

**ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT
FOR THE
PROPOSED TWO BLOCKS RESIDENTIAL UNITS DEVELOPMENT ON
PLOT L.R. NO: 10119/4 -NEXT TO GARDEN CITY MALL, OFF THIKA
SUPER HIGHWAY, KASARANI SUB COUNTY, NAIROBI COUNTY**
GPS COORDINATES LOCATION
LAT:-1.234847
LONG:36.87686



This Environmental Impact Assessment (EIA) Project Report is submitted to the National Environment Management Authority (NEMA) in conformity with the requirements of the Environmental Management and Coordination Act, 2015 and the Environmental (Impact Assessment and Audit) Regulations; 2019. It is based on information made available by the proponent to the consultant and findings from field assessment.

LEAD ENVIRONMENTAL EXPERTS	PROPONENT
<p>JULIET GATHIGIA GATHUNGU, REG.NO 1801, P.O BOX 29869 – 00100 GPO, NAIROBI.</p>	<p>KASARANI INVESTMENT HOLDINGS LTD P.O BOX 43233-00100 NAIROBI, KENYA.</p>

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REPORT PREPARED BY

Juliet Gathigia Gathungu

Lead Expert

Reg No. 1801

Signature: _____

Date : _____

Samuel Kimani Kambo

EIA and GIS Expert Reg No. 10609

Signature: _____

Date : _____

PROJECT PROPONENTS

Kasarani Investments Holdings Ltd

Name of representative: _____

Signature: _____

Date: _____

REPORT SUBMITTED TO

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

Official Rubber stamp:

EXECUTIVE SUMMARY

This is an environmental impact assessment study report, which provides relevant information and an environmental consideration on **Kasarani investment Holdings Ltd** (here in referred to as the proponent) intention to seek approval from National Environment Management Authority (NEMA); for the proposed construction of residential units on plot No.10119/4 located off Thika Super highway next to Garden City Mall and East African Breweries Ltd. The proposed development will comprise of **two blocks with 1st - 2nd Level as parking and 3rd - 15th levels accommodating 208 residential apartments units of one, two and three bedrooms.**

The ground floor will constitute of two parking levels. The only difference with the two parking levels is the presence of Generator room, switch room, transformer room and guard room in the first ground floor level. The typical floors i.e. 1st to 13th (3rd to 15th level) will comprise of 4 two bedrooms with a master bedroom, 11 one bedrooms with a master bedroom and 1 one bedroom each. *(As per the approved architectural plans attached).*

It will be associated with other facility which includes parking area, pedestrian walk ways, access road, water and sewerage reticulation plans, electrical infrastructure layout and other amenities as per the approved master plan and architectural drawings in line with the governments' housing policy. *(The architectural drawings and plans attached in the annex)*

In conformity with the Environmental Management and Coordination Act 2015 and the Environmental (Impact Assessment and Audit) regulations, 2019 contained in the Kenya gazette supplement No. 56, legislative supplement No. 31 Legal notice No. 101 of 13th June, 2003, the project proponent has appointed NEMA Certified consultants to carry out an Environmental Impact Assessment of the project and prepare a related project study report.

The purpose of the Environmental and Social Impact Assessment (ESIA) is to identify potential positive and negative environmental and social impacts associated with the proposed project and make recommendations on how to take advantage of the positive impacts on one hand and how to mitigate the negative environmental impacts on the other.

The ESIA team carried out the project assessment using a combination of methods, which include; literature reviews, desktop and ground surveys, public consultation, questionnaires and interviews with the key stakeholders, opinion leaders and neighbours. The project approved designs,

drawings, layout plans and bill of quantities were reviewed to provide an in depth understanding and evaluation of its extent and anticipated impacts. Also existing literature on statutory and other requirements on similar projects of such magnitude were reviewed. The potential environmental impacts identified are classified into the following categories:

Impacts on: land resources, air resources, water resources, ecological resources, biodiversity, existing infrastructure & services, and socio-economic issues.

The following potential impacts are included in the E.I.A report:

- ✦ Loss of biodiversity
- ✦ Urbanization leading to reduction in aesthetics reduction.
- ✦ Waste water management and disposal
- ✦ Sewer systems and drainage systems upgrades
- ✦ Increased water demand
- ✦ Solid waste management
- ✦ Oil spills during construction
- ✦ Dust emissions
- ✦ Visual intrusion
- ✦ Increase in energy demand
- ✦ Accessibility to the existing road network
- ✦ Soil compaction, erosion and pollution
- ✦ Safety concern during demolition and construction
- ✦ Noise and vibrations
- ✦ Population density
- ✦ Increased traffic along the main roads
- ✦ Air pollution during construction
- ✦ Health and safety of workers during construction phase
- ✦ Optimal use of land
- ✦ Improved security
- ✦ Creation of job opportunities

- ✦ Increase in quality residential apartments/ houses in the area and Nairobi Metropolis in general
- ✦ Increased revenue for the Government
- ✦ Improving growth of the economy
- ✦ Rise in businesses around Garden City Mall and Kasarani region
- ✦ Provision of market supply for goods and services

It is evident from this study that the construction and operation of the proposed residential apartments will bring positive effects in the study area including creation of employment, increase quality living space, boost the local economy and increase income generation, increased revenue generation to the national and county governments, rise in business in Garden City mall and improved infrastructure & services among others. *(This was evidently shown through the neighbours interviews and questionnaires filled).*

However, it is also clear that the project will come with negative impacts especially in the implementation phase. The potential negative impacts attached to this project include: Solid/liquid waste generation; pressure on land, increased pressure on infrastructures such as road, sewer line and drainage systems; air pollution; noise & vibration; water pollution; traffic disruption; visual intrusion; social evils & crime and degradation of biodiversity among others.

Mitigation measures of the negative impacts have been developed in respect of the significant negative environmental and social impacts which when adopted, will make the proposed project environmentally sustainable. In addition, the EIA team has developed an environmental and social management plan, which should be adopted and implemented fully, in order to ensure that the mitigation process is successful.

Having considered the data collected, analyzed and collated information that is available, it is the experts considered opinion that:

1. The project, even though of a big scale, has in its design and proposed implementation strategies employed adequate measures to address effectively all potential negative environmental and social impacts that may arise. This will include pressures to the utilities such as sewer systems and drainage system. It therefore **DOES NOT** pose any major negative

impact to the environment or the community within its vicinity, both in the implementation and operational phases.

2. The positive impacts of the project far outweigh the negative ones, which will be adequately contained by following the prescribed environmental management and social impact management plans. This is in addition to the well laid implementation and operation strategies adopted by the proponent for this project.

The EIA experts note that the proposed project is well conceived and is in line with the proponent's sustainability strategy in adhering to Millennium Development Goals (MDGs), the Government's Big Four Agenda and Vision 2030. The project has also supported one of the main Big 4 Kenya pillar agenda i.e. **Affordable Housing**. Affordable housing is a key pillar in the economic development of any country as it guarantees its citizens an improved standard of living. Accordingly, as per part 11 section 10 (2) of the Legal Notice No. 101 on the Environmental (Impact Assessment and Audit) Regulations, 2019, we recommend that the project be granted an EIA license.

ACRONYMS

EABL	East Africa Breweries Limited
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMCA	Environmental Management Coordination Act
EMP	Environmental Management Plan
ERP	Emergency Response Plan
ESIA	Environmental and Social Impact Assessment
GIS	Geographic Information Systems
Ha	Hectare
KM	Kilometre
KP	Kenya Power
LR	Land Reference
NEAPC	National Environment Action Plan Committee
NEC	National Environment Council
NEMA	National Environmental Management Authority
NO_x	Nitrogen Oxides
OHS	Occupational Health and Safety
PCC	Public Complaints Committee
PPE	Personal Protective Equipment
PV	Permanent Ventilation
RC	Reinforced Concrete
RS	Remote Sensing
SEM	Sustainable Environmental Management
SERC	Standard and Enforcement Review Committee
SO_x	Sulphur Oxides
TOR	Terms of Reference
VOC	Volatile organic compounds
WCC	Waste Collection Centre

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CHAPTER ONE

1. INTRODUCTION

1.1. General overview and rationale for EIA

Kasarani Investment Holdings Ltd, who is hereinafter referred to as the proponent has proposed to develop residential units on Plot No.10119/4 consisting of **two blocks with 1st to 2nd Level as parking and 3rd to 15th levels accommodating 208 residential apartments units of one, two and three bedrooms.**

The ground floor will constitute of two parking levels. The only difference with the two parking levels is the presence of Generator room, switch room, transformer room and guard room in the first ground floor level. **The typical floors i.e. 1st to 13th (3rd to 15th level) will comprise of 4 two bedrooms with a master bedroom, 11 one bedrooms with a master bedroom and 1 one bedroom each.** *(As per the approved architectural plans attached).*

It will also be associated with other facility which includes parking area, pedestrian walk ways, drive ways, access road, lift water and sewerage reticulation plans, electrical infrastructure layout and other amenities as per the approved master plan and architectural drawings in line with the governments' housing policy. The project is necessitated by the need to create more quiet and comfortable living space for the burgeoning population in areas around Garden city mall and its environments.

The proposed project is to be located on Plot LR. No 10119/4 next to Garden City Mall, Off Thika Super Highway, Kasarani Sub County. The site is also next to East African Breweries Ltd. Currently the site is accessed through the Ngumba Drive and Boulevard road which connects the Thika Superhighway, Roosters Round About and East African Breweries Ltd. There are new developments under constructions which neighbours the proposed site which include; Access way from the existing road to Garden City Mall i.e. Garden City Boulevard road to the developing site. It neighbours the newly iconic Garden City Business Park building on the Western side and Garden City apartments and townhouses on the Eastern side. There are other proposed developments which will neighbour the proposed site i.e. more residential blocks units, Medical facility and Hotel

with conferences facilities. There are other proposed upgrades in the area due to rise in infrastructural developments which includes; sewer system, electric infrastructures, water system, Gumba and Boulevard road and Mountain Mall Round About, The area on which the proposed project is situated has been zoned for business purposes. The proposed project is in line with the existing Kenya planning policy.

The proposed development will optimize the use of the designated land, hence increasing its utility. The project will provide employment during both construction and operation phases. It will create market for goods, services, and especially construction inputs, which include raw materials such as building stones and blocks, sand, ballast, timber, steel etc. and construction machinery. Many secondary businesses are also likely to spring up during the construction phase especially those providing foods and beverages to the construction workers. During the operation phase, the residential development will help in provision of modern and luxurious residential apartments, employment such as property managements companies, security personnel and cleaners. It will also increase revenue to national and local governments through payment of relevant taxes, rates and fees. The businesses in the Garden City Mall will rise immensely.

More recently in development, spurred on by regulators in Kenya and indeed globally, has recognized the need for change in order to safeguard the environment. In relation to this, Environmental concerns have now been integrated in the planning and implementation processes of any proposed projects in Kenya. The key objective is to mitigate conflicts with the environment at the vicinity; during implementation and operational phases. In addition, it is now mandatory for the proponents of such projects to carry out Environmental Impact Assessments (EIAs), to enhance *Sustainable Environmental Management* as well as controlling and revitalizing the much-degraded *environment*. The National Environmental Management Authority (NEMA) in Kenya regulates the environmental management. It should ensure the management of the EMP is strictly followed by the proponent in ensuring all the environmental mitigations are taken into account.

Pursuant to the prevailing legal requirements as envisaged in the EMCA and to ensure sustainable environmental management, the proponent undertook this EIA study for the proposed project; and incorporated substantial environmental aspects as advised by NEMA. This EIA study report thus provides relevant information and environmental considerations on the project proponent's intention to seek approval from NEMA for the development of the proposed project. It also acts as a tool to help in environmental issues mitigation in different phases of the project i.e. construction, operation and decommissioning. The EIA was conducted by a team comprising of NEMA registered Environmental Experts, sociologists, waste management experts, engineers, GIS and Remote Sensing experts, planners and architects among others.

1.2. Objectives

The main objective of this EIA was to establish the baseline conditions of the proposed site; evaluate the existing and the anticipated impacts and propose measures to enhance the positive impacts and measures to mitigate and reduce on the effects of the negative impacts. The key goal is to enhance cleaner and sustainable environment during implementation and operation phases of the proposed project.

1.3. Scope

The study was conducted to ensure that significant impacts on the environment and socio-economic aspects are taken into consideration at all times during project implementation and operation phases. The scope of the study was mainly in the subject project and the immediate environs; and to some extent on the possible far-reaching effects of the proposed activities. The following was therefore covered:

- Description of the proposed project i.e. the intensity of the project in terms of units number and the levels.
- Design and proposed Construction Materials and Methodology
- Evaluation of the location using GIS and RS tools, Land ownership and use
- Baseline information; biophysical and socio-economic
- A review of the policy, legal and administrative framework
- Potential environmental impacts during project implementation and operation phases

- Potential mitigation measures and future monitoring plans.
- Social Impact Assessment; involvement of neighbours/general public in the area.
- Environmental Management and Monitoring plans.

1.4. Terms of Reference

The terms of reference were but not limited to:

- Assessment of the ecological effects.
- Examination of the site characters specifically geological, hydrological and ecological.
- Social implications of the proposed project within the locality and general region.
- Determination of the effects on Landscape and land use
- Evaluation of Effects of the development on current demands on infrastructures and services as well as possible implications.
- Proposition of mitigation measures to be undertaken during and after implementation of the project; and development of an environmental management plan with mechanisms for monitoring and evaluating the compliance and environmental performance.
- Such other matters as NEMA may require.

The study is also aimed at ensuring that the proposed project/building would be constructed based on applicable building standards of Kenya and other international building codes i.e. British standards (*BS 8110* , *BS 5950*, etc.). In addition, the construction should incorporate environmental guidelines, health and safety measures. (Detailed structural plans are provided in the architectural drawings in the Annex).

1.5. Responsibilities

While the environmental expert provided the technical understanding on the baseline environmental status such as the biodiversity and infrastructure, potential impacts, management options and legal framework, the client was expected to provide the following:

- Site map(s) showing roads, service lines, buildings layout and the actual size of the site including the architectural and structural drawings.

- The drawings and plans for the new proposed developments such as roads, hotel, sewer system, electric fence, medical facility and income apartments.
- The proposed upgrades in the neighbourhoods.
- Full details of proposed operations and activities, input materials, site operational outline, products and by-products and any wastes to be generated,
- Measures to be put in place for handling wastes and hazardous materials on the site.
- Land ownership documents and site history.

The output from the EIA Experts was an EIA study report comprising of an executive summary, study approach, baseline conditions, existing and anticipated impacts and potential mitigation measures for anticipated negative impacts and a comprehensive environmental and social management plan (ESMP). The location of the project was mapped using GIS and RS tools and the details captured i.e. the proposed project location, infrastructures and neighbourhood characters. The area topography, soils and geology was carefully analysed by GIS and Remote sensing tools.

1.6. Methodology

The methodology of the process, which culminated to the assessment and the subsequent EIA project report, included the following:-

- **Preliminary assessment** of the site; where the experts visited the site to know the location, assessed the site and did ground truthing surveys. During the assessment the experts i.e. the Environmental Experts assessed the site location, neighbourhoods, infrastructures and biodiversity.
- **Screening:** This is the initial phase of any EIA process. It involves the determination of whether or not an EIA study is required for a particular development activity. Determination in the proposed project depended on the following aspects but not limited to:
 - The sensitivity of the area likely to be affected;
 - Public health and safety;
 - The possibility of uncertain, unique or unknown risks;

- The possibility of having individually insignificant but cumulatively significant impacts;
- Whether the proposed activity affects neighbourhood developments, protected areas, endangered or threatened species and habitats;

From the above, the proposed project was seen to require an Environmental Impact Assessment study since construction activities of such magnitude are expected to give forth both negative and positive effects to the environment and ultimately contribute to an increased waste generation both in the construction and occupational phases. This stage also involved activities such as:

- a) Getting a comprehensive site description that includes: Location of the proposed project, the assessments of soils and geology of the proposed site, water resources available on site, drainage system evident on site, climatic conditions of the proposed location and its vicinity, vegetation and flora on the site, land use systems on site and its vicinity, population characteristics of the region holding the proposed site, infrastructure at the site and justification for selection of the site.
- b) The developments in the neighbourhoods.
- c) Getting detailed information on: The nature of the proposed construction activities, the materials to be used in the construction activities on site and the expected project outputs including waste generation
 - **Collection of Baseline Data:** Data collection involved activities such as desktop study and discussion with the proponent, observation, detailed physical inspection of the proposed site and the surrounding areas to determine the present and anticipated impacts of the proposed project, study of the approved structural and technical drawings for the proposed residential home.

The data obtained was used to assess potential impacts on health, safety, environment and the community surrounding the proposed site location. From the obtained data, environmental, health, safety and social concerns were identified in relation to the proposed project location and mitigation measures proposed for the negative impacts, while enhancement measures proposed for the positive impact.

