ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT

STUDY REPORT

FOR

THE PROPOSED RESIDENTIAL CUM COMMERCIAL DEVELOPMENT ON PLOT TITLE NO. NAIROBI/BLOCK 43/40 ALONG KABARNET ROAD OFF NGONG ROAD, KIBRA SUB-COUNTY, NAIROBI COUNTY.

(GPS Coordinates: Latitude -1.302038, Longitude 36.790226)



Parts of the proposed site and a structure to be demolished to pave way for the proposed project



Done Pursuant to the provisions of the Environmental Management and Coordination Act, CAP 387 and the Environmental (Impact Assessment and Audit) Regulations, 2003 and submitted to the National Environment Management Authority (NEMA)

Proponent:

NANCHONG LONGINES BAY LIMITED,
P.O. BOX 33579-00600,
NAIROBI.

CERTIFICATION

E I A Study Report *2026*

CERTIFICATION

This EIA Study Report was conducted and prepared by a team led by: -

John Gitau Muiruri	Lead Expert	Reg. No. 0434
Ongeri Kiana Abel	Lead Expert	Reg. No. 9019

Experts' contacts:
Address: P.O. Box 36942 – 00200 Nairobi.
Mobile: 0722-796 282, 0780-796 282

For and on behalf of: -

NANCHONG LONGINES BAY LIMITED,
P.O. BOX 33579-00600,
NAIROBI.

Signature:..... Date:.... 31 August 2026 ....

(For Proponent)

TABLE OF CONTENTS

CERTIFICATION 2
TABLE OF CONTENTS 3
EXECUTIVE SUMMARY 8
1.0 INTRODUCTION 12
1.1 General overview, Justification and rationale for EIA 12
1.3 Terms of Reference (TOR) 12
1.4 Scope of EIA Study 12
1.5 Methodology 13
2.0 ENVIRONMENTAL SETTING OF THE PROJECT AREA AND ITS ENVIRONS 14
2.1 PHYSICAL ENVIRONMENT 14
2.1.1 Climate 14
2.1.2 Topography 14
2.2 BIOLOGICAL ENVIRONMENT 14
2.2.1 Flora 14
2.2.2 Fauna 14
2.2.3 Sensitive ecosystems 15
2.3 SOCIO ECONOMIC ENVIRONMENT 15
2.3.1 Roads and accessibility 15
2.3.2 Sewer system 16
2.3.3 Water resources 16
2.3.4 Surface Drainage 16
2.3.5 Solid waste Management 16
2.3.6 Energy 16
2.3.7 Communication 16
3.0 RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORK 17
3.1 The Environment Management and Coordination Act, CAP 387 17
3.2 Environmental (Impact Assessment And Audit) Regulations, 2003 17
3.3 The Environmental Management and Coordination (Water Quality) Regulations, 2024 L.N. 177/2024 17
3.4 The Environmental Management and Coordination (Waste management) Regulations, 2024 L.N. 178/2024 17
3.5 The world commission on environment and development–the Brundtland Commission of (1987) 17
3.6 National Policy on Water Resources Management and Development 17
3.8 The Physical and Land Use Planning Act, 2019 (No. 13 2019) 18
3.9 County Governments Act, 2012 18
3.10 The National Building Code, 2024 18
3.11 Public Health Act- (Revised 1986) 18
3.12 National shelter Strategy to the Year 2000 19
3.13 Water Act, 2016 19
3.14 National Construction Authority Act, 2011 19
3.15 Climate Change Act, 2016 20

3.16 Sustainable Waste Management Act, 2022 21
3.17 The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009. 22
4.0 PROPOSED PROJECT LOCATION, DESCRIPTION, AND ACTIVITIES 24
4.1 NATURE, DESIGN AND DESCRIPTION OF THE PROPOSED PROJECT 24
4.1.1 The Project Specifications 24
4.2 PROPOSED LOCATION OF THE PROJECT 25
4.3 SITE OWNERSHIP 25
4.4 PROPOSED PROJECT IMPLEMENTATION (CONSTRUCTION) 26
4.4.1 Construction Activities and inputs 26
4.5 DRIVEWAY AND PARKING 27
4.6 PROJECT BUDGET 27
5.1 Introduction 28
5.2 The proposed Alternative 28
5.3 Relocation Alternative 28
5.4 The No Action Alternative 28
5.5 Analysis of Alternative Construction Materials, Design, and Technology 29
5.6 Waste Water Management Alternatives 29
5.6.1 Waste Water Treatment Plant 29
5.6.2 Use of Stabilization Ponds/Lagoons 29
5.6.3 Use of Constructed/Artificial Wetland 30
5.6.4 Use of Septic Tank 30
5.6.5 Use of Existing Sewer Line Systems 30
5.7 Solid Waste Management Alternatives 30
6.0 SOCIAL IMPACT ASSESSMENT 31
6.1 Consultation with the Officials at the County 31
6.2 Public Meetings 31
6.3 Public Notices 31
7.0 CLIMATE CHANGE RISKS AND VULNERABILITY ASSESSMENT 32
7.1 Introduction 32
7.2 Climate Change Context 32
7.3 Methodology 32
7.4 Climate Change Hazards 32
7.5 Vulnerability Assessment 33
7.6 Climate Variability and Change: 33
7.7 Climate-Related Hazards: 33
7.8 Vulnerable Sectors and Groups: 33
7.9 Impacts on Human Health: 34
7.10 Vulnerability Assessment Process: 34
7.11 National and County-Level Action: 34
7.12 Integrating Climate Risk Management: 34
8.0 POTENTIAL IMPACTS 35
8.1 POSITIVE IMPACTS 35
8.2 NEGATIVE IMPACTS AND MITIGATION MEASURES 36

