

ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT

FOR

THE PROPOSED RESIDENTIAL DEVELOPMENT ON PART OF
PLOT L. R. NO. 209/18648 IN SOUTH C AREA OF LANGATA SUB
COUNTY, NAIROBI CITY COUNTY.



This Environmental Impact Assessment (EIA) Study Report is submitted to the National Environment Management Authority (NEMA) in conformity with the requirements of the Environmental Management and Coordination Act, 1999 and the Environmental (Impact Assessment and Audit) Regulations, 2003

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EXECUTIVE SUMMARY

Introduction

For a very long time, many development projects worldwide had not taken into account the effects of projects on the environment. As a result, there has been unprecedented environmental degradation due to lack of environmental conservation resulting to unsustainable development. Some of these problems have been irreversible and costly. In Kenya for instance, the policies, programs and strategies did not integrate environmental issues into development. A comprehensive environmental policy was therefore needed to take care of the environment in a holistic way. This was achieved through enactment of the Environmental Management and Coordination Act (EMCA), 1999. The Act stipulates that Environmental Impact Assessment (EIA) is carried out on all the projects listed in the Second Schedule. It is in response to this provision, that this report has been prepared.

The proponent, *Cool Breeze Development Limited*, appointed the environmental experts to carry out the EIA for the proposed residential development and prepare an EIA report according to the EMCA, 1999. The proposed project entails the construction of 524 apartments comprising of one hundred twenty (120) studio apartments, two hundred forty (240) one bed roomed units, one hundred forty eight (148) two bed roomed units, sixteen (16) three bed roomed units in South C area, Langata Sub County of Nairobi City County.

The purpose of undertaking an EIA for the proposed project was to identify potential positive and negative environmental impacts associated with the proposed project and provide recommendations on how to mitigate the negative environmental impacts while maximizing on the positive impacts of the project. The EIA team has evaluated the possible environmental, occupational health and safety impacts of the proposed project during design, construction, operation and decommissioning phases. The EIA study report has documented relevant and suitable methods of mitigating likely adverse impacts that may arise out of all the phases of the proposed project.

Scope

The study covered the physical extent of the project site and its immediate environs, implementation works of the proposed development (ground preparations, foundation, walling, fixtures and fitting) among other activities.

Overall objective of the project

The objectives of the proposed development include:

- i. To construct 524 housing units and other auxiliary facilities in South C area of Langata Sub County, Nairobi City County hence meeting the current demand for habitable housing units in the area
- ii. To meet the economic desires of the proponent
- iii. To put the current land into more productive and economic use

The objectives of the study were to:

- i. Identify the anticipated environmental and social impacts of the project and scale of the impacts
- ii. Propose mitigation measures to be taken during and after the implementation of the project
- iii. Develop a comprehensive EMP with mechanisms for monitoring and evaluating the compliance and environmental performance which shall include the cost of mitigation measures and the time frame of implementing the measures.

Methodology

The methodology of this study included: mobilization and planning; desk review of documents; field data collection; project data synthesis; public consultation and participation. A number of stakeholders were consulted for their inputs to the study through public meetings (baraza), key informant interviews and completion of qualitative questionnaires. The applied field methodologies for data collection included: qualitative questionnaires; key informant interviews and random field visits to the project area.

Environmental Impacts and Mitigation Measures

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

| Possible Impact | Mitigation Measures |
|-------------------|---|
| Increased Traffic | <ul style="list-style-type: none"> ▪ Employ traffic marshals to control traffic in and out of site ▪ Ferry building materials during off-peak hours ▪ Provide bill boards at the site/entrance to notify motorists and general public about the development ▪ Enforce speed limits for construction vehicles especially along the roads leading to the site ▪ Ensure that the vehicles comply with axle load limits ▪ Employ well trained and experienced drivers |

| | |
|------------------------|---|
| Increased water demand | <ul style="list-style-type: none"> ▪ To supplement water from the borehole during construction, the contractor will use water bowsers and tankers from external sources. ▪ Installation of rain water harvesting gutters. ▪ Install water conserving taps. ▪ Encourage re-use of water where possible during construction and operation phase ▪ Drill a borehole |
| Storm water | <ul style="list-style-type: none"> ▪ Construction of gabions on the lower part of the property. ▪ Rain water harvesting gutters will be installed to reduce the amount of rainfall reaching the surface. ▪ Semi permeable materials will be used for construction of pavements. ▪ Comprehensive landscaping on the riparian reserve and open areas will be done after completion of construction. |
| Air Pollution | <ul style="list-style-type: none"> ▪ Screening of the construction site to contain and arrest construction-related dust. ▪ Dust suppression with water-sprays during the construction phase on dusty areas. ▪ Exposed stockpiles of e.g. sand, will be covered and watered daily. ▪ Regular and prompt maintenance of construction machinery and equipment. This minimizes generation of hazardous gases. |
| Noise Pollution | <ul style="list-style-type: none"> ▪ Construction works will be carried out between 0800hrs to 1700 hrs. ▪ Provide and enforce use Personal Protective Equipment e.g. earmuffs during construction. ▪ Provide comprehensive policies/ rules pertaining noise control for residents as part of the Housing Agreement. ▪ Ensure quiet from 10pm to 8am in the apartments and outdoor/public areas. ▪ Monitor noise levels as per NEMA & NCC guidelines. |
| Solid waste | <ul style="list-style-type: none"> ▪ Proper disposal of construction waste in the contractor's yard (off the site). ▪ Covering of trucks when transporting building materials and waste. ▪ Use of an integrated solid waste management system; through a hierarchy of options: source reduction, recycling, composting and reuse. ▪ A private NEMA licensed company will be contracted to collect waste from the development. |
| Liquid waste | <ul style="list-style-type: none"> ▪ Conduct routine inspection and monitoring of the internal drains to identify leakages and blockages. ▪ All waste pipes will have rodding eyes accessible from outside i.e. free to every part of the system for inspection, cleaning and repair. ▪ Regular inspection and maintenance of the internal sewer system. ▪ Residents should report any incidence of blockages in their units immediately they occur for prompt maintenance ▪ As provided for by the Building Code, a portable toilet will be provided on site to be used by construction workers |

Conclusion and Recommendations

The EIA process started early in the pre-feasibility stage and environmental aspects were therefore considered during the project design stages. This proactive approach resulted in many significant environmental impacts being avoided, as the project team was able to amend design in order to manage environmental impacts, rather than manage the environmental impacts of particular designs.

In conclusion, results from the EIA study show that the proposed development has significant impacts on the environment. Implementation of the EMP will assist in dealing with environmental issues during the project cycle. There are also guidelines for addressing environmental health and safety. This project is recommendable for approval by the authority for issuance of an EIA License. This will be in compliance with the EMCA 199 and EIA regulations 2003.

ACRONYMS

| | |
|-----------|---|
| AP | Affected Persons |
| CCTV | Closed-circuit Television |
| CPP | Consultations and Public Participation |
| DRSRS | Department of Resource Surveys and Remote sensing |
| EIA | Environmental Impact Assessment |
| EMCA | Environmental Management and Coordination Act |
| EMP | Environmental Management Plan |
| ERC | Electricity Regulatory Commission |
| Ha | Hectares |
| KEFRI | Kenya Forestry Research Institute |
| KFS | Kenya Forest Service |
| KPLC | Kenya Power and Lighting Company |
| L. R. No. | Land Reference Number |
| NCA | Nairobi Construction Authority |
| NCC | Nairobi City County |
| NCWSCo | Nairobi City Water & Sewerage Company |
| NEAP | National Environment Action Plan |
| NEMA | National Environmental Management Authority |
| NET | National Environmental Tribunal |
| NPEP | National Poverty Eradication Plan |
| OHS | Occupational Health and Safety |
| PPE | Personal Protective Equipment |
| PVC | Polyvinyl chloride |
| SDG | Sustainable Development Goals |
| SVP | Soil Vent Pipe |
| TOR | Terms of Reference |
| WCC | Waste Collection Centre |
| WRMA | Water Resources Management Authority |
| WSSD | World Summit for the Sustainable Development |
| °C | Degrees Celsius |

CHAPTER ONE: INTRODUCTION

1.1 General overview

Kenya has faced major challenges in the housing sector but at the same time provided opportunities for the same. The country has been experiencing an annual shortfall of housing, exceeding 250,000 units. According to a report by the World Bank in 2011, it was estimated that Nairobi alone has over 1 million out of a city population of 3.2 million who lived in slums, with only 3% living in a house with permanent walls, water and electricity. There has also been an occurrence of rapid urbanization which is as a result of devolution and realization of Vision 2030. Access to both prime and virgin land for housing has provided a perfect opportunity for investors in the sector.

In light of these prevailing circumstances, the Proponent *Cool Breeze Development Ltd* has proposed to construct five hundred and twenty four (524) residential units on part of plot LR No. 209/18648 located off Mombasa road approximately 200 meters behind Nextgen Mall on latitude 1°19'30.01''S and longitude 36°50'34.50''E in South C area of Langata Sub County, Nairobi City County.

The project will enhance provision of quality habitable housing facilities and contribute to the government's housing policy. It will also optimize land use and its utility in line with the local physical planning, provide employment opportunities especially during construction phase and create market for goods and services (construction inputs) which include raw materials, construction machinery and labour.

1.2 Objectives of the EIA

Environmental Impact Assessment (EIA) is a process having the ultimate objective of providing decision makers with an indication of the likely environmental consequences of a proposed activity. The main objectives of this EIA therefore include the following:

- i. To identify and evaluate the significant environmental impacts of the project
- ii. To evaluate the impacts of the various alternatives on the project
- iii. To propose mitigation measures for the significant negative impacts of the project on the environment.
- iv. To generate baseline data for monitoring and evaluating impacts, including mitigation measures during the project cycle.
- v. To seek the views and concerns of all stakeholders in regards to the proposed project.

- vi. To highlight environment issues with a view to guiding policy makers, planners, stake holders and government agencies to make environmentally and economically sustainable decisions
- vii. To incorporate Environmental Management Plan (EMP) and monitoring mechanisms

1.3 Terms of Reference (TOR)

The following are the Terms of Reference for the proposed project as developed by the lead expert in conjunction with the project proponent;

- i. Assessment and description of location/site, objectives, scope, nature of the proposed project,
- ii. Analysis of the proposed project activities during the proposed project cycle; construction, operation, decommissioning phases,
- iii. Establish the suitability of the proposed project in the proposed location,
- iv. Review and establish all relevant baseline information as will be required by NEMA (Physical, Biological and Social Cultural and economic) and identify any information gaps,
- v. Description and analysis of policy legal and institutional framework including but not limited to Kenyan policies, laws, regulation and guidelines which have a bearing on the proposed project and will also serve as benchmarks for monitoring and evaluation, and future environmental audits,
- vi. In-depth description of the proposed project and associated works together with the requirements for carrying out the works,
- vii. Analysis of the designs, technology, procedures and processes to be used, in the implementation of the works,
- viii. Consultation and Public Participation (CPP): Identify key stakeholders and affected persons; hold a public meeting and provide /collect written evidence i.e. minutes,
- ix. Identify and analyze proposed project alternatives including but not limited to: Scale and extent; project site alternatives, no project alternatives, design alternatives, material alternatives and technologies alternatives,
- x. Identify, predict and carry out in-depth analysis all actual potential and significant impacts on flora, fauna, soils, air, water, the social, cultural and community settings; the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated to

be generated by the proposed project, both positive and negative throughout the project cycle,

- xi. Recommend sufficient mitigation measures for all the potential negative impacts identified,
- xii. Analyze occupational health and safety issue associated with the proposed project,
- xiii. Develop an EMP proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.

1.4 Scope of the study

The EIA study will involve the following;

- a) A description of the project
- b) Documentation of all baseline information
- c) Socio-economic study to get the views of different stakeholders/affected persons using;
 - i. Questionnaires
 - ii. Interviews
 - iii. Public meeting/baraza
- d) Review of the policy, legal and administrative framework
- e) Prediction of any sources of conflicts and making relevant recommendations
- f) Assessment of both the positive and negative impacts of all environmental and components
- g) Developing mitigation measures for the negative impacts identified
- h) Designing of an EMP for the project
- i) Designing a monitoring and evaluation plan
- j) Examining the projects phases, stages and activities to be undertaken and integrating them with environmental characteristics
- k) The monitoring programmes, parameters and procedures to be put in place for control and corrective actions in case of emergencies shall also be examined.

