ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE FOR THE PROPOSED 302 No OF APARTMENTS 23 LEVEL, MULTI STOREY RESIDENTIAL DEVELOPMENT APARTMENTS LOCATED ON PLOT L.R NO. N A I R O B I B L O C K 7/430 ALONG ROAD, GENERAL MATHENG ROAD SITUATED IN WESTLAND PARKLANDS/ HIGHRIDGES, NAIROBI CITY COUNTY.

GPS COORDINATES: -1.2565967, 36.807290; Latitude and Longitude Respectively.

Consultant: **Ecotecture Limited** NEMA Reg. No: 13981 P.O. Box 60160-00100 Nairobi, Kenya. Email: Contact person: Edgar Eredi NEMA Reg. No. 7688 Cell Phone No: 0724904217	**Client:** **WILLIAM OMONDI MUTHAMA** P.O BOX 25839-0100, NAIROBI, KENYA. E-mail:

September 2025

DOCUMENT AUTHENTICATION

This Environment Impact Assessment study report has been prepared by Ecotecture Limited (NEMA Reg. No. 13981) in accordance with the Environmental Management and Coordination Act (EMCA) 1999 and the Environmental Impact Assessment and Audit Regulations 2003 which requires that every development project must have an EIA report prepared for submission to the National Environmental Management Authority (NEMA). We the undersigned, certify that the particulars in this report are correct and righteous to the best of our knowledge.

EIA/EA LEAD EXPERT:

ECOTECTURE LIMITED FIRM REG. NO. 13981

P.O. BOX 60160 – 00100,

NAIROBI, KENYA TEL:

0724904217

Signature.....Date 21/10/2025

EDGAR EREDI (NEMA REG. NO.)

PROPONENT:

WILLIAM OMONDI MUTHAMA

P.O. BOX 25839-0100, NAIROBI.

NAME: WILLIAM OMONDI MUTHAMA

POSITION: DIRECTOR

Signature.....Date 21/10/2025

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LIST OF ACCRONYMS AND ABBREVIATIONS

Acronym	Meaning
CBD	Convention on Biological Diversity
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CPP	Consultation and Public Participation
dB(A)	A-weighted Decibel (noise measurement unit)
EA	Environmental Audit
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMMP	Environmental Management and Monitoring Plan
EOHS	Environmental, Occupational Health and Safety
GOK	Government of Kenya
GPS	Global Positioning System
HSE	Health, Safety and Environment
IAPs	Interested and Affected Parties
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
KPLC	Kenya Power and Lighting Company
L.R	Land Reference
ME&NR	Ministry of Environment and Natural Resources
MSDS	Material Safety Data Sheets
NACOSTI	National Commission for Science, Technology and Innovation
NAWASCO	Nairobi Water And Sewerage Company
NEAP	National Environmental Action Plan
NEC	National Environment Council
NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
NHC	National Housing Corporation
NO_2	Nitrogen Dioxide
NR	
OHS	Occupational Health and Safety
OHSA	Occupational Safety and Health Act
PAPs	Project Affected Persons
PM_{10}	
$PM_{2.5}$	Particulate Matter with diameter ≤ 2.5 micrometers
PPE	Personal Protective Equipment
RMP	Risk Management Plan
SDGs	Sustainable Development Goals
SO_2	Sulfur Dioxide

Acronym	Meaning
SOP	Standard Operating Procedure
TSP	Total Suspended Particulates
UNFCCC	United Nations Framework Convention on Climate Change
VOC	Volatile Organic Carbon
WHO	World Health Organization

EXECUTIVE SUMMARY

Ecotecture Limited Consultants, a NEMA registered EIA/EA Firm of experts, has been contracted by the proponent to carry out an Environmental Impact Assessment (EIA) Study Report for the proposed residential apartment complex comprising Lower Ground, Ground, Upper Ground, and 23-floor levels on L.R. No. Nairobi Block 7/430. The project is located along general Mathenge road, Westland, Parklands/Highridge Area Nairobi County.

This document is an EIA Study Report for the proposed high-rise residential development project in westlands, Parkland/Highridge Area, Nairobi County. The proponent is committed to ensuring that the ecological integrity, health, and sustainability of the environment are upheld. This commitment necessitated the undertaking of the EIA process. Through the engagement of environmental consultants, the proponent has ensured that the proposed development undergoes a comprehensive EIA process in compliance with the legal requirements of the Government of Kenya, particularly the Environmental Management and Coordination Act (EMCA), 1999 (Amendments, 2015), and the Environmental (Impact Assessment and Audit) Regulations, 2003 (Revised 2019).

The purpose of conducting the EIA process was to predict, assess and analyze all possible positive and negative impacts that the project might have on both the natural and human environment and suggest the appropriate mitigation measures for the significant negative impacts and design an Environmental Management Plan (EMP) to address the negative environmental impacts associated with the proposed residential apartment 's project. The scope of this report was to describe the project, document all baseline information, legal and regulatory frameworks associated with the project, analyze the project alternatives, assess both the positive and negative impacts and develop mitigation measures for negative impacts and design an EMP for the project. The EIA reporting exercise, inter alia, constituted the following elements:

- Description of the project location, objectives, scope and justification.
- Evaluation of the project locations, methodologies, procedures and processes to be used in the implementation of the project with other available methodologies and describing any alternatives.
- Conducting a site visit, opportunistic observations, public consultations and personal interviews.
- Evaluation of the products, by-products and wastes likely to be generated by the project.
- Evaluation of the environmental and social effects of the project including socio-cultural effects, direct and indirect effects, short- and long-term effects on pre-project, project construction and post-project operations.
- Analysis of legal and policy framework relevant to the residential housing sector.
- Drawing up an Environmental Management Plan (EMP) proposing measures for eliminating, minimizing or mitigating any adverse impacts on the environment including their cost, timeframe and the responsibility for implementation.
- Drawing up an action plan for prevention and management of foreseeable accidents and other worker related hazards during the construction and occupation phases of the project and preparing a final EIA Study Report for submission to NEMA.

Project Objectives

The objectives of the proposed project include:

i. To construct three hundred and two (302) housing units in Parkland area.
ii. To put the current land into more productive and economic use.
iii. To meet the economic desires of the proponent.

Objectives of the EIA

The objectives of undertaking the EIA were as follows;

i. To identify potential environmental impacts of proposed project and assess the significance of these impacts.
ii. To assess the relative importance of the various project alternatives.
iii. To propose mitigation measures for the significant negative impacts of the project on the environment.
iv. To seek the views and concerns of all the Project Affected Persons (PAPs) in regards to the proposed project.
v. To generate baseline data for monitoring and evaluation of how well the mitigation measures are being implemented during the project cycle.
vi. To develop comprehensive Environmental Management Plan (EMP) for the project cycle with mechanisms for monitoring and evaluating the compliance and environmental performance which shall include the cost of mitigation measures and the time frame of implementing the measures.
vii. To present the results of the EIA in such a way that they can guide informed decision making.

Legal and Administrative Frameworks

The proposed project is governed by County and National legal regulatory and policy framework, which, among others, are meant to ensure good environmental practices at all stages of the project life-cycle. The proposed two block residential apartment 's project is in line with Kenya Vision 2030, Poverty Reduction Strategy Paper (1999), National Housing Policy, 2004 and the Government of Kenya Agenda Four-National Affordable Housing. The project implementation will be affected by several legislations and subsidiary legislations as outlined in Chapter Four of this report. They include: Public Health Act, Cap 242, Water Act 2016, Factories Act, Cap 515, Local Government Act, Cap 265, Penal Code, Cap 63, Energy Act, 2006, Electric Power Act, 1997, OSHA 2007, The Physical Planning Act of 1996 CAP 286, The County Governments Act 2012/2017, EMCA (Water Quality) Regulations 2006, EMCA (Waste management) Regulation 2006, EMCA (Noise and Excessive Vibration Pollution Control) Regulations 2009, EMCA (Air Quality) Regulations 2014 and The Land Planning Act, Cap 303 among others.

Methodology

The EIA process was carried out using a combination of methods including physical examination; site assessments; literature reviews; and informal interviews/

questionnaires administration with stakeholders 'e.g. immediate neighbors and business persons.

The key approach utilized included the following:

i. Environmental screening of the proposed project in line with EMCA Cap 387, The Environmental (Impact Assessment and Audit) Regulations, 2003; Revised 2019. We established that the development falls under High-Risk Projects (Urban development including establishment of new housing estate developments exceeding one hundred housing units).
ii. A site reconnaissance and visual survey to determine the baseline information of the project area.
iii. Analysis of the project documents such as the architectural plans with the proponent and project team.
iv. Assessment of occupational health and safety issues during the implementation of the project.
v. Seeking public views through a public meeting, direct interviews and administering of questionnaires.
vi. Proposal of feasible mitigation measures to minimize anticipated negative impacts during the project cycle.
vii. Preparation and submission of the EIA Study Report to the National Environment Management Authority (NEMA).

Environmental Impacts and Mitigation Measures

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

Table 1: Summary of the Environmental Impacts and Mitigation Measures

Anticipated Impacts	**Mitigation Measures**
Increased Traffic	• Ferry building materials during off-peak hours. • Employ traffic marshals to control traffic in and out of site. • Provide bill boards at the site/entrance to notify motorists and general public about the proposed project. • Enforce speed limits for construction vehicles especially along the roads leading to the site. • Develop a traffic management plan to ensure that the site vehicles do not interfere with the regular traffic along the access roads. • Ensure that the vehicles comply with axle load limits. • Employ well trained and experienced drivers
Solid waste	• Engage the services of registered waste handler to transport the waste at the designated areas. • Covering of trucks when transporting building materials and waste. • Use of an integrated solid waste management system; through a hierarchy of options: source reduction, recycling, composting and reuse. • Provision of waste management room at a strategic

Anticipated Impacts	Mitigation Measures
	place within the apartments for segregation and disposal of the waste. • Efficient use of the materials to reduce waste and recycling/reuse where feasible. • Monitor waste in line with the waste management regulations
Liquid waste	• Channel all liquid waste to the existing NAWASCO sewer line and obtain permit to discharge liquid waste to public sewer line from NAWASCO. • Conduct routine inspection and monitoring of the internal drains to identify and repair any leakages and blockages. • Provision of sanitary facilities to the workers during the construction and proper decommissioning of the facilities once construction is complete. • All waste pipes will have rodding eyes accessible from outside i.e. free to every part of the system for inspection, cleaning and repair. • Regular inspection and maintenance of the internal sewer system.
Increased water demand	• Drill a borehole to supplement the existing water supply, subject to approval by WRA-Nairobi County. • Connect to the existing water supply after acquisition of the relevant permits. • The contractor will engage the eservices of water vendors to supplement the water supply. • Use of water efficient appliances and fixtures for plumbing products and white goods. • Provision of adequate underground and roof water tanks for water storage.
Air Pollution	• Use of dust screens/nets around the construction site to contain and arrest dust. Regular sprinkling of water on work areas to prevent fugitive dust violations especially during the dry spell. • Ensure no burning of waste such as paper and bottles on site/non-designated areas. • Covering and regular watering of the exposed stockpiles on site such as the sand and ballast. • Regular and prompt maintenance of construction machinery and equipment to minimize generation of hazardous gases.
Noise Pollution	• Construction works will be carried out during the day between 0900 hrs to 1500 hrs. • The contractor shall use noise shields on noisy equipment such as corrugated iron sheet structures. • All noisy activities shall be scheduled concurrently during the construction to reduce the exposure period.

Anticipated Impacts	Mitigation Measures
	• Operation of the noisy machinery shall be carried out when necessary and switch them off when not in use. • Provide and enforce use Personal Protective Equipment (PPE) by the workers at all times during the construction.
Energy Demand	• Use of solar energy as an alternative source of energy. • Install and routine maintenance of energy efficient fixtures and fittings. • Turn off the machinery and equipment when not in use. • Put off all the lights immediately when not in use. • Regular inspection and repairs of the solar panels
Occupational Health and Safety of workers and public	• Workers shall use properly fitting PPEs to avoid accidents, injuries and illness • The contractor shall adapt a suitable emergence response plans to manage occurrence of anticipated hazards during construction phase. • Provide appropriate signage and warnings in work areas. • Provide first aid facilities and ensure that workers are trained on emergency response such as first aid skills. • Workers shall always be sensitized on social issues such as drugs, alcohol, diseases such as HIV/AIDS and STIs etc. • Provide adequate and functional sanitary facilities for the workers. • Comply with OSHA 2007 and all other relevant regulations governing health and safety of workplaces
Fire risks/incidences	• Place portable fire extinguishers at suitable locations; • Combustible materials used during construction should be stored away from source of ignition; • Smoking on site or burning of waste should be prohibited so as to reduce the source of ignition at the workplace; • Electrical works such as electrical wiring should be done by qualified technicians or engineers to ensure shoddy work which could pose a danger to the development does not occur; • Train and induct workers on the use of fire extinguishers and other fire-fighting equipment; • Designate a fire assembly point;
Storm Water Management	• Ensuring that the speed of the storm water is reduced as it flows downstream;

Anticipated Impacts	Mitigation Measures
	• Using materials that mimic natural percolation of water. • Landscaping to ensure there are areas where water will percolate underground. • Constructing proper drains and monitoring them to ensure there are no blockages;

Conclusion and Recommendations

The proposed project will have numerous benefits to the housing sectors in the area and the country at large. However, the development might cause negative impacts hence the need to mitigate them in order to reduce their adverse effects to the environment. The study evaluated the anticipated impacts and developed an EMMP which should be implemented by the proponent to ensure environmental protection, health and safety of the workers and the general public. It is therefore our recommendation that the proponent be granted an EIA license to implement the proposed project.

CHAPTER ONE: INTRODUCTION

1.1 Project Background

The housing market in Kenya has recently become one of the most lucrative sectors, with many development companies and individuals now putting up modern housing units for rental and sale. This surge has been facilitated by banks and financial institutions offering loans and mortgages to both developers and home buyers at subsidized rates. The proposed multi storey residential development in Parkland, Nairobi County, is a privately owned project intended for rental and/or sale purposes. The project land is situated in a residential zone characterized by high-rise buildings. The site zoning policy currently permits multi-dwelling developments, as evidenced by the change-of-use approval granted to the proponent.

1.2 Principle of Environmental Impact Assessment

The fundamental principle of the EIA is that every person is entitled to a clean environment and that every person has a duty to enhance and safeguard the environment. EIA is a planning tool which presents methodologies and techniques for identifying, predicting and evaluating potential environmental impacts of the projects, policies, plans and programmes in the project cycle (planning, implementation and decommissioning phases). EIA presents decision with the information necessary to determine whether or not a project should be implemented.

1.3 Project Objectives

The objectives of the proposed project include:

i. To construct three hundred and Two (302) housing units in Parkland area.
ii. To put the current land into more productive and economic use.
iii. To meet the economic desires of the proponent.

1.4 Objectives of EIA

The overall objective of EIA is to ensure that environmental concerns are integrated in the proposed project in order to contribute to sustainable development. The specific objectives are:

i. To identify potential environmental impacts of proposed project and assess the significance of these impacts.
ii. To assess the relative importance of the various project alternatives.
iii. To propose mitigation measures for the significant negative impacts of the project on the environment.
iv. To seek the views and concerns of the PAPs in regards to the proposed project.
v. To generate baseline data for monitoring and evaluation of how well the mitigation measures are being implemented during the project cycle.
vi. To develop Environmental Management and Monitoring Plan (EMP) for the project cycle.
vii. To present results of the EIA Study Report in such a way that they can guide informed decision making.

1.5 Project Justification

The need to undertake an EIA for the project emanated from the following observations. Under section 58 (1) *of Kenya Government's Environmental Management and Coordination Act (EMCA)*, *Number 8 of 1999 (Amendments, 2015)* and *Environmental Impact Assessment and Audit Regulations of June, 2003; 2019,* an EIA study is necessary and a fully detailed EIA Study Report depending on the nature of the project is to be compiled and submitted to NEMA for approval before commencing any proposed development. The basis for undertaking this EIA Study was that the proposed residential development project constitutes several activities, which would generate considerable changes and significant effects to the environment including land, water, atmospheric resources and biological diversity. The EIA Study was thus designed to establish, in advance, some appropriate level of environmental management measures for synchronization with project activities from the planning, implementation, operation and decommissioning stages. The key driving force under which the proponent is developing the project is through the following:

a) Demand for Housing

Housing has for a long time been recognized as a basic human need, with even recent suggestions that it be made a basic human right.

The population of Kenyans towards Nairobi and its surroundings has been rapidly increasing over the years resulting to the inability of most existing accommodation facilities to fully cater for the accommodation demand.

The proposed development therefore comes as a timely venture to cater for the existing accommodation deficit more specifically in Parkland area and its environs.

b) Adjacent Land use analysis

Currently there are developments adjacent to the site. The common land uses surrounding the project site are high-rise residential developments

c) Economic Benefits

The proposed development will have various economic benefits. The development will create direct and indirect employment opportunities and the proprietor will be able to generate more income thus enhance their livelihood. The Nairobi County Government will raise extra revenue from both the enhanced Land Rates and approval fees. The central government will also get more revenue in the form of enhanced Land Rent.

1.6 Terms of Reference of the E.I.A

The Terms of Reference (TORs) for this Environmental Impact Assessment study report are based on the approved TORs issued by NEMA on 30th July, 2025, under Reference Number: NEMA/TOR/5/2/951.

The general Terms of Reference (ToRs) for this study was to conduct an EIA study for the proposed Multi- Storey Residential Apartments project with associated civil works on No: 7/430 in Parkland area,Westland/Highrigde, Nairobi County. This is in accordance with NEMAs 'Environmental (Impact Assessment and Audit) regulations, 2003 under the Environmental Management and Coordination (Amendments) Act, 2015. Specifically, this assessment was commissioned under the following Terms of Reference;

- ✓ To carry out assessment and description of location/site, objectives, scope, nature of the proposed project;
- ✓ To carry out analysis of the proposed project activities during the proposed project cycle; construction, operation, decommissioning phases;
- ✓ To establish the suitability of the proposed project in the proposed location;
- ✓ To review baseline information (Physical, Biological and Social Cultural and economic) and identify any information gaps;
- ✓ To describe and analyze relevant policies, legal and institutional framework including but not limited to Kenyan policies, laws, regulation and guidelines; international guidelines, international conventions and treaties to which Kenya is party to, related to the proposed project, which have a bearing on the proposed project and which also serve as benchmarks for monitoring and evaluation, and future environmental audits;
- ✓ To do an in-depth description of the proposed project and associated works together with the requirements for carrying out the works;
- ✓ To analyze the efficacy of the designs, technology, procedures and processes to be used, in the implementation of the works;

- ✓ To carry out Consultation and Public Participation (CPP): Identify key stakeholders and affected persons**;** Securing written submissions from Lead Agencies (including but not limited to; Water Resources Authority. Public health, physic planning, county government, lands) and the public and administration of questionnaires and undertaking informal interview sessions;
- ✓ To identify and analyze proposed project alternatives including but not limited to: scale and extent; project site alternatives, no project alternatives, design alternatives, material, processes and technologies alternatives. Giving reasons for the preferred and proposed alternatives;
- ✓ To formulate a detailed plan on the Waste Management and Disposal in accordance with the Environmental Management and Co-ordination (Waste Management) Regulations 2024 and other relevant legislations and guidelines;
- ✓ To adequately identify, predict and carry out in-depth analysis all actual potential and significant impacts on flora, fauna, soils, air , water, the social, cultural and community settings; the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated to be generated by the proposed project, both positive and negative throughout the project cycle;
- ✓ To recommend sufficient mitigation measures for all the potential negative impacts identified and analyzed in 10 above;
- ✓ To develop an emergency response procedure for the proposed project for the entire project cycle;
- ✓ To identify gaps in knowledge and uncertainties which will be encountered in compiling the information?
- ✓ To analyze materials to be used in the construction and implementation of the project, and wastes to be generated proposing alternative/appropriate options/technologies;
- ✓ Analyze occupational health and safety issue associated with the proposed project activities;
- ✓ To develop an Environmental Management Plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, time-frame and responsibility to implement the measures;
- ✓ Give details of the total project implementation costs as they relate to the Project EMP;
- ✓ To design and specify the monitoring and audit requirements necessary to ensure the implementation and the effectiveness of the mitigation measures adopted;
- ✓ To prepare a comprehensive EIA Study Report in accordance with EMCA 1999 legislation for submission to NEMA for approval;
- ✓ Submit and present draft EIA Study report to William Omondi Muthama for review;
- ✓ Incorporate proponent's comments into the EIA Study Report after review;
- ✓ Submit 1 hard copies and one soft copy of the EIA Study report to NEMA for the purposes of seeking a NEMA license that will approve the proposed project;
- ✓ Submit to William Omondi Muthama One hard copy of NEMA referenced EIA Study Report and the acknowledgment letter from NEMA;

1.7 Responsibilities

- There will be provision of solid waste cubicles for temporary storage of waste before disposal to NEMA designated waste dumping site by a contracted NEMA registered and licensed waste handler;
- The Nairobi County Government will charge a service fee to the proponent for public sewer services;
- Once complete, the project will be managed by the proponent to provide maintenance services to the estate;

1.8 Study Approach and Methods

1.8.1 Literature Review

A desk study was conducted to review available reports, plans and maps in order to compile relevant bio-physical and socio-economic information about the study area. The bio- physical information was compiled on environmental aspects such as topography, climate, drainage, soils, geology/hydrogeology, and vegetation among other aspects. The socio-economic environment study covered information on issues such as population, the dimensions of wellbeing and income levels, water supply and sewerage, sanitation levels, cultural beliefs and practices, infrastructure developments political ramifications and community participation.

1.8.2 Field Reconnaissance Survey

The EIA team conducted a reconnaissance survey of the project site in order to familiarize itself with the site location. The reconnaissance survey established the general environmental site conditions, neighboring features and characteristics. The EIA methodology was therefore underpinned by the field reconnaissance survey and as guided by the TOR developed during this reconnaissance survey.

1.8.3 Interviews aim:

To inform local people and leaders about the proposed project;

Interviews with interested and affected parties were conducted with the following objectives;

- To seek views, concerns and opinions of people in the area concerning the project;
- To establish if the local people foresee any positive or negative environmental effects from the project and if so, how they would wish the perceived impacts to be addressed;

This was achieved through informal interview sessions and structured questions administered to the local community residents.

1.8.4 Direct Observation

Onsite, the experts carried out in-situ analysis and assessments through direct observations of the prevailing environmental conditions.

1.8.5 Report Writing and Documentation

In addition to constant briefing with the client, the impact assessment report will be presented to the client before submission to the National Environment Management Authority (NEMA) as required by the law**.** The review of the EIA Study Report is anticipated to take 45 working days upon which an approval or otherwise determined and communicated to the proponent.

The TOR for this assessment was based on the NEMA Environmental Impact Assessment and Audit Regulations, dated June 2003; revised 2019. These regulations require that the report should contain descriptions of the following where possible:

- The physical location of the project including the baseline conditions of the project area; **Chapter One and Two**
- A description of the project including: project objectives, project design, activities, technology, procedures and processes, materials to be used, products, by-products and waste generated during the project construction, operation and de-commissioning phases; - **Chapter Two**
- Description of the recipient environment; - **Chapter Three**
- A description of the national environment legislative and regulatory framework, baseline information and any other relevant information related to the project; - **Chapter Four.**
- Alternative locations, technologies or processes available; analysis of alternatives, and reasons for preferring the proposed design options; - **Chapter Five**
- The potential environmental effects of the project, including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated;- **Chapter Seven**
- An environmental management and monitoring plan matrix outlaying the activities, associated impacts, mitigation measures, monitoring indicators, implementation timeframes, responsibilities, and cost;- **Chapter Eight**
- Public Consultation and Participation as well as measures to prevent health hazards and to ensure security in the working environment for the employees, the project area community and for the management of emergencies;- **Chapter Six**
- Conclusions, recommendations for the success of the project; - **Chapter Nine** and
- Any other information that NEMA may require.

1.9 The Project Cost

The construction is estimated to cost approximately **one billion, Nine hundred and four million, Nine hundred and ninety thousand, four sixty – three Kenyan shillings. (1,904,990,463.00)**

CHAPTER TWO: PROJECT DESCRIPTION

2.1 Location of the Project

The proposed project site is located within Parkland Area, Nairobi County. The project is located on **Plot L.R. Nairobi block** 7/430, situated in Parkland Area, Nairobi County at coordinates **-1.2568295 and 36.8075028** for Latitude and Longitude Respectively**.** The project location is accessed through an all-weather road breaking from Mpaka Road. The proposed site neighbours several residential apartment's that have come up in the area.

Figure 1: Project Location.

2.2 Project Description

Project Details and Description – Summary

The proposed development is a high-rise residential apartment project located along, Nairobi County. The building will consist of **four (4) parking levels, fourteen (300) apartment levels, and a rooftop level designated for resident amenities.** The development will feature a total of **302 residential units**, comprising 44 one-bedroom units, 44 one-bedroom executive units, and 132 two-bedroom units,two 5-bedroom penthouse units, All units are designed with a living room, kitchen area, and sanitary facilities, with guest/common sanitary facilities provided for shared spaces.

The 23th floor will include various resident amenities such as meeting area, gym area, kids playing area. Additionally, the rooftop level will accommodate a restaurant and roof garden alongside residential units.

The project will provide a **total of 206 parking lots**, distributed across:

- Basement 1 – 51 parking spaces
- Basement 2 – 51parking spaces
- Basement 3 – 54 parking spaces
- Ground floor -51 parking spaces, security room, outdoor toilet and reception

Other provisions in the project include three passenger lifts, each with a capacity of 16 persons, as well as common passageways and balconies for easy movement and access throughout the building.

2.3 Project Floor Plan Details

Table 2: Project Floor Plan Details

Floor Level	Area (SQM)	Function/Components	Total Units
Basement 1 Parking Basement 2 Parking Basement 3 Parking	1457.12 1457.12 1774.99	51 Slots 51 Slots 54 Slots	156
Ground Floor	1646.30	Parking for 51 slots Security room, outdoor toilet and reception,	51
1st Floor	1268.5 (each)	2 No 1- Bedroom Unit, 2 No. 1- Bedroom executive unit,6 No 2- Bedroom units	12
2nd Floor and 22nd Floor	1267.86 (each)	2 No. 1-Bedroom Units, 2 No. 1-Bedroom Units executive unit, 6 No. 2-Bedroom Units	12 per floor
23th Floor	1283.04 (each)	2 No. 5- Bedroom penthouse unit,1 No Gym.1 No meeting room, 1 No Kids playing area	5
Roof Top	511.41	Restaurant -1unit Roof garden- 1unit	2
Total Units	—	—	**302 Units**

2.4 Raw Materials Inputs

During Alteration/Construction Phase

Raw materials required for the construction of the proposed William Omondi Muthama residential project will include:

- **Water** for construction, workers`domestic use, dust suppression and material mixing purposes. Water will be obtained from the existing water supply in the project area- NAWASCO. The site has water connection already at the site and a back water from the borehole.
- **Cement** for mortar and concrete used in the construction and repairing of walls of the structure walls. Cement will be procured from local suppliers in Nairobi town.
- **Sand** for building mortar. This will be bought from the neighboring county vendors who are selling sand near the project site.
- **Wood** this will be sourced from the nearby sites and vendors within the project site.
- **Concrete stones/blocks/ bricks-**These will be obtained from local hardware suppliers and vendors in neighboring counties.
- **Tiles-**Ceramic tiles will be obtained from local hardware and vendors

During Operational Phase

The main raw material inputs required for the operation of the proposed William Omondi Muthama residential project will include:

Water for domestic purposes: This will be obtained from existing water supply in the site project from Nairobi Water and Sewerage Company. The proponent will also install roof gutters for water harvesting on the site.

Electricity for night visibility and security lighting: This will be supplied by the Kenya Power and Lighting Company (KPLC) on a commercial basis. It is expected that the proposed residential apartment`s project will exert minimal pressure on the present power supply system in the area.

2.5 By-products of the Project

The main by-products expected from the project during construction will be construction rubbles, rejected concrete blocks and rock rubbles used to construct the foundations and drainage. No by-products are envisaged during the during occupation/ operation phases and by-products during decommissioning phases will include stone debris, iron and steel, wood debris, insulation and electrical wiring, tiles, ceramics and broken glasses.

Waste water management: The proposed project site is located in an area that has a sewer line, therefore the proponent need to apply and connect the proposed residential project to this utility for the management of waste water. The

manhole for the sewer connection should be heavy duty and the inside face of the wall should be plastered with two courses of 10mm thick cement mortar.

Solid waste management: Solid waste management within the project area is normally an individual responsibility to ensure that all the solid waste generated within their households is properly disposed. It's for this reason that the proponent in partnership with other residents will engage a private service provider who is NEMA compliant (licensed to transport solid waste) to offer his/her services to them at a nominal fee during occupation. In the construction period, the construction waste will be collected by a contracted NEMA registered waste collection company for safe disposal.

Storm water management: The proposed project area is a fairly flat with an undulating topography hence storm water does drain properly when it rains.

