysis includes issues relating to the project's environmental and social sustainability. For potential negative impacts judged to be significant and require mitigation, the analysis is followed by notes on mitigation options. Impacts and their possible mitigation are combined in this chapter for easy reference. As in most impact studies, the analyses focus on potential problems and their solutions.

5.2 Impact identification

5.2.1 Sources of impacts

The impacts associated with the proposed project will emanate from project inputs, activities and outputs. The project inputs that shall be potential sources of impacts include skilled and unskilled workforce exerting indirect demand for energy, water supply, sanitation, health services etc and machinery used at the project site for various purposes. The project activities that shall be potential sources of impacts include site preparation and clearance; topsoil removal; clearing of vegetation; transportation of materials to the site; labour at the site and site restoration. Project outputs likely to lead to adverse impacts include spoil disposal; emissions from site machinery (hydrocarbons and Carbon dioxide); particulate matter; noise pollution from construction activities and hazardous waste (oil) spillage. Table 5.1 below gives summary of impact sources in the proposed project.

Table 5. 1: Sources of Impacts

Project Inputs	Project Activities	Project Outputs
(i) Skilled and unskilled workforce (ii) Machinery used at the project site	(i) Mobilization of machinery to the site (ii) Site preparation and clearance (iii) Transportation of materials (iv) Site restoration	(i) Excavated spoils (ii) Gaseous emissions from the site (iii) Noise from site activities (iv) Oil spills

5.2.2 Receptors of impacts

The anticipated negative impacts will be experienced on both the physical and human environments. Natural environment likely to be affected by project activities include fauna habitats, surface water resources within the vicinity of the project area and air quality within the project area. Table 5.2 below gives summary of receptors of impacts in the proposed project.

Table 5. 2: Receptors of Impacts

Human Environment	Physical and Biological Environment

(i) Residential houses within project vicinity (ii) Academic institutions including schools (iii) Workers on site	(i) Surface water resources in project area of influence (ii) Plants and animals within project alignment area; and (iii) Soil structure within project area of influence

5.3 Impact Assessment Criteria

The purpose of impact assessment is to assign relative significance to predicted impacts associated with the project, and to determine the manner in which impacts can be avoided, mitigated or managed. The rating of impacts assumes that standard construction procedures present in the project design will be implemented. The impact assessment criteria include the spatial context of project impacts; temporal context; reversibility, magnitude and significance of potential impacts of project construction and operation. The potentially significant environmental and social impacts have been identified based on the nature of the receiving environment, analysis of the proposed activities and analysis of the issues raised by stakeholders during public participation process.

5.4 Positive Environmental Impacts

The proposed construction of this residential complex offers several benefits, including the following:

5.4.1 Employment Creation

The proposed development will create business opportunities by providing a market to suppliers of construction materials during the construction phase. It will also provide employment opportunities both directly and indirectly during the construction phase. Casual laborers, semi -skilled and skilled labor professionals such as environmentalists, supervising engineer, contractor staff and architects among others will benefit from the employment opportunities created by the proposed project.

5.4.2 Optimal Use of Land

The proposed site is currently vacant. By building this residential complex the design has incorporated an optimal use of the currently undeveloped land therefore increasing the rate of return on investment.

5.4.3 Promote Local and National Economy

Implementation of the proposed project will promote local businesses in the area such as food vendors, construction material suppliers etc. The various permits issued by the County Government including approval of building plans will attract certain charges which will form part of the County's revenue. The National Government will benefit through income tax paid by Consultants engaged in the project as well as Value Added Tax (VAT) charged on building materials which will be required during construction, installations and interior finishes.

5.5 Measures to Enhance the Positive Impacts

Construction should adhere to recommended best construction practices that make effective and economical use of locally available resources including materials, expertise and labor. Construction materials will be sourced from certified suppliers in order to enhance the integrity of the proposed buildings.

5.6 Environmental Impacts during construction and operation phases

Construction phase of the proposed project site will involve the implementation of the approved project design. The activities at this stage will include site preparation, hiring of labour, site specific clearance, earthworks and foundation works, delivery of construction materials, masonry and concrete works, structural works, roofing, mechanical, plumbing and electrical works. These works will be undertaken according to structural engineer's specification.

On the basis of the baseline information gathered during the field study and consultation done with stakeholders, potential impacts of the proposed project have been discussed below. The effects of any form of impacts can be minimized by having an idea of the magnitude of each before the project is implemented. The magnitude of each impact is described in terms of being significant, minor or permanent, short-term or long term, specific (localized) or widespread, reversible or irreversible. Most of the impacts have been addressed in the proactive design of the proposed project and other mitigations can only be guaranteed through active and responsible management committed to the propositions of the environmental management plan

5.6.1 Air quality impacts

The main emissions to air during the construction phase are likely to be emissions of suspended particulate matter and nuisance dust from the movement of vehicles and construction equipment, excavation and rehabilitation, demolition, clearing and grading, truck loading and unloading and wind erosion.

The potential air pollutants generated from the construction of the development are considered to be both:

- Suspended particulate matter
- Deposited dust.

The key potential health and amenity issues associated with construction are:

- Elevated suspended particulate concentrations (PM_{10})
- Nuisance due to dust deposition (soiling of surfaces) and visible dust plumes.

The nearest sensitive receptor is located approximately 100 metres from the nearest site boundary, and the development does not meet any of the screening criteria for human and ecological receptor, therefore detailed assessment on sensitive receptor is not deemed necessary. Sensitivity of the area to dust soiling is also classified as low. Accordingly, there is a low risk of adverse dust soiling occurring at the off-site sensitive receptor locations if no mitigation measures were to be applied to control emissions during the works.

During the operational phase, the emergency generators would be a source of products of combustion in the event they are required to operate (i.e. during a power failure). As this would occur very infrequently and for a limited time period .

Significance of Impact

The significance of the impacts with or without mitigation is very low as shown in the impact analysis table below

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	1	1	2	3	2	4	5	20
	Activity specific	One day to one month	Potentially harmful	Monthly	Highly unlikely			Very Low
With mitigation Measures	1	1	1	3	1	3	4	12
	Activity specific	One day to one y month	Non harmful	Monthly	Almost impossible			Very Low

5.6.1.1Mitigation measures for air pollution

i. Develop a construction management plan to guide construction activities throughout the phase
ii. During construction, any stockpiles of earth should be enclosed / covered / watered during dry or windy conditions to reduce dust emissions
iii. Construction trucks removing soil from the site, delivering sand and cement to the site should be covered to prevent material dust into the surrounding areas
iv. During construction, where water is available, sprinkle the construction area with water to keep dust levels down
v. Personal protective equipment (PPE) that includes dust masks should be provided to all personnel in areas prone to dust emissions throughout the period of construction
vi. Maintain all machinery and equipment, including the generators, in good working order to ensure minimum emissions including carbon monoxide, NOX, SOX and suspended particulate matter
vii. During annual environmental audit air quality monitoring should be part and parcel of the report
viii. The Proponent should use low sulphur fuels for the power generators
ix. No burning of any waste materials whatsoever should be permitted within the site both during construction and operation

5.6.2 Noise Pollution

Noise and vibrations are expected mainly during the construction phase with the major receptors being the construction workers. Sources of noise would include, materials delivery trucks, as well noise generated by the work force. Earth moving activities are also likely to cause vibrations. Upon occupation, vehicles accessing the facility and backup generator could be a source of noise pollution.

Significance of Impact

The significance of the impacts with or without mitigation is very low as shown in the impact analysis table below

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	1	1	2	3	2	4	5	20
	Activity Specific	One day to one month	Potentially harmful	Monthly	Highly unlikely			Very Low
With mitigation Measures	1	1	1	3	2	3	5	15
	Activity Specific	One day to one month	Non harmful	Monthly	Highly unlikely			Very L0w

5.6.2.1 Mitigation measures for noise pollution

(i) Ensure that all construction equipment is maintained at the best operating conditions and avoid unnecessary noise,
(ii) All equipment and machinery must be regularly serviced by competent technicians;
(iii) Ensure workers are provided with the necessary personal protective equipment including earplugs or earmuffs when operating or working with noisy equipment; and
(iv) The backup generators should be installed in an acoustically designed structure to prevent noise pollution.

5.6.3 Occupational Safety and Health Impacts

Health and safety impacts during construction include accidents and injuries from machinery used and construction activities at the site.

Significance of Impact

The significance of the impacts is low without mitigation and very low with institution of mitigation measures as shown in the impact analysis table below

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	2	1	2	3	4	5	7	35
	Area specific	One day to one month	Potentially harmful	Monthly	Likely			Low
With mitigation Measures	2	1	1	3	1	4	4	16
	Area specific	One day to one month	Non harmful	Monthly	Almost impossible			Very Low

5.6.3.1 Mitigation measures for occupational health and safety impacts

(i) Implementation of emergency response plan that includes installation of emergency response plan to combat accidental events;
(ii) Workers should be provided with suitable personal protective gear (such as nose masks, ear plugs/muffs, helmets, overalls, industrial boots, etc.) and ensure they are used at all times while at their place of work. A fully equipped first aid kit should also be provided at site.

5.6.4 Soil Erosion

Precise Material Testing Limited were engaged to undertake a geotechnical investigation required to confirm the suitability of the site. Minimal soil erosion is anticipated from the activities of the project during construction phase. Activities expected to loosen top soil include excavations and earth moving activities, as well as from movement of the

construction vehicles. During operation impact on soil in terms of erosion will be insignificant.

5.6.4.1 Significance of Impacts

The impacts are high without mitigation measures. With implementation of mitigation measures, the impacts become low and are unlikely to affect other land uses adversely.

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	2	5	5	4	5	12	9	108
	Area specific	Permanent	Great	Weekly	Definitely			High
With mitigation Measures	2	2	1	4	1	5	5	25
	Area Specific	One month to one year	Insignificant	Weekly	Almost Never			Very L0w

5.6.4.1 Mitigation Measures

- ✓ Site clearance to be undertaken progressively in accordance to construction management plan;
- ✓ Excavations of the site will be confined only within the sections upon which construction is taking place
- ✓ Excavated earth will be held away from locations of the site not susceptible to surface runoff of storm water;
- ✓ The earth removed for external disposal will require to be deposited on sites without the risk of being washed down during rains.
- ✓ Extra precautions on control of soil erosion will be required on construction during periods of heavy rainfall;
- ✓ Re-vegetate exposed areas on the site so as to mitigate further erosion of soil; and
- ✓ Landscaping with indigenous species will help to mitigate soil erosion even during the post commissioning phase of the project.