1.5 Methodology

The methodology used for preparation of this EIA report is stated in the steps below:

- i. Screening of the project, a process that identified the project as being among those requiring EIA under schedule 2 of the EMCA 1999 and EMCA (Amendment) 2015,
- ii. A scoping exercise that identified the key issues to be addressed in the assessment.

- iii. Documentary review on the nature of the proposed activities, policy and legal framework, environmental setting of the area and other available relevant data/information.
- iv. Public participation and discussions with the local community, proponent and the project team.
- v. Physical investigation of the site and the surrounding areas using a pre-prepared checklist identifying possible environmental and human safety issues that are likely to be affected,
- vi. Reviewing the proposed project designs and implementation plan/schedules with a view to suggesting suitable alternatives,
- vii. Developing an EMP outline with responsibilities, schedules, monitorable indicators and time frames among other aspects,
- viii. A comprehensive report including issues as listed in the Environmental (Impact Assessment) Regulations 2003.

The data used for developing the EIA can be categorized into two, primary and secondary data, as tabulated below;

Table 1

| <i>Type of data</i> | <i>Source of data</i> |
|---------------------|--|
| Secondary data | Published books, official government documents and statutes, plans, reports and documentation from members of the project team. |
| Primary data | Formal/informal interviews, field observations, pictures, questionnaires, views from resident attendees during the public meeting and inputs from the project team |

1.6 Justification of the project

1.6.1 Demand for Housing

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

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

The proposed development therefore comes as a timely venture to cater for the existing accommodation deficit more specifically along Mombasa road.

1.6.2 Adjacent Land use analysis

Currently there are developments adjacent to the site. The common land uses are high-rise residential houses (The Curve), hotels (Eka hotel and Ole Sereni) and commercial buildings (Nextgen mall and Souk Car Bazaar). At a radius of five (5) Kilometers, there are retail centers, health facilities and other community facilities which will be adequate to serve the incoming development.

1.6.3 Size of the plot

At approximately 0.9105 Ha, the plot is large enough to accommodate the proposed development. (See attached copy of title)

1.6.4 Economic Benefits

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

1.6.5 Neighborhood Development Trend

The neighborhood of the plot is currently undergoing transformation with several mixed use developments coming up, including apartments, offices, hotels and institutions. The proposed development will therefore be in conformity with this trend which will ensure better utilization of the land giving it higher value.

CHAPTER TWO: PROJECT DESCRIPTION, DESIGN AND IMPLEMENTATION

2.1 Nature of the Project

The proponent, *Cool Breeze Development*, is proposing to construct residential development on part of plot L.R No 209/18648 in South C area of Langata Sub County, Nairobi City County. The proposed development will comprise of 524 habitable housing units, 475 parking bays and associated ancillary. The development will aim at providing quality habitable housing infrastructure and/or increase the utility of the Land in the area.

2.2 Project Location and Size

The proposed project site is located off Mombasa Road approximately 200 meters behind Nextgen Mall on latitude 1°19'30.01''S and longitude 36°50'34.50''E in South C area of Langata Sub County, Nairobi City County. The portion of the parcel of land to be developed measures approximately 0.9105Ha (*Attached is copy of the ownership documents*).

Plate 1: Site Location



Source: Google Earth, 2018

2.3 Land Tenure, Use, Ownership and Management

The parcel of land on which the subject development is proposed is held on Leasehold interest for 99 years from 1/9/1986. The certificate of Title is drawn under The Registration of Titles Act (Chapter 281) as L.R. No. 209/18648 and the current registered proprietor is *Next Gen Offices Suites Ltd* (Post Office Box Number 39841 - 00623). *Next Gen Offices Suites Ltd* has sold a portion of the Land measuring approximately 0.9105 Ha to *Cool Breeze Development Ltd* who are the proprietor seeking the EIA Licence for the proposed development (*See attached copy of the ownership document and sale agreement*).

2.4 Project Description

The project proponent proposes to construct a residential development on a portion of the aforementioned land comprising of 524 housing units, 475 parking bays and other auxiliary facilities as described below:

- i. **Lower Ground level** comprising the following;
 - 237 parking Bays
 - Service room, pump room, telecom provider room, extra low voltage, low voltage and medium voltage rooms, KPLC room, 2 No. refuse rooms, fuel tank room, generator room, retail shop, 2 No. transformer rooms, water tank and management office.
- ii. **Upper Ground level** comprising of the following features;
 - 238 parking bays
 - Service room
- iii. **1st Floor**
 - BLOCK 1**
 - 5 units of two bedroom apartments having a living room, dining, kitchen and washroom
 - 2 units of one bedroom apartments having a living room, dining, kitchen and washroom
 - BLOCK 2**
 - 4 units of one bedroom apartments having a living room, kitchen, dining and washroom

- 5 units of studio apartments consisting of living room, dining, kitchen, washrooms and bedroom.

BLOCK 3

- 2 units of 2 bedroom apartments having a living room, dining, kitchen and washrooms

BLOCK 4

- 4 units of one bedroom apartments having a living room, kitchen, dining and washrooms
- 5 units of studio apartments having a living room, kitchen, dining, bedroom and washroom.

BLOCK 5

- 5 units of two bedroom apartments having a living room, dining, kitchen and washroom
- 2 units of one bedroom apartments having a living room, dining, kitchen and washroom

iv. Typical 2nd to 12th floor levels

BLOCK 1

- 5 units of two bedroom apartments having a living room, dining, kitchen and washroom
- 2 units of one bedroom apartments having a living room, dining, kitchen and washroom

BLOCK 2

- 4 units of one bedroom apartments having a living room, kitchen, dining and washroom
- 5 units of studio apartments consisting of living room, dining, kitchen, washrooms and bedroom.

BLOCK 3

- 5 units of two bedroom apartments having a living room, dining, kitchen and washroom
- 2 units of one bedroom apartments having a living room, dining, kitchen and washroom

BLOCK 4

- 4 units of one bedroom apartments having a living room, kitchen, dining and washrooms
- 5 units of studio apartments having a living room, kitchen, dining, bedroom and washroom.

BLOCK 5

- 5 units of two bedroom apartments having a living room, dining, kitchen and washroom
- 2 units of one bedroom apartments having a living room, dining, kitchen and washroom

v. **13th and 14th floor (Penthouses).**

BLOCK1

- 4 units having living room, dining, kitchen, washrooms and three bedrooms on the upper floor
- 2 units having a living room, dining, kitchen, washrooms and one bedroom on the upper floor

BLOCK 2

- 2 units three bedroom apartment having a living room, dining, kitchen and washrooms
- 2 units two bedroom apartments having a living room, dining, kitchen and washrooms
- 1 unit one bedroom apartments having a living room, dining, kitchen and washrooms

BLOCK 3

- 4 units having living room, dining, kitchen, washrooms and three bedrooms on the upper floor
- 2 units having a living room, dining, kitchen, washrooms and one bedroom on the upper floor

BLOCK 4

- 2 units three bedroom apartment having a living room, dining, kitchen and washrooms

- 2 units two bedroom apartments having a living room, dining, kitchen and washrooms
- 1 unit one bedroom apartments having a living room, dining, kitchen and washrooms

BLOCK 5

- 4 units having living room, dining, kitchen, washrooms and three bedrooms on the upper floor
- 2 units having a living room, dining, kitchen, washrooms and one bedroom on the upper floor

Other salient features include staircases, lift lobbies, swimming pool, gym, changing rooms and gardens. In summary, there are 120 studio apartments, 240 one bedroom apartments, 148 two bedroom apartments, 16 three bedroom apartments totalling to 524 residential units. More fine details, specifications and features of the proposed project can be obtained from the drawings (*Attached are architectural drawings*).

2.5 Construction Inputs

The project inputs include the following:

- i. Construction raw materials i.e. stones, cement, sand, crushed rock (gravel/ ballast), ceramic tiles and other ceramic fittings, steel and wooden fixtures and fittings, glass, steel metals, timber, roofing materials, painting materials among others. All these should be obtained from licensed dealers, especially those that have complied with the environmental management guidelines and policies.
- ii. Construction machines including machinery such as trucks, concrete mixers, tools and other relevant construction equipment. These will be used for the transportation of materials, clearing of the site and construction debris, excavation works and other construction works. Most of the machinery will use electricity and petroleum products to provide energy.
- iii. A construction labour force of both skilled and non-skilled workers. These will require services such as energy, water supply and sanitation facilities.
- iv. Water for construction purposes.
- v. Power from the mains grid or provided by generators.

2.6 Construction Activities

2.6.1 Description of the Project's Construction Activities

2.6.1.1 Pre-construction Investigations

The implementation of the project's design and construction phase will start with thorough investigation of the site's biological and physical resources in order to minimize any unforeseen adverse impacts during the project cycle.

2.6.1.2 Sourcing and Transportation of Building Materials

Building materials will be transported to the project site from their extraction, manufacture, or storage sites using trucks. The building materials to be used in construction of the project will be sourced from Nairobi and neighboring areas such as Athi River. 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.

2.6.1.3 Clearance of Vegetation.

The site is characterized by vegetation cover which includes grass, shrubs, hedges and few trees. The vegetation will be cleared through cutting down of trees, grass, bushes, hedges, undergrowth, grub up roots and remove tree stumps to pave way for the proposed development. The proponent shall ensure as many indigenous trees as possible are used for re-vegetation as well as obtaining the necessary prerequisite permits and licenses before clearing the vegetation.

2.6.1.4 Storage of Materials

Building materials will be stored on site. Bulky materials such as building stones, ballast, sand and steel will be carefully piled on site. To avoid piling large quantities of materials on site, the proponent will order bulky materials such as sand, gravel and stones to the site in accordance to the demand at any particular time. Materials such as cement, paints and glasses among others will be stored in temporary storage structures, which will be constructed within the project site for this purpose.

2.6.1.5 Excavation and Foundation Works

Excavation will be carried out to prepare the site for construction of foundations, basements, pavements and drainage systems. This will involve the use of heavy earthmoving machinery such as tractors and bulldozers.

2.6.1.6 Masonry, Concrete Work and Related Activities

The construction of the foundations, building walls, floors, pavements, drainage systems and parking area among other components of the project will involve a lot of masonry work and related activities. General masonry and related activities will include construction of foundations, superstructure construction, concrete mixing, stone shaping, plastering 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.

2.6.1.7 Structural Steel Works

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

2.6.1.8 Electrical Work

Electrical work during construction of the premises will include installation of electrical gadgets, devices and appliances including electrical cables, lighting apparatus, sockets etc. In addition, there will be other activities involving the use of electricity such as welding and metal cutting. All the electrical works will be carried out by licensed electricians to the satisfaction of the relevant authorities.

2.6.1.9 Mechanical works

The mechanical works shall be done by qualified technicians under the supervision of the Project Mechanical Engineer and shall follow the set standards. The works will include and not limited the following:

- i. Plumbing and drainage
- ii. Service ducts accessible from all floor levels
- iii. Soil vent pipes (SVP) provided on doors and windows
- iv. Storm drains pipes
- v. Inspection chamber covers and framing
- vi. Underground foul and waste drain pipes

2.6.1.10 Landscaping

To improve the aesthetic value or visual quality of the site once construction ceases, the proponent will carry out landscaping. This will include establishment of a theme garden and lush grass lawns where applicable and will involve replenishment of the topsoil. It is noteworthy that

the proponent will use plant species that are available locally preferably indigenous ones for landscaping.

2.6.2 Description of the Project's Operational Activities

2.6.2.1 Residence

A total of 524 families will reside within the proposed development. Several family activities such as cooking, laundry, cleaning, leisure and recreational activities will thus accompany residence.

2.6.2.2 Solid Waste

The proponent will provide facilities for handling solid waste generated within the proposed development. These will include dust bins/skips for temporarily holding waste within the premises before final disposal at the designated dumping site. The solid wastes from each block will be assembled in the garbage collection point ready for disposal by a NEMA licensed waste disposal company. Private waste disposal companies that are approved by NEMA and County Government will be responsible for solid waste disposal.