- **Data Analysis and Evaluation of Alternatives:** Use of checklists and the threshold limits were used in data analysis; while the proposed site location, technologies to be employed, scale of construction, potential environmental impacts, capital and operating costs, suitability under local conditions, and institutional, training, and monitoring requirements were considered in the evaluation of alternatives. The questionnaires collected were analysed for coming up with conclusions on what might be done in environmental mitigation.
- **Consultation and Public Participation:** Here, stakeholders and neighbours were interviewed and asked to fill in questionnaires. Among the neighbours interviewed are the business people in Garden City mall i.e. TACC, Shoprite, Victoria Court and GAME, Willmary apartments, East Africa Brewery Limited, Telecom Kenya communications, neighbourhood townhouses and apartments on the Garden City Mall in the neighbourhoods and POSTA in order to get their views, expectations, projected environmental, economic and social effects regarding the proposed project activities and location. These findings were then analyzed and incorporated in this study report.
- **Preparation of the Project Report:** This Environmental Impact Assessment project report was then prepared by approved and registered (by NEMA) EIA experts, who are familiar with the provisions of the Environmental Management and Coordination Act (EMCA), 2015 and other relevant regulations and laws of Kenya as indicated in the Legal frame
- **Submission of the Project Report:** This report will then be submitted to National Environment Management Authority (NEMA) in copies of ten and a soft copy for review.

CHAPTER TWO

2.0 PROJECT DESCRIPTION

2.1 Introduction

The proposed project is a residential development within Garden City Mall area off Thika Superhighway, Kasarani Sub County in Nairobi County on plot L.R. No 10119/4. The residential development is a facility that promotes accommodation and housing for the people in Kasarani Sub County suburbs.

The proposed project site will consist of two blocks with **1st to 2nd Level as parking and 3rd to 15th levels accommodating 208 residential apartments units of one, two and three bedrooms**. The ground floor will constitute of two parking levels. The only difference with the two parking levels is the presence of Generator room, switch room, transformer room and guard room in the first ground floor level. The typical floors i.e. 1st to 13th (3rd to 15th level) will comprise of 4 two bedrooms with a master bedroom, 11 one bedrooms with a master bedroom and 1 one bedroom each. *(As per the approved architectural plans attached)*.

It will be associated with other facility which includes parking area, pedestrian walk ways, access road, water and sewerage reticulation plans, electrical infrastructure layout and other amenities as per the approved master plan and architectural drawings and is in line with the governments' housing policy. The project site will be accessed through the developing road connected to Boulevard road and will neighbour other proposed development such as medical facility, hotel and conference and residential apartments. It will also neighbour development such as Garden City shopping mall, East Africa Breweries Limited and Garden City apartments and townhouses.

2.2 Project Design Considerations

The design considerations incorporate aspects of modern architecture, the current local government building policy guidelines and the latest standards developed by Kenya Bureau of Standards including:

1. **Ventilation:** The design caters for natural ventilation with features that encourage natural air circulation (including use of permanent air vents above all doors and windows).
2. **Lighting:** The design caters for various types of energy efficient luminaries including fluorescent lamps and natural lighting through glass windows and doors as appropriate for both security and lighting
3. **Sanitary Accommodation:** The number of toilets, bathrooms and wash hand basins has been selected according to guidelines in BS 6465.
4. **Sustainable resource use:** The design of the development incorporates landscaped gardens which will be planted with suitable species of trees / shrubs and grass to prevent ecological deterioration and improve aesthetic value of the site. Part of the excavated soil will be used for landscaping therefore reducing the amount of soil to be transported away from the site.
5. **Solid waste management:** The proponent will be required to manage solid waste effectively, this may require the proponent to contract waste handler for proper waste management. It is recommended the proponent to hire waste handlers who are licensed.
6. **Fire protections:** The design of the proposed developments incorporates firefighting equipment to be installed in the building and the provision of a fire station.
7. **Plumbing and drainage;** Sewage to be discharged to the proposed sewer line to be upgraded. Water supply and reticulation to be done using galvanized steel piping to BS and or PPRC piping.

The Consulted Environmental experts will make an effort in ensuring they monitor the site to ensure all the above discussed standards are followed strictly. This is during both the construction and operational phase.

2.3 Project Output and Layout

The output of the proposed development will be a multi-units residential development consisting of two blocks with **1st to 2nd Level as parking and 3rd to 15th levels accommodating 208 residential apartments units of one, two and three bedrooms.** The

layout and construction specifications for the proposed developments are as shown on the architectural drawings annexed herein in this report.

2.3.1 Infrastructure

The development will have a comprehensive and robust infrastructure including access road networks such as Thika Superhighway, Ngumba Road and Boulevard, parking areas, courtyards, sewerage systems, commercial centres, public electricity distribution, business centres, telecommunication networks, recreational facilities and waste disposal system among other public utilities.

There is an existing Kenya Power main electricity supply line, which the proponent will acquire regal connections, and will be used to provide power in all phases of the project. The necessary guidelines and precautionary measures relating to the use of electricity shall be adhered to.

2.3.2 Water Reticulation System and Sewerage Management

The water used at the site and its environs is obtained from the existing Nairobi Water and Sewerage Company (NWSCO) water system. There will also be borehole which will help in water supplementary. The area is covered by a public sewer line, in to which the resultant development will be connected. There are upgrades to be done to the existing sewer line systems. All sanitary work will be in accordance with the ministry of health (MOH) rules and regulations and the Nairobi County Government requirements.

2.3.3 Landscaping

The site will be landscaped after construction, using plant species available locally. This will include establishment grass lawns to improve the visual quality of the site where pavements will not have taken space. This will be done by the contractor but any other form of landscaping will be done by management.

2.3.4 Building and Construction

The buildings will be constructed as per respective building plan appended to this report. Basically, the building structures will consist of concrete appropriately reinforced with

steel and iron metal. The building will be provided with a well-designed concrete staircase with rails for access to each upper floor.

The building will be provided with facilities for drainage of storm from the roof to drainage systems. The building will have adequate natural ventilation through provision of permanent vents in all habitable rooms, adequate natural and artificial light, piped water stored in tanks.

2.4 Description of Proposed Project Activities

2.4.1 Pre-construction phase

2.4.1.1 Site support structures

The support structures needed before commencement of construction phase include construction of water reservoirs and fencing and hoarding the site. The site is already fenced because of the already undergoing works under construction near the Business Park and Garden City Mall.

2.4.2 Construction phase

2.4.2.1. Excavation works

Excavation work involves digging of foundation and storm water channels. Human labor will be employed to do the excavation work. The materials out of excavation will be piled and compacted to avoid soil erosion and to preserve it for the purpose of using later in landscaping.

2.4.2.2. Sourcing and transportation of building materials

Building materials will be transported to the project site from their extraction, manufacture, or storage sites using transport trucks. The building materials to be used in construction will be sourced within Nairobi and Kiambu County to minimize ecological footprints, supplemented by onsite materials developed in line with the new technologies been adopted in the proposed project. Greater emphasis will be laid on procurement of building materials from within the local area, which will make both economic and environmental sense as it will reduce negative impacts of transportation of

the materials to the project site through reduced distance of travel by the materials transport vehicles as well as promoting local dealers of those products.

2.4.2.3. Storage of materials

Building materials such as rough stones, ballast, sand and steel will be carefully piled on site. To avoid piling large quantities of materials on site, the contractor will order bulky materials such as sand, gravel and stones at construction pace. Materials such as cement, paints and glasses among others will be stored in temporary storage structures constructed during pre-commission phase, which will be constructed within the project site for this purpose.

2.4.2.4. Masonry, concrete work and related activities

Masonry and related activities will include stone cutting into required sizes and shaping as desired, 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 labor intensive and will be supplemented by machinery such as concrete mixers and power floaters.

2.4.2.5. Structural steel and roofing works

The buildings shall be reinforced with structural steel for stability. Structural steel works will involve steel cutting, welding and erection. Roofing activities will include raising and fastening the roofing materials.

2.4.2.6. Electrical work

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

2.4.2.7. Winding up construction

To improve on the aesthetic value or visual quality of the site after completion of construction, the contractor will carry out collection and removal of debris and

remaining building materials from the site. The materials like sand and cements would be sieved to be used for other purposes such as the ground floor plastering.

2.4.3. Operation phase

This phase involves the owner opening up the dwelling units and possible interested parties occupying the residential houses. The apartments will serve people from within the area.

2.4.3.1. Emission and waste management

The operation phase is expected to generate waste. The project wastes are packaging materials, sewage, storm/rooftop water, solid waste, among others. The proponent is responsible for the management of waste and will provide facilities for handling solid waste generated within the new project. The waste to be generated will be handled and managed as follows:

- 1) The proponent to provide refuse storage chambers for temporarily holding waste before final collection and disposal in compost pit or by a NEMA licensed contractor;
- 2) Sewage generated from the premise will be discharged into sewer line which will be upgraded.
- 3) The rooftop water can be harvested for use or channeled as part of storm water.
- 4) The storm water from the project area will be channeled into the drainage systems which will be upgraded in the whole area.
- 5) The building will also be cleaned regularly by the occupants and will involve sweeping, waste collection, and mopping among others.

2.4.3.2. Repairs and maintenance

The buildings will be maintained regularly during the operation and will include activities such as repair of buildings walls and floors, altering and refurbishing of the building to the modern way, repair of electrical gadgets such as lighting apparatus and equipment, repairs of leaking water pipes, blocked sewage system, painting, among others.

2.4.4 Construction material handling

Most construction works take in considerable amounts of artificial and natural material. The materials to be used have to conform to KEBS requirements for quality. Some building materials such as building blocks, sand and ballast will be kept outdoors at the site while others such as cement, nails and paints will be kept indoors in lockable stores to be established at the site since they are easily destroyed by rains or direct sunshine and are vulnerable to theft because they can easily be carried away. A store will be made of iron sheet walling and roof. The iron sheets will be supported on wooden posts. Handling of all hazardous chemicals will be done in accordance with their manufacturers' instructions as outlined on their material safety data sheets. Usage of materials has both beneficial and adverse impacts on the environment. Both on-site and off-site impacts are also anticipated from extraction and usage material. The most common of these impacts are income circulation in the economy, creation of employment opportunities, off-site depletion of materials, land degradation, pollution, excessive demand on materials and health hazards. Sources of construction materials depend on the contractual agreements between the proponent and the contractors, their availability and the priorities of the person sourcing the material. Provisional sources of construction material and their uses have been given (Table 4.1)

Table 2.1: Summary of the main construction material input into the proposed project

Materials	Sources	Uses	Impacts	Mitigation
Sand	Suppliers near the proposed sites	Preparation of concrete for joining masonry stone and aggregate	Off-site depletion of raw materials and land degradation especially destruction of the river beds	Re-evaluation of the project to ensure that the design optimizes the use of sand A detailed material plan should be prepared as part of the initial design review
Stones	Suppliers near the proposed site	Reinforcement of the floor	Off-site land degradation Resultant solid wastes Excessive consumption of raw materials	Re-evaluation of the project to ensure that the design optimizes the use of blocks The structural engineer ensure all the stones used are fit for the project
Building stones	Suppliers near the proposed sites e.g Ndarugu	External walling works	Off-site land degradation Resultant solid wastes Excessive consumption of raw materials	Re-evaluation of the project to ensure that the design optimizes the use of blocks
Soil	From site after excavations	Levelling, refilling and landscaping works	Resultant solid wastes and dust pollution	Careful planning landscaping programme Spraying dusty areas with water. It should be done moderately to ensure the neighbours are not interfered.

Materials	Sources	Uses	Impacts	Mitigation
Cement	Hardware shops near the proposed site	Preparation of concrete for joinery purpose and making ballast for reinforcement concrete	Excessive consumption of cement Off-site depletion of limestone Land degradation Air pollution	Re-evaluation of the project to ensure that the design optimizes the use of cement A detailed material plan should be prepared as part of the initial design review Careful use of cement to avoid unnecessary spills
Ballast and/or hard-core	Suppliers near the proposed site	Preparation of aggregate for making slabs and reinforcement concrete		
Timber	Timber yards near the proposed site	Roofing and making doors	Off-site deforestation and resultant soil erosion	Reforestation Programme Re-evaluation of the project to ensure that the design optimizes the use of timber A detailed material plan should be prepared as part of the initial design review
Poles	Timber yards near the proposed site	Supporting structural works	Off-site deforestation and Resultant soil erosion	Reforestation Programme Re-evaluation of the project to ensure that the design optimizes the use of poles A detailed material plan should be

Materials	Sources	Uses	Impacts	Mitigation
				prepared as part of the initial design review
Murram	Suppliers near the proposed site	Backfilling of excavated sections		
Steel bars	Hardware shops near the proposed site	Reinforcement and casement	Health hazard Excessive demand on steel	Re-evaluation of the project to ensure that the design optimizes the use of steel bars Re-using and recycling of waste metals Practice effective occupational health and safety practices. Careful handling of glass
Glass	Hardware shops near the proposed site	For glazing windows	Health hazard Heavy demand of glass Resultant solid wastes	Re-evaluation of the project to ensure that the design optimizes the use of glass A detailed material plan should be prepared as part of the initial design review
PVC material such as pipes	Hardware shops near the proposed site	For water and waste water piping systems	Non-biodegradable solid wastes and resultant breeding grounds for rats and disease vectors such as mosquitoes	Re-using and recycling of wastes Proper handling of wastes

Materials	Sources	Uses	Impacts	Mitigation
Nails	Hardware shops near the proposed site	For joinery and roofing purposes	Cause injuries to the workers if not stored in an enclosed room	Use of the nails careful to avoid accidents and injuries
Gravel	Quarries within Kiambu and Nairobi and its environs	Preparation of aggregate for making ballast	Off-site depletion of gravel land degradation	Re-evaluation of the project to ensure that the design optimizes the use of gravel A detailed material plan should be prepared as part of the initial design review
Paint	Hardware shops near the proposed site	For colourful external and internal finishes	Health hazard Excessive use of paint Resultant pollution	Careful use of paint to avoid unnecessary spills Re-evaluation of the project to ensure that the design optimizes the use of paint Practice effective occupational health and safety
Paving blocks	Will be made on site	Making pavements	Excessive use of cement, sand and gravel Solid waste from broken blocks	Re-evaluation of the project to ensure that the design optimizes the use of paving blocks Re-using wasted blocks to fill road potholes or other hollow area
Water	Borehole at the site and NCWSCO water	Input in the construction works for dust suppression and	Excessive consumption in of water Waste water and pollution Conflicts with other water users in the area	Regular maintenance of pipes and taps to fix leakages Maximization on other sources of water such as rainwater harvesting and

	supply	preparation of concrete and aggregate and cleaning		storage in larger tanks
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2.4.5 Cost of proposed project

As provided under section 58 (1) of EMCA, 2015, the project proponent is required to submit an EIA report to the Authority, in the prescribed form, giving the prescribed information and which shall be accompanied by the prescribed fee. The estimated cost of the proposed project will be determined by an evaluation done by a registered quantity surveyor

CHAPTER THREE

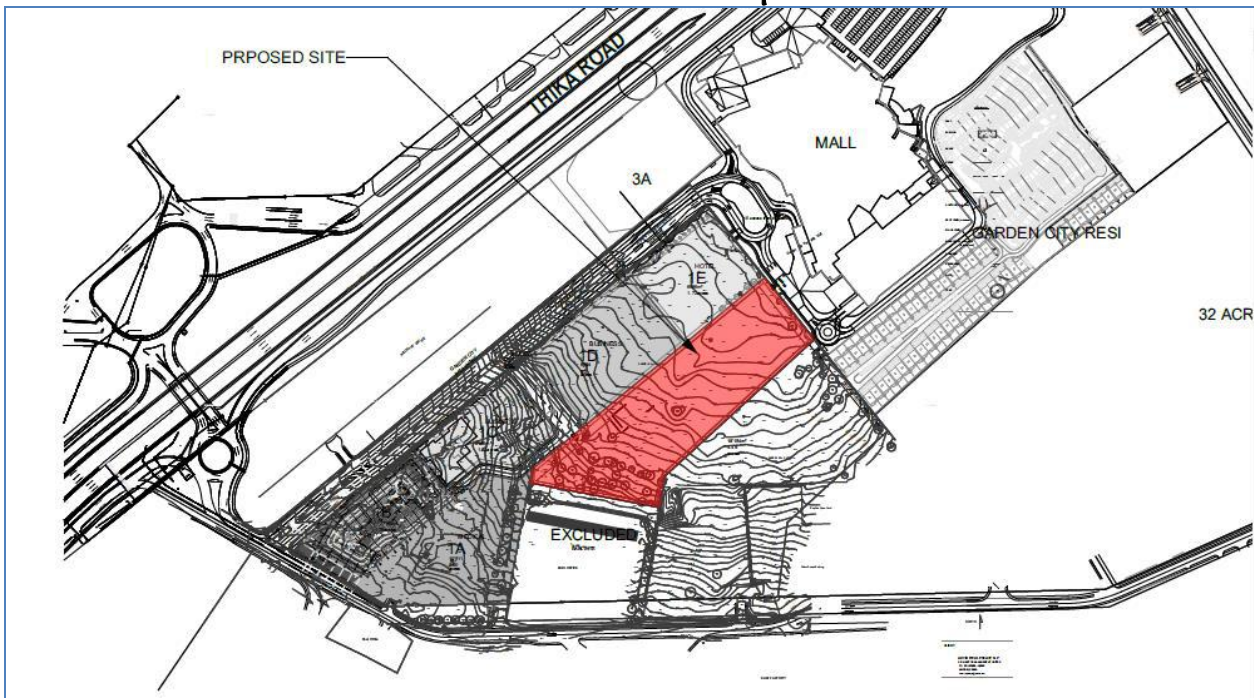
3.0 BASELINE INFORMATION OF THE LOCATION

