ENVIRONMENT IMPACT ASSESSMENT (EIA) STUDY REPORT FOR THE PROPOSED RESIDENTIAL APARTMENTS LOCATED ON PLOT L.R NO. 1870/IV/77 ALONG TERRACE CLOSE OFF RHAPTA ROAD, IN WESTLANDS, NAIROBI COUNTY.

NEMA REF: NEMA/TOR/5/2/658

COORDINATES: LATITUDE-1.265282 LONGITUDE 36.786286

PROPONENT

NANCY WANGARI AVERDUNG
& FOLKER AVERDUNG

P.O. BOX 1524-00606

NAIROBI

LEAD ESIA EXPERTS

ROSE WAMBUI
MAIGUA
(NEMA REG. NO.
13,126)

ONYANGO DAN
AMOLLO
(NEMA REG.
NO.8731)

FEBRUARY 2024

DOCUMENT AUTHENTICATION DOCUMENT AUTHENTICATION

This ESIA study report has been prepared by a team of experts in accordance with the Environmental Management and Coordination Act (EMCA) 1999, 2015 amendment and the Environmental Impact Assessment and Audit Regulations 2003 which requires that every development project must have an ESIA 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:

ROSE WAMBUI MAIGUA (NEMA REG. NO. 13,126)

Signature…… Date……

ONYANGO DAN AMOLLO (NEMA REG. NO.8731)

Signature…… Date……

ESIA TEAM

ROSE WAMBUI MAIGUA	**LEAD EXPERT**
ONYANGO DAN	**LEAD EXPERT**
IRENE MBURU	**DATA COLLECTION**
NICHOLAS GATHERU	**SOCIOLOGIST & CLIMATE CHANGE EXPERT**

PROPONENT:

NANCY WANGARI AVERDUNG & FOLKER AVERDUNG

P.O. BOX 1524-0606, NAIROBI.

Signature……Date……

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ACRONYMS

ESIA'S	Environmental and Social Impact Assessment Study
EMCA	Environmental Management Coordination Act
EMP	Environmental Management Plan
Ha	Hectare
KM	Kilometers
NEC	National Environment Council
NEAP	National Environment Action Plan
NES	National Environment Secretariat
PPE	Personal Protective Equipment
TOR	Terms of Reference
WRMA	Water Resources Management Authority
SWM	Solid Waste Management
UFL	Noise level lower the lower operating limit (50 dB) of the Mark
NPEP	National Poverty Eradication Plan
OHS	Occupational Health and Safety
NEAP	National Environmental Action Plan

GLOSSARY OF TERMS

"Air quality" means the concentration prescribed under or pursuant to the Environment Management and Coordination Act 1999 (2015 amendment) of a pollutant in the atmosphere at the point of measurement;

"Analysis" means the testing or examination of any matter, substance or process for the purpose of determining its composition or qualities or its effect (whether physical, chemical or biological) on any segment of the environment**;**

"Biological diversity" means the variability among living organisms from all sources including, terrestrial ecosystems, aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, among species and of ecosystems;

"Ecosystem" means a dynamic complex of plant, animal, micro-organism communities and their non-living environment interacting as a functional unit;

"Effluent" means gaseous waste, water or liquid or other fluid of domestic, agricultural, trade or industrial origin treated or untreated and discharged directly or indirectly into the aquatic environment;

"Environment" includes the physical factors of the surroundings of human beings including land, water, atmosphere, climate, sound, odour, taste, the biological factors of animals and plants and the social factor of aesthetics and includes both the natural and the built environment;

Environmental and Social Impact Assessment (Assessment) is a process that determines the potential environmental and social risks and impacts (including labour, health, and safety) of a proposed Project in its area of influence

Environmental Impact Assessment (EIA) is a comprehensive document of a Project's

Potential environmental and social risks and impacts.

Environmental Management Plan (EMP) summarizes the commitments to address and mitigate risks and impacts identified as part of the Assessment, through avoidance, minimization, and compensation/offset. This may range from a brief description of

routine mitigation measures to a series of more comprehensive management plans (e.g. water management plan, waste management plan, resettlement action plan, indigenous peoples plan, emergency preparedness and response plan, decommissioning plan). The level of detail

and complexity of the EMP and the priority of the identified measures and actions will be

Commensurate with the Project's potential risks and impacts.

Environmental Management System (EMS) is the overarching environmental, social, health and safety management system, which may be applicable at a corporate or Project level. The system is designed to identify, assess and manage risks and impacts in respect to the Project on an on-going basis. The system consists of manuals and related source documents, including policies, management programs and plans, procedures, requirements, performance indicators, responsibilities, training and periodic audits and inspections with respect to environmental or social issues, including Stakeholder Engagement and grievance mechanisms.

"Environmental management" includes the protection, conservation and sustainable use of the various elements or components of the environment;

"Environmental monitoring" means the continuous or periodic determination of actual and potential effects of any activity or phenomenon on the environment whether short-term or long term;

"Natural resources" include resources of the air, land, water, animals and plants including their aesthetic qualities;

"Noise" means any undesirable sound that is intrinsically objectionable or that may cause adverse effects on human health or the environment;

"Pollutant" includes any substance whether liquid, solid or gaseous which (a) may directly or indirectly alter the quality of any element of the receiving environment; (b) is hazardous or potentially hazardous to human health or the environment; and includes objectionable odours, radio-activity, noise, temperature change or physical, chemical or biological change to any segment or element of the environment;

"Pollution" means any direct or indirect alteration of the physical, thermal, chemical, biological, or radio-active properties of any part of the environment, by discharging, emitting, or depositing wastes so as to affect any beneficial use adversely, to cause a condition which is hazardous or potentially hazardous to public health, safety or welfare, or to animals, birds, wildlife, fish or aquatic life, or to plants or to cause contravention of any condition, limitation, or restriction which is subject to a license under the EMCA 1999 (2015 amendment).

EXECUTIVE SUMMARY

Environmental Impact Assessment is a tool for environmental conservation and has been identified as a key component in new project implementation. Early identification of possible development impacts promotes environmental sustainability as anthropogenic factors are balanced with natural environmental needs.

The proponent herein referred to as **Nancy Wangari Averdung and Folker Averdung** have put forth a proposal to construct a residential development on L.R. No.1870/IV/77along Terrace close off Rhapta road in Westlands sub county, Nairobi County. The proponent's objective is to develop the plot into a residential apartment development with adequate car parking and associated amenities. The proposed development will comprise of one Block of 15 storey residential apartments with a total of 210No.units of one- and two-bedrooms housing units, adequate parking bays and associated amenities.

In keeping with the requirements of the Environmental Management and Coordination Act (EMCA), 1999 (amended 2015) an Environmental and Social Impact Assessment (EIA) study for the proposed residential development was commissioned. The aim of this Environmental and Social Impact Assessment (ESIA) is to examine both the positive and negative effects that this proposed undertaking is likely to have on both the physical and socio-economic environment.

SCOPE OBJECTIVE AND ESIA CRITERIA FOR THE STUDY

The scope of the assessment covered, construction works of the proposed development, which include ground preparation, masonry, and installation of service lines as well as the other necessary utilities. The output of this work was a comprehensive Environmental Impact Assessment report for the purposes of applying for an EIA license.

The consultant on behalf of the proponent, conducted the study by incorporating but not limited to the following terms of reference:

- The proposed location of the proposed residential development and its associated infrastructure.

- A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
- The objectives of the proposed project.
- The technology, procedures and processes to be used, in the implementation of the project.
- The materials to be used in the construction and implementation of the project.
- The products, by-products and waste to be generated by the project.
- A description of the potentially affected environment.
- The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
- To recommend a specific environmentally sound and affordable wastewater management system.
- Analysis of alternatives including project site, design and technologies.
- An environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.
- Provide an action plan for the prevention and management of the foreseeable accidents and hazardous activities in the cause of carrying out the development activities.
- Propose measures to prevent health hazards and to ensure security in the working environment for the employees, residents and for the management in case of emergencies.
- An identification of gaps in knowledge and uncertainties, which were encountered in compiling the information.
- An economic and social analysis of the project.
- Such other matters as the Authority may require.

It is equally evident that, although the project will contribute to various positive impacts, some negative impacts are inevitable and the purpose of conducting this ESIA is to outline measures to mitigate them or where possible eradicate them completely.

The negative impacts of this project include increased pressure on infrastructure, noise pollution, and air pollution, generation of solid and liquid wastes among others.

It is our informed recommendation that the proponent be allowed to proceed with the implementation of the proposed provided the outlined mitigation measures in this report are adhered to and the Environmental Management Plan (EMP) is implemented effectively. An initial environmental audit will also be carried within a period of 12 months after commencement of the operations to check compliance status of the project to the set policies, standards and laws. The proponent is advised to contract licensed experts to undertake the Environmental, Health and Safety Audit Services for the construction phase of the proposed residential development

ESIA STUDY OBJECTIVES

This ESIA study is undertaken under requirements of Environmental Management Coordination Act (EMCA) of 1999 schedule II as stipulated by National Environment Management Authority (NEMA) that requires all development projects to do so in order to elucidate the potential adverse impacts of a project and thereby devising appropriate mitigation measures. This study broke down the proposed project's activities into five phases of:

- Decommissioning of existing structures on site
- Design phase
- Construction phase
- Operational phase
- Decommissioning phase

The objectives of an ESIA study are to:

- Identify and analyse the impacts of the proposed project on the natural environmental
- Evaluate impacts of the project on the socio-cultural environment
- Assess impacts on infrastructure and social amenities (sewerage, water supply, road network, electricity)
- Assess and predict any effects on any sensitive ecosystems

- Identify and predict impacts on and changes in development policy with respect to the area; and develop project mitigations

To achieve these studies the ESIA has to cover the following aspects:

- Establish the existing environment where the project falls
- Define the legal, institutional and policy framework of the proposed project
- Analyse the potential impacts of the proposed project
- Analyse the alternatives to the proposed project
- Develop accurate and practical mitigation measures for the significant negative impacts
- Develop an Environmental and Social Management and Monitoring Plan (ESMMP) for the significant negative impact.
- Identify, consult and involve all stakeholders to facilitate all study objectives

Study Methodology

To achieve these objectives the study collected baseline data firstly through desktop studies on a: national level; regional, and then finally scoping down to the study area and its immediate environs. This is done using detailed study, information from previous similar studies; developed checklist, and professional knowledge. The checklist focussed on information gained from the screening process and other cross-sectorial issues such as: health and safety, biodiversity, pollution etc.

Several methods and processes were undertaken to enable the achievement of the study's objectives. These included

- Scoping
- Literature Review
- Baseline data collection
- Impact identification
- Impact analysis and mitigation

Scoping

A scoping survey was undertaken in the initial phases of the study and it involved;

- Identifying the sources of data on baseline conditions that would be required for the study
- Identifying alternatives to the project
- Identifying and informing all stakeholders who would be interested in or affected by the project
- Identifying cross-sectorial issues and impacts and prioritizing on a shortlist
- Defining the environmental and legislative setting of the proposed project

Literature Review

A literature review was undertaken based on the findings of the scoping process, and it involved reviewing legislature, policies, development plans, and past studies carried out in the area. It also informed the ESIA study on the baseline conditions and solidified the legal, institutional, and environmental setting of the proposed project.

Baseline Data Collection Methodology

Based on scoping findings various data collection methods were employed during the study and these are outlined below:

- **Public Consultation**

  Stakeholders were consulted to facilitate all objectives of the study. The methods used included a preconceived Background Information Document providing a brief of the project and ESIA process and a comment registration sheet. The questionnaire-based interviews were mainly for stakeholders in the area surrounding the proposed project, and the information used to identify impacts and develop mitigation. Similarly, the ESIA team documented comments and concerns received via the email and telephone calls received from members of the public.

- **Photography and Transect Walks**

  Photography was used to capture salient features and baseline conditions in the project site and its neighbourhood. The photos were used to define existing features in the project area and identify soils and floral species in the area. Photography was also combined with transect walks and used to also identify impacts of the proposed project.

- **Impact Identification**

  The proposed development has the potential to create a range of impacts on the environment. These potential impacts can be both positive and negative. The objective is to assess the likelihood of impacts which will be incorporated in the project design, construction, operation and decommissioning phase. If the negative impacts cannot be eliminated a mitigated plan will be implemented to reduce the impacts to as low as reasonably practicable and meets county, national and international laws.

  The purpose of impact assessment and mitigation is to identify and evaluate the significance of potential impacts on identified receptors and resources according to defined assessment criteria and to develop and describe measures that will be taken to avoid or minimise any potential adverse effects and to enhance potential benefits.

- **Environmental and Social Management Plan (ESMP)**

  The ESIA sets out the environmental, health & safety and community-related management controls and monitoring measures that the proponents (and its contractors) will implement to avoid, minimize and manage potentially adverse environmental, health & safety and community-related risks and impacts identified as part of this ESIA. Similarly, the ESMP is geared towards ensuring that the project operates in conformance with applicable laws and regulations within Kenya and internationally.

- **Public and Stakeholder Consultation**

  As required by regulations, stakeholders were identified and engaged as part of this ESIA Project Report. The groups generally considered to be most likely to be potentially adversely impacted by the Project. Public consultation and participation ensure that the views of the affected and interested parties are incorporated as early as possible in the project development: at planning, implementation and operation phase and in the effect minimize the potential unexpected opposition of the proposed development and potential adverse effects to the environment. It is also very beneficial in incorporating the views of the public into the design process for the adoption of the best workable models and systems.

Stakeholders identified were grouped into two categories:

- **Primary Stakeholders** - The directly affected by the project such as Landowner nearby neighbours to the parcel of land that include members of the public and tenants.
- **Secondary Stakeholders** - The indirectly affected by the project but influence development through project implementation. These include the project proponent, Government line ministries (Ministry of housing and public works), County Government Nairobi CO-Environment, Planning and Public Works) and Local administration

Most of the respondents had no objection to the project because of the various advantages associated with such project but also indicated of the need the government to look into infrastructure including roads, water, electricity, sewer, and surface runoff. Below are some of the Key issues, concerns and comments raised during the stakeholder consultation:

Reported potential advantages

1. **Employment Opportunities**: Stakeholders were sure that many jobs would be created and were hopeful that local people would be employed during construction and operation phase. It was also anticipated that building materials would be sourced locally promoting businesses around and improving their livelihoods.
2. **New development**: Stakeholders appreciated that the population is growing at an exponential rate and the new population need various facilities and thus the need for such kind of developments.

3. **Local Economy**: Many people interviewed were on the opinion that the county government would benefit from the development as the local economy would be boosted by attracting other investors as a result of the project.

4. **Aesthetic value:** With the development of Averdung Apartments the aesthetic aspect of the area will be improved with planting of trees and flowers making it more appealing.

5. **Security improvement**. Stakeholders felt that security will improve with the development coming up if proper lighting were put in place and well-trained security personnel were hired hence increasing overall security in the area.

6. **Unity Promotion:** the proposed development will have different people from different culture coming and working together enhancing unity

7. **Population increase:** Many businesses around the area will benefit from the tenants who will be attracted by the new development.

8. **Improved Infrastructure:** The development will contribute towards improved infrastructure from the taxes which will be paid out.

Potential negative impacts/concerns raised

1. **Insecurity**: With the development of more high-rise apartments there is likelihood of increased number of people in the area. Such numbers increased due to increase of tenants. Influx of people and increase in the population poses security risks and safety concerns. Suggestion from the public indicates that the project proponent should invest on adequate safety and security measures.

2. **Traffic delays**: As it is, traffic is bad around the area and the public were concerned it would get worse with the new development especially during the construction phase. There were suggestions that a special lane be created to serve that particular proposed development.

3. **Pressure on existing infrastructure**: There were appreciation that every new project of whatever nature and wherever it may be definitely exerts pressure on infrastructure and existing amenities and the proposed project would not be an exception, but there is need to expand the infrastructure particularly water, power, surface drainage and construction of a sewer.

4. **Loss of flora**: Cutting down of trees and other vegetation will take place to create room for the development and the members were concerned as the trees help curb effects of Air Pollution especially from the factory that is next to the proposed development in addition to contributing to the areas aesthetics. To mitigate the potential destruction of trees and vegetation, the proponent shall landscape and plant trees after the construction phase along the road.

5. **Dust/noise/vibration**: Some members of the public expressed concerns that dust, noise and vibration from construction would impact on nearby residents. Effective mitigation techniques were proposed and explained to deal with these concerns.

6. **Waste Management**: Stakeholders were concerned about waste that would emanate from the proposed activities such as effluent and domestic waste. They expressed fear that poor waste disposal and management might degrade the environment as well as increase diseases to the communities around.

Potential Impacts

Positive Project Impacts

The proposed project will also have many positive impacts due its objectives, scope, details, the site and other baseline conditions. These can be summarized by the following which are the most significant positive impacts:

- Creation of employment throughout all of its phases and indirect employment creation from industries that may either service the people working at the warehouses.
- Economic benefits that include the capital investment `that will be injected into the economy.
- Stimulation of development through revenue and taxes that shall be levied by the government
- Creation of market for goods and services that will be utilized in the entire project such as raw materials, plumbing services, electrical fittings, transport and landscaping.

Adverse Environmental Impacts

The potential adverse impacts of the proposed project activities that are of significance which were identified through the Receptor-Analysis Approach were found to be:

- Generation of solid and liquid wastes
- Air pollution: gaseous, dusts and particulates
- Increased pressure on utilities/services
- Increase in Traffic flows
- Public safety/security risks
- Noise generation
- Loss of flora and Fauna Habitats

Impact Mitigation Measures

The above-mentioned impacts will be effectively managed and where possible eliminated through the following mitigation measures:

- Maintaining of landscaped gardens, terraces, conservation and management of the vegetation and gardens.
- Clearing vegetation only in construction areas and demarcating areas where no clearing will happen.
- Sprinkling water on soil before excavation and periodically when operations are under way to prevent raising of dusts.
- Enclosing the structures under construction with dust proof nets.
- Using efficient machines with low emission technologies for the ones that burn fossil fuels.
- Controlling the speed and operation of construction vehicles.
- Regular maintenance and services of machines and engines.
- Use of clean fuels e.g. unleaded and low sulphur fuels.
- Educate and raise awareness of construction workers on emission reduction techniques.

- Using equipment with noise suppressing technologies.
- Providing workers with Personal protective equipment (PPE) against noise e.g. ear plugs.
- Placing signs around the site to notify people about the noisy conditions.
- Regular maintenance of equipment to ensure they remain efficient and effective.
- Complying with the EMCA noise regulation Legal Notice 61.
- Construction works will be carried out only during the specified time which is usually as from 0800 hrs to 1700 hrs.
- There should not be unnecessary horning of the involved machinery.
- Provision of bill boards at the construction site gates notifying of the construction activity and timings
- Employing water conservation techniques and only using the required amounts of water to prevent wastage.
- Employing power saving techniques such as switching off equipment when not in use, using natural light whenever possible.
- Using machines with power saving technologies i.e. high efficiency equipment.
- Providing proper sanitary facilities for construction workers.
- Inspecting the drainage facilities regularly to ensure they are free of debris that may reduce their efficiency.
- Placing signs around the site notifying other vehicles about the heavy traffic and to set the speed limit around the site.
- Ensuring all drivers for the project comply to speed regulations.
- Making sure the construction doesn't occupy the road reserves and complying with traffic and land demarcation obligations.
- Ensuring all vehicles used for the project are in good working condition both legally and commensurate to their intended use.
- Following EMCA regulations on Waste Management, Legal Notice 121.
- Employing a waste management plan.
- Using waste minimization techniques such as buying in bulk.