2.6.2.3 Waste Water and Storm Water Management

Sewage generated from each unit will be discharged into the conventional trunk sewer system provide by the county government. Storm water will be properly channeled to improve drainage within the development.

2.6.2.4 Cleaning

The proponent will be responsible for regular washing and cleaning of the pavements and communal areas. The tenants/occupants of the residential units will be responsible for washing and cleaning their own residences. Cleaning operations will involve the use of substantial amounts of water, disinfectants and detergents.

2.6.2.5 General Repairs and Maintenance

The housing units and auxiliary facilities will be repaired and maintained regularly during the operational phase of the project. Such activities will include repair of building walls and floors, repairs and maintenance of electrical gadgets and equipment, repairs of leaking water pipes, repairs of refrigeration equipment, painting, maintenance of flower gardens and grass lawns, and replacement of worn out materials among others.

2.6.3 Description of the Project's Decommissioning Activities

Decommissioning is an important phase in the project cycle and comes last to wind up the operational activities of a particular project. It refers to the final disposal of the project and associated materials at the expiry of the project lifespan. If such a stage is reached, the proponent needs to remove all materials resulting from the demolition/ decommissioning from the site. The following should be undertaken to restore the environment:

- i. Remove all underground facilities from the site
- ii. The site should be well landscaped by flattening the mounds of soil
- iii. Planting vegetation which may include indigenous trees and flowers
- iv. All the equipment should be removed from the site
- v. Fence and signpost unsafe areas until natural stabilization occurs
- vi. Backfill surface openings

2.6.3.1 Dismantling of Equipment and Fixtures

All equipment including electrical and mechanical installations, furniture partitions, pipe work and sinks among others will be dismantled and removed from the site on decommissioning of the project. Priority will be given to reuse of this equipment in other projects. This will be achieved through resale of the equipment to other building owners or contractors or donation of this equipment to schools, churches and charitable institutions.

2.6.3.2 Site Restoration

Once all the waste resulting from demolition and dismantling works is removed from the site, the site will be restored through replenishment of the topsoil and re-vegetation using indigenous plant species.

2.7 Construction Products, By Products and Wastes

It is anticipated that the project will generate a variety of products, by-products and wastes during its construction and operational phases. The characteristics of the products, by-products and wastes are discussed in this section.

2.7.1 Products

The final product will be 524 housing units, 475 parking bays and other auxiliary facilities in five (5) blocks.

2.7.2 By-Products

The by-products will be disposed-off as follows:

- i. **Soil:** The soil generated during excavation will be reused (if applicable) elsewhere in the project. Unusable soil will be transported for disposal at designated dumping sites by NEMA licensed waste handlers.
- ii. **Pieces of timber/wood:** Large pieces of timber/wood generated during the construction phase will be transported back to the contractor's yard for reuse in future while the small pieces of timber/wood will be disposed-off for use as fuel for cooking and heating.
- iii. **Empty cans and drums:** These will be used to store water during construction. The damaged ones will be disposed-off to registered scrap metal and plastic waste dealers.
- iv. **Excess sand, ballast and stock piles:** These can be used for future construction activities e.g. renovations. Upon completion of the project, these will be moved by the contractor to a suitable yard.

2.7.3 Wastes

The waste generated during construction will include construction debris, sanitary waste, excavated soil and rocks. The other wastes that may likely to be generated during operation are solid waste such as paper, plastics, cans, glasses, metallic pieces, and organic waste. These wastes will be disposed by the proponent in accordance with the standards and documented procedures stipulated in the EMCA Waste Management Regulations of 2006.

2.8 Project Budget and Duration

The proposed project is estimated by the project quantity surveyor to cost **one billion five hundred million shillings (1, 500, 000, 000)**. The project implementation works is estimated to take 2 years to completion (*attached is the summary of the bill of quantities*).

CHAPTER THREE: BASELINE INFORMATION

3.1 PHYSICAL ENVIRONMENT

3.1.1 Climate

The area just like many parts in NCC experiences a bimodal rainfall pattern. The short rains fall between October and December while the long rains fall between mid-March and May. Annual rainfall is influenced by altitude with a mean annual rainfall of 800 mm. The climate is humid highland subtropical in character with seasonal dry and wet periods. Temperatures vary with altitude rising from the lowest 10°C in to the highest are 27°C. The warmest period occurs from January to March with coolest period falling between months of May to August.

3.1.2 Topography

The site lies at an altitude of about 1100m above sea-level and is generally flat in its topography. It drains its storm water in the open drains constructed along the access road.

3.1.3 Geology and Soils

The geology history of Nairobi has been dominated by volcanic activity whereby a thick succession of alkaline lavas and associated tuffs began accumulating in mid-miocene time and continued into the upper Pleistocene. The soils types in the project area are primarily black cotton soils. The soils will be excavated and disposed off in designated areas by a NEMA registered waste handler.

3.1.4 Water Resources and Wetlands

There is no river stream within and/or near the property.

3.2 BIOLOGICAL ENVIRONMENT

This section describes key biological elements, including the identification and distribution of dominant, rare and the unique flora and faunal species within the proposed project site and other potentially affected areas.

3.2.1 Flora

The natural vegetation within NCC has been cleared to pave for the establishment of both residential, commercial, offices, hotels and other developments. The natural vegetation in the area has thus been gently modified. The remnants of the natural vegetation of the site and its environs are few trees located on the eastern part of the property, shrubs, hedges as well as grass. The site has no exotic plants species. We highly recommend that the proponent do a lot of landscaping to provide greenery and maintain a healthy environment.

Plate 2; Trees and shrubs within the site



Source: Field Survey 23/03/2018

3.2.2 Fauna

The project site is situated within a commercial/residential zone where human activities have altered the natural habitat for animals over the years. The property is characterized by few bird species. None of the faunal species observed are rare or endangered. It is expected that the area will be populated by small mammals such as mice, rats, moles and other members of the rodent family. The project's effect may seem insignificant to such lives but it is of great concern to the environment at large. It would contribute to imbalances in the ecosystem as a result of removal of the vegetation cover i.e. grass and shrubs on site.

3.3 SOCIO-ECONOMIC ENVIRONMENT

3.3.1 Land Use

Urban Land use refers to spatial distribution of social and economic activities. Accordingly, an up to date land use inventory is frequently required to facilitate urban planning and growth patterns as well as monitoring urban expansion.

The neighborhood is generally characterized by a mix of different uses. Mostly, South C area is zoned for high density residential area. The housing typology consists of mainly flats, bungalows and townhouses. Although most of the developments have been maintained at low levels, the trend appears to be changing with developers constructing multiple story buildings (residential and commercial).

Plate 3: Residential buildings in the neighborhood



Source; Field Survey 23/03/2018

3.3.2 Educational

The different education facilities found in the area include; Nursery Schools (such as Nairobi South Nursery School, Beautiful Heart Nursery School); Primary Schools (St. Annah's Primary School, Khalsa Primary School, Bellevue School); Secondary Schools (Highway Secondary School); and Colleges (Railway Training Institute, College of Insurance, Boma International Hospitality College).

3.3.3 Public Purpose (Church)

Religious institutions in the neighborhood include churches, mosques and temples such as Kenya Assemblies of God Church, Winners Chapel International, St. Margaret Catholic Church, Shree Ambaji Temple, Masjid As-Salaam and Green 1 Estate Mosque.

3.3.4 Commercial Activities

These activities are concentrated along the main road and include shopping malls such as Nextgen Mall which has supermarket, shops, and banks. Other commercial activities in the area include banks and light industry (petrol station such as the Shell Petrol station and Oil Libya). Banks found within the area include Diamond Trust Bank Centre, Equity Bank, UAE Exchange Kenya etc.

Plate 4: Nextgen Mall



Source; Field Survey 23/03/2018

3.3.5 Security

Security in the area is provided by the nearby Akila Police Station which is located approximately 1400 meters from the proposed site.

3.3.6 Socio-Economic Importance of the proposed Development

The proposed development is in line with the government housing policy that aims at facilitating the attainment of adequate shelter and healthy living environment to all socio-economic groups in the country. The project will therefore help to increase quality housing infrastructure in the region by investing in the construction industry and the proponent will also contribute towards the economic growth of our nation through revenue collection.

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

- i. Provision of houses, hence increase in the national/local housing stock and quality. This is in line with the government policy of providing housing and standard housing infrastructure to the society
- ii. The optimal use of land i.e. increased utility of the parcel of land, which is currently vacant.
- iii. Boost local investment to both the government and the proponent. The proponent will benefit through renting / sale of the residential units and the government through levies and taxes.
- iv. Creation of market for goods and services. Many secondary businesses are also likely to spring up during the construction phase especially those providing foods and beverages to the construction workers.
- v. Provision of employment during both construction and occupational phases.
- vi. The proposed development will indirectly contribute towards enhancement of security in the neighborhood of the area.

3.4 INFRASTRUCTURE

3.4.1 Roads and accessibility

The property is accessed along 15 meter unnamed road off Mombasa road in South C area, Langata Sub-county of NCC. The roads are tarmacked and in good condition.

Plate 5: Access Road



Source; Field Survey 23/03/2018

3.4.2 Water supply

The general area is served with water supplied by Nairobi City Water and Sewerage Company (NCWSCo). The developer intends to connect to the main water supplier. However, due to the noted inconsistencies in the delivery of the resource from the supply company, the developer intends to:

- i. Make arrangements with registered water vendors to supply the commodity (water) to the site in case of short-fall in the normal supply.
- ii. Install standard roof water collection systems for the roof catchments of the proposed building blocks. These 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.

3.4.3 Sewer System

The general area is served with public sewerage system of NCWSCO. The proponent therefore intends to connect to the trunk sewer for sewerage disposal. The internal sewer system of the proposed project will be suitably designed to collect all effluent / waste water from the development. All sanitary works will be done to the entire satisfaction of local authority and Ministry of Health, Public Health Office.

Plate 6; Sewer line along the edge of the property.



Source; Field Survey on 23/03/2018

3.4.4 Surface Drainage

The surface water/run-off will mainly be directed to the open drains constructed along the access road. Increased surface run-off is anticipated from roof catchments of building structure; drive way and parking, which are partially impervious. Therefore, as rain falls much water/run-off is anticipated due to slight decrease in recharge areas. In connection to this, the volume of water reaching the drain system will be large and as such it greatly influences the design of effective surface drainage system of the proposed project.

In line with the above, surface drainage systems will effectively be designed and installed to manage the storm water such as may be derived from the parking, driveways and roof of the building blocks. Open (concrete drainage-inverted concrete drains) channels will be used to drain the excess surface water/storm into the public drainage system along the access road.

3.4.5 Solid Waste Management

Increased solid waste generation (from the project) is anticipated mainly arising from the construction activities (wooden, debris, metals, glass, plastics, and sanitary litter etc.). The sources include the following:

- i. Debris resulting from earth works and vegetative materials to be cleared to pave way for the proposed project.
- ii. All stony, wooden, metals and glass materials resulting from related activities, during implementation of the proposed project.
- iii. Plastic materials resulting from such works as sewerage, drainage and water systems, electricity works etc.
- iv. Sanitary litter as generated during implementation and occupation of the project.
- v. Kitchen materials and other refuse especially on the occupation of the proposed project

All debris generated during project implementation process will be disposed suitably into the approved dumpsite or as directed by the Engineer, Ministry of Works.

Handling of wastes during occupation phase shall be fundamentally considered and especially through inclusion of Waste Collection Centre (WCC) at the entrance to the site. This shall enhance storage, collection, transportation and disposal of all solid waste of the entire project, on occupation.

3.4.6 Electricity

The site is not served by electricity from the National grid but there are electric lines along the road adjacent to the property. Upon completion of construction, the proponent will connect the proposed development to the national grid upon acquiring relevant permits.

3.4.7 Communication

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

Plate 7; Electricity lines and telecommunication booster



Source; Field Survey on 23/03/2018

3.4.8 Security

There will be a single gate to the proposed project, which will be fully manned 24 hours. The entire site will also be banded with a boundary wall.

