ENVIRONMENTAL IMPACT ASSESSMENT

STUDY REPORT

FOR

THE PROPOSED DEVELOPMENT OF RESIDENTIAL APARTMENTS ON PLOT L.R. NO. 1012/133 (Original No. 1012/47/1/10) AT ROYSAMBU OFF KAMITI ROAD, ROYSAMBU SUB-COUNTY, NAIROBI COUNTY

(GPS Co-ordinates: Latitude -1.217573, Longitude 36.887706)

Done Pursuant to the provisions of the Environmental Management and Coordination Act (EMCA), CAP 387 and the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019.

Proponent:

ROYAL SUBURB PHASE 4 LTD,

P.O BOX 15854 - 00509,

NAIROBI.

CERTIFICATION

This EIA Study Report was conducted and prepared by: -

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For and on behalf of: -

ROYAL SUBURB PHASE 4 LTD,
P.O BOX 15854 - 00509,
NAIROBI.

Signed: _____ Date: _____

(For Proponent)

KEY TERMS

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

*"**Environmental Management**" Includes the protection, conservation and sustainable use of the various elements or components of the environment.*

*"**Environmental Management Plan**" means all details of project activities, impacts, mitigation measures, time schedule, costs, responsibilities and commitments proposed to minimize environmental impacts of activities, including monitoring and environmental audits during implementation and decommissioning phases of a project.*

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

*"**Environmental resources**" includes the resources of the air, land, flora, fauna and water together with their aesthetical qualities.*

*"**Environmentally friendly**" includes any phenomenon or activity that does not cause harm or degradation to the environment.*

*"**Developer**" means a person who is developing a project which is subject to an environmental impact assessment process under the EMCA Act.*

*"**Mitigation Measures**" Include engineering works, technological improvements, management and ways and means of minimizing negative aspects, which may include socio-economic and cultural losses suffered by communities and individuals, whilst enhancing positive aspects of the project.*

*"**Study Report**" Means a full statement of the likely environmental effects of a proposed development referred to in section 58 of the EMCA.*

*"**Proponent**" Means a person proposing or executing a project, program or an undertaking specified in the Second Schedule of the Act.*

*"**Waste**" Includes any matter prescribed to waste and any matter whether liquid, solid, gaseous or radioactive, which is discharged, emitted or deposited in the environment in such volume composition or manner likely to cause an alteration of the environment.*

*"**Water**" Includes drinking water, river, stream, watercourse, reservoir, well, dam, canal, channel, lake, swamp, open drain or underground water.*

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ACRONYMS

NEMA	National Environment Management Authority
EIA	Environmental Impact Assessment
EHS	Environmental Health and Safety
PPEs	Personal Protective Equipment
OHS	Occupational Health and Safety Services
EMP	Environmental Management Plan
ERPs	Emergency Response Plans
GOK	Government of Kenya
EMCA	Environmental Management & Coordination Act
NCWSC	Nairobi City Water and Sewerage Company
NCC	Nairobi City County

EXECUTIVE SUMMARY

The proponent hereby mentioned as Royal Suburb Phase 4 Ltd have proposed to construct residential apartments on Plot L. R No. 1012/133 (Original No. 1012/47/1/10) at Roysambu area off Kamiti Road, Roysambu Sub-county, Nairobi County. The architectural drawings show that there will be residential apartments as follows:-

- Studios – 204 units
- Superior studios– 168 units
- One bedroom A– 99 units
- One bedroom B– 12 units

  TOTAL UNITS – 483 APARTMENTS

There shall be one basement for car parking. Ground floor shall accommodate commercial space, trash house, power room, and car parking while first to twelfth floors shall accommodate the apartments. Accommodation shall comprise of studios/bedsitters with sanitary facilities, one and two bedroomed apartments with lounge/living room, one or two bedroom, kitchen, and sanitary facilities. The roof will also have amenities including water tanks, hanging lines, prayer area, and chill spots. The apartments are in a single block rising to twelve sky-levels. There shall be staircases and a lift shaft to facilitate access and vertical movement and the proposed project will be enclosed with a stone perimeter wall with a single gate serving as entry and exit. The proposed design has provided for sewer and other plumbing reticulation, and surface run-off drains. There shall be staircases (for emergency response) and lifts to facilitate access and vertical movement. The area is zoned for residential development.
The proposed project is situated at Roysambu off Kamiti Road, Roysambu Sub-county, Nairobi County. The immediate neighborhood is characterized by high rise multi-dwelling flats. It is evident that this is an area with high population.

The current national urban housing needs are estimated at about 150,000 per year, but only 30,000 are being built per year, resulting to an annual shortfall of over 120,000 units. The response by the public sector in building houses has not kept pace with the increase in population leading to a shortage of affordable housing.

The proposed project during its construction phase will provide jobs to youths in the area, business opportunities for purchase of building materials, and once completed it will provide accommodation facilities for the proponent.

The positive impacts of any project are in the form of sustainability indicators largely categorised into three broad classes as economic inputs, social inputs and environmental inputs. The economic inputs arising from this project come broadly in the form of real income (investments), employment and fixed capital formation. Environmental inputs include clean and healthy general environment and sustainable use of resources. However, the impacts may be more only that they are decentralized and may not be directly attributed to the project. The main include but not limited to provision of standard housing and thus wellbeing, creation of employment throughout the project cycle, optimal use of the land and increase in land value, direct and indirect increase in government revenue, economic-investment hence increases in wealth, creation of market for goods and services and especially construction inputs and many secondary businesses are also likely to spring up during the implementation phase especially

those providing foods and beverages to the construction workers and general increase in business around the project site/area due to the increased population.

The benefits mentioned notwithstanding, some associated costs may arise as well. However, the negative impacts are insignificant because the site is flat and environmentally sustainable. There is vegetation part of which has been affected but the proponent can do landscaping to restore the area in terms of vegetation. Most of the vegetation in the area has no significant conservation or economic value. The foreseeable negative impacts include but not limited to impact (constraints/pressure) to the existing infrastructure i.e. water, sewer system, power, surface drains (increased storm water/ run off resulting from the roof catchments and as a result of decreased recharge areas), roads among others, Impact to soil especially when laying the foundation and other earthworks and reduction of the green areas, Increased noise and vibration mostly during project implementation phase and enhanced potential for social crimes.

Other foreseeable impacts include health and safety concerns especially to workers not using the appropriate PPEs for the construction works. Hazards associated with construction include but not limited to falling objects, risks from poor scaffolding, ladder and formwork. Poor quality construction materials, poor workmanship and poor standards may also contribute to accidents. Other risks involve fires.

The proactive design has provided various mitigation measures to ensuring compliance with applicable environmental laws and guidelines including but not limited to lighting, ventilation, space requirements, surface drainage, sewage management system and the structural safety among others.

To cater for surface drainage, well-designed drain channels have been proposed to harmonize management of the resulting storm water within the site. Storm water/ runoff could be greatly reduced by rainwater harvesting and rainwater storage facilities. The drains should be regularly maintained and covered with gratings to avoid accidents and dirt. All workers should be provided with full protective gear (PPE) and they should be sensitised on health, safety and environmental conservation aspects. Qualified personnel must do all scaffolding, ladder and formwork to standards. Quality materials, skilled labour (where necessary), and the set standards must be put into practice.

Effective emergency response plans should be adopted during the entire project cycle. There should be a specific area for hazardous material storage. Strictly, the **Building Code** and other applicable building standards as may be in force must be adhered to and the **Occupational Safety and Health Act, 2007** must be enforced. An accident/incident record should be kept on site and under care of responsible person and a first aid kit(s) with all basic requirements and the in-charge be trained.