- Allocating responsibilities for waste management and identifying all sources of wastes, and ensuring wastes are handled by personnel licensed to do so.
- Making available suitable facilities for the collection, segregation and safe disposal of the wastes.
- Creating waste collection areas with clearly marked facilities such as colour coded bins and providing equipment for handling the wastes. The bins should be coded for plastics, rubber, organics, glass, timber, metals etc.
- Ensuring all wastes are dumped in their designated areas and through legally acceptable methods and that the bins are regularly cleaned and disinfected.
- Assessing and creating opportunities for Regulation, Reducing, Reusing, Recycling, Recovering, Rethinking and Renovation.
- Creating adequate facilities for the storage of building materials and chemicals and controlling access to these facilities.
- Ensuring bins are protected from rain and animals.
- Employing an Occupation Safety and Health (OSH) plan that will outline all OSH risks and provide a strategy for their management.
- Ensuring all potential hazards such as movable machine parts are labelled.
- Raising awareness and educating workers on risks from equipment and ensuring they receive adequate training on the use of the equipment.
- Providing the workers with adequate PPEs and monitoring regularly to ensure they are replaced on time when they wear out.
- Placing visible and readable signs around where there are risks.
- Ensuring there is security in and around the site to control the movement of people.
- Providing safe and secure storage for equipment and materials in the site and maintaining Material Safety Data Sheets (MSDS)
- Placing visible and readable signs to control the movement of vehicles and notify motorists and pedestrians around the, and workers in the site.
- Providing firefighting equipment and in easily accessible areas as well as ensuring site personnel are well trained to use them as well as maintaining them regularly.
- Labelling chemicals and material according to the risks they possess.
- Creating safe and adequate fire and emergency assembly points and making sure they are well labelled.

- Establishing emergency procedures against hazards and ensuring the workers stay aware/educated on following them and commensurate to the magnitude and type of emergency, by conducting regular drills and involving the neighbours.
- Implementing water conservation techniques such as having faucets with dead man tap openers.

Recommendations

The project will play an important role in developing the area by increasing number of housing units. However, there is great need to work in synchrony with the environment and stakeholders in order to ensure sustainability of the project. The proponent should therefore proceed with the project with the prescribed mitigation measures. Constant monitoring of the said aspects (impacts and mitigation) through the ESMP will also ensure its longevity and avoid conflicts between the project and stakeholders or between it and the natural world.

CHAPTER 1: INTRODUCTION

It is the Kenya Government's policy commitment to ensure a balanced development approach in its efforts at promoting socio-economic development and the management of natural resources and environmental quality. Emphasis has been stressed on the need for the inclusion of environmental considerations as a required factor in decision making at the planning stage of all major development projects.

The Kenya Government policy on all new project, programmes or activities requires that an environmental impact assessment is carried out at the planning stages of the proposed project to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation and decommissioning of the facility. The scope of this full study, therefore include:

- The baseline environmental conditions of the area,
- Description of the proposed project,
- Provisions of the relevant environmental laws,
- Identification and discuss of any adverse impacts to the environment anticipated from the proposed project,
- Appropriate mitigation measures,
- Provision of an environmental management plan outline.

The overall objective of the study is to ensure that all environmental concerns are integrated in all the development activities of the proposed residential development project in order to enhance sustainable development. Specifically, the objectives are:

- To identify potential environmental impacts, both direct and in direct.
- To assess the significance of the impacts
- To assess the relative importance of the impacts of relative plans designs, and sites
- To propose preventive mitigating and compensative measures for the significant negative impacts of the project on the environment.
- To generate baseline data for monitoring and evaluation of how well the mitigating measures are being implemented during the project cycle.
- To present information on impact of alternative.

- To present the results of the ESIA that can guide informed decision making and
- To prepare EMP for the proposed project and decommissioning plan.

The scope of the assessment covered site preparation works, construction works of the proposed development that included ground preparation, masonry and installation of service lines as well as the necessary required utilities by the potential residents. The output of this work was a comprehensive full study report for the purposes of applying for an ESIA license.

It is stipulated in EMCA 1999 (amended 2015) that a form of development such as the proposed residential housing project is likely to impact the site and the surrounding environment hence, before commencement of any work, an Environmental Impact Assessment should be undertaken in compliance with the principal environmental Act and Environmental Impact Assessment/Audit Regulations 2003.

The study included the necessary specialist studies to determine the environmental impacts relating to the biophysical and socio-economic aspects and to determine the issues or concerns from the relevant authorities and interested and/or affected parties. The appropriate measures to ensure co-existence of the proposed development with other social and economic activities in the area are provided as part of Environmental Management Action Plan.

The main objective of the assignment was to assist the proponent to prepare a full study report for the proposed residential project so to ensure that the proposed development takes into consideration appropriate measures to mitigate against identified adverse impacts to the environment. The study identified existing and potential environmental impacts and the issues of concern that interested and/or affected parties raised about the development. The associated prevention and mitigation measures for the proposed projects negative impacts are outlined in the environmental Management Plan (EMP) proposed.

The consultant on behalf of the proponent conducted the study by incorporating but not limited to the following terms of reference:

- Location of the proposed residential housing project

- A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
- The objectives of the project.
- The materials to be used in the construction and implementation of the project.
- The products, by-products and waste to be generated by the project
- A description of the potentially affected environment.
- The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
- To recommend a specific environmentally sound and affordable wastewater management system.
- Provide alternative technologies and processes available and reasons for preferring the chosen technology and processes.
- Analysis of alternatives including project site, design and technologies.
- An environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.
- Provide an action plan for the prevention and management of the foreseeable accidents and hazardous activities in the cause of carrying out development activities.
- Propose measures to prevent health hazards and to ensure security in the working environment for the employees, residents and for the management in case of emergencies.
- An identification of gaps in knowledge and uncertainties that were encountered in compiling the information. p. An economic and social analysis of the project.
- Such other matters as the Authority may require.

1.2 DATA COLLECTION PROCEDURES

The data collection was carried out through questionnaires/standard interview schedules, use of checklists, observations and photography, site visits, desk top environmental studies and scientific tests, where necessary in the manner specified in the Environmental (Impact Assessment and Audit) Regulations, 2003.

1.3 RESPONSIBILITIES AND UNDERTAKING

The Consultant undertook to meet all logistical costs relating to the assignment, including those of production of the report and any other relevant material. The proponent through the project architect provided the project site plan showing roads, service lines and buildings layout plans, operation permits and conditions, land-ownership documents and site history. The output from the consultants includes the following:

- An Environmental and Social Impact Assessment (ESIA) Study Report comprising of an executive summary, study approach, baseline conditions, anticipated impacts and proposed mitigation measures.
- An Environmental Management Plan Outline which also forms part of the report recommendations.

1.4 METHODOLOGY OUTLINE

The proposed site is located within an area with minimal natural resources hence the projects cumulative effect to the surrounding environment will not be adverse. Moreover, the proposed development and use of the facility will be in line with what exists in the surrounding areas, hence an environmental project reports will adequately address the projects impacts. The general steps followed during the assessment were as follows:

- Environment screening, in which the project was identified as among those requiring environmental impact assessment under schedule 2 of EMCA, 1999(amended 2015)
- Environmental scoping that provided the key environmental issues
- Desk Stop studies and interviews

- Physical inspection of the site and surrounding areas
- ESIA Public participation by the use of questionnaires
- Reporting.

1.5 ENVIRONMENTAL SCREENING

The screening process was applied to determine whether a full study was required and what level of assessment was necessary. This was done in reference to requirements of the principal environmental legislation and specifically the second schedule. Issues considered included the physical location, sensitive issues and nature of anticipated impact of the proposed project.

1.6 ENVIRONMENTAL SCOPING

The scoping process narrowed down the study to the most critical issues requiring attention during the assessment. Environmental issues were categorized into physical, natural/ecological and social, economic and cultural aspects.

1.7 DESK TOP STUDY

The study included documentary review on the nature of the proposed activities, project documents, designs, relevant policy and legislative framework as well as the environmental setting of the project site area among others. It also included discussions with managers and design engineers as well as interviews with neighbors.

1.8 SITE ASSESSMENT AND PUBLIC PARTICIPATION

Field visits were meant for physical inspections of the site characteristics and the environmental status of the surrounding areas to determine the anticipated impacts. To ensure adequate public participation in the ESIA process, questionnaires were administered to the site neighbors within a one Kilometer radius and the information gathered was subsequently analyzed and incorporated into the ESIA project report.

Reporting In addition to constant briefing of the client, this study report will be presented for submission to NEMA as required by law.

CHAPTER 2. PROJECT DESCRIPTION

2.1 LOCATION AND SIZE OF THE PROJECT

The proposed project is situated along Terrace Close road off Rhapta road. The site is located within Westlands Sub County, within Nairobi County on plot LR. NO. 1870/IV/77. The proposed site (below) is owned by the proponents. The geographical positioning system coordinates of latitude-1.265282 and longitude 36.786286 respectively.

Plate 1: Proposed Project site

2.2 PROJECT'S SURROUNDING

The proposed site is within a mixed development area where Immediate neighbors include: - the Chandarana Food plus supermarket, Ivory terraces apartments, silver terraces apartments, royal promenade apartments etc.

Plate 2: Silver Terraces Apartments neighboring the project site

Plate 3: An ongoing construction neighboring the project site

Plate 4: Chandarana Food plus Supermarket near the project site.

Plate 5: Royal Prominade Apartments neighboring the project site

2.3 PROJECT DESCRIPTION

The proposed development will comprise of one Block of 15 storey residential apartments on plot L.R No.1870/IV/77 as follows:

- **Basement 1&2:** Will have 116 number of parking
- **Ground Floor**: will have 49 number of parking bays, Reception area, Lift lobby, Board room, Lounge driveways, Kids playing area and gate house.
- **Typical 1nd to 15th Floor Plan**;

- ✓ Eight (8) units of Two(2) bedroom units(4 Units with DSQ)
- ✓ 6 units one (1) bedroom units
- ✓ Total of 14 units per floor.
- ✓ **Total No. of units (14*15) = 210 units.**
- **Roof terrace floor plan** will comprise of a gym, massage room and sauna.

(Architectural drawings attached)

2.4 SITE OWNERSHIP AND SIZE

The proposed site falls within Land Reference Numbers1870/IV/77 and will all be utilized to develop the proposed development. The land is registered in the name of the proponent **Nancy Wangari Averdung and Folker Averdung**.

2.5 DESCRIPTION OF THE PROJECT'S CONSTRUCTION ACTIVITIES

2.5.1 SITE PREPARATION WORKS

The proposed project site will be prepared for construction. This will involve demolition works of the existing structures in the project site, clearing of vegetation, excavation works, transportation of construction materials and construction works. This will be undertaken in a phased approach to mitigate soil erosion and the impacts of excessive dust generation. Due to the nature of the proposed project, construction will involve the use of earthmoving machinery such as excavators and bulldozers. The engineers will also utilize human labour where necessary so as to create employment to the local residents especially the youth.

2.5.2 STORAGE OF MATERIALS

Building materials will be stored on site. Bulky materials such as stones, ballast, sand and steel will be carefully piled at designated areas on site. To avoid piling large quantities of materials on site, the proponent will order bulky materials such as sand, gravel and stones in quotas.

2.5.3 MASONRY, CONCRETE WORK AND RELATED ACTIVITIES

The construction of the building walls, foundations, floors, pavements, drainage systems, and parking among other components of the project involves a lot of masonry work, laying of plumbing and related activities. General masonry and related activities include, concrete mixing, plastering, slab construction, construction of foundations, and erection of building walls and curing of fresh concrete surfaces. These activities are known to be labour intensive and will be supplemented by machinery.

Construction inputs (materials) include:

i. Construction raw materials i.e. sand, cement, stones, crushed rock gravel, murram, ceramic and glazed tiles, clay tiles, glass, steel metals and metal products, plastic and PVC pipes and materials, ceiling materials (soft board panels), steel pipes, timber and timber products, precast and concrete products, iron sheets and iron products, electric cables and conduits, painting materials among others. Other inputs shall include necessary fittings and fixtures such as electrical gadgets (switches, sockets, lamps etc.), water closet sets and other bathroom accessories, water taps, sinks and kitchen equipment and furniture and general office furniture among others. All these will be obtained from licensed dealers and especially those that have complied with the environmental management guidelines and policies. It is worthwhile noting that most of the construction materials are locally available.

ii. Construction machines including machinery such as excavators, graders, mixers, and bulldozers and other tools and equipment. These will be used for the transportation of materials, clearing of the vegetation and debris, in the construction of the project site. Such machinery will use petroleum products to provide energy.

iii. A construction labour force of both skilled and non-skilled workers. These will require services such as energy, water supply and sanitation facilities.

iv. Large volumes of water for construction purposes. It will be supplied from the local area supply mains.

Construction activities include the following: -

a) The first activities will involve the demolition of the existing buildings and structure(s)

b) Construction of temporary construction office(s) and store

c) Procurement of construction materials from approved dealers.

d) Transportation of construction materials using heavy and light machinery.

e) Storage of the construction materials.

f) Site clearing, excavation and filling, laying of foundation, building works, disposal of the resulting construction wastes.

g) Disposal of the existing debris/ materials. All debris and excavated materials will be dumped on sites approved by the relevant departments of the government.

h) Electrical, civil, and water engineering works. These will be done by registered expertise

i) Landscaping works and earth works.

j) Completion of the development and occupation.

The buildings 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, BS4466, BS4461 etc*. The constructions will as well incorporate environmental guidelines, health and safety measures.

2.5.4 STRUCTURAL STEEL WORKS

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

2.5.5 ELECTRICAL WORK

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

2.5.6 PLUMBING

Installation of pipe-work will be done to connect sewage from the ablution blocks to a sewer system. Plumbing will also be done for drainage of storm water from the rooftop into the peripheral storm water harvesting tanks. Plumbing activities will include metal and plastic pipe cuttings, the use of adhesives, metal grinding and wall drilling among others.

2.6 DESCRIPTION OF THE PROJECT'S OPERATIONAL ACTIVITIES

2.6.1 RESIDENTIAL ACTIVITIES

Once construction is complete, the residential apartment will be ready to be occupied by respective owners.

2.6.2 SOLID WASTE

The proponent will provide facilities for handling solid waste generated within the facility. These will include solid waste accumulation room for temporarily holding waste within the premises before final disposal at the designated sites.

2.6.3 LIQUID WASTE

The proponent will provide adequate and safe means of handling liquid waste generated within the facility by connecting to the existing sewer line that travels along Terrace close road.

These will include conducting regular inspections for pipe blockages or damages and fixing them appropriately. Also, the proponent will conduct regular monitoring of the sewage discharged to the county foul sewerage system from the project to ensure that the stipulated sewage/effluent discharge rules are not violated. The proponent is advised to undertake a pre-connection survey on the loads supported by the alternative trunks prior to selection of the suitable connection line.

2.6.4 STORM WATER DRAINAGE

The proposed development will generate enormous surface water. It is therefore recommended that adequate and well drainage channels be provided to accommodate the increased discharge. This will be determined at the site works.

2.6.5 ELECTRICITY SUPPLY

The proposed development will be connected to the Kenya Power supply line. The Kenya power electricity supply lines are already available within the neighborhood of the proposed project site.

2.6.6 MAINS WATER SUPPLY

A dedicated potable water system will be provided within the building. The system will consist of the following main system components. The existing facility is connected to NCWSC water supply, the proponent intends to similarly apply for approvals and subsequently connect to the NCWSC water supply, additionally, potable water tanks shall be provided to serve domestic and drinking water purposes. The sizes of the tanks are based on a capacity/demand storage period of wholesome/potable water consumption for each block. The proponent in the event of considerations to drill borehole, is thus advised to undertake adequate survey on the ground water tables and seek approvals from the relevant authority prior to implementation of the borehole sinking. The boreholes should there be need for one, shall undergo ESIA process and approval by NEMA, WRA and the Nairobi City County.

2.6.7 EARTHING AND LIGHTNING PROTECTION

Buildings/ structures within the proposed development which will require lightning protection will generally include a roof air termination network with suitable down conductors to ground level. Where practical, it may be possible to make use of the building structure to form the down conductor path, with suitable test and inspection facilities at the lowest levels.

2.6.8 GENERAL REPAIRS AND MAINTENANCE

The proposed development and associated facilities will be repaired and maintained regularly during the operational phase of the project. Such activities will include repair of building walls and floors, repair and maintenance of electrical gadgets, painting and replacement of worn-out materials among others.

2.7 DECOMMISSIONING PHASE

Decommissioning of operations is here taken to mean that the residential development cease to operate and the premises are closed down or reverted to another use. Under such circumstance, the proponent will be expected to adhere to the relevant legislation applicable to such an undertaking in the laws of Kenya. The decommissioning shall be undertaken through a number of steps and measures to rehabilitate the site to its initial status before the implementation of the residential development project. This will involve analysis of sustainable alternative uses of the site that is compatible to the surrounding project site area. An environmental impact assessment shall be commissioned to advice the proponent on the environmental impacts with respect to the identified new use.

2.8 PROJECT COST

The proposed project is estimated to cost **Six Hundred Million Kenyan shillings** or ($20,000,000). The project implementation works is estimated to take 2 years to completion.

CHAPTER 3. BASELINE INFORMATION OF THE STUDY AREA

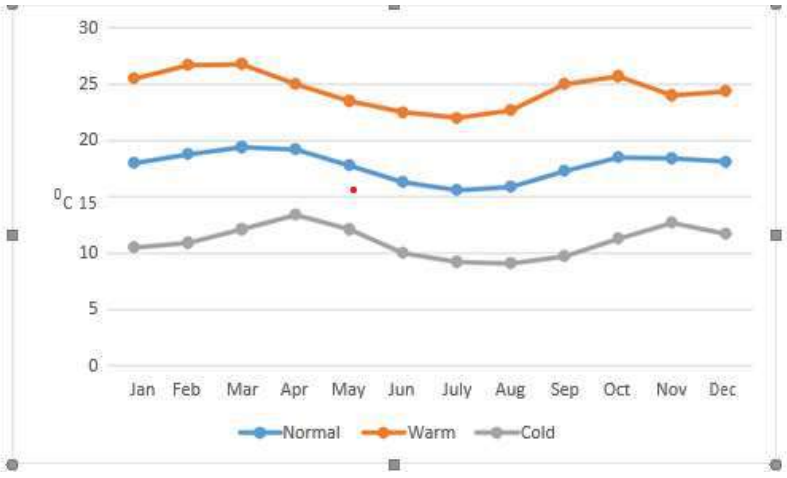
3.1 INTRODUCTION

The proposed site is located along Terrace Close road off Rhapta road within Westlands Sub County, within Nairobi County on plot LR. NO. 1870/IV/77. The site is situated in a mixed development zone of residential and commercial use. The proposed area is estimated to be 6 Km from Nairobi city Centre.

3.2 BIO-PHYSICAL ENVIRONMENT

3.2.1 CLIMATE AND METEOROLOGY

Nairobi County is characterized by mean minimum temperatures of 11.5^{0}PCP to 14.4^{0}PPC; and mean maximum temperatures ranging from 22.3^{0}P CP to 28^{0}PPC. Low temperatures are registered during cool, dry and rather cloudy months of June to mid-October; with mean maximum temperature 22.3^{0}PCP to 25.3^{0}PCP. High temperatures are recorded in the months of mid-December to mid-March with mean maximum temperature in range of 26.8^{0}PCP to 28^{0}PCP . The coldest month is July with an average monthly temperature of 16.9^{0}PC,P while the hottest month is March with an average monthly temperature of 20.9^{0}PPC. This has been represented below.