CHAPTER FOUR: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 Introduction

EIA is an instrument for environmental management and development control. It is now accepted that development projects must be economically viable, socially acceptable and environmentally sound. It is a condition that all developers conduct EIAs on the development projects.

EIAs are carried out in order to identify potential positive and negative impacts associated with the proposed development with a view of taking advantage of the positive impacts and developing mitigation measures for the negative ones. The guidelines on EIAs are contained in section 58 to 67 of the Act. According to section 68 of the EMCA 1999, the authority shall be responsible for carrying out environmental audits on all activities that are likely to have a significant effect on the environment.

There are a number of policies, laws and regulations that govern the protection, conservation and exploitation of the natural resources coupled with provisions for environmental management. These national policies, laws and regulations cover infrastructure, water, agriculture, forestry and health just to mention a few. The national environment action plan documents cover policy directions regarding integration of environmental concerns including EIA into development planning process.

Some of the key national laws, policies and regulations that govern the management of environmental resources in the country are discussed herein.

4.2 Relevant National Policies

The following national policies are of relevance to the proposed project:

4.2.1 The National Environmental Action Plan (NEAP)

The NEAP was a deliberate policy effort to integrate environmental considerations into the country's economic and social development initiatives/plans. The integration process was to be achieved through a multi-sectoral approach to develop a comprehensive framework to ensure that environmental management and conservation of natural resources are an integral part of societal decision making. As a result of its adoption and implementation, 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, EIAs were

introduced targeting the industrialists, business community and local authorities (now the county governments).

The project shall be implemented and operated based on these guidelines

4.2.2 National Policy on Water Resources Management and Development (1999)

While the National Policy on water resources management and development (1999) enhances a systematic development of water facilities in all sectors for promotion of the country's socio-economic progress, it also recognizes the by-products of this process as wastewater. It therefore calls for development of appropriate sanitation systems to protect people's health and water resources from institutional pollution. This implies that Industrial and business development activities should be accompanied by corresponding waste management systems to handle the waste water and other waste emanating there from. The same policy also requires that such projects undergo comprehensive EIAs that will provide suitable measures to be taken to ensure environmental resources and people's health in the immediate neighbourhood and further downstream are not negatively impacted by the emissions.

4.2.3 Policy Paper on Environment and Development (1999)

The key objectives of the policy include;

- i. To ensure that from the onset, all development policies, programmes and projects take environmental considerations into account,
- ii. To ensure that an independent EIA report is prepared for any industrial venture or other development before implementation,
- iii. To come up with effluent treatment standards that will conform to acceptable guidelines.

Under this paper, broad categories of development issues have been covered that require a sustainable development approach. These issues relate to waste management and human settlement. The policy recommends the need for enhanced re-use/recycling of residues including wastewater, use of low or non-waste technologies, increased public awareness raising and appreciation of a clean environment. It also encourages 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.

4.2.4 The National Poverty Eradication Plan (NPEP)

The objective of NPEP is to alleviate poverty in rural and urban areas by 50 percent by the year 2015 as well as the capabilities of the poor and vulnerable groups to earn income. It also aims to narrow gender and geographical disparities and a healthy, better educated and more productive population. This plan has been prepared in line with the goals and commitments of the World Summit for the Sustainable Development (WSSD) of 1995. Since poor housing is among the indicators of poor societies, pursuits to address it build individuals capacity to relieve poverty.

4.2.5 Public Health Policy

The prevailing public health policy calls upon the project proponent to ensure that buildings are adequately provided with utilities so that they are fit for human habitation. The proposed development has been designed by professional architects and engineers and as such will have all amenities/utilities that are essential for safeguarding public health for all people using the facilities during the construction, operational and decommissioning phases of the project.

The proponent will adhere to the provisions of the relevant Act of parliament, Public Health Act (CAP 242).

4.2.6 Sustainable Development Goals (SDG's)

On September 25th 2015, countries adopted the United Nations Sustainable Development Goals (SDG's) aimed at contributing towards ending poverty, protecting the planet, and ensuring prosperity for all as part of a new sustainable development agenda. The SDG's have very significant implications for investment needs and the role of the public sector is fundamental and pivotal. At the same time the contribution of the private sector is indispensable.

The proponent has committed to the SDG's through the proposed development in the following ways:

Goal 3 -Good Health & Well Being

Targets achieved:

- i. Contribute to improved health and productivity through the provision of a safe and clean environment

Goal 6 -Clean water and sanitation

Targets achieved:

- i. The connection of the liquid water to the sewer system will improve water quality by reducing pollution, ensuring zero proportion of untreated wastewater and substantially increasing recycling and safe reuse.

Goal 7 -Affordable and Clean Energy

Targets achieved:

- i. Implementation of an energy management system shall contribute to increased energy efficiency.
- ii. Use of solar as alternative source of energy

Goal 8 -Decent work and economic growth

Targets achieved:

- i. Employment creation that will contribute to reducing the proportion of youth not in employment.
- ii. Providing an environment that emphasizes on protection of labor rights and promotes safe and secure working environments for all workers

4.3 Legal framework

4.3.1 Environment Management and Coordination (Amendment) Act, 2015

Section 58 (1) of the Act states “Notwithstanding any approval, permit or license granted under this Act or any other law in force in Kenya, any person, being a proponent of a project, shall, before financing, commencing, proceeding with, carrying out, executing or conducting or causing to be financed, commenced, proceeded with, carried out, executed or conducted by another person any undertaking specified in the Second Schedule to this Act, submit a project report to the Authority, in the prescribed form, giving the prescribed information and which shall be accompanied by the prescribed fee”.

Section 59 (1) states that upon receipt of an environmental impact assessment study report from any proponent under section 58(2), the Authority shall cause to be published in the Gazette, in at least two newspapers circulating in the area or proposed area of the project and over the radio”:

This Act provides a legal and institutional framework for the management of the environmental related matters. This report has been written pursuant to section 58 (1) of this Act and the proponent shall take note of its provisions.

4.3.2 Environmental Impact Assessment and audit regulations 2003

These regulations stipulate how an EIA project report should be prepared and specifies all the requirements that must be complied with. It highlights the stages to be followed, information to be made available, role of every stakeholder and rules to be observed during the whole EIA project Report making process.

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

The proponent and consultant shall seek the views of the project neighbors through public meetings so as to ensure that their concerns are addressed.

4.3.3 EMCA (Water Quality) Regulations, 2006

The Water Quality Regulations (2006) are contained in the Kenya Gazette Supplement No. 68, Legal Notice No. 120. Water Quality Regulations apply to water used for domestic, industrial, agricultural, and recreational purposes; water used for fisheries and wildlife purposes, and water used for any other purposes. Different standards apply to different modes of usage. These regulations provide for the protection of lakes, rivers, streams, springs, wells and other water sources. It is an offence to contravene the provisions of these regulations with a fine not exceeding five hundred thousand shillings.

In addition, of immediate relevance to the proposed project for the purpose of this Project Report is Part II Sections 4-5 as well as Part V Section 24.

Part II Section IV states that “Every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution”.

Part IV Section 24 states that “No person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive wastes, or other pollutants or permit any person to dump any such matter into water meant for fisheries, wildlife, recreational purposes or any other uses”.

According to these regulations, “Every person shall refrain from any action which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of the Act”.

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

4.3.4 EMCA (Waste Management) Regulation, 2006

The regulations are contained in the Kenya Gazette No. 69, Legal Notice No. 121. The Regulations are meant to streamline the handling, transportation and disposal of various types of waste. The aim of the Regulations is to protect human health and the environment. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source. The regulation requires licensing of transporters of wastes and operators of disposal site (sections 7 and 10 respectively). Of immediate relevance to proposed development for the purposes of this project report is Part II Sections 4(1-2), 5 and 6.

Section 4 (1) states that “No person shall dispose of any waste on a public highway, street, road, recreational area or any other public place except in a designated waste receptacle”.

Section 4(2) and 6 explain that the waste generator must collect, segregate (hazardous waste from non-hazardous) and dispose waste in such a facility that shall be provided by the relevant local authority.

Section 5 provides method of cleaner production (so as to minimize waste generation) which includes the improvement of production processes through conserving raw materials and energy.

Section 11 provides that any operator of a disposal site or plant shall apply the relevant provisions on waste treatment under the local government act and regulations to ensure that such waste does not present any imminent and substantial danger to the public health, the environment and natural resources.

Section 12 provides that every licensed owner or operator shall carry out an annual environmental audit pursuant to the provision of the act

In section 14 (1) every trade or industrial undertaking is obliged to install anti- pollution equipment for the treatment of waste emanating from such trade or industrial undertaking.

The developer is expected to take all responsibility to ensure that solid waste is properly disposed by a solid waste collection company that is registered by NEMA and other relevant authorities.

4.3.5 EMCA (Noise and Excessive Vibration Pollution Control) Regulations, 2009

These Regulations require that no person or activity shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. In determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered:

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

These regulations also relate noise to its vibration effects and seek to ensure no harmful vibrations are caused by controlling the level of noise.

Part II Section 4 states that: except as otherwise provided in these Regulations, no person shall

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

Part III Section 2 (1) states that any person wishing to a) operate or repair any machinery, motor vehicle, construction equipment, pump, 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 provided in the First Schedule to these Regulations. Any person who contravenes this Regulation commits an offence.

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

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

and b) the permitted levels of noise as stipulated in the Second and Third Schedules to these Regulations.

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

4.3.6 EMCA (Air Quality) Regulations, 2013

The objective of these Regulations is to provide for the prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The regulations clause 5 states that no person shall act in a way that directly or indirectly causes, or is likely to cause immediate or subsequent air pollution; or emit any liquid, solid or gaseous substance or deposit any such substance in levels exceeding those set out in the first Schedule. Further, clause 6 stipulates that no person shall cause or allow emission of the priority air pollutants prescribed in the second schedule to cause the ambient air quality limits prescribed in the first schedule to be exceeded.

The proponent shall comply with these regulations and implement all mitigation measures provided in the EMP to prevent air pollution especially during construction phase.

4.3.7 Water Act, 2002

This Act of Parliament provides for the management, conservation, use and control of water resources and for the acquisition and regulation of rights to use water; to provide for the regulation and management of water supply and sewerage services; to repeal the Water Act (Cap. 372) and certain provisions of the Local Government Act.

Part II section 18 of this Act provides for national monitoring and information systems on water resources. In addition, sub-section 3 allows the Water Resources Management Authority (WRMA) to demand from any person or institution, specified information, documents, samples or materials on water resources.

Section 94 of the Act makes it an offence to throw or convey or cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive or unwholesome matter or thing into or near to water resource in such a manner as to cause, or be likely to cause pollution of the water resource.

The proponent shall ensure that all construction wastes are collected and dumped at approved sites to prevent potential for contaminating surface and underground water resources. All

hazardous materials shall be kept in a store with concrete floor. In addition, maintenance of fuel powered equipment and/or vehicles should be done off-site.

4.3.8 Occupational Health and Safety Act 2007 CAP 514

The Act makes provision for the health, safety and welfare of persons employed in factories and other places of work. The provision requires that all practicable measures be taken to protect persons employed in the factory and other places of work from any injury. The provisions of the act are also relevant to the management of hazardous and non-hazardous wastes, which may arise at the project site. The act provides that all measures should be taken to ensure safety, health and welfare of all the stakeholders in the work place.

Workers and occupants' safety will be given priority during both construction and operation phases of the project.

4.3.9 The Physical Planning Act of 1996 CAP 286

Part V—Control of development

30. (1) No person shall carry out development within the area of a local authority without a development permission granted by the local authority under section 33.

(2) Any person who contravenes subsection (1) shall be guilty of an offence and shall be liable to a fine not exceeding one hundred thousand shillings or to an imprisonment not exceeding five years or to both.

(3) Any dealing in connection with any development in respect of which an offence is committed under this section shall be null and void and such development shall be discontinued. (4)

Notwithstanding the provisions of subsection (2)—

(a) The local authority concerned shall require the developer to restore the land on which such development has taken place to its original condition within a period of not more than ninety days;

(b) If on the expiry of the ninety days' notice given to the developer such restoration has not been effected, the concerned local authority shall restore the site to its original condition and recover the cost incurred thereto from the developer.