5.6.5 Solid Waste

Solid waste may be generated from construction debris (soil, stones, pipes, packaging, etc), and during the operation phase, in the form of waste paper, boxes, packaging and wrapping, plastic containers and bottles etc), wood, oil waste, food and organic waste. The waste may be classified as hazardous and non-hazardous. Accumulation of solid waste or its improper disposal could pose health risks.

Significance of impact

Generation of solid wastes impacts are medium to high without institution of mitigation measures. With implementation of mitigation measures, the impacts are low and are unlikely to adversely affect neighbouring populations and land uses.

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	4	2	4	4	4	10	8	80
	Regional	One month to one year	Great/ harmful	Weekly	Likely			Medium-High
With mitigation Measures	2	2	2	3	2	6	5	30
	Area Specific	One month to one year	Small/ potentially harmful	Six months	Highly unlikely			L0w

5.6.5.1 Mitigation measures

The most appropriate options in waste management are identification of the waste types, segregation into the various categories and establish suitable mechanisms of collection, storage, transfer and final disposal. Ultimate destination for each of the waste categories should also be known and tracked.

The following options are proposed for wastes associated with this project through to the occupation period:

(i) All construction debris and solid waste generated by the workforce must be taken out of the site and disposed of in an appropriate manner, at a specified and approved dump site

(ii) The —3Rs‖ philosophy of reuse, recycle and reduce should be adopted. To do this, all solid waste generated at the site should be segregated at source into organic/biodegradable, metal, plastic, cardboard, hazardous , so that it can be recycled, reused or buried.

(iii) Labelled bins should be provided at the sites according to the type of wastes generated.

5.6.6 Liquid Waste

During construction phase vehicles and construction machineries that use fuels and oils will be used on site. Unless there is an accidental spill pollution due to oil and fuel are unlikely to occur during construction phase. During the operational phase, fuel will be required for the generators and for the vehicles. Pollution due to oil may result from improper storage, handling and disposal of oil and oil products. Leakages and spills may also occur during vehicle and equipment servicing and this may find its way into the environment. This can lead to the contamination of soils as well as water sources. The site will also use chemicals such as detergents, cleaning solutions, etc, but on a small scale. There is a minimal chance of pollution due to these chemicals.

Significance of impact

Liquid waste impacts are low without mitigation measures and very low when mitigation measures are instituted as shown in analysis below

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	2	2	1	4	2	5	6	30
	Area specific	One month to one year	Insignificant/ Non-harmful	Weekly	Highly unlikely			Low
With mitigation Measures	2	2	1	4	1	5	5	25
	Area specific	One month to one year	Insignificant/ Non-harmful	Weekly	Almost impossible			Very Low

5.6.6.1 Mitigation measures

(i) The reservoir water tanks, whether constructed of steel or fibre-glass reinforced plastic should be designed and built according to recognized industry standards;

(ii) Use of corrosion protection in water tanks and piping system

(iii) Any chemicals in use at the site should be stored properly – stores should be well ventilated, with lips at the doors and enclosed. Chemicals and food should not be stored together.

5.6.7 Biodiversity

The major ecological risks and impacts would come primarily from the project activities. These activities will happen mostly during construction phase of the project, and risks/impacts of different strengths are anticipated on the general biodiversity in the area of Interest (AoI). The project activities with major ecological risks include:

- Clearing of vegetation and land for construction
- Construction of access roads
- Operation of vehicles and machines/equipment
- Storage of materials for construction
- Overall ecological risks and impacts

Project activities would have varying magnitude of impact on various species, habitats and ecological processes. These include impacts on flora and fauna species and ecological indices (population dynamics). The following potential impacts are anticipated:

Significance of impact

Biodiversity impacts are low without mitigation measures and very low when mitigation measures are instituted as shown in analysis table below

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	2	2	1	4	2	5	6	30
	Area specific	One month to one year	Insignificant/ Non-harmful	Weekly	Highly unlikely			Low
With mitigation Measures	2	2	1	4	1	5	5	24
	Area specific	One month to one year	Insignificant/ Non-harmful	Weekly	Almost impossible			Very Low

5.6.7.1 Mitigation measures for biodiversity impacts

(i) The project design incorporates landscape planting around the periphery of the site and building and incorporates planting of exotic and indigenous trees. Maintenance of landscape planting, as proposed, should be ongoing to ensure tree canopies remain healthy and thereby provide the visual screening purpose for which they were planted.

(ii) Mitigation measures to reduce soil erosion and pollutant run-off during construction to be included in a standard erosion and sedimentation control plan.

(iii) Measures to minimize the generation of dust and chemical spills and associated impacts on adjacent natural environ.

(iv) The proponent to develop vegetation clearing protocols during construction phase and vegetation rehabilitation plan during operation phase

5.6.8 Surface and Subsurface Water Pollution

Run-off from the construction site may have adverse impacts on water quality in surface water bodies in the project area. There is a mad made dam for irrigation purposes in the nearby valley as well as a river. The quantity and quality (physical, chemical) of both surface waters as well as groundwater may be affected by construction activities through contamination with run off from the site. The removal of topsoil, overburden and aggregates may affect the quality of water recharging of an aquifer.

A potential source of water contamination from the operation is oil spills/ leaks from construction machinery. Spills present hazards through contact to skin and eyes or through inhalation of vapours and also hazard to the environment. They may also lead to water and soil contamination which is harmful to plants and animals.

Sanitation will be provided through the use of toilets during construction. During operation, impact on surface water resources will be negligible as proper liquid waste management infrastructure has been put in place in the design.

Significance of Impact

Water quality impacts are low without mitigation measures and very low when mitigation measures are instituted as shown in analysis table below

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	2	2	1	4	2	5	6	30
	Area specific	One month to one year	Insignificant/ Non-harmful	Weekly	Highly unlikely			Low
With mitigation Measures	2	2	1	4	1	5	5	24
	Area specific	One month to one year	Insignificant/ Non-harmful	Weekly	Almost impossible			Very Low

5.6.8.1Mitigation measures for surface /subsurface water pollution

- Discharge of any wastewater into open environment during the construction and operation phases shall be strictly prohibited
- All vehicles machinery and equipment shall be refueled at designated areas
- Regular audits shall be performed on construction machinery to ensure no leaking or defective equipment are used on site
- Any equipment repairs or maintenance will be carried out in designated areas. No repair of construction machinery or equipment shall be done on active construction site. As best practice, drip trays shall be placed under the vehicles being repaired to capture oils or lubricants discharged
- Any spillage of fuel, oils or other harmful substances shall be cleaned up immediately and reported to the safety officer for logging; and
- Training on spill control and clean-up shall be carried out through toolbox talks.

5.6.9 Community Health and safety impacts

The public as well as workers are at risk from projects such as this, particularly from construction traffic, and local commercial sex workers through sexually transmitted diseases. The project will generate relative amount of traffic compared to the non-project situation. This traffic will be using the public roads within the project area. Accidents could occur due to excessive speeds, unsafe loading, poor road surfaces, poor vehicle maintenance, and unwary pedestrians, especially drunken pedestrians and children. Commercial sex workers may take advantage of the cash available to project workers. They may therefore be involved in unsafe sex and be at high risk of becoming infected with (and subsequently passing on) sexually transmitted infections including HIV/AIDS. This is a significant gender issue.

Significance of impact

The impacts are medium- high without implementation of mitigation measures. The impacts are low when mitigation measures are instituted as shown in the analysis table below

Mitigation status	Spatial extent	Duration	Severity	Frequency of activity	Frequency of Impact	Consequence	Likelihood	Significance
Without Mitigation	4	2	4	4	4	10	8	80
	Regional	One month to one year	Harmful	Weekly	Likely			Medium-High
With mitigation Measures	4	2	1	4	1	7	5	35
	Regional	One month to one year	Non-harmful	Weekly	Almost impossible			Low

5.6.9.1 Mitigation Measures for community health and safety impacts

(i) The project proponent shall establish and enforce a strict code of conduct for all project drivers. The code shall focus on safety, especially speed, and loading, and shall ban all carriage of staff, workers and passengers except in seats; and

(ii) The project proponent shall use the existing HIV/AIDS prevention programme to deal with HIV/AIDS issues related to project's construction phase. The programme identifies specific risk groups, specific AIDS awareness campaigns for these risk groups and provision of male condoms to construction workers.

5.6.10 Mushrooming of Informal Businesses

Usually, such development projects during construction stage have the potential of attracting unplanned commercial activities that come to take advantage of the increased trade prospects. This often leads to mushrooming of kiosks/informal vendors, which are attracted by the prospects of doing business especially selling food. Some have potential to pollute the environment owing to lack of sanitation infrastructure.

5.6.10.1Proposed Mitigation Measures

- Provide clean and safe drinking water at the site
- Provide a toilet at the site to ensure hygiene and proper sanitation is observed
- The workers will have designated areas for eating and resting
- Food vendors will be allowed to sell food within the hoarded area to avoid littering of the surrounding areas.

5.6.11 Visual Impact

In order to develop the proposed development, excavation and earth works will be involved. The main visual impacts would occur during earthworks for construction of the foundation of the building. However, this impact will be generally confined to the site.

5.6.11.1Proposed Mitigation Measures

- Mandatory construction of adequate hoarding around the project area prior to commencement of any construction activity
- Ensure that all construction activities are carried out within the hoarded area.

5.6.12 Traffic Congestion

During construction, roads leading to the project site will experience increased traffic flow especially from construction vehicles. This will impact the road users through damage of roads and traffic snarl ups especially at turning points and along the access road. Appropriate measures will be undertaken to ensure smooth traffic flow.

5.6.12.1Proposed Mitigation Measures

- Provide adequate on-site parking dedicated for construction site personnel and heavy vehicles
- All deliveries and collections to and from the site shall be staggered and restricted to off-peak traffic hours to prevent obstruction of other road users
- Traffic speeds for construction and other vehicles coming to and fro the project site shall be restricted to 20 Km/h to ensure pedestrian safety
- Signage to identify the construction site shall be erected at the site entry point
- Appropriate traffic warning signs, informing road users of a construction site entrance ahead and instructing them to reduce speed, shall be placed along the main road in the vicinity of the entrance to the site during the construction period
- Train drivers on road safety
- Limit idling time for pick-up trucks and other smaller equipment, observe a common-sense approach to vehicle use, and encourage workers to put off vehicle engines whenever possible
- Repair any damage on the access road after completion of construction

5.6.13 Gender Equality

There is need to promote gender equality in all aspects of economic development and more so in construction. Women roles in construction are mainly confined to supply of unskilled labor and vending of foodstuffs to the construction workers. During construction, the contractor is likely to be biased against the female gender during hiring of casual laborers. The Contractor shall ensure that either gender constitutes at least 30% of the work force at the site. The contractor shall also develop policies to protect female workers at the site against harassment by their male counterparts.