8.2.1 Increased water demand 36
8.2.2 Surface drainage 36
8.2.3 Soil disturbance 37
8.2.4 Noise and vibration 37
8.2.5 Increased Energy Demand 38
8.2.6 Sewage and effluent 38
8.2.7 Air Quality 39
8.2.8 Oil Leaks and Spills 39
8.2.9 Solid Waste 40
8.2.10 Flora and Fauna 40
8.2.11 Construction materials 40
8.2.12 Visual Intrusion 41
8.2.13 Occupational Health and Safety (OHS) and traffic 41
8.2.14 Construction Safety 42
8.2.15 Emergency Response Plans- ERPs 42
8.2.16 Enhanced Social crime risks 43
8.2.17 Security 43
8.2.18 Fire Preparedness 43
8.2.19 Project Completion 44
9.0 DECOMMISSIONING PHASE 45
10.0 ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS 46
TABLE 2: EMMP FOR DEMOLITION OF THE EXISTING STRUCTURES 47
Table 3: EMMP FOR CONSTRUCTION & OCCUPATION PHASES 49
Table 4: Occupational Health and Safety EMP for the proposed project during construction and operational phase 54
Table 5: EMMP FOR DECOMMISSION PHASE 56
11.0 SITE SAFETY AND ACCIDENT PREVENTION MEASURES 57
11.1 Project Employee Responsibilities 57
11.2 Project Safety Orientation 57
11.3 Job site Inspections 57
11.4 Emergency Procedures, Investigation, and Reporting 58
11.5 Emergency Signals and Procedures 58
11.6 Fire Prevention Program 58
11.7 Hazard Communication Program 59
11.8 General Safety 60
11.8.1 Personal Protective Equipment (PPE) 60
11.8.2 Moving Equipment 60
11.8.3 Excavating/ Site Utilities 60
11.8.4 Crane & Rigging Safety 60
11.8.5 Fall Protection 61
11.8.6 Electrical 61
11.8.7 Scaffolding Safety 61
11.8.8 Ladder Safety 62
11.8.9 Aerial Work Platforms 62

11.8.10 Housekeeping 62
11.9 Site Specific Safety Requirements 62
11.10 Sexual Harassment 64
11.11 Grievance Redress Mechanism (GRM) 64
12.0 CONCLUSION AND RECOMMENDATIONS 66
REFERENCES 68
ATTACHMENTS 69

Annexes

- Attachments

Table 1: Acronyms and Abbreviations Used in This Report

ESIA	Environmental & Social Impact Assessment
ESMP	Environmental & Social Management Plan
NEMA	National Environmental Management Authority
PPE	Personal Protective Equipment
OHS	Occupational Health and Safety
EHS	Environmental Health and Safety
ERPs	Emergency Response plans
NOx	Nitrogen Oxides
SOx	Sulphur Oxides
COx	Carbon Oxides
EMCA	Environmental Management Coordination Act
CESMP	Construction Environmental & Social Management Plan
PV	Permanent vent
Ha	Hectares
EA	Environmental Audit

EXECUTIVE SUMMARY

Sustainability envisages all aspects of social, economic, political and natural environment. A glance at the development trend in urban centers indicates that there have been rapid development projects which threaten forward planning interventions mainly in the form of un-matching infrastructural expansion. The development wave has caught the authorities napping making a scenario of a demand-led instead of an infrastructure-led type of development. This has the potential to bring forth unprecedented negative social and environmental impacts. The purpose of EIA process is to identify potential impacts of the proposed project and then identifying the avoidable and the unavoidable for the purposes of avoiding the avoidable and proposal of appropriate measures for mitigating the unavoidable for the purposes of ensuring sustainable development. In so doing, adverse impacts are attenuated while enhancing project benefits but this can only be ensured by commitment of the proponent, sound monitoring and supervision for the purposes of initiating any necessary action to limit adverse impacts disclosed by monitoring.

The site currently has a residential house to be demolished to pave way to the proposed project. The site will be enclosed in a perimeter wall with a gate serving as an exit and entry. The proposed project involves the construction of the following in a development of three blocks of 1 basement for parking; ground floor for parking and shops, Mezannine1 for Parking and shops, Mezannine2 for Social Amenities (Swimming pool, Gym and Restaurant), while 1st to 16th floors will comprise of Residential apartments, the roof floor will comprise of Cold-water tanks, machine room, changing rooms and store.

The residential units shall be as follows:

- ✓ Studios - 352
- ✓ One bed-roomed apartments – 134 units
- ✓ Two bed-roomed apartments – 108 units
- ✓ Duplex apartments – 7 units

TOTAL – 601 units

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 and commercial purposes.

The design and orientation of the proposed project have left ample free space for passage, natural ventilation and lighting.

The design and orientation of the proposed project have left ample free space for passage, natural ventilation and lighting. (Please *refer to the attached plans/drawings in the annex for the finer details*).

The proponent's decision to develop is largely fueled by the high demand for houses, government support for private sector participation in housing (basic need) provision, and the potential profits/return to investments. It is estimated that on approval; the project will take approximately 30 calendar months to implement and it is estimated to cost approximately **Kenya Shillings Three Billion, Sixty-Four Million, Seven Hundred and Ninety-Five Thousand, Two Hundred and Twenty (KShs. 3,064,795,220.00).**

The trend is overwhelming in the area and similar projects are complete and others are underway, a trend that has caused a sharp increase in land values in the area due to the demand created for the land in the area by potential investors. Some plots in the neighborhood are under similar developments and already occupied, while some others have old bungalows, maisonettes, low rise apartments, and/or town houses, all of which are in line with the planning policy for the area. The limited supply of land and the ever-increasing demand for housing has fueled the need for multi-dwellings developments in an effort to alleviate the housing shortage. The proactive designs have provided for adequate ventilation and natural lighting, storm water drainage, water storage and foul and wastewater disposal. From the proposed designs, the essential set local standards (in terms of physical planning, minimum habitable rooms, basic facilities, health and safety) have been met. The land is registered in the name of the proponent (Please find copy of ownership documents attached).

The proposed site is within a well-developed area and all the major urban services (electricity, water, sewer, and road network) are available in the area. The relevant legislation has been adhered to in the design (discussed in the body of the report).

Environmental management and development problems require an integrated approach, as they are so integrated with social, demographic, economic and political elements. The scope of the assessment study covered the physical extent of the project site and its immediate environs as may be affected, proposed works and activities including installation of utilities/facilities and services.