31. Any person requiring development permission shall make an application in the form prescribed in the Fourth Schedule, to the clerk of the local authority responsible for the area in which the land concerned is situated. The application shall be accompanied by such plans and

particulars as are necessary to indicate the purposes of the development, and in particular shall show the proposed use and density, and the land which the applicant intends to surrender for;

- a. Purposes of principal and secondary means of access to any subdivisions within the area included in the application and to adjoining land;
- b. Public purposes consequent upon the proposed development.

36. If in connection with a development application a local authority is of the opinion that proposals for industrial location, dumping sites, sewerage treatment, quarries or any other development activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an environmental impact assessment report.

This Act provides for order in terms of development execution. The proponent shall submit the project designs to the local authority for approval. This development shall also comply with all the provisions of this law including vertical zoning requirements.

4.3.10 Public Health Act Cap 242

Part IX section 115 of the Act states that no person or institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires that the local authorities (county governments) take all lawful necessary and reasonable practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to injuries or dangerous to human health.

The plans for the proposed development have been submitted for to the Nairobi City Government for their review and approved. Attached are the architectural plans.

Section 115 of the Act states that no person/institution shall cause nuisance or, conditions likely to be injurious or dangerous to human health. Section 116 require local Authorities (currently County governments) to take lawful, necessary and reasonably practicable measures to maintain areas under their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health. Such nuisance or conditions are defined under Section 118 waste pipes, sewers, drains refuse pits in such a state, situated or constructed as in the opinion of the medical leer of health to be offensive or injurious to health. Any noxious matter or waste water, discharged from any premises into a public street or into the gutter or side channel or watercourse, irrigation channel or bed not approved for discharge is also termed as a nuisance. Other nuisances are accumulation of materials or refuse which in opinion of the medical officer of health is likely to harbor rats or other vermin.

The proponent will be required to abide by these provisions throughout the project cycle.

Part XII Section 136 states that all collections of water, sewage, rubbish, refuse and fluids which permits or facilitate the breeding or multiplication of pests shall be termed nuisances and are liable to be dealt with in the manner provided by this Act.

The proponent will be required to contract a licensed solid waste collector to collect all solid waste from the site to an approved dumping site. Sewage from the site will be discharged into the conventional sewer system.

4.3.11 County Government Act, 2012

The main purpose of the enactment of this Act was 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. Functions which were carried out by local governments were effectively transferred to the county governments. The Act gives county the responsibility of planning and co-coordinating all developments within their areas of jurisdiction. Part XI (sections 102-115) of the Act provides for planning principles and responsibilities of the county governments. The land use and building plans provided for in the Act are binding on all public entities and private citizens operating within the particular county. The proposed project is within the Nairobi City Government and thus there will be need of working in liaison with the County Government. The plans for the proposed project must be approved by the County Government and the County government may also issue directives and authorizations on various aspects e.g. waste management and fire emergency preparedness among others.

The proponent will work in liaison with NCC and in particular the Water, Energy, Forestry, Environment and Natural Resources sector.

4.4.12 Energy Act, 2006

The Energy Act, 2006 was enacted on 2nd January 2007 establishes an Energy Regulatory Commission (ERC) mandated to perform all function that pertains to energy production, transmission, setting and enforcing of energy policies, Public education and enforcing energy conservation strategies, prescribing the energy licensing process and issuing of licenses that pertain to energy sector in Kenya. Section 30 of the Act provides the factors that shall be taken into consideration prior to issuance of license. It states the need and expression of an entity to conserve and protect the environment and natural resources in accordance to the EMCA 1999. Moreover, the Act gives provisions for the need to protect health and safety of users of energy by

providing an enabling environment of operation that protects the health and safety of users of the service for which the license or permit is required and other members of the public affected by the undertaking.

4.4.13 National Construction Authority Act, 2011

The act is set to streamline, overhaul and regulate the construction industry in Kenya for sustainable development. The NCA establishes the authority and confers on its power to register contractors within the construction industry. The act requires all the contractors, both foreign and local contractors to be registered with the authority. The act also regulates the practices of foreign contractor by limiting their work to only tender work. The foreign contractors are licensed for only a specific period and once they certify they are in Kenya for that specific time. The foreign contractors must also produce a certificate of compliance. Furthermore they must lodge an affidavit with the NCA that once the project they have been licensed is over, they shall wind up their business. This prevents them from engaging in any other construction in the country.

4.4.14 Building Code, 2000

This gives general guidelines for the construction of buildings and attendant safety measures such as installation of firefighting appliances, fire escapes etc. It equally recognizes local authorities as lead planning agencies and thus requires every developer to submit building plans to the relevant local authority for approval. The local authorities are in turn empowered to disapprove any plan submitted if it is not correctly drawn or does not provide sufficient information that complies with the relevant by-laws. Any developer who intends to erect a building, such as a residential block, must also give the concerned local authority a notice of inspection before the erection of the proposed structure.

After erecting the building, a notice of completion shall be issued to the local authority to facilitate final inspection/approval. No person shall therefore occupy a building whose certificate of completion has not been issued by the local authority. As a precaution against fire breakout, the by-law states that the walls of any premise shall be non-combustible throughout. Similarly, in every building which comprises more than one story, other than a small house, shall have fire resistance.

Section 214 indicates that, in any public building whose floor is more than 20 feet above the ground level, the council may recommend the provision of firefighting equipment that may

include one or more of the following: hydrants, hose reels and fire appliances, external conations, portable fire appliances, water storage tanks, dry risers, sprinkler, drencher and water spray spring protector system.

4.3.15 The Penal Code CAP 63

Chapter XVII on “Nuisances and offences against health and convenience” contained in the penal code strictly prohibits the release of foul air into the environment which affects the health of the persons. It states “Any person who voluntarily vitiates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the neighbourhood or passing along a public way is guilty of a misdemeanor”

Waste disposal and other project related activities shall be carried out in such a manner as to conform to the provisions of this code.

4.3.16 The Registration of Titles Act (Chapter 281)

According to section 23 (1) of this Act, the certificate of title issued by the registrar to a purchaser of land upon a transfer or transmission by the proprietor thereof shall be taken by all courts as conclusive evidence that the person named therein as proprietor of the land is the absolute and indefeasible owner thereof, subject to the encumbrances, easements, restrictions and conditions contained therein or endorsed thereon, and the title of that proprietor shall not be subject to challenge, except on the ground of fraud or misrepresentation to which he is proved to be a party.

Copy of land ownership documents is attached to this Report.

4.3.17 The National Land Commission Act, 2012 (No. 5 of 2012)

Section 5 of the Act outlines the Functions of the Commission, pursuant to Article 67(2) of the Constitution as follows 5(1): (a) to manage public land on behalf of the national and county governments; (b) to recommend a national land policy to the national government; (c) to advise the national government on a comprehensive programme for the registration of title in land throughout Kenya; (d) to conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities; (e) to initiate investigations, on its own initiative or on a complaint, into present or historical land injustices, and recommend appropriate redress; (f) to encourage the application of traditional dispute resolution mechanisms in land conflicts; (g) to assess tax on land and premiums on immovable property in any area designated

by law; and (h) to monitor and have oversight responsibilities over land use planning throughout the country.

4.4 Institutional framework

There are different institutions that deal with environmental issues in Kenya. Some of the key institutions include National Environmental Management Authority (NEMA), the Department of Resource Surveys and Remote sensing (DRSRS), the Water Department, The Kenya Forest Service (KFS), The Kenya Forestry Research Institute (KEFRI) among others. While implementing the project, both the proponent and the contractor will have to work in liaison with a number of these institutions when dealing with issues within the jurisdiction of the institutions.

4.4.1 National Environmental Management Authority (NEMA)

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

- i. Co-ordinate the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations into development policies, plan, programmes and projects with a view to ensuring the proper management and rational utilization of the environmental resources on a sustainable yield basis for the improvement of the quality of human life in Kenya.
- ii. Take stock of the natural resources in Kenya and their utilization and consultation, with the relevant lead agencies, land use guidelines.
- iii. Examine land use patterns to determine their impact on the quality and quantity of the natural resources.
- iv. Carry out surveys, which will assist in the proper management and conservation of the environment.
- v. Undertake and co-ordinate research, investigation and surveys in the field of environment and collect and disseminate information about the findings of such research, investigation or survey.
- vi. Mobilize and monitor the use of financial and human resources for environmental management.

- vii. Identify projects and programmes or types of projects and programmes, plans and policies for which environmental audit or environmental monitoring must be conducted under EMCA.
- viii. Initiate and evolve procedures and safeguards for the prevention of accidents, which may cause environmental degradation and evolve remedial measures where accidents occur.
- ix. Monitor and assess activities, including activities being carried out by relevant lead agencies in order to ensure that the environment is not degraded by such activities, environmental management objectives are adhered to and adequate early warning on impending environmental emergencies is given.
- x. Prepare and issue an annual report on the state of the environment in Kenya and in this regard may direct any lead agency to prepare and submit to it a report on the state of the sector of the environment under the administration of that lead agency and,
- xi. Perform such other functions as government may assign to the Authority or as are incidental or conducive to the exercise by the authority of any or all of the functions provided under EMCA.

However, NEMA mandate is designated to various committees. *The contractor and the client will work in liaison with NEMA in getting various permits, licenses, approvals and generally in complying with the provisions of EMCA 1999 and any other subsidiary legislation under the Act.*

4.4.2 National Environmental Tribunal (NET)

This tribunal guides the handling of cases related to environmental offences in the Republic of Kenya. If disputes to the proposed project arise, they are supposed to be presented here for hearing and legal direction.

CHAPTER FIVE: PUBLIC PARTICIPATION

5.1 Introduction

This chapter describes the process of the public consultation followed to identify the key issues and impacts of the proposed project. Views from the local residents, stakeholders, surrounding institutions and development partners who in one way or another would be affected or rather interested in the proposed project were sought through administering of questionnaires, interviews and public meeting as stipulated in the Environment Management and Coordination Act, 1999.

Section 17 of the Environmental (Impact Assessment and Audit) Regulations 2003, states that an EIA should “*seek the views of persons who may be affected by the proposed project.*”

5.2 Objectives of the Consultation and Public Participation (CPP)

The objective of the consultation and public participation was to:

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

5.3 Methodology used in the CPP

The Consultation and Public Participation (CPP) process is a policy requirement by the Government of Kenya and a mandatory procedure as stipulated by EMCA 1999 section 58, on EIA for the purpose of achieving the fundamental principles of sustainable development. The environmental assessment study exercise which was conducted on the 16th March to 24th March 2018. In accordance to the EIA Regulations 2003 section 17c, appropriate notice was circulated to the affected parties/communities on 16th March 2018 one week prior to the public meeting (*attached is the notice and delivery sheet signed by the AP*).

The exercise was conducted in different ways, namely;

- i. interviews and discussion,
- ii. field surveys and observations,
- iii. administering of questionnaires,
- iv. Public meeting held on 23rd March 2018(*attached is a copy of the minutes and pictures*).

The purpose for such interviews was to identify the positive and negative impacts and subsequently promote proposals on the best practices to be adopted and mitigate the negative

impacts respectively. It also helped in identifying any other miscellaneous issues which may bring conflicts in case project implementation proceeds as planned.