5.6.13.1 Proposed Mitigation Measures

- Ensure equitable distribution of employment opportunities between men and women
- Provide toilets and bathrooms for both male and female workers on site
- Enforce workers code of conduct
- The works contractor shall be required, under its contract, to prepare and enforce a No Sexual Harassment and Non-Discrimination Policy, in accordance with national law where applicable
- The contractor shall prepare and implement a gender action plan

5.6.14. Improved security in the area

This is going to be realized through employment of security guards both during construction and operational stages of the proposed project. Lighting of the project area and its environs will also help boost the security of the area during night hours.

5.6.15.Energy Demand and Usage

The proposed project will lead to increased demand and use of energy during the construction stage (fuel for running machinery and other equipment) and during operation phase (electricity used by the occupants).

5.6.16.1Potential Mitigation Measures

1. Exterior lights shall be controlled by a programmable timer.
2. Generator should be provided as a full backup energy source throughout the development.
3. Install and routine maintenance of energy efficient appliances e.g. LED bulbs etc.
4. Monitor energy use during construction and set reasonable limit.
5. Put off all lights immediately when not in use or are not needed.
6. The water booster set will contain inverter pumps for energy saving and precise control of flow and pressure rate.
7. Turn off machinery and equipment when not in use.
8. Use of backup generator as an alternative source of energy.

CHAPTER SIX: ANALYSIS OF PROJECT ALTERNATIVES

6.1 Introduction

In order to enable the proposed project to seek different ways of minimizing its impacts on the environment and at the same time achieve its objectives, several alternatives were assessed.

6.2 The proposed Alternative

The EIA study report has been prepared for submission to NEMA; facts, findings and recommendations/proposals of which are based on the proposed site, design, materials and proposed technologies. This helps in evaluating and examining the foreseeable effects of the project on the environment and therefore assisting in addressing how the proposed development has to ensure that all environmental measures are complied with during both the implementation and operational phases.

The alternative consists of the proponent's/applicant's final proposal with the inclusion of the legal guidelines, regulations and procedures as stipulated in the EMCA, CAP 387 which aims at reducing environmental impacts to the maximum extent practicable. Appropriate Environmental Management Plans have been prepared as per the proposed project.

6.3 Relocation Alternative

Relocation option to a different site is an option for the project implementation. At the moment, the proponent has no alternative sites for relocation. Finding and acquiring land to accommodate the scale, type and size of the project and completing official transaction on it may take a long period. Besides, there is no guarantee that such land would be available and suitability is another very important factor, which cannot be ignored.

Although monetary costs should not be used to justify a wrong project, this would also call extra costs in terms of money and time for example whatever has been done and paid to date would be a direct loss to the proponent. This may also lead to a No Action Alternative situation. The other consequence is that it would discourage both foreign and local investors especially in the housing sector that has been shunned by many public and private investors hence aggravating the housing short fall. In consideration of the above concerns and assessment of the current proposed site, relocation of the project is not a viable option. The problem is further aggravated by the fixed characteristics of land and the bottlenecks of the planning policy.

6.4 The No Action Alternative

The No Action Alternative in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. The anticipated insignificant environmental impacts resulting from construction, and occupation activities would not occur. This option will however, involve several losses both to the project proponent/land owner and other stakeholders; society and Government. The landowner will continue to pay high taxes on the underutilized property. The No Project Option is the least preferred with reasons such that there will be no incremental housing stock, forfeiture of economic benefits that would accrue to the proponent, the public and the government, and it could also discourage investors wishing to invest in the housing sector.

From the analysis, it becomes apparent that the No Project Alternative is not the appropriate alternative.

6.5 Analysis of Alternative Construction Materials, Design, and Technology

The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that saves energy and water will be given first priority without compromising on cost or availability factors. 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. Beautiful and durable re-enforced concrete roofs because they are good in heat insulation with minimal iron sheet roofs. Heavy use of timber during construction is discouraged because of destruction of forests. The exotic species would be preferred to indigenous species in the construction where need will arise. However, these construction methods and technologies to be used will require very little timber.

The technologies available include the conventional brick and mortar style, concrete frame construction, prefabricated concrete panels, timber construction, steel and aluminum frame and Expanded Polystyrene Technology. The proponent has preferred the use of reinforced concrete frame construction as the technology is durable, offers outstanding resistance to explosion and/or impact and performs well during both natural and manmade disaster. Reinforced concrete can also endure very high temperatures from fire for a long time without loss of structural integrity. Priority shall be given to construction techniques and materials that are environmentally friendly save on time and cost of construction.

Various alternative designs and technology have been evaluated by the proponent and various professionals involved i.e. the architect, engineers, and surveyors end environmental consultants. After extensive discussions and relevant considerations, the various options were assessed and the most optimal design and technology were agreed as per the proposed plans, materials and technology.

6.5.1 Waste Water Management Alternatives

Eight locally available technologies are discussed below: -

6.5.1.1 Waste Water Treatment Plant

This involves the construction of a plant that will enable the recycling of the waste water from the project activities to reusable standards and utilized within the site in activities such as irrigating the flower gardens and flashing of the toilets. It is usually expensive to construct and maintain, but it is the most reliable, efficient and cost-effective in the long term. This option is not viable for the proposed project due to lack of space.

6.5.1.2 Use of Stabilization Ponds/Lagoons

This refers to the use of a series of ponds/lagoons that allow several biological processes to take place, before the water is released back to the river. The lagoons can be used for aquaculture purposes and irrigation. However, they occupy a lot of space but are less costly.

No chemicals are used/heavy metals sink and decomposition processes take place. They are usually a nuisance to the public because of smell from the lagoons/ponds. This option is not preferable in the area because the required space is not only available, and the local community are not likely to accept the option.

6.5.1.3 Use of Constructed/Artificial Wetland

This is one of the powerful tools/methods used in raising the quality of life and health standards of local communities in developing countries. Constructed wetland plants act as filters for toxins. The advantages of the system are the simple technology, low capital and maintenance costs required. However, they require space and a longer time to function. Long term studies on plant species on the site will also be required to avoid toxin accumulation in the plants. Hence it is not the best alternative for this kind of project.

6.5.1.4 Use of Septic Tank

This involves the construction of underground concrete-made tanks to store the sludge with soak pits. This option is viable in instances where the project is not served with a sewer system or is far from a sewer line.

6.5.1.5

This involves seeking approvals from the relevant authority and connecting the proposed project development with the NCWSC sewer system that exists and offers services within the area. This is the most viable alternative since the proposed development surrounding site area is connected and served by a 1.5M wide sewer system in addressing waste water issues. The developer has opted in using the sewer systems existing and connected in the area for the disposal and management of waste water generated throughout the project cycle.

6.5.1.2 Solid Waste Management Alternatives

Throughout construction, the project will produce wastes such as excavated 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).

An Integrated Solid Waste Management System (ISWMS) is recommended for management of all solid wastes generated throughout the projects phases. The following shall be given preference in its descending order:

a) The developer shall give priority to waste reduction at source of the materials. This option will demand a solid waste management awareness program in the management and the residents.

b) Secondly, Reducing, Recycling, Reuse and composting of the waste. This calls for a source separation program to be put in place. The recyclables will be sold to waste buyers within Nairobi County or donated.

c) Finally, sanitary land filling will be the last option for the developer to consider.

6.5.1.3 Water

The proposed development will be supplied with water from the planned borehole and the Nairobi City Water and Sewerage Company (NCWSC). Additional options include installing rainwater harvesting systems and recycling treated wastewater from the on-site

treatment plant. Stormwater will also be collected and reused on-site for landscaping, gardening, and other purposes.

6.5.1.4 Energy Sources

The proponent proposes to connect the development to the Kenya Power main supply for power supply. Other measures that will be put in place to conserve energy include; use of LED light bulbs, maximize the use of natural lighting, switching off lights when not in use and use of automatic lighting. The design of the proposed units will also ensure that all internal rooms are well lit from natural lighting. The proponent shall implement the above recommendations in order to conserve energy and promote sustainable use of natural resources.

6.6 The Proposed Development Option

The proponent has undertaken a feasibility study to determine the viability of the proposed development. Under the proposed Development Option, the developer settled on concept one as discussed above would be issued with an EIA License. In issuing the license, NEMA would approve the proponent's proposed Project, provided all environmental measures are complied with during the construction period and operational phases. This alternative consists of the applicant's final proposal with the inclusion of the NEMA regulations and procedures as stipulated in the environmental impacts to the maximum extent practicable.

6.7 Conclusion

All the alternative options analyzed have implications, which make the current design option proposed by the proponent to be more viable. The preferred alternatives are likely to maximize the returns on investment for the proponent while ensuring environmental sustainability.

CHAPTER SEVEN: PUBLIC CONSULTATION AND PARTICIPATION

This chapter presents a summary of stakeholder consultation process done during the project report study.

7.1 Informing potentially affected stakeholders about the Proposed Project

Informing and consulting the public are integral tasks within any environmental assessment process in Kenya and forms part of best practice. Accordingly, the TOR required the EIA consultant to organize and implement a public consultation exercise in undertaking the EIA process. Informing the local people, leaders and key stakeholders about the proposed project was carried out through community consultative meeting, key informant interviews, questionnaire administration, email communication and telephone calls. During the consultation process, stakeholders were taken through the proposed project including its objectives, technologies of implementation and possible impacts associated with implementation of the project. Stakeholders were then given time to ask pertinent questions regarding the proposed project to enable the consultants clarify on any issues that stakeholders may not have understood properly.

7.2 Determination of who should be involved in the EIA

The EIA study benefited from extensive stakeholder consultations with a wide cross section of the community. Stakeholder analysis was conducted to identify stakeholders who should be involved in the EIA process. The basis of inclusion of these stakeholders was informed by their relevance in terms of their activities within the project area and whether they are residents of the area. The Stakeholders were categorized into two groups for purposes of this study. The first group consisted of institutional stakeholders and the second consisted of community stakeholders. The institutional stakeholders were drawn from organized groups as well as various agencies with specific roles within the project area. Community stakeholders on the other hand were community representatives drawn from various structures of community governance within the project area.