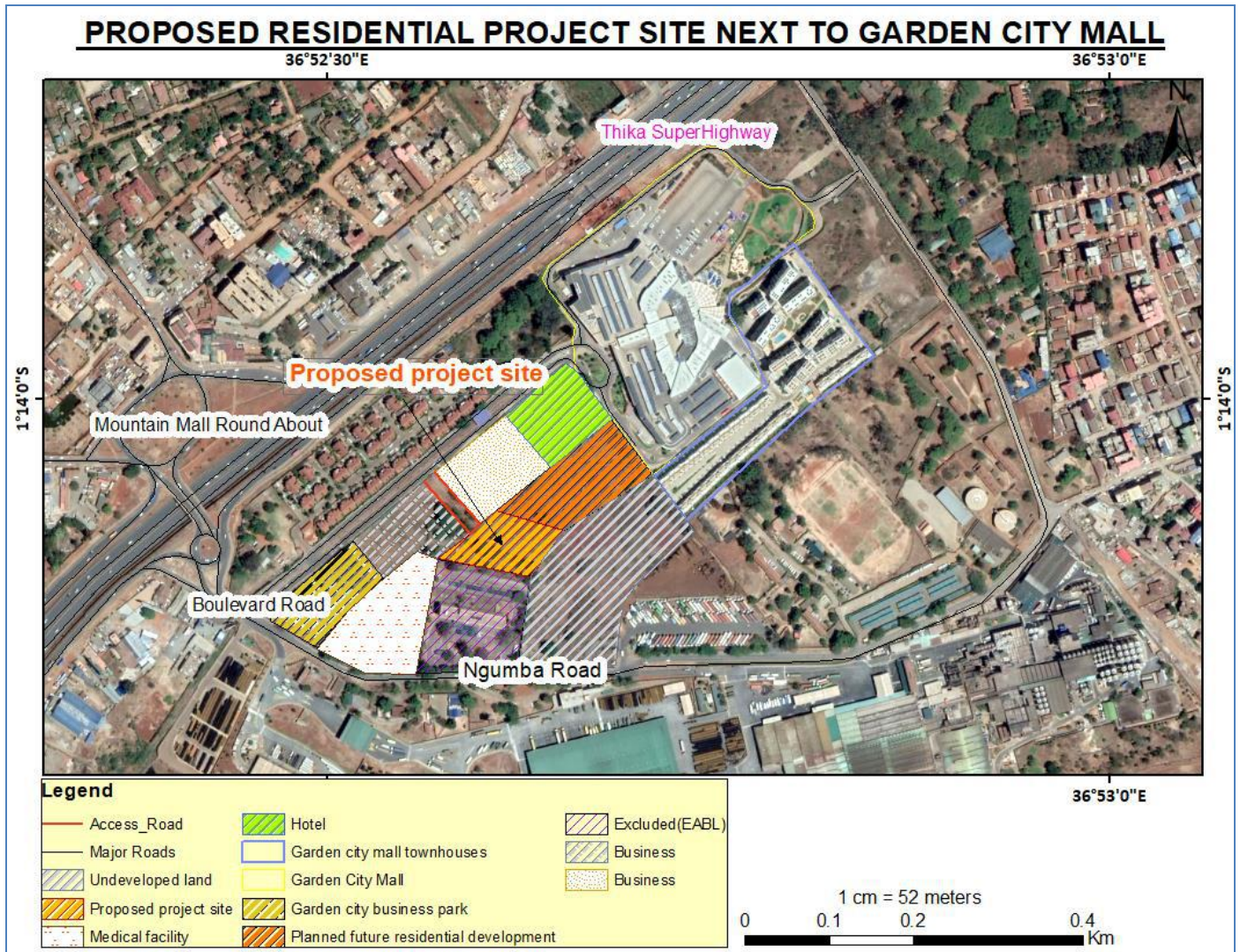
This Section describes the spatial project location, existing climate, water and geological characteristics, biological, socio-economic environment, aesthetics and cultural resources at the proposed project location. The description provides the baseline against which impacts of the project is be determined.

3.0.1 PROJECT LOCATION

The project is located off Thika Super Highway on Plot L.R. No. 10119/4 next to Garden City MALL adjacent to EABL offices, within Kasarani Sub County, Nairobi County. Its located in Map Coordinates **Lat; -1.234847 Long: 36.876860**. The area was analysed spatially using GIS and Remote Sensing tools with all the spatial aspects including the altitude, Soils and geology. It is located in a leased land which measures approximately 15 acres and was sub divided into 10 subplots. The proposed project will occupy one of the subplots. The neighbourhoods i.e. the road infrastructures, Business Park, proposed developments such as Hotel and Conferences and Medical facility were also analysed. See the maps;

Location maps





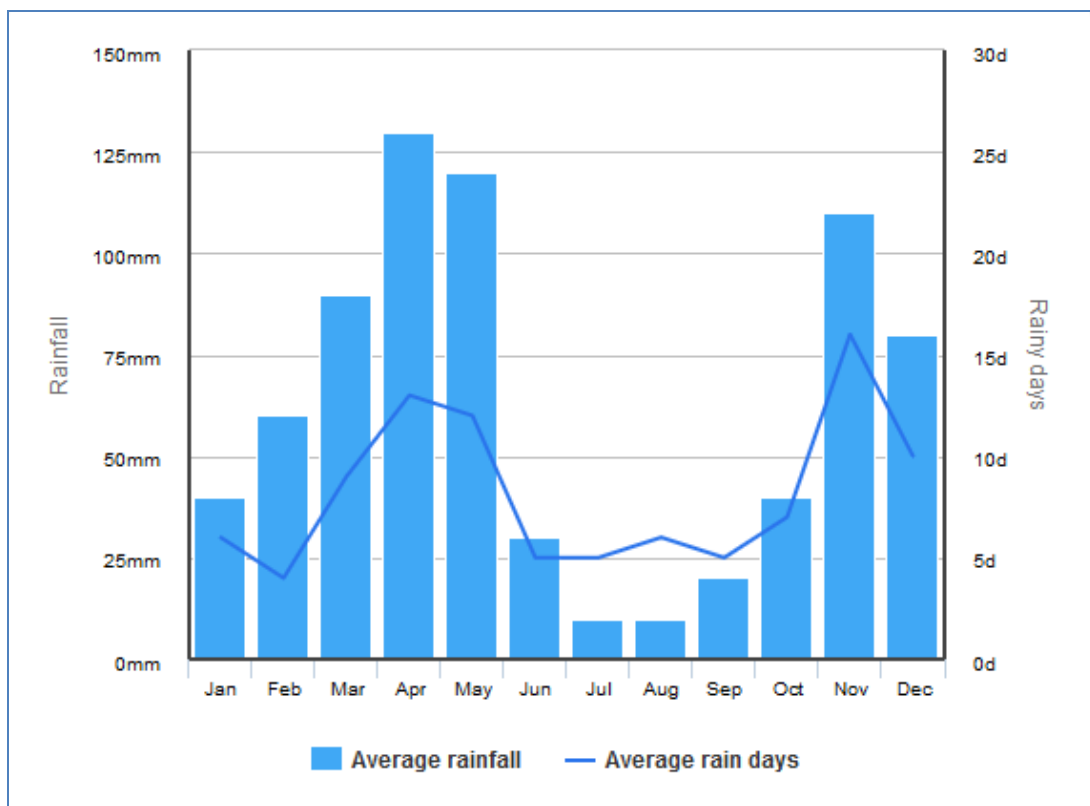
Source: ArcGIS 10.5 Map



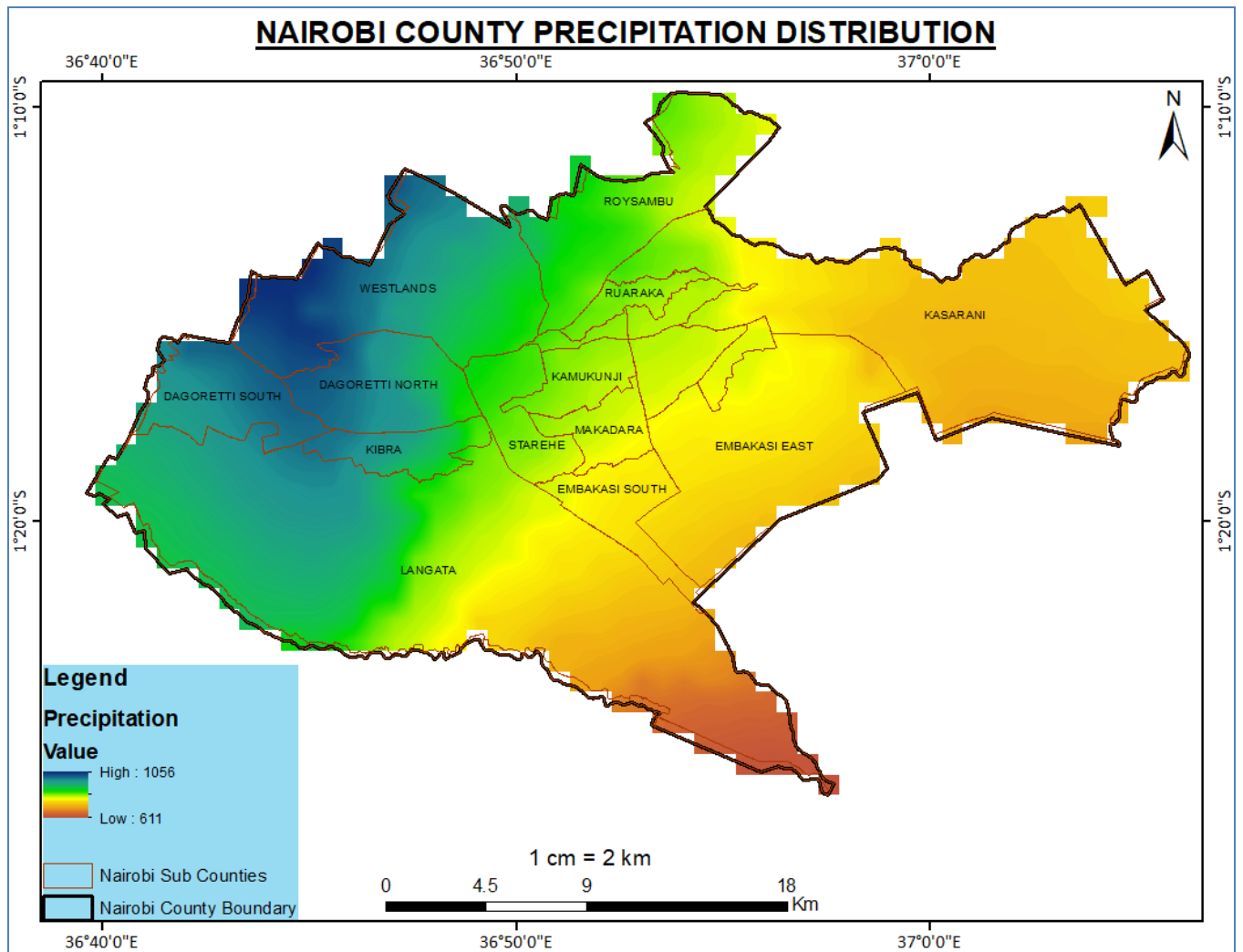
3.1 PHYSICAL ENVIRONMENT

3.1.1 Climate and Meteorology

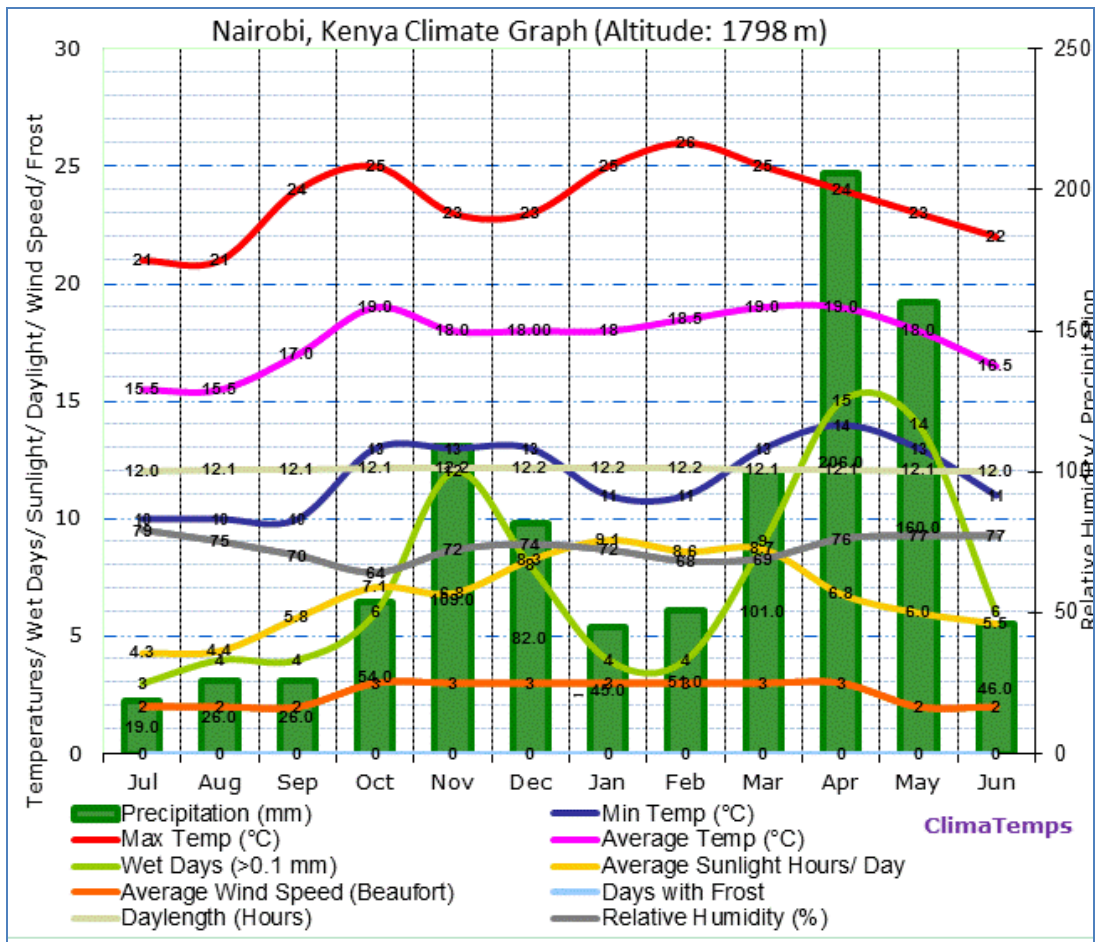
Kasarani Investments Holdings Limited proposed residential units located next to Garden City mall, Kasarani Sub County, Nairobi County. Generally most of Nairobi areas experiences biannual maximum rainfall with peaks realized on March to May and in January to December. No proper rainfall records are kept for the proposed site but about an average of 700 mm per year is experienced around the year in this area. The annual mean minimum and maximum temperature are 15° C and 28° C respectively with the hottest month being January to mid-March and coldest month is July.



Nairobi annual average rainfall



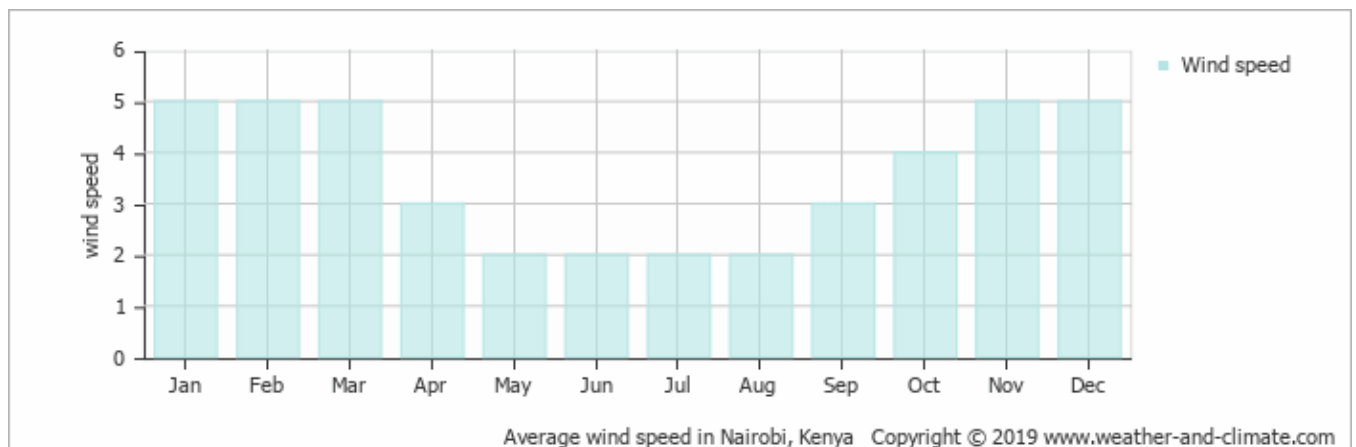
Source: ArcGIS map



Nairobi Climatic Condition graphs

3.1.2 Winds

The wind generally in Nairobi is average and the most wind is seen in January. The least wind is seen in July. The monthly wind speed over the year in Nairobi, Kenya (meters per second).