Throughout the project cycle, sound waste management systems and procedures must be adopted. During the remaining construction phase, the contractor should put in place effective and efficient waste disposal systems. Waste, including excavated soil and debris should be properly disposed of by backfilling or dumping in approved grounds by the City County or other relevant government offices. The contractor should provide acceptable and standard sanitary conveniences to the workers during the construction. On completion, comprehensive landscaping should be done to upgrade the site to appropriate environmental standards.

The study and a cost and benefit analysis reveals that the benefits far outweigh the associated costs and the benefits can further be maximized with strict adherence to the proposed mitigation measures (the EMPs) and closely working with environmental experts and other relevant professionals, NEMA, the local authority and other relevant institutions throughout the project cycle. The importance of liaising is to ensure that variation in predicted impacts is handled appropriately during the project cycle otherwise the major concerns at any point in time should be focused towards avoidance or minimizing the occurrence of negative impacts.

The proponent seeks to get an approval/license from the National Environment Management Authority by submitting this EIA Study Report. This will enable the proponent develop the flats and will certainly be a joy and beneficial to the proponent.

1.0 INTRODUCTION

1.1 General overview, Justification and rationale for EIA

The proponent has proposed to construct studio apartments/bed sitters, one and two bedroomed apartments on Plot L.R No. 1012/133 (Original No. 1012/47/1/10) in Roysambu area off Kamiti Road, Roysambu Sub-county, Nairobi County. The proposed site is within residential zone thus is compliant with planning policy. The proposed project is collaborated by the ever growing population coupled with the growing economy among others, thus the need for increase in standard residential house units. Besides, the project brings forth various advantages as discussed elsewhere in this report. Housing is a basic need but unfortunately its supply has always lagged behind the demand.

The rationale for the EIA study report is to integrate environmental aspects in the planning and implementation processes of the proposed project to mitigate adverse impacts and enhance the positives. Besides, environmental impact assessment (EIA) for such projects is now a legal requirement. The ultimate objective of an EIA is to provide decision makers, relevant institutions/organizations, proponent and other stakeholders with the foreseeable environmental impacts of a proposed activity and therefore enable planning ahead taking into account all predictable outcomes and adequately providing for them for sustainability.

The purpose of the study is to identify foreseeable potential impacts (physical, ecological and cultural/socio-economic) so as to enhance the benefits and at the same time avoid negative impacts (costs) or provide appropriate cost effective measures to remedy the negative impacts that cannot be completely avoided. The study is expected to raise both the potential positive and negative impacts likely to emanate from the proposed project. Integrating *Sustainable Environmental Management principles* in the planning, implementation and throughout the project cycle is vital in reducing/mitigating conflicts and enhancing environmental conservation.

1.2 Objectives

The main objective of this EIA study report is to establish the baseline conditions of the proposed site, evaluate the existing and the anticipated impacts and propose measures to enhance the positive impacts and measures to attenuate the effects of the significant negative impacts.

1.3 Terms of Reference (TOR)

This Environmental Impact Assessment involved the generation of baseline information, establishing the current status of the proposed site and its environs, identification of predictable effects of the development on the environment (including infrastructure, occupational health and safety issues) and direction & magnitude of the changes, analysis of the compatibility of the proposed project with the surrounding land uses (as per the prevailing policy and legal framework) and the proposition of potential mitigation measures to be undertaken throughout the project cycle; and development of an environmental management plan with proposed mechanisms for monitoring and evaluating the compliance and environmental performance.

1.4 Scope of EIA Study

The study has been conducted as per the above TOR and as set out in EMCA, CAP 387 and the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019. i.e. to evaluate the potential and the foreseeable impacts of the proposed project, generation of baseline information evaluation and recommendation of the best alternatives from the options available (if any), the nature, order of magnitude, extent, duration and reversibility of the potential changes. The geographical scope is limited to the direct and indirect physical extent as may be foreseeably affected by the proposed project.

1.5 Methodology

The methodology involved visits to the proposed site for data collection, relevant desktop study, analysis and interpretation of data collected, analysis of proposed designs, activities and schedules, public participation and consultation within the neighbourhood.

2.0 DESCRIPTION OF THE ENVIRONMENT

As mentioned earlier, the proposed project is situated in Roysambu area off Kamiti Road, Nairobi County. The area is characterized by high rise multi-dwelling residential flats. Currently, the proposed site is idle with some little vegetation to be cleared to pave way to the proposed project.

Plate 1: Overview of the general area

Source: Field Survey

2.1 PHYSICAL ENVIRONMENT

This is described through various physical parameters that are within the locality.

2.1.1 Climate

The area enjoys a double (Bi-Modal) seasonal rainfall pattern, with high to moderate rainfall from April to May and November-December. The rainfall peaks during the months of April and November annually. Rainfall is bimodal and the average rainfall received varies from 600 to 2000 mm per year (Jaetzold and Schmidt, 1982). It experiences average temperatures ranging from 17^0C to 25^0C.

2.1 2 Landscape and Soils

The area has a gently flat terrain and characterized with dark loamy and also black cotton soils.

2.1.3 Vegetation

There are mature trees and bushes on the proposed site which shall be cleared to pave way to the proposed project.

2.2 SOCIO-ECONOMIC ENVIRONMENT

2.2.1 Demographic Characteristics

Because of its close proximity to Thika Superhighway, this area has many people residing there. There are many multi-storeyed buildings hence the high population in the area. It is anticipated that because of the high demand for housing within Nairobi, more and more people will seek for housing in the area.

2.2.2 Labour Force

This comprises mostly of the youth most of whom are not employed and thus through some of these construction projects they get to earn income.

2.2.3 Water Supply and Sewer network

The area is connected to the NCWSC water supply and there is a public sewer network in the area.

2.2.4 Road Network and Communication

The area is well accessible from the Kamiti Road and Thika superhighway. All these roads are tarmacked.

The area is well endowed with communication networks. This being an urban area with a busy residential area, there is sufficient means for communication with many networks covering the area. These include Safaricom, Airtel, Telkom mobile and landline. Other channels of communication include internet services.

Plate 2: Part of infrastructure development in the area

Source: Field Survey

2.2.5 Electricity

The area is connected to the electricity transmission lines from the Kenya Power and Lighting Company national grid. This is the main form of energy for lighting households and running various household machines in the area. The internal electrical wiring will be done once the building is complete.

3.0 DESCRIPTION OF THE PROPOSED PROJECT

3.1 PROJECT LOCATION AND SITE

As mentioned earlier, the proposed project is situated in Roysambu area off Kamiti Road, Roysambu Sub-county, Nairobi County. Accessibility via vehicle is along Kamiti Road then divert at Shell Petrol Station or alternatively use Lumumba Drive.