7.3 Methods used to consult various stakeholders

The following is a summary of the methods used by the EIA experts to consult various stakeholders during the EIA process.

7.3.2 Key informant interviews

One-on-one interviews with key stakeholders within the project area were undertaken in order to gather baseline information on the project area and also to assist in analysis of existing and anticipated impacts of project activities to the community and institutions within the project area of influence. These interviews were conducted to augment and confirm data and information obtained using other tools and methodologies. The interviews were focused on getting information from key stakeholders within the project area and focused on key stakeholders residing within the project area. Among those consulted through this method include the local leaders and the various proponent's technical and professional consultants.

7.3.3 Questionnaire Administration

Questionnaires were prepared and administered to various stakeholders identified at the initial stages of the study. Those interviewed provided critical insights with regard to socio-economic activities within the project area and how project activities are likely to impact on local populations. Those consulted through this method at this stage were mainly those residing within the project area of influence.

7.3.4 Community Leaders' consultative meetings

The consultative meetings served two purposes; first they offered an opportunity for stakeholder sensitization on the proposed project. Secondly, they presented an opportunity for the EIA study team to gather data and information on contentious issues relating to implementation of the proposed project. To better address the latter objective, participants were first taken through the key highlights of the issues to be explored under the EIA study. Through a question and answer session, stakeholders were given opportunity to understand the implication of the proposed project on the environment and local populations.

7.3.5 Public meeting

One public meeting was held during EIA study. The meeting was part of public consultation exercise and was meant to inform the local leaders and stakeholders about the proposed project and also seek their views about the same. The meeting also presented the community members and the potentially affected persons (PAPs) with the opportunity to freely express their views concerning the proposed project.

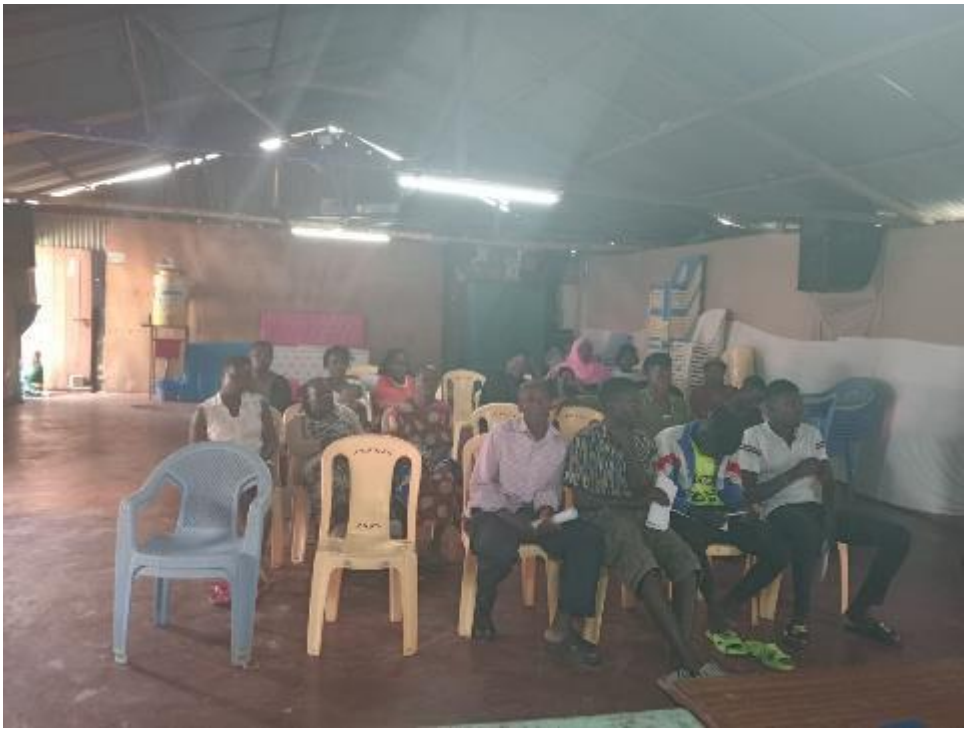

Plate 3: Participants following the proceedings

7.4 Public Notices

Public notices were put around the site, on the newspapers and on local radio as per regulation 17(a) of the Environmental (Impact Assessment And Audit) Regulations, 2003.

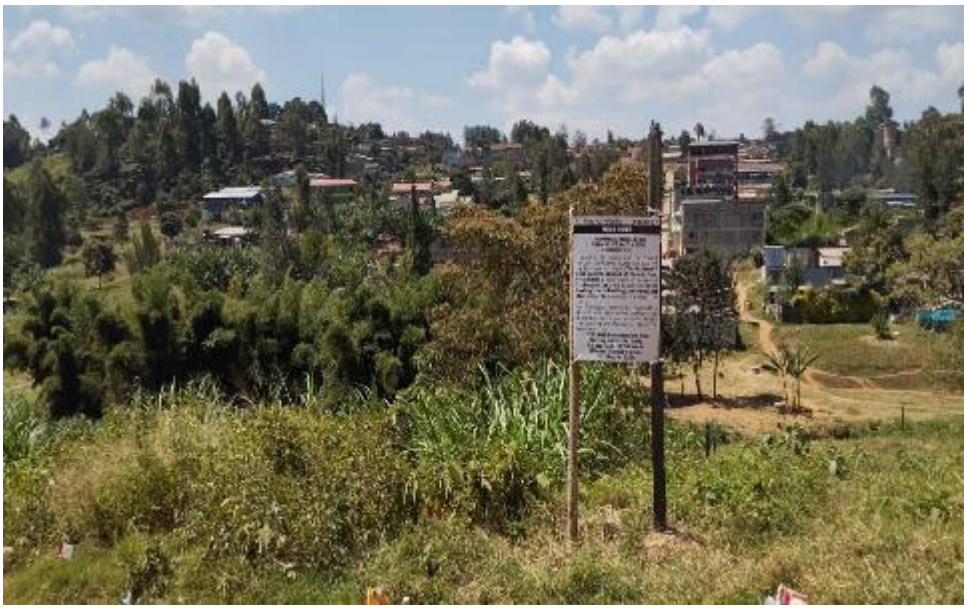

Plate 4: Public Notices well displayed at the site

7.5 Values held by stakeholders about the quality of the environment

The local stakeholders value the environment as source of their livelihood, provider of ecosystem services and source of basic commodities. They see a healthy environment in terms of the following:

i. Providing services which are the most recognizable as benefits to people. These include food, fuel and genetic material
ii. Regulating services which ensure that ecosystems keep on functioning through changes and include climate regulation; water regulation; water purification and waste treatment; erosion regulation; natural hazard regulation; and pollination
iii. Provision of cultural services which are generally non-tangible and include spiritual and inspirational, recreational, aesthetic, and educational needs
iv. Supporting ecological services which are basically functions that are provided over a long-term time and include habitats for small animals and insects, soil formation and nutrient cycling.

The stakeholders contacted have a feeling that they are likely to lose various benefits associated with clean environment if the proposed project is not implemented in a sustainable way.

7.6 Responses from stakeholders consulted during the study

7.6.1 Responses from administration of questionnaires

The analysis of the consultation and interviews led to the following conclusions;

i. Proposed project is to be located within an idle land thus opening up the area for development
ii. Most people interviewed during the study supported project operation due to the anticipated benefits and the proposed mitigation measures for the adverse impacts anticipated
iii. The stakeholder requested for mutual engagement between the proponent and other developers and resident's association in the area

7.6.2 Responses from consultations using other methods

The stakeholders consulted noted that the proposed project will lead to development of a world class facility within the area, creation of employment opportunities more so to the local youths, promotion of development in the area, increase in business opportunities and enhancing the resource provision among the local people. However, some of the residents highlighted that the proposed project may lead to development incompatibility and disturbance in the area and as part of mitigation measures, they indicated that there is need for the proponent to put in place sustainable means to protect the environment. The table below summaries the positive and negative issues raised by the residents.

Table 7. 1: Summary of issues noted by the residents during CPP process

Positive Impacts	Negative impacts
Job opportunities during the construction and operation phase- The respondents indicated that the project is expected to employ the local people especially the youth either directly or indirectly. It is expected that both casual and permanent jobs will be available.	Air pollution during construction phase from earth works, foundation works and delivery of material. The proponent is required to ensure that such emissions are controlled well to avert any form of environmental pollution.
Business opportunities through supplies of construction and operation materials	Traffic pile up along the access road especially during delivery of construction materials
	Noise pollution - The construction of the facility will cause a substantial temporary or periodic increase in ambient noise levels in the vicinity above levels existing without the project. During the construction phase of the development the increase is expected due to machinery and other construction activities. The project team should therefore observe the noise regimes for the different zones.
	Vegetation loss- Construction of the facility will require all the vegetation to be removed from the site to pave way for the construction of the facility, internal roads, walkways and other facilities.
	Excessive usage of domestic water during construction phase - it was pointed out that the proponent should continually engage residents throughout the construction phase of the project and the project should seek an independent source of water due to water shortages being experienced in the area.

CHAPTER 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Introduction

The key outcome of the Environmental Impact Assessment (EIA) process for the proposed residential site project is the Environmental and Social Management Plan (ESMP). This ESMP is an instrument that will allow the project proponent to integrate environmental mitigation measures during implementation, operation and decommissioning phases of the project.

8.2 Scope and Objectives of the ESMP

This ESMP focuses on mitigating the impacts identified during the environmental assessment process. The plan is meant to establish measures and procedures to control the identified impacts and monitor their progress. It will achieve the following in the long run:

(i) Provide the National Environment Management Authority (NEMA) with a tool to make ease the evaluation of the implementation status of commitments made by the proponent during EIA study phase;
(ii) Provide clear and mandatory instructions to the contractor with regard to their environmental and social responsibilities during project implementation phase;
(iii) Ensure continuous compliance of the contractor with Kenyan legislation and policies regarding the environment;
(iv) Assure the regulators and interested and affected parties the satisfaction of their demands in relation to environmental and social performance of the project;
(v) Ensure that adequate financial and human resources are allocated to the project in order to give effect to such requirements or commitments, and to ensure that the scale of ESMP-related interventions is consistent with the significance of identified impacts;
(vi) Provide a coherent and pragmatic framework for the implementation of the requirements, ranging from the formation of structures to administer the implementation, through the roles and responsibilities of the key project role-players, to the auditing and reporting of compliance; and
(vii) Ensure suitably qualified personnel with adequate power of authority are integrated within the various project implementation organisations to timeously identify and render appropriate and proactive corrective actions to unforeseen events or changes in project implementation not considered in the EIA process.