Broadly, the terms of reference were but not limited to evaluation of project objectives, the location of the proposed project site, baseline information generation, legal provisions, technology, materials, procedures and processes to be used, in the implementation and operation of the project of the project vis a viz the principles of environmental conservation and the prevailing legal requirements. The methodology for the study involved comprehensive physical inspection of the site and its environs, desktop studies and consultations with the proponent, his consultants and the neighbors among others.

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. The foreseeable negative impacts include but not limited to impact (constraints/pressure) to the existing infrastructure i.e. water, foul and wastewater disposal, 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.

Others potentially include air pollution (dust particles emanating from excavation and construction activities and exhausts from the involved machinery), health and safety concerns especially to workers and immediate neighbours due to potential accidents, pollution and disturbance. Hazards associated with construction include but not limited to falling objects, risks from poor scaffolding, ladder and formwork. There is also risk of crossing live underground 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 hazard. Other risks involve fires.

The ideal strategy to counter identified adverse effects is avoidance and whenever not be possible, alternative strategies of reduction, remediation, and compensation may be explored. Measures can therefore be divided into two categories namely primary measures that intrinsically comprise part of the development design; and secondary measures designed to specifically address the remaining (residual) adverse effects. 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, sewerage system and the structural safety among others.

Siting, planning and design should ensure compatibility with surroundings and construction standards. To minimize air pollution and soil disturbance/erosion, ensure soil compaction and watering of loose soils on all unpaved access paths/roads, parking areas, dust-generating construction materials at the construction sites in addition to a dust-proof net around the site. Emission of noxious fumes should be avoided or minimized as possible. 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. To reduce noise pollution, portable barriers to shield compressors and other small stationary equipment where necessary should be installed; engines should be switched off when not in use; machineries well maintained, install silencers whenever possible and ensure that the work is carried out during the day. Vehicle/machinery idling should be minimized/controlled. Encourage use of cleaner fuels such as low sulphur diesel and unleaded gasoline, or electric cars. The maintenance should be conducted in appropriate and designated service bays (off-site) to reduce chances of contamination of environment by resulting oils and greases. Any of such oils should be collected and disposed appropriately. For health and safety, the entire sewerage system are properly designed (using approved materials), and shall be installed and regularly maintained to effectively drain effluent into the public sewer line. All workers should be provided with full protective gear (PPE) and they should be trained and sensitised on health, safety and environmental conservation aspects. Qualified personnel must do all scaffolding, ladder and formwork to standards. Any live underground cables on site must be identified if they exist before excavations. Quality materials, skilled labour (where necessary), and the set standards must be put into practice. All precautions (barriers) must be taken to prevent accidents from falling objects. The site should be fenced off during construction to keep off the general public.

Effective emergency response plans should be adapted both 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. To prevent social crimes, the workers should be vetted during recruitment and should be closely monitored and movement out of site should be restricted. Construction workers should not reside on site and should be trained and sensitised on anti-social behaviour.

Throughout the project cycle, sound waste management systems and procedures must be adopted. During the 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 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 standard.

Generally, the significant impacts of such developments are the respective pressure they exert on the infrastructure due to failure of the central and local governments upgrade the same accordingly through various respective agencies/departments/parastatals, using funds raised through various taxes and infrastructure development levy charged on developers/proponents. The implementation of these is long overdue and the buck stops at the government and or implementing agencies.

The study and a cost and benefit analysis reveal 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, County Government 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.

1.0 INTRODUCTION

1.1 General overview, Justification and rationale for EIA

The proponent has proposed a residential development on Plot L.R. No. Nairobi/Block 43/40 along Kabarnet Road, off Ngong Road, Nairobi County. The site currently has some structures to be demolished to pave way to the proposed project. The proposed site is within a residential cum commercial zone thus is compliant with the planning policy. The proposed project is collaborated by the ever-growing population coupled with 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 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 & Social 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 was to establish the baseline conditions of the proposed site, evaluate the existing and the anticipated impacts and propose measures to enhance the positive impacts and measures to 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) Regulations, 2003. 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 with professionals and other stakeholders.

2.0 ENVIRONMENTAL SETTING OF THE PROJECT AREA AND ITS ENVIRONS

2.1 PHYSICAL ENVIRONMENT

2.1.1 Climate

Nairobi areas have no real winter or summer. For the greater part of the year the days are sunny and nights cool and pleasant. The long rains occur in March / May and the short rains from the end of October to the mid December.

Rainy season- November –winds light easterly, usually warm sunny and showery. Mean precipitation ranges at 1,213 mm per annum. Hottest periods are usually during January, February and September, October with temperatures getting as high as 32^0 C while the coolest periods are between June- July and December with temperatures as low as 10^0 C.

2.1.2 Topography

The topography of the general area is gentle slopping towards East (with an increasing gradient towards South). This has great influence to the drainage of the general area.

The proposed development site has a low gradient and will have little or no influence to the movement of surface materials (mostly soil) once set loose; during earth works.

2.2 BIOLOGICAL ENVIRONMENT

2.2.1 Flora

The general area has lots of vegetation (trees) mostly along the roads and along the plot boundaries including compounds. The project area has mature trees and other vegetation which some shall be cleared to pave way to the proposed project.

The seedlings at the site shall be transferred to other locations with the guidance of the area administration. Tree plants will be evenly distributed at the front side of the building structures upon project completion

2.2.2 Fauna

There is no fauna/wildlife threatened by the development except may be rodents and insects.

Plate 1: Part of vegetation along the road in the general neighborhood



Source: Site Survey

2.2.3 Sensitive ecosystems

There are no sensitive ecosystems like rivers or forests near the proposed site.

2.3 SOCIO ECONOMIC ENVIRONMENT

The proposed project site is within an area predominantly commercial cum residential and therefore almost every other plot in the neighborhood is residential, offices or residential cum commercial related activities. The location is well accessible from Kabarnet Road and the general area is within a capital city with various commercial activities including shops primarily to serve the residents and the visitors. Due to proximity to the Nairobi CBD, the area's population is growing by the day with so many people moving there for accommodation and business opportunities. All social amenities (hospitals, schools, religious places, shopping areas etc.) are within easy reach. All major urban infrastructures (electricity, roads, sewer, and landline telephony) are connected to the proposed project site. All emergency facilities (ambulances etc.) are within easy reach from the various providers. The area is currently a high-density residential area. The area is within the jurisdiction of Nairobi City County Government and therefore bound by its by-laws.