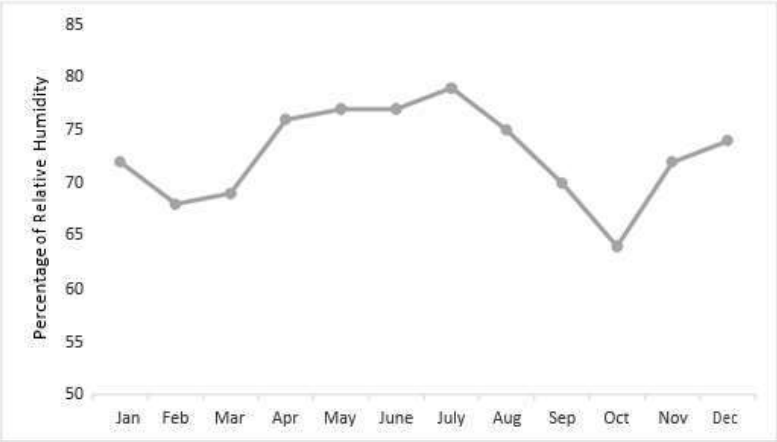


Graph 1:Average temperature per month

Source: *Norwegian Meteorological Institute and Norwegian Broadcasting Corporation Relative Humidity*

The average annual relative humidity in Nairobi County is 72.8% (Source: Climatemps.com) and average monthly relative humidity ranges from 64% in October to 79% in July. Air in the early morning is at/or very close to saturation, afternoons are characterized by a relative humidity. However, climate change has affected weather patterns in Nairobi and there are more extreme weather events particularly flash droughts and flash floods as well as increased heat and cold.

Graph below shows summary of mean Relative Humidity (%) for each month in a year.



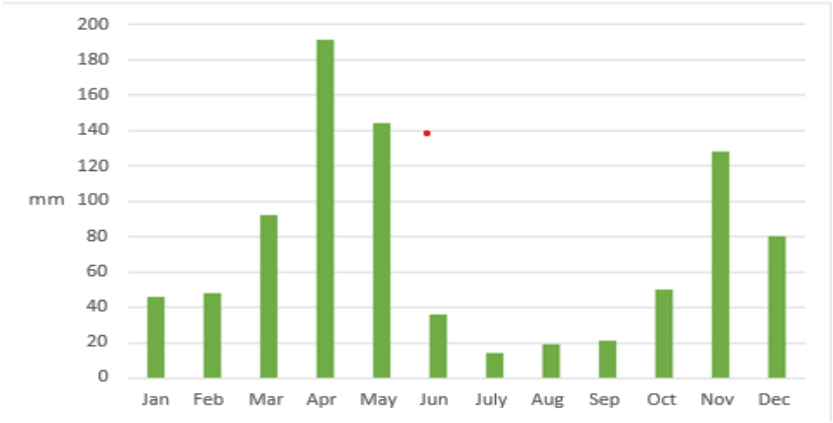
Graph 2:Mean relative humidity percentage

Source: Climatemps.com

3.2.2 RAINFALL

Nairobi County is generally flat with an altitude of 1795 meters (m) above the sea level, this attribute explains the moderate climatic patterns that are experienced in the county. The County also experience bimodal rainfall that falls in different times of the year, with long rains being registered in the months of March to May, and short rains from October to December. The two rainy seasons coincide approximately with the time of changeover of the South-West monsoon and the North-East Monsoon currents which affects the Eastern Africa (including Kenya). The average range of rainfall 900mm; but the actual amount in any one year may vary from less than 500mm to more 1500mm per year.

Graph below shows precipitation rate in mm in Nairobi County



Graph 3*: *Precipitation rate in mm

Source: Climate-Data.org

3.2.3 WIND AND SUNSHINE

Nairobi County is located within the path of predominantly Easterly winds. The winds are near the ground, strong winds with speed of 30 to 40 km/h are common during the dry season, just before the start of the long rains in mid-March; especially from mid-morning to early afternoon. Wind speeds of 15 to 25km/h are also recorded during other times of the year; while nights are commonly characterized by light winds. Nairobi County in general are often cloudy, but the sunny by midmorning. The county and its surroundings receive a considerable amount of sunshine, averaged at about 7 hours of brighter sunshine per day, throughout the year. This positions Nairobi as a good hub for use of solar energy.

3.2.4 AIR QUALITY

The main source of air pollution in Nairobi is from vehicles, industries, municipal sources such as open burning of waste. Motor vehicle traffic is one of the main sources of particulate pollution in Nairobi, coupled with lack of effective transport and land use planning is resulting in increasing vehicle ownership and traffic congestion in the city (Kinney, et al., 2011). The proportion of the Kenyan vehicles registered in Nairobi is high and is still increasing as more citizens continue to own vehicles (Government of Kenya (GOK), 2009. It is estimated that 90% of urban air pollution in developing countries is attributed to motor vehicles: coupled with increasing road congestion, high

prevalence of old poorly maintained vehicles and low-quality fuel. This has implications on the Air quality especially during the traffic peak hours where large volumes of carbon dioxide are emitted from the exhaust pipe to the environment. This is evident as observed in the vegetation along the major highways within Nairobi, for it has gone dark as a result of the smoke and fumes released (United Nations Environmental Program (UNEP). Motor vehicle emissions include a range of pollutants, including particulate matter (PM), carbon monoxide, Sulphur oxides, nitrogen oxides and a wide range of volatile organic compounds, which react with sunlight to form ozone.

3.2.5 NOISE AND VIBRATION

The main source of noise in and around the project area is from the main road. From the results, noise levels in all Nairobi North PSVs are higher than the maximum permissible level of 60 dBA. Even the lowest noise levels recorded in some PSVs in this route are still significantly higher than the permissible limit, with 54% average rate of non-compliance with the recommended legislation. Noise during construction phase will be minimized as described in the ESMP.

3.2.6 GEOLOGY AND SOILS

The geology of Nairobi area is characterized mainly by a succession of volcanic rocks and Pyroclastic of Cainozoic age (Saggerson, 1991). Underlying the volcanic rocks is a foundation of folded crystalline metamorphic rocks (gneisses and schists) of Precambrian age which belongs to the Mozambique. The volcanic rocks are part of a wider East African alkaline suite characterized by a dominance of soda over potash. The rocks are distinguished in two groups: the first of which is a strongly alkaline series represented by feldspathoidal-bearing phonolites, basanites, tephrites and more basic varieties. The second group is a mildly alkaline series and includes feldspathoidal-free rocks containing soda-rich amphiboles and pyroxenes. Differentiation of members of the two series is accompanied by an increase in silica content, giving rise to trachytes, rhyolites and obsidians (Saggerson, 1991). The Nairobi trachytes exhibit a wide distribution, extending from the Dagoretti–Karen area, and eastwards to underly Nairobi city. They also extend farther northwards, beyond the present area, to underly areas of Kiambu and south Githunguri**.** Soil spotted on site is reddish-brown, the color indicates good drainage. Iron found within the soil is oxidized mores hence causing the soil to develop the rusty color which can be darker due to organic matter. The figure below depicts the soils spotted on the proposed site.

3.2.7 TOPOGRAPHY

The terrain in the eastern side of the County is gently rolling but divided by steep valleys towards the City boundaries. Karura forest which is characterized by steep sided borders Nairobi to the North . The Karen - Langata area is characterized by plains surrounded by Nairobi National Park on the east and Ngong Forest on the south. Several streams with steep-sided valleys covered with vegetation are a dominant landscape feature of the County. The main rivers in the County are Nairobi River, Ngong River and Kabuthi River. These rivers are highly polluted as open sewers and industrial waste is directed towards them. Nairobi dam, which is along the Ngong River, and Jamhuri dam are the main water reservoirs in the County. The main types of soils are the black cotton and the red soils that form patches in different parts of the County. There are three forests in the County namely Ngong Forest to the south, Karura Forest to the north and the Nairobi Arboretum. The three forests have a total coverage of 23.19 Km^2 .

Elevation is in the range of 1,460m to 1,920m. The main drainage in the County is consequent upon the regional topography and prevailing slope of the volcanic rocks. The streams are generally easterly-flowing, but a few cases of drainage and flows to the South-east and South (Morgan, 1967; survey of Kenya, 1990). The main features influencing the topography of the region are the Aberdare, Kikuyu escarpment and Ngong Hill for the Northern zone. The topography of the proposed site is generally slanting toward the South. On site there is a storm water drainage running from North to South joining the main storm water drainage along Kileleshwa into Kirichwa Kubwa river.

3.2.8 HYDROLOGY

Nairobi mainly receives its water from rivers originating from Aberdare's, and Mt. Kenya water catchment area. The Nairobi River Basin consists of three major rivers (Nairobi, Ngong and Mathare) whose catchments are found within the Kikuyu and Limuru Hills. Nairobi aquifer system (surface area of about 6,500 sq Km) is Nairobi second water source (Mumma et al.,2011). It underlies much of the Nairobi metropolitan area, but recharges naturally from southern Aberdare's and Eastern Rift escarpment. This aquifer system is predominantly vulnerable to depletion (Mumma et al., 2011) and future degradation and extensive agricultural use could impact Nairobi aquifer water quality. There are approximately 4800 boreholes in Nairobi, with an estimated daily

supply of 65,000 mP 3 P for domestic, 60,00mP 3 Pof industrial water, 3000mP 3 P for livestock use and 28,000mP 3 P for irrigation in the Nairobi aquifer suite catchment area (WRMA, 2010).

There are four sources of water supply in the County; Kikuyu springs, Ruiru reservoir on the Ruiru River, Sasumua reservoir on the Chania River and Chania River gravity intake. These are capable of supplying of 217,000mP 3 P/day at a reliability of 90%. The water demand of the County is forecasted at 363,400 mP 3 P/day in 2000, 450,200mP 3 P/day in 2005, 557,700mP 3 P/day in 2010, and estimated 806,600mP 3 Pday in 2020.

3.2.9 LAND USE AND ZONING

Land is a natural resource which is scarce while its demand remains huge in many parts of the county. The land ownership systems exist in Nairobi County include government (central government/local government land) and privately owned (institutional, individual and societies/company) land. The total area of the county is 696.1 km where about 50% consisting of 175.6 km is residential and 198.8 km is open land. The other half is for industrial uses, urban agriculture, infrastructure and recreation, water bodies and ravine areas, and a large portion being open lands. Land use planning in Nairobi is not effectively implemented and monitored. This scenario has contributed enormously to issues such as pollution, congestion, and lack of access to basic services, like electricity, water, and sanitation which are still out of reach for many dwellers of informal areas. The opposite is true for dwellers in formal settlements. Access to public infrastructure such as roads is also least for informal areas dwellers compared to dwellers in formal settlements. Informal areas in Nairobi are characterized by congestion, poor housing status, low social-economic status and low-income levels . Kileleshwa was formerly a high-end area populated by upper class residents with few high-rise buildings but changes in zoning laws in 2016 has seen an influx of high-rise buildings particularly in Kilimani area and Parklands overloading basic amenities like water, garbage collection and sewerage system.

3.3 BIODIVERSITY AND ECOSYSTEM SERVICES

Nairobi County has both terrestrial and aquatic ecosystem with various sub-types including forests, grasslands, wetlands and fresh water dams/ponds and rivers. These forms important habitats for diverse wildlife and additional play crucial social and economic function within the County. The County's vegetation ranges from grassland scattered with acacia trees in the East, with some hardwood forest in the higher areas to the west. Mwaura (2005) identifies the downtown flora as the flora of urban centers which includes relatively high proportion of alien plant species.

Some of the few indigenous trees in the city center include acacia tree species, *acokanthera oppositifolia, combretum molle* among others. The common shade and ornamental trees within the county include *jacaranda mimosifolia, chorisia speciosa, grevillea robusta*, *schinus molle*, *Spathodea capanulata* etc.

3.3.1 FLORA ON SITE

Natural vegetation in the proposed area has been modified by human activities. During the site visit vegetation spotted include; jacarandas, bougainvillea, open land covered with trimmed grass, *croton megalocarpus, spathodea campanulata, melia azedarach, schinus molle, markhamia lutea, grevillea robusta* Chinese pepper tree, Agave Americana. The figures below depict some of the vegetation spotted on the site

INVASIVE SPECIES

Nairobi has a record number of invasive species either planted as hedges like *tithonia diversifolia, lantana camara* and *anredera cordifolia,* or flowers for example, *Euryops chrysanthemoides/*African daisy, *brugmansia suaveloens* and *optunia ficus indica*. *Cassia didymobotrya, caesalpinia decapetala, bauhinia tormentosa, senna bicapsular, senna occidentalis*, *ipomea indica, ricinus communis, datura stramonium, solanum incanum, rubus pinnatus,* and *passiflora* species among others. During construction, invasive species are likely to colonise even more areas as most are gap colonizers which thrive in disturbed areas. Mitigation measures to curb their spread must be put into place by the project proponent and contractor and monitoring and evaluation done after project completion.

Plate 6: Maleleuca armillaris tree

Plate 7:Phoenix reticulata

Plate 8: Indigenous tree species (Markhamia lutea, polycious fulva and Spathodea campanulate)

3.3.2 FAUNA ON SITE

The proposed site is situated within a residential zone where human activities have altered the natural habitat for wild animals over the years. Bird species spotted included the black kite, grey headed sparrow weaver, house sparrow, speckled mousebird, pied crows, red cheeked cordonbleau, white browed robinchat, red billed waxbill and baglafecht weavers inter alia. There are also several insects and small mammals like lizards and ants seen on trees in the site. None of the faunal species observed are rare or endangered.

3.4 SOCIO-ECONOMIC BASELINE

DEMOGRAPHY AND SOCIAL DETERMINANTS

3.4.1 MIGRATION

As at 1999, Kenya Population and Household Census enumerated 2,025,724, whereas in 1998 the population was 1,683,761 portraying 341,963 immigrants. This figure amounts to 16.9% increase in population in Nairobi. At the same time, there were 149,853 out-migrants from Nairobi, 8.2% of the enumerated population. The net migrants, being the difference between the immigrants and the outmigrants was 192,110 people in 1999. The project site does not fall on any cultural sites.

3.4.2 EDUCATION

The Kenyan Government Secondary Education (FTSE) programmes in 2003 and 2008 respectively. As a result of these programmes, some remarkable successes have been recorded where primary schools .introduced the Free Primary Education (FPE) and Free Tuition The County has 211 public ECD centers. Among these 21 are stand-alone ECDs while us 190 are in main primary schools. The private ECDs are 344 in number. The total number of EDC teachers is 413. The teacher pupil ratio in the pre-primary school is 1:29. As of 2018, there were 205 public primary schools with total enrolment of 193,058 and 2000 private primary schools with a total enrolment of 254,476. The teacher pupil ratio in the primary schools is 1:47. The gross enrolment rate is 84% while the net enrolment rate is 77.8%. Nairobi County has 95 public secondary schools and 57 private secondary schools with 2,028 teachers. The teacher pupil ratio is 1:24 with a total enrolment is 48,669(CIDP 2018). As for tertiary education, Nairobi County hosts two public universities, that is, University of Nairobi and Technical University of Kenya. There are ten private universities and 16 campuses operated by both public and private universities in the County. Most of the campuses are located within the Central Business District (CBD). In addition, the County has 237 science and technology institutes.

3.4.3 ECONOMY

Real GDP growth slowed to 5.5% in 2022 from 7.5% in 2021, attributable to the drought, increased commodity prices, and tight global financial conditions. Growth was driven on the supply side by services and on the demand side by household consumption. Inflation rose to 7.6% from 6.1% in 2021, driven by food and energy inflation. Inflation was moderated by subsidies and raising the policy rate to 8.25% from 7% in 2021. The fiscal deficit narrowed to 6.3% of GDP from 8.2% in 2021 due to improved revenue collection and adherence to the International Monetary Fund–supported fiscal consolation path. Public debt rose to 70% of GDP from 68% in 2021, driven by higher interest payments and exchange rate depreciation.

The current account deficit widened to 6.0% of GDP in 2022 from 5.5% in 2021, driven by the lower trade deficit. It was financed by drawing down foreign exchange reserves, which fell to $7.42 billion (4.2 months of import cover) at end-2022 from $9.5 billion (5.8 months) at end- 2021. The Kenyan shilling depreciated to 123.3 per US dollar at end-2022 from 110.2 at end-2021.

The capital adequacy ratio of 18.9% and liquidity ratio of 55% were higher than the respective targets of 14.5% and 20%. The nonperforming loans ratio remained high, at 14%. Credit risk concentration is high in manufacturing, energy and water, and agriculture. High extreme poverty (18%), unemployment (12.3%), and income inequality (Gini coefficient of 0.408)—manifestations of slow structural change—remain challenges(AfDB 2023).

3.4.4 WATER AND SANITATION

Nairobi has its water supplied by NCWSC which was incorporated in December 2003 under the Companies Act Cap. 486 to provide clean water to the residents of Nairobi City County. NCWSC has four primary sources of water including: Ndakaini dam, Sasumua dam, Kikuyu Springs and Ngethu water works plants in Kiambu County. These sources have a design capacity of 525,000 mP 3 P/day. This is a shortfall from the daily water requirements of 690,000 mP 3 P (Living in Nairobi, 2015). This portrays a wide gap between water supply against demand.

The ever-increasing population growth in Nairobi has stretched quality water supply and availability in Nairobi. Water supply systems and efficiency in Nairobi has improved. This improvement has been attributed to increased water supply projects thereby keeping pace with population growth. Water availability has been improved by construction of new mains, improved water services to the city and expanded water supply network.

Nairobi has 230,704 water connections piped into dwellings, 514,943 households piped, giving a total of 745,647 households connected to piped water, representing 76% of the households connected to piped water (NCWSC, 2014). Water is a critical human basic need for survival, whose availability promotes up scaled economy. Of the total inhabitants of Nairobi, 3.1 million of them are supplied with water. This number has steadily risen from 65,000 people in the year 1940. Water is also supplied using tanker trucks which are popular in Ruaraka. Water tanker trucks are owned and operated privately and supply water in bulk to users who have installed storage tanks at their premises. These tanker trucks have private boreholes and the utility company as their sources of obtaining water. The operators are always alert and they respond to calls to replenish storage tanks. Some tanker trucks operate round the clock the entire day.

The proposed project Averdung Apartments will be served by Nairobi County Water as well as water from a borehole which is powered by solar energy.

3.4.5 SEWERAGE

According to KNBS, 2009 Population Census, 48% of households in Nairobi are connected to the main sewer, and NCWSC accounts for 70% of national sewerage coverage. During 2014/15 – 2018/19 strategic plan period, NCWSC has planned various investments to enhance its relative contribution towards achievement of overall sewerage coverage goal. The overall household's human waste disposal waste in Nairobi is 469,830 use main sewer line; 95,410 use septic tanks; 10,489 use cess pool; 26,477 use VIP pit latrine; 370,463 use covered and uncovered pit latrines; 5,205 use buckets; 3,962 prefer using bushes; whereas 3,180 use other means of human waste disposal (KNBS, 2009).