8.3 Applicable Legislation

The pieces of legislation applicable to the Environmental and Social Management Plan are described in Chapter four of this Project Report. International normative instruments concerning the environment as well as international best practice have also been considered.

8.4 Principles of Environmental and Social Management Plan

8.5 Responsibilities in Environmental and Social Management Plan

8.5.1 General

The proponent and the contractor are the main entities responsible for implementing this ESMP. In the interest of environmental protection, health and safety of workers and the public, and in their own interest, the proponent should include in their contractual arrangements with contractors, clauses relating to environmental protection -and, specifically, compliance with the ESMP - that will safeguard the right to require the contractor's compliance with environmental requirements and social action in case of breach.

8.5.2 Responsibility of the Contractor

All contractors must designate individuals responsible for the overall management of environmental, social, safety, and health aspects throughout all operations. The contractor is also responsible for ensuring relevant staff training to efficiently and appropriately carry out project activities in compliance with the proponent's contractual requirements. Among many tasks, the contractor shall:

(i) Prepare its own EMP as well as a health and safety plan within 30 days of signing of the contract. The EMP implementation plan must be approved by proponent prior to the initiation of construction works;
(ii) Submit to the proponent the work procedures/methods or equivalent documents for approval;
(iii) Operate on the basis of valid Licenses/Approvals/Authorizations for the activities to be implemented;
(iv) Employ techniques, practices and construction methods to ensure compliance with the ESMP;
(v) Prevent or minimize the occurrence of accidents which might cause damage to the environment and be able to respond positively to an accident if it occurs;
(vi) Meet the working procedures and environmental requirements and health and safety established by contract with the Proponent; ensure compliance with them by sub-contractors who might be hired by him;
(vii) Minimize environmental damage, waste control, avoid pollution, prevent loss or damage on natural resources and minimize the effects on the users and occupants of surrounding lands and the public;
(viii) Provide Personal Protective Equipment (PPE) to workers which is appropriate to the tasks to be performed and ensure that it is used;
(ix) Implement all corrective activities agreed in audit (internal or performed by other agencies) or inspections, within the pre- established deadline;
(x) Manage the complaints process on the elements that fall within its jurisdiction, or refer complaints to the Proponent, so that they can receive treatment/appropriate response;
(xi) Prepare a Rehabilitation Plan which shall include preliminary designs on the temporary and permanent landscaping plan during both the construction and post-construction and maintenance period (where applicable).

8.5.3 Responsibilities of Regulatory Agencies

Regulatory Agencies directly involved in this project include the National Environment Management Authority (NEMA), County Labour Officers, KPLC, Nairobi Water and Sewerage Company among others. NEMA is the institution that plays a greater role in the process since it is responsible for taking decision on the EIA process and responsible for regulating the environmental performance of projects in Kenya. They are also responsible

for verification, inspection and audit, before, during and after the implementation of projects (in accordance with (EMCA) 1999 (Revised 2015). NEMA is also a governmental agency with expertise in waste management with regard to: the issuance and dissemination of the mandatory rules on the procedures to be followed for waste management.

The other institutions listed above play a subsidiary role in specific issues of the EIA process and its implementation. For instance KPLC and Nairobi Water and Sewerage Company shall be responsible for power and water connection to the site.

(i) Comply with and enforce existing laws and the requirements of environmental agencies and other relevant bodies involved;
(ii) Ensure that the Environmental Management Plan is fulfilled according to the stipulated standards;
(iii) Identify and evaluate periodically the effects and results on the basis of established environmental standards and propose, where necessary, changes, additions or new actions and activities, considering also the progress of services and their capacity to contractual deadlines and resources allocated.

8.5.4 Extended Producer Responsibility (EPR)

Section 13(1) of the Sustainable Waste Management Act 2022 stipulates that every producer shall bear extended producer responsibility obligations to reduce pollution and environmental impacts of the products they introduce into the Kenyan market and waste arising therefrom. It states further that the extended producer responsibility obligations can be fulfilled either individually or collectively in a compliance scheme.

These provisions apply to the proponent, contractor and suppliers for the wastes that arise from their operations. Measures must be put in place for re-use, recycling and proper disposal. Where required, a take back scheme shall be put in place to collect waste products produced by the various parties to this project either individually or collectively.

8.6 Construction Phase Environmental Management Plan

The EMP for the construction phase mainly focuses on impacts that are likely to affect the environment, the health and safety of the public as well as the workers during the planning and construction process. Mitigation measures are then proposed to minimize the anticipated impacts. Issues covered by the construction EMP include; Occupational safety and health, air pollution, surface and ground water contamination, noise pollution and traffic impact among others. The EMPs have considered both construction and occupation phases.

Table 8. 1: EMMP FOR CONSTRUCTION & OCCUPATION PHASES

Environmental /Social Impacts	Proposed Mitigation and Aspects For Monitoring	Responsibility during design ,Construction and Defects Liability Period	Responsibility after defects Liability Period	Monitoring means (C) = Construction N (O) = Occupation	Estimated Cost (Kshs)
Soil disturbance	• Control earthworks & compact loose soils • Install drainage structures properly • Landscaping on project completion • Control and manage excavation activities • Control activities especially during rainy conditions • Provide soil erosion control and conservation structures/means where necessary • Ensure standard appropriate practices on the provided gardens.	Contractor	Proponent	(c) Inspection (o)Routine maintenance (c) Inspection (o)Routine maintenance	1,000,000
Changes in land use- extent	• Plant vegetation after project completion even if in pots. • Ensure compliance with existing planning policy • The project shall be approved by the relevant government bodies before commencement.	Proponent and contractor	Proponent	Inspection and records inspection	500,000

Environmental /Social Impacts	Proposed Mitigation and Aspects For Monitoring	Responsibility during design ,Construction and Defects Liability Period	Responsibility after defects Liability Period	Monitoring means (C) = Construction N (O) = Occupation	Estimated Cost (Kshs)
Changes in hydrology/ impended drainage/deep excavations	• proper Installation of drainage structures • Install cascades to break the impact of water flowing in the drains • Ensure efficiency of drainage structures through proper design and maintenance • Provide gratings to the drainage channels • A geotechnical survey shall be conducted and the recommendations thereof followed. There shall be no blasting during excavation • A methodology for excavation shall be generated as required by NCA prior to excavation	Contractor	Proponent	(c) Inspection (o)Routine maintenance	900,000
Air pollution	• Enclose the site with dust-proof net during construction • Water should be sprayed during the construction phase of excavated areas during dry conditions • Control speed and operation of construction vehicles • Prohibit idling of vehicles	Contractor	Proponent / Contractor	c)Inspection/ observation	1,500,000

Environmental /Social Impacts	Proposed Mitigation and Aspects For Monitoring	Responsibility during design ,Construction and Defects Liability Period	Responsibility after defects Liability Period	Monitoring means (C) = Construction N (O) = Occupation	Estimated Cost (Kshs)
	• Ensure sound condition of construction machinery and equipment • Engage sensitive construction workers.				
Noise Pollution	• Erect suitable barriers to control noise • Sensitize drivers of construction machinery on effects of noise • Maintain plant equipment (if present) • Construction activities to be restricted to daytime • Workers in the vicinity of or involved in high-level noise to wear safety & protective gear.	Contractor	Proponent / Contractor	c)Inspection/ observation	840,000
Water quality and sewerage infrastructure	• The design of the entire sewerage system should consider the estimate discharges from individual sources and the cumulative discharge of the entire project even during peak volumes • Provide for adequate drainage systems • Ensure effluents are discharged responsibly to the sewerage system • The proponent shall seek approval from NWSC before connecting to the existing public mains	Contractor	Proponent / Contractor	c)Inspection/ observation	3,000,000

Environmental /Social Impacts	Proposed Mitigation and Aspects For Monitoring	Responsibility during design ,Construction and Defects Liability Period	Responsibility after defects Liability Period	Monitoring means (C) = Construction N (O) = Occupation	Estimated Cost (Kshs)
	• Monitor quality of wastewater to ensure compliance with the Environmental Management & Coordination (Water Quality) Regulations, 2006 and other relevant Laws.				
Oil pollution	• Proper storage, handling and disposal of new oil and used oil wastes as per waste regulations • Maintain plant and equipment to avoid leaks • Maintenance of construction vehicles should be carried out in the contractor's yard (off the site) • Provide oil interceptors along the drains leading from car park and potentially oil risk areas.	Contractor	Contractor	c)Inspection/ observation	960,000
Road safety	• Enforce speed limits for construction vehicles especially along roads leading to the site • Provide bill boards at the site/entrance to notify motorists about the development	Contractor	Proponent ,Traffic & roads Dept/trans porters	c)Inspection/ observation	400,000

Environmental /Social Impacts	Proposed Mitigation and Aspects For Monitoring	Responsibility during design ,Construction and Defects Liability Period	Responsibility after defects Liability Period	Monitoring means (C) = Construction N (O) = Occupation	Estimated Cost (Kshs)
Public health, occupational health and safety	• Train staff/workers on occupational health and safety • Provide full protective gear & workmen's compensation cover in addition to the right tools and operational instructions & manuals during construction • Adopt sound waste management system to ensure proper solid waste disposal and collection facilities • Adopt sound housekeeping practices. • Sensitize residents on environmental management • Design of sewerage system should be as provided in the plans and should be constructed to approved size and design, standard and of approved materials • Engage the services of qualified personnel and/or ensure training • Ensure use of standard construction materials and to the specifications. Avoid undesirable, substandard,	Contractor, supervising Foreman	Proponent where relevant	(o)Observation	3,600,000

Environmental /Social Impacts	Proposed Mitigation and Aspects For Monitoring	Responsibility during design ,Construction and Defects Liability Period	Responsibility after defects Liability Period	Monitoring means (C) = Construction N (O) = Occupation	Estimated Cost (Kshs)
	hazardous or unauthorized materials during construction & maintenance. • Sensitized staff on social/health issues such as drugs • Ensure machinery and equipment servicing and maintenance as per schedules & legal requirements Post strategically the Factories and Other Places of Work Act Abstract & provide material safety data sheets • Post clear warning signs e.g. 'No unauthorized use of machines', ensure there are guards on moving parts etc. • Provide fully equipped First Aid kits & train staff on its use • Ensure adherence with the legal requirements-Factories Act. • Sensitize residents on environmental management • Ensure Nairobi City County certifies and issues occupation certificates.				