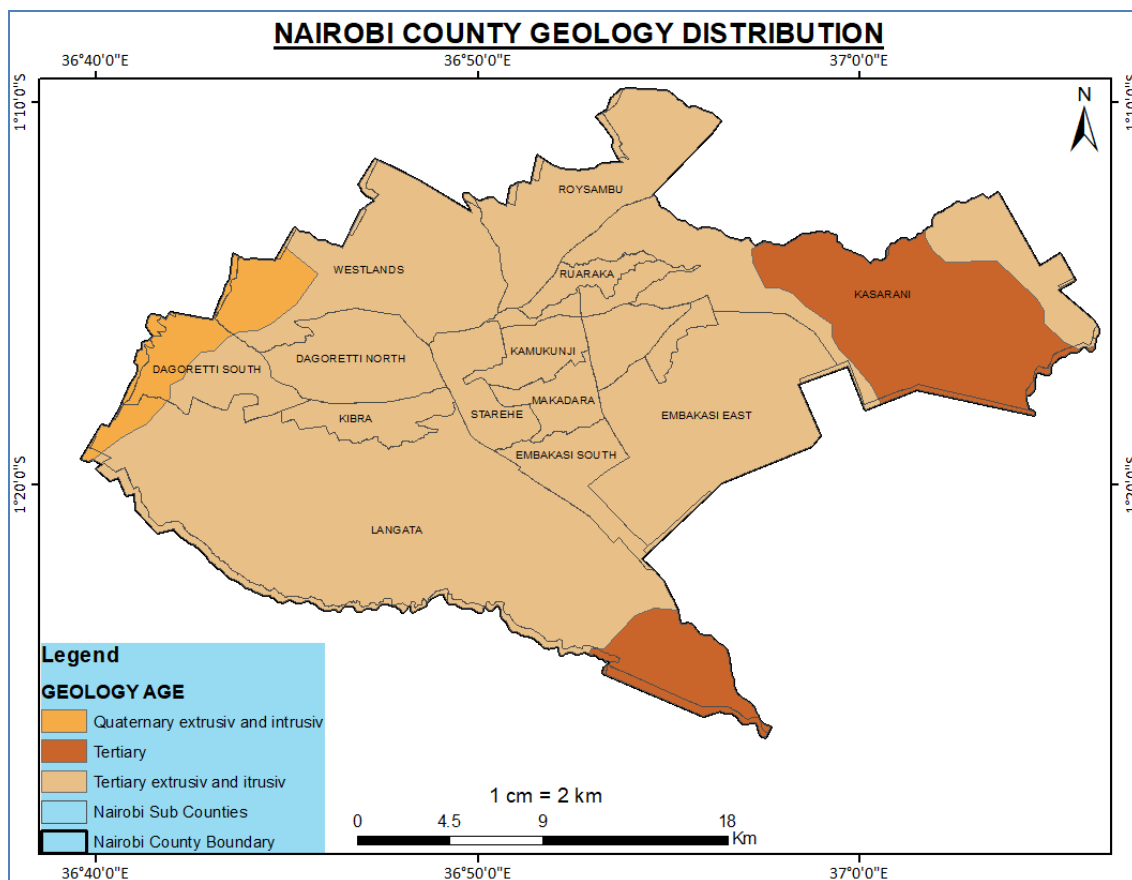


Average wind speed in Nairobi, Kenya Copyright © 2019 www.weather-and-climate.com

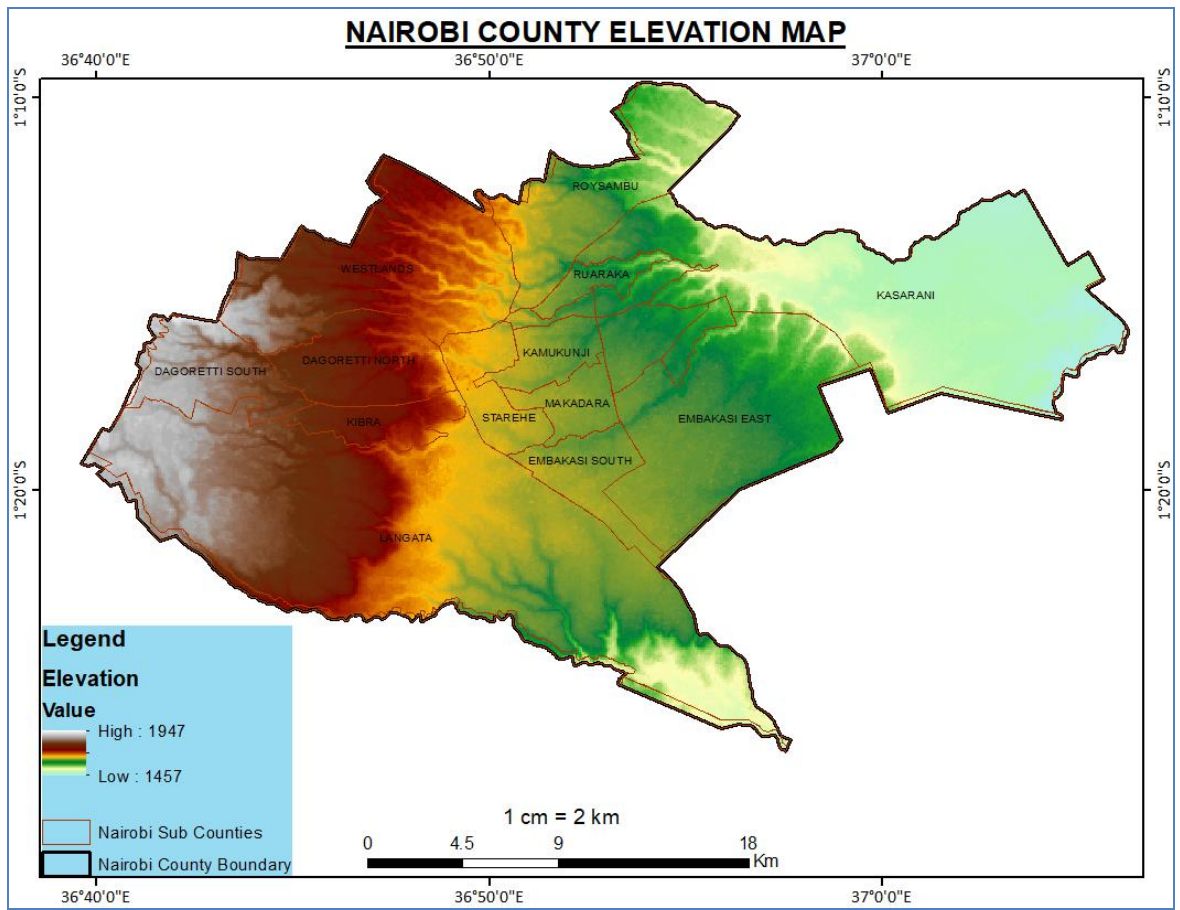
Average wind in Nairobi

3.1.3 Physiographic and Natural Conditions

The plot lies at an altitude of about 1798-m amsl. The Nairobi terrain is generally low. The study area is situated in a flat terrain, which slopes very gently towards the EABL. The surface is covered by red soils, and anthills are noted in the compound. The dominant vegetation in this area is shrubs, grasses and tall trees. The geology of the area is comprehensively described in Saggerson (1991). Exclusively Tertiary volcanic materials overlying folded Precambrian Basement System rocks of the Mozambique Belt cover the project Area. The intense tectonic activity associated with the formation of the Great Rift Valley, led to a series of widespread eruptions and lava flows, which occurred from Mid-Miocene to Upper Pleistocene times. The youngest Tertiary rocks are the Nairobi Phonolites (NP), Nairobi Trachytes, which occur a few metres below the surface at the site. The Upper Athi Series (AS) and Mbagathi Phonolitic Trachytes subsequently underlie these. The thick volcanic sheet is underlain at great depths (probably more than 300 m) by metamorphic rocks of the Basement complex (gneisses and schists) of the Mozambican System.



Source: Processed remote sensed data



Nairobi county terrain

3.2 Ecological Environment

3.2.1 Flora

The site is located within an area with flora such as bushes, grasses and trees. It is also located within a less agricultural productive area where conditions are not much favourable for vegetation but the proponent proposed to develop the area by putting up a residential building. The neighbouring plots to be developed are covered by grass and other vegetation.



Flora in the site

3.2.2 Fauna

There is no fauna in the site to be threatened by the development. The micro organisms in the soils are the ones which might be threatened such as millipede, centipede, earthworms etc. The moles in the area might also be threatened.

3.3 Socio - Economic Environment

The site is well served, with good communication and transport network such as road and telecommunications. Moreover it is located in an area with good road network i.e. is well connected to the main roads networks such as Ngumba Road and Thika superhighway. There is also a developing road to connect the site and the Boulevard road. The site falls in an area that has a conventional sewer system and is intended to be upgraded. Foul water drainage from the project site will be connected to the sewer line. Solid waste management will consist of dustbins stored in cubicles protected from rain and scavenging animals. The waste will then be collected by a private waste management company to be composted, palletised or re-cycled depending on the waste management strategy to be adopted. The proposed project site will be connected Nairobi Water and Sewerage Company (NWSCO) which are quite reliable in the area. The borehole water will be used for water supplementary. Backup storage tanks are going

to be placed on the building to provide emergency water since the area experiences water shortages most of the time and also to serve during temporal water shortage.

The use of roof catchments, to enhance provision of water will also be put into consideration. The design will incorporate standard roof water collection systems for the roof catchments of the buildings. This will include gutters, down pipes and suitable water storage tanks for the harvested rainwater. It will greatly help in minimizing pressure on the existing water supply.

Energy will also be needed during occupation phase (on completion of the project). The power (electricity) is accessible from the neighbourhood development such as Business Park and Garden City Mall. It will just be connected on completion of the proposed project. The need for energy conservation will be emphasized mostly during construction and operation phases.

The area is well covered by communication facilities such as Telkom, Safaricom, Airtel among others. All these will facilitate communication during the implementation and occupation of the project.

3.3.1 Population and Demography

The project site is in a high density residential zone around Kasarani and Rooster areas with an emerging affluent and middle class population. The population is composed of middle and high income calibre residents mostly those living in townhouses and apartments within the place. The living standard of the residing population is usually middle and upper class level. The area is popularly known for businesses.

3.3.2 Land use

Land has aesthetic, cultural and traditional values and is a vital factor of production in the economy. Land in the County is broadly used for Industrialization, businesses, transportation, Housing, tourism and educational centre. The absence of the national land use policy has led to the proliferation of inadequate infrastructure services, congestion environmental degradation, unplanned urban centres leading to Environmental challenges such as water, roads, electricity, in appropriate urban and housing planning, drainage and sewer systems and businesses.

3.4 INFRASTRUCTURE AND SERVICES

3.4.1 Roads and Accessibility

The transport and communication network in the project area is excellent. The project is off the Thika Superhighway, which is a national major highway. The road leading directly into the site will be connected to this highway via Ngumba road and Boulevard road. There a developing road to connect Boulevard and the site. The proponent has liaised with the relevant agency (Kenya National Highways Authority – KENHA) for the improvements of the roundabout in the Mountain mall to help in the area development. *(See in annex)*



Boulevard road connecting the site, Ngumba Road and Garden City Mall



Developing road

3.4.2 Water supply

The main water resource is supplied by the NWSCO. This will form the main source of water both during construction as well as during operation. However, it is important to put into consideration the prevalent water shortage in the country. The proponent has proposed to drill boreholes to supplement the public water supply and avoid increasing pressure on the already strained water supply by the county. In case of any shortage, water may be brought to the site using water bowsers. To take care of any shortages during occupation, the proponent will be expected to install water underground reservoirs as well as storage tanks on the upper floors of the buildings. This is well articulated in the architectural drawings.

3.4.3 Sewer system

The proposed project area is served with a public sewer system and will be upgraded, through which all sewage and wastewater from the project can be disposed. This is because the magnitude of the people in the area utilizing the facilities will rise. Four water drainages from the project site will be connected to the sewer line. This has been properly articulated in the project designs.

3.4.3 Surface Drainage

Most of the rainwater will mainly be absorbed into the soil during construction phase. Appropriate drainage systems have been provided for in the designs and will be put in place to handle the run-off/storm water from the site during operation of the project.

3.4.4 Waste Management

The project proponent and the contractor will develop modalities to ensure safe disposal of the generated solid waste. The adoption of *integrated Solid Waste Management System* will be encouraged during construction and operation phases. In addition, the project's contractor and the proponent will work closely with NEMA for the guidance on the modes and site of the waste disposal.

Some materials may be disposed through the process of incineration. Wastes generated from excavation may be used in back filling of quarry pits. During the operational phase, all wastes will be collected from the site by a licensed contracted waste handler for disposal in the approved dumpsite.

3.4.5 Energy

Construction machinery will require fuel during construction. This will be sourced from legitimate and licensed petroleum dealers. Electrical power will come in handy in driving the selected construction machinery. It will also be needed on operation of the completed project. The power (electricity) will be drawn from the power grid lines running at the frontage of the project site. Standby generators will be available in the ground floor level one which will be used when there are supply interruptions.

3.4.6 Communication

The area is well covered by communication facilities by the main telephone service providers including a Telkom, Safaricom, and Airtel among others. All these will facilitate communication during the implementation and on occupation of the project.

3.4.7 Security

There will be sharing of the gate to the site and the undergoing developing developments such as Business park, medical facilities, hotel and hall conferences. This will be manned 24 hours by

qualified security personnel. The proposed project site will have a masonry perimeter wall served by a single gate. The proponent should also install security lights to beef up security at the site both during construction and the operational phase of the project.

CHAPTER FOUR

4.0 LEGAL, POLICY AND INSTITUTIONAL FRAMEWORK

Everyone has a right to clean and healthy environment. The law has provisions for the establishment of the National Environment Management Authority (NEMA), as the supreme regulatory and advisory body on environmental management in Kenya under EMCA CAP 387. NEMA is charged with the responsibility of coordinating and supervising the various environmental management activities being undertaken by other statutory organs. NEMA also ensures that environmental management is integrated into development policies, programmes, plans and projects. The Environmental Management and Co-ordination Act, CAP 387, and the Environmental (Impact Assessment and Audit) Regulations, 2019 are the legislation governing Environmental Assessments (EIA & EA).

Policies and legislation highlighting the legal and regulatory requirements pertinent for this study are presented below.

4.1 Institutional Framework

4.1.1 National environment management authority (NEMA)

The objective and purpose for which NEMA is established is to exercise general supervisory and co-ordinate over all matters relating to the environment and to be the principal instruments of the government in the implementation of all policies relating to the environment. However, NEMA mandate is designated to work within the following committees:-

a) Provincial and County Environment Committees

According to EMCA, 2015 No. 8, the Ministry by notice in the gazette appoints Provincial and County Environment Committee of the Authority in respect of every province and County respectively. The Provincial and County Environment Committees are responsible for the proper management of the environment within the County in respect of which they are appointed. They are also to perform such additional functions as are prescribed by the Act or as may, from time to time be assigned by the Minister by Notice in the gazette.

b) Public Complaints Committee

The committee performs the following functions:-

- Investigate any allegations or complaints against any person or against the authority in relation to the condition of the environment in Kenya and on its own motion, any suspected case of environmental degradation and to make a report of its 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) and
- To perform such other functions and exercise such powers as may be assigned to it by the Council.

c) National Environment Action Plan Committee

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

- Contain an analysis of the Natural Resources of Kenya with an indication as to any pattern of change in their distribution and quality 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;
- Set out operational guidelines for the planning and management of the environment and natural resources;
- Identify actual or likely problem 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 impacts on the environment, and strategies for the amelioration of their negative impacts.
- 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 and
- Be binding on all persons and all government departments, agencies, state Corporation or other organ of government upon adoption by the national assembly.

d) Standard and Enforcement Review Committee

This is a technical committee responsible for environmental standards formulation methods of analysis, inspection, monitoring and technical advice on necessary mitigation measures.

e) National Environmental Tribunal

This tribunal guides the handling of cases related to environmental offences in the republic of Kenya.

f) National Environment Council (NEC)

EMCA 2015 No. 8 part iii section 4 outlines the establishment of the NEC. NEC is responsible for policy formulation and directions for 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 department, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes.

4.2 Policies

4.2.1 Constitution of Kenya 2010

Article 42 of the Bill of Rights of the Kenyan Constitution provides that „every Kenyan has the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative and other measures“. Under Chapter 5 (land and Environment), Part 1 is devoted to land. It requires that land be used and managed in „a manner that is equitable, efficient, productive and sustainable, and in accordance with the following principles;

- a) Equitable access to land
- b) Security of land rights
- c) Sustainable and productive management of land resources
- d) Transparent and cost effective administration of land
- e) Sound conservation and protection of ecologically sensitive areas.

Part 2 of Chapter 5 of the constitution is dedicated to Environment and Natural Resources. Article 69 in Part 2 provides that the state shall;

I. Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits.

II. Work to achieve and maintain tree cover of at least ten per cent of the land area of Kenya.

III. Encourage public participation in the management of, protection and conservation of the environment.

IV. Protect genetic resources and biological diversity.

V. Establish systems of environmental impact assessment, environmental audit and monitoring of the environment.

VI. Eliminate processes and activities that are likely to endanger the environment.

VII. Utilize the environment and natural resources for the benefit of the people of Kenya.

Further, Article 70 states 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, denied, violated, infringed or threatened, the person may apply to a court for redress. The sub-project should ensure compliance with the constitution in so far as equitable sharing of the resources, between the stakeholders. Further, the project should ensure the sustainability of livelihoods and biological resources within the project areas are protected. Any development proposals should also be cognizant of the increased powers under the Constitution given to communities and individuals to enforce their rights through legal redress.