A parking space: There are designated personal parking space on the semi basement and Site plan floors. On the 1,2,3 basement, there are 156 parking spaces while the Site Plan Floor/ Ground floor is having 51 parking spaces. Hence the total parking spaces as per the approved plans is 206.

2.6 Project Activities

2.6.1 Description of the project's construction activities

The implementation of the project's design and construction phase will start with thorough investigation of the site soil chemical and physical properties and water table level determination. Initial activities during this pre-construction phase relating to construction management will in addition, include establishment and agreement on management, inspection and reporting procedures. The construction of the residential project shall be as per the approved designs. The construction will be based on the building standards, code and regulations applicable in Kenya. The proposed works will follow standard environmental guidelines, health and safety measures. The County's general bye-laws on building, water and sewerage bye-laws, and Public Health Act must be adhered to during the construction phase. This phase will be undertaken by a contractor who will be able to handle all the civil works including leveling of the site and clean up. The construction will involve but not be limited to the following activities:

- Procurement of construction materials from approved dealers;
- Excavation and removal of overburden;
- Storage of the construction materials;
- Transportation of construction materials and disposal of the resulting construction wastes/debris using heavy and light machinery;
- Laying of foundations and structural members;
- Erection of water storage tanks, septic tank and other structures on site;
- Installation of electrical and mechanical fittings onto the structure;
- Finishing of the structure; and
- Landscaping works and earth works to be done mostly on completion of the proposed residential development.

In order to alleviate any negative impacts emanating from the construction and operation activities of the proposed residential apartment's project, relevant and cost

effective mitigation measures have been proposed in the EMMP which is part of this report.

Key summary descriptions of the construction activities are presented in the following section and they include:

Procurement of building materials

Greater emphasis shall be laid on procurement of building materials which shall strictly be done within the project area and its environs. This makes both economic and environmental sense as it will reduces both the costs and negative impacts of transportation of the materials to the project site through reduced distance of travel. To avoid much wastage of construction materials, the proponent shall order the materials in quotas as at when they are required and the quantities required. The proposed project construction activities shall require concrete blocks, sand, cement, ballast, steel metals, roofing materials among others.

The Structural Framework: The foundation and all reinforced concrete structural members e.g. ground beam foundation, columns, beam casting will be carried out in accordance with Ministry of Public works regulations. The best concrete cast must also conform to mixing ration of reinforced concrete as per the specifications of the structural engineer and be tested in accordance by the material testing section of the Ministry of Public Works.

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

Roof construction works: The roof construction shall depend on the architectural designs.

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

Door/Window Fixtures: The doors and their frames shall be of standard measurement as per the architectural designs and structural engineers'specifications. The windows shall be of steel casement glass and fabricated as proposed in the design concept but must provide adequate light into the house.

Walling and Floor Finishing: The walls will be built of thick reinforced concrete as per the specifications given and plaster, thick cement, sand mix ratio finished in smooth with steel float for the internal walls. Toilets, washrooms and bathrooms will be fitted with ceramic filing as designated tiles.

Security and services: During peak construction, more workers will be employed on site. The majority of these workers will be sourced from the local population. It is anticipated that no criminal or security threats will be reported from the neighbour-hood. As a control measure the proponent should have a 24 hours security provided.

Landscaping: On completion of the project, massive landscaping shall be carried out across the project area especially open areas of the project site. Different types of trees and flowers shall be planted within the site to help improve the aesthetic quality.

2.6.2 Description of the Project's operational Activities

Residential services: The main activity during operation is residential accommodation. This is expected not to cause any significant environmental impacts due to the nature save for solid waste produced during occupation.

Water supply: The water to be used for both construction and during operational phases of the project will be obtained from water supplies or water vendors as well as the proposed borehole drilling on the site.

Electricity supply: Kenya Power and Lighting Company (KPLC) is a limited liability company responsible for the transmission, distribution and retail of electricity throughout Kenya. The main supply to the facility will be from the existing KPLC line that is in the project area.

Solid waste: Considering that the Nairobi County Government does not provide solid waste management services as per the law requirements, the proponent in partnership with other residents has proposed to contract a private service provider licensed by

both NEMA and the Nairobi County Government to help manage all the solid waste generated from the estate.

Waste water management: The project proponent shall cater for waste management in appropriate structures, facilities and operations. These will be provided in such a way as to meet the requirements of the Waste Management Regulations and as stipulated under the EMCA 1999 and as per the relevant EMCA Waste Management (2024) Regulations. In so doing the proponent will pursue waste minimization, recycling and disposal. The proponent commits to handle liquid wastes through connection to a NAWASCO sewer line that passes in the project area.

2.6.3 Description of the project's decommissioning activities

The main objective of decommissioning shall be to make the area occupied by the residential apartment's project equivalent or better than its original condition upon decommissioning. During this phase, a project decommissioning plan will be prepared and a report submitted to NEMA before decommissioning commences. Some of the major activities that will be undertaken during this phase include the following:

Demolition works: Upon decommissioning, the project components including buildings, drainage systems and boundary wall will be demolished. This will produce a lot of solid waste mostly construction debris, which will be reused for other construction works or if not reusable, disposed of appropriately by a licensed waste collection and disposal company.

Dismantling of equipment and fixtures: Project and housing equipment (e.g. electrical installations, furniture, finishing fixtures partitions, pipe-work and sinks) will be dismantled and removed from the site. Priority will be given to reuse of these equipment in other projects. This will be achieved through re-sale of the equipment to other building owners or contractors or donation of this equipment to charitable institutions in Parkland area.

Site restoration: Once all the waste resulting from demolition and dismantling works will have been removed from the site, the site should be restored through replenishment of the top-soil and re-vegetation using indigenous tree species.

Table 3: Materials Used, By-products and Waste Generated during project life cycle

Project Phase	Materials used	Wastes/Byproducts	Disposal Method
Building Works	• Stone/ bricks • Cement and water • Timber and Nails • Glasses for window panes	• Debris • Used Timber • Broken Tiles and Glasses	• Contractor to dispose of-site
Operational phase/Occupation	• Food staff • Plastic Containers • Water	• Domestic Garbage • Waste Water	• Waste collection contractor • NAIROBI WATER AND SEWERAGE COMPANY

			(NAWASCO) sewer connection.
Decommissioning phase	• Demolitions	• Stone debris, Steel • Wood debris/ broken glasses • Insulation and Electrical wiring • Tiles and ceramics	• Recycling the recyclable waste • Registered waste handler to dispose off-site

CHAPTER THREE: BASELINE INFORMATION

3.1 Introduction

This chapter provides a overview of the existing environmental, social, and infrastructural conditions at the project site for the proposed residential apartment construction in Parkland, Nairobi County. The study encompasses an analysis of the physical location, climatic conditions, geological features, drainage patterns, existing infrastructure, demographic profiles, and socio-economic indicators within the project vicinity. This foundational information is critical for assessing the potential impacts of the project, ensuring compliance with environmental regulations, and developing effective mitigation strategies.

3.2 Project Location, Land ownership and surrounding area

The proposed project is located on Plot L.R. No. Nairobi block 7/430, situated in Westland area of Nairobi County. The surrounding area is predominantly residential, featuring a mix of high-rise and low-rise developments. The project site is privately owned by the proponent, William Omondi Muthama.

3.3 Climate and Meteorological Conditions

3.3.1 Temperature Patterns

The Gen.Mathenge road -Westlands area, located within Nairobi County, experiences a moderate subtropical highland climate, characterized by relatively stable and pleasant temperatures throughout the year due to its elevation of approximately 1,795 meters (5,889 feet) above sea level.

Daily temperatures typically range between 10°C and 26°C, with minimal extremes. The warmest months are usually January through March, when daytime temperatures can reach up to 25°C to 28°C, while July and August tend to be the coolest months, with daytime temperatures averaging around 20°C to 22°C, and nighttime temperatures occasionally dropping to around 10°C.

3.3.2 Rainfall Patterns

The Westland area in Nairobi County experiences a bimodal rainfall pattern, characterized by two distinct rainy seasons annually. The long rains occur from March to May, while the short rains are experienced from October to December. These patterns are influenced by the movement of the Inter-Tropical Convergence Zone (ITCZ), which brings moisture-laden winds to the region during these periods.

The average annual rainfall in the area ranges between 900 mm and 1,200 mm, with April typically being the wettest month. The rainfall is generally moderate to heavy during the peak months and often occurs in the form of afternoon or evening showers and thunderstorms. During the dry seasons—typically from January to February and June to September rainfall is minimal or sporadic.

Rainfall in Westland plays a crucial role in supporting the area's vegetation cover and contributes to groundwater recharge. However, the increased rate of urbanization and reduction in natural ground cover may lead to surface runoff challenges and localized flooding during periods of intense rainfall, particularly in low-lying areas.

3.3.3 Wind Characteristics

The Westland area in Nairobi County experiences moderate wind speeds throughout the year, with notable seasonal variations. According to data from the Kenya Meteorological Department, the average wind speeds in Nairobi range between 2 to 5 meters per second (approximately 7.2 to 18 km/h), with the highest speeds typically occurring between September and April. Wind patterns in this region are influenced by both local topography and broader regional weather systems, including the monsoon winds from the Indian Ocean.

Prevailing winds typically blow from the east and southeast during most parts of the year, particularly between March and October. During the short dry season (January to February) and the long rains (March to May), occasional westerly or northwesterly winds may be experienced, though they are usually less dominant.

Average wind speeds range from 2 to 5 meters per second (m/s), with slightly higher speeds observed during the drier months. The winds in the area are generally gentle and do not pose a significant threat to structural stability or environmental integrity. However, during storms or heavy rainfall events, wind speeds may increase temporarily, contributing to the dispersion of airborne particles such as dust and pollutants.

3.4 Topography and Drainage

Terrain and Elevation

The terrain of the proposed project site along **General Mathenge Road, Westlands**, is moderately sloping. The sloping terrain necessitates careful planning to mitigate soil erosion, manage stormwater effectively, and protect the hydrological integrity of adjacent water bodies.

The site lies at an elevation ranging between approximately **1,620 and 1,680 meters above sea level**, placing it within the greater Nairobi upland zone. This elevation supports a temperate microclimate, characterized by moderate temperatures and relatively high rainfall, contributing to the area's lush vegetation. While the slope introduces certain structural and hydrological challenges, it also offers opportunities for sustainable architectural interventions, such as **multi-level building designs**, **terraced landscaping**, and **gravity-assisted drainage systems** that align with the land's natural contours.

3.4.1 Drainage Systems and Runoff

The proposed project site features a sloping terrain that naturally directs surface water toward the river. The drainage systems in the area are typically urbanized, consisting of a combination of surface drains and culverts, which manage runoff during rainfall events. However, due to the sloping nature of the land, runoff can be concentrated and rapid, which may lead to localized flooding if not properly managed.

The existing drainage infrastructure in the area is designed to handle moderate rainfall, but there may be concerns regarding capacity during heavy downpours, particularly in areas near the river. The Mathare River itself plays a significant role in the drainage of the surrounding areas, and maintaining its water quality and flow is crucial to prevent erosion and contamination. Proper stormwater management systems will need to be incorporated into the project design to reduce the potential for runoff, minimize soil erosion, and ensure that drainage flows are controlled in a manner that complies with local environmental regulations.

The design of the drainage systems must take into account the sloping terrain, proximity to the riparian zone, and existing urban infrastructure, ensuring that water runoff is effectively channeled, filtered, and directed to prevent flooding, waterlogging, or pollution of the nearby river.

3.5 Hydrogeology and Soils

3.5.1 Groundwater Resources and Aquifers

The groundwater resources in the Westlands area, including the vicinity of the proposed project site, are primarily sourced from the Nairobi aquifer system. According to the Water Resources Authority (WRA) and various hydrogeological studies, the Nairobi aquifers are characterized by moderate to high yields, providing a critical source of water for both domestic and commercial use in Nairobi County.

The area's aquifer system is generally well-protected, but over-extraction and contamination risks from urban activities, such as improper waste disposal and pollution, could impact water quality and availability. Groundwater levels can fluctuate due to seasonal variations in rainfall, but the general depth of the water table in this region is within 20-50 meters from the surface. The proximity to the Mathare River suggests that there may be interconnection between surface water and groundwater, making it essential to manage any potential contamination risks from the proposed project activities.

3.5.2 Soil Types and Composition

The soil types at the project site are primarily composed of *sandy loams*, *clayey soils*, and occasional layers of *gravelly sands*. These are typical of urban settings in Nairobi, particularly in areas near the Mathare River. The topsoil is generally fertile, followed by moderately compacted layers of silty and sandy soils with low to medium plasticity. The depth of these soil layers varies, with sandy loam depths reaching up to 1.5 meters before transitioning into clay and silt layers. The underlying soil properties suggest good load-bearing capacity, although some localized areas may require soil stabilization measures like lime or cement treatment to improve the subgrade conditions for foundation work. Detailed soil analysis, including tests for compaction, shear strength, and permeability, are provided in the attached Geotechnical Report.

3.5.3 Geology and Rock Formations

The site is located in an area dominated by volcanic rock formations, primarily *basalt* and *rhyolite*, which are typical of the Nairobi region's geology. These formations are part of the broader East African Rift System and provide a solid, stable base for construction. Basalt, specifically, is a fine-grained volcanic rock known for its strength and durability, making it an excellent material for supporting heavy structures. In certain sections of the site, the basalt layers are found at depths of 3 to 6 meters below the surface, providing a strong foundation. Additionally, the presence of *trachyte* in certain localized areas is noted, which may require additional excavation or drilling in foundation works. The rock layers have been studied for their fracture patterns, and further geophysical analysis can be found in the attached Geotechnical Report. The geological profile supports the anticipated load-bearing capacity for the project.

3.6 Biological Environment

3.6.1 Flora (Dominant and Unique Plant Species within Nairobi)

The site is primarily urban, with limited natural vegetation due to its proximity to developed areas. However, a few dominant plant species are present in the vicinity, particularly ornamental trees and shrubs planted along roadsides and residential compounds. Common species include *Grevillea robusta* (Silk Oak), *Jacaranda mimosifolia* (Jacaranda), *Ficus benjamina* (Weeping Fig), and various species of grass. The area also hosts non-native plants like *Lantana camara* (Lantana) and *Nicotiana glauca* (Wild Tobacco), which are commonly found in disturbed urban areas. There are no rare or endangered plant species recorded within the project area. The flora in the surrounding riparian zone is characterized by some aquatic plants, including species like *Phragmites australis* (Common Reed), which thrive along the river's edge due to the presence of moisture.

3.6.2 Fauna (Wildlife and Biodiversity in Nairobi)

Due to the urbanized nature of the area, the fauna is mainly limited to common urban species. Mammals like *Rattus rattus* (Roof Rat) and *Mus musculus* (House Mouse) are prevalent in the surrounding areas, along with occasional sightings of *Ceratotherium*

simum (White Rhinoceros) and *Aepyceros melampus* (Impala) in nearby urban parks. The bird population is diverse, with species such as *Passer domesticus* (House Sparrow), *Turdus merula* (Blackbird), *Corvus albus* (White-necked Raven), and *Accipiter badius* (Shikra) being commonly observed. These species often adapt to urban environments where food sources like human waste are readily available. The riverine area, particularly along the Kirichwa River, supports some aquatic fauna like fish species and amphibians, though this biodiversity is relatively low in comparison to more pristine riparian zones. The project area does not harbor any significant populations of endangered or protected wildlife.

3.7 Land Use and Surrounding Developments

3.7.1 Existing Land Use in the Area

The area surrounding the project site is primarily urban and characterized by mixed land use, including residential, commercial, and recreational spaces. The dominant land use is residential, with both high-rise and low-rise buildings. Notable high-rise buildings in the vicinity include *Marwa heights*, which is located a short distance from the site. Other examples of high-rise buildings nearby include *The Parkade*, *Khaleel homes*, and *The Rodol homes*, which are all part of the modern development trend in the area. These buildings are typically residential, with some offering mixed-use spaces that combine living, retail, and office facilities. The surrounding neighborhood also includes several commercial establishments, such as restaurants, shops, and service providers, as well as recreational facilities like parks and fitness centers.

Figure 2: High-rise building observed during scoping neighbouring the proposed project site

3.7.2 Zoning and Development Restrictions

The proposed project land is situated within a residential zone, which is characterized by high-rise buildings and is subject to specific zoning regulations that permit multi-dwelling developments. The zoning policy of the area supports the development of residential

complexes, including apartment buildings and mixed-use projects. In line with this zoning policy, the proponent has obtained the necessary approvals for the change of use of the land.

3.1.1 Air Quality

The air quality in the project area, Gen. Mathenge road Westland, Nairobi County, is influenced by a mix of residential, commercial, and light institutional activities. The area lies within the urban fabric of Nairobi and experiences moderate traffic volumes, especially during peak hours, which contributes to ambient air pollution. Localized emissions may arise from vehicular traffic, small-scale combustion, dust from unpaved surfaces or construction works, and domestic fuel usage

Summary of Baseline Air Quality Assessment Report

An air quality baseline assessment was conducted to establish the existing ambient air conditions at the proposed project site prior to the commencement of construction activities. The assessment aimed to evaluate the concentration of key air pollutants in the surrounding environment and determine the air quality status in relation to national and international standards. Sampling was carried out at strategic locations within and around the project area, focusing on typical pollutants such as particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), and

total suspended particulates (TSP). The results indicated that pollutant levels at all monitoring stations were within the permissible limits set by the National Environment Management Authority (NEMA) and World Health Organization (WHO) air quality guidelines. The primary sources of air emissions in the area were found to be vehicular traffic from nearby roads and minor dust generation from existing urban activities. These findings provide a reference point for future comparisons and emphasize the need for implementing dust suppression and emission control measures during the project's construction phase to maintain air quality within acceptable levels. Below are tables showing the guidelines and the points of sampling. A full air quality assessment report has been annexed to this document.

Table 4: EMCA Ambient Air Quality Tolerance Limits

Pollutant	**Time Weighted Average (TWA)**	**Residential, Rural & Other Areas (µg/m³)**
Particulate Matter (PM10)	24 hours	50
Particulate Matter (PM2.5)	24 hours	75
Sulfur Dioxide (SO_2)	24 hours	125
Nitrogen Dioxide (NO_2)	24 hours	100
Volatile Organic Carbon (VOC)	24 hours	600
Carbon Monoxide (CO)	24 hours	5
Carbon Dioxide (CO_2)	24 hours	5

Table 5: Table of the monitoring points for William Omondi Muthama sampling:

Monitoring Point (MP)	**Description of Sampling Point**	**GPS Coordinates**
MP1	Corner south of the Gate	1° 17' 0.9884" S, 36° 47' 14.66556" E
MP2	Corner next to the road area	1° 17' 2.05908" S, 36° 47' 13.70832" E
MP3	Corner left of the Gate area	1° 17' 1.66234" S, 36° 47' 15.98556" E
MP4	Corner at the Gate area	1° 17' 1.88844" S, 36° 47' 16.08144" E
MP5	Receptor point outside the site	1° 17' 1.1112" S, 36° 47' 16.35756" E

3.1.2 Noise Quality

General Mathenge road in Westland is a primarily residential area with some small commercial activities. The noise environment is influenced mostly by moderate vehicular traffic, including private cars, motorcycles, and occasional public service vehicles. Peak noise levels occur during morning and evening rush hours when traffic volume increases. Social activities and localized construction also contribute to daytime noise.

At night, the area is generally quiet with minimal disturbances, making it suitable for residential living. The mix of buildings and greenery provides some natural noise buffering. Understanding this baseline is essential for managing potential noise impacts from any upcoming project in the area.

Summary of Baseline Ambient Noise Assessment Report

The objective of this baseline survey was to determine and document existing environmental noise levels at the site prior to commencement of construction activities. The results provide a reference point for evaluating potential noise impacts during project implementation and for ensuring compliance with applicable legal thresholds.

Noise Monitoring Details

Noise level measurements were conducted during the daytime period in line with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009. Monitoring covered five locations characterized by various common sources of noise, such as vehicular traffic, human activity, nearby construction, and natural ambient sounds.

Table 6: Environmental Noise Monitoring Points and Observed Sources

ID	Measuring Point Description	Observed Noise Sources	GPS Coordinates
MP1	Measurement Point 1	Birds chirping	S1°17'0.9884" / E36°47'14.66556"
MP2	Measurement Point 2	Vehicular noise from Denis Pritt Road	S1°17'2.05908" / E36°47'13.70832"
MP3	Measurement Point 3	Birds chirping, vehicular from Denis Pritt Road	S1°17'1.66234" / E36°47'15.98556"
MP4	At the main entrance gate	People conversing, construction activities nearby	S1°17'1.88844" / E36°47'16.08144"
MP5	Receptor point (neighbouring residence gate)	Construction activities at a nearby plot	S1°17'1.1112" / E36°47'16.35756"

Legal Framework for Noise Standards

The applicable regulatory framework is the EMCA (1999) through Legal Notice No. 61 of 2009 — *Noise and Excessive Vibrations Pollution Control Regulations*. These regulations stipulate permissible noise levels based on land use zones. The table below summarizes the limits.

Permissible Noise Levels by Zone – Legal Notice No. 61 of 2009

Zone Category	Daytime Limit (dB(A))	Night Limit (dB(A))	NR (Day)	NR (Night)
A - Residential (Outdoor)	50	35	40	25
B - Mixed Residential with Commercial Activities	55	35	50	25
C - Commercial	60	35	55	25

Findings and Interpretation

All recorded noise levels were found to be below the IFC guideline limit of 70 dB(A) for daytime activities. However, the noise level at the receptor point (MP5) exceeded the EMCA regulatory limit of 60 dB(A), primarily due to ongoing construction activities at a neighboring plot. Additional noise contributors included vehicular traffic along Denis Pritt Road, birds chirping, and human conversations near the site gate. The baseline survey indicates that while overall noise levels remain within international standards, certain locations exceed local legal thresholds, highlighting the need for appropriate mitigation measures during the construction phase to ensure regulatory compliance.

3.2 Socio-Economic Environment

3.2.1 Population Size and Demographics

Westland Ward, where the proposed project is located, is a high-density residential area within Nairobi County. The area has experienced rapid urbanization over the last decade, with an increase in multi-dwelling apartment units replacing former low-density residences. As per the 2019 Kenya Population and Housing Census, the population of Westland Ward was estimated at 29,673 people. The demographic distribution reflects a diverse, predominantly middle-to-upper-income population, with a significant number of working professionals and expatriates.

Table 7: key population statistics for Westland Ward summary:

Demographic Indicator	Statistic
Total Population (2019 Census)	29,673
Gender Distribution	Male: 14,421 (48.6%) Female: 15,252 (51.4%)
Number of Households	Approx. 10,757
Average Household Size	2.8 persons

3.2.2 Infrastructure and Accessibility

a. Roads and Transportation

The project area in Westland is well-connected by a developed urban road network and public transportation system. The primary access route to the site is General Mathenge Road, which links to major roads such as Ring Road, Kandara Road, and Gitanga Road. These roads provide seamless connectivity to Nairobi 's central business district (CBD).

Public transportation in the area is served mainly by matatus (minibuses) and boda bodas (motorcycle taxis). Ride-hailing services such as Uber, Bolt, and Little Cab are also widely used by residents. Footpaths and pedestrian walkways are common along the main roads, though in some areas they are narrow or encroached upon. Traffic congestion can occur during peak hours, particularly at junctions along Ring Road.

b. Water Supply Systems

The project area is primarily served by the Nairobi City Water and Sewerage Company (NCWSCO). The municipal water supply system sources its water from Ndakaini Dam, Sasumua Dam, and Kikuyu Springs, with treatment done at Ngethu and Kabete Treatment Plants.

In Westland, most properties have underground sump tanks and overhead storage tanks to manage intermittent water supply. In addition, private boreholes are common in the area and often serve as supplementary sources. The project will consider integration with both municipal supply and borehole systems, depending on demand projections.

c. Sewerage and Waste Management

Sewerage services are facilitated through NACWSCO and feed into the Dandora Estate Wastewater Treatment Plant (DEWWTP), which is Nairobi's primary wastewater treatment facility.Solid waste is managed by licensed private companies approved by Nairobi City County Government (NCCG) under the Environmental Management and Coordination (Waste Management) Regulations, 2024. Waste segregation at source is encouraged under the Sustainable Waste Management Act, 2022.

d. Electricity and Power Distribution

Power distribution in Westland is managed by the Kenya Power Company (KPC). Most high-rise developments integrate backup diesel generators, automatic transfer switches (ATS), and increasingly, solar PV systems with battery storage, in line with the national push for renewable energy integration as outlined in Kenya's Least Cost Power Development Plan (LCPDP). Smart metering and three-phase connections are typically provided for developments with high load demand.

e. Communication and Telecommunication

The area is well-serviced by all major telecom operators including Safaricom, Airtel, Telkom Kenya, and Faiba (JTL). The site benefits from access to 4G and 5G mobile network coverage, and fixed internet is supported through fiber optic cables laid along major roads such.

Internet providers such as Zuku, Safaricom Home, and JTL Faiba offer broadband services with speeds of up to 250 Mbps. The region also has good mobile phone reception, and most buildings are equipped with satellite TV systems, intercoms, and digital surveillance systems (CCTV).

3.2.3 Key Economic Activities

The Westland area, where the proposed project is located, is predominantly a high- income residential zone within Nairobi County. The key economic activities in the region include real estate development**,** professional services**,** hospitality, and retail trade. The area hosts numerous office suites, serviced apartments, hotels, restaurants, and shopping outlets catering to middle and upper-income groups. According to the Kenya National Bureau of Statistics (KNBS), the real estate and construction sector contributed approximately 9.3% to Kenya's GDP in 2023, with Nairobi accounting for the majority share due to its rapid urbanization and infrastructure development. Additionally, many residents in the area are employed in the formal employment sector, including positions in finance, insurance, education, medical, and legal professions, as well as self- employment in consultancy and entrepreneurship.Westlands also benefits economically from proximity to commercial hubs.

3.2.4 Educational Profile

Nairobi County is renowned for its high literacy rate, with the 2019 Kenya Population and Housing Census revealing that over 89% of Nairobi's population aged 3 years and above have attended school. This statistic is reflective of the area's well-developed educational infrastructure. In Westland, access to quality education is further enhanced by a robust mix of public and private educational institutions, including early childhood development centers, primary schools, secondary schools, and tertiary institutions.

3.2.5 Healthcare Facilities

The Westland area benefits from proximity to a variety of healthcare facilities that serve the local and surrounding communities. Notable hospitals including Kenyatta National Hospital, Nairobi Women 's Hospital, Aga Khan University Hospital, located a short distance from the project site in the nearby Parklands area. This hospital is renowned for its high standards of healthcare, offering a wide range of medical services, including specialist care, diagnostic services, and emergency treatment. The Nairobi Hospital, located in the Upper Hill area, is one of Kenya's leading healthcare providers, offering advanced medical care across various specialties the area have access to comprehensive medical care, which is an essential consideration for any development in the region.

3.3 Cultural and Heritage Considerations

3.3.1 Cultural Sites and Practices

The Westland area, while predominantly residential and commercial, is located near several cultural and historical sites that reflect Nairobi's rich heritage. These include Nairobi National Museum and Kazuri Beads, both offering insights into Kenya's diverse cultures, arts, and history. The city's proximity to such cultural sites fosters a deep appreciation of local traditions, with many residents participating in cultural festivals, arts exhibitions, and traditional ceremonies. These sites and practices contribute to the cultural vibrancy of the area and enhance the overall living experience.

There are no burial sites or graves located within the project site or its immediate vicinity. The land is free of any culturally significant sites such as graves, and the surrounding area is primarily characterized by residential and commercial developments. This ensures that there are no potential conflicts with cultural or ancestral land use at the proposed project location.

CHAPTER FOUR: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 General Overview

Environmental Impact Assessment (EIA) is a methodology used to identify the actual and probable impacts of projects on the environment and to recommend alternatives and mitigation measures. The assessment is required at all stages of project development with a view to ensuring environmentally sustainable development for both existing and proposed public and private sector development ventures. Various National Policies and Acts of parliament are discussed below as they relate to the environment management and the sector into which the proposed project has interest.

4.2 Policies

Any EIA must conform to the policy guidelines under its jurisdiction. Recognizing that Environment and Development issues must promote aspirations for an innovative, progressive, and prosperous Kenya, it is the expectation that any development initiatives are reflective of these policies. Policies are normally translated into actionable how to‖ by implementable action plans or programmes, bearing with them a systematic code of ethics for reward at compliance or sanction and penalties otherwise. The policies outlined below are relevant to the proposed project.

4.2.1 National Environmental Action Plan (NEAP)

According to the NEAP-1994 the Government of Kenya recognized the negative impacts on ecosystems emanating from economic and social development programmes that disregard environmental sustainability. Following on this, establishment of appropriate policies and legal guidelines resulted in harmonization of the then 76 existing Statutes into the Environmental Management and Coordination Act (EMCA), cap 387. The NEAP process introduced Environmental Impact Assessment in Kenya culminating in to the development of the Sessional Paper No. 66 on the Environment and Development.