Nairobi has a fully functional sewerage system that has domestic and industrial sewerage handled at both Kariobangi Wastewater Treatment Plant and Dandora Estate Sewerage Treatment Works (DESTW). Kariobangi Wastewater Treatment Plant has the capacity to handle 32,000mP 3 P whereas DESTW can handle 80,000 mP 3 P of sewer per day. This is equivalent to 80% of wastewater generated in Nairobi City. At DESTW, wastewater treatment is biological through wastewater stabilization ponds which heavily relies on sunshine and bacteria to break down organic compounds. The stabilization ponds are the second biggest in Africa and covers over 200 hectares of land with over 500 hectares for future expansion (NCWSC, 2010) The project area is located approximately 5 km from the CBD and is well served by road networks.

Kileleshwa is well linked to a network of sewerage systems that were recently improved under an AfDB grant known as "Allocation of Sewerage Infrastructure under Sewerage Improvement Project Phase II". Averdung Apartments will channel the sewage from the sewage into this system.

3.4.6 SOLID WASTE MANAGEMENT

A total of 1,530 tons of solid wastes are generated in Nairobi on a daily basis. Given that 1999 Population and Housing Census estimated the population at 2,143,254 people, representing 0.714 kg of solid waste is generated daily per person. With that high amount of solid waste generation, collection efficiency of about 25%; 75% of the solid waste will go uncollected daily. The proposed project area is well served by private NEMA registered garbage collection firms.

3.4.7 INFRASTRUCTURE, HOUSING AND URBAN DEVELOPMENT

The current road network in the County is has been inadequate but has really developed positively in the past in terms of coverage to meet current and future demands as envisaged in the Vision 2030. congestion has been eased by construction of several by- passes and overpasses. The. main means of transport used in the County is PSV matatus at 58.74% , followed by walking. The paved County road network covers 1155.15 km, while the paved National roads cover 599.9 km. Out of the total paved road network of 1755.05 km, 30.82% is in good condition, 43.77% in fair condition and 22.54% in poor condition. The status of ICT access and use in the county is low, especially among households. The housing tenure is predominantly owner occupied at 9.3% with 90.6% of the households under rental tenure [1].The perception that individuals do not need to use the internet, the high cost of services, access to internet elsewhere than home and lack of knowledge and skills on internet are the leading reasons that the people of in the County do not have internet connection.

Nairobi County hosts 3 airports; Jomo Kenyatta International Airport, Wilson Airport and Eastleigh Airport. Jomo Kenyatta International Airport (JKIA) is the biggest Airport in East and Central Africa, and is the focal point for major aviation activity in the region. Its importance as an aviation Centre makes it the pacesetter for other airports in the region. JKIA, located 18 kilometers to the East of Nairobi City centre. The County has a railway network of 75Km and a total of 15 functional railway stations which are: Embakasi, Makadara, and Nairobi main terminal, Dandora, Githurai, Kahawa, Kibera, Dagoretti, JKIA and Syokimau. The establishment of Makadara and Imara Daima railway

[1] https://repository.kippra.or.ke/bitstream/handle/

stations and expansion of Nairobi platform has greatly helped to improve public transportation in Nairobi for socio economic development[2]

The proposed project area is well served by road networks. Moving around in Kileleshwa has become easier due to the good road network and the construction of a bypass connecting to Ngong Road.

[2] https://krc.co.ke/nairobi-commuter-rail-service/

CHAPTER 4 RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORK

4.1 INTRODUCTION

Environmental and Social Impact Assessment is a tool for environmental conservation and has been identified as a key component in new project implementation. According to Environmental Management and Coordination Act No. 8 of 2015. The report must be submitted to the National Environment Management Authority (NEMA) for approval and issuance of the relevant certificates.

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

4.2 ENVIRONMENTAL POLICY

This ESIA has been prepared to fully comply with environmental and social safeguard policies and procedures as outlined in the various regulations by Kenya's National Environment Management Authority.

4.3 RELEVANT KENYA POLICIES

4.3.1NATIONAL ENVIRONMENT POLICY 2013

The National Environment Policy aims to provide a holistic framework to guide the management of the environment and natural resources in Kenya. The major objective of the policy is to provide a framework for an integrated approach to planning and sustainable management of Kenya's environment and its natural resources. The policy further ensures that the environment is integrated in all government policies in order to facilitate and realize sustainable development at all levels. This would help promote green economy, enhance social inclusion, improve human welfare and create opportunities for employment and maintenance of a healthy ecosystem.

4.3.2 PHYSICAL PLANNING POLICY

The current policy governs the development and approval of all building plans as provided for in the Physical Planning Act (Cap 286). The proposed project has been subjected to the provisions of this policy and legislation.

4.3.3 PUBLIC HEALTH POLICY

The prevailing public health policy calls upon the project proponent to ensure that ancillary buildings are adequately provided with utilities that make them fit for human habitation. The proposed development has been designed by professional engineers and architects and as such will have all amenities/utilities that are essential for safeguarding public health for all the residents and visitors who access the facilities.

4.3.4 THE SESSIONAL PAPER NO.4 ON ENERGY

The major objective of the Policy is to ensure adequate, quality, cost effective and affordable supply of energy through indigenous resources while protecting the environment. It encourages wider adoption and use of renewable energy technologies to enhance their role in the country's energy supply matrix. The Energy Policy is aligned to long term development strategy -Vision 2030 and other policies.

4.3.5 THE KENYA VISION 2030

The Kenya Vision 2030 is the national long-term development policy that aims to transform Kenya into a newly residential, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment.

4.3.6 THE KENYA NATIONAL CLIMATE CHANGE RESPONSE STRATEGY

The purpose of this strategy is to put in place robust measures needed to address most of the challenges posed by climate variability and change through thorough impact assessments and monitoring of various projects. According to Climate Change Projections, the country is likely to experience hotter drier sunny seasons, warmer wetter rainy seasons, rise in sea levels and an increase in extreme weather events.

In the construction sector, priority inclusion areas should include energy efficient innovations and technologies, and utilization of low-carbon appliances and tools; the utilization of eco-friendly energy resources such as wind, solar, biogas, etc.; as well as possible utilization of biofuels.

4.3.7 THE NATIONAL OCCUPATIONAL SAFETY AND HEALTH POLICY

This Policy significantly sustains continual development and implementation of the National Occupational Safety and Health systems and programs to reduce incidences of work-related accidents and diseases. In addition, it seeks to offer equitable compensation to those who suffer physical injuries and contract occupational diseases. The Policy addresses the current challenges, gaps and future development of safety and health systems and programs in the country.

It promotes basic principles of assessing occupational risks or hazards; combating occupational risks or hazards at source; and developing a national preventative safety and health culture that includes information, consultation, research and training.

The policy also promotes continuous improvement of occupational safety and health by integrating Kenyan national laws and regulations with Regional Protocols, ILO Conventions, ISO standards and the best practices in the world. It sets up mechanisms for resource mobilization for occupational safety and health programs and activities and provides guidance to all stakeholders in the development and implementation of national occupational safety and health systems and programs.

In all phases of the project, the issues of occupational safety and health will emerge and the National Occupational Safety and Health Policy will be handy in addressing these issues.

4.4 INSTITUTIONAL FRAMEWORK

Environmental Impact Assessment (EIA) is a critical examination of the effects of a project on the environment. The goal of an EIA is to ensure that decisions on proposed projects and activities are environmentally sustainable. It guides policy makers, planners, stakeholders and government agencies to make environmentally and economically sustainable decisions. It is therefore a legal requirement to carry out an EIA before commencement of the proposedproject.

At present there are over twenty (20) institutions and departments which deal with environmental issues in Kenya. Some of the key institutions relevant to the proposed residential development include the National Environmental Council (NEC), National Environmental Management Authority (NEMA), the Kenya Forest Service, and Water Resources Authority (WRA), Directorate of Occupational Safety and Health Services (DOSHS) and others. There are also local and international NGOs involved in environmental issues in the country.

4.4.1 NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

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

- Co-ordinate the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations into development policies, plan, programs and projects with a view to ensuring the proper management and rational utilization of environmental resources on a sustainable basis for the improvement of the quality of human life in Kenya.
- Take stock of the natural resources in Kenya and their utilizations in consultation, with the relevant lead agencies, land use guidelines.
- Examine land use patterns to determine their impact on the quality and quantity of the natural resources.
- Carry out surveys, which will assist in the proper management and conservation of the environment.
- Advise the government on legislative and other measures for the management of the environment or the implementation of relevant international conservation treaties and agreements in the field of environment as the case may be.
- Advise the government on regional and international environmental convention treaties and agreements to which Kenya should be a party and follow up the implementation of such agreements where Kenya is a party.

- Undertake and co-ordinate research, investigation and surveys in the field of environment and collect and disseminate information about the findings of such research, investigation or survey.
- Mobilize and monitor the use of financial and human resources for environmental management.
- Identify projects and programmes or types of projects and programmes, plans and policies for which environmental audit or environmental monitoring must be conductedunder EMCA.
- Initiate and evolve procedures and safeguards for the prevention of accidents, which may cause environmental degradation and evolve remedial measures where accidents occur.
- Monitor and assess activities, including activities being carried out by relevant lead agencies in order to ensure that the environment is not degraded by such activities, environmental management objectives are adhered to and adequate early warning on impeding environmental emergencies is given.
- Undertake, in co-operation with relevant lead agencies programmes intended to enhance environmental education and public awareness about the need for sound environmental management as well as for enlisting public support and encouraging the effort made by other entities in that regard.
- Publish and disseminate manuals, codes or guidelines relating to environmental management and prevention or abatement of environmental degradation.
- Render advice and technical support, where possible to entities engaged in natural resources management and environmental protection so as to enable them to carry out their responsibilities satisfactorily.
- Prepare and issue an annual report on the state of the environment in Kenya and in this regard may direct any lead agency to prepare and submit to it a report on the state of thesector of the environment under the administration of that lead agency and,
- Perform such other functions as government may assign to the Authority or as are incidental or conducive to the exercise by the authority of any or all of the functions provided under EMCA.

However, NEMA mandate is designated to the following committees

4.4.2 NATIONAL ENVIRONMENTAL COMPLAINTS COMMITTEE (NECC)

The NECC'S mission is to facilitate access to environmental justice to the public by providing a forum for environmental conflict resolution and contributing to environmental policy. The Committee performs the following functions:

- Investigate complaints or allegations regarding the condition of the environment in Kenya and suspected cases of environmental degradation.
- The NECC also undertakes public interest litigation on behalf of the citizens in environmental matters.

4.4.3 COUNTY ENVIRONMENT COMMITTEE

The County Environment Committee shall-

a) Be responsible for the proper management of the environment within the county forwhich it is appointed;
b) Develop a county strategic environmental action plan every five years for considerationand adoption by the County Assembly.

Every County Environment Committee, in preparing a county environment plan, shall undertake public participation and take into consideration every other county environment action plan already adopted with a view to achieving consistency among such plans. The respective County Executive Committee members of every county shall submit the county environment action plan to the Cabinet Secretary for incorporation into the national environment action plan.

a) Perform such additional functions as are prescribed by the EMCA (Amendment) Act 2015or as will from to time, be assigned by the county Governor by notice in the Gazette.

4.4.4 NATIONAL ENVIRONMENTAL TRIBUNAL

The tribunal's principal function is to receive, hear and determine appeals arising from decisions of the National Environment Management Authority (NEMA) on issuance, denial or revocation of environmental impact assessment (EIA) licenses, among other decisions.

If disputes with respect to the proposed project arise, the NET will function very much like a court of law.

4.4.5 NATIONAL ENVIRONMENTAL COUNCIL (NEC)

Part III section 4 of the principal Act outlines the establishment of the National Environment Council (NEC). NEC is responsible for policy formulation and directions for purposes of EMCA; sets national goals and objectives, determines policies and priorities for the protection of the environment, promotes co-operation among public departments, county governments, private sector, non-governmental organizations and such other organizations engaged in environmental protection programs. It also performs such other functions as assigned under EMCA.

4.4.6 DIRECTORATE OF OCCUPATIONAL SAFETY AND HEALTH SERVICES (DOSHS)

This is one of departments within the current Ministry of East African Community, Labor and Social Protection, whose primary objective is to ensure safety, health and welfare of all workers in all workplaces. Unsafe and unhealthy work environment causes accidents, diseases, disasters and environmental pollution that occasion huge economic and social burdens to individuals andenterprises thereby stifling economic and social growth.

The Directorate enforces Occupational Safety and Health Act, 2007 (OSHA, 2007) with its subsidiary legislation which aims at prevention of accidents and diseases at work. It also administers the Work Injury Benefits Act, 2007 (WIBA, 2007) which provides for compensation of workers who have been injured or have suffered a disease out of and in the course of employment.

Functions

In fulfilment of its responsibility of identifying hazards at workplaces and assessment of risks with a view of preventing accidents, diseases and damage to property, the Directorate undertakes the following functions;

- Systematic inspection and auditing of workplaces to promote best practices and ensure compliance with safety and health standards as set out in OSHA, 2007 and its subsidiarylegislations.

- Examination and testing of passenger lifts, hoists, cranes, chains and other lifting equipment to ensure their safe use.
- Identification, evaluation and control of biological, chemical, physical, psychosocial, ergonomic and other factors in the work environment which may affect the safety and health of employed persons and the general environment.
- Medical surveillance, including medical examination to monitor and check on the healthstatus of the workers and advise on intervention measures.
- Training and awareness creation on occupational safety and health in order to promotesafety and health culture in the country.
- Ensuring compensation to employees for work related injuries and diseases contractedin the course of their employment in accordance with the provisions of WIBA, 2007.
- Investigation of occupational accidents, dangerous occurrences and cases of occupational diseases with a view to preventing recurrence.

4.5 LEGAL FRAMEWORK

4.5.1 ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT, CAP 387

Section 58.(1) Of the Act states —Notwithstanding any approval, permit or license granted under this Act or any other law in force in Kenya, any person, being a proponent of a project, shall, before financing, commencing, proceeding with, 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.

Relevance to the proposed project

Environmental Management and Coordination Act, Cap 387 provides a legal and institutional framework for the management of the environmental related matters. This report has been written pursuant to section 58 (1) of this Act.

4.5.2 INTEGRATED ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2018

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. It also requires that during the EIA process a proponent shall in consultation with the Authority seek views of persons who may be affected by the project or activity.

Relevance to the proposed project

The proponent and consultants shall seek the views of the project neighbours through PCMs and the use of questionnaires so as to ensure that their concerns are addressed in this report.

4.5.3 WATER QUALITY REGULATIONS (2006)

The Water Quality Regulations (2006) are contained in the Kenya Gazette Supplement No. 68, Legal Notice No. 120. Water Quality Regulations apply to water used for domestic, residential, agricultural, and recreational purposes; water used for fisheries and wildlife

Purposes, and water used for any other purposes. Different standards apply to different modes of usage. These regulations provide for the protection of lakes, rivers, streams, springs, wells and other water sources. It is an offence to contravene the provisions of these regulations with a fine not exceeding five hundred thousand shillings. In addition, of immediate relevance to the proposed project for the purpose of this Project Report is Part II Sections 4-5 as well as Part V Section24.

Part II Section IV states that —Every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution. Part IV Section 24 states that —No person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive wastes, or other pollutants or permit any person to dump any such matter into water meant for fisheries, wildlife, recreational purposes or any other uses. According to these regulations, —Every person shall refrain from any action which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of the Act.

Relevance

All waste water shall be channeled to the main drain so as not to pollute the ground and surface water and if a pollution incidence occurs the contractor/proponent shall notify the authority immediately.

4.5.4 EMCA (WASTE MANAGEMENT) REGULATION, 2006

The Waste Management Regulations (2006) are contained in the Kenya Gazette No. 69, Legal Notice No. 121. The Waste Management Regulations are meant to streamline the handling, transportation and disposal of various types of waste. The aim of the Waste Management

Regulations are to protect human health and the environment. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source. The regulation requires licensing of transporters of wastes and operators of disposal site (sections 7 and 10 respectively). Of immediate relevance to proposed development for the purposes of this project report is Part II Sections 4(1-2), 5 and 6. Section 4 (1) states that

—No person shall dispose of any waste on a public highway, street, road, recreational area or any other public place except in a designated waste receptacle. Section 4(2) and 6 explain that the waste generator must collect, segregate (hazardous waste from non-hazardous) and dispose waste in such a facility that shall be provided by the relevant local authority.

Section 5 provides method of cleaner production (so as to minimize waste generation) which includes the improvement of production processes through conserving raw materials and energy. Section 11 provides that any operator of a disposal site or plant shall apply the relevant provisions on waste treatment under the local government act and regulations to

Ensure that such waste does not present any imminent and substantial danger to the public health, the environment and natural resources.

Section 12 provides that every licensed owner or operator shall carry out an annual environmental audit pursuant to the provision of the act In section 14 (1) every trade or residential undertaking is obliged to install anti- pollution equipment for the treatment of waste emanating from such trade or residential undertaking.

Relevance

The Developer is expected to take all responsibility to ensure that solid waste is properly disposed by a solid waste collection company that has a valid license from the National Environment Management Authority (NEMA).

4.5.5 EMCA (NOISE AND EXCESSIVE VIBRATION POLLUTION CONTROL) REGULATIONS, 2009

These Regulations require that no person or activity shall make or cause to be made anyloud, unreasonable, unnecessary or unusual noise that annoys, disturbs, injures orendangers the comfort, repose, health or safety of others and the environment. Indetermining whether noise is loud, unreasonable, unnecessary or unusual, the followingfactors may be considered:

Time of the day;

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

These regulations also relate noise to its vibration effects and seek to ensure no harmful vibrations are caused by controlling the level of noise. Part II Section 4 state that: except as otherwise provided in these Regulations, no person shall

a) Make or cause to be made excessive vibrations annoys, disturbs, injures or endangers thecomfort, response, health or safety of others and the environment; or
b) Cause to be made excessive vibrations which exceed 0.5 centimeters per second beyond any source property boundary or 30 meters from any moving source.

Part III Section 2 (1) states that any person wishing to a) operate or repair any machinery, motor vehicle, construction equipment, pump, fun, air conditioning apparatus or similar mechanical device; or b) engage in any commercial or residential activity, which is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels provided in the First Schedule to these Regulations. Any person who contravenes this Regulation commits an offence.

Section 13 (1) states that except for the purposes in sub-Regulation (2) hereunder, no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations. These purposes include emergencies, those of domestic nature and/or public utility construction.

Section 14 relates to noise, excessive vibrations from construction, demolition, mining or quarrying site, and state that: where defined work of construction, demolition, mining or quarrying is to be carried out in an area, the Authority may impose on how the work is to be carried out including but not limited to requirements regarding a) machinery that may be used, and b) the permitted levels of noise as stipulated in the Second and Third Schedules to these Regulations.

Relevance

The contractor shall be required to implement these measures, ensure that all machineries are in good working condition to reduce noise. Also, construction activities shall be restricted between 0800Hrs-1700Hrs to ensure that the neighbors are not disturbed.

4.5.6 ENVIRONMENTAL MANAGEMENT AND COORDINATION (AIR QUALITY) REGULATIONS, 2014

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

Relevance

The contractor shall implement the mitigation measures provided in the EMMP to prevent air pollution especially during construction phase.

4.5.7 THE ENERGY (SOLAR WATER HEATING) REGULATIONS, 2012 INSTALLATION AND USE OFSOLAR WATER HEATING SYSTEMS

All premises within the jurisdiction of a local authority with hot water requirements of acapacity exceeding one hundred liters per day shall install and use solar heating systems

A person who contravenes the provisions of this regulation commits an offence and shall, on conviction, be liable to a fine not exceeding one million shillings, or to imprisonment for a term not exceeding one year, or to both.