4.2.2 The Kenya Vision 2030

Kenya Vision 2030 is the current national development blueprint for period 2008 to 2030 and was developed following on the successful implementation of the Economic Recovery Strategy for Wealth and Employment Creation which saw the country's economy back on the path to rapid growth since 2002. GDP growth rose from 0.6% to 7% in 2007, but dropped to between 1.7% and 1.8% in 2008 and 2009 respectively. The objective of the vision 2030 is to transform Kenya into a middle income country with a consistent annual growth of 10 % by the year 2030". The 2030 goal for urban areas is to achieve "a well-housed population living in an environmentally-secure urban environment." This will be achieved by bringing basic

infrastructure and services namely roads, street lights, water and sanitation facilities, storm water drains, footpaths, and others. One of the aims of the vision is to make Kenya to be a nation that has a clean, secure and sustainable environment by 2030. This will be achieved through promoting environmental conservation to better support the economic pillar. Improving pollution and waste management through the application of the right economic incentives in development initiatives is critical. The current land use practices in the country are incongruent with the ecological zones. For instance, large portions of land in high potential areas have been subdivided into uneconomic parcels, while some parts of land in the medium and low potential areas are rapidly being converted into agriculture, despite the fragile environment they are located in.

4.2.3 National Environment Action Plan (NEAP)

According to the Kenya National Environment Action Plan (NEAP, 1994) the Government recognized the negative impacts on ecosystems emanating from economic and social development programmes that disregarded environmental sustainability. In this regard, establishment of appropriate policies and legal guidelines as well as harmonization of the existing ones have been accomplished and/or are in the process of development. Under the NEAP process, EIA was introduced and among the key participants identified were the District Development Committees.

4.2.4 National Policy on Water Resources Management and Development

The National Policy on Water Resources Management and Development (Sessional Paper No. 1 of 1999) was established with an objective to preserve, conserve and protect available water resources and allocate it in a sustainable rational and economic way. It also desires to supply water of good quality and in sufficient quantities to meet the various water needs while ensuring safe disposal of wastewater and environmental protection.

The policy focuses on streamlining provision of water for domestic use, agriculture, livestock development and industrial utilization with a view to realizing the goals of the Millennium Development Goals (MDGs) as well as Vision 2030. To achieve these goals, water supply (through increased household connections and developing other sources) and improved sanitation is required in addition to interventions in capacity building and institutional reforms. While the National Policy on Water Resources Management and Development (1999) enhances

a systematic development of water facilities in all sectors for promotion of the country's socio-economic progress, it also recognizes the byproducts of this process as waste water. It, therefore, calls for development of appropriate sanitation systems to protect people's health and water resources from institutional pollution. Development projects, therefore, should be accompanied by corresponding waste management systems to handle the waste water and other waste emanating there from. The same policy requires that such projects should also undergo comprehensive EIAs that will provide suitable measures to be taken to ensure environmental resources and people's health in the immediate neighborhood and further downstream are not negatively impacted by the emissions. In addition, the policy provides for charging levies on waste water on quantity and quality (similar to polluter-pays-principle) in which case those contaminating water are required to meet the appropriate cost on remediation, though the necessary mechanisms for the implementation of this principle have not been fully established under the relevant Acts. However, the policy provides for establishment of standards to protect the water bodies receiving wastewater, a process that is ongoing.

4.2.5 Sessional Paper No. 6 of 1999 on Environment and Sustainable Development

Among the key objectives of the Sessional Paper No. 6 of 1999 on Environment and Sustainable Development (1993) are;

- a. To ensure that from the onset, all development policies, programmes and projects take environmental considerations into account,
- b. To ensure that an independent environmental impact assessment (EIA) report is prepared for any development before implementation,
- c. To ensure that effluent treatment standards which will conform to acceptable health standards.

Under this paper, broad categories of development issues have been covered that require sustainable approach. These issues include the waste management and human settlement sectors. The policy recommends the need for enhanced reuse/ recycling of residues including wastewater and increased public awareness raising and appreciation of clean environment as well as the participation of stakeholders in the management of wastes within their localities. Regarding human settlement, the paper encourages better planning in both rural and urban areas and

provision of basic needs such as water, drainage and waste disposal facilities among others for decent housing of every family.

4.3 Legal Framework

Applications of national statutes and regulations on environmental conservation suggest that the proponent will have a legal duty and social responsibilities to ensure the proposed project development is carried out without compromising the status of the natural resources in the area, environment resources, social and cultural setting as well as the economic potential of the local communities health and safety. This position enhances the importance of this environmental impact assessment for the proposed site to provide a benchmark for its sustainable operation. The key national laws that govern the management of environmental resources in the country have been briefly discussed below. It is noteworthy that wherever any of the laws contradict each other, the Environmental Management and Co-ordination Act, CAP 387 prevails.

4.3.1 The Environment Management and Co-ordination Act, CAP 387

Part II of the Environment Management & Coordination Act, CAP 387 states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. In order to partly ensure this is achieved, the Act directs that this category of project should undergo environmental impact assessment and a report prepared for submission to the National Environmental Management Authority (NEMA), who in turn may issue a license as appropriate. The second schedule of the same Act lists water programmes and sewage disposal works among the key activities that must undergo environmental assessments. Part VIII section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into aquatic environment. Section 73 require that operators of projects which discharges effluent or other pollutants to submit to NEMA accurate information about the quantity and quality of the effluent. Section 74 demands that all effluent generated from point sources be discharged only into the existing sewerage system upon issuance of prescribed permit from the local authorities or from the licensee. Finally, section 75 requires that parties operating a sewerage system obtain a discharge license from NEMA to discharge any effluent or pollutant into the environment. Section 87 sub-section 1 states that no person shall discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any

person, while section 88 provides for acquiring of a license for generation, transporting or operating waste disposal facility. According to section 89, any person who, at the commencement of this Act, owns or operates a waste disposal site or plant or generate hazardous waste, shall apply to the NEMA for a license. Sections 90 through 100 outline more regulations on management of hazardous and toxic substances including oils, chemicals and pesticides. Finally the environmental impact assessment guidelines require that study 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.

4.3.2 EMCA Regulations

4.3.2.1 The Environmental (Impact Assessment and Audit) Regulations, 2019

These Regulations, made under section 147 of the Environmental Management and Co-ordination Act, contain rules relative to content and procedures of an environmental impact assessment. In the sense of section 58 of the Act, contain rules relative to environmental impact audit and monitoring and strategic environmental assessment and regulate some other matters such as appeal and registration of information regarding environmental impact assessment.

4.3.2.2 Water Quality Management Regulations, 2006 (Legal Notice No. 120)

These regulations were drawn under section 147 of the Environmental Management and Coordination Act, CAP 387. In accordance with the regulations, every person shall refrain from acts that could directly or indirectly cause immediate or subsequent water pollution and no one should throw or cause to flow into water resources any materials such as to contaminate the water. The regulation also provides for protection of springs, streams and other water sources from pollution.

4.3.2.3 Waste Management Regulations, 2006 (Legal Notice No. 121)

The regulations are formed under sections 92 and 147 of the Environmental Management and Coordination Act, CAP 387. Under the regulations, a waste generator is defined as any person

whose activities produces waste while waste management is the administration or operation used in handling, packaging, treatment, conditioning, storage and disposal of waste. The regulations requires a waste generator to collect, segregate and dispose each category of waste in such manners and facilities as provided by relevant authorities. Regarding transportation, licensed persons shall operate transportation vehicles approved by NEMA and will collect waste from designated areas and deliver to designated disposal sites.

4.3.2.4 Noise and Excessive Vibration Pollution Control Regulations, 2009

Part II section 3(1) of these Regulations states that: no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment and section 3(2) states that in determining whether noise is loud, unreasonable, unnecessary or unusual. Part II Section 4 also states that: except as otherwise provided in these Regulations, no person shall (a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations which exceed 0.5 centimeters per second beyond any source property boundary or 30m from any moving source. Part III, Section 11(1) states that any person wishing to (a) operate or repair any machinery, motor vehicle, construction equipment or other equipment, pump, fan, air-conditioning apparatus or similar mechanical device; or (b) engage in any commercial or industrial activity, which is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels prescribed in the First Schedule to these Regulations. Any person who contravenes this Regulation commits an offence. Section 13(1) states that no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations. These purposes include emergencies, those of a domestic nature and /or public utility construction. Section 14 relates to noise, excessive vibrations from construction, demolition, mining or quarrying sites, and states that: where defined work of construction, demolition, mining or quarrying is to be carried out in an area, the Authority may impose requirements on how the work is to be carried out including but not limited to requirements regarding (a) machinery that may be used, and (b) the permitted levels

of noise as stipulated in the Second and Third Schedules to these Regulations. It further states that the relevant lead agency shall ensure that mines and quarries where explosives and machinery used are located in designated areas and not less than two kilometers away from human settlements and any person carrying out construction, demolition, mining or quarrying work shall ensure that the vibration levels do not exceed 0.5 centimeters per second beyond any source property boundary or 30 Metres from any moving source.

4.3.2.5 Air Quality Regulations

Under the general prohibitions (Part II), section 5 states that no person shall act in a way that directly or indirectly causes immediate or subsequent air pollution. Among the prohibitions are priority air pollutants (as listed under schedule 2 of the regulations) that include general pollutants, mobile sources and greenhouse gases.

Odors are also prohibited under section 9 of the regulations (offensive emissions). Emissions into controlled areas such as schools, hospitals, residential areas and populated urban centers are also prohibited. Part VII on occupational air quality limits in section 29 states that an occupier of premises shall ensure that exposure of indoor air pollutants does not exceed the limits stipulated under the Factories and Other Places of Work rules or under any other law. Other sources are recognized at sections 32 and 33 are those arising from construction equipment and materials as well as particulate matter from demolitions of structures and buildings as well as stockpiled dry materials.

4.3.2.6 Biodiversity Regulations

Part II of Regulations, section 4 states that no person shall engage in any activity that may have adverse impacts on ecosystems, lead to introduction of exotic species or lead to unsustainable use of natural resources without an EIA license. The regulation puts in place measures to control and regulate access and utilization of biological diversity that include among others banning and restricting access to threatened species for regeneration purposes. It also provides for protection of land, sea, lake or river declared to be a protected natural environmental system in accordance to section 54 of EMCA, CAP 387.

4.3.3 The Water Act, 2016

The purpose of this Act is to provide for the regulation, management and development of water resources and water and sewerage services in line with the Constitution. It provides for the established the Water Resources Authority. The Cabinet Secretary, the Water Resources Authority, the Regulatory Board, county governments and any person administering or applying this Act shall be guided by the principles and values set out in Articles 10, 43, 60 and 232 of the Constitution. It states that every water resource is vested in and held by the national government in trust for the people of Kenya. The Water Resources Authority established shall serve as an agent of the national government and regulate the management and use of water resources. Upon the commencement of this Act, no conveyance, lease or other instrument shall convey, assure, demise, transfer or vest in any person any property, rig

4.3.4 County Governments Act, 2012

This is an Act of Parliament to give effect to Chapter Eleven of the Constitution; to provide for county governments powers, functions and responsibilities to deliver services and for connected purposes and shall come into operation upon the final announcement of the results of the first elections under the Constitution. It states that a county government shall be responsible for any function assigned to it under the Constitution or by an Act of Parliament. Under this Act, a county government shall be responsible for:

- a) County legislation in accordance with Article 185 of the Constitution;
- b) Exercising executive functions in accordance with Article 183 of the Constitution;
- c) Functions provided for in Article 186 and assigned in the Fourth Schedule of the Constitution;
- d) Any other function that may be transferred to county governments from the national government under Article 187 of the Constitution;
- e) Any functions agreed upon with other county governments under Article 189 (2) of the Constitution; and
- f) Establishment and staffing of its public service as contemplated under Article 235 of the Constitution.

Under this act the objectives of county planning shall be to:

- a) Ensure harmony between national, county and sub-county spatial planning requirements;

- b) Facilitate the development of a well-balanced system of settlements and ensure productive use of scarce land, water and other resources for economic, social, ecological and other functions across a county;
- c) Maintain a viable system of green and open spaces for a functioning eco-system;
- d) Harmonize the development of county communication system, infrastructure and related services;
- e) Develop urban and rural areas as integrated areas of economic and social activity;
- f) Provide the preconditions for integrating under-developed and marginalized areas to bring them to the level generally enjoyed by the rest of the county;
- g) Protect the historical and cultural heritage, artifacts and sites within the county; and
- h) Make reservations for public security and other critical national infrastructure and other utilities and services;
- i) Work towards the achievement and maintenance of a tree cover of at least ten per cent of the land area of Kenya as provided in Article 69 of the Constitution; and
- j) Develop the human resource capacity of the county.

4.3.5 Land Act, 2012.

This is Act of Parliament to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land based resources, and for connected purposes. This Act shall apply to all land declared as:

- a) Public land under Article 62 of the Constitution;
- b) Private land under Article 64 of the Constitution; and
- c) Community land under Article 63 of the Constitution and any other written law relating to community land.

4.3.6 Health Act, 2017

This is an Act of Parliament to establish a unified health system, to coordinate the inter-relationship between the national government and county government health systems, to provide for regulation of health care service and health care service providers, health products and health technologies and for connected purposes, interest or privilege in respect of any

water resource except as may be prescribed under this Act. Section 68 (2) states that the national health system shall ensure that measures for managing environmental risk factors to curtail occurrence and distribution of diseases are put in place and implemented. In particular such measures shall target factors like the reduction of disease burden arising from poor environmental hygiene, sanitation, occupational exposure and environmental pollution; among other factors stated in the Act. Section 69 (1) states that Pursuant to meeting the objects set out in section 68, the national government department of health shall formulate national strategic and operation policies that shall provide for measures that include ensuring houses, institutions, hospitals and other public places maintain environment to the highest level of sanitation attainable to prevent, reduce or eliminate environmental health risks among other factors stated in the Act.

4.3.7 The Forest Act, 2005

The Forest Act No7 of 2005 consolidates all forests under the act, and prescribes heavy penalties for damage to forests and trees. Charcoal burning in a forests or farmlands without a license or permit is an offence. Section 52(1) deals with felling, cutting, burning, injuring or removing of any forest produce only cover state, local authority or provisional forest. It sets heavy penalties for damaging trees. This will assist farmers in maximizing benefits from growing trees. Section 40(1) of the act sets to ensure that the forest areas under her management are maintained for biodiversity, cultural or recreational use. In addition it protects the concession area from destruction and encroachment by other persons. Section 41(1) says that all indigenous forests and woodlands shall be managed on a sustainable basis for purposes of, Conservation of water, soil and biodiversity, River line and shoreline protection. The Act puts emphasis on the need to strengthen community-based institutions by creation of Community Forest Associations, which gives the public a greater participatory role to the community in the forest conservation.

4.3.8 Physical Planning Act

It is a requirement under the Physical planning act that such a project be subjected to the local county government policy requirements as regards to waste water disposal, proximity to the sewer lines etc. Section 24 of the Physical Planning Act gives provision for the development of local physical development plan for guiding and coordinating development of infrastructure facilities and services within the area of authority of a city, municipal, town or urban council or

with reference to any trading or marketing center and for specific control of the use and development of land. The plan shows the manner in which the land in the area may be used. Section 29 of the physical Planning Act gives the county councils power to prohibit and control the use of land, building, and subdivision of land, in the interest of proper and orderly development of its area. The same section also allows them to approve all development applications and grant development permissions as well as to ensure the proper execution and implications of approved physical development plans. On zoning, the act empowers them to formulate by-laws in respect of use and density of development. Section 30 states that any person who carries out development within an area of a local authority without development permission shall be guilty of an offence and the development shall be invalid. The act also gives the local authority power to compel the developer to restore the land on which such development has taken place to its original conditions within a period of ninety days. If no action is taken, then the council will restore the land and recover the cost incurred thereto from the developer.

In addition, the same section also states that no person shall carry out development within the area of a local authority without development permission granted by the local authority. At the same time, sub-section 5, re-enforce it further that, no licensing authority shall grant under any written law, a license for commercial use for which no development permission had been granted by the respective local authority. Section 36 states that if in connection with development application a local authority is of the opinion that, the proposed activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an Environmental Impact Assessment report. The environmental impact assessment report must be approved by the National Environmental Management Authority (NEMA) and followed by annual environmental audits as spelled out by EMCA, CAP 387. Section 38 states that if the local authority finds out that the development activity is not complying to all laid down regulations, the local authority may serve an enforcement notice specifying the conditions of the development permissions alleged to have been contravened and compel the developer to restore the land to its original conditions.

4.3.9 Occupational safety and health Act, 2007 OSHA

This is an act of parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces. This Act applies to all workplaces where any person is at work, whether temporary or permanently. Part II (1) states that; every occupier shall ensure the safety, health and welfare at work of all persons in his workplace. Part II (2) (a) provides the duties of an occupier as; arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances. Part V of the Act states that before any person occupies or uses any premises as a workplace, he shall apply for the registration of the premises by sending to the Director a written notice containing the particulars set out in the Fourth Schedule. The Act further states that; every workplace shall be kept in clean state, and free from effluvia arising from any drain, sanitary convenience or nuisance.