4.2.2 National Environment Action Plan Committee

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

- Contain an analysis of the Natural Resources of Kenya with an indication as to any pattern of change in their quality, distribution and quantity over time.
- Contain an analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational and intra-generational equity.
- Recommend appropriate legal and fiscal incentives that may be used to encourage the business community to incorporate environmental requirements into their planning and operational processes.
- Recommend methods for building national awareness through environmental education on the importance of sustainable use of the environment and natural resources for national development.
- Set out operational guidelines for planning and management of the environment and natural resources.
- Identify actual or likely problems as may affect the natural resources and the broader environmental context in which they exist.

- Identify and appraise trends in the development of urban and rural settlements, their impact on the environment, and strategies for the amelioration of their Negative Impacts.
- Propose guidelines for the integration of standards of environmental protection into development planning and management.
- Identify and recommend policy and legislative approaches for preventing, controlling or mitigating specific as well as general diverse impacts on the environment.
- Prioritize areas of environmental research and outline methods of using such research findings.
- Without prejudice to the foregoing, be reviewed and modified from time to time to incorporate emerging knowledge and realities.
- To be binding on all persons and all government departments, agencies, States Corporation or other organ of government upon adoption by the National Assembly.

4.2.3 National Policy on Water Resources Management and Development

The National Policy on Water Resources Management and Development (1999) seeks to enhance a systematic development of water facilities in all sectors for the country's socio-economic progress, and therefore calls for development of appropriate sanitation systems to protect people's health and water resources from pollution. It also sets guidelines for the utilization of water resources to prevent overexploitation and depletion of the resource.

Development projects, therefore, should be accompanied by corresponding waste management systems to handle the wastewater and other waste emanating there from. The policy also requires that such projects should undergo comprehensive Environmental Impact Assessments that will provide suitable measures to be taken to ensure environmental resources and people's health in the immediate neighborhoods and further downstream are not adversely affected by any emissions or discharges. (GOK, 1999)

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

The paper presents broad categories of development issues that require sustainable approach. The paper harmonizes environmental and development objectives so as to ensure sustainability. The paper provides comprehensive guidelines and strategies for government action regarding the environment and development. ***The proposed project will proceed under auspices of these guidelines and strategies that foster environmental values in development projects.***

Among the key objectives of the Policy Paper on Environment and Development (Sessional Paper No. 6 of 1999) are: -

- To ensure that from the onset, all development policies, programmes and projects take environmental considerations into account,
- To ensure that an independent Environmental Impact Assessment (EIA) Study report is prepared before project implementation,
- To come up with effluent treatment standards that will conform to acceptable health guidelines.

Under this paper, broad categories of development issues have been covered that require a sustainable approach. Among these issues are waste management and human settlement. The policy recommends a need for enhanced re-use/ recycling of residues including wastewater, use of low non-waste technologies, increased public awareness and appreciation of a clean environment. It also encourages participation of stakeholders in the management of wastes within their localities. On human settlements, the paper advocates for better planning in both rural and urban areas and provision of basic needs such as water, drainage and waste disposal facilities among others.

The design of the proposed residential apartment's development project should be such that it adequately addresses the need for a sound waste management system. (GOK, 1999)

4.2.5 National Housing Policy

It is the Act under which National Housing Corporation (NHC) is established and granted its legal mandates. The act make provision for NHC for establishment of a housing fund, power to loan and grant and repayment of loans as provided within the Act, undertake and encourage research and experiment in housing related matters and undertake and encourage the collection and dissemination of information concerning housing and related matters, take part in housing exhibitions and other forms of publicity, undertake and encourage the provision of training in furtherance of the purpose of the and provide training for members of its staff, perform any other duties connected with housing as the ministry may direct, operate a financing institution with powers to borrow fund from the government, overseas agencies, pension and trust funds and any other institution or persons, as well as to collect deposits and saving from the public to be applied to the financing of residential housing development and related matters and to establish, promote or aid in establishing or promoting, constitute, form or organize companies syndicate or partnerships alone or in conjunction with any other person or institutions for the carrying on of any such functions as the corporate is empowered to carry under this act. The proponent should comply with this policy (GOK, 1990).

4.2.6 Public Health Policy

The prevailing public health policy calls upon the project proponent to ensure that buildings are adequately provided with utilities so that they are 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 people using the facilities. (GOK, 1986)***

4.2.7 Physical Planning Policy

The local Authorities are empowered under section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section, therefore allows for the prohibition or control of the use and development of land and buildings in the interest of proper and orderly development of an area. Section 36 states that, if in connection with a development application, the local Authority is of the opinion that the proposed development activity will have a injurious impact on the environment, the applicant shall be required to submit together with the application an environmental impact assessment EIA Study report.

The proposed project is in complete cognizance with the provisions of the Physical Planning Act, as it going to sit on land already approved by the Nairobi City County Government.

4.2.8 Environment Impact Assessment Guidelines Policy, 2002

The EIA guidelines require that an EIA be conducted in accordance with the issues and general guidelines spelt out in the second and third schedules of the regulations. These include coverage of the issues on schedule 2 (ecological, social, landscape, land use and water considerations) and general guidelines on schedule 3 (impacts and their sources, project details, national legislation, mitigation measures, a management plan and environmental auditing schedules and procedures. ***This assessment has been conducted according to the EIA guidelines (NEMA, 2003).***

4.2.9 The Kenya Vision 2030

The Kenya Vision 2030 is a policy document outlining Kenya's development programme covering the period between the years 2008 to the year 2030. The objective of Vision 2030 is to help transform Kenya as a newly industrializing, middle-income country providing a high quality of life to all its citizens in a clean and secure environment by 2030. The Kenyan Vision 2030 has a housing and urbanization strategy within its second pillar on investing in the Kenyan society. The Housing and Urbanization sub-strategy talks of Kenya becoming a predominantly urban country by 2030. The strategy additionally outlines the aim of having an adequately and decently housed nation in a sustainable environment. The medium term goal by 2012 was also to increase the annual production of housing units from 35,000 to over 200,000 annually. ***The project proponent will therefore help answer Vision 2030's call for housing development initiative by providing affordable housing to the residents of Westlands and the Country's citizenry at large.***

The Kenya Vision 2030 also has environmental goals outlined under the social pillar. According to the pillar, Kenya aims to be a clean, safe and sustainable environment by 2030. The country aims to achieve this goal by for example improving pollution and waste management strategies. By commissioning an EIA study for the project, the proponent has displayed his desire to support the Kenya Vision 2030.

4.2.10 Sustainable Development Goals, (SDG)

The Sustainable Development Goals (SDGs), otherwise known as the Global Goals, are a universal call to action to end poverty, protect the planet and ensure that all people

enjoy peace and prosperity. These 17 Goals build on the successes of the Millennium Development Goals, while including new areas such as climate change, economic inequality, innovation, sustainable consumption, peace and justice, among other priorities. The goals are inter-connected – often the key to success on one will involve tackling issues more commonly associated with another. The SDGs work in the spirit of partnership and pragmatism to make the right choices now to improve life, in a sustainable way, for future generations. They provide clear guidelines and targets for all countries to adopt in accordance with their own priorities and the environmental challenges of the world at large. The SDGs are an inclusive agenda. They tackle the root causes of poverty and unite us together to make a positive change for both people and planet.

4.2.11 National Climatic Change Response Strategy (NCCRS)

Climate change is considered one of the most serious threats to sustainable development globally. Studies have shown that about 90% of all natural disasters afflicting the world are related to severe weather and extreme climate change events. Impacts of the projected climate change are expected in many sectors such as environment, human health, food security, economic activities, natural resources and physical infrastructure. Kenya acknowledges that the change in the Earth's climate and its adverse effects are a common concern of humankind. The Ministry of Environment and Mineral Resources (MEMR) has therefore recognized the need to enhance coordination of climate change activities in the country with a view to ensuring a climate-proof socioeconomic development anchored on a low - carbon path.

The vision of the Strategy is for a prosperous and climate change resilient Kenya. The mission is to strengthen and focus nationwide actions towards climate change adaptation and GHG emission mitigation. This will be achieved by ensuring commitment and engagement of all stakeholders while taking into account the vulnerable nature of Kenya's natural resources and society. The objectives are to:

- enhance understanding of the global climate change regime: the negotiation process, international agreements, policies and processes and most importantly the positions Kenya needs to take in order to maximize beneficial effects of climate change,
- assess the evidence and impacts of climate change in Kenya,
- recommend robust adaptation and mitigation measures needed to minimize risks associated with climate change while maximizing opportunities
- enhance understanding of climate change and its impacts nationally and in local regions,
- recommend vulnerability assessment, impact monitoring and capacity building framework needs as a response to climate change,
- recommend research and technological needs to respond to climate change impacts, and avenues for transferring existing technologies,
- recommend a conducive and enabling policy, legal and institutional framework to combat climate change, and
- Provide a concerted action plan coupled with resource mobilization plan and robust monitoring and evaluation plan to combat climate change.

4.3 Legal Aspects

4.3.1 National.
The Constitution of Kenya (2010)

The constitution of Kenya was promulgated on 27th August 2010. Several articles are relevant to the proposed residential apartment's project in relation to the environment. **Article 42** states that, every person has the right to a clean and healthy environment, which includes the right-

a) To have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69;

b) To have obligations relating to the environment fulfilled under Article 70.

Article 69: Obligations in respect to the environment

The Article provides that – The State shall-

a) ensure sustainable exploitation, utilization, management, and conservation of the environment and natural resources , and ensure the equitable sharing of the accruing benefits
b) Work to achieve and maintain a tree cover of at least ten percent of the land area of Kenya.
c) protect and enhance intellectual property in, and indigenous knowledge of biodiversity and the genetic resources of the communities
d) Encourage public participation in the management, protection, and conversation of the environment
e) Protect genetic resources and biological diversity
f) Establish systems of environmental impact assessment, environmental audit and monitoring of the environment
g) processes and activities that are likely to endanger the environment; and
h) Utilize the environment and natural resources for the benefit of the people

Section (2) states that; every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

Article 70: Enforcement of environmental rights

1. It stipulates that: If a person alleges that a right to a clean and healthy environment recognized and protected under Article 42 has been, is being or is likely to be, violated, infringed or threatened, the person may apply to a court for redress in addition to any other legal remedies that are available in respect to the same matter.
2. on application under clause (1), the court may make any order or give any directions , it considers appropriate –
    a) to prevent, stop or discontinue any act or omission that is harmful to the environment;
    b) to compel any public officer to take measures to prevent or discontinue any act or omission that is harmful to the

environment; or to provide for compensation for any victim of a violation of the right to a clean and healthy environment.

For the purposes of this Article, an applicant does not have to demonstrate that any person has incurred loss or suffered injury.

Housing Act (Cap 117), 1990.

It is the act under which NHC is established and granted its legal mandates. The act make provision for NHC for establishment of a housing fund, power to loan and grant and repayment of loans as provided within the act, undertake and encourage research and experiment in housing related matters and undertake and encourage the collection and dissemination of information concerning housing and related matters, take part in housing exhibitions and other forms of publicity, undertake and encourage the provision of training in furtherance of the purpose of the and provide training for members of its staff, perform any other duties connected with housing as the ministry may direct, operate a financing institution with powers to borrow fund from the government, overseas agencies, pension and trust funds and any other institution or persons, as well as to collect deposits and saving from the public to be applied to the financing of residential housing development and related matters and to establish, promote or aid in establishing or promoting, constitute, form or organize companies syndicate or partnerships alone or in conjunction with any other person or institutions for the carrying on of any such functions as the corporate is empowered to carry under this act. (GOK, 1990).

The Environmental Management and Coordination Act, Cap 387.

It is the policy of the government (NEAP, GoK, 1994) to ―integrate environmental conservation with economic development to provide sustainable development for posterity‖ . Environmental Management and Co-ordination Act, No. 8 of 1999, provides a legal and institutional framework for the management of the environment and development related matters. It is the framework law on the environment, which was enacted on the 14th of January 1999 and commenced in January 2002. Top-most in the administration of the Act is National Environment Council (NEC), which formulates policies, set goals, and promotes environmental protection programmes. The implementing organ is National Environment Management Authority (NEMA).

Part VIII, section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radio-active or any other pollutants into the aquatic environment. Section 73 requires that operators of projects which discharge effluent or other pollutants submit for NEMA accurate information about the quantities and quality of the effluent. Section 74 demands that all effluent generated from point sources are discharged only into the existing sewage system upon issuance of a prescribed permit from the Local Authorities with jurisdiction.

Part VI Section 58 stipulates that before any development or project is undertaken, an Environmental Impact Assessment must be undertaken under the rules governing the nature of the project and type of impacts.

This EIA is in compliance with Section 58 of the Environmental Management and Coordination Act (EMCA) No.8 of 1999 Second Schedule Part 3 (a), and the Environment (Impact Assessment and Audit) Regulations 2003. Environmental quality conservation aspects of this project will be realized through the implementation of the Environmental

Management and Monitoring Plan aimed at mitigating the potentially negative impacts and enhancing the potentially positive impacts predicted through this EIA.

The Environment (Impact Assessment and Audit) Regulations, 2003

The Regulations supplements EMCA, 1999. In the following Sections, the regulation states that;

10. (1) On determination of the project report, the decision of the Authority, together with the reasons thereof, shall be communicated to the proponent within forty-five days of the submission of the Project Report.

(2) Where the Authority is satisfied that the project will have no significant impact on the environment. or that the Project Report discloses sufficient mitigation measures, the Authority may issue a license in Form 3 set out in the First Schedule to these Regulations.

(3) If the Authority finds that the project will have a significant impact on the environment and the project report discloses insufficient mitigation measures, the Authority shall require that the proponent undertake an environmental impact assessment study in accordance with these Regulations.

(4) A proponent who is dissatisfied with the Authority's decision that an environmental impact assessment study is required may within fourteen days of the Authority's decision appeal against the decision to the Tribunal in accordance with regulation 46.

11. (1) An environmental impact assessment study shall he conducted in accordance with terms of reference developed during the scoping exercise by the proponent and approved by the Authority.

(2) The terms of reference shall include matters required to he considered in the making of an environmental impact assessment as may be contained in the Second Schedule to these Regulations and such other matters as the Director General may in uniting require.

12. (1) An environmental impact assessment study shall be conducted in accordance with the general environmental impact assessment guidelines and sector environmental impact assessment guidelines set out in the Third Schedule to these Regulations. (2) Sector environmental impact assessment guidelines shall be developed by the lead agency in consultation with the Authority.

Environmental Management and Coordination (Water Quality) Regulations, 2024

This Legal Notice on Water Quality provides that anyone who discharges effluent into the environment or public sewer shall be required to apply for Effluent Discharge License. The license for discharge is Ksh. 5,000 while annual license fee for discharge into the environment will be Ksh. 20,000 or 100,000 depending on the facility. Non-compliance with the regulations attracts a fine not exceeding Ksh. 500,000 and the polluter pay principle may apply depending on the court ruling. During the construction phase, the contractor shall obtain the necessary discharge permits into the rivers, if the area water regulatory authority shall so require, depending on the quality of water being discharged. The contractor will abide by the conditions of the discharge license(s), which may include quality trend monitoring and data archiving.

Environmental Management and Co-Ordination (Waste Management) Regulations, 2024

These regulations define the responsibilities of waste generators and define the duties and requirements for transportation and disposal of waste. The regulations provide for mitigation of pollution and handling of hazardous and toxic wastes. The regulations require a waste generator to dispose waste only to a designated waste receptacle. ***The proponent shall adhere to the regulations and proposes to contract a NEMA registered waste transporter (NEMA, 2024)***

Environmental Management and Coordination (Noise and Excessive Vibrations Pollution) (Control) Regulations, 2009

This regulation prohibits any person to cause unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. Part 11 section 6(1) provides that no person shall cause noise from any source which exceeds any sound level as set out in the First Schedule of the regulations. The contractor will prepare a Noise and Ground Vibration Control Plan (NGVCP) to reduce the possibility of adverse noise and vibration impacts to human health.

The Occupational Health and Safety Act (OSHA), 2007

This legislation provides for protection of workers (employees) during construction and operation phases. It is tailored at implementation of the EHS plan in compliance with the relevant sections of this Act. The following are some of the provisions of the act:

PART VI – HEALTH – GENERAL PROVISIONS
Cleanliness: Section 47

(1) Every workplace shall be kept in a clean state, and free from effluvia arising from any drain, sanitary convenience or nuisance, and, without prejudice to the generality of subsection (1)—

(a) Accumulations of dirt and refuse shall be removed daily by a suitable method from the floors and benches of workrooms, and from the staircases and passages;

(b) The floor of every workroom shall be cleaned at least once in every week by washing or, if it is effective and suitable, by sweeping or by any other method;

(c) All inside walls and partitions, and all ceilings or tops of rooms, and all walls, sides and tops of passages and staircase, shall:

i. Where they have a smooth impervious surface, at least once in every period of twelve months, be washed with hot water and soap or cleaned by other suitable method;
ii. where they are kept painted with oil paint or varnished, be repainted or varnished at least once in every period of five years, or such other period as the director may deem necessary, and at least once in every period of twelve months be washed with hot water and soap or cleaned by other suitable method; and
iii. In other cases, be kept whitewashed or colour washed, and the whitewashing or colour washing shall be repeated at least once in very period of twelve months.

(2) An occupier who contravenes the provisions of this section commits an offence.

Overcrowding: Section 48

1) An occupier shall ensure that his workplace shall not, while work is carried on, be so overcrowded as to cause risk of injury to the health of the persons employed therein.
2) Without prejudice to the generality of subsection (1) a workplace shall be of sufficient size for work to be carried out with ease and shall further have the necessary free space and , having regard to the nature of the work ,an adequate amount of air for each employee , the minimum permissible being ten cubic meters per person:
3) Provided that, in determining, for the purposes of this sub-section the amount of cubic space in any room, no space more than four point five metres from the floor shall be taken into account, and, where a room contains a gallery, the gallery shall be treated for the purposes of this subsection as if it were partitioned off from the remainder of the room and formed a separate room.
4) Every workroom shall be not less than three metres in height, measured from the floor to the lowest point of the ceiling or, where there is no ceiling, to the lowest point of the roofing material:
5) Provided that, if the Director is satisfied that owing to the special conditions under which the work is carried on in any workroom the application of the provisions of this subsection to that workroom would be inappropriate or unnecessary, he may by certificate in writing except the work room from those provisions subject to any conditions specified in the certificate.

Ventilation: Section 49

(1) An occupier shall ensure that effective and suitable provision is made for securing and maintaining, by the circulation of fresh air in each workroom, the adequate ventilation of the room.

(2) The Minister may by rules, prescribe a standard of adequate ventilation for workplaces or for any class or description of workplaces or part thereof and for any other places of work.

(3) An occupier who contravenes the provisions of this section commits an offence

Lighting: Section 50

(1) An occupier shall ensure that effective provision is made for securing and maintaining sufficient and suitable lighting, whether natural or artificial, in every part of his workplace in which persons are working or passing.

(2) All glazed windows and skylights used for the lighting of workrooms shall, so far as practicable be kept clean on both the inner and outer surface and free from obstruction:

Provided that this subsection shall not affect the white-washing or shading or windows and skylights for the purpose of mitigating heat or glare.

(3) Nothing in subsections (2) and (3) or in any rules made there under, shall be considered as enabling direction to be prescribed or otherwise given as to whether any artificial lighting is to be produced by any particular source of light.

50.(1) An occupier shall ensure that effective provision is made for securing and maintaining sufficient and suitable lighting, whether natural or artificial, in every part of his workplace in which persons are working or passing.

(2) All glazed windows and skylights used for the lighting of workrooms shall, so far as practicable be kept clean on both the inner and outer surface and free from obstruction.

Provided that this subsection shall not affect the white-washing or shading or windows and skylights for the purpose of mitigating heat or glare.

(3) Nothing in subsections (2) and (3) or in any rules made there under, shall be considered as enabling direction to be prescribed or otherwise given as to whether any artificial lighting is to be produced by any particular source of light.50.(1) An occupier shall ensure that effective provision is made for securing and maintaining sufficient and suitable lighting, whether natural or artificial, in every part of his workplace in which persons are working or passing.

Work Injury Benefits Act 2007 (WIBA)

This is an Act of Parliament to provide for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes.

PART II — OBLIGATIONS OF EMPLOYERS
Section 7: Employer to be insured

(1) Every employer shall obtain and maintain an insurance policy, with an insurer approved by the Minister in respect of any liability that the employer may incur under this Act to any of his employees.

(2) The Minister may exempt from the provisions of subsection (1), an employer who provides and maintains in force a security which complies with the requirements of subsection (3), and any exemption under subsection (3) shall continue in force only so long as the security is maintained.

(3) For the purposes of subsection (2), a security shall consist of an undertaking by a surety approved by the Minister to make good, subject to any conditions specified in the security, any failure by the employer to discharge any liability which the employer may incur under this Act to any of its employees up to an amount approved by the Minister.

(4) Any employer who contravenes the provisions of subsection (1) commits an offence and shall on conviction be liable to a fine not exceeding one hundred thousand shillings or to imprisonment for a term not exceeding three months, or to both. (5) If the contravention in respect of which an employer is convicted is continued after the conviction, the employer is guilty of a further offence and liable in that respect to a fine not exceeding ten thousand shillings for each day on which the contravention continues.

Section 8: Registration of employer.
(1) Every employer carrying on business in Kenya shall within the prescribed period and in the prescribed manner –

(a) Register with the Director;

(b) Furnish the Director with the prescribed particulars of their business; and

(c) Within a period determined by the Director furnish additional particulars as the Director may require.

(2) The particulars referred to in subsection (1) shall be furnished separately in respect of each business carried on by the employer.

(3) An employer shall, within thirty days of any change in the particulars so furnished notify the Director of such change.

PART III — RIGHT TO COMPENSATION

Section 10: Right to compensation

(1) An employee who is involved in an accident resulting in the employee's disablement or death is subject to the provisions of this Act, and entitled to the benefits provided for under this Act.

(2) An employer is liable to pay compensation in accordance with the provisions of this Act to an employee injured while at work.

(3) An employee is not entitled to compensation if an accident, not resulting in serious disablement or death, is caused by the deliberate and wilful misconduct of the employee.

(4) For the purposes of this Act, an occupational accident or disease resulting in serious disablement or death of an employee is deemed to have arisen out of and in the course of employment if the accident was due to an act done by the employee for the purpose of, in the interests of or in connection with, the business of the employer despite the fact that the employee was, at the time of the accident acting—

(a) In contravention of any law or any instructions by or on behalf of his employer; or

(b) Without any instructions from his employer.

(5) For the purposes of this Act, the conveyance of an employee to or from the employee's place of employment for the purpose of the employee's employment by means of a vehicle provided by the employer for the purpose of conveying employees is deemed to be in the course of the employee's employment.

(6) For the purposes of this section, an injury shall only be deemed to result in serious disablement if the employee suffers a degree of permanent disablement of 40 % or more.

PART VII — MEDICAL AID

First Aid Section 45

(1) An employer shall provide and maintain such appliances and services for the rendering of first aid to his employees in case of any accident as may be prescribed in any other written law in respect of the trade or business in which the employer is engaged.

(2) Any employer who fails to comply with the provisions of subsection (1) commits an offence.

(3) The Minister may, after consultation with the Council, by notice in the Gazette exempt an employer or class of employers from application of this section.

Section 46: Conveyance of injured worker

(1) If an employee is injured in an accident, which necessitates the employee's conveyance to a hospital medical facility or from a hospital or medical facility to the employee's residence, the employer shall make the necessary conveyance available.

The Water Act, 2016

The Water Act 2002 vests the rights of all water to the state, and the power for the control of all body of water with the Cabinet Secretary, the powers is exercised through

the Cabinet Secretary and the Water Resources Authority in consultation with the regional water resources boards. It provisions aim at the conservation of water, apportionment, and use of water resources.

Part II, section 18, of the Act 2002 provides for national monitoring and information archiving system on water resources. Following on this, sub-section 3 allows the Water Resources Authority (WRA) to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a facility operator and the information thereof furnished to the authority.

Section 25 of the Act requires a permit to be obtained for any use of water from a water resource, and the discharge of a pollutant into any water resource. Under Section 29, application for such a permit shall be subject to public consultation as well as an environmental impact assessment in line with the Environmental Management and Coordination Act, Cap 387. The conditions of the permit may also be varied if the Authority is of the opinion that the water so used is causing deterioration of water quality or causing shortage of water for other purposes for which the Authority lays a higher priority. This is provided for under section 35 of the Act.

Section 73 of the Act allows a person, who has been granted a license to supply water (licensee), to make regulations for purposes of protecting against degradation of their water source(s). Under the Section, the licensee could be a local authority, a private Trust or an individual, and enforcement will under the supervision of the Regulatory Board with jurisdiction.

Section 76 states that no person shall discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary. The consent shall be issued on conditions including the payment rates for the discharge as may be provided under section 77 of the same Act.

The proposed project shall require large quantities of water during the construction phase and generation of equally large volumes of surface run-off during construction and operations. The local rivers will not form the sources of water for construction. The same rivers will be receiving bodies for the surfaces run-off, as all the drainage systems shall be designed to discharge into them. The contractor shall seek the necessary permits to obtain water and shall abide by the conditions attached to the permit(s).

Section 116(2) of the Water Act, Cap 372 of 2016, unless otherwise determined by a Water Resources Inspector, the riparian land on each side of a watercourse shall be defined as a minimum of six (6) metres or equal to the full width of the watercourse, up to a maximum of thirty (30) metres on either side of the bank. This provision is intended to protect and preserve riparian zones from encroachment, degradation, and activities that may compromise the ecological integrity of water bodies.

Section 117(1) of the Act empowers the Water Resources Authority (WRA), either on its own initiative or upon request by a riparian landowner, to demarcate the riparian boundary of any watercourse or water body at its own cost, where there is sufficient cause. This legal framework ensures that riparian areas are clearly identified and managed in line with sustainable water resource practices.

The public Health Act (Cap. 242)

The Public Health Act has no environmental protection standards. The Act is primarily concerned with the protection of the quality of water supplies and sources used for human, domestic and animal consumption. It contains provisions against environmental pollution by what it describes as —nuisance‖ that would result in the pollution of the environment by gaseous emissions, solid wastes and liquid effluent in order to protect public health. The project supervising agency and the contractor are legally bound by this Act to prevent this from happening. Bounding of the perimeter for equipment maintenance spaces, including controlled substances storage areas will be undertaken by the contractor and under the oversight of the project supervising agency.

Energy Act (Cap 314), 2006

This law converts an advisory regulator, the Energy Regulatory Board, into a decision-making regulator, the Energy Regulatory Commission. The law also gives the new commission explicit authority over imports and exports of electricity. It sets out the National Policies and Strategies for short to long-term energy development. ERC is a single sector regulatory agency, with responsibility for economic and technical regulation

of electric power, renewable energy, and downstream petroleum sub-sectors, including tariff setting and review, licensing, enforcement, dispute settlement.

The broad objective of the new Energy Policy is to ensure the provision of adequate, quality, cost-effective, affordable supply of energy while ascertaining environmental conservation.

Energy (Solar Water Heating) Regulations, 2012

Regulation 3, make provision for installation of solar water heating system in all premises within the jurisdiction of a local authority with hot water requirements of a capacity exceeding one hundred litres per day shall install and use solar heating systems.

Responsibility for compliance as per regulation 6 is imposed on:

- 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.
- 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 new premises designs and extensions or alterations to existing premises. 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.
- 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.
- 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.
- An owner or occupier to whom these regulations apply may investigate the inclusion of the relevant solar water heating system into a project to be registered under any carbon finance mechanism that may be established from time to time includes the Clean Development Mechanism (CDM).

A person who contravenes the provisions of this regulation commits an offence and shall be liable, on conviction, to a fine not exceeding one million shillings, or imprisonment for a term not exceeding one year, or to both. (GOK, 2012).

Energy (Energy Management) Regulations, 2012

Require a the owner or occupiers to develop an energy management policy, conduct an energy audit, prepare and submit to the commission an energy investment plan for the next three years, setting out proposals for the conservation of energy during that period, take measures for energy conservation, submit an annual implementation report (GOK, 2012).

Urban and Cities Act No 13 of 2011

The Act came into function with regard to Article 184 of the Constitution providing regulations on the classification, governance and management of urban areas and cities and further providing the criteria of establishing urban areas. Part III of the Act gives the regulations and functions of every city or municipality with regard to integrated

development plans, which shall include but not limited to environmental plans and disaster preparedness, within the area of jurisdiction in achieving objects of devolved governments under section 174 of the constitution while maintaining the socio-economic rights of the people. Moreover, in the first schedule, the Act enlists the services that any municipality shall provide to its residents which include but not limited to traffic control and parking, water and sanitation, refuse collection, solid waste management, pollution abatement services among others (GOK, 2011).

Physical Planning Act (Cap 286)

The local Authorities are empowered under section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section, therefore allows for the prohibition or control of the use and development of land and buildings in the interest of proper and orderly development of an area. Section 36 states that, if in connection with a development application, the local Authority is of the opinion that the proposed development activity will have a injurious impact on the environment, the applicant shall be required to submit together with the application an environmental impact assessment EIA Study report. The proposed project is in complete consonance with the provisions of the Physical Planning Act, as it going to sit on land already approved by the City County Government.