Fig 2: Sketch map of the proposed project site and showing direction *(not drawn to scale*)

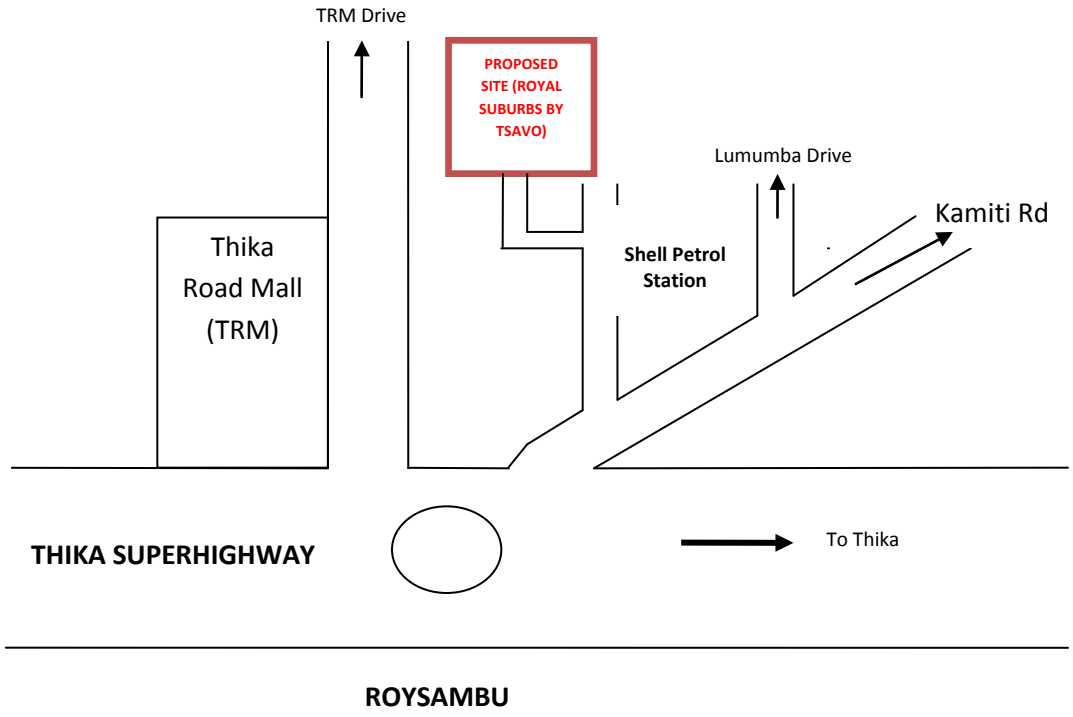

Fig 3: Google maps showing the proposed site

3.2 PROJECT DESCRIPTION

The proponent hereby mentioned as Royal Suburb Phase 4 Ltd have proposed to construct the following:

- Studio apartments– 204 units
- Superior studio apartments– 168 units
- One bedroom A apartments – 99 units
- One bedroom B apartments– 12 units
  TOTAL UNITS – 483 APARTMENTS

There shall be one basement for car parking. Ground floor shall accommodate commercial space, trash house, power room, and car parking while first to twelfth floors shall accommodate the apartments. Accommodation shall comprise of studios/bedsitters with sanitary facilities, one and two bedroomed apartments with lounge/living room, one or two bedroom, kitchen, and sanitary facilities. The roof will also have amenities including water tanks, hanging lines, prayer area, and chill spots. The apartments are in a single block rising to twelve sky-levels. There shall be staircases and a lift shaft to facilitate access and vertical movement and the proposed project will be enclosed with a stone perimeter wall with a single gate serving as entry and exit. The proposed design has provided for sewer and other plumbing reticulation, and surface run-off drains. There shall be staircases (for emergency response) and lifts to facilitate access and vertical movement. The area is zoned for residential development.

The main objective of the establishment is to provide accommodation to many residents seeking accommodation in the area. The project once complete shall provide job opportunities for some people e.g. estate manager, security guard, solid waste collectors etc.

3.3 THE PROJECT SPECIFICATIONS

The following are specific descriptions of the project.

- Materials to be used will be of approved quality which will include stones, sand, cement, timber, glass, steel, stone blocks, PVC products etc.
- Foundation depth shall be determined by the structural engineer.
- The walling will be of machine cut stones/reinforced columns and approved damp proof courses will be provided to all superstructure walls.
- The staircases (r.c) will have 250mm treads and 150mm risers and standard handrails
- The roofs will be pitched reinforced concrete slab overlaid with concrete roofing tiles to structural engineer's detail.
- Roof finish will be done using gutters and plastic rainwater outlets down pipes provided.
- All finishes will be of approved materials including parquet, ceramic, cement and clay tiles, and painting. All reinforcement shall be of standard quality to the structural engineer's details
- All soil and wastewater drainage pipes laid within the development will be of UPVC material. Those within the building structure and the parking/driveways will be encased in 150mm concrete surround.
- All internal fixtures and fittings will be to the approved standards and to specifications and will be carried out by qualified personnel.
- Cold-water storage tanks will be installed at the drying yard.
- Other works like the landscaping, plumbing and electrical works will be executed by qualified and competent staff or reputable sub-contractors.
- A reputable contractor with experienced and skilled manpower will implement the project using suitable approved materials.
- Internal storm water drains to discharge to the existing public drainage system along the road.
- Sewerage system to discharge to the public sewer line in the area while water and electricity (power) shall be from the NCWSC and national grid (KPLC) networks respectively.

(The finer details of the proposed project can be found in the proposed copies of the architectural drawings attached in the Annex).

3.4 PROPOSED PROJECT BUDGET

The total budget for the construction of 483 apartments in twelve storey building block will cost approximately Kenya Shillings Four hundred million (Kshs. 400,000,000).

4.0 JUSTIFICATION FOR THE PROJECT

Kenya is experiencing an acute shortage of housing for both its rural and urban population. The problem has been more evident over the last two decades as a result of the country's depressed economic performance. There is proliferation of informal settlements due to high demand for housing. The demand for housing in urban areas is currently estimated to be 150,000 units annually yet only about 35,000 are built every year. On the other hand, an estimated 300,000 housing units are required annually to cater for housing demand in rural areas.

Housing development is strategically an important social-economic investment to a country and its people. Furthermore comfortable housing is necessary for good living and this will generally constitute well planned/designed housing and infrastructure of acceptable standards and affordable cost which when combined with essential services affords dignity, security and privacy to the individual, family and community at large.

The proposed project is one way through which the private sector has taken up the role of provision of housing needs.

The proponent shall benefit from the income accrued from the tenants. The government and the NCC shall also benefit from the various taxes it will receive through this proposed development.

With the benefits that the proposed project comes with, there are also negative impacts that come with the proposed project. Adequate mitigation measures have been included in the EMP to be followed during the construction and operation phases of the project.

5.0 RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORK

5.1 The Environment Management and Coordination Act, CAP 387

The Act entitles every person in Kenya to a clean and healthy environment and aims to safeguard and enhance the environment. Though there are other sectoral laws on environmental conservation, this is the supreme legislation. It provides guidelines on issues of environment, stipulates offences and penalties and establishes NEMA. The Act also lists the type of projects, which must be subjected to the EIA process and establishes NEMA. *In compliance, the proponent appointed experts to conduct the EIA study report to seek approval before implementation and completion of the proposed project.*

5.2 The Environment (Impact Assessment and Audit) (Amendment) Regulations, 2019

These are entrenched under section 147 of the EMCA. The regulations provide the framework for carrying out EIAs and EAs in Kenya. *This EIA study report is conducted in conformity with these regulations and EMCA, CAP 387.*

5.3 EMCA (Water Quality) Regulations, 2006

These regulations set the standards of domestic water and wastewater. The regulations are meant for pollution control and prevention and provides for protection of water sources. *The proposed project has no chance of significantly affecting this since the project will connect to the NCWSC supply and sewer line and the proponent shall take appropriate measures as provided in the regulations.*

5.4 EMCA (Waste Management) Regulations, 2006

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

5.5 The world commission on environment and development–the brundtland Commission of (1987)

The Brundtland Commission addresses the environmental aspects of development. It has emphasized on sustainable development that produces no lasting damage to the biosphere and to particular ecosystems. In addition to environmental sustainability is the economic and social sustainability. Economic sustainable development is development for which progress towards environmental and social sustainability occurs within available financial resource. *The proponent is committed to adhere to the proposed EMP to ensure environmental enhancement and this would first be monitored through the initial environmental audit.*

5.6 National Policy on Water Resources Management and Development

It enhances a systematic development of water facilities in all sectors for the promotion of the country's socio-economic progress, and also recognizes the by-products of these processes as wastewater. It calls for development of appropriate sanitation systems to protect people's health and water resources from pollution. *The proponent has provided for sewer reticulation in the design and will connect to the public sewer line available in the area.*

5.7 The Occupational Safety and Health Act, 2007

The Act makes provision for the health, safety and welfare of persons employed in factories and other places of work. The provisions require that all practicable measures be taken to protect persons in places of work from dust, fumes or impurities originating from any process within the workplace. The provisions of the Act are also relevant to the management of hazardous and non-hazardous wastes, which may arise at a project site.