Responsibility for compliance

1. A developer of a housing estate, a promoter of the construction, an owner of the premises or an Architect or an Engineer engaged in the design or construction of premises shall comply with these Regulations.
2. An owner of premises, Architect and an Engineer engaged in the design, construction, extension or alteration of premises shall incorporate solar water heating systems in all newpremises designs and extensions or alterations to existing premises.
3. An owner or occupier of premises that has a solar water heating system shall use and carry out the necessary operational maintenance and repairs required to keep the installation in good and efficient working condition.
4. An electric power distributor or supplier shall not provide electricity supply to premises where a solar water heating system has not been installed in accordance with these Regulations.

Relevance

In compliance to these regulations solar energy shall be adopted for water heating, water pumping, lighting common areas and cooling systems within the development.

4.5.8 ENVIRONMENTAL MANAGEMENT AND COORDINATION CONTROLLED SUBSTANCES REGULATIONS, 2007 (LEGAL NOTICE NO.73 OF 2007)

The Controlled Substances Regulations defines controlled substances and provides guidance on how to handle them. This regulation mandates NEMA to monitor the activities of persons handling controlled substances, in consultation with relevant line ministries and departments, to ensure compliance with the set requirements. Under these regulations, NEMA will be publishing a list of controlled substances and the quantities of all controlled substances

imported or exported within a particular period. The list will also indicate all persons holding licenses to import or export controlled substances, with their annual permitted allocations.

The regulations stipulate that controlled substances must be clearly labelled with among other words, "Controlled Substance-Not ozone friendly'') to indicate that the substance or product is harmful to the ozone layer. Advertisement of such substances must carry the words, "Warning: Contains chemical materials or substances that deplete or have the potential to deplete the ozone layer."

Producers and/or importers of controlled substances are required to include a material safety data sheet. Persons are prohibited from storing, distributing, transporting or otherwise handling a controlled substance unless the controlled substance is accompanied by a material safety data sheet. Manufacturers, exporters or importers of controlled substances must be licensed by NEMA. Further, any person wishing to dispose of a controlled substance must be authorized by NEMA. The licensee should ensure that the controlled substance is disposed of in an environmentally sound manner. These regulations also apply to any person transporting such controlled substances through Kenya. Such a person is required to obtain a Prior Informed Consent (PIC) permit from NEMA.

4.5.9 ENVIRONMENTAL MANAGEMENT AND COORDINATION (CONSERVATION OF BIODIVERSITYREGULATIONS), 2006

Kenya has a large diversity of ecological zones and habitats including lowland and mountain forests, wooded and open grasslands, semi-arid scrubland, dry woodlands, and inland aquatic, and coastal and marine ecosystems. In addition, a total of 467 lake and wetland habitats are estimated to cover 2.5% of the territory. In order to preserve the country's wildlife, about 8% of Kenya's land area is currently under protection.

The country has established numerous goals, as well as general and specific objectives that relate to these issues, among others: environmental policies and legislations; involvement of communities; documentation of national biological resources; sustainable management and conservation of biodiversity; fair and equitable sharing of benefits; technical and scientific cooperation; biodiversity assessment; dissemination of information; institutional and community capacity building; and integration of biodiversity concerns into development

planning. The proposed project must comply with the various national provisions that aim at the protection and conservation of the country's biodiversity

4.5.10 COUNTY GOVERNMENTS ACT, 2012

This Act vests responsibility upon the County Governments in planning of development projects within their areas of jurisdiction on projects of importance to the local County Government or those of national importance.

Section 102 of the Act provides the principles of planning and development facilitation which include integration of national values in county planning, protect the right to self-fulfillment within the county communities and with responsibility to future generations, protection of rights of minorities and marginalized groups and communities, promotion of equity resource allocation, among others.

Section 103 of the Act outlines the prime objective of county planning which aligned to the bill of rights and the constitution of Kenya.

Section 114 and 115 indicate and give guidelines in planning of projects of national significance and instill the aspect of public participation in every aspect of the planning process through that: clear strategic environmental assessments; clear environmental impact assessment reports; expected development outcomes; and development options and their cost implications. Each county assembly is tasked with the role to develop laws and regulations giving effect to the requirement for effective citizen participation in development planning and performance management within the county.

Relevance to the project

The project proponent has initiated the process of County Government engagement in the initial project planning through application of essential development approvals from Nairobi County Government.

4.5.11 LAND PLANNING ACT CAP 303

Section 9 of the subsidiary legislation (the development and use of land Regulations 1961) under which it requires that before the local Authority to submit any plans to then minister for approval, steps should be taken as may be necessary to acquire the owners of any land affected

by such plans. Particulars of comments and objections made by the landowners should be submitted, which intends to reduce conflict of interest with other socio-economicactivities.

Relevance to the proposed project

The proponent has submitted architectural plans to Nairobi County for approval.

4.5.12 THE LAND ACT, 2012

This is an Act of Parliament to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land-based resources, and for connected purposes. The Land Act of 2012 subsection (1) states that 'any land may be converted from one category to another in accordance with the provisions of this Act or any other written law.' it continues to state in subsection (2) that Without prejudice to the generality of subsection (1)

a) Public land may be converted to private land by alienation

b) Subject to public needs or in the interest of defense, public safety, public order, public morality, public health, or land use planning, public land may be converted to communityland

c) private land may be converted to public land by

- Compulsory acquisition;
- Reversion of leasehold interest to Government after the expiry of a lease; and
- Transfers; or
- Surrender.

d) Community land may be converted to either private or public land in accordance withthe law relating to community land enacted pursuant to Article 63(5) of the Constitution.

It is important to note that any substantial transaction involving the conversion of public land to private land shall require approval by the National Assembly or county assembly as the case may be.

Part I of the same Act states that title to land may be acquired through:

(a) allocation;

(b) land adjudication process;

(c) compulsory acquisition;

(d) prescription;

(e) settlement programs;

(f) transmissions;

(g) transfers; long term leases exceeding twenty-one years created out of private land; or any othermanner prescribed in an Act of Parliament.

Part viii of this ACT provides procedures for compulsory acquisition of interests in land. Section 111 (1) States that if land is acquired compulsorily under this Act, just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. The Act also provides for settlement programmes. Any dispute arising out of any matter provided for under this Act may be referred to the Land and Environment Court for determination.

4.5.13 THE LAND REGISTRATION ACT, 2012

The Land Registration Act is place to revise, consolidate and rationalize the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes. This Act applies to Subject to section 4, this Act shall apply to:

- Registration of interests in all public land as declared by Article 62 of the Constitution;
- Registration of interests in all private land as declared by Article 64 of the Constitution;and
- Registration and recording of community interests in land.

Section 24 states that: (a) the registration of a person as the proprietor of land shall vest in that person the absolute ownership of that land together with all rights and privileges belonging or appurtenant thereto; and (b) the registration of a person as the proprietor of a

lease shall vest in that person the leasehold interest described in the lease, together with all implied and expressed rights and privileges belonging or appurtenant thereto and subject to all implied or expressed agreements, liabilities or incidents of the lease.

4.5.14 THE ENVIRONMENT AND LAND COURT ACT, 2011

This Act is in place to give effect to Article 162(2) (*b*) of the Constitution; to establish a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land, and to make provision for its jurisdiction functions and powers, and for connected purposes.

4.5.15 THE NATIONAL LAND COMMISSION ACT, 2012 (NO. 5 OF 2012)

Section 5 of the Act outlines the Functions of the Commission, pursuant to Article 67(2) of the Constitution as follows 5(1):-

- to manage public land on behalf of the national and county governments;
- to recommend a national land policy to the national government;
- to advise the national government on a comprehensive programme for the registration oftitle in land throughout Kenya;
- to conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities;
- to initiate investigations, on its own initiative .or on a complaint, into present or historicalland injustices, and recommend appropriate redress;
- to encourage the application of traditional dispute resolution mechanisms in land conflicts;
- to assess tax on land and premiums on immovable property in any area designated by law; and To monitor and have oversight responsibilities over land use planning throughout the country.

4.5.16 NATIONAL CONSTRUCTION AUTHORITY REGULATIONS, 2014

The NCA published the National Construction Authority Regulations 2014, the Code of Conduct and Ethics for the Construction Industry, and the NCA Strategic Plan (2015-2020) to effectively regulate the construction industry in Kenya. Contractors operating or willing to undertake construction operations in Kenya are required by law to register through the

National Construction Authority (NCA), which is constituted under Act No. 41 of 2011 Laws of Kenya. The NCA is mandated to clear builders and contractors as a way of eliminating rogue contractors in Kenya and malpractices in the building and construction industry. The Authority has provided the regulatory framework for registration and renewal ofcontractors.

It is tasked with the responsibility of inspecting construction and building projects around the country to ensure high quality of work and close projects posing health risks and collapse hazards.

4.5.17 OCCUPATIONAL SAFETY AND HEALTH LAWS AND REGULATIONS

The following pieces of legislation form the basis for occupational safety and health matters in Kenya:

THE OCCUPATIONAL SAFETY AND HEALTH ACT, NO. 15 OF 2007

His Excellency the President assented into law this Act on 22nd October 2007 and the date of commencement declared as 26th October 2007. This is the main operational law for health and safety in Kenya today.

Duties of the proponent pertaining to safety and health

It is the duty a proponent to:-

a) Ensure absence/elimination of risks at the workplace.

b) Provide information to employees to ensure safety and health at the project site.

c) Carry out the workplace risk assessment and send a copy of the risk assessment to the Directorate of Occupational Safety and Health Services (DOSHS).

d) Stop any hazardous activities.

e) Obtain a certificate of registration of a workplace with the Directorate of Occupational Safety and Health Services.

f) Prepare safety & health policy and submit a copy to the Directorate of Occupational Safety and Health Services.

g) Bring the content of the safety and health policy statement to the attention of employees.

h) Prevent environmental pollution

i) Send notice of accident occurrence, cases of occupational diseases and dangerous occurrence to DOSHS

j) To have the architectural plans of the project site approved by the Directorate of Occupational Safety and Health Services before construction activities commence.

In approving the plans Directorate of Occupational Safety and Health Services will among other requirements ensure that:

- Space defining machine layout for intended use by operators will be within statutory limits
- Emergency exits are provided for and are designed to open in accordance to statutory requirements
- Sanitary conveniences are provided for with adequacy as to number of intended employees and are designed to have separate approaches
- First aid facilities like first aid room(s) are provided for,
- There is provision for adequate ventilation
- There is provision for storage of firefighting water storage tank with acapacity of at least 10,000 liters

k) Ensure that no employee is discriminated against by virtue of:-

- Lodging a complaint about an unsafe condition at the workplace
- Being an active member of a health safety committee.

l) Establish a health and safety committee whose composition should be in accordance to the (Health and Safety Committees) Rules L.N. 31of 2004, if he will employ 20 or more employees.

m) Carry out workplace health and safety audit on an annual basis.

WORK INJURY BENEFITS ACT, NO. 17 OF 2007

This law was assented to by His Excellency the President on 22nd October 2007. Various sections in this law were nullified by the high court as they were found to be unconstitutional. This is an act of parliament designed to provide for compensation to employees for work-related injuries and diseases contracted in the course employment andfor connected purposes. This is the law whose enactment led to the demise of the WorkmenCompensation Act Cap 236.

Relevance to the proposed project

The contractor as the employer has a duty provide for compensation to employees for work related injuries and diseases contracted in the course of their employment at the construction site.

Rules and Regulations

The following rules have been promulgated by the Minister for Labour as provided for in the statues in the furtherance of the safety & health agenda in various applicable workplaces, processes, occupations and branches of the economy; construction sites inclusive:

SAFETY & HEALTH COMMITTEE RULES, 2004 LEGAL NOTICE NO. 31

These rules apply in all workplaces where The Occupational Safety and Health , No. 15 of 2007 applies.

These rules are described in Legal Notice No. 31 of the Kenya Gazette Supplement No. 25 of 14th May 2004. The rules apply to all places work that regularly employs twenty or more employees. Among other items, the rules state that:

- The occupier of every workplace shall establish a health and safety committee;
- The committee shall consist of safety representatives from the management and the workers;
- Every member of the Health and Safety Committee shall undertake a prescribed basic training course in occupational health and safety within a period of six months from the date of appointment or election, and thereafter further training from time to time; The Legal Notice also describes the functions and duties of the health and safety committee, the purpose of meetings and recording minutes, and the roles of the office bearers. It furtherdescribes the duties of the occupier and those of the Health and Safety Adviser.

Relevance to the proposed project

This Subsidiary legislation require the contractor to form a safety and health committee to oversee safety and health on site while construction activities on site are ongoing

FIRST AID RULES, 1977 LEGAL NOTICE NO. 160

These rules outline first-aid box content with respect to size of a workplace and under whose charge the first-aid box should be placed.

Relevance to the proposed project

During all phases of the project provision of first aid is a requirement and the rules will be useful in this regard in catering for injuries sustained on site and workplace.

EYE PROTECTION RULES LEGAL NOTICE NO. 44 OF 1978

The rules were developed for purposes of eye safety in workplaces. Processes where eye protection is required include blasting, cleaning, chipping, metal cutting, arc welding, abrasive wheel use (grinding).

Relevance to the proposed project

During the construction phase, work activities requiring eye protection will be a common feature. The rules will provide a good platform for ensuring eye safety of the workers involved in the stated activities

ELECTRIC POWER(SPECIAL) RULES, 1979 LEGAL NOTICE NO. 340

The rules were developed to provide for electrical safety with regards to electrical power installations, use and handling. These rules apply to generation, transformation, conversion, switching, controlling, regulating, distribution and use of electricity.

BUILDING OPERATIONS AND WORKS OF ENGINEERING CONSTRUCTION RULES, 1984 LEGAL NOTICE NO. 40

These rules provide for the safety, health and welfare of workers in construction sites.

Relevance to the proposed project

The contractor will be expected to ensure safety, health and welfare of workers and all persons lawfully present at the construction site

MEDICAL EXAMINATION RULES, 2007 LEGAL NOTICE NO. 24

The rules apply to workplaces of classified hazards. Every employer has to ensure medical examination of workers in the workplaces of classified hazards.

Relevance to the proposed project

During the construction phase there will be noise emission, exposure to dusts and fumes (cement, soil, welding fumes etc.) and exposure to musculoskeletal hazards. Exposure to the said hazards will require statutory medical examination on the victims.

NOISE PREVENTION AND CONTROL RULES, 2005. LEGAL NOTICE NO. 25

Kenya's Noise Prevention and Control Rules were passed under Legal Notice No. 25 dated 2005, as a subsidiary legislation of the now repealed Places of Work Act, Cap. 514. The rules state that '*No worker shall be exposed to noise level excess of the continuous equivalent of 90 dB(A) for more than 8 hours within any 24 hours duration*'.

Relevance to the proposed project

During the construction phase there is likely to be noise emission in excess of 90 dB(A) requiring the invoking of these rules to provide for the safety with regards to noise. The rules will guide the contractor in protecting the workers from effects of high noise levels.

4.5.18 THE STANDARDS ACT CAP. 496

The Act is meant to promote the standardization of the specification of commodities, and to provide for the standardization of commodities and codes of practice; to establish a Kenya Bureau of Standards, to define its functions and provide for its management and control. Code of practice is interpreted in the Act as a set of rules relating to the methods to be applied or the procedure to be adopted in connection with the construction, installation, testing, sampling, operation or use of any article, apparatus, instrument, device or process.

4.5.19 PUBLIC ROADS AND ROADS OF ACCESS ACT (CAP. 399)

Sections 8 and 9 of the Act provides for the dedication, conversion or alignment of public travel lines including construction of access roads adjacent lands from the nearest part of a pubic road. Section 10 and 11 allows for notices to be served on the adjacent land owners seeking permission to construct the respective roads.

4.5.20 WATER ACT, 2016

This Act of Parliament provides for the management, conservation, use and control of water resources and for the acquisition and regulation of rights to use water; to provide for the regulation and management of water supply and sewerage services; to repeal the Water Act (Cap. 372) and certain provisions of the Local Government Act. Section 25 (1) states that a permit shall be required for any of the following purposes: —

(a) Any use of water from a water resource, except as provided by section 26;

(b) The drainage of any swamp or other land;

(c) The discharge of a pollutant into any water resource;

(d) Any purpose, to be carried out in or in relation to a water resource, which is prescribed by rules made under this Act to be a purpose for which a permit is required.

4.5.21 PHYSICAL AND LAND USE PLANNING ACT, 2019

The government, at both national and county level, is tasked with the preparation of physical and land use plans. The national, county, inter-county and local plans are required to be integrated, and these plans shall collectively form the basis of how land is to be used in Kenya.

County governments to control development in their respective counties. All applications for development permission shall be made in the relevant county.

Permission must be sought prior to undertaking any development. A developer who does not obtain such prior permission risks criminal sanctions and demolition of the unapproved works.

Members of the public are given the opportunity to give their views and raise objections to various matters e.g. the suitability of the national and county plans.

The Act lists developments that require development permission. In this regard, developments such as subdivision, amalgamation, change of user, extension of user, extension of lease and approval of building plans require development permission to be issued by the relevant county government.

Processing of easements and wayleaves require express development permission, as siting of educational institutions, base transmission stations, petrol stations, eco lodges, campsites, power generation plants and factories.

Development permission in respect of commercial and industrial use is a pre-requisite for other licensing authorities granting a license for a commercial or industrial use, or occupation of land.

Relevance to the proposed project

The Proposed Project shall seek approval from the Physical Planning Department.

4.5.22 COUNTY GOVERNMENTS ACT

The Act empowers county governments to protect the environment and natural resources with a view to establishing a durable and sustainable system of development. In addition, the county governments are responsible for development planning and control including the county spatial plans.

Relevance to the proposed project

The proponent will work in liaison with Nairobi County Government to ensure compliance with land use requirements within the county.

4.5.23 THE PENAL CODE (CAP. 63)

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

Relevance to the proposed project

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

4.5.24 THE TRAFFIC ACT, 2012

The Traffic Act, 2012 gives provisions and guidelines that govern the Kenya roads transport sector. These guidelines are essential to private, public and commercial service vehicles in ensuring safety and sanity on the roads hence ensuring the environment; the human being a component is safeguarded. In section 41 The Act demands for installation and certification of speed governors for the commercial vehicles ferrying goods adjusted to the loading condition of such vehicles to a limit of 80 KPH, registration and competence of drivers.

Moreover, the owner of commercial vehicles or trailer shall ensure clear markings on their vehicles in English language on the right side of the vehicle showing ownership details, tare weight of vehicle and maximum authorized weight.

Section 26 and 27 of the same discourages engines that emit exhaust gases to the atmosphere without passing via a silencer or expansion chamber

In ensuring safety of all the persons in transit section 56 encourages that every public and commercial vehicle be fitted with inspected and first class first aid box and fire extinguisher. In ensuring compliance to this Act the contractor and developer shall ensure that all site drivers and all material suppliers to the site satisfy the provisions as stipulated in Act.

4.5.25 PERSONS WITH DISABILITY ACT (PWD), 2003

Kenya has a Person with Disabilities Act (PWD), 2003 which is a comprehensive law coveringrights, rehabilitation and equal opportunities for people with disabilities.