Local Government Act (Cap 265)

Section 160 helps Local Authorities to ensure effective waste disposal. It states in part that municipal authorities have powers to establish and maintain sanitary services for the removal and destruction of, or otherwise, deal with all kinds of refuse and effluent and where such service is established, compel its use by persons whom the services is available. ***The contractor and the supervising agency shall engage county government for appropriate means of disposal for solid and liquid wastes arising from construction phase activities.***

County Government Act, 2012

Section 109 of the County Government Act (2012) helps counties to ensure effective coordination of spatial developments. Subsection (2) part C states in part; a spatial county plan shall;

- Indicate desired patterns of land use within the county;
- Address the spatial construction or reconstruction of the county;
- Provide strategic guidance in respect of the location and nature of development within the county
- Set out basic guidelines for a land use management system in the county taking into account any guidelines, regulations or laws as provided for under Article 67(2) (h) of the Constitution;
- Set out a capital investment framework for the county's development programs; and
- Contain a strategic assessment of the environmental impact of the spatial development framework;

Building Code By – Laws.

This is a document based on British building standards introduced in Kenya to control building design and control. The adoptive by-laws are divided into Local Government

Adoptive By-laws Grade 1 and Local Government Adoptive Bylaws Grade 2. The Local Government Adoptive By-laws Grade 1 controls high income housing, while Grade 2 Bylaws control buildings for low-income populations. The Building Code, 1968 deals with controls in housing quality, building materials and planning standards. The by-laws rigidly prescribe planning and design standards with respect to minimum plot sizes, maximum coverage, and minimum space around buildings. They also outline room dimensions, including minimum room area, minimum room height, kitchen dimensions, wet cores/ablutions minimum dimensions, access to rooms (minimum width of doors), lighting and ventilation(minimum widths of windows). They also provide for standards on construction materials for foundations, floors, walls, roofs. They are adoptive in the sense that any local authority in Kenya can adopt them for application within their areas of jurisdiction. In recognition of the role of local authorities as lead planning agencies, the adoptive by-law compels any potential developer to submit development application to relevant local authority for approval. The local authority is empowered to disapprove any plan submitted if it is not correctly drawn or do not provide sufficient information that complies with the by-law. Any developer, who intends to erect a building such as a shop/office block, must give the concerned local authority a notice of inspection, before the erection of the structure. After erecting the building, a notice of completion shall be issued to the local authority to facilitate final inspection/approval. No person shall therefore occupy a building whose certificate of completion has not been issued by the local authority. As a precaution against fire breakout, the by-law states that the walls of any premise shall be non-combustible throughout, similarly, in every building, other than a small house, which comprises more than one storey, shall have firefighting equipment.

By-law 214 indicates that in any public building where floor is more than 20 feet above the ground level, the council may recommend the provision of firefighting equipment that may include one or more of the following: hydrants, hose reels and fire appliances, external conations, portable fire appliances, water storage tanks, dry risers, sprinkler, drencher, and water spray protector system (KEBS, 2009).

The Penal Code (Cap 63)

Section 191 of the Penal Code states that if any person or institution that voluntarily corrupts or foils, water for public springs or reservoirs, rendering it less fit for its

ordinary use is guilty of an offense. Section 192 of the same Act says a person who makes or vitiates the atmosphere in any place to make it noxious to the health of persons/institution, dwelling or business premises in the neighbour-hood or those passing along public way, commits an offense. The vitiation of the atmosphere, corruption of and foiling of the water springs is not an inherent quality of the proposed project's nature. None the less the operational aspects of the project have significantly foreseeable negative impacts. Enforcement of this Act in complimentary with all the aforementioned environmental systems, conserving policies and specific Acts will achieve the desired goals and objectives in this respect. The supervising agency in conjunction of the officers of Nairobi County Government with jurisdiction will exercise due diligence.

Occupiers Liability Act (Cap 34)

The Act regulates the duty that an occupier of premises owes to his visitor in respect of dangers due to the state of the premises or to the things done on them. It requires that the occupier warn the visitors of the likelihood of dangers within his premises to enable the visitors to be reasonably safe (GOK, 1980).

The National Construction Authority Act (NCA), 2011

The National Construction Authority Act, Number 41 of 2011 is set to streamline, overhaul and regulate the construction industry in Kenya. The industry has for many years suffered poor legislative framework and has been dominated by quacks and unqualified persons. The industry has also suffered a lot of competition from foreign contractors who are seen to offer cheaper and more quality work. The new Act is a win for the public as it guarantees public safety. All contractors must be registered with the Authority, meaning that shady contractors and quacks will be locked out of the industry. It is an offence to carry out any construction work without first having been registered with the Authority. The Contractor who will undertake the project will be one who is registered by the NCA. The Act also outlines that every development projects must be registered with and subsequent construction permit secured from the Authority prior to commencement of the project activities. ***The project proponent should ensure they secure a construction permit from the Authority.***

The Land Planning Act (Cap. 303)

Section 9 of the subsidiary legislation (the development and use of land regulations 1961) requires that before the local authorities submit any plans to the Minister for approval, steps should be taken as may be necessary to acquaint the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should also be submitted. This is intended to reduce conflict with other interests such as settlement and other social and economic activities.

4.3.2 International Conventions and Treaties

United Nations Framework Convention on Climate Change (UNFCCC), 1992

The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

African Convention on Conservation of Nature and Natural Resources (1968)

It requires the adoption and implementation of measures necessary to achieve the objectives of this Convention, in particular through preventive measures and the application of the precautionary principle, and with due regard to ethical and traditional values as well as scientific knowledge in the interest of present and future generations. Of particular interest to the housing estate is the requirement to prevent pollution, or any other form of land degradation on land and soil, water; Make provision for prevention of detrimental effects of processes and activities affecting the environment and natural resources and as well as promotion of sustainable development(African Union, 1968).

Kyoto Protocol

The essence of the Kyoto Protocol is that it calls for nations to commit themselves to reducing greenhouse gas emissions.

Some of the principal concepts of the Kyoto Protocol are:

1) The main feature of the Protocol is that it established a legally binding commitments to reduce emissions of greenhouse gases. The commitments were based on the Berlin Mandate, which was a part of UNFCCC negotiations leading up to the Protocol.
2) Implementation. In order to meet the objectives of the Protocol, Annex I Parties are required to prepare policies and measures for the reduction of greenhouse gases in their respective countries. In addition, they are required to increase the absorption of these gases and utilize all mechanisms available, such as joint implementation, the clean development mechanism and emissions trading, in order to be rewarded with credits that would allow more greenhouse gas emissions at home.
3) Minimizing Impacts on developing countries by establishing an adaptation fund for climate change.
4) Accounting, Reporting and Review in order to ensure the integrity of the Protocol.
5) Compliance. Establishing a Compliance Committee to enforce compliance with the commitments under the Protocol.

Paris Agreement

The Paris Agreement establishes the main framework for cooperative action on climate change beyond 2020 and will replace the Kyoto Protocol.

The key elements

1. To keep global increase in temperatures "well below" 2^0C (3.6F) above pre-industrial times and "endeavor to limit" them even more, to 1.5^0C
2. To limit the amount of greenhouse gases emitted by human activity to the same levels that trees, soil and oceans can absorb naturally, beginning at some point between 2050 and 2100
3. To review each country's contribution to cutting emissions every five years so they scale up to the challenge
4. For rich countries to help poorer nations by providing "climate finance" to adapt to climate change and switch to renewable energy.

Safety Provision (Building) Convention 1937

This Convention applies to all construction activities, namely building, civil engineering, and erection and dismantling work, including any process, operation or transport on a construction site, from the preparation of the site to the completion of the project. The Convention describes the term ‗construction' as;

1. building, including excavation and the construction, structural alteration, renovation, repair, maintenance (including cleaning and painting) and demolition of all types of buildings or structures ;
2. civil engineering, including excavation and the construction, structural alteration, repair, maintenance and demolition of, for example, airports, docks, harbors, inland waterways, dams, river and avalanche and sea defense works, roads and highways, railways, bridges, tunnels, viaducts and works related to the provision of services such as communications, drainage, sewerage, water and energy supplies;
3. the erection and dismantling of prefabricated buildings and structures, as well as the manufacturing of prefabricated elements on the construction site;

Article 6 states that: Measures shall be taken to ensure that there is co-operation between employers and workers, in accordance with arrangements to be defined by national laws or regulations, in order to promote safety and health at construction sites.

Article 12, Section 1, States that the National laws or regulations shall provide that a worker shall have the right to remove himself from danger when he has good reason to believe that there is an imminent and serious danger to his safety or health, and the duty so to inform his supervisor immediately.

Convention on Biological Diversity (CBD), 1993

Signed by 150 government leaders at the 1992 Rio Earth Summit, the Convention on Biological Diversity is dedicated to promoting sustainable development. Conceived as a practical tool for translating the principles of Agenda 21 into reality, the Convention recognizes that biological diversity is about more than plants, animals and microorganisms and their ecosystems. It is about people and our need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live. It has three main objectives: 1) the conservation of biological diversity; 2) the sustainable use of its components; and 3) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

4.4 The National Administrative Framework

4.4.1 The National Environment Council, (NEC)

EMCA 1999 No. 8 part III, section 4 outlines the establishment of the National Environment Council (NEC). NEC is responsible for policy formulation and directions for the purposes of EMCA; set national goals and objectives and determines policies and priorities for the protection of the environment and promote co-operation among public

departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programs.

4.4.2 The National Environmental tribunal, (NET).

The National Environment Tribunal (NET) is established under section 125 and Part XII of the Environmental Management and Coordination Act (EMCA) No. 8 of 1999. Its 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. Such licenses are, in effect, statutory permission to undertake developments of specified nature. The function arises from EMCA's enumeration (in the Third Schedule) of certain kinds of developments that require EIA and thereafter, NEMA's issuance of EIA license, without which the specified developments cannot proceed. The listed developments include, but are not limited to: road construction works, establishment of industries and construction of housing facilities in certain circumstances.

4.4.3 The 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 environment and to be the principal instrument of the government in the implementation of all policies relating to the environment. NEMA's mandate is designated to the following committees:

4.4.4 The County Environment Committees (CECs).

According to EMCA, 1999 No. 8, section 40, the following sub-sections states that:

1) Every County Environment Committee shall, within one year of the commencement of this Act and every five years thereafter, prepare a county environment action plan in respect of the county for consideration and adoption by the County Assembly.
2) 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.
3) The respective County Executive Committee members of every county shall submit the county environment action plan referred to in subsection (1) to the Cabinet Secretary for incorporation into the national environment action plan referred to in section 37.
4) The Authority shall consider every county environment action plan and either recommend incorporation of such plan into the national environment action plan or specify changes to be incorporated into a respective county environmental plan.

5) The Cabinet Secretary shall, on the recommendation of the Authority, issue guidelines and prescribe measures for the preparation of environmental action plans.

4.4.5 National Environmental Complaints Committee, (NECC)

The Committee performs the following functions:

- Investigate any allegations or complaints against any person or against the Authority in relation to any environmental condition in Kenya and on its own volition, any suspected case of environmental degradation and to report findings together with its recommendations thereon to the Council.
- Prepare and submit to the Council periodic reports of its activities which shall form part of the annual report on the state of the environment under section 9 (3)
- To perform such other functions and exercise e such powers as may be assigned to it by the Council.

Table 8: The Regulatory Agencies Relevant to the Project

S/N	Institution	Envisioned role in the proposed project	Project phase required
1.	National Environment Management Authority (NEMA)	Issuance of EIA license and Monitoring for Compliance with conditions and environmental law	Construction, operation and decommissioning
2.	Nairobi County Government/ Westlands Sub-county	Approval of plans and building inspections, issuance of licenses	Construction, operation and decommissioning
3.	Physical Planning Department- Nairobi County	Building certifications	Construction
4.	Water Resources Authority (WRA)	Supply of water permits for surface and ground water abstraction.	Construction, operation and decommissioning
5.	Directorate of Occupational Health and Safety Services (DOSHS)	Ensure safety of workers at construction site	Operation
6.	National Construction Authority (NCA)	Project Registration and Certification	Construction

CHAPTER FIVE: ANALYSIS OF ALTERNATIVES TO THE PROJECT

This section outlines the main alternatives provided by the applicant, an evaluation of the impacts of each alternative with clear information on the criteria used to assign significance and an indication of the main reasons for choosing the proposed development taking into account the environmental impacts.

- No Project Alternative
- The Alternative Site
- Waste management alternatives
- Project development with mitigation measures

5.1 No Project Alternative

The —no development option‖ entailed leaving the current status of the site as it is. The environmental effects of the proposed development will be avoided making the option desirable considering the state of the environment. If this is the case, one of the main reasons for developing the site - provision of housing - will not be realized. A significant investment of investment be spent in building material, employment etc including housing opportunities besides the potential of the project stimulating development in the area will not be realized. This option implies economic loss to the proponent, local and national economies. Already a substantial monetary commitment has been made in the procurement of the proposed site, development of building plans as well as designs. In case the project is not implemented, all the participants such as the designers, the local and national authorities, the contractors, materials suppliers and the workers in the development chain will lose economic gains that would have otherwise been realized during project life. Generally, the nil development option will be retrogressive in view of the current economic situation and the Government's efforts to achieve middle income country by year 2030 as envisaged in Vision 2030 and as per the Big Four Agenda where housing is inclusive.

5.2 Alternative Site

Pursuing a change of site alternative on the other hand requires that the project be implemented at an alternative site other than the one already acquired. This would entail purchasing an alternative piece of land. The project proponent however has access to only this property for the stated development. The resultant effect of changing the site would be increase in timeframe and resources required to realize the development. The unpredictability of financial resources and the lag time required in acquiring and designing the development may also mean that the project may be unable to break even once implemented. This will make this alternative more undesirable and more so as there are similar upcoming developments in the vicinity.

5.3 Waste management alternatives

Solid and liquid wastes will be generated from both the project construction and operational phases.

Solid Waste

Solid wastes will be collected from the site for safe disposal by a NEMA licensed waste collector after necessary contractual agreement during both construction and operational

phases. Solid wastes management, an integrated solid waste management system is recommended which is as follows. a) First the proponent should give priority to reduction at source of the materials. This option will demand a solid waste management awareness programme in the individual households. b) The proponent should also consider recycling, reusing and composting of the waste as a second alternative in priority. This shall call for at source separation programme to be put in place. The recyclables may be sold to waste buyers locally or directly to any company that recycles waste such as plastic bags. c) The third priority in the hierarchy of options is combustion of the waste that is not recyclable in order to produce energy. d) Finally, sanitary land filling will be the last option for the proponent to consider. It is to the interest of the proponent and the community that the waste is effectively managed so as to maintain a safe and healthy environment to the worker and the community at large through appropriate disposal mechanism.

Liquid Waste

Liquid wastes in the facility will be managed through connection to Nairobi Water and Sewerage Company (NAWASCO) sewer line during operational phase. As an alternative liquid waste management plan option, we advise the proponent to consider installing an onsite waste water management system on the estate in the event that the municipal sewer system would be dysfunctional or out of operations. This will ensure that the proponent manages its liquid waste in a sustainable manner

5.4 Selected Site Alternative

Pursuit of this alternative will entail going forward with the development but taking into account all the potential impacts on the biophysical environment by incorporating and integrating the recommended mitigation and enhancement measures into the project designs and implementation.

The proposed site provides a most suitable site for the project as it is currently owned by the proponent and is in harmony with the existing land uses; it is situated next to Mombasa Road hence ease of access as well as the ease to connect to KPLC and Nairobi Water And Sewerage Company (NAWASCO) main lines which are in the area. With these advantages, presence of the indicated facilities and from the findings of this impact assessment study, the existing designs provide the optimum alternative for implementing and operating the proposed housing apartment's project subject to the effective implementation of the proposed EMP. The selected alternative will be enhanced through appropriate mitigation measures, including due diligence and best construction management practices that will help protect the physical, ecological and socio-economic environment of the project area. Commitments included in this project report, as well as licenses and other authorizations that would be issued, are all designed or geared to avoid environmental damage in accordance with the Environmental Management and Co-ordination Act, 1999 (Amendments, 2015). The proponent undertakes to incorporate all necessary measures to ensure adverse impacts are mitigated to the maximum extent practicable during the entire project life cycle.

This alternative is more desirable as it will inject a significant amount of money into the economy thereby stimulating economic development and providing affordable middle level housing facility.

CHAPTER SIX: CONSULTATION ANDPUBLIC PARTICIPATION AND OCCUPATIONAL HEALTH AND SAFETY.

6.1 Consultation and Public Participation (CPP)

Public consultation is useful for gathering environmental data, understanding likely impacts, determining community and individual preferences, selecting project alternatives and designing viable and sustainable mitigation and compensation plans. The welfare of human societies and the quality of life is directly linked to sustainable use of our natural resources. This has been duly recognized in Agenda 21, where it is stated that:

"Special attention should be paid to the demand for natural resources generated by unsustainable consumption and to the efficient use of those resources consistent with the goal of minimizing depletion and reducing pollution."

The Kenya government has enshrined the need for human societies' involvement in project development in the Constitution. The EMCA, 1999 (Amendments, 2015) requirements read together with the EIA/EA Guidelines of 2003 require that the general public and major stakeholders be consulted on the impacts to the environment that may be occasioned by projects either in the public or private domain. Community consultation and participation ensures that communities and stakeholders are part and parcel of the proposed development projects and in so doing assures the acceptability and sustainability of the project. It has also been demonstrated successfully that projects that go through this process acquires high level of acceptance and accrue benefits to a wider section of the society. Public consultations form a useful component for gathering, understanding and establishing likely impacts of projects determining community and individual preferences and selecting best practicable solutions or alternatives.

Public consultation in the EIA process is undertaken during the project design, implementation and initial operation. The aim is to disseminate information to the public, interested and affected parties (stakeholders), solicit their views and consult on sensitive issues. Inadequate public consultation can result in significant information gaps, which could mislead environmental experts undertaking an environmental assessment. Lack of attention to communication and consultation processes can generate individual, community, or regional opposition to a project. This can ultimately be a cause of substantial delays, increased costs, and unsatisfactory compromise solutions, which could have been avoided through earlier consultation. Participation is therefore a process through which different stakeholders influence and share their views regarding development initiatives and the decisions and resources that affect them. An important element in the process of environmental impact assessment is consulting with stakeholders to gather the information needed to complete the assessment.

In a bid to gather socioeconomic information of the project area, a number of tools were put in place. Public consultations were used to enable understanding of the social and economic characteristics of the local community. The EIA consultants understand that the local community members are major stakeholders in the project, and therefore gathered their views and included them in this report.

As part of the Environmental Impact Assessment (EIA) process, **three (3) public participation meetings (barazas)** were held to engage stakeholders and local community members regarding the proposed development in Westland. These meetings aimed to inform residents and other interested and affected parties (IAPs) about the project, its potential environmental impacts, and to collect views, concerns, and recommendations from the public. The meetings were organized through the area Sub-Chief's office, and public notices were posted at various strategic locations near the project site to maximize community awareness and participation.

The first meeting was held on 14th August 2025 at the project site, with representation from the ESIA team, government officials, and local leadership. The second meeting was conducted on 30th August 2025 from 11:30 AM to 1:00 PM and included the project consultants and site management team. The third and final meeting was held on 6th September 2025 at the project site and engaged local residents and the ESIA team. The summary of attendees is presented in the table below.

Summary of Public Participation Meetings

Date	Location	Time	Representatives Present	Male	Female	Total
14th August 2025	Project Site	10:30 AM – 1:30 PM	Edgar Eredi (ESIA Lead Sociologist), Alex Wainaina (Lead Architect),Martha Omondi (Associate expert), Micheal K.Mugo (Ward administrator), Hezekiah Kunya (Area Chief Westland)	24	6	30
30th August 2025	Project Site	11:30 AM – 1:00 PM	Edgar Eredi (ESIA Lead Sociologist), Alex Wainaina (Lead Architect), Hezekiah Kunya (Area Chief)	-	-	27
6th September 2025	Project Site	11:30 AM – 1:00 PM	Edgar Eredi (Social Expert), Valeria Moraa (Associate expert), Hezekiah Kunya(Area Chief)	—	—	19

Attached as annex are the minutes and attendance sheets for all three public meetings

Due to economic setup of the area that affects 100% residents' turnout in a public meeting, the consultant administered questionnaires were filled during this exercise and others were not returned back, which involved questionnaire administration as well as oral informal interviews. This consultation process dealt more with the project's anticipated impacts on the local environment as well as health and safety of the neighbouring residents.

6.2 Objectives of the public consultation program

The overall goal of the consultation process was to disseminate project information and to incorporate the views of the Project Affected Persons (PAPs) in the design of the mitigation measures and environmental management plan.

The specific aims of the consultation process are to:

- Improve project design and, thereby minimise conflicts and delays in implementation;
- Increase long term project sustainability and ownership;

- Reduce problems of institutional coordination; and

- Inform the public and all stakeholders of the details of the proposed residential apartments;

The main objectives of community consultations were to:

- Provide clear and accurate information about the project to the residential neighbours;
- Obtain the main concerns and perceptions of the population and their representatives regarding the project;
- Obtain opinions and suggestions directly from the affected community members and preferred mitigation measures;
- Collect views on the positive and negative impacts anticipated by stakeholders and how these can be overcome; and
- Identify local leaders with whom further dialogue can be continued in subsequent stages of the project.

6.3 Stakeholder Engagement

The public consultation and disclosure programme was designed and implemented so as to foster community awareness of the proposed project, and to provide opportunities for community input and involvement.

6.4 Stakeholders Analysis

The stakeholder analysis was undertaken to identify all the potential stakeholders of the project. They included: local administration; Government Agencies; Local Community representation and associations; Institutional stakeholders and the general public in the project area. Ecotech Consultants through its delivered a transmittal and public invitation letters to area chief providing details about the project and inviting the public to a meeting. The letters included information the project, in addition, Notices were pinned on several areas within the project area to create awareness to the public. This approach was chosen to ensure fairness and easy distribution of information, as the members of the public were invited through the administration office.

Public Meeting one (1) Image held on 14th August 2025

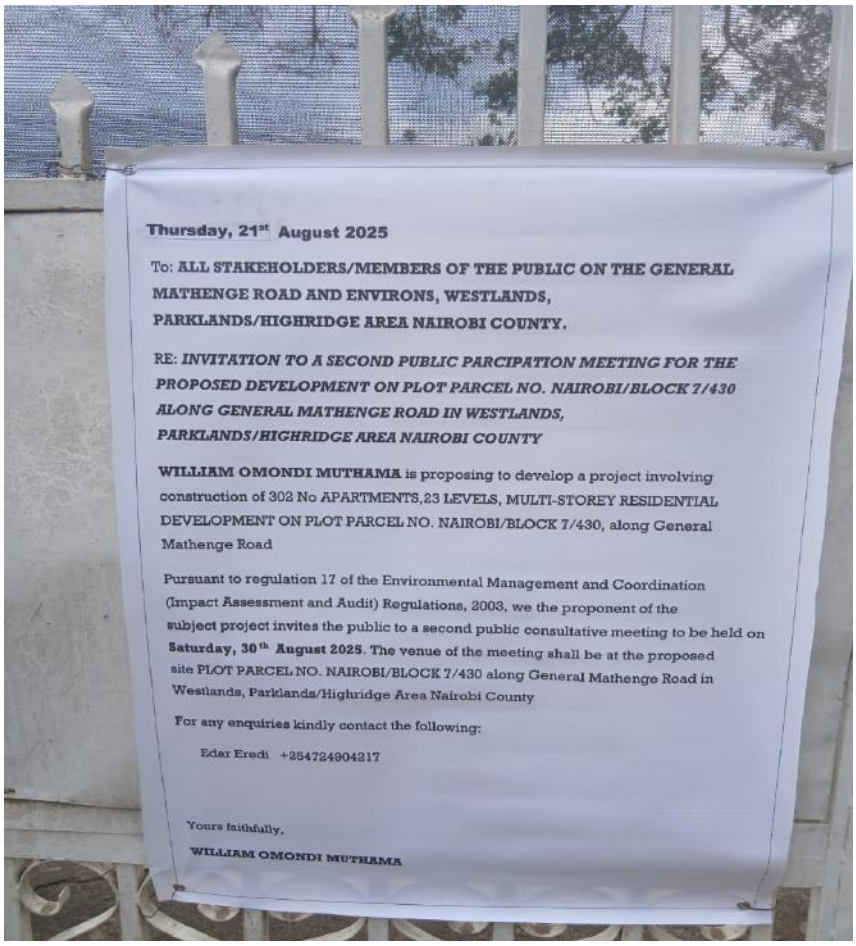
Plate 1: A sample of the Public Invitation Notice posted in various locations within the neighbourhood to raise awareness about the proposed meeting on date 14th August 2025.

Plate 2: The Area Chief officially opening the public meeting and the proponent‘s representative presents the proposed project overview and addresses attendees‘ questions and concerns

Plate 3:.The following image shows Mr. Hezekiah Kunya, Area Chief of Westlands, also in attendance.

Plate 4: Mr. Hezekiah Kunya, Area Chief of Westland, addressing the attendees. The next image shows our enumerators engaging with members of the public.

Public Meeting Two (2) Images held on 30th August 2025



Thursday, 21st August 2025

To: **ALL STAKEHOLDERS/MEMBERS OF THE PUBLIC ON THE GENERAL MATHENGE ROAD AND ENVIRONS, WESTLANDS, PARKLANDS/HIGHRIDGE AREA NAIROBI COUNTY.**

RE: ***INVITATION TO A SECOND PUBLIC PARCIPATION MEETING FOR THE PROPOSED DEVELOPMENT ON PLOT PARCEL NO. NAIROBI/BLOCK 7/430 ALONG GENERAL MATHENGE ROAD IN WESTLANDS, PARKLANDS/HIGHRIDGE AREA NAIROBI COUNTY***

WILLIAM OMONDI MUTHAMA is proposing to develop a project involving construction of 302 No APARTMENTS,23 LEVELS, MULTI-STOREY RESIDENTIAL DEVELOPMENT ON PLOT PARCEL NO. NAIROBI/BLOCK 7/430, along General Mathenge Road

Pursuant to regulation 17 of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003, we the proponent of the subject project invites the public to a second public consultative meeting to be held on **Saturday, 30th August 2025**. The venue of the meeting shall be at the proposed site PLOT PARCEL NO. NAIROBI/BLOCK 7/430 along General Mathenge Road in Westlands, Parklands/Highridge Area Nairobi County

For any enquiries kindly contact the following:

Edar Eredi +254724904217

Yours faithfully,

WILLIAM OMONDI MUTHAMA

Plate 5: The proponent's representative explaining the proposed development to members of the public who attended the second public meeting for date 30th August 2025.

Public meeting 3 held on 6th September2025

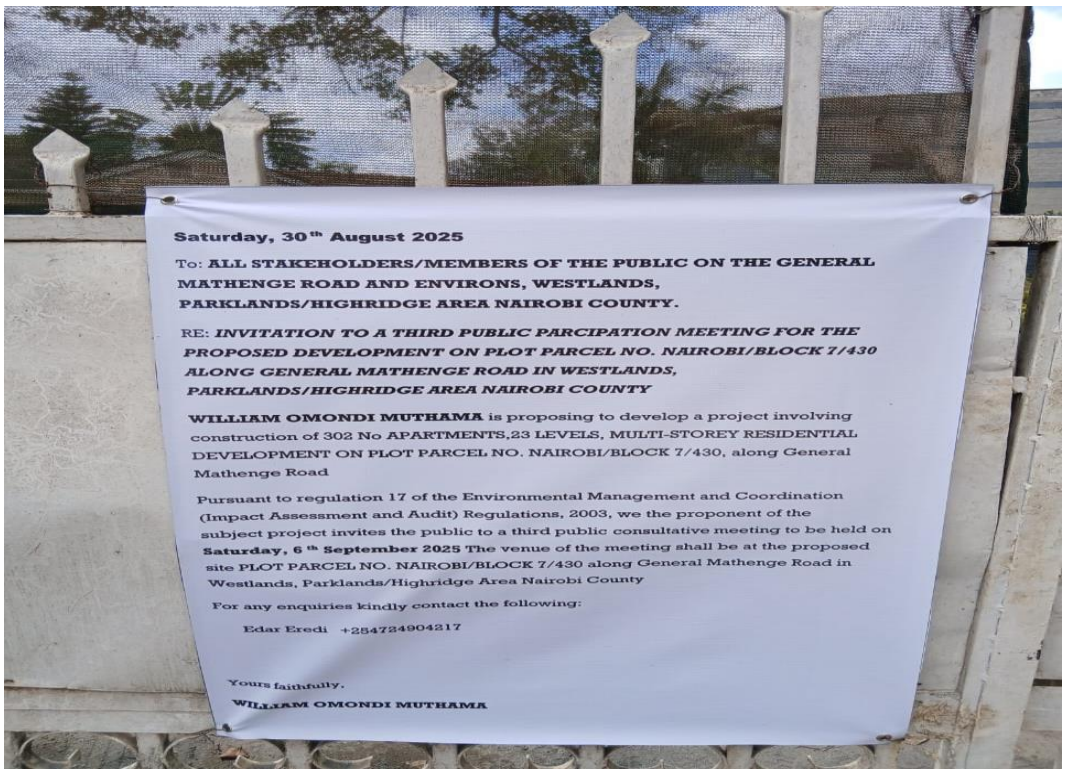


Plate 6: Image 1 shows the Public Notice posted to invite residents to the third public meeting for date 6th August 2025. Image 2 captures members of the public who had already arrived, while others were still being awaited. Image 3 features Mr. Edgar Eredi, the lead Sociologist for the public meetings, addressing questions raised by attendees.