The Act provides for all necessary safety precautions to ensure the health and safety of workers. *The proponent will appoint a reputable contractor who will be responsible in enforcing the requirements during construction and subsequent repairs and maintenance after project completion.*

5.8 The Physical Planning Act of 1996

This is the principle Act governing land planning and the project proponent is required to acquire a Certifiate of Compliance or approval letter from the relevant institutions as set out in the Act. The sole objective of the Act is to harmonize deveolopment. The drawings have been approved by the Nairobi County Government*, an indication of compliance.*

5.9 County Governments Act, 2012

The Act replaces the Local Governments Act of 1986 and it empowers county governments to make by-laws in respect of suppression of nuisances, imposing fees for any license or permit issued in respect of trade or charges for any services. County Governments are given power to control or prohibit all developments which, by reason of smoke, fumes, chemicals, gases, dust, smell, noise, vibration or other cause, may be or become a source of danger, discomfort or annoyance to the neighborhood, and to prescribe the conditions subject to which such developments shall be carried on. In compliance, EIA study report has proposed potential mitigation measures (in the EMP and monitoring plan; and the environmental management Framework in the report.

5.10 Building code 2000

This provides the basic rules, guidelines and standards for construction. It is a comprehensive document, which every developer/proponent/ contractor should have. *All approvals will be sought before commencement of the work and regular monitoring will follow to ensure compliance with set standards and conditions.*

5.11 Public Health Act- (Revised 1986)

The Act demands the adoption of practicable measures to prevent injurious and unhealthy conditions in the site. The Act requires the proponent to enhance effective management of Nuisances i.e. noxious matter or wastewater as will be discharged from the proposed project throughout the project cycle. To achieve this, systems on the management of both solid and liquid waste (effluent) will be adopted as proposed in the report. *For instance, the effluent is being discharged into the public sewer line in the area. The solid waste shall be handled by a professional garbage collector on regular basis and disposed appropriately as per the waste regulations. Sanitary facilities shall be in conformity with MOH standards and installation of standard fittings.*

5.12 National shelter Strategy to the Year 2000

This strategy was formulated to advocate a change in policy in order to allow investors to come in and give the government a hand in providing housing. The government's role was to simply facilitate. *This is the role the proponent wishes to contribute to by investing and reaping some economic returns in the process.*

5.13 The Water Act, 2016

Part III section 21 (1) of this Act provides for national monitoring and geo -referenced information systems on water resources to be effected by the Water Resources Management Authority. Following on this, sub-section 2 allows the Authority to demand from any person or institution, within a reasonable time or on a regular basis, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a site operator and the information thereof furnished to the authority.

Part IV Section 63 states that "every person in Kenya has a right to clean and safe water in adequate quantities and to reasonable standards of sanitation as stipulated in Article 43 of the Constitution"

Section 110 of the Act allows a person with license (licensee) to supply water to make regulations for purposes of protecting against degradation of water sources. Section 107 and sub-section 1 allows the licensee to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon such land for preventing pollution of water sources within his/her jurisdiction.

Section 108 subsections 2 and 3 state that a person shall not discharge any trade effluent from any trade premises into the sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the trade effluent, maximum quantity of effluent to be discharged on any one day, highest rate of discharge and any other information deemed necessary. The consent shall be issued on conditions including payment of rates for the discharge as may be provided under section 109 of the same Act.

Section 143 subsections 1 (b) of the Act makes it an offence to throw, convey, cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive matter or

thing into or near to any water resource in such a manner as to cause, or be likely to cause, pollution of the water resource.

The proponent shall connect to the Nairobi City Water and Sewerage Company for water and sewerage services.

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

The regulations seek to control noise and vibration pollution generated from various sources. Regulation 13 prohibits any person from carrying out construction activities at night, if such activities are likely to generate noise above the levels set under second schedule of these regulations. Regulation 14(3) requires that any person carrying out construction, demolition, mining or quarrying work shall ensure that the vibration levels do not exceed 0.5 centimeters per second beyond any source property boundary or 30 meters from any moving source.

6.0 SIGNIFICANT ENVIRONMENTAL IMPACTS

The proposed project is one which has been planned by the proponent. Though the project had started, it is likely to attract several impacts once it commences.

Several positive impacts are identified here and also negative impacts which may arise out of the project's implementation. Good mitigation measures have been given which the proponent ought to follow during the entire lifespan of the establishment i.e. construction and operation phase.

6.1 POSITIVE IMPACTS

Employment and Income Opportunities

Building and construction industry employs many people both permanent and casual laborers. This has a significant impact since unemployment is currently quite high in the area and the country at large. Both skilled and unskilled workers will be involved in this project. On occupation, people will be employed as cleaners and security personnel. Some have already been employed.

Besides the direct employment, other forms of employment are likely to result from the multiplier effects, such as increased urbanization, industrialization and local markets for providing goods and services during both the implementation and operational phases.

Revenue to Government

Value Added Tax (VAT) on construction materials/ tools to be purchased and NEMA fees among others will be sources of revenue for the government and its institutions. Several of the already paid taxes involve the purchase of various construction materials, which attract VAT.

Business Opportunities

This will be created from the supply of building materials that will be used for construction purposes. These materials will be sourced locally.

Source of Income

After the completion of the proposed project, the proponent (owner) will be able to earn income from the tenants.

Provision of more Housing Facilities

The proposed project will increase the housing capacity within the locality and thus reduce the high demand for houses in the area.

6.2 NEGATIVE IMPACTS AND MITIGATION MEASURES

The ideal strategy to counter identified adverse effects is avoidance but when this is not possible, alternative strategies of reduction, remediation and compensation should be explored. This can be achieved through primary measures that intrinsically comprise part of the development design; or secondary measures designed to specifically address the remaining (residual) adverse effects of the proposed project. The potential impacts can be greatly reduced and this will be much determined by the technology used, nature of the materials, equipment used and level of diligence among others. The foreseeable impacts identified that may not be completely avoided are addressed here below and potential recommended measures provided. As such, the proposed measures also explore opportunities available for improving the situation wherever possible. The initial design should facilitate a high degree of mitigation, built into the scheme from the onset so that the potential for adverse effects is substantially reduced. If consideration of mitigation measures is left to the later stages of proposed project design, it can result in increased mitigation costs because early opportunities to avoid the need for such measures have been lost. In general, primary mitigation measures are likely to be more effective and less likely to cause secondary adverse effects (i.e. the mitigation measures themselves may in turn cause adverse effects.

6.2.1 Increased water demand

The importance of water can never be overemphasized and in fact is increasingly becoming a very hot issue due to the dwindling amounts and the ever increasing demand in several cases culminating to being source of fights amongst communities/users. So to speak, it is a major issue by most of the stakeholders. The proposed development may cause some strain to the existing water supply since construction activities are known to be heavy water consumers and the increase in population proportionately increases water demand thus direct impact to the water supply during both the construction and occupation phases.