2.3.1 Roads and accessibility

The immediate access roads are Kabarnet Road and Ngong Road that are well connected to other roads.

Plate 2: Part of infrastructural developments in the area



Source: Site Survey

2.3.2 Sewer system

The area is served with a public sewer line. The sewer system reticulation has been effectively designed in the proposed plans and will be connected to each unit and to the public mains sewer line upon approval by NCWSC.

2.3.3 Water resources

The proposed project site shall be connected to the water supply network in the neighborhood. It is proposed that the proposed development will have cold-water storage tanks on the roof to the specifications of the mechanical engineer. The proponent shall drill a borehole upon obtaining all approvals.

2.3.4 Surface Drainage

The area slopes gently and the proposed design has provided for effective storm water drainage system to the public drainage along the road. The proposed design has provided for internal drains to collect the surface run-off for final disposal.

2.3.5 Solid waste Management

The area is within the jurisdiction of the Nairobi City County Government, which has the responsibility of disposal of waste. However, the proponent/contractor has an option of contracting a private garbage collecting company. During construction however, construction solid waste - arising from vegetation materials to be cleared, and construction material wastes (wooden, glass, plastics, sanitary litter etc.) handling may be a challenge. This calls for sound waste management system especially during construction. All solid wastes should be dumped in approved dumpsites and in accordance with the regulations.

2.3.6 Energy

The site will be connected to the national grid. Fossil fuels will power some machinery/equipment.

2.3.7 Communication

The area is well covered by all communication facilities such as landline, email and mobile services. All these will facilitate communication throughout the project cycle.

3.0 RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORK

3.1 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 Act. 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 with the above regulation, the proponent *appointed experts to conduct this EIA study report to seek approval for the proposed project.*

3.2 Environmental (Impact Assessment And Audit) Regulations, 2003

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.

3.3 The Environmental Management and Coordination (Water Quality) Regulations, 2024 L.N. 177/2024

These regulations set the standards of domestic water and waste water. 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 local supply. The proposed project will connect to the public sewer line.*

3.4 The Environmental Management and Coordination (Waste management) Regulations, 2024 L.N. 178/2024

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. The proponent will further seek a license from NEMA to comply with the regulations.*

3.5 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.*

3.6 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 and take all precautions to avoid leakages.*

3.7 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 has appointed a reputable contractor who is/will be responsible in enforcing the all safeguards during construction and subsequently after project completion.*

3.8 The Physical and Land Use Planning Act, 2019 (No. 13 2019)

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 development. *The drawings (plans) of the proposed project have been approved by NCC.*

3.9 County Governments Act, 2012

The Act 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 neighbourhood, and to prescribe the conditions subject to which such developments shall be carried on. *In compliance, the EIA report has proposed potential mitigation measures (in the EMP and monitoring plan; and the environmental management Framework in the report).*

3.10 The National Building Code, 2024

3. The purpose of this Code is to promote order and safety in construction works, and the health and safety of persons in or about construction works.

Purpose of Code.

4. (1) The scope of this Code is to provide— Scope of Code.

(a) standards for the design, construction, operation, inspection and maintenance of a building;
(b) standards for design, building materials, products, elements, systems and building services;
(c) standards for infrastructure services;
(d) standards for the operations and works at a construction site;
(e) standards for disaster management at a construction site; and
(f) standards for the safety and security of the users and occupants of a building.

Compliance: During project implementation, the appointed contractor shall meet registration and approval requirements with NCA.

3.11 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 will be*

discharged into the public sewer line. 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.

3.12 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.*

3.13 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 local water supply and the public sewer line for water and sewerage services.

3.14 National Construction Authority Act, 2011

This Act establishes the National Construction Authority (NCA), meant to oversee the construction industry and coordinate its development. The authority is meant to promote quality assurance of the construction industry; accredit and register contractors as well as accredit and certify skilled construction workers and construction site supervisors.

Compliance: During project implementation, the appointed contractor shall meet registration and approval requirements with NCA.

3.15 Climate Change Act, 2016

This is an Act of Parliament to provide for a regulatory framework for enhanced response to climate change, to provide for mechanism and measures to achieve low carbon climate development, and for connected purposes. Part IV section 15 provides on how climate change should be integrated in every public-sector entity. A public entity is expected to observe the Act together with provisions of the National Climate Change Action Plan. The Climate Change Act, 2016 requires the Government to develop five-year National Climate Change Action Plans (NCCAP) to guide the mainstreaming of adaptation and mitigation actions into sector functions of the National and County Governments.

Part IV Section 16 states thus:

16. (1) The Council may, in consultation with the Cabinet Secretary and relevant State Departments, impose entities including entities constituted under the Public Benefits Organizations Act, 2013.

(2) The Council shall make regulations governing the nature and procedure for reporting on performance by private entities, including the authority to monitor and evaluate compliance.

(3) Notwithstanding other provisions in this Act, the Council may—

a) by notice in the Gazette, require a private entity that is subject to climate change obligations to, at any time, prepare reports on the status of its performance of the climate change duties and prescribe the period for reporting; and

b) Require any private entity that fails to comply with its climate change obligations to prepare a report within a specified time, on the actions it has taken, is taking or intends to take to secure future performance with those duties.

Part IV Section 17 states thus: -

17. (1) The National Environmental Management Authority shall on behalf of the Council-

(c) regulate, enforce and monitor compliance on levels of greenhouse gas emissions as set by the Council under this Act.