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. An occupier shall ensure that effective and sustainable provision is made for securing and maintaining, by the circulation of fresh air in each workroom, adequate ventilation of the room. 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. Sufficient and suitable sanitary conveniences for the persons employed in the workplace shall be provided, maintained and kept clean, and effective provision shall be lighting the conveniences; and, where persons of both sexes are or are intended to be employed (except in the case of workplaces where the only persons employed are members of the family dwelling there), such conveniences shall afford proper accommodation for persons of each sex. Other important provisions in the act include:

a) Registration of workplaces

Before any person occupies or uses any premise as a workplace, he shall apply for the registration of the premises by sending to the Director a written notice containing the particulars set out in the Fourth Schedule. All workplaces which were registered under the Factories and Other Places of Work Act (now repealed) shall be deemed to have been registered under this Act.

b) Cleanliness

Each 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.

c) Lighting

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 this workplace in which persons are working or passing. 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 of windows and skylights for the purpose of mitigating heat or glare. An occupier who contravenes the provisions of this commits an offence.

d) Sanitary convenience

Sufficient and suitable conveniences for the persons employed in the workplace shall be provided, maintained and kept clean, and effective provision shall be made for the lighting the conveniences; and where persons of both sexes are or are intended to be employed (except in the case of workplaces where the only persons employed are members of the same family dwelling there) such convenience shall afford proper separate accommodation for persons of each sex.

e) Ventilation

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.

f) Overcrowding

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 free spacer and , having regard to the nature of the work, an adequate amount of air for each employee, the minimum permissible being cubic metres per person.

g) Drainage of floors

Where any process is carried on which renders the floor liable to be wet to such an extent that the wet is capable of being removed by drainage, effective means shall be provided and maintained for draining off the wet.

4.3.10 Way-leaves Act (Cap. 192)

According to the Way-leaves Act Cap. 292, Section 2, private land does not include any land sold or leased under any act dealing with government lands. Section 3 of the act states that the government may carry any sewer, drain or pipeline into, through, over or under any lands whatsoever, but may not in so doing interfere with any existing building.

Section 8 further states that any person who, without the consent of the Permanent Secretary to the Ministry responsible for works (which consent shall not be unreasonably withheld), causes any building to be newly erected over any sewer, drain or pipeline or on property of the government shall be guilty of an offence and liable to a fine of one hundred and fifty Kenya shillings, and a further fine of sixty shillings for every day during which the offence is continued after written notice in that behalf from the Permanent Secretary; and the Permanent Secretary may cause any building erected in contravention of this section to be altered, demolished or otherwise dealt with as he may think fit, and recover any expense incurred by the government in so doing from the offender.

4.4 The International Framework

This EIA is based on internationally accepted and respected procedure recommended by the international standards organization (ISO 9001) which provides for the relevant sectoral guidelines. This EIA is intended to meet the expectation of international supporters through the government of Kenya. Kenya is a signatory to some international legislation. Some of these are relevant to this project and were reviewed for the purpose of writing this report.

4.4.1 The World Commission on Environment and Development

The commission commonly referred to as 'the Brundtland Commission focuses on the environmental aspects of development, in particular, the emphasis on suitable development that produces no lasting damage to biosphere and to particular ecosystem. In addition, environmental sustainability is the economic and social sustainability. Economic sustainability development is development for which progress towards environment and social sustainability occurs within available financial resources. Social sustainable development maintains the cohesion of a society and its ability to help its members work together to achieve common goals ,while at the same time meeting individual needs for health and well-being , adequate nutrition, and shelter, cultural expression and political involvement.

4.4.2 The Rio Declaration on Environment and Development

Agenda 21-a Programme of action for sustainable development worldwide in the Rio Declaration on Environment and Development was adopted by more than 178 government at the united nations conference on environment development (UNICED), known as the earth summit, held in Rio de Janeiro, Brazil from 3rd to 14th June 1992. Kenya is a third world country and therefore its plans falls into the agenda 21 whereby the government, local authorities, donors and other stakeholders have committed large amounts of resources to facilitate sustainable developments. Principle no. 10 of the declaration underscored that environment issues are best handled with participation of all concerned citizens at all concerned citizens at all relevant levels. At the national level, each individual shall have appropriate access to information that is concerning environment that is held by public authorities. The states shall encourage and facilitate public participation by making information widely available

4.5 Compliance with Existing Legislation

By carrying out this Environmental Impact Assessment, the proponent has already complied with the Environmental Management and Coordination (amendment) Act, 2015 (EMCA) and the Environmental Management and Co-ordination (Water quality) Regulations which require that an EIA must be carried out for a project of such magnitude.

The project proponents have also applied for authorization permit from the Water Resources Management Authority (WRMA) in fulfillment of the Water Act and Physical Planning Act and has agreed to dump the waste in NEMA approved sites in regards to the Public Health Act, Local Government Act and the Councils By-Laws.

The project proponent will observe strict adherence to the provisions of the various Acts and regulations cited above in order to avoid any non-compliance/conflicts and assure sustainability, both in the implementation and operational phases of the project.

CHAPTER FIVE

5.0 PREDICTED ENVIRONMENTAL, HEALTH AND SOCIAL-ECONOMIC IMPACTS

5.1 EXISTING IMPACTS

There were no notable negative environmental impacts on site, at the time of assessment. There were no observable adverse impacts from the developing infrastructures. The neighbouring developing sites were enclosed by dust nets and much health and safety measures were taken into consideration.

5.2 ANTICIPATED IMPACTS

Impacts can be positive or negative, direct or indirect. The magnitude of each impact is described in terms of being significant, minor or negligible, temporary or permanent, long-term or short-term, specific (localized) or widespread, reversible or irreversible. Some impact mitigation has already been addressed in the proactive design and other mitigations can only be guaranteed through active, responsible management, helped by following the guidelines in the project Environmental Management Plan.

These qualities are indicated in the assessment tables as follows:

Table 1: Impacts assessment scale

Key	Type of Impact	Key	Type of Impact
++	Major positive impact	+	Minor positive impact
--	Major negative impact	-	Minor negative impact
0	Negligible/ zero impact	NC	No change
Sp	Specific/ localized	w	Widespread
R	Reversible	ir	Irreversible
Sh	Short term	L	Long term
T	Temporary	p	Permanent

On the basis of information gathered during the field study, potential environmental impacts of the project are tabulated below.

Table 2: Anticipated Environmental Impacts

Impacts on or due to the implementation of the project.	Construction	Occupation	Remarks
Changes in hydrology	-/0	0	No major effect to the hydrology of the area. There will be no obstruction to the flow of both surface and ground water resources, which is so because the soil in the area is not predominated with clay hence presence of surface and ground water is not notable. Water conservation measures will however be required on operation of the project to minimise water usage.
Pollution: Air/ dust Noise	- t ir - t ir	-/0 -	During construction: dust and exhaust emissions from involved machinery will affect air quality; construction activities, hooting of the involved vehicles and workers will generate noise and (vibration) which may have effect to the immediate neighbourhoods.
Site drainage	-/0	+/0	Run-off will result from the increased impervious surfaces of the proposed project. Due consideration should be taken on the surface drainage systems of the entire project and roof catchments installed.
Soil erosion	- L sp	0	Earthworks during construction will have an impact on soil erosion. During operation phase, soil erosion will not be a problem. Incorporating appropriate soil conservation measures and proper drainage facilities during construction would mitigate the impacts.
Water resources	- sh	+	Water for construction purposes will be obtained from existing NWSCO water pipe lines. To take care of any shortages, the proponent will be expected to install water reservoirs on the roof of the building.
Vegetation/ Flora	- L, sp ir	+	There is no significant vegetation on site Landscaping will be done within the site to improve site appearance. During operation, any impact on vegetation/ flora will be negligible.
Health and	- t ir	NC	During construction, increased dust, noise and air pollution

Proposed two blocks residential units development on plot L.R No. 10119/4 Garden City Mall, Kasarani Sub County.

Safety			<p>levels could impact on health and safety, particularly in the direct impact zone.</p> <p>During the operation of the project no major health and safety effects will be expected.</p>
Disturbance of the public	- t ir sp	-	<p>Disturbance to the public/neighbours would occur due to noise and dust during construction and traffic movement. This will be minimal since the developing works undergoing are regulated and less noise is observed.</p> <p>After construction, noise levels compared to the current situation will be negligible.</p>
Visual intrusion	- t/p	+/- p	<p>During construction, visual intrusion is attributed to construction works including construction traffic.</p> <p>After construction of the project, the situation will be permanent. In line with this, the proposed project should be blend in a way to merge with the existing environment and approvals by the local council.</p> <p>Visual impacts can be mitigated through controlling the operating hours of construction traffic, clearing debris after construction and landscaping the site.</p>
Construction materials	-	0	<p>Building stones, sand and ballast will be required for the construction of the project. Other materials will include steel, cement, timber, plumbing materials etc. All these should be sourced from credible commercial suppliers who are sensitive to the general environment.</p> <p>Undesirable, hazardous or unauthorized materials will not be used</p>
Construction waste	- sh sp	0	<p>Construction waste will be minimal. Proper disposal of wastes generated is necessary; the waste should be disposed into the approved dumpsites, by licensed waste handlers.</p>
Clean on completion	- sp	0	<p>The contractor should ensure that when works are completed, the site is left clean and tidy.</p>
Positive impacts	++, t	++, L	<p>Construction activities will create jobs for skilled and non-skilled workers.</p> <p>Job opportunities for skilled and non-skilled personnel during operation phase i.e. more engineers, masons and technicians and others who will be working on the project</p>

5.2 .1 Direct and Indirect Effects

Employment and Income

The facility will create employment opportunities both during construction and operation phases, thus generating wealth and livelihoods. Besides the direct employment, other forms of

employment are likely to result from the multiplier effects, such as increased urbanization, local markets for providing goods and services during both the implementation and operational phases. Source of revenue through the payment of taxes and levy.

Impacts of Construction Activities

During the construction phase, sources of negative environmental impacts will emanate from the site preparation activities including excavation of soils, and other geological formations, levelling of landscape and the subsequent construction activities.

The above activities will have varying negative impacts on the biophysical environment. Immediate negative impacts will include the subsequent disturbance of the exposed topsoil, which could lead to soil erosion and siltation. The combined effect of site preparation and construction activities on the site can lead to potential soil erosion problems. Development on the transformed site may lead to continued soil loss especially during construction period when the ground is exposed. Soil wash out by the rains can lead to considerable ecological consequences. This is however not expected at the site.

In addition, there may be negative impacts related to visual intrusion, pollution, and negative socio-economic effects (including safety and health hazards) among other negative impacts if safe construction procedures are not followed.

5.2.2 Economic effects: Short-Term and Long –Term Effects

Utility of the site

The proposed development shall increase the value of the plot in which the project will be situated because it will entail construction of the operation space for the plot and hence exercising the full value of the area. The development will help in optimal growth due to the other proposed project in the neighbourhood such as medical facility, hotel and conferences halls and income apartments. The presence of Garden City mall and the developing infrastructure will also help in the urban growth of the area.

5.2.3 Products, By-Products and Waste generated by the Project

Products, By-products and Waste generated during Project Construction

During the construction phase of the project, it is envisaged that the following products, by-products and waste will be generated:

- Dust emissions arising from excavation works of the proposed project site as well as emissions arising out of various construction activities, for example, VOCs from construction machinery and equipment,
- Timber, polythene sheeting and nails arising from the formwork that will be used to contain various concreting activities, empty cement bags, wet gunny bags (used for curing concrete) etc.
- Fugitive oil spills arising out of improperly serviced trucks and construction equipment.
- Human effluent emanating from construction workers on the proposed site.

Products, By-Products and Waste generated during Operations.

Once the site is operational; products, by-products and waste generated shall mainly be household wastes that will be produced from the operations of the various houses. Approved waste handlers will be collecting the household wastes regularly for appropriate disposal in the approved dumpsites.

CHAPTER SIX

6.0 ISSUES OF CONCERN AND MITIGATION MEASURES

This part includes impacts during implementation/construction phase, operation phase and decommissioning phase on the following issues: *soil degradation; air quality; noise; oil wastes; water resources; solid and liquid waste management; drainage, terrestrial ecology, visual and landscape; traffic; public comfort; occupational health and safety (OHS); and energy*. Most of these key issues were identified during the scoping exercise and are clearly elaborated as follow:

6.1 Noise and Vibration

Noise is unwanted/undesirable sound that can affect job performance, safety, and health. Psychological effects of noise include annoyance and disruption of concentration. Physical effects include loss of hearing, pain, nausea, and interference with communications when the exposure is severe.

Relatively high noise levels are expected in the area during the construction phase. Noise control measures should be implemented in the construction area if the noise levels exceed 90dB (A) for a continuous 8 hours exposure as per the requirements of the Noise Prevention Control and Prevention Rules, 2005 a subsidiary legislation to the Occupational Safety & Health Act, 2007. In addition, protection against the effect of the noise exposure among the workers should be effected.

The noise produced by the construction works may be a nuisance to the neighbours. This will however not have serious effects as the construction works will be done during the day when most of the neighbours are not in their houses.

Potential Mitigation Measures

- Construction work should be carried out during the specified time i.e. from 0730 hrs. to 1700hrs; noise generated during the day is not quite disturbing as compared to it being generated at night hours

- Sensitize construction vehicles' drivers and machinery operators to switch off engines of vehicles when not in use.
- Workers should be provided with relevant Personal Protective Equipment (PPE)/ materials such as earmuffs and earplugs; when operating noisy machinery and when in noisy environment. These provide a physical barrier that reduces inner ear noise levels and prevent hearing loss from occurring
- Installing Suppressors or silencers (acoustic cladding) on equipment or noise shields; for instance, corrugated iron sheet structures should be put around the proposed project site (acoustic fencing).
- Machinery should be maintained regularly to reduce noise resulting from friction.
- Provision of billboards and signboards at the construction site notifying of the construction activity and timings.
- Manual labour is recommended in the construction phase where applicable, to reduce the noise emitted by construction machinery.

6.2 Soil Erosion

Soil movement is common in construction projects. This mostly happens during the laying of foundations (earthworks) for the projects and site clearing. Most top loose material is excavated and transported elsewhere. There will be some soil disturbance which would expose and set the soils loose to the agents of soil erosion. The excavated soil may be used for backfilling of quarry pits. Comprehensive soil erosion measures are thus important during the construction and operation phases:

Potential Mitigation Measures

- Provision of soil conservation structures on erosion prone areas to control occurrence of soil movement.
- Avoid unnecessary movement of soil materials from the site.
- Good management of the runoff/storm water to reduce its impact on loose soil
- Control construction activities especially during rainy / wet conditions
- Landscaping: Re-surface open areas on completion of the project and introduce appropriate vegetation where applicable.
- Provide appropriate drainage systems to manage surface runoff.

6.3 Increased Water Demand

Water is a universal resource and whose demand in the urban areas is high. The increase in demand for water will occur during the construction phase as well as during operation since some of the activities will require use of large quantities of water. The area is served with public water supply networks, from Nairobi Water and Sewerage Company government. In addition the proponent has proposed to drill boreholes to supplement the county water supply. This will form the main source of water during both the construction and operation phases of the project.

Potential Mitigation Measures

- Encourage water reuse/recycling mostly during construction phase and for the long run during occupation phase.
- Ensure additional water conservation measures including rain water harvesting, storage, and reuse/recycling.
- Provide notices and information signs i.e. *'keep/leave the tap closed'*, etc. This will awaken the civic consciousness with regard to water usage and management.
- Install water-conserving taps that turn-off automatically when water is not in use.

6.4 Air Quality

The construction activities on the site will result to increased dust and gaseous pollutants emissions. Construction machinery and trucks generate hazardous exhaust fumes such as Carbon Oxides (CO_x), Sulphur Oxides (SO_x), Nitrogen Oxides (NO_x) and Volatile Organic compounds (VOCs). Particulate matter (dust) would be generated by such activities as concrete mixing, grading, excavation and the movement of construction vehicles. It is not possible to accurately estimate the particulate concentration that might occur at the site because it is dependent on meteorological conditions and soil moisture.

Vehicular/ equipment engine exhaust emissions and particulate matter generation will be temporary during construction. The project will generate significant vehicle trips to the area, especially private cars, during project occupation phase. Therefore, it is expected to have a minor incremental/cumulative impact locally and regionally.

Potential Mitigation Measures

- Provide Personal Protective Equipment (PPEs) such as nose masks, goggles, overalls etc. to the affected workers on site during construction phase
- Regular and prompt maintenance of construction machinery and equipment. This will minimize generation of noxious gases and other suspended particulate matter
- Control over areas with exposed soil surfaces. Such areas should be regularly cleaned or sprinkled with water, preferably twice each day during dry weather to reduce dust generation. The areas can be enclosed to mitigate effects of wind blowing the loose soil and hence dust generation.
- Vehicle speeds in the construction area will be limited to minimize dust generation in the area.
- Discourage idling of vehicles i.e. vehicle and equipment will be turned off when not in direct use to reduce exhaust emissions.
- The management will sensitize the employees on sound environmental management
- Workers should be trained to understand the hazards that may be generated in such work environments

6.5 Oil Leaks and Spills

Oil/grease spills are noted to be prevalent in construction sites; and in most areas that make use of petroleum products. Such products contain detrimental elements to the environment since they contain traces of heavy metals such as mercury, lead and sulphur among others. 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.

Potential Mitigation Measures

- All construction machinery should be keenly observed not to leak oils on the ground. This can be done through regular maintenance of the machinery.
- Any maintenance work should be carried out in a designated area (protected service bays) and where oils spills are completely restrained from reaching the ground. Such areas should be covered to avoid storm water from carrying away oils into the soil.