Mitigation

- Avoid wastage of the water. Approvals for water supply and use should be sought from the relevant authorities. The contractor should 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) subject to authorization.
- Roof catchments should be provided with rainwater harvesting systems (gutters, down pipes and water storage facilities) to enhance collection and storage of the would be run-off.
- Sensitize all stakeholders on means and need to conserve water resource. Water conserving taps should be installed that turn-off automatically when water is not in use. They should be encouraged on water reuse/recycling during both construction and occupation phases.

6.2.2 Surface drainage

Run-off generated by rainfall may cause a myriad of consequences in various facets including flooding and its consequences, which may include damage to property, health and safety hazards. The drainage layout should ensure effective flow of the anticipated surface run-off emanating from the roof catchments and other areas within the site.

Mitigation

- The designs should ensure that surface flow is drained suitably into the existing and new drains effectively. The internal channels should be designed with regard to the peak volumes and must ensure the safe final disposal of run-off /surface water and must be self-cleaning.
- Soil erosion must be controlled by landscaping and introducing appropriate vegetation.
- Drainage channels should be installed in all areas that generate or receive surface water. The channels should be covered with gratings or other suitable and approved materials to prevent occurrence of accidents and dirt entry that may compromise flow of run-off.
- Storm water generated from roof catchments should be harvested, stored and made use in various household activities i.e. general cleaning and garden watering. This will reduce run-off.

Paving of the side walkways, driveway, parking and other open areas should be done using pervious materials i.e. concrete blocks to encourage water percolation; reducing run-off volume

6.2.3 Noise and vibration

Construction activities generally generate noise and hence affecting the immediate environment. Such noise emanate from the construction personnel, machinery and equipment. During occupation noise will come from vehicles, and other operations within the site. The proposed perimeter stonewall will provide some buffer against noise propagation but the following precautions should be taken in addition.

Mitigation

- Construction works should be carried out only during the specified time i.e. from 0800 hrs to 1700 hrs and should avoid working on Sundays when many residents are expected to be within the environs.
- Use machine cut stone that requires no chisel dressing which can be a major source of noise
- Sensitize construction vehicles' drivers and machinery operators to switch off engines of vehicles or machinery when not in use
- Machineries should be maintained regularly to reduce noise resulting from friction.
- The generators and other heavy duty equipment (if present) should be insulated or placed in enclosures to minimize ambient noise levels
- There should be no unnecessary horning of the involved machinery and vehicles.
- Provision of bill boards at the construction site gates notifying of the construction activity and timings.
- Workers should be provided with relevant personal protective equipment (PPE)/ materials.

6.2.4 Increased Energy Demand

There will be increased use of energy due to increased energy uses during construction and occupation phases and potential wastage. Construction machineries will require fuels (petroleum or electricity) during construction phase. Energy, mainly electricity will also be needed during occupation phase (on completion of the whole project).

Mitigation

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.

- Switch off electrical appliances when not in use and optimize operations of electrical equipment or energised machinery to enhance energy conservation.
- Install or use energy conserving electric lamps for general lighting. Put off all lights immediately when not in use or when not needed.
- Make use or install alternative source of energy such as solar power, which is renewable. The proponent should include solar power systems, which can be used for lighting and heating purposes

6.2.5 Sewage and effluent

Sewage encompasses soil and wastewater from sanitary facilities and is of significant concern with respect to the environment and particularly to water and soil. In its raw form, it is serious health hazard and emits offensive odours. It must always drain effectively into the public sewer line available in the area; via high quality, well designed and laid pipe networks.

Mitigation

- The proponent should ensure that the internal and external sewerage system are made of hard, strong, durable, smooth, impervious, and non-corrodible materials. All drain pipes passing under building; driveway or parking should be of heavy duty UPVC pipe tube encased in concrete surround. All manholes on drive ways and parking areas must have heavy-duty covers set and double sealed airtight; as approved by specialists. All waste and soil pipes must have cleaning eyes which must be accessible externally
- Sanitary facilities must be kept clean always, through regular washing and disinfecting.
- The design of the sewerage system should consider the estimate discharges from individual sources and the cumulative discharge of the entire project even during peak volumes. The gradient should be sufficient to ensure and maintain maximum depth of flow. Branches should be streamlined in the direction of flow.

6.2.6 Air Quality

Construction activities have the potential to generate air pollutants in the form of dust particles and gas emissions (fumes) from machinery and vehicles. Some Construction machinery and trucks (including small vehicles) generate hazardous exhaust fumes such as Carbon Oxides (CO_x), Sulphur Oxides (SO_x) and Nitrogen Oxides (NO_x).

Dust (particles) as caused by vibrations of machines and vehicle movement suspends in the air mostly during dry spells. Such dust and gases have direct negative impact to the ambient air quality.

Mitigation

- Provide personal protective equipment (PPE) / full protective gear to workers. They should also be trained on occupational health and safety and should be encouraged to go for regular health check-ups
- Regular and prompt maintenance of construction machinery and equipment. This will minimize generation of noxious gases and other suspended particulate matter.
- Control over areas generating dust particles through regular cleaning or sprinkling of water to reduce dust. The areas can be enclosed to mitigate effects of wind on them.
- Regular air monitoring and tests to analyze the quality of air.
- Enclose the site with dust-proof net during the construction

6.2.7 Oil Leaks and Spills

It is important to note that oil/grease spills / leaks are prevalent in construction sites and in most areas that make use of petroleum products, which contain hard/hazardous elements that are detrimental to the environment.

During occupation phase, oil waste may be generated from the vehicles of the residents if poorly maintained.

Mitigation

- All machinery must be keenly observed not to leak oils on the ground. Maintenance must be carried out in a designated area (protected service bays more suitably outside) and where oils are completely restrained from reaching the ground. Such areas should be covered to avoid storm water from carrying away oils into the soil or water systems by installation of oil interceptors and other suitable facilities.
- All oil products and materials should be stored in site stores or in the contractor's yard and should be handled appropriately to avoid spills and leaks.
- Car park areas and other places handling oil activities (especially during construction) in the site must be well managed. If present, oil interceptors should be installed in the channels leading from such areas.

6.2.8 Solid Waste

Millions of tonnes of solid waste is generated annually by human activity and may therefore pose great hazard if there are no proper disposal and handling systems. Construction activities contributes to increased solid wastes including stones, wood, glasses, plastics, containers, metal rods, pieces of iron sheets, sharp objects (nails) etc.

On completion and occupation, the project will be generating waste products from various operations and activities; mostly *house refuse including the polythene challenge.* The proactive design has provided for dustbin cubicles but in addition, the following should be adopted:

Mitigation

- The contractor or proponent should work hand in hand with private refuse handlers, NEMA and the County Government to facilitate sound waste management as per the prevailing regulatory provisions.
- The wastes should be properly segregated to encourage recycling of some useful waste materials; i.e. some demolished stone and concrete materials used as backfills. This calls for source reduction, recycling, composting and reuse. There should preferably be two bins maintained by every unit, one for organic matter and the other for mineral matter. The receptacles (bins) must be kept in a good condition, and frequently washed and disinfected.
- The collection of waste materials should be made at least once in 24 hours, and it should be done in such a way to minimize nuisance of smell and dust during filling into carts or vans.
- Train or educate the involved stakeholders/tenants on the importance and means of waste (garbage) management and handling especially during occupation phase.