Environmental /Social Impacts	Proposed Mitigation and Aspects For Monitoring	Responsibility during design ,Construction and Defects Liability Period	Responsibility after defects Liability Period	Monitoring means (C) = Construction N (O) = Occupation	Estimated Cost (Kshs)
Vegetation	• Avoid unnecessary removal of vegetation especially along plot boundaries • Landscaping and planting vegetation in all available areas	Contractor Contractor	Proponent	(o)Observation (o)Observation	670,000
Fire safety and preparedness	• Install firefighting equipment as provided elsewhere in the report. • Conduct training on firefighting, evacuation and emergency response • Sensitize the residents on fire risks i.e. conduct regular fire drills • Adapt effective emergency response plan • Maintain/service firefighting machinery regularly • Provide emergency numbers at strategic points.	contractor	Proponent	(o)Observation	720,000
Security and Social impacts	• Provide security guards, CCTV cameras and other security apparatus during the entire project cycle. Construction work timings shall only in line with the NEMA licensing conditions	Contractor	Proponent	(o) Observation	700,000

Environmental /Social Impacts	Proposed Mitigation and Aspects For Monitoring	Responsibility during design ,Construction and Defects Liability Period	Responsibility after defects Liability Period	Monitoring means (C) = Construction N (O) = Occupation	Estimated Cost (Kshs)
Water Quality	• The design of the entire sewerage system should consider the estimate discharges from individual sources and the cumulative discharge of the entire project even during peak volumes • Provide for adequate drainage system • Ensure effluents are discharged responsibly to the sewerage system • Install an oil water interceptor to trap oils that may be present in wastewater • Apply and obtain an Effluent Discharge License (EDL) for effluent released into the environment • Monitor quality of wastewater to ensure compliance with the Environmental Management & Coordination (Water Quality) Regulations, 2006 and other relevant Laws.	Proponent/contractor	Proponent	Data Collection	300,000 per year
Waste Management	• During construction phase, designate an area for temporarily holding waste materials • All wastes should be disposed of in accordance with the Environmental	Proponent	Proponent	Records	200,000 per year

Environmental /Social Impacts	Proposed Mitigation and Aspects For Monitoring	Responsibility during design ,Construction and Defects Liability Period	Responsibility after defects Liability Period	Monitoring means (C) = Construction N (O) = Occupation	Estimated Cost (Kshs)
	Management & Coordination (Waste Management) Regulations, 2006 and other relevant Laws • Segregation of wastes at the source for ease of handling and disposal • Contract a NEMA licensed waste transporter to transport solid waste from the proposed site during construction and occupation phases • Sell recyclable waste to recyclers • Provide bins for temporarily holding waste before collection by licensed transporters during occupation phase.				
Traffic Management	• Conduct a traffic Impact Assessment and generate a traffic management plan • The Traffic management plan should be followed throughout the project cycle	Traffic Engineer	Proponent	Records	500,000
Power sources	• Power supply requirements shall be calculated and shared with KPLC as is the requirement • A dedicated transformer for the entire project shall be a consideration				

Environmental /Social Impacts	Proposed Mitigation and Aspects For Monitoring	Responsibility during design ,Construction and Defects Liability Period	Responsibility after defects Liability Period	Monitoring means (C) = Construction N (O) = Occupation	Estimated Cost (Kshs)
	• Alternative power sources (solar) shall also be installed for lighting and heating				

Table 8. 2: Occupational Health and Safety EMP for the proposed project during construction and operational phase

KEY ISSUES	MITIGATION MEASURE	Responsibility	TIME FRAME	COST KSH.
Registration of the premises	Register the premises under the Occupational Health and Safety Act Cap 514, of the Laws of Kenya.	Proponent	One-off	5,000
General register	Sec 62 (1) of the Keep a general register of all workers within the facility as stipulated in Occupational Health and Safety Act.	Proponent, contractor	Construction	500
Incidents and accidents	Report any incidents and accidents using prescribed forms obtainable from the Occupational Health and Safety Office	Site Safety Officer	Continuous	1000/month
	Conduct regular safety education and training.	Site Safety Officer	Quarterly	10,000
	Prepare a contingency plan for emergency response before the start of the project.	Site Safety Officer	One-off	10,000

KEY ISSUES	MITIGATION MEASURE	Responsibility	TIME FRAME	COST KSH.
Insurance	Insure the premises as per statutory requirements (third party and workman's compensation)	Proponent and all occupants	Annually	-
Safety healthy environment (SHE) policy	Develop, document and display prominently an appropriate Safety and Healthy Environment policy.	Site Safety Officer	One-off	5.000
Sanitary conveniences	Provide suitable, efficient, clean, well-lit and adequate sanitary amenities at the site taking care of gender division	Contractor, proponent and all occupants	One-off	100,000
Machinery/equipment safety	Ensure that machinery, equipment, PPE, appliances and tools to be used comply with the prescribed safety and health standards and be appropriately installed, maintained and safeguarded.	Contractor, proponent and all occupants	One-off	-
Storage of materials	Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse.	Contractor, proponent and all occupants	Continuous	-
Safe of access in the buildings	All floors, steps, stairs and lift of the premises must be of sound construction and be properly maintained	Contractor, proponent and all occupants	Continuous	-
Emergency preparedness and evacuation procedures	Design suitable documented emergency preparedness and evacuation procedures for emergencies	Site Safety Officer	One-off	1,000
First Aid	On site a stocked first aid box which is easily available and accessible	Site Safety Officer	One-off	10,000

KEY ISSUES	MITIGATION MEASURE	Responsibility	TIME FRAME	COST KSH.
Fire protection	Regularly inspect and service fire-fighting equipment by a reputable service provider and maintain inspection records.	Site Safety Officer	Every 3 months	5,000
	Prominently display signs such as "NO SMOKING" at the site especially in parts where inflammable materials are stored.	Site Safety Officer	One-off	1,000
Ventilation	Provide adequate space within the premises to allow for adequate natural ventilation through circulation of fresh air.	Contractor, occupants	One-off	-
Lighting	Provide adequate artificial or natural lighting in all parts of the premises where persons are working or passing.	Contractor, occupants	One-off	-
Electrical safety	Do not overload circuits.	Proponent and Contractor	Continuous	-
	Clearly mark distribution board switches to indicate respective circuits and pumps.	Proponent and Contractor	One-off	-
	Ensure that no live electrical wires are exposed.	Proponent and Contractor	Continuous	-
	Earth all electrical equipment	Proponent and Contractor	One-off	10,000
Diseases	Provide complete refuse collection and handling service.	Proponent and Contractor	Continuous	10,000
Security	Fence the site and employ security personnel operating 24 hours. Install security alarms and/or surveillance systems.	Proponent and Contractor	Continuous	50,000

8.4 Monitoring, Auditing Auxiliary Information

8.4.1 Monitoring

Monitoring to be undertaken will be both active and reactive.

8.4.1.1 Active monitoring: Monitoring of the achievements of specific plans of the EMP, performance criteria and fulfillment of objectives;

- Systematic inspection of work place; Surveillance and monitoring of the work environment, including the organization of work and activities involved
- Monitoring of workers. health; and Monitoring of compliance with laws, regulations and other requirements
-

8.4.1.2 Reactive monitoring: Work related injuries, ill health (including record keeping and monitoring of sickness/absence), disease and accidents;

- Losses such as damage to property
- Deficient safety and health performance including OHSMS failures
- Workers rehabilitation and health restoration programmes.

8.4.2 Monitoring parameters

Monitoring will involve measuring, observing, recording and evaluation of physical, socioeconomic and ecological variables within the project area and the neighborhood. This may include the following: -

- Water quality monitoring; Solid waste disposal monitoring; and
- Hydro-geological impact monitoring.

8.4.3 Environmental Auditing

While the construction of the project may be considered to be a one off event needing no further audits, routine one routine annual environmental audit should be carried out as provided for in the EMCA 2003. The audit will serve to confirm the efficacy and adequacy of the proposed Environmental Management Plans. The audit should include the following;

- Water analysis, Waste generation, management and disposal,
- Views and comments from neighbors and progress in implementation of Environmental Management Plan

CHAPTER NINE: OCCUPATIONAL HEALTH & SAFETY AND MANAGEMENT PLAN

9.1 Project Employee Responsibilities

a) Project Manager - must lead project team by setting an example for safety awareness as well as developing, communicating and supervising the safety program. The project manager must enforce and set the tone for all safety related issues during and prior to the planning of each project phase. They must provide leadership and show commitment to a safe and healthy environment. Responsibilities shall include reviewing inspection reports, safety meeting reports and addressing health and safety issues on the jobsite.

b) Site Agent - must lead, oversee and manage all site work, including safety. The superintendent must ensure that safety procedures are applied in an effective manner and that all employees are conforming to established rules and regulations. Duties include establishing a pre-job assessment prior to the start of the project, ensuring site foremen comply with safety regulations, conducting safety orientations for all new employees, reviewing all incident & corrective action reports, pre-task plans and enforcing disciplinary action when necessary. The site agent will also work with the site safety representative overseeing regular site inspections, developing a site-specific emergency plan and implementing weekly tool box topics with subcontractors.

c) Project Engineer - Responsibilities include collecting all subcontractor safety programs, material safety data sheets (MSDS) and ensuring all site foreman have access to site plans.

d) Site Safety Representative - will act as the designated safety manager and will inspect the jobsite weekly, conducting safety inspections. Responsibilities include providing education and training opportunities to all employees, conducting safety audits, discussing & providing weekly tool box topics, developing an emergency action plan and procedures, reviewing all safety programs and safety data sheets (SDS), scheduling Pre-Task planning meetings & overseeing implementation, issuing violation notices, issuing corrective action reports.

9.2 Project Safety Orientation

Each employee working on the site are required to complete the Employee Safety Orientation. This must be complete within one week of any employee beginning work on site.