6.5 Environmental Occupational, Health and Safety impacts

It is a requirement that William Muthama must develop adequate and responsive HSE policies and integrate them into the project lifecycle. The construction workers must also ensure that they adhere, at all times, to all national and local health and safety standards applicable. The contractor should be compliant with the findings of the EIA Study report and the NEMA licensing conditions. All personnel should be issued with necessary personal protection equipment (PPE) and trained by their supervisors to complete their assigned tasks in a safe and secure manner. The key to achieving healthy and safe working conditions is to ensure that health and safety issues are planned, organized, controlled, monitored and reviewed. Everyone controlling site work has health and safety responsibilities. Checking that working conditions are healthy and safe before work begins and ensuring that the proposed work is not going to put others at risk and this requires planning and organization.

Environmental, Occupational Health and Safety (EOHS) is an important aspect of an environmental assessment and evaluation exercise since most of the activities which will be carried out within the project area should comply with specific standards as set by the local authorities, NEMA, DOSHS and other recognized institutions such as the World Health Organization (WHO). Health, safety and environmental protection and responsibility are among the most important aspects of modern construction industry activities. The health and safety of all personnel and the impact of operations on third parties and on the environment are of paramount importance. It is the responsibility of proponent and the contractor to ensure that safety standards are maintained and all members at the construction site adhere to safe working practices. Some of the safety issues include, but are not limited to, the following factors: Risk of personal injury at

work, especially during excavation; Noise generation from the machines; Heat / sun exposure; Solid and liquid waste management, including wastewater and effluent discharges; Oil and chemical spills; dust emissions, Fire; and material handling.

The proponent is required to assess risks and take practical measures in advance to protect the health and safety of the workers, keep accident records, provide information and training, consult employees, cooperate as well coordinating mitigation measures with the contractors. Some of the key aspects to be implemented on the site include:

- Standard HSE Management procedures for the site;
- Strategically place safety signage and postage around the facility and in all appropriate areas; and
- Provide fit for use PPE for workers such as, aprons, gloves, hard helmets, safety shoes etc.;

To achieve the above key approaches include planning and organization, documentation, enforcement and good housekeeping.

6.2.1 Planning the work

This will involve gathering as much health and safety information about the project and the proposed site before work begins, this is important. Sources of information include.

- The client;
- The design team;
- Contract documents;
- The main contractors on the site;
- Specialist contractors and consultants;
- Trade and contractor organizations;
- Equipment and material suppliers; and
- HSE relevant laws regulations and guidelines.

The contractor shall identify site hazards as well as see if there are any unusual features which might affect the work, or how the work will affect others in close proximity to the project site.

6.2.2 Organizing the work

- The contractor shall decide who will supervise the work – check that they are adequately trained and experienced.
- The project proponent shall make sure that the Main Contractor and sub-contractors on site provide adequate supervision for their workers.
- The Contractors management on the project will oversee that work methods and safety precautions agreed before work is started are put into practice.
- Make sure that people working for subcontractors also get the information they require and provide training, supervision etc as needed.

6.2.3 Notifying DOSHS

According to the Factories and Other Places of Work (Safety and Health Committees) Rules, 2004, a project site should be registered as a work place with DOSHS if it regularly employs twenty or more employees and hence shall establish a Safety and Health Committee in the manner provided in these Rules.

6.2.3 Setting up the site

Site access

- There should be safe access onto and around the site for people and vehicles. there shall be a plan how vehicles will be kept clear of pedestrians, especially at site entrances
- The plan should include how vehicles can be kept clear of pedestrians at vehicle loading/ unloading areas, parking areas and areas where drivers' vision may be obstructed.

Site boundaries

The construction worksite should be fenced off and suitably signed. This will protect people (especially children) from site dangers and the site from vandalism and theft. For some jobs the workplace will have to be shared. A plan on who has to control each area. Shall be Agreed, what fences, barriers, means of separation or permits to work are required to keep both construction workers away from hazards created by others and other people away from hazards created by the construction work; site rules might be needed to make sure there is a system to ensure necessary precautions are kept in place during working hours and that night-time and weekend protection is put in place as required before the site closes.

Welfare facilities

- Everyone who works on project site must have access to adequate toilet and washing facilities, a place for consuming refreshments and somewhere for storing and drying clothing and personal protective equipment.
- The project contractor and others who have control over construction sites are responsible for providing or making available site welfare facilities. Employers are also responsible for ensuring that welfare facilities are adequate for their employees.
- The welfare facilities should be sufficient for everybody who is working on the project site. If facilities such as toilets and canteens provided by someone else are to be used, check that they are suitable and properly maintained. They should be kept clean, warm and properly ventilated and lit.
- Welfare facilities shall be easily available to people working on the site. Toilets need to be easily accessible from where the work is being done. Washing facilities should be as close as possible to the toilets. Washing facilities also need to be rest rooms so that people can wash before eating.

Sanitary conveniences

- The numbers of toilets required will depend on the number of people working on the project site.
- Wherever possible toilets should be flushed by water and connected to a mains drainage system. If this is not possible, toilets with a built-in water supply and drainage tank may be provided. If neither option is possible, chemical toilets may be provided.
- Men and women may use the same toilet, provided it is in a separate room with a door that can be locked from the inside.
- A washbasin with water, soap and towels or dryers should be located close to the toilets.

Washing facilities

- On all sites sections, provide basins large enough to allow people to wash their faces, hands and forearms. All basins should have a supply of clean hot and cold,

or warm, running water. Because the mains water is not available in the project area, this water will be supplied from a tank.

- Where the work is particularly dirty or workers are exposed to toxic or corrosive substances (e.g. during excavations and demolitions), showers will be provided.
- Men and women can share basins used for washing their faces, hands and arms

Rest facilities

- Facilities should be available for taking breaks and meal breaks facilities should provide shelter from the wind and rain and be heated as necessary.
- It should be possible for non-smokers to use the facilities without suffering discomfort from tobacco smoke. This can be achieved by providing separate facilities for smokers and non-smokers, or by prohibiting smoking in the rest facilities.
- Rest facilities may be provided within the site office or site hut.

Storing and drying clothing and personal protective equipment

1. The contractor shall make sure there are proper arrangements for storing:
   - Clothing not worn on site (e.g. hats and coats);
   - Protective clothing needed for site work (e.g. wellington boots, overalls, gloves etc.);
   - Personnel should be issued equipment (e.g. ear defenders, goggles, harnesses etc.).
2. The site office may be a suitable storage area, provided it is kept secure. Where there is a risk of protective site clothing contaminating everyday clothing, store items separately.
3. Where necessary for propriety, men and women should be able to change separately.

Drinking water

1. The proponent shall make sure there is a supply of drinking water.
2. The drinking water tank should be clearly marked if it is possible not to confuse the drinking water supply with other water supplies or other liquids such as:
   a. those not fit for consumption (e.g. water from storage tanks used for wheel washers); or
   b. certain toxic materials
3. Cups or other drinking vessels should be available at the water point, unless the water is supplied as an upward jet that can be drunk from easily (e.g. a drinking fountain).

6.6 Good order, storage areas and waste materials.

1. Plans should be made on how the site will be kept tidy and how housekeeping will be actively managed:
   - Keep walkways and stairways free of tripping hazards such as trailing cables, building materials and waste. This is especially important for emergency routes. Make sure that all flammable waste materials (such as packaging and timber offcuts) are cleared away regularly to reduce fire risks;
   - Keep inside floor areas clean and dry;
   - Outdoor footpaths should be level and firm and should not be used for storing materials

2. Designate storage areas for plant, materials, waste, flammable substances (e.g. foam plastics, flammable liquids and gases such as propane) and hazardous substances (e.g. pesticides and timber treatment chemicals). Flammable materials will usually need to be stored away from other materials and protected from accidental ignition. Care must be taken not to store materials where they obstruct access routes or where they could interfere with emergency escape.
3. If materials are stored at height (e.g. on top of a container or on a scaffold gantry), make sure necessary guard rails are in place if people could fall when stacking or collecting materials or equipment.
4. All storage areas shall be kept tidy, whether in the main compound or on the site itself. Try to plan deliveries to keep the amount of materials on site to a minimum.
5. A decision must be made on how the waste stream will be managed to ensure it is timely and effective. The contractor should consider whether to be responsible for collecting their own waste or whether you will provide someone to do this for the site. Don't forget that waste materials also need storing safely before their removal from the site and make sure that to make allowance for sufficient space for waste skips and bins. If you are collecting waste in skips you will need to decide where the skips can be positioned and how often they will need to be collected. Consider waste generated inside and whether you need to provide wheeled bins to enable it to be brought out of the building safely.

6.7 Emergency procedures

1. At most sites, the most obvious emergency is fire. The general principles for dealing with fire risks can be applied to planning for other emergencies. Plan emergency procedures before work begins and put general precautions in place from the start of work.
2. Some emergencies may require evacuation of the site or part of the site, while others might involve the rescue of an injured person. For example, it may be necessary to plan how someone injured in a fall can be attended to by first aiders and the emergency services before being taken to a place of safety.

a) Planning for an emergency

1. When planning emergency procedures, routes and exits, the following should be into account:
    - The type of work being done on site (e.g. extra precautions may be required to maintain routes down stairs during demolition);
    - The characteristics and size of the site and the number and location of workplaces on the site. A large site with people working at many locations will probably need bells or sirens at a number of places to raise the alarm. On small sites with only two or three people working, an air horn may be adequate;
    - The plant and equipment being used (e.g. consider tower crane drivers, people working on suspended access equipment or where the exit may be obstructed by equipment);
    - The number of people likely to be present on the site at any one time. On sites where many people work, escape routes need to be wide enough to allow everyone to get through doorways or down stairs easily without them becoming overcrowded; and

- The physical and chemical properties of substances or materials on or likely to be on the site (e.g. work at petrochemical installations or at sites where flammable paints or glues are in use may require an increased standard of ventilation).

2. Take precautions to ensure:
    - The likelihood of emergencies arising is as low as possible;
    - Everyone on site can be alerted in an emergency;
    - Everyone working on site (including contractors who may only be at the site for a few hours) knows what signal will be given if there is an emergency and knows what to do;
    - Someone who has been trained in what to do is on site while work is in progress and will take responsibility for coordinating procedures;
    - Emergency routes are available, kept clear, signed and adequately lit. When the site is not adequately lit by daylight for all periods when people are at work, provide lighting that will come on automatically in an emergency;
    - There are arrangements for calling the emergency services. It is good practice to let the Fire Brigade know about any work in tunnels, confined spaces or above 18 m (above this height they may require specialist access equipment) and anywhere else where specialized rescue equipment may be needed;
    - There is adequate access to the site for the emergency services and that access does not become blocked by plant or material building up;
    - Arrangements for treating and recovering injured people are available;
    - If an emergency does arise, someone is posted at the site entrance, or in another prominent position, so that they can direct the emergency services

b) Precautions to prevent fires

The following precautions should be taken to prevent fires:

- Use less-easily ignited and fewer flammable materials, e.g. use water-based or low-solvent adhesives and paint;
- Keep the quantity of flammables at the workplace to a minimum;
- Always keep and carry flammable liquids in suitable closed containers;
- If work involving the use of flammable materials is being carried out, stop people smoking and don‘t allow other work activities involving potential ignition sources to take place nearby. For example, if floor coverings are being laid using solvent-based adhesives, don‘t allow soldering of pipes at the same time;
- Ensure that pipes, barrels, tanks etc. which may have contained flammable gases or liquids are purged or otherwise made safe before using hot cutting equipment, such as a cutting torch or angle grinder. A pipe or container may appear to be empty, but can contain enough material on its sides, or within rust or other sediments, to produce a flammable or explosive atmosphere within it when heated or disturbed. Specialist advice may be required;
- To minimize the risk of gas leaks and fires involving gas-fired plant:
    - Close valves on gas cylinders when not in use;
    - Regularly check hoses for wear and leaks;
    - Prevent oil or grease coming into contact with oxygen cylinder valves;
    - Do not leave bitumen boilers unattended when alight;
- Store flammable solids, liquids and gases safely. Separate them from each other and from oxygen cylinders or oxidizing materials. Keep them in ventilated secure stores or an outdoor storage area. Do not store them in or under occupied work areas or where they could obstruct or endanger escape routes;

- Have an extinguisher to hand when doing hot work such as welding or using a disc cutter that produces sparks;
- Check the site at lunch time and at the end of the day to see that all plant and equipment that could cause a fire is turned off. Stop hot working an hour before people go home, as this will allow more time for smoldering fires to be identified; and
- Provide closed metal containers to collect rubbish and remove them from the site regularly. Collect highly flammable waste such as solvent-soaked rags separately in closed fire-resisting containers.

c) Precautions in case of fire

If a fire should break out, people must be able to escape from it. To achieve this consider the following procedures;

1. Means of giving warning.

Set up a system to alert people on site; this could be a temporary or permanent mains operated fire alarm (which should be tested regularly, e.g. weekly), a klaxon, an air horn or a whistle, depending on the size and complexity of the site. Any warning needs to be distinctive, audible above other noise and recognizable by everyone.

2. Means of escape.

Plan escape routes and ensure they remain available and unobstructed. For work areas above or below ground, provide well separated alternative ways to ground level where possible. Protect routes by installing the permanent fire separation and fire doors as soon as possible. It is important that escape routes give access to a safe place where people can assemble and be accounted for. Signs will be needed if people are not familiar with the escape routes Make sure that adequate lighting is provided for enclosed escape routes – emergency lighting may be required.

3. Means of fighting fire.

a) As well as providing fire extinguishers for hot work, fire extinguishers should be located at identified fire points around the site. The extinguishers should be appropriate to the nature of the potential fire:
   - Wood, paper and cloth – water extinguisher;
   - Flammable liquids – dry powder or foam extinguisher;
   - Electrical – carbon dioxide (CO_2) extinguisher.

b) Nominated people should be trained in how to use extinguishers.

d) First Aid

Factories (First-Aid) Order required by section 50(1) of the Act require the occupier to provide The first-aid boxes or cupboards at a work place which are adequate and appropriate equipment, facilities and personnel to enable first aid to be given to your employees if they are injured or become ill at work. The minimum provision for all sites is:

- A first aid box with enough equipment to cope with the number of workers on site as per the order;
- An appointed person to take charge of first-aid arrangements;
- Information telling workers the name of the appointed person or first aider and where to find them. A notice in the site hut is a good way of doing this.

The first-aid arrangements should cover shift working, night and weekend working where this is carried out. This may mean appointing or training several people to ensure adequate cover.

e) Reporting injuries, diseases and dangerous occurrences

Employers have a duty under the law (OSHA, 2007) to report to DOSHS certain types of accidents that happen to their employees. Whoever is in control of the site also has a legal obligation to report certain accidents which involve a self-employed worker or member of the public and certain dangerous occurrences. Generally, you have to report deaths, serious injuries and dangerous occurrences immediately and less serious injuries within seven days. Certain occupational ill-health issues and diseases also have to be reported. Further details of when you must report an accident, disease or dangerous occurrence are given in Factories and other places of work (Safety and health committees) Rules.

f) Site rules

It is recommended to enact certain safety precautions while construction work is in progress. It may assist everyone if site rules are applied. Site rules might cover, for example, the use of personal protective equipment, traffic management systems, pedestrian routes, site tidiness, fire prevention, emergency procedures or permit-to- work systems. It should be very clear where site rules apply. Make sure everybody knows and follows the rules relevant to them.

6.8 Site management and supervision

This should entail making provision of either all or some of the following.

1. Safety while working at height.
2. Selecting the right means of access and work equipment.
3. Safe working platforms.
4. Inspections and reports.
5. General access scaffolds.
6. Guard rails, toe boards and brick guards.
7. Tower scaffolds.
8. Mobile access equipment.
9. Suspended access equipment.
10. Safety nets and soft landing systems.
11. Rope access techniques.
12. Safety harnesses.
13. Ladders and stepladders.
14. Roof work and fragile surfaces.
15. Roof truss installation.
16. Management of site traffic and mobile plant.
17. Moving goods safely.
18. Hazardous substances and processes.
19. Personal protective equipment.
20. Electricity safety.
21. Prevention of slips and trips.
22. General Public Safety

CHAPTER SEVEN: ASSESSMENT OF POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

7.1 Introduction

This chapter presents the relevant environmental and social issues that may occur (potential impacts) throughout the project cycle. The purpose of the Environmental Impact Assessment (EIA) of the project is to ensure the project progresses in a sustainable approach. The assessment is based on identified potential impacts through fieldwork and public participation. The proposed project is expected to have both positive and negative impacts. Specifically, the chapter covers the main environmental and social impacts that are likely to occur during construction, operation and decommissioning phases of the proposed project. The anticipated impacts are then discussed in three phases namely: construction, operational and decommissioning phases. The initial identification of activities with a potential to have a significant impact on the local physical, human and ecological environment was performed using a screening matrix. In this process several criteria were used to allow the significance of each impact to be assessed, including but not limited to: extent, frequency, duration, reversibility, repairability and scale. The impacts identified during the initial screening were then subjected to an extended evaluation. This evaluation included establishment of a rating, on a scale, for each impact in terms of the level of its significance and the probability of its occurrence. The individual rating of each criterion was then followed by a matrix- based assessment where they were weighed against each other to retrieve a final estimation based on local conditions as per the Leopold's Matrix. The result of this assessment is an individual scoring of each impact allowing for comparability between activities (useful when prioritizing mitigation efforts). The assessment of the impacts from each activity was then followed by initial recommendations on mitigation efforts, adapted to local conditions, which are considered necessary to reduce the estimated impact from each activity to an acceptable level. In order to alleviate negative impacts emanating from the implementation of the project, relevant mitigation measures have also been proposed in this chapter

7.2 Classification of environmental impacts and significance

Impacts may be categorized into the following:

- Positive (beneficial) or negative (adverse);
- Direct or indirect, long-term or short-term in duration;
- Localized or widespread in the extent of their effect;
- Cumulative or non-cumulative.

The aim of this assessment exercise was to identify the significant impacts related to the project. Significant impacts were defined as being those which:

- Are subject to legislative control;
- Are of public concern and importance;
- Are determined as such by technically competent specialists;
- Trigger subsequent secondary impacts;
- Elevate the risk to life threatening circumstances; and
- Affect sensitive environmental factors and parameter in the project area.

Impact significance was described as follows:

High: Where it could have a no-go implication for the project irrespective of any possible mitigation.

Medium: Where the impact could have a moderate influence on the environment, which would require modification of the project design or alternative mitigation.

Low: Where the impact would have little influence on the environment and would not require the project design to be significantly accommodated.

Negligible: Where the impact would have no influence on the environment and would not require the project design to be accommodated at all.

The criterion used in determining the significance of the impact should be was through the following approach:

Nature of Impact: A brief description of how the proposed activity will impact on the environment. This should be stated as: Positive (a benefit); Negative (a cost) or Neutral.

Duration: The period of contact between the impact and the receptors both biophysical and socio-economic. The impact could then be termed as short term, medium term or long term and permanent. Also the impacts could be intermittent or continuous.

Extent: This evaluates the area of occurrence and influence of the impact on the receptor environments. Impacts could occur on site where project activities are taking place, within a limited area thus a radius of 500-1000m, local jurisdiction of 3km radius of the spatial coverage of the project.

Magnitude: The quantifiable effects of impacts. These were measured where possible against the appropriate standards for a given environmental component. Standards included operational guidelines, different environmental standards and schemes drawn based on expert judgment by experienced professionals. Magnitude was then expressed in terms severity thus major, moderate or low.

Irreversibility: Impacts could be reversible or irreversible. Reversible impacts are those for which solutions are available using current knowledge and technology. The changes on the biophysical and socio-economic receptors are not permanent. There is technology available to undo the changes. Irreversible impacts are those for which there is no technology available to restore receptors to their pre-impact state. They are permanent changes in the parameters and functioning of the receptor environment.

Significance: This constitutes the overall impact rating taking into account all the other impact parameters. It was expressed in terms of severe, moderate, minor and negligible. The matrix in the table below presents the criteria for scaling the significance of impacts of the proposed residential apartment‘s project.

Likelihood: This considered the likelihood of the impact occurring and was described as:

- Unlikely (where the impact is unlikely to occur);

- Likely (where there is a good probability, < 50 % chance that the impact will occur);
- Highly likely (where it is most likely, 50-90 % chance, that the impact will occur); or
- Definite (where the impact will occur, > 90 % chance of occurring, regardless of any prevention measures).

Table 9: Criteria for assessing significance

Environmental and Social Issue/Impact	**Description**
Project Phase	**Pre-construction, Construction, Operation and Decommissioning**
Impact	
Nature	Negative or Positive Direct or Indirect
Extent	Localised or Regional or National
Duration	Long term or Short term
Probability ()	Highly Likely, Likely or Not Likely,
Degree to which impact cannot be reversed	Low or High
Degree to which Impact may cause irreplaceable loss of resources	Low, Medium or High
Significance Pre-Mitigation	Low or High Positive or Negative
Significance Post-Mitigation	Neutral, Positive or Negative
Degree of Mitigation	Easily Mitigated, Not Easily Mitigated

7.3 Impact identification, description and mitigation

An impact matrix is a simple but effective tool for identifying the possible impacts of the project activities on the environment and this was done for the proposed residential apartment's project. The project activities for the construction of the proposed residential project were arrayed against a selection of environmental factors that were deemed to be relevant to the project or which may be affected indirectly as a result of project activities. In order to ensure sound development and effective implementation of the proposed Environmental and Management Plan, it is necessary to identify and define the responsibilities and authority of the various persons and organizations that will be involved in the project. The following entities are key for the success of the proposed project and should be involved as adequate in the in the implementation of this EMP: Project Manager, the Project Contractor, Westlands Sub-county and NEMA. The Project Manager will oversee the construction program and construction activities which shall be compliant with the developed EMP. The contractor is required to comply with all the requirements of the EIA license and other relevant legislations.

The relevant department within the Westlands Sub-county shall be called upon where necessary during the project implementation to provide the required permits and advisory services to the proponent and Project Manager while NEMA will exercise general supervision and coordination over all matters relating to the environment and the principal instrument of the government for implementation of all environmental policies.

7.4 Pre-construction phase impacts discussion

This stage involves the design, planning and pre-construction activities of the project. Key activities considered included:

- Vegetation clearing;
- Transportation of materials to project site;
- Public consultations;
- Storm water management;
- Visual intrusion;
- Landscape design;

7.4.1 Positive impacts during the pre-construction phase

Public consultation

Prior to any development, the proponent was required to conduct public consultations and obtain feedback from the community on their views concerning the proposed project as part of the EIA exercise. Through this activity the proponent got to know more on the views of the residents about the proposed development and therefore incorporates appropriate measures in order to be in line with the needs of the community before implementation of the project.

Environmental sound designs

The incorporation of renewable sources of energy and recycling of waste water into the design of the William Omondi Muthama would ensure that environmental considerations have been taken into the concept of the development making it environmentally friendly hence we propose the installation of solar panels for use in the proposed apartments.

7.4.2 Negative impact during the pre-construction phase

Vegetation clearing

During site preparation, vegetation consisting of grasses, shrubs and small trees on the site will be cleared and the overburden removed so as to commence construction of the structures. Vegetation clearing is associated with loss of biodiversity, soil erosion, sedimentation and siltation, increased run off and degradation of surface water quality.

Mitigation measures

- Incorporation of natural vegetation into site landscape design;
- Vegetation clearing should be limited during this phase and only where the temporary structures are to be erected;

Restriction of movement

Site handing over to the contractor after signing of civil contract will be the beginning of the site preparation. The contractor will have to fence the site to restrict the movement of people through the site hence increasing the distance and time taken to access certain resources e.g. access to grazing land.

7.5 Construction Phase Impacts Discussion

7.5.1 Positive impacts during construction

Creation of employment opportunities

This project will create job opportunities in the project area. Direct job opportunities are available for high calibre professionals including architects, engineers, civil works contractors and consultants. The project will also offer direct or indirect employment opportunities to semi-skilled and unskilled labourers such as foremen, clerks and drivers.

Table 10: Impacts from creation of employment

Environmental and Social Issue	**Creation of employment opportunities**	
Project Phase	**Construction**	
Impact	**Increased income**	**Improved livelihood**
Nature	Positive (direct and indirect)	Positive (direct and indirect)
Extent	Study area	Study area
Duration	Short term	Long term
Probability	Highly Likely	Highly Likely
Degree to which impact cannot be reversed	Low	Low
Degree to which Impact may cause irreplaceable loss of resources.	Low	Low
Significance Pre Enhancement	Positive and High	Positive and High
Significance Post Enhancement	Positive and Very High	Positive and Very High
Degree of Enhancement	Easily Mitigated	Easily Mitigated

Enhancement measures include:

- During employment of semi-skilled and unskilled labour, priority should be given to the local residents and immediate community;
- Gender Equity should be considered when employing labours so as to ensure a balance between the two sexes is almost equal and there should be no bias towards the male;
- Better remuneration for the employees in line with Employment Act 2007 and the Regulation of Wages (General) (Amendment) order, 2009;
- The contractor should inform workers that the employment opportunity is short term so as to prepare them in case employment comes to an end due to reduction in work.

Provision of market for building materials

The project will require supply of large quantities of building materials most of which will be sourced locally within Mlolongo town. This provides ready market for building material suppliers such as quarrying companies and hardware shops hence will be a source of income for owner which enable further investment in their business and create employment opportunities for labourers.

Table 11: Impacts from provision of market for building materials

Environmental and Social Issue	**Provision of market for building materials**	
Project Phase	**Construction**	
Impact	**Increased income**	**Employment opportunities**
Nature	Positive (direct)	Positive (direct)
Extent	Study area and the surrounding region	Study area
Duration	Long term	Short term
Probability	Highly Likely	Highly Likely
Degree to which impact cannot be reversed	Low	Low
Degree to which Impact may cause irreplaceable loss of resources.	Low	Low
Significance Pre Enhancement	Positive and High	Positive and High
Significance Post Enhancement	Positive and High	Positive and Very High
Degree of Enhancement	Easily Mitigated	Easily Mitigated

Mitigation measures include:

- Construction contract should stipulate that the Contractor sources materials from an approved site and sources e.g. hard stones for building should be obtained from bonafide commercial quarries;
- Adherence to the NEMA national sand harvesting guidelines by sand harvester supplying sand for building. This is to mitigate the degradation of riverbed and acceleration of erosion;
- Quarry providing aggregates for construction should be licenced and in line with the various regulatory guidelines such as the Mining Act, EIA guidelines and local authority bylaws;
- The Project Manager should ensure that source of timber used during construction should be obtained from approved sources;
- Materials such as steel and cement should be accredited company with Kenya Bureau of Standards marks of highest quality as well as Ministry of Public Works Material testing section. This is to ensure high building standards are upheld and not compromised by low quality materials;
- The tender documents should specify required standards and certification for procurement of all materials and appliances.

Enhancement of local economic growth

Income generated from employment during construction and from the informal and formal business around the project area is expected to improve the economic status of the local populous. Increased income would lead to increased saving and investment on the household level for example in housing, education and assets.

7.5.2 Negative impacts during construction

Vegetation Clearing

It is anticipated that the entire land surface is going to be cleared to create space for construction of structures and the needed supporting services and facilities. Further, the site will be enhanced through landscaping leading to massive disruption of the existing natural vegetation cover.

Table 12: Impacts of vegetation clearing

Environmental and Social Issue	**Vegetation clearing**		
Project Phase	**Construction**		
Impact	**Top soil loss and Erosion**	**Increased run off causing sedimentation and siltation of surface water features**	**Loss of biodiversity**
Nature	Negative (direct)	Negative (indirect)	Indirect (direct)
Extent	Site	Project area	Site
Duration	Short term	Short term	Long term
Probability	Highly Likely	Highly Likely	Highly Likely
Degree to which impact cannot be reversed	Low	Low	High
Degree to which Impact may cause irreplaceable loss of resources.	Very high	Low	Very High
Significance Pre Mitigation	Negative and Very High	Negative and High	Negative and Very High
Significance Post Mitigation	Positive and High	Positive and Low	Positive and Low
Degree of Mitigation	Easily Mitigated	Easily Mitigated	Moderately Mitigated

Mitigation measures include:

- Minimal clearing of the few tree species on the site. The Project Management should ensure retention and restoration of much of the original vegetation cover;
- Removal of vegetation to take place only within demarcated construction site;
- Non-essential removal of vegetation should be avoided;
- Re-vegetation should incorporate natural vegetation.