6.2.9 Flora and Fauna

Vegetation has a great effect on the general and localized environment and normally can modify microclimate. Usually, the flora creates a good environment for habitats thus the two may go together more often than not. In consequence, de-vegetation may result to negative effects on the fauna. Singly, the proposed project may appear of no significant impact but the cumulative effect in concert with other current and future projects are capable of significant and serious effects including but not limited to soil erosion, decreases in air purifiers (carbon sinks) and thus contribution to global warming etc.

The proposed side has long grass which will be cleared to pave way to the proposed project thus causing temporary and permanent disturbances to small animals / bird life.

Mitigation

- Landscape and plant vegetation in all open areas after the completion of the project and manage the introduced vegetation on completion of the development to restore or improve the site.

6.2.10 Construction materials

Various construction materials are required for execution of the various respective activities. Poor quality materials, substandard and those materials that pose health or safety hazards should be avoided.

Mitigation

- All materials should be of the appropriate quality and should be sourced from licensed dealers and suppliers who are compliant especially with environmental requirements. Quality should be thoroughly controlled through regular tests.
- Procurement of the materials should follow specifications by the respective consultants such as structural, mechanical and architectural engineers.

6.2.11 Visual Intrusion

Visual impacts occur during earthworks for the foundation of projects and throughout to the completion of the project. Foundations have already been done. However, the proposed project will not by far be out of scale with the existing developments and in the environs. The visual impact will therefore not be significant and will have very little effects to the neighboring activities and the general public. However, great care should be taken to protect the neighborhood character.

Mitigation

This may be unavoidable during construction but fortunately the effects are insignificant due to the low magnitude and the small effect relative to the general area.

- Shield off the particular areas of construction with suitable materials. The worked area should be restored through backfilling, leveling and planting of more vegetation so as to blend in a way to merge with existing environment. The building and the choice of colors should be attractive to match the general environment.
- All solid waste and debris from construction site must be cleared on completion.
- Ensure compliance with planning policy for uniformity.

6.2.12 Occupational Health and Safety (OHS) and traffic

During construction, there are chances for increased dust, air and noise pollution. These plus other safety hazards such accidents, falling objects, risks from poor scaffolding, ladder and formwork are considered negative impacts. There is also risk of coming across live electric cables during excavations. Poor quality construction materials, poor workmanship and poor standards may also contribute to accidents. Inadequate skills in machinery operation and stress are serious safety hazards. Most of the contractors hire on casual basis and therefore do not take responsibility of training the workers on health and safety. The entry and exit points to the development may also pose the danger of imminent accidents if not properly designed.

The immediate neighbours and workforce involved would be exposed to these hazards. Food for the construction workforce is usually provided by mobile individuals who usually operate without licenses. This can compromise health of the workers especially if such foodstuffs are prepared in unhygienic conditions. There is also the potential risk of traffic accidents along the road around the entry point due to the heavy trucks and machinery entering and leaving the site. It is important to note that the proposed design has taken care of all the basic set standards in a work place such as space, lighting, ventilation etc.

Potential Mitigation Measures

- All workers should be provided with full protective gear. These include working boots, overalls, helmets, goggles, earmuffs, masks, and gloves among others. Factories Act abstract should be posted at a strategic point on site. The requirements of the **Occupational Safety and Health Act, 2007** should be strictly adhered to, the **Building Code** and other relevant regulations. Only specialised machine operators should operate machinery and specialised equipment and all moving parts should be provided with appropriate guards.
- Properly design to allow for deceleration and acceleration to the site. Clearly indicate direction of traffic especially during construction

- A first aid kit(s) should be provided within the site. This should be fully equipped at all times and should be managed by a trained person. The contractor should not expose workers to stress inducing factors.
- The contractor should have workmen's compensation cover. It should comply with workmen's compensation Act, as well as other ordinances, Regulations and union Agreements.
- Sanitary facilities should be provided and standard cleanliness of the facilities maintained.
- Individuals preparing food for the workers at the site should be controlled and monitored to ensure that food is hygienically prepared.
- Workers should always be sensitised on social issues such as drugs, alcohol, diseases particularly HIV/AIDs etc. There should be a training program to facilitate this by the contractor.
- Billboards should be suitably erected on the onset of the project. The signs should indicate and inform the public e.g. 'DANGER! HEAVY VEHICLES TURNING'. The traffic along the connecting road should be controlled especially during construction phase.

6.2.13 Construction Safety

Construction work can be particularly hazardous. Personal protective equipment, fire safety, electrical safety, and other precautions are essential for safe construction work. Follow these guidelines when visiting or working at construction sites:

- Do not walk, stand, or work under suspended loads. If you raise a load, be sure to crib, block, or otherwise secure the load as soon as possible.
- Avoid placing unusual strain on equipment or materials.
- Be prepared for unexpected hazards. BE ALERT!

- Proper personal protective equipment, (i.e. safety shoes, hardhat, goggles, Respiratory Equipment and gloves) must be used at all times on the site or as conditions warrant. Jewelry should be avoided.
- Prior to the start of construction, all areas should be inspected for the presence of potentially hazardous energy in the area should be located and precautions taken.
- Workers should be trained on the proper use of tools and protective equipment.
- Great care must be given to excavations and the safety of the machinery, tools and other equipment such as scaffolding, ramp or ladder must be guaranteed. Accident prevention should be the overriding safety precaution. A qualified person should always be on site to oversee the working.

Contractors and project managers should use barriers and guards as necessary to protect employees, and visitors from physical hazards. Areas that typically require permanent or temporary protection include the following:

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

6.2.14 Emergency Response Plans- ERPs

Emergencies and disasters are a reality of everyday life. Workers/people must therefore be sensitized and prepared on how to react during both the construction and occupational phases. Absence of such plans may be risky since there would be no guidelines to handle or control emergencies should they occur.

Mitigation

- The contractor/proponent should initiate and develop effective ERPs to cater for various eventualities such as fire outbreaks, and other accidents/incidents that are likely to occur. Training is prerequisite in planning ahead. Such plans must be properly documented and made available to all.
- Regular drills should be conducted on possible incidences.

6.2.15 Enhanced Social crime risks

Due to the influx of construction workers on site, there are chances of introduction of individuals with potentially anti-social behaviors such as thieves/thugs, drug users and traffickers and may pose a risk to the community both during the implementation and occupational phases.

Mitigation

Adopt strict hiring guidelines to lock out the bad elements and limit movement outside the site. The contractor has a responsibility of sensitising the workers on social issues such as HIV/AIDS, drugs and other social issues through regular training and social gatherings and strict monitoring. Workers should not be housed on site.

6.2.16 Security

The need for security can never be overemphasized whether personal or for property. During construction, security is very important in any site. This ensures that materials are in order. It also controls movement within the site especially for the intruders who might be injured by the materials and other hazardous features available within the site. Security is also of paramount importance during the operational phase of the project.

Mitigation

- Enclose the site using suitable walls to beef-up security and to control movement as proposed in the design and employ security guards who must always guard the site/property and document movements on the site/ property. This has already been done.
- Strategically install lighting as well as security alarms

6.2.17 Fire Preparedness

Potential causes of fire are many and varied electrical faults, smoking, gas leaks, carelessness etc. Fire incidences result to economic and social drawbacks. It is therefore always important to consider the issue of fire by bringing in the element of preparedness. In this regard, the design should provide and recommend implementation of fundamental firefighting measures and control facilities.