9.3 Job site Inspections

a) Site Safety Representative will conduct weekly site inspections, and review all safety documents (pre-task plan, crane plan, etc.).
b) Contractors shall perform daily safety inspections of their work area and equipment per OSHA, 2007 requirements.
c) After inspecting a job site/work area, the site safety representative and superintendent will identify and evaluate all potential hazards for:
a. Possibility for severe injury.
b. Probability of accident occurrence.

d) This site safety representative will also consider the skill and knowledge level demonstrated by exposed workers.
e) This site safety representative shall then take the following actions:

- Discuss all hazards with the necessary parties
- Explain appropriate recommendations and precautions
- Assist with any necessary training (i.e. provide appropriate Tool Box Talks), in accordance with the level of hazard
- Issue citations & corrective actions
- Records shall be maintained for all recommendations, precautions, and training for each hazard identified
- All incidents, regardless of severity, will be discussed at the next project safety meeting, with an emphasis on eliminating future occurrences.

9.4 Emergency Procedures, Investigation, and Reporting

- Contractors/employees shall report all work-related injuries, illnesses, first aid cases, near misses, property damage, and environmental incidents such as a spill or release of hazardous materials, regardless of severity, immediately to the Project Superintendent and Safety Manager
- The contractor shall investigate all incidents and forward copies of the incident report to the Safety Manager within 4 hours of the incident. An incident report must be provided for: near misses, first aid, recordable injuries, third party property damage or personal injury, and builders risk claims.
- Corrective actions will be implemented and any worker compensation or liability claims shall be reported to project manager
- Follow-up information on personal injuries (doctor's reports, insurance or worker's compensation reports etc.), shall be forwarded to the Safety Manager within a reasonable time frame.

9.5 Emergency Signals and Procedures

1. **Serious Emergency** - A single long blast from an air horn shall be given by the Project Superintendent in the event of a serious emergency on the site. These include serious or life-threatening injury, severe weather or other impending natural disaster, or other emergencies not requiring immediate evacuation of the site. Please discontinue working and report to your foreman. Foremen shall report to the Project Superintendent for further instructions. Two quick blasts from an air horn shall signal the all clear.

2. **Evacuation** - Three or more long blasts from an air horn shall be given by the Project Superintendent in the event that total evacuation of the site is necessary. Immediately discontinue working and evacuate to a safe location (designated by project superintendent). Foremen shall account for all workers in their crew and shall report to the Project Superintendent. The Superintendent shall instruct the foremen according to circumstances to remain at the gathering location or retreat to a safer distance. Two quick blasts from an air horn shall signal the all clear.

9.6 Fire Prevention Program

1. There should be a program committed to minimizing the threat of fire to employees, visitors, and property. It is the responsibility of the contractor to have their own Fire Prevention Program (FPP) and to instruct and train all employees in fire prevention and fire response.
2. When Cutting, Welding, and Open Flame Work are performed, the contractor shall at minimum ensure the following:

- All cutting and welding equipment is inspected and operated by competent, trained personnel
- No cutting or welding shall take place on metal walls, ceilings, or roofs built of combustible sandwich-type panel construction or having combustible covering
- A fire extinguisher shall be located within 10' of all cutting, welding, or other hot work
- Proper PPE must be utilized.

3. All combustible materials must be properly secured and stored outdoors
4. Smoking is prohibited at the site projects.
5. The contractor must establish and maintain a means of proper egress, and all exits must be marked by a readily visible sign.
6. Fire Extinguishers must comply with the following:

- readily available every 3,000sf.
- Require quarterly inspection tag. Any defective device must be removed from service immediately
- Shall be located & labeled so it can be readily seen and accessible along normal paths of travel. In multi-story buildings, at least one extinguisher must be adjacent to a stairway.

9.7 Hazard Communication Program

1. Hazard Determination

a. SDS supplied by the contractors and manufacturers shall be utilized in identifying hazardous materials.
b. Subcontractors must submit all appropriate MSDS documentation to project manager office prior to beginning work on project site.

2. Labeling

a. All containers on the jobsite shall be properly labeled by the responsible contractor.
b. All labels shall clearly indicate:

- ✓ Identity
- ✓ Hazard
- ✓ Precautionary Statement
- ✓ Name and address of responsible party.

3. Safety Data Sheets (SDS)

a. SDS for all hazardous chemicals to which employees may be exposed will be kept at the corporate office and the jobsite field office.
b. SDS will be available for review to all workers and employees.
c. Notification of new or revised MSDS shall be posted.

4. Employee Information

a. All known hazardous substances present on the site and location of SDS shall be disclosed to the workers in the mandatory Project Safety Orientation.

b. When workers are required to perform work in areas known to contain hazardous materials, it is the subcontractor's responsibility to identify:

- ✓ Specific chemical hazards.
- ✓ Protection/safety measures the employee is required to take to lessen risks.
- ✓ Potential hazard reduction measures
- ✓ The main contractor will work with the subcontractor to the greatest extent feasible to limit exposure to the hazard(s).

5. Training

a. Employers must provide employees with effective information and training on hazardous chemicals in their work area, and whenever a new hazardous chemical is introduced

b. Employees are required to wear and have appropriate training on PPE associated with each hazardous chemical being used.

9.8 General Safety

9.8.1 Personal Protective Equipment (PPE)

- All personal protective equipment shall be provided by contractors prior to the start of job
- Personal protective equipment including hard hats, safety glasses, work boots and high visibility shirts must be worn 100% of the time
- Proper work attire
- Fall protection is required for all trades when working at heights of 6' or more
- Protective gloves or clothing shall be worn when required to protect against a hazard
- A face shield or safety goggles are required when cutting, grinding, welding or power washing
- Hearing protection is required when working in areas where noise levels exceed 85 decibels, or normal conversation cannot be conducted, or when the area is posted as a noise hazard
- Dust masks or respirators shall be worn in all dusty environments. Pulmonary testing, fit tests and written respiratory programs are required for respirator use
- All personal protective equipment must be inspected daily as per OSHA, 2007 standards.

9.8.2 Moving Equipment

- All operating equipment shall be equipped with rollover guards per OSHA 2007 standards
- Operating equipment shall be equipped with an audible notification, strobes and/or beacons per manufacturer's requirements
- A spotter is required whenever a vehicle has a restricted view while operating on site

- Properly set-up barricades or traffic control zones when operating equipment near public roadways. When construction activities are at a peak level, the use of a spotter/traffic controller is permitted to help direct and control traffic
- Contractor/Sub-contractors is required to conduct daily inspections of all equipment
- Employees assigned to traffic control duties must wear high visibility clothing per OSHA 2007 standards.

9.8.3 Excavating/ Site Utilities

1. The competent person must inspect the excavation
    a. Daily before work activities commences
    b. After a heavy rainfall
    c. At depths greater than 4" for oxygen deficiencies or hazardous atmospheres
    d. For failures of protective systems, equipment and adjacent structures.
2. Miss Dig must be contacted prior to starting any excavating.
3. When working in a trench 4 feet or more in depth, proper sloping, shoring, or other cave in protection methods shall be utilized.
4. Ladders shall be provided at least every 25 feet for access to trenches exceeding 4 feet in depth.
5. Material and spoil piles shall be kept a minimum of 2 feet away from the edge of a trench.
6. All open holes, trenches, and excavations shall be barricaded and clearly marked to alert the public and other workers in the area.
7. Excavations and trenches may be confined spaces where air monitoring could be required. 8. All vehicles hauling soil from site must pull into site and turn around.

9.8.4 Crane & Rigging Safety

- Must be included in a Pre-Task plan
- All operators shall be certified and cards submitted to project supervision before start of work
- All cranes are to be inspected on a daily basis
- All cranes must have proof of annual inspection
- Outriggers must be manufactured and be fully extended and on stable ground.
- The swing radius of all cranes must be properly barricaded
- Contractor must submit a copy of the crane plan (operation, swing radius, etc.) to superintendent prior to the start of the project.

9.8.5 Fall Protection

1. Fall protection systems are required when exposed to heights of 6' or more. Systems include:
a) Guardrails
b) Safety nets
c) Personal fall arrest systems. All systems must be inspected, constructed and installed per OSHA, 2007 requirements.
2. When conducting roofing work, contractors are required to submit a pre-task analysis.
3. All holes/ floor openings greater than 2" in depth or diameter are required to be properly barricaded/covered or secured, and clearly marked with high visibility paint as a "hole". All

hole/openings that are barricaded and covered shall be securely/mechanically fixed in place.
4. Contractors are required to maintain all fall protection devices.
5. If an employer can demonstrate conventional fall protection methods are infeasible or present a greater hazard, a fall protection plan may be implemented. The fall protection plan must comply with OSHA standards and include the following:
a) Site specific requirements/unique circumstances
b) Prepared by a qualified person.
c) Supervised by a competent person.
d) Explain why conventional methods are infeasible.
e) Discuss the safety measures that will be taken to reduce or eliminate the fall hazard of the workers.
f) Describe all controlled access zones
g) Require training for all employees.

9.8.6 Electrical

- Cords and tools must be inspected on a daily basis. If the insulation or casing of the cord is damaged, or the ground prong is missing, the cord will be cut by project supervision
- All cords must be 3 prong heavy duty cords and be protected from indoor/ outdoor traffic
- Portable generators must be provided with ground fault circuit interrupters
- Temporary lighting must be protected with safety guards
- Stairwells, corridors & work areas shall be properly illuminated with either temporary or permanent lighting.

9.8.7 Scaffolding Safety

- All scaffolds must be erected and inspected daily by a competent person.
- Each work level of the scaffold system shall be full planked and overhang the end supports by a minimum of 6 inches and a maximum of 12 inches. Planking which does not meet this requirement must be cleated
- The scaffold system must have a ladder provided for access. Climbing the bracing is not acceptable unless the system has a built-in ladder for that purpose
- Scaffolding height must never exceed 4 times their minimum base dimension. If this is exceeded, the scaffold must be tied into the structure
- All working and walking levels must be fully planked and not overloaded
- Planks must be scaffold grade lumber. Cracks shall not penetrate more than 12 inches.
- Riding of wheeled scaffolding is prohibited
- The footing or anchorage for scaffolds must be sound, rigid and capable of carrying the maximum intended load without settling or displacement.

9.8.8 Ladder Safety

- Only type 1A ladders with a heavy-duty rating are required
- No painted or aluminum ladders are allowed on site

- All ladders must extend a minimum of three (3) feet above the landing and be secured. If the ladder cannot be secured, it must be held at the bottom by another worker
- Keep ladder bases clear from debris, hoses, wire, materials, etc
- Use the "four and one" rule when positioning a ladder – one foot of base for every four feet of height
- Step ladders must be fully extended and locked into place. Placement shall be on stable surfaces
- Workers shall not straddle or stand on the top two rungs of a ladder, and shall work facing the ladder.