Solid wastes management

During the construction phase, three types of solid wastes will be generated: Debris from demolitions, spoils and domestic refuse. At present it is not known the quantities of waste which will be generated from the three sources; however it is believed to be in larger quantities. Such waste materials include excavated soil, stones, construction debris, wood, broken glasses, containers, rods of metal, pieces of iron sheets, extirpated vegetation on the site etc. Other construction waste will be generated while the works

are ongoing. This will consist of building materials, concrete, paper and plastic (for example from packaging materials and lagging), timber, scrap metal, etc. Apart from visual impacts, debris can affect water quality and be deterioration to aesthetic beauty of the project area.

Table 13: Impacts from solid waste management

Environmental and Social Issue	**Solid Waste Management**	
Project Phase	**Construction**	
Impact	**Pollution**	**Handling, Collection and Disposal**
Nature	Negative(direct)	Negative (direct)
Extent	Regional	Regional
Duration	Long term	Short term
Probability	Highly Likely	Highly Likely
Degree to which impact cannot be reversed	Low	Low
Degree to which Impact may cause irreplaceable loss of resources.	Low	Low
Significance Pre Mitigation	Positive and High	Positive and High
Significance Post Mitigation	Positive and High	Positive and Very High
Degree of Mitigation	Easily Mitigated	Easily Mitigated

Mitigation measures:

- Efficient use, re-use and re-cycling of materials to minimise on solid waste;
- Good housekeeping to ensure no littering from packaging materials;
- Segregation of waste before appropriate disposal;
- The contractor should provide disposal bin around the site for proper disposal of papers and plastics. This to eliminate littering of the construction site and keeping it clean;
- Paper and glass to be sent for reuse/ recycling;
- The contractor should prepare a waste management plan for management of solid waste management. The waste management plan should contain the waste streams, management procedures, responsibilities and monitoring frequency;
- Disposal of solid waste that accumulate at the construction site should be properly disposed in NEMA licenced landfill in accordance with NEMA solid waste disposal Guidelines and regulations;
- No burning, on-site burying or dumping of waste shall occur;
- Waste minimization by avoiding unsustainable construction practices;
- Provision of waste collection bins and cubicles for collection and temporal holding of the generated waste within the site before disposal;
- Purchase construction materials in quotas to avoid wastage;
- Provide solid waste handling containers within the project site to help in proper collection and management; and
- Ensure separation at source of the solid waste generated on site is done to enhance reusing of any material recovery.

Liquid Wastes

Liquid waste is expected to arise during construction from mixing, rinsing and cleaning activities. These may find its way into surface water features within the drainage system of the site and may equally contribute to underground water polluted.

Table 14: Liquid waste impacts

Environmental and Social Issue	**Liquid waste**	
Project Phase	**Construction**	
Impact	**Pollution of surface and ground water**	**Public health**
Nature	Negative(direct)	Negative (direct)
Extent	Regional	Regional
Duration	Long term	Short term
Probability	Highly Likely	Highly Likely
Degree to which impact cannot be reversed	Low	Low
Degree to which Impact may cause irreplaceable loss of resources.	Low	Low
Significance Pre Mitigation	Positive and High	Positive and High
Significance Post Mitigation	Positive and High	Positive and Very High
Degree of Mitigation	Easily Mitigated	Easily Mitigated

Mitigation measures include:

- Concrete batching and mixing should occur at one particular point and the site should be bunded or paved and drains provided to ensure polluted water is drained at a particular suitable point;
- Prudent use of water to reduce liquid waste volumes;
- Contaminated water from construction works should be directed to a containment area where it could be reused at the construction site;
- Portable toilets should be provide onsite so as to mitigate pollution of subsurface water in case where pit latrine are used

Noise pollution and visual intrusion

The proposed development will impact on the environment both visually and through noise pollution. The project site is currently adjacent to low level flats and therefore the construction of the development will disturb the landscape to some extent disrupting the natural landscape. Noise levels are expected to rise during the construction phase of the development. Construction activities that cause noise include vehicle trafficking, generator noise, pressure hammers and construction worker‘s voices, etc. These noise levels are not assessed to be a nuisance to adjacent residents and communities.

Visual impacts occur during earthworks for the foundation of projects. However, the proposed project will not by far be out of scale with the existing projects or developments (within the area). The visual impact will not be significant and will have very little affects neighbouring activities and the general public. There are already completed similar projects in the immediate neighbour-hood, which is thought to have psychologically prepared the general environment.

Table 15: Noise and visual impacts

Environmental and Social Issue	**Noise and visual**	
Project Phase	**Construction**	
Impact	**Noise**	**Visual impacts**
Nature	Negative (direct)	Negative (direct)
Extent	Local	Site
Duration	Short term	Long term
Probability	Highly Probable	Highly Probable
Degree to which impact cannot be reversed	Medium	Medium
Degree to which Impact may cause irreplaceable loss of resources.	Medium	Medium
Significance Pre Mitigation	Low (-ve)	Medium (-ve)
Significance Post Mitigation	Low (-ve)	Low (-ve)
Degree of Mitigation	Easily Mitigated	Moderately Mitigated

Mitigation measures for Noise include:

- Schedule noisy activities during the normal working hours of between 8am to 5pm. No work should be undertaken at night or very early in the morning;
- Put off machines and equipment when not in use. Apart from fuel cost saving ;
- Ensure machinery is well maintained to reduce noise emitted;
- The contractor should adhere to the provision in the Environmental Management and Coordination (Noise and Excessive Vibration pollution) (control) regulations,2009;
- Provide worker with appropriate PPEs when working under noisy environment e.g. ear plugs;

Mitigation measures for Visual impacts:

On completing the earthworks, the worked area should be restored through backfilling, levelling and planting of vegetation;

- All solid waste and debris from construction site must be cleared on completion;
- The scheme should be blended in a way to merge with existing environment. It should in fact upgrade the quality of the surroundings. Landscaping and planting of vegetation especially trees shall go a long way in mitigating the visual intrusion.

Air/Dust Pollution

The construction activities on the site will result to increased dust and gas emissions. Construction machinery and trucks (including small vehicles) generate hazardous exhaust fumes such as Carbon Oxides (COx), Sulphur Oxides (SOx) and Nitrogen Oxides (NOx). Dust particles caused by vibrations of machines and vehicle movement suspends in the air mostly during dry spells. Diesel engines emit black carbon, which absorbs sunlight and warms the atmosphere and micro-particles. Unseen and odorless, microscopic particles of air pollution is very harmful. Exhaust from diesel engines and dust swirl into an insidious cocktail of tiny particles that can spend weeks airborne. The most harmful are the smallest, less than 2.5 microns in diameter; when inhaled, the lungs or pass directly into the bloodstream and damage arteries.

The level of air pollution originating from the above mentioned sources are expected to be low, localized and short term. No serious impacts are expected on people and the environment.

Mitigation measures

- Ensure strict enforcement of on-site speed limit regulations;
- Avoid excavation works in extremely dry weather when soil is pulverized;
- Sprinkle water on access routes each day to reduce dust generation during heavy machines usage;
- Provide dust nets to prevent the spread of dust to neighbouring residential houses;
- Ensure all trucks delivering construction materials such as sand are properly covered to prevent the spread of dust;
- Ensure proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips done per vehicle or the number of vehicles on the access road;
- Provide adequate personal protective gears to all employees;
- Ensure all transportation trucks are covered while carrying away excavated soils and construction debris for final disposal;
- Minimize dust generation and implement a dust control program; and
- Protect exposed soil and material stockpiles against wind-blown erosion;
- Practice dust management techniques, including watering spraying to suppress dust;
- Move earth and sand in covered vehicles/ transport to avoid it being blown by wind increasing suspend particulate in the atmosphere;

Table 16: Air pollution impacts

Environmental and Social Issue	**Air/dust pollution**	
Project Phase	**Construction**	
Impact	**Atmospheric pollution resulting to poor air quality**	**Public health**
Nature	Negative(direct)	Negative (direct)
Extent	Regional	Local
Duration	Long term	Short term
Probability	Likely	Likely

Degree to which impact cannot be reversed	High	High
Degree to which Impact may cause irreplaceable loss of resources.	Low	Low
Significance Pre Mitigation	Low (-ve)	Medium (-ve)
Significance Post Mitigation	Low (-ve)	Low (-ve)
Degree of Mitigation	Easily Mitigated	Easily Mitigated

Soil Erosion and pollution

This is loss of the top-most soft material on the earth surface (soil) down - slope or transportation by the use of machinery or other equipment including animals. Soil movement is common in construction activities. This mostly happens during the laying of foundations for the projects and site clearing. The top loose material is excavated and transported elsewhere. This also exposes the underlying material to more dangers of degeneration by erosion agents. In this case soil erosion will not be a major environmental impact especially when the project is over since there will hardly be open areas. However, during site clearing and construction phases, there will be massive movement of soil materials from the site. Most of the vegetation on site will be cleared (and in fact much of it has been extirpated) paving way for soil degradation.

Risk of soil erosion would result from extensive vegetation clearing, excavations for the structures or inadequate measures for storm water management. This would increase the surface run off from the area and lead to siltation of surface water features due to increase load of sediments.

Table 17: Impacts associated with soil erosion and pollution

Environmental and Social Issue	**Soil erosion and Pollution**	
Project Phase	**Construction**	
Impact	**Water quality**	**Increased run off and loss of top soil**
Nature	Negative(direct)	Negative (direct)
Extent	Site	Site
Duration	Short term	Short term
Probability	Likely	Likely
Degree to which impact cannot be reversed	Low	Low
Degree to which Impact may cause irreplaceable loss of resources.	Low	High
Significance Pre Mitigation	Medium (-ve)	Medium (-ve)
Significance Post Mitigation	Low (-ve)	Low (-ve)
Degree of Mitigation	Easily Mitigated	Easily Mitigated

Mitigation measures include:

- Install adequate storm water management measures such as sand filters;
- Schedule earth moving activities during the dry season. This is to reduce acceleration of soil erosion by run off when it rains;
- Avoid unnecessary movement of soil materials from the site;
- Control construction activities during rainy / wet conditions to mitigate erosion effects to the soil;
- Resurface (pavement) open areas after the completion of the project;
- Introduce suitable and well-managed vegetation to generate surface covers on the open areas; to control soil movement by erosion agents i.e. water, animals and wind;
- Provide storm water drainage channel to discharge water to safe areas. Such channels need to be regularly maintained and repaired to avoid point discharges in case of breakages or blockages. Point water discharges usually have pronounced effect to soil erosion.

Land Degradation

Most of the building materials such as stones, aggregates, and sand required for construction of the proposed project will be obtained from nearby quarry sites, concrete block sites and borrow pits. Since substantial quantities of these materials will be required for construction of the development, the availability and sustainability of land resources at the extraction sites will be negatively affected as they are not renewable in the short term. Similarly, during construction of the proposed housing project a lot of construction solid wastes will be generated. These include papers used for packing cement, plastics, timber remains, landscape and land clearing debris, asphalt pavement, gravel and aggregate products, concrete, masonry scrap and rubble (concrete masonry, stone) among others. These will have a negative impact on the receiving environment. It is expected that the contractor will obtain these materials for construction purposes from licensed suppliers or from authorized areas. Likewise, disposal of construction waste will be on designated sites. The extent of this impact is localized with a low intensity. The impact will be highly reduced/eliminated with mitigation. Therefore, the impact is negative and of low significance.

Table 18: Land degradation and Pollution

Environmental and Social Issue	**Land degradation and Pollution**	
Project Phase	**Construction**	
Impact	**Soil quality**	**Degraded land areas**
Nature	Negative(direct)	Negative (direct)
Extent	Site/Project area	Site/Project area
Duration	Short term	Short term
Probability	Likely	Likely
Degree to which impact cannot be reversed	Low	Low
Degree to which Impact may cause irreplaceable loss of resources.	Low	High

Significance Pre Mitigation	Medium (-ve)	Medium (-ve)
Significance Post Mitigation	Low (-ve)	Low (-ve)
Degree of Mitigation	Easily Mitigated	Easily Mitigated

Mitigation measures

- All wastes should be segregated and appropriately stored on site before final disposal; and
- Backfilling of opened up borrow pits, borrow pits and quarries should be undertaken at the end of the construction process.

Surface drainage and run-off

In this particular project some of the surface water/run-off will mainly be absorbed within the site i.e. open areas. However, these (open) areas are limited since much land will be covered by building structures, driveway, parking and pavements. Therefore as rain falls much water is anticipated to overflow the surface as storm water. In connection to this, the amount of water reaching storm water drain channel will be high.

The aim of a good surface drainage is to prevent land and human settlement from being saturated with water. Poor drainage causes dampness to building structures as well as water stagnation with a myriad of consequences to human health and safety and buildings. Damp (as influenced by poor drainage), in the presence of warmth and darkness, breeds germs and mosquitoes and may cause acute and Chronic Rheumatism. Poor drainage may also lead to property damage due to flooding.

The drainage of the storm water will be greatly compromised especially if it rains, since storm water drain channels will not be present during construction. In addition, it should be realized that a given area of land can only absorb a certain quantity of rain water/surface water. Therefore in and around the projected area where houses are built close together, the space of land (left open) which is useful in absorbing the surface water will be very small. The drainage of the general apartment's design comes in handy to enhance the flow of the much-anticipated surface run-off emanating from the roof catchments and other areas within the site, into the drains.

Table 19: Surface drainage and run-off

Environmental and Social Issue	**Surface drainage and run-off**	
Project Phase	**Construction**	
Impact	**Water quality**	**Increased run off and loss of top soil**
Nature	Negative(direct)	Negative (direct)
Extent	Site	Site
Duration	Short term	Short term
Probability	Likely	Likely
Degree to which impact cannot be reversed	Low	Low
Degree to which Impact may cause irreplaceable	Low	High

loss of resources.		
Significance Pre Mitigation	Medium (-ve)	Medium (-ve)
Significance Post Mitigation	Low (-ve)	Low (-ve)
Degree of Mitigation	Easily Mitigated	Easily Mitigated

Mitigation Measures

- During construction, the designs should ensure that surface flow is drained suitably into the public drains provided and water channels. There should be no flooding within the site at all;
- Drainage channels should be provided within the site and should be covered with gratings or other suitable and approved materials. They must be installed as provided for in the approved plans and designs;
- The channels should be designed with regards to the peak volumes i.e. periods or seasons when there is high intensity of rainfall. They should never at any time be full; say due to the resulting heavy downpours;
- The drainage channels must ensure the safe final disposal of run-off surface water and must be self-cleaning i.e. should have suitable gradient;
- Storm water generated from roof catchments should be harvested, stored and used in various household activities i.e. general cleaning. This will minimize resultant soil erosion and other associated impacts. It will reduce strain on the existing water supply systems. In this connection, it would be better if gutters are incorporated in the designs as well as down pipes to enhance water collection in to the storage tanks say of individual households.

Increased water demand due to construction works

Considerable amount of fresh water will be required during the construction works especially concrete mixing, operation of the concrete batching plant and curing of the constructed structures. This if not well managed will put some strain on the water supply at the construction site. Improper usage of water is anticipated to leads to wastage that can contribute to increase in project cost and poor hygiene and sanitation.

Table 20: Increased water demand due to construction works

Environmental and Social Issue	**Increased water demand**	
Project Phase	**Construction**	
Impact	**Reduction in the amount of water available for industrial purposes**	**Over extraction from water resources**
Nature	Negative(direct)	Negative (direct)

Extent	Regional	Regional
Duration	Long term	Long term
Probability	Likely	Likely
Degree to which impact cannot be reversed	Low	Low
Degree to which Impact may cause irreplaceable loss of resources.	High	High
Significance Pre Mitigation	High (-ve)	Medium (-ve)
Significance Post Mitigation	Medium (-ve)	Low (-ve)
Degree of Mitigation	Not Easily Mitigated	Easily Mitigated

Mitigation measures include:

- The contractor should sensitize construction workers on the importance of proper water management through clerks of works by having talks with them when doing their rounds around the site;
- Replace or repair leaking pipes supplying water to the construction sites to minimized wastage from leakages or pipe burst;
- The Contractor should ensure provision of adequate water storage facilities on the construction site to meet project needs during periods of high demand externally and refill of storage tanks during periods of low demand;
- Reuse of waste water from the construction activities for curing of concrete surfaces and cleaning of equipment so as to reduce on the fresh water use;
- Direct construction water runoff to areas where it can soak into the ground or be collected and reused;
- Lock water tank valves to prevent unauthorized use. To discourage wasteful use of water by construction workers, the contractor should lock the water storage facilities to restrict unnecessary access;
- Repair water equipment as needed to prevent unintended discharges.

Occupational Health and Safety

Risks of accidents and incidents will be heightened during the construction activities. Construction workers will be in direct contact with heavy machinery and equipment.

Construction work can be particularly hazardous. Personal protective equipment, fire safety, electrical safety, and other precautions are essential for safe construction work.

Table 21: Impacts associated with occupational health and safety

Environmental and Social Issue	**Occupational health and safety**	
Project Phase	**Construction**	
Impact	**Construction workers**	**Public safety**
Nature	Negative (direct)	Negative (direct and indirect)
Extent	Site	Local
Duration	Short term	Short term

Probability	Highly Probable	Probable
Degree to which impact cannot be reversed	Low	Low
Degree to which Impact may cause irreplaceable loss of resources.	Medium (-ve)	Low (-ve)
Significance Pre Mitigation	Low (-ve)	Low (-ve)
Significance Post Mitigation	Low (-ve)	Low (-ve)
Degree of Mitigation	Easily Mitigated	Easily Mitigated

Mitigation measures include:

- Contractor should ensure registration of all construction works by the Director, Directorate of Occupational Safety and Health Services (DOSHS) in compliance with the Buildings and Works of Construction Engineering Rules, 1984;
- Contractor should contract a qualified Health and Safety Advisor to conduct training and monitoring of construction works;
- The contractor should construct a temporary clinic on site to be run by a qualified nurse/ paramedics who will treat opportunistic ailments and injuries such as cold, malaria etc.;
- Contractor should provide a standard First Aid Kit on site;
- The Contractor should train several workers in First Aid depending on the number of workers on site as stipulated in the First Aid Rules 1977 through DOSHS certified First Training institution e.g. Red Cross, St. John Ambulance;
- Dangerous works should be protected, fenced, demarcated or cordoned off;
- Workers should be inducted with training on health and safety by DOSHS certified Health and Safety Advisor so as to enable or ensure machine safety, construction safety, fire safety and electrical safety as well as workplace inspection technique;
- Provide and enforce the use of Personal Protective Equipment (PPE) to workers as appropriate such as overalls, safety boots, hand gloves;
- The contractor should provide and install fire fighting equipment such as fire extinguishers to fight different classes of fire (Class A, B, C D);
- The Contractor should erect safety and informative signage for hazardous activities taking place such as deep excavations, electrical hazard, signage for fit for use personal protective equipment such as helmets, hand gloves, boots among others and prohibited activities such as smoking;
- The contractor should ensure that all plants to be used during construction such as pressure vessels, lifting machines and cylinders for compressed gas to are examined and inspected by an approved inspector before starting to use them;
- The contractor should develop site Health and Safety guidelines which are to be adhered to by construction workers and visitors to the construction site;

- Maintain an incident/ accident register, in accordance with the Occupational Safety and Health Act, 2007, and report incidences to DOSHS;
- Do not walk, stand, or work under suspended loads. If you raise a load, be sure to crib, block, or otherwise secure the load as soon as possible;
- Be prepared for unexpected hazards. BE ALERT!
- Prior to the start of construction, all areas should be inspected for the presence of potentially hazardous energy in the area should be located and precautions taken care off;
- Great care must be given to excavations and the safety of the machinery, tools and other equipment such as scaffolding, ramp or ladder must be guaranteed. Accident prevention should be the overriding safety precaution. A qualified person should always be on site to oversee the working.

Fire Risks/ Management

Fire risks during construction arise due to hot works, and use of inflammable chemicals. Additionally, with the abundance of grass in the area, the risk of fire is normally high during the dry seasons.

Table 22: Impacts associated with fire risk / management

Environmental and Social Issue	**Fire risk/Management**	
Project Phase	**Construction**	
Impact	**Loss of property**	**Injuries to worker**
Nature	Negative (direct)	Negative (direct and indirect)
Extent	Local	Local
Duration	Long term	Long term
Probability	Probable	Probable
Degree to which impact cannot be reversed	Low	Low
Degree to which Impact may cause irreplaceable loss of resources.	High (-ve)	High(-ve)
Significance Pre Mitigation	High (-ve)	High (-ve)
Significance Post Mitigation	Low (+ve)	Low (+ve)
Degree of Mitigation	Easily Mitigated	Easily Mitigated

Mitigation measures include:

- Place portable fire extinguishers at suitable locations;
- Combustible materials used during construction should be stored away from source of ignition and
- Smoking on site or burning of waste should be prohibited so as to reduce the source of ignition at the workplace;

- Electrical works such as electrical wiring should be done by qualified technicians or engineers to ensure shoddy work which could pose a danger to the development does not occur;
- Train and induct workers on the use of fire extinguishers and other fire fighting equipment;
- Train all staff on fire safety and procedures;
- Allocate a fire assembly point;
- Ensure fire safety warnings are prominently displayed at appropriate locations where fires are likely to occur;
- Provide and enforce the use of Personal Protective Equipment (PPE);
- Develop a Fire Safety Plan through a qualified specialist and implement the provision of the plan at the workplace.

Sexually Transmitted Infections and HIV / AIDS

Increased disease risk can occur due to social interaction between immigrant workers working on the project and the local population as is the case of HIV/AIDS and STI. Therefore necessary measures to make workers and the local population aware of the risk of transmitting and contracting HIV/AIDs and STIs need to be implemented by the contractor.

Table 23: Impacts surrounding STIs and HIV/AIDS

Environmental and Social Issue	**STIs and HIV/AIDS**	
Project Phase	**Construction**	
Impact	**Reduction of workforce**	**Diseases amongst construction workers**
Nature	Negative (direct)	Negative (direct and indirect)
Extent	Local	Local
Duration	Long term	Long term
Probability	Probable	Probable
Degree to which impact cannot be reversed	High	High
Degree to which Impact may cause irreplaceable loss of resources.	High (-ve)	High(-ve)
Significance Pre Mitigation	High (-ve)	High (-ve)
Significance Post Mitigation	Low (-ve)	Low (-ve)
Degree of Mitigation	Easily Mitigated	Easily Mitigated

Mitigation measures include:

- Voluntary Counselling and Testing to be undertaken monthly for construction workers so as to establish their HIV status;
- Information, Education and Communication materials such as posters (A3) and brochure to be used to sensitize workers. These poster should be pinned at strategic points within the workplace where they can be easily

viewed by workers such as at the site office notice board, the ablutions and at the entrance gate;

- Education and sensitisation of workers and the local communities on STIs;
- Formation of peer groups from among the project staff to ensure continuity in training and awareness raising;
- The contractor has to institute HIV/AIDS awareness and prevention campaign amongst workers for the duration of the contract e.g. erect and maintain HIV/AIDS information posters at prominent locations within the construction site, provision of condoms and monthly Educational Video presentation and discussions ;
- The contractor has to ensure that staff are made aware of the risks of contracting or spreading sexually transmitted diseases;

Ground and surface water quality

In the short term, surface and ground water may be impacted by construction activities, such as the contamination from fuels, cement, oils and other liquid waste. A potential impact on water quality may also arise from the risk of soil erosion and poor surface drainage management during the construction phase. Any surface water contamination may enter the area drainage water resources and negatively impact on the aquatic ecology of the system. Good environmental management practices must be followed to prevent potential contamination of the water resources.

Table 24: Impacts Associated with ground and surface water quality

Environmental and Social Issue	**Ground and surface water quality**	
Project Phase	**Construction**	
Impact	**Pollution of ground and surface water**	**Health**
Nature	Negative (direct)	Negative (indirect)
Extent	Local	Local
Duration	Short Term	Medium Term
Probability	Likely	Unlikely
Degree to which impact cannot be reversed	Low	Medium
Degree to which Impact may cause irreplaceable loss of resources.	Low	Low
Significance Pre Mitigation	Low (-ve)	Low (-ve)
Significance Post Mitigation	Low (-ve)	Low (-ve)
Degree of Mitigation	Easily Mitigated	Moderately Mitigated

Mitigation measures

The following measures should be adhered to in order to limit the impact of the construction phase on the quality of water in the area:

- No mixing of concrete to occur on bare ground. Concrete mixing should be done on bunded surface to avoid soil pollution and contaminating the ground and surface water;
- Appropriate containment structures should be provided to store contaminated water from the construction site. The contractor should ensure these waters are properly disposed and not allowed to be drained on site;
- No concrete batching to occur directly on the ground. Concrete batching area should be bunded to prevent contamination of soils and surface water features;
- All fuel storage to be appropriately bunded and provided with a canopy ;
- Project site should have drip trays to contain any potential leakages of fuels and oils;
- Ablutions for construction workers to enable proper disposal of faecal matter and avoid contamination of surface water features which could be a cause of waterborne diseases.

Loss of biodiversity

The site has already undergone transformation from its perceived natural state. With regards to flora, there are no known red data species or significant indigenous vegetation on-site or within the project area, however when clearing commences these may be revealed. The site is currently green though with human interference as evident by the waste dumped on the site thus very minimal impacts on biodiversity as a result of the current undertaking are envisaged. The only areas of concern with regards to biodiversity are the shrub and grass vegetation on the site. The vegetation within and around project area is important in anchoring the soils and soil erosion prevention.

Table 25: Impacts surrounding loss of biodiversity

Environmental and Social Issue	**Biodiversity**	
Project Phase	**Construction**	
Impact	**Loss of ecological services/ disturbance to local fauna**	**Loss of ecological benefits**
Nature	Negative (direct)	Negative (direct)
Extent	Site	Site
Duration	Medium Term	Medium Term
Probability	Likely	Likely
Degree to which impact cannot be reversed	Not Replaceable	Not Replaceable
Degree to which Impact may cause irreplaceable loss of resources.	Low (-ve)	Medium (-ve)
Significance Pre Mitigation	Low (-ve)	Medium (-ve)
Significance Post Mitigation	Low (-ve)	Low (-ve)

Degree of Mitigation	Moderately Mitigated	Not Easily Mitigated

Mitigation measures:

- Modifications to the design of the development to ensure spaces are left to allow for regeneration of vegetation;
- Post project restoration of loss habitat through vegetation of affected areas
- Compensation by the relocation of important grassland habitats from the development site to another area identified as suitable.

Extraction of natural resources

Materials for construction such as sand, aggregated material and other natural recourses to be used by the contractor will be transported from the source to site. Movement of this material could have an impact on the environment and settlements. How and where the material is sourced from is also a key determinant on the magnitude of the impact these activity may cause.

Table 26: Impacts associated with natural resource extraction

Environmental and Social Issue	**Natural resources extraction**	
Project Phase	**Construction**	
Impact	**Environmental degradation**	**Economic benefits**
Nature	Negative (direct)	Positive (direct)
Extent	Region	Region
Duration	Short term	Medium Term
Probability	Likely	Likely
Degree to which impact cannot be reversed	High	Low
Degree to which Impact may cause irreplaceable loss of resources.	High (-ve)	Low (-ve)
Significance Pre Mitigation	High (-ve)	High (+ve)
Significance Post Mitigation	High (+ve)	High (+ve)
Degree of Mitigation	Easily Mitigated	Easily Mitigated

Mitigation measures:

To minimise impact of material and waste disposal during the delivery on site the following mitigation measure have been proposed:

- Strictly source material from NEMA authorised dealers of sources
- Avoid overloading trucks and cover trucks to minimize dust and loss of load from trucks during transportation;
- For aggregate and sand, use water sprays or covered chutes to reduce dust emission during loading and unloading of materials from barges;
- Maintain mixing plants in good working condition so as to reduce emission from the plant;

- As far as possible, plan truck trips to material source and to the sites during low traffic hours; and
- Implement safety procedures to reduce the potential for road accidents in village or urban areas.

For the following probable impacts the preliminary analysis was carried out and mitigation measures presented in the sections below.

Security

Security is a prerequisite for any development. During construction, security is very important on the site. This will ensure that materials are in order and minima cases of material loss are reported on the site. It would also control movement within the site especially for the intruders who might be injured by the materials and other hazardous features available within the site.

The project area is well covered with communication facilities, which facilitate security to large extent. After the project is over, security guards and facilities should be provided. The issue has been catered for in the drawings.

Mitigation Measures

- Security guards must always guard the gate to the construction site to keep away the intruders and to control movement within the site;
- Lighting as well as security alarms should be installed in strategic positions all over the site during construction and after the completion of the project;
- The Contractor should provide adequate security during the construction period when there are no works on the site.
- The guards stationed at the gate should document movements in and out of the construction site.