- It creates the National Council of Persons with Disabilities as a statutory organ to overseethe welfare of persons with disabilities.
- The Act aims to ensure that Persons with Disabilities' issues and concerns are mainstreamed.
- Requires establishment of DMCs in all public institutions

Section 21 of this Act entitles Persons with disabilities ‘to a barrier-free and disability- friendly environment to enable them to have access to buildings, roads and other social amenities, and assistive devices and other equipment to promote their mobility’.

The Proponent shall ensure that the main contractor adopts implements and mainstream PWD Provisions throughout the project phases.

4.5.26 PUBLIC HEALTH ACT (CAP. 242)

Part IX, section 115, of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires that County governments take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 as waste pipes, sewers, drainers or refuse pits in such state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health.

4.5.27 BUILDING CODE 2000

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

CHAPTER 5 PUBLIC PARTICIPATION

5.1 INTRODUCTION

Public consultation and participation process is a policy requirement by the Government of Kenya and a mandatory procedure as stipulated by EMCA 1999 section 58, on Environmental Impact Assessment for the purpose of achieving the fundamental principles of sustainable development. Therefore, the chapter describes the process undertaken in the public consultation and public participation followed to identify the key issues and impacts of the proposed the residential development in Nairobi County. The objective of the consultation and public participation was to:

- Disseminate and inform the stakeholders about the project with Special reference to its key components and location.
- Gather comments, suggestions and concerns of the interested and affected parties about the project.
- Incorporate the information collected in the ESIA study

In addition, the process enabled,

- The establishment of a communication channel between the general public and the team of consultants, the project proponents and the Government.
- The concerns of the stakeholders be known to the decision-making bodies at an early phase of project development.

5.2 METHODOLOGY USED IN PUBLIC CONSULTATION

The exercise was conducted by a team of experienced registered environmental experts. The following process in carrying out the entire process involved:

- Key informant interviews and discussions
- Public barazas
- Field surveys, photography and observations

CPP questionnaires The use of pre-designed questionnaires captured all the phases of the proposed development The purpose for such interviews and barazas was to identify the positive and negative impacts and subsequently identify proposals for the best practices to be adopted to mitigate the negative impacts. It also facilitated the in identification any other miscellaneous issues, which may bring conflicts in case project implementation proceeds as planned. The information gathered identified specific issues from the stakeholders' response, which provided the basis for undertaking the Environmental Impact Assessment process.

Plate 9: Poster within the project inviting the public for a PCM

Plate 10: PCM within the project site.

Plate 11: PCM within the project site.

5.3 CONSULTED STAKEHOLDERS

Two physical public consultations were conducted at the project site and more consultations were done through zoom meetings, questionnaires and emails. Stakeholders identified were grouped into two categories:

- **Primary Stakeholders** - The directly affected by the project such as Landowner nearby neighbours to the parcel of land that include members of the public and tenants.
- **Secondary Stakeholders** - The indirectly affected by the project but influence development through project implementation. These include the project proponent, Government line ministries (Ministry of housing and public works), County Government Nairobi CO-Environment, Planning and Public Works) and Local administration

Most of the respondents had no objection to the project because of the various advantages associated with such project but also indicated of the need the government to look into infrastructure including roads, water, electricity, sewer, and surface runoff.

5.4 VIEWS EXPRESSED

From the field work surveys it was apparent that the proposed development was received with mixed reactions by the interviewed people as they anticipated numerous impacts both negative and positive alike. The local community people, neighbors, and major stakeholders independently gave their views, opinions, and suggestions.

5.4.1 POSITIVE VIEWS EXPRESSED

5.4.1.1 EMPLOYMENT OPPORTUNITIES

The respondents interviewed were optimistic that the project will create numerous employment opportunities for both for skilled and unskilled labour alike from the construction phase to the operational phase. Despite the fact that most of the project will need skilled labor force, some of those interviewed expressed hope that they will be able to access employment once the project commences mostly as casual workers. This will be a source of income for several individuals and households and hence is expected to boost the GDP and improve the living standards of the local people.

5.4.1.2 ECONOMIC GROWTH

The use of locally available materials during the construction phase of the proposed residential development such as cement, building blocks concrete and ceramic tiles, timber, sand, ballast electrical cables etc., will enhance the growth of the economy as well as the living conditions of the business enterprises trade on these construction materials. The consumption of these materials, fuel oil and others will attract taxes including VAT which will be payable to the government hence increased government revenue.

5.4.1.3 INCREASED BUSINESS OPPORTUNITIES

Those with businesses along and around the area were optimistic that the increased number of visitors and customers in the area will result in an increased customer base to their business enterprises. According to them, the number of customers will increase from the construction workers, the security and maintenance personnel including visitors who will be visiting the residential housing development during its operation phase.

IMPACT	DISCUSSION
Employment opportunities for the locals	The respondents were positive that the project would create numerous employment opportunities for both skilled and unskilled labour alike, during the construction and operational phases. Even though most of the works would need skilled labour force during construction, people expressed hope that they would be able to access

	employment once project commences mostly as casual workers. The respondents were also optimistic that they would take up relevant training to take up jobs during construction stage.
Poverty Alleviation	The respondents were positive that the proposed development activities would reduce poverty in the area and its environs due to improved income brought about by employment.
Increased Business Opportunities	The respondents and participants were optimistic that business opportunities would arise during construction of the Development
Increase in land value	Land rent and standard of living of the populace will increase due to high demand for space for urban development thus increasing the value of land and property within and surrounding.
Attraction of investors	With the proposed development, investors will be attracted to invest their money in the proposed development through enterprises, business, residence among others
Development of Infrastructure and Social Amenities in the Area	Respondents were optimistic that the proposed development activities would improve infrastructure in the area.
Improved and Accessible Education	The respondents were optimistic that the proposed development activities would improve the value of education in the area and accessibility to research institutes
Better Healthcare	Respondents were positive that the proposed development activities will improve health services in the area and it will reduce fatalities from curable diseases.
Improved Water Supply	The participants were optimistic that the proposed boreholes for water extraction would improve the availability of water in the area
Improved Electricity Facilities	The participants were optimistic that the proposed connections to Kenya Power and Solar Power would improve the availability of electricity in the area.

Improved Security	The respondents were optimistic that the proposed development activities will lead to improved security situation in the neighborhood due to the numbers that will reside in the areas
Housing amenities availability	The respondents were positive that the proposed residential apartment would boost availability of improved housing conditions in the area
Transfer of Skills	The members of the public suggested that with the project being a source of employment. Many different skilled workers would be employed from within and without the area. This would lead to a transfer of skills and gaining of experience during the implementation phase.
Economic Growth / Increased revenue	The use of locally available materials and labour for the proposed development activities will contribute towards growth of the local and national economies by contributing to the gross domestic product.
Improve Networking and Culture Exchange	The development will attract various people from different counties and countries and this will promote cultural integration of knowledge and exchange of a wide range of ideas.

Table 1:Positive Concerns

5.4.2 NEGATIVE CONCERNS EXPRESSED

5.4.2.1DUST EMISSIONS

The people expressed concern over possibility of generation of large amount of dust and exhaust fumes within the project site and surrounding areas as a result of construction works and transportation of construction materials. The proponent shall ensure that dust levels at the site are minimized through implementation of dust abatement techniques on unpaved, un-vegetated surfaces to minimize windblown erosion. Sprinkling water in areas being constructed and along the tracks used by the transport trucks and diversions within the site will be done. Additional mitigation measures presented within the EMP will be fully implemented to minimize the impacts of dust generation.

5.4.2.2 NOISE AND VIBRATION POLLUTION

The residents expressed their fears over noise pollution that would come from the construction works and the vehicles during the operation phase. They requested the proponent to use minimum noise producing machines and to reduce the duration of idling of vehicles making deliveries. Residents were informed that maximum permissible noise levels as per the EMCA (Noise and Excessive Vibration Pollution Control) Regulations 2008 would be observed during the construction phase. It is also recommended that quieter construction machines such as jack-in piling machines, which generate about 20 dB (A) less noise than bore piling machines be utilized. It is also recommended that the proponent consider using noise control equipment such perimeter noise barriers, which can reduce noise by 5 dB (A) to 10 dB (A). These measures will be effective in reducing construction noise, when used as part of a good noise management system.

5.4.2.3 SOLID WASTE GENERATION

Some of the excavation spoil material will be rendered unusable and thus will have to be disposed of. This also applies to some of the soil/rocks, which may not be reusable after excavation processes are complete. All these materials need to be collected, transported and disposed of appropriately in approved designated areas. It is encouraged that other alternative uses of these materials should be found e.g. filling excavated areas at the site. During construction and the operational phase, designated areas for waste collection will be provided and the solid wastes will be disposed of by a NEMA registered Waste operator.

IMPACT	DISCUSSION
Noise Pollution and Vibrations	The residents expressed fear over noise and vibrations likely to occur during the execution of the project. They highlighted construction equipment and other moving machines in the construction sites
Air Pollution	The people expressed concern over the possibility of generation of large amount of dust and fumes within the execution stage of the project. They noted that surrounding areas might encounter air pollution from excavation works and transportation of construction materials and industries.
Water Pollution	The residents feared that execution of the project would lead to increased population in the area, the natural water ways would be polluted through sewage effluent and water waste water from the construction process if not adequately managed.
Increased pressure on infrastructure	Some participants were concerned that due to magnitude of the proposed project, its execution will increase pressure on existing infrastructure such as roads, water supply system, waste handling facilities, electricity etc. This would be due to increased volumes on human and vehicle traffic along the access road.
Interference of Existing Development Infrastructure	The respondents also claimed that the execution of the proposed project would interfere with already existing infrastructure such as the pipeline, water pipes, power lines, roads and thus cause inconveniences.
Displacement of the site residents	The participants were worried that the proposed development activities would lead to displacement of those residing within the project site
The non-skilled are unlikely to get jobs	Respondents were concerned that only the skilled would have jobs leaving out the unskilled who are the majority in the area
Increased Insecurity	There were concerns that due to an influx of many people during project execution phase, insecurity is likely to increase.
Dust Generation	The public expressed concerns over the possibility of generation of large amounts of dust within the project site and surrounding areas because of demolition, excavation works and transportation of building materials

Loss of Vegetation Cover	Members of the public expressed concerns that during the construction phase of the project, there would be clearance of vegetation, which would lead to the negative impacts. The clearance of vegetation would affect the scenic beauty and ecological functioning of these sensitive areas. Also, the clearance of vegetation would have impacts on the soil particularly increased soil loss which subsequently might impact on the water quality and ecosystem productivity.
Increase in the spread of STD, HIV and AIDS	The residents expressed concern that there would be an increase in incidences of sexually transmitted diseases including HIV and AIDS during construction and operational phase as a result of increased interactions
Competition for resources and other utilities	The respondents feared that the proposed project would attract a high population in the area which would result to increased demand of shared resources and other utilities. This is feared to bring about competition of resources against the increasing population

Table 2:Negative Concerns

CHAPTER 6: POTENTIAL ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES

6.1 INTRODUCTION

The environmental baseline information and the project characteristics discussed earlier, form the basis for impact identification and evaluation. The potential impacts expected impacts from the project could either be termed as positive, negative, direct, indirect, short- term, long-term, temporary, and permanent depending on their area of impact and their stay in the environment. This assessment is done for all the project phase namely; constructions, operational and decommissioning phases.

6.2 CONSTRUCTION PHASE

6.2.1 POSITIVE IMPACTS

6.2.1.1 EMPLOYMENT OPPORTUNITIES

During the construction phase, job opportunities to both skilled and casual workers will be available. Several workers including casual labourers, masons, carpenters, joiners, electricians and plumbers are expected to work on the project site from the project start period to its completion date. Apart from casual labour, semi-skilled and unskilled labour and formal employees are equally expected to obtain gainful employment opportunities during the project construction phase.

6.2.1.2 GAINS IN THE LOCAL AND NATIONAL ECONOMY

The proposed project will improve income/economic status of people within the project neighborhood. There will be gains in the local and national economy. Through consumption of locally available building materials including: concrete tiles, timber and cement. The consumption of these materials, fuel oil and others will attract taxes including VAT which will be payable to the government. The cost of the materials will be payable directly to the producers.

6.2.1.3 INCREASED BUSINESS WITHIN THE SURROUNDING

The construction crew will buy various commodities from the neighboring business premises. This would boost to some extend the businesses of the concerned people and hence of their families.

6.2.1.4 OPTIMAL LAND USE

The public interviewed were optimistic that the implementation of the proposed project will lead to opening up the area by adding more residential space that ensures optimal land use as compared to the current use or any perceived future use of the said plot.

6.2.2 NEGATIVE IMPACTS

6.2.2.1 NOISE POLLUTION

The construction works will most likely be a noisy operation due to the moving machines (mixers, tippers, communicating workers) and incoming vehicles to deliver construction materials and workers to site. To be affected mostly are neighboring residents and the site workers since noise beyond the legally stipulated limit in the principal environmental act level is itself a nuisance.

Construction activities often take place outside fields where they can be affected by weather, wind tunnels, topography, atmosphere and landscaping. Construction noise makers, e.g., heavy earth moving equipment, can move from location to location and is likely to vary considerably in its intensity throughout a work day. As a rule, engineering and administrative controls should always be the preferred method of reducing noise levels on worksites. Only, when these controls are proven unfeasible, earplugs as a permanent solution should be considered.

Engineering controls modify the equipment or the work area to make it quieter. Examples of engineering controls are: substituting existing equipment with quieter equipment; retro-fitting existing equipment with damping materials, mufflers, or enclosures; erecting barriers; and maintenance.

Administrative Controls are management decisions on work activities, work rotation and work load to reduce workers' exposure to high noise levels. Typical management decisions that reduce worker exposures to noise are: moving workers away from the noise source; restricting access to areas; rotating workers performing noisy tasks; and shutting down noisy equipment when not they not operational.

Personal Protective Equipment Earplugs are the typical PPE given to workers to reduce their exposure to noise. Earplugs are the control of last resort and should only be provided when other means of noise controls are infeasible. As a general rule, workers should be using earplugs

whenever they are exposed to noise levels of 85 Db or when they have to shout in order to communicate.

Noise impacts would be considered significant if the project would result in the following:

- Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- Exposure of persons to, or generation of, excessive ground-borne vibration or ground-borne noise levels.
- A substantial permanent increase in ambient noise levels (more than five DBA) in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. The proponents shall put in place several measures that will mitigate noise pollution arising during the construction phase.

The following noise-suppression techniques will be employed to minimize the impact of temporary construction noise at the project site:

6.2.2.2 QUIETER EQUIPMENT

A cost-effective way to reduce noise at a construction worksite is to lease or hire quiet machinery equipment. In addition, the equipment in use should be the most suitable for the job. The proponent should avoid the use of equipment that is over-powered or those under powered. Whenever feasible the quietest alternative equipment should be used. In general, electronic powered machinery equipment are quieter than diesel powered equipment and hydraulically powered equipment are equally quieter than pneumatic power.

6.2.2.3 MODIFYING EXISTING OLD EQUIPMENT

The most common way to reduce the noise levels of the most common construction equipment is through worksite modifications. Some common worksite modifications include fixing existing equipment with dumping materials and mufflers.

6.2.2.4 BARRIER PROTECTION

An effective way of reducing noise is to locate noisy equipment behind purpose-built barriers. The barriers can be constructed on the work site from common construction building material (plywood, block, stacks or spoils) or the barriers can be constructed from commercial panels

which are lined with sound absorbing material to achieve the maximum shielding effect possible. The noise source should not be visible and barrier should be located as close as possible to either the noise source or the receiver.

6.2.2.5 WORK ACTIVITY SCHEDULING

Work activity scheduling are administrative means to control noise exposure. Planning how noise sources are sited and organized on a work site can reduce noise hazards. Whenever possible, stationary noise sources like generators and compressors should be positioned as far as possible from noise sensitive receivers (workers, schools, residential buildings). When possible, stacks, spoils, and other construction material can be placed or stored around noise sources to reduce the hazard to receivers.

Transferring workers from a high exposure task to a lower exposure task could make the employee's daily noise exposure acceptable. Administrative controls include activity planning, for example, scheduling operations so as to reduce the number of work site workers are exposed to. In addition, noisy equipment should not be run for periods longer than necessary and should be switched off when not in use.

6.2.2.6 DISPOSAL OF EXCAVATED REJECTED/ UNUSABLE MATERIALS

Excavation works on the project site will be extensive due to the relative scale of the project and significant amount of spoil material that will be generated. Most of the excavated soil will be utilized on site to adjust levels and as back filling where necessary and the rest shall be disposed in authorized disposal sites. Procurement procedures that encourage the purchase of substandard materials that may be rendered unusable should be avoided. Any rejected material onsite will be sold to recyclers of the same where possible or donated to individuals or institutions who may utilize them. If none of these options are viable then, the rejected material will be collected for disposal by a NEMA registered waste handler to ensure proper disposal.

6.2.2.7 SOLID WASTE GENERATION

During construction solid waste will be generated. These include papers used for packing cement, plastics and timber remains among others. Dumping around the site will interfere with the aesthetic status of the area. This has a direct effect on the surrounding community. Disposal of the same solid wastes off-site could also be a social inconvenience if done in the wrong places. The off-site effects could be aesthetic interference, pest breeding, pollution of physical

environment, invasion by scavengers and informal recycling communities. It is recommended that demolition and construction waste be recycled or reused to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses. In this regard, where possible, the proponent shall ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed of. In addition, upon completion of the project, damaged or wasted construction materials including cabinets, doors, plumbing and lighting fixtures, marble and glass will be recovered for refurbishing and use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents or homeowners.

The proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal.

Additional recommendations for minimization of solid waste during construction of the project include:

- Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements
- Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste
- Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials

6.2.3 IMPACTS RELATED TO OCCUPATIONAL HEALTH AND SAFETY

6.2.3.1 PRE-CONSTRUCTION/PLANNING PHASE

i. Approval of Architectural Plans

Pursuant to section 125 of OSHA, 2007, no building shall be erected or converted for use as a workplace and no structural alteration and no extension shall be made to any existing workplace except in accordance with plans showing details of the proposed construction, conversion, alteration or extension, approved by the Director of Occupational Safety and Health Services.

The proponent will ensure arrangements are made for submission of the architectural plans for approval at the offices of the Directorate of Occupational Safety and Health Services before commencement of construction. Upon satisfaction that the plans provide for suitable premises for use of a workplace of the type proposed, an approval for such plans will be issued by the Directorate of Occupational Safety and Health Services.

ii. Notification of Building Operations and Works of Engineering Construction

It is required of the contractor engaged by the proponent to give notice, in a prescribed form, of the building operations and works of engineering construction at least 10 days before commencement of the construction phase of the project to the Directorate of Occupational Safety and Health Services. This is a provision in the Building Operations and Works of Engineering Construction Rules, 1984 Legal Notice No.40.

Upon receipt of the notice, the Director of Occupational Safety and Health Services shall take such steps as may be necessary to satisfy himself that the site is suitable for use as a workplace of the nature stated in the notice, and upon being so satisfied, shall cause the site to be registered and shall issue to the applicant (the contractor in this case), upon payment of a prescribed fee, a certificate of registration which is renewable annually until the construction phase is over.

6.2.3.2 CONSTRUCTION PHASE

The proponent will set it out as preconditions for every contractor to adhere to during award of the contract so that aspects of occupational safety and health are factored in financial allocations. During the construction, the contractor is expected to adhere to the requirements in the following table so as to uphold safety, health and welfare of persons employed at the site.