Plate 8; Public meeting within the project site



Source; Field Survey 23/03/2018

5.4 Analysis of the Public Consultation findings

5.4.1 Positive Issues

- i. Creation of employment opportunities
- ii. Increase in habitable housing units in the neighborhood
- iii. Source of market to EKA hotel
- iv. Creation of business opportunities

5.4.2 Negative Issues

The following are negative issues raised by the neighbors/affected parties (AP) that need to be addressed;

- i. Increased traffic along the access road.
- ii. Increased water demand
- iii. Increased storm water along the open drains
- iv. Air and noise pollution (dust) especially during the construction phase
- v. Increased solid and liquid wastes
- vi. Pressure on the existing infrastructure

CHAPTER SIX: PROJECT ALTERNATIVES

6.1 Introduction

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

6.2 No project alternative

This option implies that the existing situation prevail i.e. no construction/development activity to take place. This option is mostly applicable in situations where the proposed project area is in ecologically sensitive areas. The land in which the proposed project is to be constructed is in a stable environment and therefore will not be affected by this development activity. From a socio-economic perspective the “no action” alternative may not be the best alternative as the numerous benefits to be gained from the development both locally and nationally would not be realized and the resources in the area would continue to be underutilized since the land lies idle. The ‘No Project Option’ is the least preferred from the socio-economic and partly environmental perspective since if the project is not done:

- i. The economic benefits especially during construction i.e. provision of jobs for skilled and non-skilled workers will not be realized
- ii. There will be no generation of income by the developer and the Government.
- iii. The social-economic status of Kenyans and local people would remain unchanged.
- iv. The local skills would remain under utilized
- v. No employment opportunities will be created for Kenyans during operation phase.
- vi. Discouragement for investors to produce this level of standard and affordable developments.

From the analysis above, it becomes apparent that the ‘No Project Alternative’ is not the appropriate alternative to the local people, Kenyans, and the Government of Kenya. This alternative describes a situation where the proposed development fails to be implemented. In case this happens, positive impacts associated with the proposed development will not accrue to the stakeholders, the development consultants, contractors and suppliers of materials. However, from an environmental conservation perspective, this alternative will be beneficial in the sense that any potential negative impacts associated with the project will be avoided. The “No Action

Alternative” should not be adopted, as we need to encourage development so long as it is undertaken on a sustainable basis as per the environmental management plan developed in this report. In addition, adopting the no action alternative will mean that the existing shortfall in residential, commercial and retail outlets needs will continue to prevail unabated. This is not viable since the proponent had already committed finances and land to a development project that suits development objectives. Construction of this development will create employment, both skilled and semi-skilled. If the project is abandoned, then the trickle-down of financial resources will not be felt in this area. In this respect, the “No project alternative” is deemed inappropriate.

6.3 Alternatives to Site

Currently, there is no other alternative site available to the proponent for the proposed development. Looking for suitable land to accommodate the scale and size of the project and completing official transaction on it may take a long period. In addition, it is not a guarantee that such land would be available. The project design and planning before the stage of implementation would call for cost; already incurred in the proposed development i.e. whatever has been done and paid to date would be considered as a loss to the proponent. Assuming the project will be given a positive response after (say relocation) by the relevant Authorities including NEMA, it (project) would have been delayed for a long period before implementation. The other consequence of this is that it would discourage both foreign and local investors especially in the building sector. In consideration of the above concerns and assessment of the current proposed site, relocation is not a viable option.

6.3 Alternative land use

Alternative land uses such as hotel, commercial may be considered for the site. However, given there is demand for residential units in the area as attributed by the feasibility study conducted by the proponent, coupled with the size of the plot and the net return, it is advisable for the proponent to undertake the proposed development.

6.3 Alternative design

The architectural design that was selected proved to be the most feasible. It provides sufficient housing requirements for the residents, a variety of units to choose from, privacy, security, recreational facilities among other specifications favorable for households. It concurs with the stipulated standards and specifications.

The proponent settled on this design as a unique design that best meets the objectives of the project. *Attached are the architectural drawings.*

6.4 Alternative construction materials and technologies

The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security, environmental and aesthetic requirements. Equipment that saves on water and energy will be given priority. The concrete pillars will be built using locally sourced stones, sand, cement, metal bars and fittings that meet the Kenya Bureau of Standards (KBS) requirements.

The alternative technologies available include the conventional brick and mortar style, prefabricated concrete panels or even temporary structures. Due to cost and durability, the brick and mortar style is most popular in Kenya.

Other various technologies include; concrete frame construction, timber construction, prefabricated space frame construction, steel frame and aluminum frame. The technology to be adopted will be most economical and one sensitive to the environment. Heavy use of timber during construction is discouraged because of destruction of forests. The exotic species will be preferred over indigenous species where need arises.

CHAPTER SEVEN: DESCRIPTION OF EXISTING AND ANTICIPATED IMPACTS AND THEIR MITIGATION MEASURES

7.1 Existing impacts

The subject property is characterized by grass, shrubs and a few trees. The vegetation cover prevents occurrence of soil erosion and provides habitat for birds and insects.

7.2 Anticipated Impacts

The anticipated impacts of the proposed project on the environmental elements are both positive and negative. The magnitude of each impact is described in terms of being significant, minor or permanent, short-term or long term, specific (localized) or widespread, reversible or irreversible.

The assessment criteria for the significant impacts are as shown in the table below:

Table 2: Assessment criteria for significant impacts

| 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 | Temporaire | P | Permanent |

On the basis of information gathered during both the desktop and field study, the potential environmental impacts of the proposed project are as tabulated below.

Table 3: Potential Environmental and Socioeconomic Impacts

| Impacts on Or due to | Construction | Occupation |
|-----------------------------------|--------------|------------|
| Excess noise and vibrations | - | 0 |
| Air Pollution | Sh | 0 |
| Soil erosion | -- | 0 |
| Pressure on water resources | - | 0 |
| Vegetation loss | - | 0 |
| Increased liquid and solid wastes | - | - |
| Occupational Safety and Health | Sp | - |
| Population growth | Sh | L |

| | | |
|--------------------------|----|---|
| Traffic snarl-ups | Sh | - |
| Increased energy demands | Sh | - |

7.3 Environmental impacts

7.3.1 Positive impacts

Positive impacts on the site will be experienced after completion of construction phase. A landscaping plan will be implemented to replace the cleared vegetation and improve natural aesthetic value of the property.

7.3.2 Negative Impacts

7.3.2.1 Soil Erosion

The activities involved in the site preparation and construction phase of the development may have a major negative and moderate impact on soil and geology of the project site. This is due to the removal of vegetation from the area which will leave considerable areas of soil exposed to weather elements, which may result in soil erosion. Heavy machinery will be traversing the site due to the construction activities this may lead to soil compaction and erosion of the soil. Uncontrolled soil erosion can have adverse effects on the local water bodies.

Potential Mitigation measures

- i. Control over excavation works especially during rainy / wet conditions
- ii. The stockpiling of construction materials should be properly controlled and managed.
- iii. Materials to be delivered on site in installments.
- iv. Provide soil erosion control measures i.e. suppressing open surfaces with water or use of soil erosion control structures on soil-erosion prone areas within the site.
- v. Avoid unnecessary excavations and other soil disturbances that can predispose it to the agents of erosion.
- vi. Avoid unnecessary movement of soil materials from the site.
- vii. Re-surface open areas on completion of the project and introduce appropriate vegetation.
- viii. Re-cover exposed soils with grass and other ground cover as soon as possible.
- ix. Leveling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil
- x. Building of physical barriers to prevent mass movement where necessary.

7.3.2.2 Air Pollution

During the construction phase air quality is expected to decline as a result of an increase in levels of fugitive dust from excavation works, the stockpiled earth materials, dusty roads and concrete

mixing. Tiny particulates are a public health hazard and may otherwise create considerable nuisances to the public. There may be air pollution due to combustion of fossil fuels expected from construction machinery. This is expected to be a short-term, reversible impact lasting only for the duration of the construction activity.

Potential Mitigation measures

- i. Work areas and access road shall be watered or treated with Dust Suppressants as necessary to prevent fugitive dust violations.
- ii. An operational water truck should be available at all times. Apply water to control dust as needed to prevent visible emissions violations and offsite dust impacts.
- iii. Onsite dirt piles or other stockpiled material should be covered, wind breaks installed, and water and/or soil stabilizers employed to reduce wind-blown dust emissions.
- iv. Restricting heights from which materials are to be dropped, as far as practicable to minimize the fugitive dust arising from unloading/ loading
- v. Where a vehicle leaving a construction site is carrying a load of dusty materials, the load shall be covered entirely by clean impervious sheeting to ensure that the dusty materials will not leak from the vehicle
- vi. Stockpiles of fine materials (e.g. sand and ballast) should be wetted or covered with tarpaulin during windy conditions.
- vii. Provide personal protective equipment (PPE) such as nose masks, goggles etc. to the workers. Workers in dusty areas on the site shall be issued with dust masks during dry and windy conditions
- viii. Regular and prompt maintenance of construction machinery and equipment. This minimizes generation of hazardous gases.
- ix. Use of dust nets/screens at high levels of the building.
- x. Monitor the air pollution levels regularly as per the Air Quality regulations

7.3.2.3 Noise Pollution

Although not expected to create a significant negative impact, the use of vehicular activities and heavy equipment during construction and building works will inevitably generate noise, which may create a nuisance for nearby residents, particularly the immediate neighbors. Albeit annoying, this negative impact will be short-term (limited to the construction phase). Noise beyond some level is itself a nuisance and need to be avoided. Such noise emissions should be minimized as much as possible from the source point through appropriate measures.

A number of measures may be undertaken by the developer to reduce the impact of noise to the neighbors as well as the workers involved in the project. This is temporary, however, and the aim at this point is to make the increase in noise as small as possible until this construction is completed.

Potential Mitigation measures

- i. Install noise barriers such as hoarding before the construction begins.
- ii. Schedule noisy activities concurrently during construction to reduce the exposure period.
- iii. Use of noise suppressors or silencers on noisy equipment or noise shields i.e. corrugated iron sheet structures.
- iv. Construction works shall be carried out only during the specified time i.e. from say 0800hrs to 1700 hrs.
- v. Machineries shall be maintained regularly to reduce noise resulting from friction.
- vi. Operate noisy machinery only when necessary and switch them off when not in use.
- vii. Workers should be provided with suitable PPE such as earmuffs when operating noisy machinery and when in noisy environment.
- viii. Drivers delivering materials should avoid unnecessary honking of the trucks/vehicles
- ix. Provision of a bill board at the construction site/gate notifying of the construction activity and timings.
- x. Regular monitoring of noise levels at the site as per the regulations.

7.3.2.4 Oil leaks and spills

It is important to note that oil/grease spills are prevalent in construction sites and in most areas that make use of petroleum products. Such products contain detrimental elements to the environment such as heavy metals (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. During operational phase, oil spills might occur at the parking lots.

Potential Mitigation measures

- i. All machinery shall be keenly inspected not to leak oils on the ground. This can be ensured through regular maintenance.
- ii. Maintenance will be carried out in a well-designed and protected area and where oils/grease is completely restrained from reaching the ground. Such areas should be covered to avoid storm from carrying away spilled oils into the soil/water systems.

- iii. All oils/grease and materials will be stored in a site's store, in the contractor's yard.
- iv. Proper disposal of oil handling materials such as drums, oily clothes/papers/materials and cans.

7.3.2.6 Solid Waste

A significant amount of solid waste will be generated in the construction phase through the clearing of vegetation and construction activities which will generate related solid wastes including cement bags, stones, wood, broken glasses, containers, rods of metal, sharp objects (nails) etc. The proponent should take the initiative of segregation of wastes at source to enable recycling and removal of the unrecyclable solid wastes.

The project is expected to generate enormous amounts of solid waste during its operation phase. The bulk of the solid waste generated during this phase will consist of paper, plastic, glass, metal, and organic wastes. Such wastes can be injurious to the environment through blockage of drainage systems, choking of water bodies and negative impacts on human health. Some of these waste materials especially the plastic/polythene are not biodegradable thus may cause long term injurious effects to the environment. Even the biodegradable ones such as organic wastes may be injurious to the environment because as they decompose, they produce methane gas, a greenhouse gas known to contribute to global warming.

Potential Mitigation measures

- i. Efficient use of building material to reduce waste and recycling where possible
- ii. Engage the services of registered waste handlers to transport waste to designated disposal sites
- iii. Use of an integrated solid waste management system; through a hierarchy of options: source reduction, recycling, composting and reuse, will facilitate waste handling during occupation phase.
- iv. Provision for dustbin cubicles
- v. Segregation of waste at the source
- vi. Regular and appropriate disposal of solid waste
- vii. To manage waste in line with the Waste Management Regulations, 2006.