Oil Leaks and Spills

It is important to note that oil/grease spills are prevalent in construction sites and in most areas that make use of petroleum products. Such products contain detrimental elements to the environment. Though this may not be common at the site, it is wise to control and observe the little that could occur especially during maintenance of the involved machinery. During construction phase, some of the site's construction equipment will require diesel and/or oil. There is therefore the risk of leaks or spills and the potential for contaminating the site's soil.

Mitigation measures

- All machinery must be keenly observed not to leak oils on the ground. This can be affected through regular maintenance of the machinery.
- Maintenance must be carried out in a designated area (protected service bays) and where oils are completely restrained from reaching the ground. Such areas should be covered to avoid storm from carrying away oils into the soil or water systems. Waste water/ wash water from these areas should be properly disposed.

- All oil products and materials should be stored in site stores or in the contractor's yard. They should be handled appropriately to avoid spills and leaks.

- Car wash areas and other places handling oil activities within the site must be well managed and the drains from these areas controlled. Oil interceptors must be installed along the drainage channels leading from such areas.

- Regular maintenance of equipment and machinery should be carried out to ensure any leakages are detected and controlled; and

- Train personnel on the risks of oil spills and leakages.

7.6 Operation Phases Impacts Discussion

To minimize on-going impacts after construction is completed, the Contractor will be responsible for the proper decommissioning of the temporary construction sites.

Suggested mitigation measures to achieve this objective are:

- Rake or loosen all compacted ground surfaces.
- Implement re-vegetation / rehabilitation of the sites involving, where possible, local women's / community groups.

7.6.1 Positive impacts during operation

Employment Opportunities

Operation of the development is expected to provide direct and indirect employment opportunities to the local community, such as security guards, housekeepers, drivers, shopkeepers.

Mitigation measures include:

- Priority should be given to the local community during employment;
- Gender equity to be considered during the recruitment of worker so as achieve a balance and comply with Gender Policy
- Ensure compliance with the Employment Act, 2007 and Regulation of Wages (General) (Amendment)order, 2009

Development of infrastructure social amenities

The proposed Ranam Investment residential development will result in development of learning institutions-Kindergarten and other social amenities in the area including the upgrade of the access road, setting up of the KPLC power transformer etc to support the expected population that will be occupying the area.

Increase and improved housing facilities

The housing apartment's development will provide better affordable housing unit. This will aid in reducing the deficit in the number of housing units required as compared to the population and better housing demand. It will therefore provide quality housing which improves the lifestyle of the people who will occupy them.

7.6.2 Negative impacts during operation

Solid Wastes

When all the structures are operational and occupied, it is expected that solid wastes will be generated in large volumes. These will be primarily household waste from the kitchens and sanitary facilities. Removal and disposal of house refuse comes under public cleaning and is very important and costly item on the Sub-county budget. If it is not removed promptly away from the generation points (within the apartments), it accumulates in large heaps harbouring rats, flies and vermin which disseminate germs of disease. A good deal depends upon the mutual cooperation between the local authorities and the public. Proper maintenance and use of dustbins is the key to the satisfactory solution of the problem of sanitary storage and collection of refuse without causing nuisance.
The problem of dealing with house refuse resolves itself into four parts: storage, collection, transportation and disposal. Therefore bins come in handy during storage and collection; both in the house and on foot paths of the streets for the throwing of whatever rubbish such as paper wrappings, cigarette ends etc., into them instead of scattering them all over. Transportation of the collected waste need be simplified and finally, the use of sound method of waste disposal. The proponent shall provide for dustbin cubicle at the project site as given in the project designs yet to be approved by Westlands Sub-county

Mitigation measures include:

- Prudent use of materials to reduce solid waste volumes;
- Waste separation to encourage reuse and recycling e.g. plastic and glass bottle;
- Domestic refuse should be collected and removed from all facilities at least twice per week and transported to the approved refuse disposal site in covered containers or trucks;
- Provision of waste collecting bins to households which will then be collected for proper disposal by a NEMA licenced waste handler.

Wastewater/ Liquid wastes

The quantity of liquid waste expected as output from the development is enormous. The area where the proposed estate will be developed has NAIROBI WATER AND SEWERAGE COMPANY (NAWASCO) sewer line as waste water disposal infrastructure. The proponent should seek approval and connect to the sewer line.
Sewage is the used water or liquid waste of a community, which includes human and household wastes together with street-washings, industrial wastes such as ground and storm-water as may be mixed with it. Effluent/sewage resulting from sanitary facilities and wastewater from washrooms is of significant importance to the environment. It must never come into contact with the surrounding i.e. water, soil, air etc. It must always drain effectively into the existing sewer systems via well designed and laid pipe networks. Sound sanitation should be ensured to influence prevention of the sporadic outbreak of diseases dangerous for the general health of the community (within the projected area), workers and the general public. Either controlling or eliminating such environmental factors that contribute in some form or the other to the transmission of the diseases can achieve this.

Mitigation Measures

- The proponent must connect the sewerage effluent to the NAWASCO sewer. The design of the sewer system should consider the estimate discharges from

individual sources and the cumulative discharge of the entire project i.e. it must have the capacity to consistently handle the loads even during peak volumes.

- The system (sewer) line connection should be made of hard, strong, durable, smooth, impervious, and non-corrodible materials. The sewerage lines require to be upgraded in order to adequately service the increased levels of sewage discharge due to rising levels of development;

- Sanitary facilities must be kept clean always;

- The gradient should be sufficient to ensure and maintain maximum depth of flow;

- The trunk sewer must be regularly monitored to avoid overfilling and overflowing. They must be checked regularly to monitor levels of effluent;

- Branches should be streamlined in the direction of flow and there should be no right-angled junctions that would affect the flow of the effluent;

- All drain pipes passing under building, driveway or parking should be of heavy duty PVC pipe tube encased in 150mm concrete surround;

- All manholes on drive ways and parking areas must have heavy-duty covers set and double sealed airtight; as approved by specialists.

Fire safety

Fire risk is expected to occur during operation of the project through electrical fault caused by power upsurges and accidents occurring mainly from the kitchens. The proponent and residents will not burn waste on site. However, electrical faults during electrical installations and due to power brown outs may cause risk of fire. Safety measures should therefore be applied to control and prevent fire risks.

Mitigation measures

- Place portable fire extinguishers at suitable locations where they could be easily accessed and visible from a distance;
- Induct all the occupants on the fire safety procedures and the use of fire fighting equipment such as fire extinguishers;
- Burning of waste within the estate should be prohibited as this could cause fire in cases where the fire is left to burn without monitoring;
- Electrical faulty equipment should be repaired or not put to use. This IS to eliminate the risk of fire caused by electrical fault;
- Electrical wires and socket which are broken or open should be repaired immediately by qualified electrician;
- Allocate a fire assembly point in an open and isolated space within the project area. The fire assembly point should not be obstructed;
- Ensure safety warnings are prominently displayed at appropriate locations;

Increased pressure on existing utilities

The proposed Ranam Investment residential development will result to increased pressure on existing utilities such as roads and service lines such as sewerage, water, electricity etc. due to the increased number of people who will be using these facilities.

Mitigation measures include:

- Installation of solar panels on each structure to provide alternative source of power for household use;
- Install water automatic taps that have the capacity to enhance water saving.

7.7 Decommissioning Phases Impacts Discussion

Environmental Emergency and Response

In the event of an environmental emergency during the decommissioning activity, the proponent should establish a procedure for handling the emergency. For example, if a spill of fluid occurred during project decommissioning, the proponent should be able to activate the emergency response protocol, which should include spill response, contingency and urgency communications.

Fire hazards and Management

The proponent should implement the fire procedures, assignment and guidance information on the project site to help in the prevention and management of fire. This will help highlight fire hazards, precautions and suppression facilities necessary to prevent fires from occurring or spreading to prevent loss of life, serious injuries and damage to plant, equipment and structures. The same should also provide the authority and channel of command in the event of fire.

Recycling and Reuse

During decommissioning, there is need to identify the materials that will be of economic value if reused or can be recycled for use gain. In this regard, there is need to identify suitable recycling and disposal options for the equipment and materials that are dismantled, in line with best management principles of the waste hierarchy. Recycling and reuse of materials is to be maximized to the greatest extent possible, subject to safety and pollution considerations. Where practicable, and subject to considerations about safety and pollution, provide local people with first choice concerning acquisition of recyclables or reusable infrastructure.

Reinstatement and Rehabilitation

After demolition of the building and associated infrastructure, remove access roads with no beneficial re-use potential by deep ripping, shaping and levelling after the removal and disposal of any culverts, drains, ditches and/or other infrastructure. Natural drainage patterns should be reinstated as closely as possible. Also shape, level and de-compact the final landscape, dress with topsoil and, where necessary, vegetate with indigenous species. Ecology specialists to assist in planning re-vegetation and the management of environmental impact as appropriate and when deemed necessary.

7.7.1 Positive impacts during decommissioning

Rehabilitation of the site

Upon decommissioning of the residential development, the site will be rehabilitated and reinstated to its original quality or even better than before. This will include replacement of topsoil and re-vegetation of the site, which will lead to improved visual quality of the area.

Employment opportunities

The decommissioning process will be need of both skilled and semi-skilled labour. The required labour can easily be sourced locally. This will help in reducing social vulnerability and increase household income. However, the job will be short term will the workers soon thereafter being unemployed. It is therefore concluded that the provision of employment opportunities during decommissioning shall therefore provide a positive socio-economic impact but on a short term basis.

Informal Business Growth

During decommissioning period the informal sector will benefit from the operations. This will involve different local entrepreneurs such as local food vending operators who will be selling their food stuffs to the site workers. Such a move for instance, shall promote these local entrepreneurs in the project area.

7.7.2 Negative impacts during decommissioning

Noise and vibration

Demolition of structures and removal of the supporting facilities such as water and electricity lines will involve the use of heavy machinery which will generate noise and excess vibration which will impact on the surrounding activities. The excessive noise and vibrations impact receptors will be general and casual workers on site, adjacent property personnel. The decommissioning process is a temporary nature and it is anticipated that the noise generated will be short lived. However, the proponent is advised to undertake a combination of the following mitigation measures so as to reduce the residual impacts.

Mitigation measure will include:

- Scheduling all the decommissioning works within the normal working hours of between 8am and 5pm;
- Provision of screening around the site when the demotion works is on-going to reduces the impact of noise by cordoning the area;
- Adherence to the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.

Air pollution

Dust generated from the demolition of the concrete structure, excavation works and rehabilitation of the area will pollute the air within and around the project area. Increase in particulates in the air will pose a respiratory health risk to the surrounding community near the project as well as other sensitive receptors located within.

Mitigation measures include:

- Water spraying to suppress dust especially where dust activities are taking place;

- Cordoning the site using meshed cloth to capture particulates during demolition of the structures;
- Providing workers involved with appropriate protective personal equipment such as dust masks or respirators;

Solid Waste

Demolition activities will lead to solid waste generation mainly from building materials used and other materials used in finishing, cement blocks, steel, power and water connection as well as other building materials removed from the foundations. Plastic and metal materials, concrete surfaces and foundations, metal cuttings, reinforcing bars and piping materials all need to be removed. Other waste types will be composed of degradable and non-toxic wastes generated from food wastes, office papers, cardboard and used timber remain. These types of waste need to be adequately separated and appropriate transportation to approved dumping site be undertaken in compliant to EMCA 1999 (Waste Management) Regulation, 2024.

All options will be considered in avoiding or minimizing transporting any unsuitable excavated materials from site, as this is undesirable from both an ecological and economic perspective. Where practicable, materials should be reused or recycled appropriately before being re used. Excess materials generated at the facility are also required to be tested for potential environmental concerns. The test will allow for proper classification and characterization of excess materials. The results of the test help determine if excess materials can be reused onsite or if they are considered waste. If it is deemed acceptable for reuse onsite, the excess materials may be reused during site reclamation landscaping or visual and sound barrier purposes or it will be shipped offsite to an approved facility. If determined to be waste, the excess materials will be managed in accordance with set waste management requirements on site.

In order to minimise the impacts due to the generation of solid wastes during decommissioning process the following measures will be adopted.

Mitigation Measures:

- The contractor shall put in place a waste management plan aimed at minimising the production of all wastes and maximize on resource recovery;
- Where possible measures will be put in place to recycle materials such as metal off-cuts, some plastics and clean paper/ cardboard utilising existing specialist recycling firms in Kenya;
- A suitable location within site for placing concrete and foundations removal and washing down equipment will be undertaken with no discernable impact;
- Other non-recyclable materials should be segregated and stored in plastic bins, collected and disposed of through the municipal waste system;
- Disposal bins should be provided at designated areas at the project site to help in waste segregation to encourage recycling;
- Prepare a contaminated land assessment which identifies all areas of contaminated land, the nature of the contamination and the necessary measures to contain and rehabilitate these sites;
- Enforce regular collection and disposal of garbage by the project contractor through licensed NEMA waste handler in the entire decommissioning process;
- Prepare an inventory of all hazardous materials and wastes to be disposed of and specify the method of disposal in accordance with the MSDS and current NEMA‘s legislation;

- Remove and dispose of all demolition waste at an appropriate authorized waste disposal facility;
- Remove and dispose of all litter, parts and equipment at an approved disposal site;
- Disassemble and remove all machinery from the site.

7.8 Proposed Traffic Management Plan for the William Omondi Muthama Residential Apartments in Westland

The Traffic Management Plan (TMP) is developed to ensure that the construction of the proposed residential apartments in Westland, Nairobi, proceeds without causing undue disruption to the local traffic flow, road safety, and public convenience. The project is located on Plot L.R. No. 7/430 along General Mathenge road, and the TMP is designed to support the efficient management of traffic, including the movement of construction vehicles, workers, and materials, while prioritizing safety for pedestrians, cyclists, and other road users. This proposed plan adheres to local regulations and best practices, considering both the short-term impacts during construction and the long-term traffic implications once the project is complete.

Key Considerations:

- Compliance with local and national traffic regulations.
- Communication and coordination with local authorities, stakeholders, and the community.
- Minimizing disruption to surrounding residential, commercial, and public areas.
- Develop and implement a traffic management plan; and adhere to the Traffic Act/ Rules;
- Speed bumps and limit should be set at 5 KMs per hour and signs put up to that effect; and
- Premises should have provisions for first aid facilities.

a. Construction Traffic Flow Management

The movement of construction vehicles is expected to be substantial during the construction phase. Proper traffic flow management is essential to minimize congestion and disruptions to the surrounding areas.

Actions to Implement:

- Construction vehicles to use General Mathenge road and other major roads for access. Routes through residential streets will be avoided. A detailed route map will be shared with all contractors and drivers.
- Construction vehicle movement to be restricted to off-peak hours (e.g., 9:00 AM – 3:00 PM) to avoid interference with rush-hour traffic and to minimize congestion.
- Trained marshals to be stationed at key intersections and the site's entry and exit points to manage the movement of vehicles and minimize delays.
- Designated loading and unloading zones to be established on-site to prevent trucks from blocking roads or causing disruptions. These zones will be marked and accessible at all times.

b. Site Access and Egress

To ensure safe and efficient entry and exit for construction vehicles, clear and controlled access points will be established. Managing access and egress effectively is critical for maintaining safe traffic flow around the construction site.

Actions to Implement:

- The main construction access to be through Likoni Lane, with a secondary emergency access point for use by emergency vehicles only. Proper signage will be installed to direct vehicles to these points.
- In the case of roadworks or temporary disruptions, traffic diversions to be implemented, with clear, advance notice to the public. Detour routes will be clearly marked, and appropriate signage will be installed.
- Entry and exit points to be controlled via gates, ensuring that vehicles are monitored and that no unauthorized access occurs.

c. Construction Vehicle Parking Management

Efficient management of parking for construction vehicles is necessary to ensure that they do not cause congestion or block traffic flow during the construction phase.

Actions to Implement:

- A dedicated parking area for construction vehicles to be established within the site to prevent vehicles from parking on surrounding roads. This will help minimize the impact on local traffic flow and reduce the likelihood of congestion.
- If on-site parking is insufficient, arrangements for off-site parking to be made in nearby areas, with shuttle services to transport workers to and from the site.
- To reduce the number of vehicles on-site at any given time, workers to be assigned to staggered shifts. This will minimize vehicle congestion within and around the construction site.

d. Pedestrian and Bicycle Safety

The construction site is situated in a densely populated urban area, with high foot and bicycle traffic. It is essential to ensure the safety of pedestrians and cyclists during construction activities.

Actions to Implement:

- Temporary, clearly marked pedestrian walkways to be set up along the construction site to keep pedestrians safe and separate from the construction area. These walkways will be wide enough to accommodate pedestrian traffic and equipped with proper lighting.
- If the site affects existing bicycle lanes, temporary rerouting to be arranged to keep cyclists safe and moving freely. Signage will direct cyclists to alternate routes.
- Proper crosswalks to be installed at key intersections near the construction site, and traffic signals will be adapted as necessary to maintain pedestrian and cyclist safety.

e. Traffic Signage and Communication

Clear communication and signage are essential for directing traffic and ensuring that road users are aware of any changes, disruptions, or hazards related to the construction.

Actions to Implement:

- A comprehensive set of temporary road signs to be installed to indicate detours, construction zones, reduced speed limits, and other critical information. Signs will be placed in advance of the site to allow road users to adjust their routes.
- Regular updates to be provided to the public through local media, social media platforms, and physical notices in the area to inform the public of construction activities and any road changes.
- Trained traffic marshals and flaggers to be stationed at critical junctions to guide vehicles and pedestrians through the construction zone. They will help manage traffic flow and ensure that safety measures are followed.

f. Waste Disposal and Traffic Flow

Managing construction waste disposal without disrupting traffic flow is critical. Efficient waste removal strategies will be implemented to keep the surrounding roads clear and minimize delays.

Actions to Implement:

- Construction waste to be removed during off-peak hours, ideally early mornings or late evenings, to prevent traffic congestion during peak hours.
- Waste removal vehicles to use designated routes to transport debris to approved disposal sites. These routes will be planned to avoid heavily trafficked areas and residential zones.
- Construction practices to prioritize waste minimization and recycling. Recyclable materials will be sorted and processed on-site to reduce the amount of waste that needs to be transported.

g. Emergency Response and Incident Management

In the event of an accident, breakdown, or other emergency, immediate and effective response protocols are crucial to maintaining public safety and minimizing disruptions.

Actions to Implement:

- Emergency access routes to be maintained at all times to ensure that emergency vehicles can access the construction site and nearby areas without obstruction.
- A dedicated incident response team to be on standby to manage traffic-related emergencies, including accidents or vehicle breakdowns. The team will work closely with local authorities to minimize traffic disruptions.
- Essential emergency equipment, such as traffic cones, barricades, and first aid kits, will be available on-site to manage incidents effectively.

h. Post-Construction Traffic Management

Once construction is completed, traffic patterns in the area will likely change, with an increased number of residents, visitors, and delivery vehicles. Managing these changes effectively will be essential to avoid congestion.

Actions to Implement:

- A traffic flow analysis to be conducted after construction to evaluate the impact of the new development on local traffic and identify areas for improvement.
- Adequate parking to be provided within the site for residents and visitors. Traffic flow on-site will be monitored, and adjustments will be made to improve the movement of vehicles.

- After construction, continuous coordination with local authorities will ensure that any traffic issues that arise are quickly addressed. Regular maintenance and monitoring of road infrastructure will be carried out to accommodate increased traffic volumes.

Table 27: Traffic Management Plan: Key Actions and Responsible Persons

S/N	Key Action	Responsible Person/Entity
1.	Designated Routes and Site Access Management	Construction Manager, Traffic Control Officer, Site Foreman
2.	Traffic Timing and Temporary Diversions	Site Supervisor, Traffic Engineer, Traffic Authorities
3.	Traffic Control Personnel and Road Signage	Traffic Marshals, Site Supervisor, Traffic Management Team
4.	Pedestrian and Bicycle Lane Protection	Site Safety Officer, Traffic Management Team
5.	Public Awareness and Notifications	Public Relations Officer, Community Liaison Officer
6.	On-Site Parking and Waste Management	Site Manager, Waste Management contractor
7.	Emergency Response and Coordination	Emergency Response Team, Traffic Police, Project Manager
8.	Post-Construction Traffic Flow and Parking Management	Traffic Engineer, Property Manager, Local Authorities

7.9 Environmental Impacts Analysis: Leopold Matrix (LM) Analysis.

7.9.1 Matrix Rationale

In the matrix, the rows cover the key aspects of the environment and society, while the columns list the project‘s activities during all stages of the project. Environmental factors must correspond to all those that can be affected by the development of the activity in the project area and the area of influence as shown in the table below. Each box of interaction must determine whether the action in question will have an impact on the environmental factor given. The second step in using the Leopold Matrix was to describe the interaction in terms of its magnitude (M) in the upper section and importance (I) in the lower section of each box. Rate it from 1 to 10, 1 being lowest and 10 being highest, with the number placed in each box identified above to indicate the magnitude of the specific action‘s impact on the environment. This number is to be placed in the upper left-hand corner. Using the same rating system, rating is made in the lower right hand corner of the defined boxes, representing the importance of the impact to the project.

7.9.2 Matrix Analysis

From the matrix of the environmental impact above it is evident that the envisaged impacts are minimal with a slight increase on their magnitude and significance during the project construction and decommissioning phase. The envisaged impacts magnitude

and significance are at the lowest during the project operational phase of the proposed residential development project.

Table 28: The Impact Analysis Leopold Matrix

PROJECT ACTIVITIES.

Ranam Investment Ltd	Project Activity.	Construction Phase.					Operation Phase.		Decommissioning Phase.			
	Resources.	Site Clearance.	Transport, Storage, Handling.	Excavation.	Metal & wood works.	Construction works.	Tenancy.	Waste management.	Demolition.	Debris Clearance.	Site Rehabilitation.	*Average Values.*
Physical Components.	Soil/ Geology	2 2	1 2	5 7	1 2	1 3	1 7	2 4 3 2	1 3	3 2	4 3	**2.3 3.3**
	Hydrology	3 .3	4 ..2	5 7	2 ..3	1 ..2	5 ..6	2 5 .5 ..7	3 ..6	1 ..3	2 2	**3 ..4.2**
	Air	2 3	1 ..1	3 3	0 .. 0	3 2	2 …3	1 1 2 1	4 .4	1 ..2	4 ..5	**2 .2.4**
	Noise & Vibrations	3 5	4 5	3 5	3 3	4	2	0 0	3	1	1	**2.2**
	Visual Impacts	0 0	0 0	2 2	0 0			*Corridors*	5 2 0	0		0 0
Biological Component	*Diversity of flora*	2 1	1 ….1	1 1	0 0	1 1	0 0	0 0 0 0	1 2 1	0 1 1	0 2 0	0 0
	Diversity of fauna	1 2	1 ..1	1 1	0 .0	0 0	0 .0	0 1 1 1	1 1 .0	0 1 .0	1 .1	0 0
	Barriers /	1	0	0	0							0

0 0

6 1 1 **3**

2 0 0 **0.9**
1 0 0 **0.7**

0.6
0.5
0.6
….0.7

0 0 0 **0.1** 105
0 0 0 **0.1**

Social Economic Components	**Population**	2 / 2	1 / 1	1 / 1	1 / 1	1 / 2	3 / 4	2 / ..2	2 / 1	2 / 2	1 / 1	1 / 2	**1.4 / 1.7**
	Site access	0 / 0	1 / ..1	1 / 1	1 / 1	1 / 2	1 / 1	1 / 1	0 / 0	1 / 2	1 / 1	2 / 2	**1.4 / 1.6**
	Economic Activities.	1 / .. 1	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	1 / 0	1 / 0	1 / 1	0 / 0	0 / 0	**0.4 / 0.2**
	Public health	1 / 1	2 / 1	1 / 1	2 / 1	2 / 2	1 / 1	2 / 3	3 / .2	1 / 1	1 / 1	0 / 0	**1.5 / 3**
	Culture	1 / 1	1 / 1	1 / 1	1 / 1	2 / 3	2 / 2	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	**0.7 / 0.8**
	Employment	0 / 0	0 / .. 0	0 / 0	0 / ..0	0 / 0	0 / ..0	0 / 0	0 / ...0	1 / ..1	0 / ..0	0 / .0	**0.1 / ..0.1**

Chapter EIGHT: CLIMATE CHANGE RISKS AND VULNERABILITY ASSESSMENT

8.1 Introduction

The assessment aims to enhance the climate resilience of the project by identifying and characterizing the climate-related risks that could affect the construction phase, the long-term operation, and the structural sustainability of the apartments. By adopting a structured risk management approach, this assessment seeks to inform decision-making, support adaptation planning, and ensure the project complies with the provisions of Kenya's Climate Change Act, 2016, and applicable best environmental and construction practices.

Climate change continues to accelerate at an alarming rate. According to recent global observations, the Earth's average surface temperature has increased by approximately 1.1 °C since the late 19th century. The last decade (2011–2020) was the warmest on record, with 2023 recorded as one of the hottest years ever. Sea levels have risen by about 20 centimeters since 1900, and the rate of rise has nearly tripled over the last 30 years. Extreme weather events, such as heat-waves, floods, and wildfires, have become more frequent and intense, with over 3.6 billion people living in areas highly vulnerable to climate change impacts (as of 2022).

In urban areas, rapid construction activities, the replacement of natural vegetation with hard surfaces, and the concentration of buildings contribute to the Urban Heat Island (UHI) effect, where cities experience significantly higher temperatures than surrounding rural areas. This localized warming intensifies energy demands, strains water resources, and increases health risks, further compounding the broader effects of global climate change.

Scope of the Assessment

The assessment in this report covers:

- Identification of relevant climate hazards affecting the Westland area under both current and future climate scenarios.
- Evaluation of the vulnerability of the construction process, materials, infrastructure, and operations to these climate hazards.
- Assessment of the significance of identified risks in relation to the project's objectives.
- Development of potential climate adaptation measures aimed at minimizing climate-related vulnerabilities.
- Re-evaluation of residual risks after the incorporation of proposed adaptation measures.

The climate hazards considered include rising temperatures, altered rainfall patterns, increased frequency of intense storm events, potential flooding, and prolonged drought conditions, all of which can affect construction timelines, material integrity, and the safety of workers and occupants.

Importance of Assessing Climate Risks in the Westlands Region

Westlands areas, being highly urbanized and rapidly developing, are particularly sensitive to the effects of climate change. The importance of this assessment is underscored by several key factors:

- With reduced green cover and increasing built-up surfaces, the area is vulnerable to higher ambient temperatures, which could impact worker health and building energy demands.
- Changes in rainfall intensity and patterns increase the likelihood of urban flooding, potentially damaging the foundation works and causing delays during construction.
- Fluctuating rainfall and increased urban demand can lead to water shortages, affecting construction activities that depend heavily on water resources.
- More frequent extreme weather events such as storms can lead to physical damage to structures during and after construction, requiring that buildings be designed to withstand such forces.
- Increased vulnerability of surrounding communities and urban ecosystems can indirectly affect the project`s operational stability and social license to operate.

8.2 Overview of Climate Change in Westlands Area

8.2.1 Historical Climate Data for Westlands

Westland area, located in Nairobi County, lies within a tropical highland climate zone characterized historically by moderate temperatures and bimodal rainfall. Historically, average daytime temperatures ranged between 20°C to 26°C**,** with cooler nights. Rainfall patterns followed two primary rainy seasons: March–May (long rains) and October– December (short rains)**.** However, over the past few decades, shifts in rainfall timing, duration, and intensity have been observed, with increasingly unpredictable patterns becoming common.

8.2.2 Current Climate Trends and Patterns

Recent meteorological records show increasing average temperatures across Nairobi County, including Parklands. The Nairobi region has experienced a gradual warming trend of approximately 0.3°C to 0.5°C per decade since the 1980s. In Westlands, rapid urbanization, increased impervious surface coverage, and vegetation loss have contributed to urban heat island effects, leading to locally elevated temperatures compared to adjacent vegetated areas. Rainfall variability has also increased, with a rise in the frequency of short, high- intensity storms leading to localized flooding, overwhelmed drainage infrastructure, and erosion in some areas.

8.2.3 Projected Climate Change Scenarios for Westlands

Climate models project that the Nairobi region, including Westlands will experience further warming over the next 30 to 50 years. Average temperatures are expected to rise by 1.5°C to 2.5°C by mid-century under moderate emission scenarios. Rainfall projections suggest continued unpredictability, with a likelihood of more intense rainfall events within shorter periods, increasing risks of surface runoff and flash floods in urbanized zones. Additionally, prolonged dry spells may increase, placing pressure on water resources, energy systems,

and vegetation health. These changes will affect construction timelines, infrastructure integrity, and operational resilience of developments in the area.

8.3 Climate Change Risks Identified for the Apartment Construction

The proposed residential apartment development in Westlands faces several climate-related risks that may affect its design, construction, operational efficiency, and long-term sustainability. Climate risk assessment helps to anticipate these hazards and incorporate adaptive measures to enhance project resilience. The key climate change risks identified for the project are outlined below:

8.3.1 Rising Temperatures and Heat Waves

With projected increases in average temperatures and more frequent heatwave events, the apartment construction may be exposed to thermal stress, affecting both construction workers and building materials. High ambient temperatures can reduce the efficiency of labour, compromise curing of concrete, and increase cooling demands in finished structures. Moreover, prolonged heat events can stress local energy infrastructure due to higher demand for air conditioning.