The Table below shows the requirements to be adhered to during the construction phase of the project

Requirement	Relevant clause in the Law
1. Appoint a Site Safety Supervisor	Legal Notice No.40 of 1984
2. Provide Personal Protective and Equipment (PPE) tosite workers i.e. a) Helmets/hard hats for head protection b) Goggles/shields for eye protection whennecessary c) Ear protection (ear muffs or ear plugs) for thoseworkers exposed to high noise levels d) Dust masks/respirators for protection frominhalation of air contaminants when necessary e) Body protection (overalls, reflector jackets oraprons as appropriate) f) Gloves for hand protection when necessary g) Foot protection (safety boots or safetyshoes) h) Safety harnesses, when necessary, for prevention of falls from height	Legal Notice No.40 of 1984 as read together with Section 101 of OSHA, 2007
3. Acquire and display at a prominent place within site offices an abstract of Building Operations and Worksof Engineering Construction Rules.	Section 121 of OSHA, 2007
4. Acquire and maintain a General Register	Section 122 of OSHA, 2007
5. Develop an occupational safety and health policy and ensure all workers are informed of its content.	Legal Notice No.31 of 2004 as read together with Section 7 of OSHA, 2007
6. Undertake the risk assessment exercise, compile a report and submit a copy to the Directorate of Occupational Safety and Health Services.	Section 6 of OSHA, 2007

7. Form a workplace Safety and Health Committee and have it trained on matters relating to OccupationalSafety and Health.	Legal Notice No.31 of 2004 as read together with Section 9 of OSHA, 2007
8. Provide first aid i.e. a) Appoint and train using a government recognizedtrainer, first aiders b) Provide and maintain, to the prescribed standard, first aid box(es)/cupboards c) Provide and maintain a stretcher d) Provide and maintain a first aid room	Legal Notice No. 160 of 1977 as read together with Section 95 of OSHA, 2007
9. Ensure safe Housekeeping by:- a) Placing barrier tapes around pits, excavations andareas where construction works are ongoing b) Designating walkways and driveways for site safe movement. c) Neat arrangement of site material like timber, iron rods, cement, boards, used materials etc.	Legal Notice No.40 of 1984 as read together with Section 77 of OSHA, 2007
10. Ensure safety of workers at height by:- a) Providing and maintaining safe work platforms ofthe standards prescribed b) Providing and maintaining safe scaffolds of the standards prescribed c) Providing and maintaining safe harnesses d) Development of a permit to work document to be used risky work at height e) e) Providing and maintaining safe ladders	Legal Notice No. 40 of 1984
11. Protect workers from adverse weather conditions by providing and maintaining adequate shelter atthe site.	Legal Notice No.40 of 1984
12. Ensure medical examination is done to workersexposed to classified hazards e.g. excessive noise levels, hazardous dusts, chemicals, radiation etc.	Legal Notice No.24 of 2005

13. Cause the safety and health audit of the constructionworks to be conducted on an annual basis	Legal Notice No.31 of 2004 as read together with section11 of OSHA,2007
14. Cause the fire safety audit of the construction works to be conducted on an annual basis	Legal Notice No.59 of 2007
15. Provide adequate and suitable sanitary conveniences to all persons employed	Section 52 of OSHA, 2007
Provide and maintain fire safety at site and campby:- a) Providing firefighting appliances and instructionworkers in their use b) Conducting fire drills as necessary c) Providing a documented fire emergency procedure d) Ensuring proper storage of highly flammable materials	Legal Notice No.59 of 2007 as read together with sections 78, 81 and 82 of OSHA, 2007
Ensure general welfare provisions to site workersby:- a) Providing clean wholesome drinking water b) Providing washing facilities c) Providing accommodation for clothing not wornduring working hours	Sections 91, 92 and 93 of OSHA, 2007
18. Ensure plant and machinery safety at the site by:- a) Ensuring proper maintenance and repair of plant and machinery b) Guarding, fencing and encasing of dangerous parts, whichever the case may be, of plant and machinery c) Ensuring prescribed statutory examinations are carried out on plants e.g. cranes, air receiver etc. at prescribed intervals	Section 55 and 72 of OSHA, 2007
19. Notify occurrence of accidents and incidents to the Directorate of Occupational Safety and Health Services and ensure compensation when work injuries occur.	Section 31 of OSHA, 2007 and WIBA,2007

Table 3: Requirements to be adhered to during the construction phase of the project

6.2.3.3 OCCUPATIONAL AND PUBLIC HEALTH AND SAFETY

During construction, the movement of construction material may result in accidents if good supervision is not provided. Accidental cuts and bruises are common among construction workers as a result the use machinery and hand tools, an impact that needs careful consideration. Requiring similar attention are, flammable liquids such as fuels and lubricants, which at some point of the project cycle will be stored at the site for use in vehicles and construction equipment. Leakage or spillage of such substances may result in fires that may cause considerable losses in terms of injury to persons and damage to property. These may also occur at any time during construction, decommissioning and operational stages of project, safety risks resulting from any leftover electrical cables, uncovered manholes and steel structures. These may cause injury to passers-by if this phase is not well handled.

Adequate collection and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated areas shall be provided. In addition, the proponent is committed to adherence to the occupational health and safety rules and regulations stipulated in Occupational Health and Safety Act, 2007.

Other measures that will be implemented will include:

- The workers, immediate neighbors and other stakeholders should be sensitized on the dangers and risk associated with the construction works for enhanced self-responsibilityon personal safety.
- Appropriate sanitation conveniences should be provided at the site as required in the OSHA, 2007 and echoed in the Public Health Act.
- The proponent should ensure that the completed buildings are fitted with safety facilities including fire detectors, firefighting equipment, fire exits, adequate access and buffer between the residential developments.

6.3 OPERATIONAL PHASE

6.3.1 POSITIVE IMPACTS

6.3.3.1 EMPLOYMENT CREATION

Employment opportunities are one of the long-term major impacts of the proposed residential development that will be realized after the construction phase and during the operation and maintenance of the facility.

6.3.3.2 OPTIMAL USE OF LAND

By building the homes the design has incorporated an optimal use of the available land. Land is a scarce resource in Kenya and through construction of the proposed homes shall ensure optimal use of land.

6.3.3.3 INCORPORATION OF COLLECTIVE WASTE MANAGEMENT

The project is designed such that there will be provision of a designated spot for the dumping of garbage which is well protected from rain and animals. These wastes will thus be collected from the site in bulk and as one unit such that the careless disposal and hence proliferation of wastes within the surrounding areas will be curbed.

6.3.2 NEGATIVE IMPACTS

6.3.2.1 INCREASED PRESSURE ON INFRASTRUCTURE

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

6.3.2.2 VECTOR BREEDING GROUNDS

The proponent will put in place efficient storm water and waste management systems that will prevent the accumulation of rain water and uncontrolled waste, as well as an efficient collection system and off-site disposal.

However, if the project does not have well designed storm water drains, the rain water may end up stagnating and hence creating conducive breeding areas for mosquitoes and other water-based vectors which may lead to human diseases like malaria.

Poor solid waste management practices may also lead breeding grounds for pests such as rats and other scavenging animals.

6.3.2.3 SOLID WASTE GENERATION

The project is expected to generate solid waste during its operation phase. The bulk of the solid waste generated during the operation of the project will consist mainly of organic wastes, packaging wastes amongst others. Such wastes can be injurious to the environment through blockage of drainage systems, choking of water bodies and negative impacts on animal health. Some of these waste materials especially the plastic/polythene are not biodegradable hence may cause long-term injurious effects to the environment if appropriate care is not taken. Even the biodegradable ones such as organic wastes may be injurious to the environment because as they decompose, they produce methane gas, a powerful greenhouse gas known to contribute to global warming. The proponent will be responsible for efficient management of solid waste generated by the project during its operation. In this regard, the proponent will encourage waste separation at the source and will provide waste handling facilities such as waste bins and skips for temporarily holding waste generated at the site. In addition, the proponent will ensure that such disposed of regularly and appropriately.

An integrated solid waste management system is recommended. The proponent will adhere to the Environmental Management and Coordination (Waste Management), Regulations 2006.

6.3.2.4 INCREASED WATER UTILIZATION

The proponent will consider the installation of water-conserving automatic taps or push type taps. Moreover, any water leaks resulting from damaged pipes and/or faulty taps, will be promptly fixed by qualified staff. In addition, the proposed development residents will besensitized on efficient water utilization.

6.3.2.5 WATER POLLUTION

If the sites for dumping solid wastes are not well managed, they may cause contamination ofground water sources and also form breeding areas for various disease vectors.

The proponent will put in place an efficient waste management scheme that will prevent the accumulation of uncontrolled waste, as well as an efficient collection system and off-site disposal.

6.3.3 IMPACTS RELATED TO OCCUPATIONAL HEALTH AND SAFETY

6.3.3.1 FIRE HAZARDS, ACCIDENTS AND INCIDENTS

Fire hazard is a reality during the operation phase since use of electricity and related appliances will be used within the project site. The proponent has committed to take all themeasures against a fire outbreak as outlined in the EMP.

Workers' accidents and incidents at the workplace shall be mitigated by enforcing safety procedures and preparing contingency plan for accident response in addition safety education and training that shall be emphasized.

To ensure safety and health workers employed and to eliminate or minimize incidents during the operational phase of the project, a number of requirements to be adhered to by the proponent are outlined in table hereunder.

The table below shows the requirements to be adhered to during the operational phase of the project

Requirement	Relevant clause in the Law
1. Ensure acquisition and annual renewal of registration certificate of the workplace by lodging an application and remitting prescribed fees to the Directorate of Occupational Safety and Health Services	Legal Notice No.14 of 2011 as read together with Section 44 of OSHA, 2007
2. Provide Personal Protective and Equipment (PPE) to construction site workers i.e. a) Helmets/hard hats for head protection b) Goggles/shields for eye protection where necessary c) Ear protection (ear muffs or ear plugs) for thoseworkers	Section 101 of OSHA, 2007

exposed to high noise levels d) Dust masks/respirators for protection from inhalation of air contaminants where necessary andas applicable e) Body protection (overalls, reflector jackets, apronsdust coats as appropriate) f) Gloves for hand protection where necessary g) Foot protection (safety boots or safety shoes) h) Safety harnesses, when necessary, for prevention offalls from height	
3. Acquire and display at a prominent place within workplace an abstract of OSHA, 2007	Section 121 of OSHA, 2007
4. Acquire and maintain a General Register	Section 122 of OSHA, 2007
5. Develop an occupational safety and health policy andensure all workers are informed of its content.	Legal Notice No.31 of 2004 as read together with Section 7 of OSHA, 2007
6. Undertake the risk assessment exercise, compile a report and submit a copy to the Directorate ofOccupational Safety and Health Services.	Section 6 of OSHA, 2007
7. Form a workplace Safety and Health Committee and have it trained on matters relating to Occupational Safety and Health.	Legal Notice No.31 of 2004 as read together with Section 9 of OSHA, 2007
8. Provide first aid i.e. a) Appoint and train using a government recognizedtrainer, first aiders b) Provide and maintain, to the prescribed standard, first aid box(es)/cupboards	Legal Notice No. 160 of 1977 as read together with Section 95 ofOSHA, 2007

9. Ensure safe Housekeeping by:- a) Ensuring good machine layout and arrangement b) Designating and marking walkways, gangways anddriveways for workplace safe movement. c) Proper arrangement of stocks and products	Section 77 of OSHA, 2007
10. Ensure safety of workers engaged in high-riskactivities by development of a permit to work document to be used in such activities	Section 77 of OSHA, 2007
11. Ensure good health of workers employed by:- a) Causing prescribed periodical medical examinations to be done on workers exposed to classified hazards e.g. excessive noise levels, hazardous dusts, chemicals, radiation etc. b) Causing pre-employment medical examinations to be done on workers to be employed in areas with classified hazards c) Causing post-employment medical examinations to be done on workers formerly employed in areas withclassified hazards d) Causing prescribed medical surveillance to be done on workers employed in areas with classified hazards	Legal Notice No.24 of 2005 as read together with section103 of OSHA,2007
12. Cause the safety and health audit of the workplace tobe conducted on an annual basis	Legal Notice No.31 of 2004 as read together with Section11 of OSHA, 2007
13. Cause the fire safety audit of the workplace to be conducted on an annual basis	Legal Notice No.59 of 2007
14. Provide adequate and suitable sanitary conveniences to all persons employed	Section 52 of OSHA, 2007

15. Provide and maintain fire safety at workplace by:- a) Providing firefighting appliances and instructionworkers in their use b) Conducting fire drills as necessary c) Providing a documented fire emergency procedure d) Ensuring proper storage of highly flammablematerials	Legal Notice No.59 of 2007 as read together with sections 78, 81 and 82 of OSHA, 2007
16. Ensure general welfare provisions to site workers by:- a) Providing clean wholesome drinking water b) Providing washing facilities Providing accommodation for clothing not wornduring working hours	Sections 91, 92 and 93 of OSHA, 2007
Ensure plant and machinery safety at the workplaceby:- a) Ensuring proper maintenance and repair of plant andmachinery b) Guarding, fencing and encasing of dangerous parts, whichever the case may be, of plant and machinery c) Ensuring prescribed statutory examinations are carried out on plants at prescribed intervals	Section 55 and72 of OSHA, 2007
18. Ensure control of air pollution, noise and vibration. The proponent will put measures in place to prevent the pollutant from accumulating in any workroom, and in particular, where the nature of the process makes it practicable, exhaust appliances shall be provided and maintained, as near as possible to the point of origin of the dust or fume or other impurity, so as to prevent it entering the air of any workroom and the dust, fumes or impurity shall not be allowed to enter into the atmosphere without undergoing appropriate treatment to prevent air pollution or other ill-effect to life and property.	Section 89 of OSHA, 2007

19. Notify occurrence of accidents and incidents to the Directorate of Occupational Safety and Health Services and ensure compensation when work injuries occur.	Section 31 of OSHA, 2007 and WIBA, 2007

Table 4: Requirements to be adhered to during the operational phase of the project

6.4 DECOMMISSIONING PHASE

6.4.1 REHABILITATION

Upon decommissioning the project, rehabilitation of the project site will be carried out to restore the site to its original status. This will include replacement of topsoil and re-vegetation, which will lead to improved visual quality of the area. The proponent is recommended to seek the expertise of an environmental expert during the decommissioningphase of the project.

CHAPTER 7. ANALYSIS OF PROJECT ALTERNATIVES

This section analyses the project alternatives in terms of site and technology scale.

7.1 RELOCATION OPTION

Relocation option to a different site is an option available for the project implementation. At present the landowner/developer does not have an alternative site. This means that the proponent has to scout for an alternative parcel of land. This is a delay that our economy can ill afford.

In consideration of the above concerns and assessment of the current proposed site, relocation of the project is not a viable option.

7.2 NO PROJECT ALTERNATIVE

The No Project option in respect to the proposed project implies that the status quo is maintained. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- No employment opportunities will be created for thousands of Kenyans who will work in the housing project area.
- Increased poverty and crime in Kenya.
- The developer will not invest in increased housing stock in the city
- The economic status of the Kenyans and the local people would remain unchanged.

From the analysis above, it becomes apparent that the No Project alternative is no alternative to the local people, Kenyans, and the Government of Kenya.

7.3 THE PROPOSED DEVELOPMENT ALTERNATIVE

Under the proposed development alternative, the developers of the proposed project would be issued with an EIA License. In issuing the license, NEMA would approve the proponent's proposed residential development, provided all environmental measures are complied with during the construction period and occupation 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.

7.4 ANALYSIS OF ALTERNATIVE CONSTRUCTION MATERIALS 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.

Durable well reinforced concrete roofs will be used. This will ensure that the rainwater harvested will be utilized on site. 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.

7.5 WATER SUPPLY

Water is becoming a scarce resource day by day in most parts of the country. Therefore, the proponent looked into methods of sustaining water supply.

ALTERNATIVE ONE - RAIN WATER HARVESTING

Rain water flowing into drainage systems during wet seasons will be harvested and used for various purposes. In addition, a lot of water can also be harvested from roofs. This water can be used for watering flower gardens and grass lawns, flushing toilets and general cleaning by the residents.

ALTERNATIVE TWO – TANKER/BOWSERS WATER SUPPLY

Several commercial water supply companies operate in Nairobi. These are usually licensed by Water Resources Management Authority (WARMA) to supply water to clients when normal NWSC water supply system is cut-off. The proponent can use these services as a supply option. However, this option is not sustainable since it's expensive and there is no guaranteed supply of clean water.

ALTERNATIVE THREE - DRILLING OF A BOREHOLE

The proponent will undertake hydro-geological studies of the proposed project site and obtain permits from the Water Resource Management Authority (WRMA). An ESIA will be conducted for purposes obtaining a NEMA license to sink a borehole within the Development. Water supply from the borehole will cover the water supply deficits experienced from other water supply sources.

ALTERNATIVE FOUR - COMBINED WATER SUPPLY

This is the option preferred by the proponent. A dedicated main water infrastructure system provided for the development. The water will be conveyed to a central storage comprising of elevated and ground storage tanks to balance the fluctuating water supply and for emergencies. Nairobi Water and Sewerage Company water supply may be supplemented by a borehole.

CHAPTER 8: CLIMATE CHANGE ADAPTATIONS AND MITIGATION STRATEGIES

The built environment tops the list as the most significant contributor to GHG emissions, accountable for more than one third of global carbon emissions, one third of global resource use, and 40% of worldwide energy consumption. This includes emissions directly produced by the construction industry, such as those from machinery used on construction sites, and emissions during the operational phase of a building's lifespan. The operational phase of a building — when it's in use — is responsible for substantial emissions, chiefly due to heating, cooling and electricity consumption[3].

Indirect emissions primarily stem from energy-intensive production processes of raw materials like cement, steel, and glass and from transporting these materials and equipment to construction sites. Concrete production alone accounts for approximately 8% of global CO2 emissions, surpassing global carbon emissions from aviation. If the cement industry were a nation, it would rank as the world's third-largest emitter of carbon dioxide, following the US and China. Furthermore, the construction industry significantly contributes to waste generation, responsible for 40% of global waste.

Inefficient resource usage, design flaws, and a lack of recycling and reuse strategies result in considerable waste, often relegated to landfills, producing methane, a highly potent greenhouse gas.

8.1 CLIMATE CHANGE AND ITS IMPACT ON CONSTRUCTION

Climate change can substantially influence the operation and efficiency of Averdung Apartments. Extreme weather events are becoming more common in Kenya due to climate change, thus there's a rising need to climate proof the apartments to withstand these conditions. This calls for the Kenyan construction industry to innovate and build more resilient structures.

There is a need for stricter regulations on carbon emissions and energy efficiency in an effort to counteract climate change. Carbon emissions are likely to increase as a result of construction activities of Avderdung Apartments.

[3] https://www.constructionbriefing.com/news/climate-change-construction-s-hottest-topic/8030738.article

8.2 CLIMATE MITIGATION AND ADAPTATION STRATEGIES FOR CONSTRUCTION

The construction industry must accelerate its efforts to reduce or prevent greenhouse gas emissions to decelerate global warming while simultaneously adapting to increase resilience to climate impacts. The construction industry is experiencing the damaging impacts of climate change that are already occurring and will continue to occur even with strong mitigation efforts.

Green Building Practices – Theres a need to Construct Averdung apartments using energy-efficient technology, energy-efficient design, building methods, incorporating renewable energy sources and using sustainable or recycled materials so as to mitigate impacts of climate change.

Climate-resilient infrastructure – Climate change increases the risk of extreme weather events thus Averdung Apartments must build infrastructure that can withstand these challenges.