- Car wash areas and other places handling oil activities within the site should be well managed and the drains from these areas controlled. Oil interceptors should be installed along the drainage channels leading from such areas.
- Develop a spill prevention and control plan to counter and manage emergencies that may occur/arise in the event of accidental spills

6.6 Solid waste

Huge quantities of solid wastes are normally generated from construction activities. Such wastes include stones, wood, broken glasses, containers, rods of metal, pieces of iron sheets etc. There is need for proper management (proper disposal) of the solid wastes expected from the site during construction phase. However, during operation by-products and waste generated shall mainly be household wastes. The proponent will be expected to design and institute appropriate measures for the collection and disposal of the various wastes produced by their operations.

Potential Mitigation Measures

- The contractor or proponent should work hand in hand with private refuse handlers, NEMA and the Nairobi County Government to facilitate sound waste handling and disposal from site.
- All solid wastes should be taken for disposal to the approved dumpsites and by licenced waste handlers.
- The wastes should be properly segregated and separated to encourage recycling of some useful waste materials i.e. some demolished and excavated materials will be used as backfills.
- Proper dustbins should be provided and the occupiers of the various houses should make arrangements on proper disposal of wastes during operation.

6.7 Ecological impacts

The proposed site is covered by grass and vegetations. The region is relatively dry hence limited vegetation growth is supported and one has to plant and water the vegetation to promote their growth. The proponent intends to clear this grass to create room for the development. It is

however prudent to consider introduction of vegetation (landscaping plants) on site as part of environmental conservation initiative during the operation phase.

Potential Mitigation Measures

- Landscaping: After completion of the project the proponent will rehabilitate the land by planting trees and ornamental flowers on the disturbed areas.
- Project construction will disturb as little area as possible in order to minimize potential impacts to biodiversity: vegetation cover that does not interfere with the sitting of the project will be left intact.
- Plant vegetation in all practical open areas on project completion.
- Manage the introduced vegetation on completion of the development to restore or improve the site.
- During the decommissioning stage the proponent shall rehabilitate the land by removing any unnecessary materials that shall be covering land and protecting the natural biodiversity

6.8 Occupational Health and Safety (OHS)

During construction there will be increased dust, air and noise pollution. These are considered as negative impacts as they significantly lower the quality of environment.

Potential Mitigation Measures

- Capacity building and training of staff/workers with respect to Occupational Health, Safety and Environment. Provide safety measures for personnel, Personal Protective equipment (PPE) – safety gear as per Health and Safety and Welfare – Special Provisions and Rules Regulations; conduct medical examination of workers as required by the Medical Examinations Rules of 2005 under the Occupational Safety and Health Act, 2007, for occupations covered under Schedule II of the act. Construction works fall under this schedule II and therefore all workers should undergo the medical examinations.

- A first aid kit should be provided within the site and should be fully equipped (as per sec. 2 of the First Aid Rules, 1977) at all times and managed by qualified and trained first aider(s).
- The contractor/proponent should initiate and develop effective Emergency Response Plans-ERPs to cater for various eventualities such as fire outbreaks, oil spills and other incidences that are likely to occur.
- Proper documented possible action plans (ERPs) need to be put in place in case of any incidences occurring.
- Where the workforce exceeds 20, the contractor should facilitate formation of a Safety and Health Committee, in accordance with the Safety and Health Committees Rules, 2004. The safety and health committee should be adequately trained on Occupational Safety and Health in line with sec. 12 of the Safety and Health Committee Rules, 2004 and be appraised on their functions as stipulated under sec. 6 of the Safety and Health Committee Rules, 2004.
- The contractor should obtain a certificate of registration of Building or Construction from DOHSS.
- Appropriate abstracts should be displayed at strategic location including, the Workplaces Act, and Building Operations and Works of Engineering Construction, Rules, 1984.

6.9 Public disturbance

Construction disturbances result from noise, lighting etc. Such disturbances result to stress and other body reactions.

There may occur disturbances, which are likely to cause stress and other similar effects mostly during project implementation processes due to continued vibrations and noise generated by heavy trucks and machinery.

Potential Mitigation Measures

- Construction activities should be done only during the day
- Erect billboards on the start of the project to psychologically prepare the people in the vicinity

- The signs should indicate and inform the public when works starts and when it will be completed. Such information should be made clear for the interest of the motorists along the connecting roads

6.10 Security

Security is a necessity for any development since it ensures that all planned activities run smoothly without any loss of construction materials especially during the construction phase. It (security) controls movement within the site especially for the intruders who might be injured by the materials and other hazardous features in the construction site. The area is well covered by communication networks and this to a great extent facilitates security in the area. There is a telcom office and booster in the nearby. The Safaricom, Airtel and Zain networks are available which ease communication.

Potential Mitigation Measures

- Security should be beefed-up and movement within the site should be controlled
- Provide lighting systems that illuminate the area well. Security alarms should be installed in strategic points all over the site area after completion of the project. The security alarms have been installed in designated areas for the developing projects.
- Contractor should provide adequate security during the construction period when there is no work going on at the site. E.g. during the night and weekends.
- Ensure that the access gate is manned (24hrs) by qualified security personnel.

6.11 Fire hazards and Fighting

There are some operations that may pose a risk to fire occurrences at the construction site and even during the operational period. These occurrences may arise during the construction phase but more in the operation phase since there will be extensive use of electricity in the various houses which are likely to cause Class C Fires. It should therefore be ensured that all operations during construction and operation phases are in tandem with the Fire Risk Reduction Rules, 2007.

Potential Mitigation Measures

- Install an automatic fire alarm system for the entire project mostly on operation.
- Install fire fighting equipment as approved by the County Council.

- All fire control and fighting facilities to be installed as per the requirements stipulated in the approved plans.

In addition to the above, the project management should consider the following:-

- Conduct regular fire drills/simulations to sensitize workers during construction phase.
- Adapt an emergency response plan for the entire project during operational phase.
- Ensure that all fire fighting equipment are strategically positioned, regularly maintained and serviced.
- Provisions of marked fire exits and ensure that all fire exits are unobstructed at all times.
- The proponent to put up a trained fire fighting team in accordance with the sec. 20& 21 of the Fire Risk Reduction Rules, 2007.

6.12 Traffic density

The proposed project will come along with increased (vehicle) traffic along the adjacent road networks and mostly during construction phase. The proponent has liased with the KENHA for the upgrades of the Mountain Mall Round About. It will help in ensuring the developing infrastructures in the mall will be accessed conveniently.

Potential Mitigation Measures

- The warning/informative signs (billboards) be erected at the site. These should indicate the operation hours and when works are likely to be started and completed. The signs should be positioned in a way to be easily viewed by the public and mostly motorists.
- The traffic along connecting routes should be controlled especially during construction phase and mostly when large trucks are turning into the site, say for delivery of materials

6.13 CONSTRUCTION SAFETY

Introduction

This section provides general guidelines and procedures for construction safety during project implementation process.

General Construction Guidelines

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

Follow these guidelines when visiting or working at construction sites:

- 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.
- Avoid placing unusual strain on equipment or materials.
- Be prepared for unexpected hazards. BE ALERT!

Barriers and Guards

Contractors and project managers should use barriers and guards as necessary to protect employees, and visitors from physical hazards. If any person identifies a mechanical hazard that is not sufficiently protected, s/he should notify the attending supervisors, the Health and Safety Advisor or the *DOHSS office* immediately.

NOTE: Barriers, guards, and warning signs are required to ensure safety against existing hazards.

Types of Barriers and Guards

- Physical barriers and solid separators (dust barriers, hazard barriers, temporary walkways, etc.)

NOTE:

- Signs that state DANGER, WARNING, or CAUTION are also important when barriers or guards are necessary.
- Remember to make signs legible, visible, and brief.

Areas that Need Barriers or Guards

Any area that poses a physical threat to workers and/or pedestrians requires barriers or guards.

Areas that typically require permanent or temporary protection include the following:

- Stairways,
- Open Manholes,
- Elevated platforms,
- Areas with moving machinery,
- Excavation sites,
- Construction sites,
- Temporary wall or floor openings,
- Doors opening into construction
- Balcony

6.14 Summary of Positive Impacts of the Proposed Project

The proposed development will have positive impacts to the society and the environment in general. Some of benefits include the following:

- Through construction of the proposed development, the project will ensure optimal use of the land to the great benefit of the country and its people with land being a scarce resource in Kenya.
- Improvement of local and national modern property standards
- Economic-investment for the proponent who will earn some income or save on spent capital from renting the residential units.
- Creation of market for goods and services and especially construction inputs which include raw materials, construction machinery and labor. Secondary businesses are also likely to spring up during the construction phase especially those providing foods and beverages to the construction workers.
- Increase in national housing stock
- Improved security in the area
- Massive job opportunities for Kenyans both during planning, construction and operational phases. They include building contractors, architectures, structural engineers, mechanical engineers, surveyors, environmentalists, security agents, transporters, construction workers, site managers and foremen.
- Increase in revenue for the government; from processing of the building plans to the County council and through annual rates.
- The project will act as flagship towards the fulfillment of vision 2030
- Provision of employment during construction phase and operational phase

6.15 Summary of Negative Impacts of the proposed Project

Against the background of the above positive impacts, there are a few negative drawbacks that are anticipated mostly during the construction of the project. They include the following:

- Loss of biodiversity from the project site which has a some trees and grasses
- Waste water management and disposal
- Increased water demand
- Increased power demand

- Solid waste management
- Oil spills during construction
- Dust emissions
- Accessibility to the existing road network
- Soil compaction, erosion and pollution
- Noise and vibrations
- Population density increase
- Increased traffic, both vehicular and human, along the nearby roads
- Air pollution during construction.
- Health and safety for the workers during construction phase

6.16 Summary of the Mitigation Measures

One of the objectives of the environmental assessment has been to identify measures to be taken by the proponent to mitigate environmental impacts. These will include:

- A code of practice to minimize construction noise, vibration dust and disturbance of the site.
- Planting of trees, and wild flowers to supplement the ground cover on the excavated area.
- Application of soil conservation measures to reduce surface runoff during wet seasons and especially during construction phase.
- Recovery of all debris generated and reuse of materials where possible e.g. the stone chippings which can be used as hardcore.
- Recycling and reuse of appropriate materials.
- Provision of security measures to deter intruders and protect them from the risk of injury; and fitting of noise mufflers on generator exhausts.
- Installation of oil/diesel separators on site especially where there is storage of machinery or petroleum products etc. to keep oils from storm runoff.
- Predetermined route to the site, oil spillages will be minimized by using right machinery that are regularly serviced and operators who are qualified following the operations instructions strictly.

- The contractor will ensure management of excavation activities, if any- the activities will be controlled especially if construction will take place during rainy season.
- After construction the proponent shall rehabilitate the land by removing any unnecessary materials that shall be covering the land and preventing natural biodiversity.
- To minimize potential impacts to bio diversity, grass cover that does not interfere with the sitting of the project will be left intact,
- Sensitize drivers of construction machinery on effects of noise; billboards will be suitably erected on the start of the project to psychologically prepare the people in the vicinity.
- Signs must indicate and inform the public when the works start and when it will be completed, construction activities to be restricted to daytime to avoid accidents and possible harm to gears provide barriers such as walls around site boundaries to provide some buffer against noise propagation.
- Vehicle speeds in the construction area will be limited to minimize dust in the area, discourage idling of vehicles i.e. vehicle and equipment engines will be turned off when not in direct use to reduce exhaust emissions.
- Regular maintenance of construction plant and equipment, engage sensitive construction workers.
- Provide personal protective Equipment such as nose masks to the workers on site, the construction contractor will water the site with exposed soil surface twice each day during dry weather.
- All residual waste materials to be recycled sold or disposed in an environmentally friendly manner. Wastes will be properly segregated and separated to encourage recycling of some useful wastes; dustbins will be provided at the construction site.
- A first aid kit will be provided within the site and it will be fully equipped at all times.
- Sanitary facilities will be provided, local individuals preparing food for the workers at the site will be controlled to ensure that food is hygienically prepared
- Construction crew at the site will be sensitized on social issues such as drugs, alcohol, diseases, ensuring proper solid waste disposal and collection facilities, ensure effective waste water management.
- Provision of safe drinking water, contractor to take an insurance cover for workers in case of major accidents on site.

- Unauthorized persons will be restricted from construction site, enforce speed limits for construction vehicles especially along roads leading to the site, provide bill boards at the site/entrance to notify motorists about the development, put up warning signs like “speed limit 10kph”, “heavy vehicles” etc.
- For the prevention of accidents the contractor shall adhere to the guidelines under the factories and other places of work act.

CHAPTER SEVEN

7.0 PUBLIC PARTICIPATION - SOCIAL IMPACT ASSESSMENT

Public participation enables evaluation of the public and neighbours views. It is an important part of the EIA as it helps identify various concerns, which should be addressed at the initial stages of project implementation processes.

For the subject project, a questionnaires and interviews were used to collect the views of the various stakeholders and neighbours. Majority of the respondents indicated that they had no problem with the project in the area so long as the proposed works. The interviews and questionnaires were carried out to different stakeholders in the area such as the site managers ,EABL, poster Kenya, Telecom Communication, Town house residents in the neighbourhood, Willmary apartments residents and Garden City Mall business personnels such as GAME, Shoprite, TACC and Victoria Courts.

The people consulted through interviews and questionnaires generally welcomed the proposed project saying it will provide more job opportunities to the youth both during construction and operational phases of the project. It will increase more luxurious apartments working in the mall, areas around and the ones in the CBD. It will help and increase the business in the Garden Mall, the people residing in the residential development will have full capabilities of utilizing the mall hence increasing the businesses.

Other positive views raised by the respondents are the accommodation of the people working in the area increases and affordable housing achieved. The development will aid in the value appreciation of the properties within.

Occupational health and safety of the workers and the public including the issue of traffic on the access road especially during construction should be keenly observed. Noise pollution especially by the vehicles transporting the materials was an issue raised widely which they recommended the vehicles in the site to be regulated. There were issues of the overloading and congestion of the sewer line, drainage systems and roads raised. They recommended that sewer systems, drainage systems and road and walkways infrastructures should be upgraded .Most of the

respondents suggested that the project site should be properly managed to ensure that the vehicles and all the site activities such as excavations and machineries use are regulated.

Neighbours within the projects vicinity welcomed the idea saying that it will multiply customers. Other advantages mentioned include creation of employment (during construction, operation and maintenance activities), revenue to the government and promotion of development in the area. *(The responses are well shown in the questionnaires attached).*

All the issues raised and many other foreseeable impacts have been adequately addressed in this report and in the EMP.

Attached in the appendices are:

- Photos inventory
- Filled in questionnaires

CHAPTER EIGHT

8.0 PROJECT COMPLETION AND DECOMMISSIONING

8.1 PROJECT COMPLETION

On completing the construction works on the site, everything should be left in order. This can be achieved through the following:

- Comprehensive Landscaping of undeveloped and disturbed areas should be done. Such areas should be sealed from pits and other depressions
- All waste materials should be cleared and removed from the site. There should be no such materials as wood, glass, stones, scrap metals etc. However, these should be disposed of appropriately.
- General rehabilitation of any excavated areas; quality vegetation should be introduced to add aesthetic value to the site. This should be regularly watered.
- The structure should be cleared and robbed of any dust particles
- All construction equipment and machinery should be removed and the old ones sold to the respective scrap material handlers.

8.2 PROJECT DECOMMISSIONING

Information pertaining to the decommissioning of the project at the end of its life cycle and associated impacts, proposed measures to return the site as far as possible to its suitable state, or rehabilitation measures has been elaborately provided.

The proponent shall plan, engineer and implement the decommissioning, demolition and clean-up of the residential block and other associated structures. The proponent shall develop decommissioning designs so that hazardous and dangerous materials are safely removed and salvageable equipment and structures are protected before the remaining facilities are safely dismantled. The designs shall carefully consider reuse goals for the site and materials. It should however be noted that at the time of decommissioning of the project.

8.2.1 Existing Condition Evaluation

The first step in engineering a decommissioning project is to evaluate existing conditions and plan for appropriate handling of all site conditions, materials or structures. The considerations to be considered shall include

- Developing an inventory of hazardous and solid wastes, underground storage tanks and other subsurface structures to assure proper management.
- Identification of electric utilities and communication systems to ensure that active site operations continue uninterrupted.
- Assessment of historic structures and materials, which can be reclaimed to comply with preservation requirements (if applicable) and to maximize cost recovery.

8.2.2 Facility Demolition

The development of demolition plans shall consider the structural stability of the structures being taken down, clearance of adjacent structures and rigging requirements. The proponent shall engineer the dismantling of buildings, tanks, piping, and storage facilities.

8.2.3 Preparation for the site reuse

Future site use is a key consideration because costs can be reduced by understanding, which components of the site have to be removed versus built over or around. Topography and backfilling needs will be efficiently addressed relative to future construction and storm water management.

8.2.4 Materials Recycling and Reuse

Materials that can be recycled, reused, or salvaged shall be identified and removal planned accordingly to capture financial benefits.

8.2.5 Integrated Safety Design and Review

Safety for workers and the community is of great importance, and includes physical hazards, protection of waterways, and control of potential airborne hazards.

CHAPTER NINE

9.0 PROJECT ALTERNATIVES

The No Action Alternative

This alternative represents the situation that would result if the project were not implemented. Under this option, the proponent's proposal would not receive the anticipated approval from NEMA and the proponent will not be able to undertake the development.

The socio-economic impacts resulting from the site activities will not be realized. The economic benefits during implementation i.e. market for materials, provision of jobs for skilled and non-skilled workers will not be realized and there will be no generation of income. The anticipated better living space and localized economic development may not be realized.