9.8.9 Aerial Work Platforms

- Must be inspected daily
- Operated by trained and authorized personnel. Employees must have operator's certification readily available
- All employees must wear a body harness and be tied off inside the basket when elevated at all times.
- Lifts should only be operated in accordance with the manufacturer's manual.

9.8.10 Housekeeping

- Contractor/Subcontractors must properly dispose of all waste materials on a daily basis
- Contractor/Subcontractors must properly store and secure all work material and equipment
- Site clean-up is required on a daily basis
- Stairways and passageways must be kept clear of debris.

9.9 Site Specific Safety Requirements

9.9.1Site Work

- ·Employees must wear proper PPE
- Contactor/Subcontractors must maintain a clear path through the jobsite
- Storing of materials and goods will be located in a way as to prevent site congestion. Concrete
- All exposed rebar will be capped, or covered to protect against impalement or injury
- Employees operating equipment such as vibrators pump nozzles, and/ or buggies will wear appropriate clothing and PPE, such as boots, eye protection and hearing protection. Long sleeve shirts will be worn to protect against the exposure of concrete
- Concrete contractor must appropriately barricade working area during concrete forming and after concrete has been poured
- Material used for formwork must be removed and properly disposed of. Subcontractor will remove all debris and conduct a clean-up of the work area daily.

9.9.2 Steel Erection

- Subcontractor must conduct a pre-task analysis with the superintendent before all overhead hoisting activities take place
- The area of erection must be securely barricaded. If necessary, a controlled access zone may be permitted
- All steel erectors must wear appropriate PPE, including fall protection at heights greater than 6 feet and a face mask when welding
- Contractor must provide the following when using a crane:
    - ✓ Crane operator certification
    - ✓ Crane plan, including staging area, swing radius and required barricades.

9.9.2 Block Masonry

- Mason contractor must provide, if applicable, wall bracing plan prior to start of work.
- Competent person (foreman) must conduct daily inspections of scaffold equipment
- Employees working within restricted fall zone must be trained and certified to work in restricted fall zone area
- Masonry block walls at heights of 8 feet or greater, not tied into the structure, must be adequately braced
- Restricted fall zone areas must be established prior to the construction of the wall, and will be restricted to employees who are actively engaged in constructing the wall.

9.9.3 Truss & Deck Framing

- All walkways and working surfaces must be clear of debris to prevent tripping hazards
- Employees are required to wear appropriate PPE, including fall protection at heights greater than 6 feet
- Contractors must establish a controlled access zone to prevent other contractors from entering work area
- Trusses/Joists must be adequately braced to prevent falling or tipping
- Contractor must barricade crane swing radius when loading and setting trusses in place.

9.9.4 Window Installation

- All window openings require a guardrail if the window sill measures a height below 39" and a width greater than 18"
- When installing windows on the upper floors, the area below (ground level) must be properly barricaded
- Employees are required to wear a personal fall arrest system when installing windows on the upper floors.
- If using any lifting devices (rough terrain, aerial), employees must: A. Wear a personal fall arrest system B. Have operator's license to use equipment. C. Inspect equipment daily.

9.9.5 Roofing

- Employees are required to use a method of fall protection. Slide guards are no longer permissible
- Employees are restricted from throwing material from roof. Contractor must set up a drop zone, which requires a barricade and a spotter
- Employees working on roofs must wear appropriate footwear that provides good traction
- Working surfaces must be free of tripping hazards (tools, cords, etc.) and must be clean to prevent material from falling below
- A written pre-task analysis is required and must be submitted to superintendent prior to start of work
- Employees must have proper and safe access to roofing surface. The use of any temporary ladder must be constructed and properly secured to prevent movement
- Employees should refrain from working on the roof during inclement weather conditions.

9.9.6 Drywall

- Daily cleanup is required
- A clear path must be maintained
- Proper storing methods are required
- Employees must wear proper PPE at all times.

9.9.7 Paint Primer

- Contractor must submit all required MSDS
- Employees must wear appropriate work attire and PPE, including face masks/ respirators when spraying paint. A written respiratory program is required as well
- Employees must use ladders/ lifts to reach difficult areas
- While painting/ priming, contractor must make sure work area is properly ventilated
- Contractor is permitted to set up a restricted work zone when spraying paint
- Properly store all paint material, and dispose of empty paint buckets daily.

9.10 Sexual Harassment

Discrimination against any employee or applicant on the basis of the person's sex is strictly prohibited. Sexual harassment is a violation of state law and will not be tolerated. Any unwelcome sexual advances, requests for sexual favors and other verbal or physical conduct of a sexual nature constitute sexual harassment when:

a) It is stated or implied that submission to such conduct is a term or condition of a person's employment; or

b) Submission to or the rejection of such conduct by a person is used as a basis for any employment decision affecting such person, such as, but not limited to, pay increases, work assignments, promotions, performance evaluation, etc. or;

c) Such conduct has either the purpose or effect of interfering with a person's work performance or creates an intimidating, hostile or offensive work environment.

Any employee or applicant who feels that he or she has been subjected to sexual harassment should report any incidents of sexual harassment to his or her supervisor, or any member of management, without fear of reprisal. The totality of the circumstances, the nature of the alleged harassment and the context in which the alleged incidents occurred

should be investigated in determining whether alleged conduct constitutes sexual harassment. Every reasonable effort will be made to maintain confidentiality. Sexual harassment case shall be reported to police for further investigation and prosecution.

9.11 Grievance Redress Mechanism (GRM)

The main objective of a Grievance Redress Mechanism (GRM) is to assist an entity to resolve complaints and grievances in a timely, effective and efficient manner that satisfies all parties involved. Specifically, it provides a transparent and credible process for fair, effective and lasting outcomes. It also builds trust and cooperation as an integral component of broader community consultation that facilitates corrective actions.

Specifically, and for this project the GRM:

- shall provide affected people with avenues for making a complaint or resolving any dispute that may arise during the course of the implementation of project. They shall include site visits, Telephone contacts/communications, Emails conversations
- Shall Ensure that appropriate and mutually acceptable redress actions are identified and implemented to the satisfaction of complainants; and
- shall avoid the need to resort to judicial proceedings.

The proposed GRM framework shall include the following steps:

1. The project sociologist shall receive and register grievances or complaints.
2. Acknowledge, assess and assign (Acknowledge receipt of grievance, outline how grievance will be processed, assess eligibility and assign responsibility)
3. Propose Responses and communication structures to the affected parties
4. Discuss with affected parties to reach agreements.
5. If agreement is reached, implement agreement resolutions and monitoring by both parties
    i. If agreement is not reached, review case and discuss further
    ii. If no agreement is reached under the review/engagement process, then the discussions are escalated and details shared with NEMA for further guidance.

CHAPTER TEN: DECOMMISSIONING

10.1 Introduction

Decommissioning normally takes place during the final phase of a project life-cycle. Environmental planning is therefore necessary before any decommissioning activities should be allowed to commence. Decommissioning of one or all components of this project will therefore have some effect on the environmental status quo of the project site, either in a positive or in a negative way.

10.2 Purpose and objectives of decommissioning

The generally accepted purpose of decommissioning is the release of valuable assets such as machinery and sites for alternative use, recycling and reuse of materials and the restoration of environmental amenity. The basic objective is to achieve an end-point that is sensible in technical, social and financial terms and that properly protects workers, the public and the environment.

10.3 Decommissioning and site restoration activities

The decommissioning exercise will involve dismantling of site facilities; stabilizing all disturbed areas and transportation of materials out of site for disposal or re- use in similar projects elsewhere. 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

10.4 Disposal of materials from the construction site

Materials from the site will be basically remains from demolition/decommissioning activities and include demolished stones, electrical cables, metal scraps and salvaged equipment among others. These materials can be reused, exchanged, recycled or sold to interested individuals. Scrap materials, can often be reused or refurbished. The Table below gives a summary of various activities associated with decommissioning process.

Table 10.1. EMP for Decommissioning

Expected Negative Impacts	Recommended Measures	Responsible Party	Time Frame	Cost (KShs)
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,	Implement an appropriate re-vegetation programme to restore the site to its original status	Project manager & Contractor	During Decommissioning	3,000,000
Land deformation; soil erosion, drainage problems	-During the vegetation period, appropriate surface water runoff controls will be taken to prevent surface erosion.	Project manager & Contractor	During Decommissioning	

Expected Negative Impacts	Recommended Measures	Responsible Party	Time Frame	Cost (KShs)
	-Monitoring and inspection of the area for indications of erosion will be conducted and appropriate measures taken to control any 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

The TG Riruta Apartments project is a comprehensive response to the growing demand for high-density, modern urban housing in Nairobi. By constructing a 17-storey residential complex with 313 units and integrated amenities like commercial spaces, parking, borehole water supply, and recreational areas, the project aims to optimize land use and enhance the urban living environment. The development incorporates sustainable measures for energy, water, and waste management, aligning with environmental and planning regulations. While potential negative environmental impacts such as stormwater management, noise, air pollution, and traffic—were identified, mitigation measures have been proposed to minimize these effects. With proper adherence to the Environmental Management and Monitoring Plan (EMMP) and compliance with regulatory frameworks, the project is expected to positively impact Nairobi's urban development, contributing to the area's sustainability, economic potential, and livability.

11.2 Recommendations

11.2.1 Work closely with other stakeholder and institutions

The proponent to work closely with other stakeholders and institutions in the area in ensuring that the project upholds the development and management plans envisioned for the area by the Nairobi County government who are the custodians of the spatial development plan of the county.

11.2.2 Assign resources to implement ESMP

The proponent to assign resources and personnel to oversee the implementation of the ESMP and put in place plans for evaluation and monitoring

11.2.3 Carry out Environmental Audit

Once the project is operational the proponent should carry out initial environmental audit in the first year and subsequent self-environmental audit which will help in monitoring the efficacy of implementation of the ESMP. Air quality and noise level monitoring should be part and parcel of the audit

11.2.4 Recruitment of labour from within the local area

Although man power requirements for the site is low, stakeholders consulted during EIA process mentioned provision of employment opportunities as one of the benefits they anticipate from implementation of the proposed project. It is therefore recommended that members of the local community be given priority during labour recruitment process. All unskilled labour can be sourced from within the local community while skilled labour can be sourced competitively.

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