Compliance: The contractor shall be required to work closely with stakeholders to ensure that the project is in line with the set-out strategies by the county government in mitigating climate change as per the Act by:

Action Plan to Climate Proof the project:

i. Prevention of heat waves

The proponent shall create green spaces to reduce heat waves. Trees shall be planted in any open spaces even in pots. This will cool the surrounding environment by offering shade and releasing moisture through their leaves.
The structural designs have provided high-rise rooms, and large openings to improve ventilation and air circulation while reducing heat waves.

ii. Green Vegetation

Planting trees and flowers or other vegetation around the proposed buildings shall be another way of addressing effects of climate change. The construction will use very limited quantity of wood products as a way of green cover preservation.

iii. Solar water heating and solar powered security lights

The proponent will use Solar systems for water heating and also solar powered security lights to reduce energy demand (carbon foot prints). The proposed deigns also allow natural sun lighting into the houses hence reducing energy demands. Motion sensor lighting shall be used in common areas and a viable frequency pump with increased power factor shall be used to reduce energy demands.

3.16 Sustainable Waste Management Act, 2022

This Act aims to:

a) Promote sustainable waste management,

b) improve the health of all Kenyans by ensuring a clean and healthy environment,

c) reduce air, land, fresh water and marine pollution

d) promote and ensure the effective delivery of waste services

e) create an enabling environment for employment in the green economy in waste management, recycling and recovery,

f) establish an environmentally sound infrastructure and system for sustainable waste management,

g) promote circular economy practices for green growth,

h) mainstream resource efficiency principles in sustainable consumption and production practices; and

i) Inculcate responsible public behavior on waste and environment.

Duties of private sector entities :

(1) A private sector entity shall prepare a three-year waste management plan and submit an annual monitoring report to the Authority which shall specify: -

(a) the actual quantities of waste generated by the entity;

(b) the waste management methods applied by the entity; and

(c) any other information that the Authority may require.

(3) A private sector entity that fails to comply with the provisions of subsection (1) above commits an offence and shall, on conviction, be liable to a fine of not more than two hundred thousand shillings and the person responsible for the private sector entity shall, in addition to the fine imposed on the entity, be liable to imprisonment for a term not exceeding three months.

(4) A private sector entity shall: -

(a) adopt the following cleaner production principles including: -

(i) improvement of production processes through conserving raw materials and energy;

(ii) limiting the use of toxic raw materials to safe laws within such time as may be prescribed by the Authority;

(iii) reducing toxic emissions and wastes; and
(iv) monitoring the product cycle from beginning to end by;

(b) identify and eliminate potential negative impacts of the product;
(c) enable the recovery and reuse of the product where possible;
(d) reclaim and recycle;
(e) incorporate environmental concerns in the design, process and disposal of the product;
(f) collect, segregate and dispose of or cause to be disposed of the waste in accordance with this Act;
(g) shall segregate waste by separating hazardous waste from non-hazardous waste and dispose of the waste in a facility provided by the county government or the Authority;
(h) transfer the waste to a person who is licensed to transport and dispose of the waste in accordance with this Act;
(i) clean up and restore the site it was using to its natural state;
(j) prepare a waste management plan and integrate it in its corporate strategies and plans; and
(k) Provide waste segregation receptacles at its premises for organic, plastic and general dry waste.

Compliance: The contractor and the proponent in conjunction with the relevant authorities and professionals shall provide for sustainable waste management systems and procedures during the entire project cycle. This will be done by: -

i. Segregating construction waste by separating hazardous waste from non-hazardous waste, organic, plastic, and general waste and disposing them in areas approved by the county government.
ii. Preparing a waste management plan for the entire project cycle.
iii. Reduce all kinds of pollution on the site.
iv. Recycle construction materials which are recommended for use by the engineer.
v. After construction phase, the contractor shall ensure the site is cleaned up and restored to its original state or even better.

3.17 The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.

Part II - General Prohibitions

3.(1) Except as otherwise provided in these Regulations, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

(2). In determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered-

(a) Time of the day;
(b) Proximity to residential area;
(c) Whether the noise is recurrent, intermittent or constant;

(d) The level and intensity of the noise;
(e) Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and,
(f) Whether the noise can be controlled without much effort or expense to the person making the noise.
Part III- Provisions Relating to Noise from Certain Sources

Radio, TV, other sound amplifying devices

8 (1) No person shall use or operate any radio or receiving set, musical instrument, phonograph, television set, any other machine or device for the producing or reproducing of sound or any other sound-amplifying equipment in a loud, annoying or offensive manner such that the, noise from the device-

(a) interferes with the comfort, repose, health or safety of members of the public;

(b) Creates a risk thereof, within any building or, outside of a building, at a distance of 30 meters or more from the source of such sound.

Compliance:

Construction activities shall be done during the day from 8:00am to 5:00pm when most neighbours are away from home.

4.0 PROPOSED PROJECT LOCATION, DESCRIPTION, AND ACTIVITIES

4.1 NATURE, DESIGN AND DESCRIPTION OF THE PROPOSED PROJECT

NANCHONG LONGINES BAY LIMITED, hereinafter referred to as the proponent proposes to construct a development of three blocks of 1 basement for parking; ground floor for parking and shops, Mezannine1 for Parking and shops, Mezannine2 for Social Amenities (Swimming pool, Gym and Restaurant), while 1st to 16th floors will comprise of Residential apartments, The roof floor will comprise of Cold-water tanks, machine room, changing rooms and store.

The residential units shall be as follows:

- ✓ Studios - 352
- ✓ One bed-roomed apartments – 134 units
- ✓ Two bed-roomed apartments– 108 units
- ✓ Duplex apartments – 7 units

TOTAL – 601 units

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 and commercial purposes.

The design and orientation of the proposed project have left ample free space for passage, natural ventilation and lighting.

The design and orientation of the proposed project have left ample free space for passage, natural ventilation and lighting. (Please *refer to the attached plans/drawings in the annex for the finer* details).

4.1.1 The Project Specifications

The following are specific descriptions of the project.

- ❖ The entire property will be enclosed in a perimeter stonewall and reinforced concrete columns
- ❖ Materials to be used will be of approved quality which will include stones, sand, cement, timber, glass, steel, PVC products etc.
- ❖ Foundations will 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 will have 275 treads and 175mm risers and standard handrails
- ❖ 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

- ❖ 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 public drainage system along the road
- ❖ Sewerage system to discharge to the public sewer line while water and electricity (power) shall be from local water supply and national grid (KPLC) networks respectively.

4.2 PROPOSED LOCATION OF THE PROJECT

The proposed project site is Land Reference Number Nairobi/Block 43/40 along Kabarnet Road, off Ngong Road, Nairobi County.