On the other hand, the anticipated small-scale environmental impacts resulting from construction, and operation activities would not occur.

This option is however not viable for the proponent, the government, and the county authority.

Alternative materials and technology

Several alternatives were considered for this project, based on the need for sustainable and environment friendly implementation and operation of development projects. The project should be developed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental requirements. Equipment that saves energy and water should be given first priority without compromising on cost or availability. A proper landscaping and tree planting system should be adopted to ensure that all vegetation removed and landscapes distorted are restored.

An integrated solid waste management system is recommended. This should give priority to reduction at source of the materials, recycling, reuse and composting of the waste. This will call for separation at source programme to be put in place. The waste should be collected by a NEMA licensed firm.

Comparison of Alternatives

Undertaking the project would provide all the benefits (social, economic and infrastructure development), which is crucial to spur socio-economic development for the County and Kenya at large. This would also provide employment directly and indirectly to the Kenyan population. It would provide jobs for the workers during implementation. After completion, more jobs would be generated for manual workers, such as cleaners, agents and real estate managers, guards and caretakers, technicians and Masons among others.

The use of materials and technologies that promote sound environmental management both for the implementation and operation phases offers the best alternative, and therefore this alternative will be adopted for the project.

The proponent has invested heavily on the use of alternative and environmentally friendly technologies, materials and processes for this project. These include:

- Use of renewal energy (solar) for supply of power during occupational phase of the project;
- Recycling and reuse of waste water, including pre-treatment; this will not only cut on the amount of water used in the project, but will also reduce the amount of wastewater discharged in to the sewer line.
- The proposal to extract ground water through boreholes for the project will reduce on the potential increased demand on the county water supply network. This will mitigate against increased demand for water resources associated with such development projects.

CHAPTER TEN

10.0 ENVIRONMENTAL AND SOCIAL IMPACTS MITIGATION/MANAGEMENT PLAN

Environmental monitoring involves measurement of relevant parameters, at a level of details accurate enough, to distinguish the anticipated changes. Monitoring aims at determining the effectiveness of actions to improve environmental quality. The EMPs outlined in the tables below address the identified issues of concern (potential negative impacts) and mitigation measures as well as roles, costs and monitorable indicators that can help to determine the effectiveness of actions to upgrade the quality of environment as regards this particular project. The ESMPs have considered both construction and operational phases).

Table 3: Environmental & Social management plan (ESMP)

Environmental/ Social Impact	Proposed Mitigation and Aspects for Monitoring	Responsibility for intervention and monitoring during design, construction and defects liability period	Responsibility for mitigation, monitoring and/or maintenance after defects liability period	Estimated cost Kshs.	Monitoring means (c) = Construction (o) = Occupation	Recommended frequency of Monitoring
Changes in hydrology/ impended drainage and sewerline upgrades	<ul style="list-style-type: none"> ▪ Proper Installation of drainage structures ▪ Install cascades to break the impact of water flowing in the drains ▪ Ensure efficiency of drainage structures through proper design and maintenance ▪ Provide gratings to the 	Contractor	Proponent	1,000,000	(c) Inspection (o) Routine maintenance of all drainage channels Upgrade of	(c) During construction and on completion of each structure (o) A continuous and regular schedule

	<p>drainage channels</p> <ul style="list-style-type: none"> ▪ Regular checks on any sludge along drainage channels ▪ The drainage and sewer systems to be upgraded 				the Sewer system	
Soil erosion	<ul style="list-style-type: none"> ▪ Control earthworks ▪ Rehabilitate degraded environment to avoid siltation and wash offs. ▪ Compact loose soils <p>Landscaping</p> <ul style="list-style-type: none"> ▪ Ensure management of excavation activities ▪ Control activities especially during rainy conditions ▪ Provide soil erosion control and conservation structures where necessary. ▪ Proper disposal of excavated loose soil 	Contractor/ Proponent	Proponent	500,000	<p>(c) Inspection (o) Routine maintenance</p> <p>(c) Inspection (o) Routine maintenance</p>	<p>(c) Daily; Erosion control measures: During construction and on completion of each measure (o) Once month (c) Once a month (o) Once a month during project lifetime</p>
Air pollution through dust and gaseous emissions	<ul style="list-style-type: none"> ▪ Control speed and operation of construction vehicles ▪ Prohibit idling of vehicles ▪ Water should be sprayed during the construction phase on excavated areas ▪ Regular maintenance of 	Contacto	Contractor	600,000	(c) Inspection/ observation	<p>(c) Daily (c) Quarterly</p>

	<p>construction plant and equipment</p> <ul style="list-style-type: none"> ▪ Engage sensitization among construction workers. ▪ Proper use of PPEs ▪ Quarterly monitoring – through measurements and reporting 					
Noise pollution	<ul style="list-style-type: none"> ▪ Sensitize drivers of construction machinery on effects of noise ▪ Construction activities to be restricted to daytime ▪ Workers in the vicinity of / involved in high-level noise to wear respective safety & protective gear i.e. earplugs & earmuffs ▪ Appropriate selection of machinery ▪ Regular maintenance of construction machinery 	Contractor	Contractor	150,000	(c) Inspection/ observation	(c) Random
Oil pollution	<ul style="list-style-type: none"> ▪ Proper storage, handling and disposal of new oil and used oil and related wastes (during construction) ▪ Maintain plant and equipment to avoid leaks ▪ Maintenance of construction vehicles should be carried out in the contractors yard (off the 	Contractor	Contractor	200,000	(c) Inspection	(c) Daily

	site)					
Water resource	<ul style="list-style-type: none"> ▪ Management of water usage to avoid unnecessary wastage ▪ Recycling of water during construction phase where possible ▪ Use of water conservation signs at the wash rooms and install water conserving taps 	Contractor	Contractor/ Proponent	200,000	(c) Inspection/ observation	(c) Random
Contractors lay down area	<ul style="list-style-type: none"> ▪ Special attention should be paid to the sanitary facilities on site especially disposal of human waste. ▪ Garbage should be disposed off in accordance with Nairobi City council and NEMA requirements 	Contractor	-	100,000	(c) Inspection	(c) Daily
Road safety	<ul style="list-style-type: none"> ▪ Enforce speed limits for construction vehicles especially along road linking to the site ▪ Provide bill boards at the site/entrance to notify motorists about the development 	Contractor	Traffic police/transporters	25,000	(c) Observation	(c) Continuous (o) Once off
Public health and occupational safety	<ul style="list-style-type: none"> ▪ Ensure proper solid waste disposal and collection facilities ▪ Ensure effective wastewater management ▪ Design of sewerage system should be as provided in the 	Contractor, supervising Foreman	Proponent	30,000	(o) Observation (c) Observation	(o) Weekly for solid waste disposal and once a month for others.

	<ul style="list-style-type: none"> plans ▪ Provide First Aid kits on the site ▪ Sensitize stakeholders/workers on environmental management ▪ Workers should be trained on occupational health & safety and first Aid administration 		Proponent			
Vegetation	<ul style="list-style-type: none"> ▪ Landscaping and planting all disturbed areas ▪ Planting flowers / grassing should be done just before the rains or irrigated on dry spells. 	Contractor Contractor	Proponent	500,000	(c) Inspection (c) Observation (o) Observation	(c) Daily (c) Weekly (o) Random
Fire safety training/ Emergency response procedures (ERPs)	<ul style="list-style-type: none"> ▪ To enhance health and safety preparedness among stakeholders ▪ Provide fire-fighting appliances as provided for in the plans and approved. ▪ Ensure fire-fighting equipment is in good working condition. ▪ Put up emergency response contacts ▪ Put up ERP notification instructions ▪ Put up simple instructions on 	Proponent/ Contractor	Proponent	20,000	(c) Inspection (o) Inspection	Monthly

	how to handle fires, product spills, armed robbery and product contaminations					
Record Keeping	<ul style="list-style-type: none"> ▪ Collection and analysis of relevant environmental data at the site. ▪ Data of maintenance of fire fighting equipment ▪ Vehicle movement in and out of the site 	Proponent/ contractor	Proponent	10,000	(c) Inspection (o) Inspection	(c) Weekly
Internal Audits	<ul style="list-style-type: none"> ▪ Monitoring will involve measurements, observations, evaluations, assessment of changes in water quality, waste management, Noise levels, contractor safety etc 	Proponent/ contractor	Proponent	30,000	(o) Inspection	(o) Random
Fire outbreak	<ul style="list-style-type: none"> ▪ Install fire-fighting equipment. ▪ Sensitize the occupiers on fire risks ▪ Adapt effective emergency response plan ▪ Provide emergency numbers at strategic points ▪ Provide appropriately marked fire exits and auxiliary doors. 	Contractor	Proponent	20,000	C) Observation O) Observation	C) On completion time O) Random
Security	<ul style="list-style-type: none"> ▪ Provide security guards and facilities during construction 	Contractor	Proponent	As appropriate	C) Observation	C) Daily

	<p>period</p> <ul style="list-style-type: none"> ▪ Security men should always be available to alleviate cases of robbery and other related incidences. 					O) Daily
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Table 4: Environmental Management Plan for Decommissioning Phase

Expected Negative Impacts	Recommended Mitigation Measures	Responsibility Party	Time Frame	Cost (ksh)
1. Operation Machinery/Structures & Wastes				
Scraps and other debris on site	<ul style="list-style-type: none"> ▪ Use of an integrated solid waste management system i.e. through a hierarchy of options: ▪ Wastes generated as a result of facility decommissioning activities will be characterized in compliance with standard waste management procedures. Disposal locations will be selected by the contractor based on the properties of the particular waste stream. 	Contractor	One-off
	<ul style="list-style-type: none"> ▪ All buildings, machinery, equipment, structures and tools that will not be used for other purposes should be removed and recycled/ reused say in other projects 	contractor	One-off	0
	<ul style="list-style-type: none"> ▪ Where recycling/reuse of the machinery, equipment, implements, structures, tools and other waste is not possible, the materials should be taken to approved dumpsites. 	Contractor	One-off	0

Oil spills and leaks	<ul style="list-style-type: none"> ▪ Clean and treat all oil contaminated areas ▪ Suitably dispose all used oil and oil handling materials 	contractor	One-off
2. Rehabilitation of project site				
Vegetation disturbance, Land deformation: soil erosion, drainage problems	<ul style="list-style-type: none"> ▪ Implement an appropriate re-vegetation programme to restore the site to its original status ▪ During the re-vegetation period, appropriate surface water runoff controls will be taken to prevent surface erosion; ▪ Monitoring and inspection of the area for indications of erosion will be conducted and appropriate measures taken to correct any occurrences; ▪ Fencing and signs restricting access will be posted to minimize disturbance to newly-vegetated areas; 	Contractor/proponent	One-off	100,000
	<ul style="list-style-type: none"> ▪ Comprehensive Landscaping 	contractor	One-off	50,000
3. Safety and Social-Economic impacts				

<p>Loss of income, Reduced ability to support dependants, Loss of quality of life</p>	<ul style="list-style-type: none"> ▪ The safety of the workers should surpass as a priority of all other objectives in the decommissioning project ▪ Adapt a project – completion policy: identifying key issues to be considered earlier before decommissioning. ▪ Assist with re-employment and job-seeking of the involved workforce. ▪ Compensate and suitably recommend the workers to help in seeking opportunities elsewhere. ▪ Offer advice and counselling on issues such as financial matters. 	<p>Proponent</p>	<p>.....</p>	<p>.....</p>
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CHAPTER ELEVEN

11.0 CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusion

In accordance with the Environmental Management and Coordination Act 2015 and The Environmental (Impact and Audit) Regulations, 2019, the findings of the environmental impact assessment carried out for this indicate that possible environmental impacts generated during operations and decommissioning phases will be addresses effectively by the proponent as mitigation measures indicated in the matrix above. As per the above analysis of the aspects of both positive and negative environmental impacts of the project's development, we, the experts found no significant negative impacts that could pose adverse effects to the extent of the proposed project not being implemented. However, the minor potential negative impacts of the proposed project could be managed with the suggested environmental and social mitigation management plans.

Having considered the data collected, analyzed and collated information that is available, it is the experts considered opinion that:

- i. The project **DOES NOT** pose any serious environmental concern, other than those of minor scale that accompany most development activities.
- ii. The positive impacts of the project far outweigh the negative ones, which will be adequately contained by following the prescribed environmental management and social impact management plans.
- iii. As such the project should be **licensed** to continue, and activities be managed within the provided Environmental Management Plan and sound environmental management practices that are internationally recognised.

11.2 Recommendation

This report recommends that the project be allowed to go ahead provided the outlined mitigation measures are adhered to. Major concerns should nevertheless be focused towards minimizing the occurrence of impacts that would degrade the general environment. This will

however be overcome through close follow-up and implementation of the recommended Environmental Management and Monitoring plans (EMPs). We recommend these:

- ✦ The proponent should follow the guidelines as set by the relevant departments to safeguard and envisage environmental management principles during construction and operations/occupation phases of the proposed project.
- ✦ It is important that warning or informative sign (bill boards) be erected at the site. These should indicate the operation hours and when works are likely to be started and completed. The signs should be positioned in a way to be easily viewed by the public and mostly motorists.
- ✦ All solid waste materials and debris resulting from construction activities should be disposed off at approved dumpsites.
- ✦ All construction materials and especially pipes, pipe fittings, sand just to mention a-few should be sourced/procured from bonafide /legalized dealers.
- ✦ During construction all loose soils should be compacted to prevent any erosion by water and wind.
- ✦ Other appropriate soil erosion control measures can be adapted. Any stock piles of earth should be enclosed, covered or sprinkled with water during dry or windy conditions to minimize generation of dust particles into the air.
- ✦ Once earthworks have been done, restoration of the worked areas should be carried out immediately by backfilling, landscaping/leveling and planting of suitable tree species.
- ✦ Proper and regular maintenance of construction machinery and equipment will reduce emission of hazardous fumes and noise resulting from friction of metal bodies. Maintenance should be conducted in a designated area and in a manner not to interfere with the environment.
- ✦ A fully equipped first aid kit should be provided within the site
- ✦ Workers should get food that is hygienically prepared. The source of such food should be legalized or closely controlled.

- ✦ The contractor should have workmen's compensation cover and is required to comply with workmen's compensation Act as well as other relevant ordinances, regulations and Union Agreements
- ✦ The contractor should provide adequate security during the construction period.

11.3 Statutory Compliance

The proponent and the contractor shall ensure that they implement statutory provision of the statutes mentioned in Chapter Four. A quarterly environmental monitoring programme should be instituted during the implementation phase; this should be backed up by daily supervision and inspection of the project site activities.

REFERENCES

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Annexes and the Terms of Reference of the Assignment (PSR)

Terms of Reference (TOR)

Activities by the Consultant:

The Consultant shall carry out an environmental impact assessment of the proposed development and prepare a project report, which shall incorporate the following details:

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

- Such other matters as the authority may require.

Expected Outputs

An Environmental Impact Assessment Project Report

Responsibility of the Client

- Make payments to NEMA as required.
- Pay for any testing that may be demanded by NEMA
- Pay consultancy fees for preparing the Project Report.

Appendices

Annex 1.Site Photography

Annex 2. Completed copies of questionnaire

Annex 3. A copy of the land ownership documents

Annex 4. Architectural drawings and approval certificate

Annex 5.Neighbourhood proposed developments

LIST OF EXPERTS

No.	Staff member	Specialty	Position /responsibility
1.	Juliet Gathigia Gathungu	Environment and Lead expert (<i>NEMA Reg.1801</i>)	Team leader :Supervisory role over the project team and representing the team in meetings with the client and other stakeholders
2.	Martin Kiambati Kanyango	Environment & Associate Expert <i>NEMA Reg.9827</i>)	Associate expert & data collection, review and analysis and report writing. (<i>NEMA Reg.</i>)
3.	Matthew Mathenge	Sociologist	Advisor & leader for social impact assessment and public participation, analysis of the social and cultural attributes in relation to the scope of the project
4.	Mary N. Kamau	Occupational safety and health expert and Lead Expert(Nema Reg 7071)	Duties: data collection , review and analysis ,report writing , monitoring and evaluation with emphasis on, occupational health and safety policy. Evaluation of the safety and health management strategies, for the various project activities at different phases




5.	Samuel K. Kambo	GIS expert and Associate expert (Nema Reg 10609)	Data collection, review and analysis and report writing, monitoring and evaluation with emphasis on climate change methods adaptation and energy systems
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ANNEX 1

PROJECT SITE AND PHOTOGRAPHY

SITE PHOTOGRAPHS:

PLATE NO:	PHOTOGRAPH	REMARKS
1. Proposed plot		The proponent intend to develop this plot
2. Proposed project site		The site to be developed by the proponent
3. Neighbors.		Neighboring developments (EABL neighbouring the proposed site)
4. Neighbours		Garden City Business park development in the neighbourhood.

<p>5. infrastructure and amenities</p>		<p>Power line passing right in front of the site. The proponent will make connections for use during occupation</p>
<p>6. Access Road</p>		<p>The access road to the proposed site (The road under construction)</p>
<p>7. Neighbourhood developing site</p>		<p>The developing neighbourhoods</p>

ANNEX 2

PUBLIC CONSULTATIONS

ANNEX 3

LAND OWNERSHIP DOCUMENTS

ANNEX 4

PROJECT APPROVED DRAWINGS

ANNEX 5

PROJECT DRAWINGS OF THE NEIGHBOURHOODS TO BE DEVELOPED