8.3.2 Intense Rainfall and Flooding Risks

The increasing intensity and unpredictability of rainfall events elevate the risk of surface water flooding, particularly in urbanized areas with inadequate drainage systems. Westlands, already experiencing seasonal flash floods, may pose a challenge to excavation works, foundation integrity, and general site safety. Floodwaters can also disrupt supply chains, damage partially completed structures, and cause delays in construction timelines.

8.3.3 Drought and Water Scarcity

Longer dry periods and reduced reliability of rainfall may lead to water scarcity, particularly affecting construction processes that rely on consistent water supply for curing, cleaning, and dust suppression. Post-construction, the residential apartments may also face water supply pressures, impacting occupant welfare and increasing dependence on water-efficient appliances and rainwater harvesting systems.

8.3.4 Increased Frequency of Storms and Wind Events

While severe storms are less frequent in Nairobi than in coastal regions, climate projections suggest a potential increase in wind gust events during shifting weather patterns. Strong winds during construction can pose hazards to scaffolding, cranes, and workers. In the long term, design elements such as roofing, windows, and external finishes must account for potential wind-loading and weatherproofing needs.

8.3.5 Impact of Climate Change on Urban Heat Island Effect

Urban heat island (UHI) effects are intensified by the increase in impervious surfaces such as rooftops, pavements, and roads, which absorb and retain heat. Construction of the apartment complex contributes to this effect unless mitigated. Elevated temperatures within the urban environment can lead to higher cooling costs, reduced comfort for residents, and increased stress on local energy systems. Integration of green spaces, reflective roofing, and passive cooling strategies can help counteract UHI impacts.

8.4 Vulnerability of the Proposed Construction Site

A critical aspect of climate risk assessment is understanding the site-specific vulnerabilities that may exacerbate climate-related impacts. The proposed residential apartment site Westlands presents several physical, infrastructural, and social vulnerabilities, which must be addressed to ensure resilient development.

8.4.1 Topography and Drainage Systems

The Westlands area is characterized by gently sloping terrain with pockets of poorly maintained or undersized stormwater infrastructure. The site‘s topography, if not properly graded or planned during excavations phase, can lead to surface runoff accumulation, increasing the risk of local flooding during intense rainfall. Existing drainage systems may be insufficient to cope with projected rainfall volumes, posing a threat to both construction works and the long-term functionality of the development.

8.4.2 Infrastructure and Building Materials Vulnerability

The construction process and final structure are both vulnerable to climate extremes if materials are not carefully selected. Unprotected steel, untreated timber, or low-grade concrete may degrade rapidly under intense weather conditions. Improper sealing or weatherproofing can lead to moisture ingress, affecting insulation, electrical systems, and occupant health. Construction timing also becomes critical, with certain materials and processes more sensitive to extreme heat or moisture.

8.4.3 Social Vulnerabilities (Local Communities and Occupants)

The social vulnerability of both the surrounding communities and future apartment residents must be considered. Limited access to alternative water sources, exposure to heat stress, and increased energy bills due to cooling needs can disproportionately affect low-income residents. Additionally, temporary displacement or disruptions caused by construction or flooding events can strain local infrastructure and services. Prioritizing inclusive planning, community engagement, and equitable access to green and resilient infrastructure is key to reducing these vulnerabilities.

8.5 Climate Change Risk Assessment and Mitigation Overview

This section presents a summary of the key climate-related risks likely to affect the proposed apartment project in Westland. Each risk is evaluated based on its potential impact without mitigation, and appropriate strategies are recommended to reduce the severity of those impacts.

The Impact Rating System used is as follows:

- **High**: Severe or immediate impact on the project without intervention.
- **Moderate**: Manageable impact with proper mitigation.
- **Low**: Minor impact requiring minimal adjustments.

Impact Rating Definitions**:**

- **High**: Immediate or severe impact on the project without mitigation.
- **Moderate**: Significant impact but manageable with proper mitigation measures.
- **Low**: Minimal impact that may require minor adjustments

The table below outlines the climate risks, proposed mitigation measures (in bullet points), and the expected change in severity after applying mitigation strategies. This helps guide climate-resilient planning and ongoing risk management.

Climate Change Impacts, Mitigation Measures, and Risk Management Strategies for the Proposed Apartment Development

Focus Area	Impact Description	Mitigation Measures (Point Form)	Impact Rating (Pre-Mitigation)	Impact Severity (Post-Mitigation)
Impact of Climate Change on Project Design and Construction				
Effects on Construction Materials and Techniques	High temperatures, rainfall, and humidity degrade materials.	- Use weather-resistant materials (e.g., treated timber, reinforced concrete) - Apply corrosion-resistant coatings on steel - Avoid scheduling works around weather extremes - Use of high-durability materials such as UV-resistant polymers - Implement construction techniques that allow materials to breathe (e.g., ventilated facades)	High	Moderate
Adjustments to Building Design for Climate Resilience	Climate extremes affect structure and comfort.	- Incorporate passive ventilation and shading - Elevate buildings to reduce flood risks - Use reinforced foundations - Utilize thermal mass in design - Reinforced foundation designs for wind and seismic resilience	High	Low
Energy Efficiency and Sustainability Measures	Urban warming increases energy demand.	- Install energy-efficient HVAC systems - Use double-glazed windows and insulation - Implement smart energy systems - Apply reflective roofing materials - Use LED lighting	Moderate	Low
Impact on	Extreme weather causes	- Allow flexible timelines with	High	Moderate

Focus Area	Impact Description	Mitigation Measures (Point Form)	Impact Rating (Pre-Mitigation)	Impact Severity (Post-Mitigation)
Construction Timeline and Costs	delays and cost hikes.	buffers - Set aside contingency budgets - Apply modular and prefabricated construction - Monitor weather forecasts and plan accordingly		
Adaptation and Mitigation Measures				
Climate-Resilient Design Strategies	Risk of structural vulnerability.	- Apply climate-resilient architectural designs - Use renewable energy sources - Elevate structures and waterproof foundations - Use water-resistant finishes - Include rain-screen cladding	High	Low
Stormwater Management Solutions	Risk of site flooding due to intense rainfall.	- Install permeable paving - Construct rainwater harvesting systems - Develop detention basins and underground tanks - Oversize and maintain drainage infrastructure - Install vegetative swales and filters	High	Moderate
Renewable Energy Integration	Reliance on unsustainable grid energy.	- Install rooftop solar panels - Implement solar water heaters - Use battery storage systems - Employ energy-efficient appliances and lighting - Explore wind and hybrid systems	Moderate	Low
Sustainable Landscaping and Urban Greening	Urban heat island effect and loss of cooling.	- Plant native trees and shrubs - Develop green roofs and walls - Preserve open green spaces - Limit paved surfaces - Design green corridors for	Moderate	Low

Focus Area	Impact Description	Mitigation Measures (Point Form)	Impact Rating (Pre-Mitigation)	Impact Severity (Post-Mitigation)
		biodiversity		
Urban Greening Reduction	Loss of vegetation exacerbates heat and reduces air quality.	- Preserve and enhance existing green spaces - Allocate at least 10–15% of the plot to landscaping - Integrate vertical gardens and green walls - Implement rooftop gardens - Encourage communal green areas for residents - Use permeable surfaces in parking areas	High	Low
Monitoring and Managing Climate Risks throughout the Project Lifecycle				
Ongoing Monitoring of Climate Risks	Future variability in climate.	- Set up weather and flood monitoring stations - Periodically update risk assessments - Engage local climate data providers - Conduct annual climate risk audits - Use GIS for hazard mapping	Moderate	Low
Adaptive Management Approaches	Static designs may fail over time.	- Build flexibility into infrastructure - Review designs based on	Moderate	Low

Focus Area	Impact Description	Mitigation Measures (Point Form)	Impact Rating (Pre-Mitigation)	Impact Severity (Post-Mitigation)
		observed changes - Train staff on adaptive systems - Allow space for retrofitting or expansion		
Climate Change Risk Management Framework	Need for systematic, integrated response.	- Adopt climate risk frameworks (per Climate Change Act, 2016) - Form project climate risk team - Integrate resilience into all project phases - Include periodic policy reviews	High	Moderate

Recommended Actions for Risk Mitigation and Adaptation:

To address these risks and enhance resilience, the following actions but not limited to are recommended:

- Incorporate climate-resilient design principles, including elevated foundations, heat-reflective materials, and proper insulation.
- Implement green infrastructure such as permeable pavements, rainwater harvesting systems, and bioswales for stormwater management.
- Preserve and integrate green spaces within the site plan to reduce urban warming and improve environmental quality.
- Adopt renewable energy sources and enhance building energy efficiency through passive design.
- Continuously monitor and manage the flood risk posed by Kirichwa River, including setback limits, reinforced drainage, and riverbank protection measures.
- Monitor climate risks continuously and update mitigation strategies as new data and climate patterns emerge.

CHAPTER NINE: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

9.1 Auditing the EMMP

The Environmental Management and Monitoring Plan (EMMP) is prepared to show how site-specific concerns and mitigation measures are addressed through the project cycle.

To ensure that the negative environmental impacts can be controlled and mitigated effectively, a stringent and scientific management and monitoring plan has been prepared. The proposed EMMP is to be utilized by the contractor together with the local administration and local community to be responsible for ensuring that the overall environmental and social targets are achieved, and that the environmental responsibilities and obligations of the EIA are satisfied during the life of the project. Annual audits should be conducted to ensure that the system for implementation of the EMMP is operating effectively.

The table below sets out the potential impacts associated with construction, along with the location of occurrence, management and mitigation measures and responsibility.

At completion of construction, the client will be responsible for implementation of the environmental management measures associated with operation of the development. This may be through an assigned Project Manager. If necessary, the client will be required to acquire technical assistance and training in environmental management practices, to strengthen its capabilities in this area.

The proponent shall organise to conduct annual audits to ensure that the system for implementation of the EMMP is operating effectively. The audit shall check that a procedure is in place to ensure that:

- The EMMP being used is the up-to-date;
- Variations to the EMMP and non-compliance as well as corrective action are documented;
- Appropriate environmental training of personnel is undertaken;
- Emergency procedures are in place and effectively communicated to personnel;
- A register of major incidents (spills, injuries, complaints, legal transgressions, spot fines and penalties etc..) is in place and other documentation related to the EMMP;
- Ensure that appropriate corrective and preventive action is taken during construction and operation once instructions have been issued.

Table 29: Environmental Management and Monitoring Plan (EMMP)

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
Pre-Construction Phase-1- (Site Office/ Camp)						
1.1	Vegetation clearing	• Incorporation of natural vegetation into site landscape design; • Vegetation clearing should be limited during this phase and only where the temporary structures are to be erected to facilitate the construction phase;	The Contractor	During Site preparation	Weekly	30,000.00
1.2	Fencing of the Site	• The proponent should fence the site before starting the ground breaking and other construction activities.	Contractor	During Site preparation	Weekly	100,000.00
Construction Phase-2						
1.3	Vegetation clearing	• Incorporation of natural vegetation into site landscape design. • Vegetation clearing should be limited during this phase and only where the temporary structures are to be erected.	The Contractor	During site pre-construction activities	Daily Weekly	100,000.00
1.4	Solid waste management	• Efficient use, re-use and re-cycling of materials to minimise on solid waste; • Good housekeeping to ensure no littering from packaging materials; • Segregation of waste before	The Contractor NEMA Westlands Sub-County	During the construction period	Continuous Continuous	200,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		appropriate disposal; • The contractor should provide disposal bin around the site for proper disposal of papers and plastics; • The contractor should prepare a waste management plan for management of solid waste management; • Disposal of solid waste that accumulate at the construction site should be properly disposed in NEMA licenced landfill in accordance with NEMA solid waste disposal regulations.				
1.5	Liquid waste	• Concrete batching and mixing should occur at one particular point and the site should be bunded or paved and drains provided to ensure polluted water is drained at a particular suitable point; • Contaminated water from construction works should be directed to a containment area where it could be reused at the construction site; • Portable toilets should be provide on-site so as to mitigate pollution of subsurface water in case where	The Contractor NEMA NAWASCO City County Government.	During the construction period	Daily Continuous	100,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		pit latrine are used				
1.6	Provision of market for building materials	• Construction contract should stipulate that the Contractor sources materials from an approved site and sources e.g. hard stones for building should be obtained from bona fide commercial quarries; • Adherence to the NEMA national sand harvesting guidelines by sand harvester supplying sand for building. This is to mitigate the degradation of riverbed and acceleration of erosion; • Quarry providing aggregates for construction should be licenced and in line with the various regulatory guidelines such as the Mining Act, EIA guidelines and local authority bylaws; • The Project Manager/ Contractor should ensure that source of timber used during construction should be obtained from approved sources; • Materials such as steel and cement should be accredited company with Kenya Bureau of Standards marks of highest quality. This is to ensure high building standards are	The Project Manager The Contractor	During the construction period	Weekly	150,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		upheld and not compromised by low quality materials.				
1.7	Creation of employment opportunities	• During employment of semi-skilled and unskilled labour, priority should be given to the local residents; • Gender equity should be considered when employing labours so as to ensure a balance between the two sexes is almost equal and there should be no bias towards the male; • Better remuneration for the employees in line with Employment Act 2007 and the Regulation of Wages (General) (Amendment) order, 2009.	The Contractor The Project Manager	During the construction period	Continuous	200,000.00
1.8	Noise and vibration pollution and visual intrusion	• Schedule noisy activities during the normal working hours of between 8am to 5pm; • Asses the risk of the quarry to the development and liaise with the quarry owner and the authority to ensure that the risk of the quarry are assessed and an informed decision taken. • Put off machines and equipment when not in use as part of fuel cost saving; • Ensure machinery is well	The Project Proponent, NEMA and the Contractor.	During the construction period	Daily Weekly	150,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		maintained to reduce noise emitted; • The contractor should adhere to the provision in the Environmental Management and Coordination (Noise and Excessive Vibration pollution) (control) regulations,2009 • Provide worker with appropriate PPEs when working under noisy environment e.g. ear plugs.				
1.9	Air/Dust pollution	• Practice dust management techniques, including watering spraying to suppress dust; • Move earth and sand in covered vehicles/ transport to avoid it being blown by wind increasing suspended particulate in the atmosphere; • Set up dust barriers/ screens at strategic locations; • Provide and enforce the appropriate use of Personal Protective Equipment (PPE) against dust such as dust masks.	The Contractor, Project Manager, NEMA, Nairobi City County Government.	During the construction period	Daily Weekly	150,000.00
1.10	Soil erosion and pollution	• Practice selective vegetation clearing where necessary; • Install adequate storm water management measures such as	The Contractor Project Manager	During the construction period	Weekly Monthly	150,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		sand filters, wet ponds; • Replant cleared vegetation as soon as possible and landscape the cleared areas; • Avoid vegetation clearing especially on steep slopes during the rainy season; • Schedule earth moving activities during the dry season. This is to reduce acceleration of soil erosion by run off when it rains.	City County Government.			
1.10	Increased water demand due to construction works	• The contractor should sensitize construction workers on the importance of proper water management through clerks of works by having talks with them when doing their rounds around the site; • Replace or repair leaking pipes supplying water to the construction sites to minimized wastage from leakages or pipe burst; • The Contractor should ensure provision of adequate water storage facilities on the construction site to meet project needs during periods of high demand externally and refill of storage tanks during periods of	The Contractor / Project Manager, Nairobi City County Government.	During the construction period	Weekly Monthly	250,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		low demand; • Reuse of waste water from the construction activities for curing of concrete surfaces and cleaning of equipment so as to reduce on the fresh water use; • Direct construction water runoff to areas where it can soak into the ground or be collected and reused; • Lock water tank valves to prevent unauthorized use. To discourage wasteful use of water by construction workers, the contractor could lock the water storage facilities to restrict unnecessary access; • Repair water equipment as needed to prevent unintended discharges.				
1.12	Occupational health and safety	• Contractor should ensure registration of all construction works by the Director, Directorate of Occupational Health and Safety Services; • The contractor should contract a qualified Health and Safety Advisor to conduct training and monitoring of construction works; • The contractor should construct a temporary clinic on site to be run by a qualified nurse/ paramedic	The Contractor, Project Manager, NEMA and DOSHS County Government of Nairobi City County Government.	During the construction period	Daily Weekly Monthly	300,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		who will treat opportunistic ailments and injuries such as cold, malaria etc. • The contractor should provide a standard First Aid Kit on site; • The Contractor should train several workers in First Aid depending on the number of workers on site as stipulated in the First Aid Rules; • Dangerous works should be protected, fenced, demarcated or cordoned off; —Permit for work – should be issued; • Workers should be inducted with training on health and safety by DOSHS certified health and safety advisor so as to enable ensure machinery safety, construction safety, fire safety and electrical safety as well as workplace inspection technique; • Provide and enforce the use of Personal Protective Equipment (PPE) to workers as appropriate such as overalls, safety boots, hand gloves; • The contractor should provide and install fire fighting equipment such as fire extinguishers to fight				

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		different classes of fire (Class A, B, C D); • The Contractor should erect safety and informative signage for hazardous is taking place such deep excavations, electrical hazard, signage for personal protective equipment such as helmets, hand gloves and boots and prohibited activities such as smoking; • The contractor should develop site Health and Safety guidelines which are to adhered to by construction workers and visitors to the construction site; • Maintain an incident/ accident register, in accordance with the Occupational Safety and Health Act, 2007, and report incidences to DOSHS				
1.13	Fire risk and management	• Place portable fire extinguishers at suitable locations; • Combustible materials used during construction should be stored away from source of ignition; • Smoking on site or burning of waste should be prohibited so as to reduce the source of ignition at the workplace;	The Contractor, Project Manager, Nairobi City County Government.	During the construction period	Daily Weekly Monthly	150,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		• Electrical works such as electrical wiring should be done by qualified technicians or engineers to ensure shoddy work which could pose a danger to the development does not occur; • Train and induct workers on the use of fire extinguishers and other fire fighting equipment; • Train all staff on fire safety and procedures; • Allocate a fire assembly point; • Ensure fire safety warnings are prominently displayed at appropriate locations where fires are likely to occur; • Provide and enforce the use of Personal Protective Equipment (PPE); • Develop a Fire Safety Plan through a qualified specialist and implement the provision of the plan at the workplace.				
1.14	Landscaping	• Consider leaving the environment as natural as possible;	The Contractor Project Manager	Construction period	Weekly Monthly	250,000.00
1.15	Sexually Transmitted Infections and HIV/AIDS	• Voluntary Counseling and Testing to be undertaken monthly for construction workers so as to establish their HIV status;	The Contractor Project Manager	During the construction period	Weekly Monthly	100,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		• Information, Education and Communication materials such as posters (A3) and brochure to be used to sensitize workers. The Contractor could work in collaboration with local Non-Governmental organization dealing with HIV/AIDS and local hospitals in the project area. The poster should be pinned at strategic points within the workplace where they can be easily viewed by workers such as at the site office notice board, the ablutions and at the entrance gate; • Education and sensitization of workers and the local communities on STIs including provision of condoms to the project team and the public by installing condom dispensers at different point at the workplace; • Formation of peer groups from among the project staff to ensure continuity in training and awareness raising; • The contractor has to institute HIV/AIDS awareness and prevention campaign amongst				

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		workers for the duration of the contract e.g. erect and maintain HIV/AIDS information posters at prominent locations within the construction site, provision of condoms and monthly Educational Video presentation and discussions ; • The contractor has to ensure that staff are made aware of the risks of contracting or spreading sexually transmitted diseases; • The contractor should ensure that the project workers are sensitised on the local culture; • The contractor should ensure the mobilization and sensitization of the general population on reproductive health and STIs;				
1.16	Loss of biodiversity	• Modifications to the design of the development to ensure spaces are left to allow for regeneration of loss biodiversity; • Post project restoration program.	Contractor	During construction	Weekly Monthly Continuous	350,000.00
1.17	Ground and surface water quality	• No mixing of concrete to occur on bare ground. Concrete mixing should be done bonded surface to avoid soil pollution and contaminating the ground and surface water;	Contractor	During construction	Daily Weekly Monthly	100,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		• Appropriate containment structures to be provided to store contaminated water from the construction site; • No concrete batching to occur directly on the ground. Concrete batching area should be bunded to prevent contamination of soils and surface water features; • All fuel storage to be appropriately bunded and provided with a canopy ; • Project site to have drip trays to contain any potential leakages of fuels and oils; and • Ablutions for construction workers to enable proper disposal of feacal matter and avoid contamination of surface water features which could be a cause of waterborne diseases.				
1.18	Materials management to minimise the impact of material delivery and waste disposal	• Develop materials delivery and waste disposal handling plan; • Develop site sediment control plan; • Develop safety measures to avoid loss of load from trucks; • Implement methods to reduce dust emission from the loads e.g. covering of trucks;	Contractor Project Manager	During construction	Daily Weekly Continuous	80,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		• Develop safety measures to ensure stability of exposed faces or waste material stockpiles				
1.19	Oil Leaks and Spills	• All machinery must be keenly observed not to leak oils on the ground; • Maintenance must be carried out in a designated area (protected service bays) and where oils are completely restrained from reaching the ground; • All oil products and materials should be stored in site stores or in the contractor's yard. They should be handled appropriately to avoid spills and leaks; • Regular maintenance of equipment and machinery; • Train personnel on the risks of oil spills and leakages.	Contractor Project Manager	During construction	Daily Weekly	50,000.00
1.20	Traffic and pedestrian safety	• Develop and implement a traffic management plan; and adhere to the Traffic Act/ Rules; • Speed bumps and limit should be set at 5 KMs per hour and signs put up to that effect; and • Premises should have provisions for first aid facilities.	Contractor Project Manager	During construction	Daily Weekly Monthly Continuous	50,000.00
1.21	Security	• Security guards must always guard the gate to the construction	Contractor	During construction	Daily	100,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		site to keep away the intruders and to control movement within the site; • Lighting as well as security alarms should be installed in strategic positions all over the site during construction and after the completion of the project; • The Contractor should provide adequate security during the construction period when there are no works on the site. • The guards stationed at the gate should document movements in and out of the construction site.	Project Manager		Continuous	
	Operation Phase					
2.1	Employment Opportunities	• Priority should be given to the local community during employment; • Ensure compliance with the Employment Act, 2007 and Regulation of Wages (General) (Amendment)order, 2009	Project Manager	Occupation	Weekly Monthly Yearly	50,000.00
2.2	Solid waste management	• Prudent use of materials to reduce solid waste volumes; • Waste separation to encourage reuse and recycling; • Provision of waste collecting bins to households which will then be collected for proper disposal by a	Project Manager	Occupation	Daily Weekly Monthly Continuous	80,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		NEMA licenced waste handler.				
2.3	Fire Risk/Management	• Place portable fire extinguishers at suitable locations; • Induct all the occupants on the fire safety procedures and the use of fire fighting equipment such as fire extinguishers; • Allocate a fire assembly point; • Ensure safety warnings are prominently displayed at appropriate locations;	Project Manager	Occupation	Weekly Annually	100,000.00
2.3	Increased pressure on existing utilities	• Recycling of waste water from the different houses using a bio digester and the recycled water used for irrigation of lawn and flushing of toilets; • Installation of solar panels on each structure to provide alternative source of power for household use; • Construction of septic tanks to cater for the excess sewage from the development since the existing sewer lines have a lower carrying capacity compared to the increased population.	Project Manager	Occupation	Weekly Monthly	1,550,000.00
2.4	Liquid waste generation	• The proponent must connect the sewerage effluent to the NAIROBI WATER AND SEWERAGE COMPANY (NAWASCO) sewer. The	Project Management Tenants	Occupation	Weekly Monthly	1,550,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		design of the sewer system should consider the estimate discharges from individual sources and the cumulative discharge of the entire project i.e. it must have the capacity to consistently handle the loads even during peak volumes. • The system (sewer) line connection should be made of hard, strong, durable, smooth, impervious, and non-corrodible materials. The sewerage lines require to be upgraded in order to adequately service the increased levels of sewage discharge due to rising levels of development; • Sanitary facilities must be kept clean always; • The gradient should be sufficient to ensure and maintain maximum depth of flow; • The trunk sewer must be regularly monitored to avoid overfilling and overflowing. They must be checked regularly to monitor levels of effluent; • Branches should be streamlined in the direction of flow and there should be no right-angled junctions that would affect the			Semi-annually Annually	

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		flow of the effluent; • All drain pipes passing under building, driveway or parking should be of heavy duty PVC pipe tube encased in 150mm concrete surround; • All manholes on drive ways and parking areas must have heavy-duty covers set and double sealed airtight; as approved by specialists.				
	Decommissioning					
3.1	Noise and vibrations	• Scheduling all the decommissioning works within the normal working hours of between 8am and 5pm; • Provision of screening around the site when the demotion works is on-going to reduces the impact of noise by cordoning the area; • Adherence to the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.	Project Manager / Contractor	During Decommissioning	Daily Weekly Continuous	100,000.00
3.2	Air pollution	• Water spraying to suppress dust especially where dust activities are taking place; • Providing workers involved with appropriate protective personal	Project Manager / Contractor	Daily basis during decommissioning	Daily Weekly Continuous	100,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		equipment such as dust masks or respirators.				
3.3	Solid waste	• The contractor shall put in place a waste management plan aimed at minimising the production of all wastes and maximize on resource recovery; • Where possible measures will be put in place to recycle materials such as metal off-cuts, some plastics and clean paper/ cardboard utilising existing specialist recycling firms in Kenya; • A suitable location within site for placing concrete and foundations removal and washing down equipment will be undertaken with no discernable impact; • Other non-recyclable materials should be segregated and stored in plastic bins, collected and disposed of; • Disposal bins should be provided at designated areas at the project site to help in waste segregation to encourage recycling; • Enforce regular collection and disposal of garbage by the project contractor through licensed NEMA waste handler in the entire			Daily Weekly Monthly Continuous	150,000.00

REF NO.	ENVIRONMENTAL PARAMETER	MANAGEMENT AND MITIGATION OR ENHANCEMENT MEASURES	RESPONSIBILITY	TIME FRAME	Monitoring Frequency	ESTIMATED COST (KES)
		decommissioning process; • Prepare an inventory of all hazardous materials and wastes to be disposed of and specify the method of disposal in accordance with the MSDS and current NEMA's legislation; • Remove and dispose of all demolition waste at an appropriate authorized waste disposal facility; • Remove and dispose of all litter, parts and equipment at an approved disposal site				

N:B Continuous means during the entire phase cycle

CHAPTER TEN: CONCLUSIONS AND RECOMMENDATIONS

Conclusion

This EIA Study Report has been prepared to provide sufficient and relevant information on the proposed residential development project to enable the Authority-NEMA to establish the sustainability and compliant of the project and whether activities of the project are likely to have significant adverse environmental impacts. Mitigation measures have been proposed for the identified impacts in this report and an EMMP for the implementation of the proposed measures presented.

The study has also established a number of negative environmental consequences that the project activities are likely to induce. However, it will be possible to mitigate these negative impacts by strictly implementing the recommended mitigation and enhancement measures provided for in EMMP. There will be no major environmental and social impacts associated with this project should the involved parties comply to the proposed EMMP.

The EMMP presented in this report is a tool to be used by the project team, contractor and project proponent during the entire life cycle of the project. Based on the findings of this study, the EIA study team concludes that the project and subsequent operation activities will generate significant socio-economic benefits to the public, the proponent, local government and the nation at large. This study has also established a number of negative environmental consequences that the project activities are likely to induce if mitigation measures are not implemented effectively. However, there are no significant environmental and social effects that cannot be adequately mitigated by the measures put forward in the proposed EMMP. Hence, we categorically state that there will be no major environmental and social impacts associated with this project should the involved parties comply with the provisions of the EMMP.

We as the study team here by recommends the approval of the project subject to the client commitment to adherence to all the proposed mitigation measures in this report. The Client must confirm adherence in writing to the Director General, National Environment Management Authority (NEMA) on the same.

Recommendations

A summary of the key recommendations for the proposed residential development project are as follows:

- Construction works at the project site should be carried out in accordance with approved designs, regulations, policies and laws;
- The proponent should obtain all the necessary permits and licenses from the relevant authorities and employ qualified and adequate personnel to implement the project as per the best practicable technologies;
- The proponent should adhere to the local authorities-Westlands Sub-County code of conduct during construction and operational phases of the project;
- The proponent should implement the mitigation measures/ guidelines provided in the EMMP; and
- The operation and maintenance of the proposed project should comply with the best management practices and the principles of good environmental management and occupational health and safety.

REFERENCES

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3. Kenya Gazette Supplement Acts, Environmental Management and Coordination (Waste Management) Regulations, 2006, Government Printer, Nairobi Republic of Kenya (2008);

4. Kenya Gazette Supplement Acts, Occupational Health and Safety Act, 2007, Government Printer, Nairobi Republic of Kenya (2005);

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11. County Integrated Development Plan 2013-2017, Nairobi County Government.

Appendices