Plate 3: Google map showing the exact site location



4.3 SITE OWNERSHIP

The proposed project site is Land Reference Number Nairobi/Block 43/40 (0.6026Ha) along Kabarnet Road, off Ngong Road, Nairobi County.

From the proposed designs, the essential set local standards (in terms of physical planning, minimum habitable rooms, basic facilities, health and safety) have been met. The land is registered in the name of the proponent. (Please find the attached ownership documents).
Similar high-rise developments have been implemented in the general neighborhoods while others are ongoing.

Plate 4: Some developments in the general neighborhood



Source: Field survey

4.4 PROPOSED PROJECT IMPLEMENTATION (CONSTRUCTION)

The building will be constructed based on applicable building standards of Kenya. These include but not limited to the Building Code and the British Building Standards *BS 8110* and *BS 5950, BS4449, BS446, BS5255, BS497, BS556 etc*. The constructions will as well incorporate environmental guidelines, health and safety measures.

4.4.1 Construction Activities and inputs

The project inputs include the following:

- Construction raw materials i.e. sand, cement, stones, crushed rock (gravel/ ballast), ceramic tiles and other ceramic fittings, parquet, clay vent blocks, steel and wooden fixtures and fittings, glass, steel metals, timber, painting materials among others. All these should be obtained from licensed dealers and especially those that have complied with the environmental management guidelines and policies.
- Construction machines including machinery such as trucks, concrete mixers, and tools and other relevant construction equipment. These will be used for the transportation of materials, and in the construction of the project. Most of the machinery use petroleum products, as the source of energy but electricity is also available.
- A construction labor force of both skilled and non-skilled workers. These require services such as, water supply and sanitation facilities.
- Large volumes of water for construction purposes. This will be supplied from the local supply.

- Power from the mains grid or provided by generators.

Construction activities include the following:

- Procurement of construction materials from approved dealers.
- Transportation of construction materials and debris using heavy and light machinery.
- Appropriate storage of the construction materials.
- Site works i.e. site preparation, excavation; earth works and filling, laying of foundation, masonry works/building works including roofing, finishes, fixtures and fittings.
- Disposal of the resulting debris/ waste materials. All debris and excavated materials will be dumped on approved sites but should be recycled in then project as much as is possible e.g. in backfilling if any
- Electrical, civil, and water engineering and sanitary works. These will be done by reputable expertise.
- Landscaping works and earth works mostly on completion of the proposed development.
- Completion of the development and occupation/operation.

4.5 DRIVEWAY AND PARKING

The proposed project has provided for driveway and parking on the basement, ground, and mezzannine1 floors. According to the proposal, there will be a gate opening onto a driveway leading to the parking. The proposed design is adequate to avoid accidents during entry and exit. The driveway will be surfaced with concrete slab.

4.6 PROJECT BUDGET

The construction is estimated to cost approximately **Kenya Shillings Three Billion, Sixty-Four Million, Seven Hundred and Ninety-Five Thousand, Two Hundred and Twenty (KShs. 3,064,795,220.00).**

5.0 ANALYSIS OF PROJECT ALTERNATIVES

5.1 Introduction

In order to enable the proposed project to seek different ways of minimizing its impacts on the environment and at the same time achieve its objectives, several alternatives were assessed.

5.2 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 both the implementation and operational phases.

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.

5.3 Relocation Alternative

Relocation option to a different site is an option for the project implementation. At the moment, the proponent has no alternative sites for relocation. 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.

5.4 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 underutilized 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.

5.5 Analysis of Alternative Construction Materials, Design, and Technology

The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that saves energy and water will be given first priority without compromising on cost or availability factors. The concrete pillars and walls will be made using locally sourced stones, cement, sand (washed and clean), metal bars and fittings that meet the Kenya Bureau of Standards requirements. Beautiful and durable re-enforced concrete roofs because they are good in heat insulation with minimal iron sheet roofs. Heavy use of timber during construction is discouraged because of destruction of forests. The exotic species would be preferred to indigenous species in the construction where need will arise. However, these construction methods and technologies to be used will require very little timber.

The technologies available include the conventional brick and mortar style, concrete frame construction, prefabricated concrete panels, timber construction, steel and aluminum frame and Expanded Polystyrene Technology. The proponent has preferred the use of reinforced concrete frame construction as the technology is durable, offers outstanding resistance to explosion and/or impact and performs well during both natural and manmade disaster. Reinforced concrete can also endure very high temperatures from fire for a long time without loss of structural integrity. Priority shall be given to construction techniques and materials that are environmentally friendly, save on time and cost of construction.

Various alternative designs and technology have been evaluated by the proponent and various professionals involved i.e. the architect, engineers, and surveyors end 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.

5.6 Waste Water Management Alternatives

Four locally available technologies are discussed below: -

5.6.1 Waste Water Treatment Plant

This involves the construction of a plant that will enable the recycling of the waste water from the project activities to reusable standards and utilized within the site in activities such as irrigating the flower gardens and flashing of the toilets. It is usually expensive to construct and maintain, but it is the most reliable, efficient and cost-effective in the long term. This option is not viable for the proposed project due to lack of space.

5.6.2 Use of Stabilization Ponds/Lagoons

This refers to the use of a series of ponds/lagoons that allow several biological processes to take place, before the water is released back to the river. The lagoons can be used for aquaculture purposes and irrigation. However, they occupy a lot of space but are less costly.
No chemicals are used/heavy metals sink and decomposition processes take place. They are usually a nuisance to the public because of smell from the lagoons/ponds. This option is not preferable in the area because the required space is not only available, and the local community are not likely to accept the option.

5.6.3 Use of Constructed/Artificial Wetland

This is one of the powerful tools/methods used in raising the quality of life and health standards of local communities in developing countries. Constructed wetland plants act as filters for toxins. The advantages of the system are the simple technology, low capital and maintenance costs required. However, they require space and a longer time to function. Long term studies on plant species on the site will also be required to avoid toxin accumulation in the plants. Hence it is not the best alternative for this kind of project.