Mitigation:

- Install an automatic fire alarm system for the entire project mostly on occupation, provide 6No. 30m hose reels and provide for adequate fire reserve water storage tanks with an automatic booster pump for hose reel and 20No. 9kgs water fire extinguisher.
- All installation to follow County Government's Fire Masters requirements approval.
- Ensure that all firefighting equipment are strategically positioned, regularly maintained and serviced.

- Provide fire hazard signs such as 'No Smoking' signs, Direction to exit in case of any fire incidence and emergence contact numbers should be provided as well as the assembly points.

6.2.18 Project Completion

At one point in time, the proposed on-going project, if approved will be completed after the first phase of the project (implementation) which will pave way for the second phase (occupation). At this point, the contractor will leave the site after officially handing over the completed project to the proponent. Before leaving the site, the proponent should ensure that the contractor does or causes to be done the following:

- Comprehensive landscaping of open areas should be done.
- All waste materials must be cleared and removed from the site. However, these should be disposed appropriately and to the approved dump sites in accordance to the laid down regulations.
- The structures should be cleared, cleaned and rubbed of any dust particles before occupation.

6.2.19 DECOMMISSIONING PHASE

Decommissioning is an important phase in the project cycle and comes as the last to wind up the operations/activities of a particular project. The main purpose of decommissioning is to restore/rehabilitate the site to acceptable standards.

Quality and standard housing projects of this nature have a lifespan of between 50 and 100 years which is much dependent on the maintenance quality. This is long period of time and there may be many changes which may not be foreseeable including the technological and legal aspects. The decommissioning may also come earlier than the lifespan of the buildings again due to various reasons like change in physical planning policy or the discovery/realization of a more optimal use of the land. It is therefore recommended that an EIA be conducted when the time for decommissioning comes so that all aspects will be looked at against the prevailing conditions and requirements. However, the purpose of decommissioning is mainly to rehabilitate the project site to an acceptable standard and all efforts should be geared to making the site as close as possible to its original state before the project was implemented. The decommissioning will in brief involve demolitions of the structures, removal of debris and landscaping. The other social implications involve the laying off workers who may be employed thus will lose their income, issues of safety and health etc. due to the fact that nobody knows the future, it is highly recommended that an EIA be prepared when the time comes since quit may come earlier or later due to the vagaries of weather, human behavior and policy changes among other factors and quantification and accurate prediction of the likely potential impacts is quite difficult.

In view of the foregoing and in line with the principles of sound environmental management, it is paramount that the appropriate controls and procedures be put in place at the design, implementation and operational phases of the proposed project to control environmental degradation as this is the only way of simplifying the decommissioning. These measures are recommended elsewhere in the report and in the EMP.

7.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

7.1 The proposed alternative

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

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

7.2 Relocation alternative

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

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

7.3 The No Action Alternative

The No Action Alternative in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. The anticipated insignificant environmental impacts resulting from construction, and occupation activities would not occur.

This option will however, involve several losses both to the project proponent/land owner and other stakeholders; society and Government. The landowner will continue to pay high taxes on the unutilized property. The No Project Option is the least preferred with reasons such that there will be no incremental housing stock, forfeiture of economic benefits that would accrue to the proponent, the public and the government, and it could also discourage investors wishing to invest in the housing sector.

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

7.4 Alternative design and technology

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

7.5 The comparison of alternatives

Under the proposed Development Alternative, the project would create more and standard housing stock and would provide employment directly and indirectly to the public. It would provide jobs for the workers during construction. After completion more jobs would be generated during occupation. Under the No Action Alternative, there would be no development at all. There would be no benefits from the site and neither would there be the insignificant environmental Impacts.

Provided the Environmental Impact mitigation measures are implemented as well as adoption of sound construction management practices, negative impacts will be avoided/minimized. However, commitments related to development alternative would ensure that potential impacts are minimized to levels of insignificance as envisaged in the EMP.

7.6 Mitigation for the proposed Action

Mitigation measures for the proposed action are included hereinafter in this report.

8.0 PUBLIC PARTICIPATION

In compliance with EMCA, CAP 387, the experts interviewed some of the immediate neighbors on the proposed project site with a view to seeking their comments on the potential impacts of the proposed project to environment and socio-economic wellbeing of the society.

This is a very important and an integral part of the EIA process, which is a legal requirement and a very important tool for collection of the data and especially the baseline/background information. Also known as the Social Impact Assessment (SIA), public participation helps bring out the contentious issues and gives a chance to those who may be affected by a proposed project to give their views, inputs and opinions and any significant issue is addressed at the initiation stage. However, the process is made difficult by the same people who are supposed to be consulted by dragging their feet or failing to respond totally. Those who responded indicated that the proponent be allowed to construct the project since the whole neighborhood is developed with similar structures.

In summary, none of those who responded objected the project on the subject plot.

Any issues raised and many others foreseeable have been adequately addressed in the report and in the EMP.

Some completed questionnaires are appended in the report.

9.0 ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS

The environmental management plan involves risk management strategies that should be undertaken by the project proponent and all the stakeholders to mitigate environmental degeneration. They are approaches to monitor, control, reclaim and restore the environment to a sustainable state. EMPs for projects thus provide logical frameworks within which the identified issues of environmental concern can be mitigated or monitored i.e. provide a checklist for project monitoring and evaluation. The EMP is meant to address the existing impacts and the potential foreseeable impacts. Currently, there are no significant existing impacts on the proposed site since the property is used for residential purposes.

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 environmental management and monitoring plans have been developed and outlined to bring home the key findings of the *Environmental Impact Assessment*; recommending necessary mitigation actions, defining roles, monitorable indicators and the estimated cost.

The EMPs outlined here after 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/new residential cum commercial development. The EMPs have considered both construction and occupation phases.

Table 2: EMMP FOR CONSTRUCTION AND OCCUPATION PHASES

ENVIRONMENTAL/ SOCIAL IMPACT	PROPOSED MITIGATION AND ASPECTS FOR MONITORING	RESPONSIBILITY DURING DESIGN, CONSTRUCTION AND DEFECTS LIABILITY PERIOD	RESPONSIBILITY AFTER DEFECTS LIABILITY PERIOD	MONITORING MEANS (C) = CONSTRUCTION (O) = OCCUPATION	ESTIMATED COSTS (KSHS)	MONITORING INDICATORS AND FREQUENCY
Soil disturbance	• Control earthworks & compact loose soils • Install drainage structures properly • Landscaping on project completion • Control and manage excavation activities • Control activities especially during rainy conditions • Provide soil erosion control and conservation structures/means where necessary. • Ensure standard appropriate practices on the provided gardens	Contractor	Proponent	(c) Inspection (o) Routine maintenance (c) Inspection (o) Routine maintenance	200,000	• Vegetation cover • Type of machinery and equipment • Paved area
Changes in land use-extent	• Plant vegetation after project completion even if in pots. • Ensure compliance with existing planning policy	Proponent and contractor	Proponent	Inspection and records inspection	50,000	• conserved vegetation • records
Changes in hydrology/ impended drainage	• Proper Installation of drainage structures • Install cascades to break the impact of water flowing in the drains • Ensure efficiency of drainage structures through proper design and maintenance • Provide gratings to the drainage channels	Contractor	Proponent	(c) Inspection (o) Routine maintenance	200,000	• Amounts of storm water • Efficient storm water drains
Air pollution	• Enclose the site with dust-proof net during construction. • Water should be sprayed during the construction phase of excavated areas during dry conditions. • Control speed and operation of construction vehicles • Prohibit idling of vehicles. • Ensure sound condition of construction machinery and equipment. • Engage sensitive construction workers.	Contractor	Proponent / Contractor	c) Inspection/ observation	500,000	• Amounts of dust • Extent of paved area • Type of machinery • Amounts of emission
Noise	• Erect suitable barriers to control noise.	Contactor	Proponent	c) Inspection/	240,000	• Ear muffs/