Digital technology and innovation – New technologies are being utilized to help reduce the sector's environmental impact. This includes using Building Information Modeling (BIM) for better planning and resource management or artificial intelligence (AI) and machine learning to optimize building design for energy efficiency.

Also, technologies like 3D printing and drones fitted with sensors can be harnessed to improve the efficiency and sustainability of construction. ESMP. projects. Thes are recommended to the project proponents and Contactor of Averdung Apartments and will be included in the

Lifecycle assessment – It will be critical to assess the direct and indirect environmental impact of Averdung Apartments across their entire lifecycle, from the extraction of raw materials to construction, operation and, finally, demolition or repurposing. This assessment of a circular economy approach will enable waste minimization, and materials reusing or recycling wherever possible including during repairs and building maintenance.

8.3 EFFECTS OF CONSTRUCTION ACTIVITIES ON CLIMATE CHANGE AND PROPOSED MITIGATION MEASURES

Climate Change Effects from Building and Construction Activities	**Description**	**Examples of Impact**	**Mitigation Strategies**
Increased carbon emissions	Construction activities often involve the burning of fossil fuels, leading to higher carbon dioxide emissions.	Contribution to global warming	Use of sustainable construction materials
		Air pollution from construction machinery	Energy-efficient building design
Habitat disruption	Urbanization and construction can result in the destruction and fragmentation of natural habitats.	Loss of biodiversity and ecosystems leading to increases in atmospheric carbon	- Sustainable urban planning
		Displacement of wildlife populations	Green building practices
		Altered water flow and drainage patterns	Preservation of green spaces
Heat Island Effect	The construction of Averdung apartments increase paved surfaces contributing to localized increases in	Elevated temperatures	Green roofing and permeable surfaces

	temperature.		
		Increased energy consumption for cooling	Planting trees and vegetation around the building and in house balconies
		Adverse health effects on residents	Use of reflective materials for surfaces
Resource depletion	Construction activities will consume significant amounts of natural resources.	Depletion of forests for timber and construction wood	Use of recycled and sustainable materials
		Over-extraction of minerals for building materials	Sustainable sourcing and extraction practices
		Water consumption for construction and concrete	Water recycling and conservation measures
Vulnerability to extreme weather events	Inadequate construction practices can result in Averdung apartments being susceptible to damage during extreme weather events.	Increased damage to buildings during storms and floods	Incorporation of resilient building design
		Higher repair and reconstruction costs	Adherence to building codes and standards
		Increased risk to occupants' safety	Climate-resilient infrastructure planning

Table 5: Effects of Construction Activities On Climate Change And Proposed Mitigation Measures

CHAPTER 9: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

9.1 INTRODUCTION

The proponent of the proposed project acknowledges the fact that the proposed project activities will have some impacts on the biophysical environment, health and safety of its employees and members of the public, and socio-economic well-being of the local residents.

The Environmental and Social Management Plan (ESMP) for the proposed project provides a logical framework within which identified negative environmental impacts can be mitigated and monitored. In addition, the ESMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done. The ESMP is a vital output of an Environmental Impact Assessment study as it provides a checklist for project monitoring and evaluation.

9.2 CONSTRUCTION PHASE ESMP

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase the housing project are outlined below.

9.3 SIGNIFICANCE OF ESMP

The ESMP for the proposed project provide all the details of project activities, impacts, mitigation measures, time schedules, costs, responsibilities and commitments proposed to minimize Environmental Audits during implementation.

9.4 OBJECTIVES OF ESMP

1. To bring the project into compliance with applicable National, social and legal requirements social policies and procedures.
2. To outline mitigating/ enhancing, monitoring consultative and institutional measures required to prevent, minimize, mitigate or compensate from adverse environmental and social impacts or enhance the project beneficial impacts.

9.5 RESPONSIBILITIES

In order to ensure sound development and effective implementation of ESMP, it will be necessary to identify and define the responsibilities and authority of the various persons and organization that will be involved in the project.

9.6 ENVIRONMENTAL MONITORING AND AUDITS

In this project, environmental monitoring and audits will be conducting to ensure that identified potential negative impacts are mitigated during the project's life cycle.

9.7 MONITORING AND TRAINING

In order to ensure sustainable and a healthy environment of the project area and its environs, NEMA and public health should undertake to monitor the quality of the environment as a routine practice. Monitoring will involve measurements, observations, evaluations, assessments and reporting on the following variables during the operation cycle of the project.

- Occupational health and safety
- Air Quality
- Noise levels

Personnel should be provided with necessary training to enable for effective participation in environmental monitoring program and on reliability of data.

The measures proposed in the ESMP presented in the table below are aimed at ensuring that the total environment is not adversely affected by the implementation of the proposed project. In preparing this ESMP, issues of Health, Safety and Environment have been taken into account. In addition, the need for compliance with the laid down regulation was also considered. It is hoped that proponent will fully implement the EMP.

IMPLEMENTATION PHASE (IMPLEMENTATION/CONSTRUCTION PHASE)					
Soil, oil & grease, Noise & vibrations, Air pollutions, Topography and Public participations.					
ENVIRONMENTAL ASPECT	ANTICIPATED IMPACTS	MITIGATION METHODS	PROJECT PHASE	RESPONSIBILITY	ESTIMATED COST
Soil erosion	• Disturbance of microorganisms in the soil. • Loosening of the microorganisms in the soil making it vulnerable to agents of erosion (mainly water & wind). • Soil pollution as a result of burying unwanted or non-biodegradable substances.	• All construction should be done using the recommended building materials and equipment. • Use of heavy machinery which causes massive destabilization of soil and killing of organisms should be avoided. • Natural organism niches should be conserved. And also, construction activities to be confined within the site area.	Implementation Phase	Contractor	200,000

Oil and grease	• Soil pollution killing micro –organisms. • Pollution of water collection pans through surface flow. • Drying of vegetation leaving the soil bare.	• Regular maintenance of construction machines and vehicles to note leaking. • All repairs and servicing of machines and vehicles should be done at the recommended sites. • Proper disposal of used oils and grease	Implementation phase.	Contractor	80,000
Solid waste generation	Lodging of unwanted materials on the ground like wrapping papers, pieces of pipes/metal bars, pieces of wood etc.	Installation of waste bins/pits on site to avoid scattering on the ground. Dumping of unwanted materials on the recommended places. Re-using any recyclable materials	Implementation on phase	Contactor.	100,000
Noise and vibrations	Hearing problems. May cause noise related illnesses like headache.	• Use machines of low noise levels. • Turning off construction machines and vehicles while not in use. Use of protective gadgets for the ears e.g. ear muffs.	Site implementation phase.	Contractor	250,000

Air pollution	• Dust particles in the air causing in-hailing problems. Polluting of water bodies/storage facilities.	• Sprinkling of water during the dry seasons. Construction workers should use protective clothing. E.g. dust masks and goggles	Site implementation phase.	Contractor	100,000
Topography	Alterations of the landscape form increased soil erosion.	• Proper landscaping should be done after the end of all the construction works. Planting of trees and grass in areas where they had been cleared.	Implementation phase.	Contractor	Project cost
Public Participation	Resistance from the community on the implementation of the project in fear of its impacts e.g. depletion of other similar boreholes.	• Proper sensitization of the community at the initial stages of the project with aim of educating them on advantage of the project. Involving the community on its implementation especially as casuals.	Pre- construction /Construction phase.	Contractor	200,000

Table 6: Construction phase

OPERATIONAL PHASE.					
Water quality and usage, Electrical safety and oil/fuel spillage.					
ENVIR ONME	**ANTICIPATED IMPACTS**	**MITIGATION METHODS**	**PROJECT PHASE**	**RESPONSIBILI TY**	**ESTIMATED COST**
Occupational safety and Health (OHS)	• Inhaling contaminated air. • Illness from consuming unhygienic food/ water	• Provide safety gears to the workers e.g. overalls, helmets, gloves. • Treating water before domestic use. • Water should be used sparingly to avoid wastage e.g. use of press on taps. • Install sanitary facilities	Operational phase.	Proponent.	300,000
Electrical safety	• Electrocution of the site workers during the installation phase. • Electrocution of the surrounding community during the operational phase • Outbreak of fire.	• Use of qualified electricians in the installation of all electrical gadgets. • All electrical cables should be earthed in the correct manholes. • Use of protective clothing for the workers on site. • ''Danger warning'' warning signs should be placed at strategic place on site. • Install fire extinguishers.	Operational phase	Contractor	Project cost
Oil/fuel spillage	• Outbreak of fires • Skidding of vehicle causing accidents • Bad smell	• Fire hydrants and sand buckets should be placed strategically In case of fire. Any spillage should be wiped and dried immediately. • Servicing of vehicles should be done on a designated yard.	Operational phase.	Contractor	50,000

FIRE SAFET Y	Loses from burning of facility Loss of life	• Keep well services and working fire hydrants. • Have a chart of hotlines within the facility, this would include fire services, Ambulance, police etc. • Keep the facility dry of any fuel or oil spillage. • Designate a FIRE ASSEMBLY POINT within the compound in case of fire.	Operational phase.	Proponent.	140,000
Sewer /waste water disposal	• Bad odor from the waste water • Growing of grass causing breeding of mosquitoes and other disease organisms.	• Proper installation of drainage/sewer lines by qualified technicians. Frequent monitoring of the sewer system.	Operational phase.	Proponent.	Project cost
Solid waste disposal	• Bad visual image from garbage heaps. • Foul smell. • Breeding sites for rodents. Blockage of drainage/ communication lines.	• Install garbage collection facilities. • Employ garbage collectors/monitors. • Put labels on where to dispose of waste. Proper transportation of waste to prevent spreading along the way.	Operational phase.	Proponent.	Project cost

Table 7: Operational Phase

DECOMMISSIONING PHASE.					
Occupational safety, Public Health, Noise & Vibrations, Dust pollutions, Landform.					
ENVIRONMENTAL ASPECT	**ANTICIPATED IMPACTS**	**MITIGATION METHODS**	**PROJECT PHASE**	**RESPONSIBILITY**	**ESTIMATED COST**
Occupation safety	• Bruises and cuts caused during the demolition works. • Falling from heights Inhaling of poisonous gases • Fire outbreaks	• Providing workers with protective clothing and facilities like helmets, safety harness, boots and gloves. • The dismantling exercise should be carried out separately to avoid accidents to people who might be on the ground. • Train the site workers on basic first aid methods. • Provide first aid kit on site in case of small cuts/bruises. • Provide a public "NOTICE" on the ongoing works.	Decommission phase.	Contractor.	Project cost
Public health	• Ailments from contaminated food. Careless disposal of human waste.	• Provide a sanitary unit on site. Food for the site workers to be prepared in hygienic conditions.	Decommissioning phase.	Contractor	Project cost

Noise and vibrations	Noise and vibrations from the machines may cause illnesses like mild headaches, to the people who frequent visit the site.	• Use of machine of low noise and vibration levels. • Switching off machines while not in use. Switching off vehicles on site while not in use	Decommissioning phase.	Contractor	Project cost
Dust pollutions.	• Pollution of air with dust particles from the demolition works especially the concrete surfaces which may cause respiratory diseases. • Pollution of water collection equipment which may turn cause of disease if consumed	• Providing workers with protective gadgets like dust masks and ear muffs. • Sprinkling water on concrete surfaces in case of excessive dust. Ensure all water vessels are tightly covered.	Decommissioning phase.	Contractor	Project cost
Landform	• Change of the landform after demolitions. • Accidents which may be caused by falls into the excavated pits.	Reverting the land to its original form by filling the excavations and planting trees or grass in the affected areas.	Decommissioning phase.	Contractor.	Project cost

Solid waste	Generation of waste debris.	• Donate any re-usable remains to any willing individual/organization e.g. iron sheets. • Dispose-off any un reusable waste into the approved dumpsites Sell metallic waste to licensed scrap metal dealers.	Decommissioning phase.	Contractor.	Project cost

Table 8: Decommissioning Phase

9.8 OPERATIONAL PHASE ESMP

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the operational phase of the homes are outlined in the table below:

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (Kshs)**
Solid waste generation	Provide solid waste handling facilities such as waste bins across the estate and ensure that they are often emptied to enhance maximum cleanliness.	Proponent & Contractor	One-off	50,000
	Ensure that solid waste generated at the homes, is regularly collected by licensed operators and disposed of appropriately at authorized dumping sites	Proponent & Contractor	Continuous	200,000
Sewage release into environment	Provide adequate and safe means of handling sewage generated at the apartments.	Proponent	Continuous	50,000
	Ensure regular monitoring of the sewage discharged from the project to ensure that the stipulated sewage/effluent discharge rules and standards are not violated	Proponent	Continuous	0

Energy Consumption	Install energy saving fluorescent tubes at all lighting points within the apartments instead of bulbs which consume higher electric energy	Proponent	One-off	20,000
	Sensitize apartments' occupants to use energy efficiently	Proponent	Continuous	0
	Monitor energy use during the operation of the project and set targets for efficient energy use	Proponent	Continuous	0
Water exploitation	Promptly detect and repair of water pipe and tank leak	Proponent	Continuous	5000
	Install water conserving taps that turn-off automatically when water is not being used	Proponent	Continuous	Site specific
Health and safety risks	Implement all necessary measures to ensure health and safety of workers and the occupants of housing units during operation of the apartments as stipulated in Factories and Other Places of Work Act Cap 514	Proponent	Continuous	50000
safety and security of the premises and surrounding areas	Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises during night hours.	Proponent	Continuous	-

Climate change	Use of renewable energy for heating purposes Recycling and reuse of water	Proponent	Continuous	

Table 9: Negative Impacts

9.9 DECOMMISSIONING PHASE

In addition to the mitigation measures provided in two above tables in this chapter, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the proposed project have ceased. The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project, are outlined in the table below:

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (Ksh s)**
Demolition waste	All recovered building materials, machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as Possible	• Proponent & Contractor	• One-off	•
	Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site	• Proponent & Contractor	• One-off	200,000

	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3.Composting and reuse 4. Combustion 5. Sanitary land filling.	• Proponent & Contractor	• One-off	50,000

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (Kshs)**
Rehabilitation of project Site	Implement an appropriate re-vegetation programme to restore the site to its original Status.	Proponent	One-off	100,000
	Consider use of indigenous plant species in re-vegetation.	Proponent	One-off	50,000

Table 10: Decommissioning Phase

9.10 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

The Environmental and Social Monitoring Plan is vital for any Environmental and Social Impact Assessment for development plans. The monitoring plan will help in assessing the effectiveness of proposed mitigation measures, in assessing changes in environmental conditions and to provide warning of significant deterioration in environmental quality for further preventive action.

The principle elements of a monitoring plan are:

- A clear statement of aims and objectives
- A description of sampling sites
- A description of variables that will be measured
- A plan for quality control and quality assurance
- An estimate of the resources required to implement the design
- Delineation of responsibility to implement the monitoring plan
- Proposed frequency and timing of sampling

Specific attention has been made to ensure that the monitoring plan conforms to the following criteria, it is auditable in that it:

- Associates mitigation and monitoring tasks to specific impacts,
- Conforms to all best practice principles by acknowledging the existence of both long term and immediate impacts and the resulting mitigation measures necessary to deal with such
- Delineates key lines of accountability,
- Ensures flexibility to enable incorporation of additional monitoring and mitigation techniques as deemed necessary throughout the life of the development,
- Gives guiding costs of implementation,
- Identifies specific quantifiable monitoring regimes,
- Where practically possible identifies key indicator, which can be utilized for environmental performance monitoring.

9.11 MONITORING REQUIREMENTS

To ensure that the whole ESIA is effective, environmental monitoring is mandatory. Because of the complexity of cumulative effects at a strategic level, there will be uncertainty about

impact predictions. Monitoring is therefore important to assess the accuracy of the predictions and to monitor the effectiveness of mitigation measures.

The monitoring frequency and indicators have been recommended for each management action. Regular monitoring using the recommended indicators will indicate the level of progress regarding ensuring environmental sustainability in the proposed project.

The parameters of the proposed project that were identified for monitoring include: water quality, air quality, solid waste generation, Occupational Health and Safety risks, soil erosion, storm water drainage, and livelihoods.

Environmental Component	Points to be monitored	Parameters to be monitored	Lab materials and other equipment/ other requirements	Frequency of monitoring	Responsibility
Water Quality and Quantity	▪ Ground water resources Borehole ▪ NCC, NCWSC ▪ Runoff from buildings ▪ Water treatment plant	▪ pH, Total Suspended Solids (TSS) and Total Dissolved Solids (TDS), heavy metals, oils and grease ▪ Construction activities ▪ Abstraction rates and drawdown ▪ Waterborne diseases prevalence	▪ Sampling bottles ▪ Cooler box ▪ Access to a NEMA accredited laboratory	Quarterly or at least two times a year to cover seasonal variations	▪ Proponent ▪ WRA ▪ NCWSC
Air Quality	Construction activities	TSP, NOx, SO2, CO, Dust particles, particulate matter	Air sampling equipment	Continuous throughout and operational phases	▪ Proponent ▪ NEMA
Solid and Liquid Waste Generation	▪ Operational and construction phase ▪ Water treatment plant.	▪ Domestic refuse, metallic scraps, sludge, waste composition, treatment methods ▪ Waterborne diseases prevalence ▪ pH, TSS and TDS, heavy metals, oils and grease	▪ Sampling bottles, cooler box, Access to a NEMA accredited laboratory Waste sampling bins, plastic bags, boxes, weighing machine	Continuous	▪ Proponent ▪ NEMA ▪ Government lead Agencies

Biodiversity Loss	Vegetation to be cleared	▪ Individual species count (capture recapture) ▪ Biomass Index ▪ Rainfall volume, ▪ Topography	Periodical ecological surveys ▪ field survey maps ▪ Rain-gauge	Continuous	KFS, KWS ▪ NEMA ▪ KMFRI ▪ Proponent ▪ Developers /Contractor
Soils (Fertility, Erosion, Compaction)	▪ Project construction sites ▪ Excavated areas, sloppy areas ▪ Water sources	▪ Soil salinity, ▪ Humus content ▪ Turbidity in storm water and other water sources ▪ Floods	▪ Laboratory analysis, ▪ Field equipment for soil sampling/ analysis	Continuous	▪ Proponent ▪ Developer /Contractor ▪ NEMA ▪ DOSHS
Socio-Economic	Planning and implementation phase of the project	Number of jobs create Incomes Quality of life Access to potable water	Quantitative and Qualitative analysis	Annually	▪ Proponent

Table 11:

CHAPTER 10. CONCLUSION AND RECOMMENDATIONS

The proposed residential development portends numerous positive impacts such as creation of employment, quality shelter, improved infrastructure, increase in national housing stock and increase in revenue among others as outlined in the report. The negative environmental impacts that will result from establishment of the project include: increased pressure on infrastructure; air pollution; water pollution and generation waste among others which however can be mitigated.

The proponent of the proposed project is committed to implementing the outlined measures in this report to mitigate against the negative environmental, safety, health and social impacts associated with the Development cycle of the proposed housing project. It is recommended that in addition to this commitment, the proponent shall focus on implementing the measures outlined in the EMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects. It is also recommended that the positive impacts that emanate from such activities shall be maximized as much as possible. The outlined measures will effectively ensure the best possible environmental compliance and performance standards.

It is our recommendation that the proponent be allowed to implement the project provided the mitigation measures outlined in the report are adhered to, and the developer adheres to the conditions of approval of the project.

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