5.6.4 Use of Septic Tank

This involves the construction of underground concrete-made tanks to store the sludge with soak pits. This option is viable in instances where the project is not served with a sewer system or is far from a sewer line.

5.6.5 Use of Existing Sewer Line Systems

This involves seeking approvals from the relevant authority and connecting the proposed project development with the NCWSC sewer system that exists and offers services within the area. This is the most viable alternative since the proposed development surrounding site area is connected and served by a sewer system in addressing waste water issues. The developer has opted in using the sewer systems existing and connected in the area for the disposal and management of waste water generated throughout the project cycle.

5.7 Solid Waste Management Alternatives

Throughout construction, the project will produce wastes such as excavated soil, wood chips, metal scraps and paper wrappings among other. Wastes to be generated during operation phase are mainly domestic in nature. The Proponent is expected to observe EMCA (Waste Management Regulations, 2006).

An Integrated Solid Waste Management System (ISWMS) is recommended for management of all solid wastes generated throughout the projects phases. The following shall be given preference in its descending order:

a) The developer shall give priority to waste reduction at source of the materials. This option will demand a solid waste management awareness program in the management and the residents.

b) Secondly, Reducing, Recycling, Reuse and composting of the waste. This calls for a source separation program to be put in place. The recyclables will be sold to waste buyers within Nairobi County or donated.

c) Finally, sanitary land filling will be the last option for the developer to consider.

6.0 SOCIAL IMPACT ASSESSMENT

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. The SIA 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. This enables evaluation of the public and neighbors' views and is thus a very important part of the study. The proposed type of development has been embraced in Kilimani, Kileleshwa, Parklands, South C, and Westlands that are developed with similar developments and others are ongoing.

6.1 Consultation with the Officials at the County

The outcome of the consultation with the County Government was based on approval of the site and building plans and change of use by the Nairobi City County Government.

6.2 Public Meetings

Public Consultation meetings (Pursuant to regulation 17 (b) of the Environmental (Impact Assessment And Audit) Regulations, 2003) were held and minutes of the meetings are attached

6.3 Public Notices

Public notices were put on the site, on the newspapers and on local radio as per regulation 17 (a) of the Environmental (Impact Assessment And Audit) Regulations, 2003.

7.0 CLIMATE CHANGE RISKS AND VULNERABILITY ASSESSMENT

7.1 Introduction

A climate change risk and vulnerability assessment chapter outlines how a project will be affected by climate change and how the project can be adapted to minimize negative impacts. This chapter identifies potential climate hazards, assess the project's sensitivity to these hazards, and analyze its adaptive capacity. It also proposes mitigation measures to reduce greenhouse gas emissions and adaptation strategies to enhance resilience. The assessment is aligned with the provisions of the Climate Change Act, 2016, which provides a framework for climate change action in Kenya.

7.2 Climate Change Context

Kenya's vulnerability to climate change is well-documented, with recurring droughts, erratic rainfall patterns, and increased frequency and intensity of extreme weather events posing significant threats to various sectors. The Climate Change Act, 2016, recognizes the need to address these challenges through adaptation and mitigation measures.

7.3 Methodology

The assessment will employ a participatory approach, involving stakeholders at various levels (e.g., community members, county government, technical experts) to gather information on climate change impacts and vulnerabilities. The methodology will incorporate the following steps:

1) **Hazard Identification:**

Identify potential climate hazards relevant to the project location, such as increased temperatures, changes in rainfall patterns, droughts, floods, and extreme weather events.

2) **Vulnerability Assessment:**

Assess the project's sensitivity to the identified hazards, considering factors like location, infrastructure, and reliance on natural resources.

3) **Adaptive Capacity Analysis:**

Evaluate the project's ability to adapt to climate change impacts, considering existing resources, technologies, and institutional capacities.

4) **Risk Assessment:**

Integrate hazard identification, sensitivity, and adaptive capacity to determine the overall climate change risks to the project.

Mitigation and Adaptation Strategies:

Based on the risk assessment, propose specific measures to mitigate greenhouse gas emissions and adapt the project to minimize climate-related risks.

7.4 Climate Change Hazards

The project area is likely to experience the following climate change hazards:

Increased Temperatures: Higher temperatures can affect crop yields, livestock productivity, and water resources.

Flooding: Increased rainfall intensity can lead to flooding, damaging infrastructure and disrupting livelihoods.

7.5 Vulnerability Assessment

The project's vulnerability will be assessed by considering the following factors:

Sensitivity: The degree to which the project is affected by climate change impacts. This may include factors like crop types, water sources, and reliance on specific infrastructure.

Adaptive Capacity: The project's ability to adjust to climate change impacts, including access to resources, technology, and institutional support.

1. **Mitigation Measures**

To reduce greenhouse gas emissions, the project will consider the following mitigation measures:

a) Promoting Renewable Energy: Utilizing solar power or other renewable energy sources to reduce reliance on non-renewable energy

b) Improving Energy Efficiency: Implementing measures to reduce energy consumption in project operations.

2. **Adaptation Strategies**

To enhance the project's resilience to climate change impacts, the following adaptation strategies will be implemented:

a) Water Management: Implementing water conservation measures, exploring alternative water sources, and promoting efficient irrigation techniques.

b) Climate-Resilient Infrastructure: Designing infrastructure that can withstand extreme weather events, such as flood-resistant buildings and drainage systems.

In addition, Kenya's climate change vulnerability and risk assessments highlight the country's susceptibility to climate-related hazards like droughts, floods, and temperature increases, particularly impacting agriculture, water resources, and human health. These assessments are crucial for informing national and county-level adaptation planning and accessing climate finance.
Key aspects of climate change risk and vulnerability assessment in Kenya:

7.6 Climate Variability and Change:

Kenya experiences significant climate variability, with both regional and seasonal differences. Observed changes include rising temperatures and shifts in rainfall patterns, with increased rainfall during short rains and unreliable long rains in some areas.

7.7 Climate-Related Hazards:

Droughts, floods, and heat waves are major climate-related hazards in Kenya, with droughts causing significant livestock and crop losses, famine, and displacement. Floods, though more localized, have also resulted in loss of life.