pollution	• Sensitize drivers of construction machinery on effects of noise. • Maintain plant equipment (if present). • Construction activities to be restricted to daytime. • Workers in the vicinity of or involved in high-level noise to wear safety & protective gear.		/ Contractor	observation		Buffers/ Mufflers
Water resources	• Management of water usage. Avoid unnecessary wastage. • Recycling of water at the construction phase where possible. • Make use of roof catchments to provide water i.e. for general purpose.	Contractor	Contractor / Proponent	(c) Inspection/ observation	2,000,000	• Water amounts used • Roof catchments and storage
Oil pollution	• Proper storage, handling and disposal of new oil and used oil wastes as per waste regulations. • Maintain plant and equipment to avoid leaks. • Maintenance of construction vehicles should be carried out in the contractor's yard (off the site). • Provide oil interceptors along the drains leading from car park and potentially oil risk areas.	Contractor	Contractor	(c) Inspection/ observation	160,000	• Incidences of spillage • Poorly disposed wastes • Composition of runoff
Road safety	• Enforce speed limits for construction vehicles especially along roads leading to the site • Provide bill boards at the site/entrance to notify motorists about the development	Contractor	Proponent , Traffic & roads Dept/transporters	(c) Inspection/ observation	40,000	• Bill boards • Safe access
Public health, occupational health and safety	• Train staff/workers on occupational health and safety. • Provide full protective gear & workmen's compensation cover in addition to the right tools and operational instructions & manuals during construction. • Adopt sound waste management system to ensure proper solid waste disposal and collection facilities. • Adopt sound housekeeping practices. • Sensitize residents on environmental management. • Design of sewerage system should be as provided in the plans and the bio-digester should be constructed to approved size and design, standard and of approved materials. • Engage the services of qualified personnel and/or ensure training. • Ensure use of standard construction materials and to the specifications. Avoid undesirable, substandard, hazardous or unauthorized materials during	Contractor, supervising Foreman	Proponent where relevant	(o) Observation (o) Observation	1,600,000	• Training records • Waste receptors • Clean sanitary facilities • First aid kits and training • Sensitive workers

	construction & maintenance. • Sensitized staff on social/health issues such as drugs • Ensure machinery and equipment servicing and maintenance as per schedules & legal requirements • Post strategically the Factories and Other Places of Work Act Abstract & provide material safety data sheets • Post clear warning signs e.g. 'No unauthorized use of machines', ensure there are guards on moving parts etc. • Provide fully equipped First Aid kits & train staff on its use • Ensure adherence with the legal requirements- Factories Act. • Sensitize residents on environmental management. • Ensure Nairobi City County certifies and issues occupation certificates.					
Vegetation	• Avoid unnecessary removal of vegetation. • Landscaping and planting vegetation in all disturbed areas.	Contractor Contractor	Proponent	(o) Observation (o) Observation	80,000	• State of waterways • State of landscape vegetation
Record Keeping	• Collection and analysis of relevant environmental data of the site	Proponent/contractor	Proponent	Data collection & analysis	40,000	• Relevant environmental records
Fire safety and preparedness	• Install firefighting equipment as provided elsewhere in the report. • Conduct training on firefighting, evacuation and emergency response. • Sensitize the residents on fire risks i.e. conduct regular fire drills. • Adapt effective emergency response plan. • Maintain/service firefighting machinery regularly. • Provide emergency numbers at strategic points.	Contractor	Proponent	(o) Observation	220,000	• Firefighting equipment • Training records • Display of emergency numbers
Water quality management	• The design of the proposed internal sewer system and the entire sewerage system should consider the estimate discharges from individual sources and the cumulative discharge of the entire project even during peak volumes. The volume of the proposed sewer system should be determined from this information among other factors. • Provide for adequate drainage system.	Contractor/Estate Manager	Proponent	Data Collection	100,000 per month	• Records

	• Ensure effluents are discharged responsibly to the sewer system. • Install an oil water interceptor to trap oils that may be present in wastewater. • Apply and obtain an Effluent Discharge License (EDL) for effluent released into the environment (where applicable) • Monitor quality of wastewater to ensure compliance with the Environmental Management & Coordination (Water Quality) Regulations, 2006 and other relevant Laws.					
Waste management	• During construction phase, designate an area for temporarily holding waste materials. • All wastes should be disposed off in accordance with the Environmental Management & Coordination (Waste Management) Regulations, 2006 and other relevant Laws. • Segregation of wastes at the source for ease of handling and disposal. • Contract a NEMA licensed waste transporter to transport solid waste from the proposed site during construction and occupation phases. • Sell recyclable waste to recyclers. • Provide bins for temporarily holding waste before collection by licensed transporters during occupation phase.	Contractor/Estate Manager	Proponent	Data Collection	100,000 per month	• Records
Security	• Provide security guards and facilities during the entire project cycle.	Contractor	Proponent	(o) Observation	300,000	• Security guards • Security lights and records

Table 3: EMP FOR THE DECOMMISSIONING PHASE

Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Demolition waste management			
a) Any component related with the project that will not be used for other purposes must be removed and recycled/reused as far as possible	Contractor, Proponent	One-off	-
b) All wastes must be removed and recycled, reused or disposed of as per a licensed methods			
c) Where recycling/reuse of the project components, gadgets and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site	Contractor, Proponent	One-off	-
d) Donate reusable demolition waste to any willing party	Contractor, Proponent	One-off	-
2. Rehabilitation of project site			
a) Implement an appropriate re-vegetation program to restore the site to its original status	Contractor, Proponent	One-off	-
b) Consider use of indigenous plant species in re-vegetation	Contractor, Proponent	One-off	-

10.0 CONCLUSION AND RECOMMENDATIONS

From the report it is clear that the proposed project is associated with both positive and negative impacts during construction, operation and decommissioning phases of the project. The proponent and contractor are advised to implement Environmental Management Plan so as to reduce adverse impacts and boost good environmental practices. Guidelines on environment, health and safety must also be followed in order to reduce incidences of accidents, health problems and compromise to environmental well being. Continuous monitoring of the various indicators ought to be followed throughout the project cycle.

10.1 RECOMMENDATIONS

Various recommendations have been put in place that will enhance good environmental, health and safety management of the proposed project site and its activities

The following are the recommendations for mitigation of the anticipated negative impacts:

- All solid waste materials and debris resulting from construction activities must be disposed off at approved dumpsites. The wastes should be properly segregated and separated to encourage recycling of some useful waste materials; i.e. some excavated stone materials can be used as backfills.
- The proponent should ensure all approvals from relevant authorities are acquired before continuation with the project.
- All construction materials and especially sand, gravel, hardcore and wood must be sourced/procured from legalized dealers.
- Construction activities must be undertaken only during the day i.e. between 0800 hours to 1700 hours. This will minimize disturbance to the general public within the proximity of the site/project especially this been a residential area.
- Once earthworks have been done, restoration of the worked areas should be carried out immediately by backfilling, professional landscaping/leveling and planting of low grass in open areas
- Proper and regular maintenance of construction machinery and equipment will reduce emission of hazardous fumes and noise resulting from friction of rubbing metal bodies.
- The contractor must have workmen's compensation cover; the contractor is required to comply with workmen's compensation Act
- Heavy construction activities should be limited (or avoided) during the rainy season to minimize the chances of soil degradation (soil erosion).
- Used and new oils must be handled and stored appropriately to avoid oil leaks and spills on the site.

ATTACHMENTS