7.3.2.7 Liquid Waste

During construction stage it is expected that wastewater shall arise from the proposed activities which shall be sprinkled on the working areas to reduce dust generation by the construction

machinery while contaminated waste water shall be channeled into the sewer line to prevent water and soil pollution.

Lack of or inadequate provision of toilets for use by workers can lead to ad hoc defecation in secluded areas or structures on the site, thus creating unsanitary conditions and sources of fly infestation. This can threaten the health of neighbors and workers themselves. Indiscriminate sewage disposal can also result to contamination of underground water resources.

Wastewater during operational stage if not properly managed can cause contamination of water resources, land and also air pollution. Thus all waste water shall be properly managed through connection to a sewer line.

Potential Mitigation measures

- i. Channel all liquid waste to the sewer line
- ii. The design of the internal sewerage system shall consider the estimate discharges from individual sources and the cumulative discharge of the entire project i.e. it will have the capacity to consistently handle the loads even during peak volumes.
- iii. All drain pipes passing under building, driveway or parking should be of heavy duty PVC pipe tube encased in concrete surround. All manholes on drive ways and parking areas shall have heavy-duty covers set and double sealed airtight; as approved by specialists.
- iv. Sanitary facilities will be kept clean always, through regular washing/cleaning.
- v. Frequent monitoring of the internal drainage system.
- vi. Blockages and damages shall be fixed expeditiously.

7.3.2.8 Surface drainage

The clearance of site vegetation cover and excavation works will lead to increased soil erosion at the project site and release of sediments into the drainage systems. The building roofs and pavements shall lead to increased volume and velocity of storm water or run-off flowing across the area covered by the buildings. This can lead to increased amounts of storm water entering the drainage systems, resulting in overflow and damage to such systems.

Potential Mitigation measures

- i. Rain water harvesting gutters and storage tanks will be installed to reduce the amount of rainfall reaching the surface.
- ii. Semi permeable materials will be used for construction of pavements.

- iii. Drainage channels should be covered; say with gratings, to avoid occurrence of accidents and entry of dirt.
- iv. Construct gently sloping drains to convey water at non-erosive speed.
- v. After completion of construction, the proponent shall embark on comprehensive landscaping to increase softscape cover on the plot.

7.3.2.9 Increased Water demand

A considerable amount of fresh water will be required during the construction works, especially for cement mixing and for wetting of the site to control dust and for use by the workers (washing, drinking etc). This may place some amount of strain on water supply and may exacerbate current shortage of water supply in Nairobi.

Potential Mitigation measures

- i. The contractor will use water bowsers and tankers to bring in water for construction activities i.e. during periods of high water demand (i.e. during slab formation). Water fetching shall however be subject to authorization by the relevant authority.
- ii. Install water conserving taps that turn-off automatically when water is not in use.
- iii. Encourage water reuse/recycling during construction and occupation phases.
- iv. Roof catchments of building blocks will be provided with rainwater harvesting systems (gutters, down pipes and water storage facilities) to enhance collection and storage of the resulting run-off. Such water can be used in watering flower gardens, general cleaning etc
- v. Provide notices and information signs to sensitize on means and needs to conserve water resource i.e. ‘Keep/Leave the Tap Closed’, etc. This will awaken the civic consciousness of the workers and residents with regard to water usage and management
- vi. Drill a borehole that will provide an alternative source of water.

7.4 Social-economic Impacts

7.4.1 Positive impacts

There are a number of positive benefits associated with the proposed development. The following are some of the positive benefits anticipated:

i. Increase in revenue to the government.

Through payment of relevant taxes, rates, permits and fees to the government and the County Government, the project will contribute towards the national and local revenue earnings.

ii. Economic investment hence increases in wealth

The proponent will receive returns on his investments.

iii. Provision of high quality habitable residential units

This will alleviate the shortage of the housing units in the area and the country at large

iv. Provision of employment opportunities of skilled, semi-skilled and unskilled laborers.

The proposed project will create many jobs for both skilled and semi-skilled workers. During the construction phase, the project will employ a large workforce including; masons, plumbers, electricians among others, cooks among others.

For the operation phase, the project will employ a small work force including; cleaners, security guards, caretakers among others.

v. Improved Security

Security will be ensured around the proposed development through distribution of suitable security lights and presence of 24 hour security guards. This will lead to improvement in the general security in the surrounding area.

vi. Provision of market for supply of building materials

During the construction phase, the project will consume a lot of building materials sourced both locally and in other parts of the region. This will have a positive impact towards the economic status of the supplies and to the national economy through V.A.T rates for goods.

vii. Gains in the local economy

The economy of the neighborhood will receive a boost especially during the construction phase due to the activities of the workers; buying food, drink and commodities.

viii. Land Use Intensification

The development will result to a more economical use of the land without significant environmental degradation.

7.4.2 Negative Impacts

7.4.2.1 Public Health

During construction, there will be increased dust, air and noise pollution. These are considered harmful to human health. The residents and workforce involved will be subjected to these environmental hazards putting them at high risk.

Waste material such as pieces of glass and nails left lying on the ground may cause injuries/accidents to the workers. Food for the construction workforce is usually provided by mobile

individuals most of which operates without licenses. This can compromise health of the workers especially if such foodstuffs are prepared in unhygienic conditions.

Potential Mitigation measures

- i.* Depending on the occupational safety and health hazards anticipated while performing assigned job tasks, workers will require using properly fitting PPE to avoid injuries and illness. These include working boots, overalls, helmets, goggles, earmuffs, masks, gloves etc
- ii.* A First Aid Kit shall be provided within the site and during construction phase. This should be fully equipped at all times and should be managed by qualified persons.
- iii.* Adapt a suitable emergence response plans to manage occurrence of anticipated hazards during construction phase.
- iv.* Safety awareness may be gained through regular safety meetings, safety training or personal interest in safety and health.
- v.* The contractor shall have workmen's compensation cover. It will comply with Work Injury and Benefits Act, as well as other ordinances, Regulations and union Agreements.
- vi.* Sanitary facilities should be provided; and maintain Standard cleanliness of the facilities.
- vii.* Local individuals preparing food for the workers at the site should be controlled, monitored and evaluated to ensure that food is hygienically prepared.
- viii.* Workers should always be sensitized on social issues such as drugs, alcohol, diseases such as HIV/AIDS and STIs etc.
- ix.* Ensure provision of safe drinking water for the workers on site.

7.4.2.2 Insecurity

Insecurity may arise during the construction phase since intruders may try to steal the building materials deposited on the site. This especially happens in cases where there is no fence.

Potential Mitigation measures

- i.* The project site will be enclosed using a perimeter wall to beef-up security and to control movement within the site.
- ii.* There will be a guard house at the gate. Security guards will be expected to monitor the gate of the facility to keep away the intruders and to control movement within the site.
- iii.* Contractor shall provide adequate security during the construction period when there are no works on the site.

- iv. The guards stationed at the gates will document movements in and out of the site/ property.
- v. Installation of CCTV cameras at strategic points for monitoring and enhancing the security of the property during operation phase.

7.4.2.3 Fire

The operations that lead to fire outbreaks include poor handling of electricity systems, faulty electrical equipment, carelessness etc. These should be avoided both during construction and operation phases of the project through proper training and sensitizations.

Potential Mitigation measures

- i. Hire competent and properly authorized electrical contractor to do the wiring and other electrical works.
- ii. Provide adequate number of appropriate firefighting equipment
- iii. Organize for inspection and maintenance of fire equipment at least once in a period of six months
- iv. Conduct regular firefighting drills within the site.
- v. Post 'No smoking signs' where flammable materials will be stored
- vi. Develop and post at the site, fire emergency and evacuation procedures
- vii. Train staff on the use of the available firefighting equipment
- viii. At least one person trained on handling firefighting techniques should be available through-out the construction phase of the project.
- ix. Maintain on site telephone contacts for fire brigade, G4S fire brigade and St. Johns ambulance service provider

7.4.2.4 Increased Energy demand

There will be increased use of energy during the construction stage (fuel for running machinery and other equipment) and during operation phase (electricity used by the residents of the housing project). Energy conservation is thus fundamental.

Energy conservation involves optimum use of petroleum products (diesel and gasoline), electrical appliances (equipment), lighting systems and other electric machinery as used for different purposes. It also includes use of renewable energy sources.

Potential Mitigation measures

- i. Turn off machinery and equipment when not in use.
- ii. Monitor energy use during construction and set reasonable limit.

- iii.* Put off all lights immediately when not in use or are not needed.
- iv.* Use energy conserving electric lamps for general lighting.
- v.* Make use of alternative source of energy such as solar power. Solar panels proposed in the project shall be fully utilized and timely repaired in case of damage.

7.4.2.5 Traffic Density

There will be increase in traffic along the access road and Mombasa road especially during construction phase since trucks will be accessing the site to deliver construction materials and taking away construction wastes. This phase of the development may have a negative impact on the present road network in the study area. During the operation phase of the project, a major negative impact on the road network in the area will also be experienced as the volume of traffic associated with the project activities will be significantly increased.

Potential Mitigation measures

- i.* Employ traffic marshals to control traffic along the adjacent roads and in and out of the site.
- ii.* Notify the motorists about the proposed development once implementation is started. It is important that warning/ informative signs (bill boards) be erected at the site. The signs should be positioned in a way to be easily viewed by the public and mostly motorists.
- iii.* The traffic along the connecting roads should be controlled especially during construction phase and mostly when trucks are turning into the site, say when delivering of materials.
- iv.* Rehabilitate the access road leading to the property. In case the major road is damaged by the heavy trucks and machinery, the proponent should embark on repair after completion of construction phase.
- v.* Construction an entrance with a neck from the access road that caters for at least four cars within the property to avoid strain on the access road
- vi.* Seek an alternative exit route to the Mombasa road to reduce pressure on the 15 metre access road

7.4.2.6 Conflict with the community

Projects of such magnitude usually attract public uproar (especially from the neighboring residents and community) if they are not made to own the project. Conflicts usually arise mostly from the foreseen negative impacts. Consultations with the neighbors and relevant stakeholders on the mitigation measures prescribed for the negative impacts should be done as a way of conflict prevention.

CHAPTER EIGHT: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN (EMP)

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 table addresses 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 the proposed project.

The EMPs have considered for all phases; construction, operational and decommissioning.

8.1 EMP FOR THE CONSTRUCTION PHASE

Table 4: Environmental Management and Monitoring Plan during construction phase

| Environmental/ Social Impact | Proposed Mitigation Measures | Responsibility for mitigation | Monitoring frequency | Estimated Cost (Kshs) |
|--|--|---|--|-----------------------------|
| Vegetation loss / disturbance | <ul style="list-style-type: none"> • Ensure proper demarcation and delineation of the project area to be affected by construction works. • Apply for tree cutting permit from relevant authorities before cutting of any tree | - Proponent - Contractor | Routine inspection | 50,000 |
| Soil erosion | <ul style="list-style-type: none"> • Ensure management of excavation activities • Control activities especially during rainy seasons • Provide soil erosion control and conservation structures where necessary. • Compact loose soils to minimize wind erosion | - Proponent - Contractor - Workers - NEMA inspectors | Routine inspection | 75,000 |
| Air pollution | <ul style="list-style-type: none"> • Sprinkling of water on dusty areas at least twice a day • Careful screening of construction site to contain and arrest construction related dust. • Daily enclosing, covering and watering of exposed stockpiles e.g. sand • Ensure construction machinery and equipment are well maintained to reduce exhaust gas emission | - Proponent - Contractor - County Public Health Officer - Workers - NEMA inspectors | Daily inspection Routine maintenance | 200,000 |

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| | <ul style="list-style-type: none"> All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction. Drivers of construction including bulldozers, earth-movers etc. will be under strict instructions to minimize unnecessary trips and minimize idling of engines. | | | |
| Noise pollution | <ul style="list-style-type: none"> Construction activities to be restricted to daytime i.e. 8am to 5pm Use of suppressors or noise shields on noisy equipment for instance corrugated iron sheet structures Sensitize drivers of construction machinery on effects of noise Trucks used at construction site shall be routed away from noise sensitive areas where feasible. Maintain plant equipment to suppress frictional noise Workers in the vicinity or involved in high-level noise to wear PPE Comply with EMCA (Noise and excessive vibration pollution control) Regulations 2009 | <ul style="list-style-type: none"> - Proponent - Contractor - County Public Health Officer - Workers - NEMA inspectors | <p>Random inspection</p> <p>Routine maintenance</p> | 150,000 |
| Oil pollution | <ul style="list-style-type: none"> Proper storage, handling and disposal of new / used oil and related wastes Maintain construction machinery and equipment to avoid leaks Maintenance of construction vehicles to be carried out in the contractors yard (off the site) | <ul style="list-style-type: none"> - Proponent - Contractor | Routine maintenance | 75,000 |
| Storm water drainage | <ul style="list-style-type: none"> Proper installation of drainage structures/facility Install cascades to break the impact of water flowing in the drains Ensure efficiency of drainage structures through proper design and maintenance Provide gratings to the drainage channels | <ul style="list-style-type: none"> - Proponent - Contractor | <p>Routine inspection</p> <p>Random inspection</p> | 75,000 |
| Solid waste and liquid waste | <ul style="list-style-type: none"> Segregate the waste at the site Ensure proper disposal of construction waste to approved sites Engage services of a registered NEMA waste handler to dispose the waste Covering of the trucks during transportation all the building materials and waste Sensitize workers on the reuse of materials where appropriate. As provided for by the Building Code, a portable toilet will be provided on site to be used by construction workers | <ul style="list-style-type: none"> - Proponent - Contractor - Workers | Weekly checks | 150,000 |

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|-------------------------------------|---|---|--------------------|---------|
| Increased water demand | <ul style="list-style-type: none"> • Employ services of water vendors to supplement water supply • Sensitize workers to reduce water wastage • Sink a borehole to as a supplementary water source | - Contractor - Workers | Daily inspection | 250,000 |
| Traffic congestion | <ul style="list-style-type: none"> • Employ traffic marshals to control traffic in and out of site • Ferry building materials during off-peak hours • Provide bill boards at the site/entrance to notify motorists and general public about the development • Enforce speed limits for construction vehicles especially along the roads leading to the site • Ensure that the vehicles comply with axle load limits • Employ well trained and experienced drivers | - Proponent - Contractor - Drivers | Daily observation | 150,000 |
| Health and safety of workers | <ul style="list-style-type: none"> • Construction work will be limited to daytime only • Workers to be adequately insured against accidents. • All workers will be sensitized before construction begins on how to control accidents related to construction. • Keep record of the public emergency service telephone numbers including: Police, Fire brigade, Ambulance at strategic points • Provide first aid kits at strategic places in the site • All workers to wear protective gear during construction e.g. helmets. • Provide clean water and food to the workers. • Ensure that the workers are registered with NHIF / NSSF and remit appropriate fees • A comprehensive contingency plan will be prepared before construction begins on accident response. | - Proponent - Contractor - Workers - NHIF and NSSF officials | Random checks | 100,000 |
| Insecurity | <ul style="list-style-type: none"> • Provide security guards during construction period for both during the day and night • Construct temporary barrier (iron sheet) around the site before commencement of construction • Keep records of all movement in and out of the construction site | - Contractor - Proponent | Daily observation | 50,000 |
| Re-vegetation | <ul style="list-style-type: none"> • Design and implement an appropriate landscaping and tree planting program to help in re-vegetation of the project area after construction. • Introduction and maintenance of vegetation (trees and grass) on open spaces and around the site | - Proponent - Contractor | Routine inspection | 120,000 |

8.2 EMP FOR THE OPERATION PHASE

Table 5: Environmental management and monitoring plan during Operation phase

| Environmental/ Social Impact | Proposed Mitigation Measures | Responsibility for mitigation | Monitoring frequency | Estimated Cost (Kshs) |
|--|--|--|---|----------------------------------|
| Sewage/waste water spillage | <ul style="list-style-type: none"> Regular inspection and maintenance of the internal sewer system. Residents should report any incidence of blockages in their units immediately they occur | - Proponent Residents | Periodic checks Routine Maintenance | 100,000 |
| Solid waste generation | <ul style="list-style-type: none"> Encourage segregation of waste (organic and inorganic) and provide for clearly marked dustbins to serve the specified use. Ensure that wastes generated are efficiently managed through recycling, reuse and proper disposal procedures A private NEMA licensed company to be contracted to handle solid waste | - Proponent - Residents - County public health officer | Periodic Checks | 50,000 |
| Air pollution | <ul style="list-style-type: none"> Gardening of landscaped areas Watering of uncovered areas Periodic maintenance of generator and water pumps | - Proponent | Weekly checks Routine maintenance | 100,000 |
| Noise and vibration Pollution | <ul style="list-style-type: none"> Installation of silencers on the generators and transformer rooms Do annual noise measurements. Sensitize residents on minimal permissible noise levels Comply with EMCA (Noise and excessive vibration pollution control) Regulations 2009 | - Proponent - NEMA inspectors - Residents | Periodic checks | 250,000 |
| Storm water drainage | <ul style="list-style-type: none"> Proper maintenance of drainage structures Inspection and maintenance of water harvesting gutters and storage tanks | - Proponent | Routine inspection and maintenance | 100,000 |
| Increased water use | <ul style="list-style-type: none"> Harvest rain-water Install water conserving taps that turn off automatically when not in use Place notices at water taps e.g. 'TURN OFF TAP AFTER USE' Provision of roof/ underground tanks for water storage Maintenance of water components | - Proponent - Residents | Daily Inspection Routine maintenance | 150,000 |
| Increased energy use | <ul style="list-style-type: none"> Switch off electrical appliances when not in use. Switch off all lights immediately when not in use or are not needed. | - Proponent - Residents | Daily Observation | 100,000 |

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|-------------------|---|--|--|---------|
| | <ul style="list-style-type: none"> • Use energy conserving bulbs e.g. LED bulbs for general lighting. • Maintenance of electrical components. • Use alternative source of energy such as solar energy | | Routine maintenance | |
| Fire | <ul style="list-style-type: none"> • Install fire fighting equipment • Sensitize the residents on fire risks i.e. conduct regular fire drills • Adapt effective emergency response plan • Maintain fire fighting equipment regularly • Provide emergency numbers at strategic points | <ul style="list-style-type: none"> - Proponent - Residents | Routine inspection | 100,000 |
| Insecurity | <ul style="list-style-type: none"> • Engage services of security guards • Install and regular maintenance of the CCTV cameras • Place hotline numbers on strategic places • Sensitize residents on security precautions • Sensitize the residents on “Nyumba Kumi Initiative” | <ul style="list-style-type: none"> - Proponent - Residents | Periodic checks Routine maintenance | 150,000 |
| Traffic | <ul style="list-style-type: none"> • Provide warning lights and other signs to reduce risk of accidents • Provision of adequate on-site parking bays • Maintenance of the parking bays | <ul style="list-style-type: none"> - Proponent | Routine maintenance | 100,000 |

8.3 EMP FOR THE DECOMMISSIONING PHASE

Note: A due diligence environmental audit will be undertaken and submitted to NEMA at least three months prior to decommissioning and in line with the Environmental Management and Coordination Act No. 8 of 1999.

Table 6: Environmental management and monitoring plan during Decommissioning phase

| Environmental/ Social Impact | Proposed Mitigation Measures | Responsibility for mitigation | Monitoring means | Recommended frequency of monitoring | Estimated Cost (KShs) |
|--|--|---|--|-------------------------------------|-----------------------|
| Demolition of existing structures | <ul style="list-style-type: none"> ▪ Apply for demolition permit from relevant authorities before commencing the demolition ▪ Engage a registered private contractor to carry out the demolition ▪ Provide workers with PPE ▪ The demolition exercise to be limited to day time only ▪ Comply with EMCA (Noise and excessive vibration pollution control) Regulations 2009 | <ul style="list-style-type: none"> - Project proponent - Contractor - NEMA inspectors | Inspection | Daily | 500,000 |
| Air pollution | <ul style="list-style-type: none"> ▪ Dust suppression with water sprays on dusty areas ▪ Careful screening of construction site to contain and arrest construction related dust ▪ Ensure demolition machinery and equipment are well maintained to reduce exhaust gas emission | <ul style="list-style-type: none"> - Proponent - Contractor - NEMA inspectors | Inspection Maintenance | Daily Routine | 150,000 |
| Noise pollution | <ul style="list-style-type: none"> ▪ Demolition activities to be restricted to daytime (8am to 5pm) ▪ Use of Suppressors on noisy equipment or use of noise shields for instance corrugated iron sheet structures ▪ Workers in the vicinity or involved in high level noise to wear respective safety & protective gear. ▪ Comply with EMCA (Noise and excessive vibration pollution control) Regulations 2009 | <ul style="list-style-type: none"> - Proponent - Contractor - Workers - NEMA inspectors | Inspection Observation Maintenance | Routine | 100,000 |
| Health and safety of workers | <ul style="list-style-type: none"> ▪ All workers to wear PPEs e.g. helmets. ▪ All workers will be sensitized before demolition begins, on how to control accidents related to construction. | <ul style="list-style-type: none"> - Contractor - Workers - Proponent - NEMA inspectors | Checks | Daily | 150,000 |

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|--|--|--|------------|--------|---------|
| | <ul style="list-style-type: none"> ▪ Accordingly, adherence to safety procedures will be enforced. ▪ All workers will be adequately insured against accidents. | | | | |
| Solid and liquid waste | <ul style="list-style-type: none"> ▪ Ensure proper solid waste disposal and collection facilities ▪ Refuse collection vehicles will be covered to prevent scatter of wastes by wind. ▪ Demolition wastes to be collected by a licensed operator to avoid illegal final dumping at unauthorized sites. ▪ All persons involved in refuse collection shall be in full protective attire. | <ul style="list-style-type: none"> - Contractor - Proponent - NEMA inspectors | Checks | Daily | 250,000 |
| Re-vegetation and comprehensive landscaping | <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 run off 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; | <ul style="list-style-type: none"> - Contractor - Proponent | Inspection | Random | 150,000 |

CHAPTER NINE: CONCLUSIONS AND RECOMMENDATIONS

The proposed Residential Development shall bring with it numerous positive impacts including increase in the residential units, creation of employment opportunities, improved businesses in the project area especially for various suppliers and increase in revenue to both the county and national governments among others as outlined in the report.

The negative environmental impacts that will result from establishment of the project which include increase in traffic along the access roads, air and noise pollution, increased water demand, strain to existing infrastructure among others can however be mitigated.

The proponent has committed to put in place various mitigation measures to mitigate the negative environmental, safety, health and social impacts associated with the proposed development. It is recommended that in addition to this commitment, the proponent should focus on implementing the measures outlined in the EMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

It is also recommended that the positive impacts that emanate from such activities shall be maximized as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards.

REFERENCES

1. Kenya gazette supplement Acts 2000, Environmental Management and Coordination Act Number 8 of 1999. Government printer, Nairobi
2. Kenya gazette supplement number 56. Environmental Impact Assessment and Audit Regulations 2003. Government printer, Nairobi
3. Kenya gazette supplement Acts, Environmental Management and Coordination (Water Quality) Regulations, 2006. Government printer, Nairobi
4. Kenya gazette supplement Acts, Environmental Management and Coordination (Waste Management) Regulations, 2006. Government printer, Nairobi
5. Kenya gazette supplement Acts, Environmental Management and Coordination (Noise and Excessive Vibrations Pollution) Regulations, 2009. Government printer, Nairobi
6. Kenya gazette supplement Acts Building Code 2000. Government printer, Nairobi
7. Kenya gazette supplement Acts Physical Planning Act, 1999. Government printer, Nairobi
8. Kenya gazette supplement Acts Public Health Act (Cap. 242). Government printer, Nairobi
9. Kenya gazette supplement Acts Water Act, 2002. Government printer, Nairobi
10. The Occupational Safety and Health Act, 2007. Government Printer, Nairobi

ANNEXES

1. Copy of ownership documents
2. Copy of expert practicing licenses
3. Copy of architectural plans
4. Location map
5. Copy of the invitation letter
6. Copy of public meeting delivery receipt
7. Copy of minutes of the Public Meeting held on 23rd of March 2018
8. Questionnaires