7.8 Vulnerable Sectors and Groups:

Agriculture and food security, water resources, human health, and energy infrastructure are among the most vulnerable sectors to climate change impacts. Rural communities, particularly those in arid and semi-arid lands, are disproportionately affected by droughts and other climate-related events.

7.9 Impacts on Human Health:
Climate change exacerbates existing health risks, leading to geographic expansion of vector-borne diseases, increased waterborne illnesses, and nutritional challenges due to food shortages.

7.10 Vulnerability Assessment Process:
Climate change vulnerability assessments in Kenya often involve participatory approaches, engaging local communities in identifying hazards, impacts, and adaptation priorities. These assessments inform the development of County Climate Change Action Plans (CCAPs) and County Integrated Development Plans (CIDPs).

7.11 National and County-Level Action:
Kenya has a legal framework for climate change, including the Climate Change Act of 2016, which provides a framework for coordinating, planning, and implementing climate change actions. The National Treasury's Financing Locally Led Climate Action (FLLoCA) program also uses climate risk assessments to guide the allocation of climate resilience investment grants.

7.12 Integrating Climate Risk Management:
Kenya is working to integrate disaster risk reduction, climate change adaptation, and sustainable development goals. This includes mainstreaming climate change considerations into various sectors and developing climate risk management frameworks.

8.0 POTENTIAL IMPACTS

Construction activities involve a series of defined physical operations, which include site preparation; excavation works, building works etc. All are potentially significant sources of particular impacts both significant and insignificant. On completion, the activities during the operational phase also have potential impacts. The following are foreseen to comprise potential impacts:-

8.1 POSITIVE IMPACTS

1) Provision of housing and income generation

Housing is a basic good and a major contributor to productivity. Supply of standard and affordable housing has always lagged behind demand for the same and the proposed project has a contribution towards reduction of the deficit. The proposed project shall also increase cash flows to the proponent whether by renting or sale of the units.

2) Promotion of healthy competition, convenience and uniformity in land use

The area has been for a long time restricted to single dwelling units but this has now changed and housing demand has opened up the area for multi-dwellings. This has led to the majority of the plots being developed with flats and the process is ongoing in others. The proposed project shall blend well with the rest. It shall also promote healthy competition in housing market, which has an effect on improved service and fair prices.

3) Optimal utilization of the land

The proposed site has been with one family for some time but the proposed project shall accommodate more families thus raising the utility of the land. The proposed use also conforms to the area's land use and is not unique in the neighborhood.

4) Employment

The proposed project will provide direct and indirect job opportunities to a significant number of the population during construction and occupational phases thus reducing the unemployment and, in the process, provide livelihood.

5) Promotion of development

The proposed project has the potential to influence the commercial trends in the area in various ways and in the long run the multiplier effect will lead to development and reduction of poverty. The proposed project shall contribute in overcoming the challenges of today's life including strategies for alleviating poverty and promoting sustainable development.

6) Increase government revenue

The proposed project shall generate tax revenue for the government directly and indirectly.

7) Creation of market for goods and services and secondary businesses

The proposed project shall consume various materials during construction such as stones, cement, sand, glass, steel products, wood products, PVC products, ceramic products etc. Various professionals have and shall continue giving their services during both the construction and operational phases and thus making livelihoods. Those doing commercial activities in the neighborhood shall also have their market widened by the occupants and workers.

8.2 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.

8.2.1 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 to use ready mix concrete to alleviate high water demand during construction
- 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.
- The developer should drill a borehole to supplement the mains water supply

8.2.2 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 natural drainage system 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.

- 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

8.2.3 Soil disturbance

This will mainly occur during excavation and backfilling. Diligence is required to prevent any effect.

Mitigation

- Avoid unnecessary movement of soil materials from the site and provide soil conservation structures on the areas prone to soil erosion mostly to reduce impact by the run-off.
- Depending on the period, monitor construction activities for appropriate and effective control measures of erosion e.g. during rainy / wet conditions, ensure suitable barriers on potential water erosion paths while avoiding wind erosion during dry conditions.
- Conduct standard landscaping after project completion i.e. resurface (pave) open areas after the completion of the project and introduce suitable and well-managed vegetation to generate surface covers on the open areas; to control soil movement by erosion agents i.e. water, animals and wind. It is recommended that landscaping be done on completion of proposed works and introduce appropriate vegetation in open surfaces.
- Ensure suitable storm water drainage channels to effectively discharge water safe to existing public drainage channels. Such channels need to be regularly maintained and repaired to avoid point discharges (have pronounced effect to soil erosion) in case of breakages or blockages.
- All these activities should consider effects on the neighboring properties.
- The recommendations of Geotechnical Engineer should be adhered to.

8.2.4 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 1800 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.
- The excavation machines should use the hydraulic system that generates lower noise

8.2.5 Increased Energy Demand

Potentially increased use of energy due to increased energy uses during construction and occupation phases and potential wastage is real. 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 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.

8.2.6 Sewage and effluent

Sewage encompasses waste water 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 proposed sewer systems; via high quality, well designed and laid pipe networks.

Mitigation

- The internal and external sewerage system should be 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 150mm concrete surround. All manholes on drive ways and parking areas must have heavy-duty covers set and double sealed airtight; as approved by specialists. All waste pipes must have cleaning rodding eyes which must be accessible.
- 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. The sewer system should be constructed to the relevant standards and appropriate quality materials.

8.2.7 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/scheduled air quality monitoring.
- Enclose the site with dust-proof nets/polythene sheets during the construction phase.

8.2.8 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. Oil interceptors should be installed in the channels leading from such areas.

8.2.9 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 Nairobi City 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. 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.

8.2.10 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, hydrological regime imbalance, decreases in air purifiers (carbon sinks) and thus contribution to global warming etc. The proposed site has planted vegetation and mature trees which majority will be cleared to pave way for the proposed project.

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.
- Conserve the mature trees along the road setbacks

8.2.11 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, electrical and architectural engineers.

8.2.12 Visual Intrusion

Visual impacts occur during earthworks for the foundation of projects and throughout to the completion of the project. Great care should be taken to protect the neighborhood character.

Mitigation

- Ensure no destruction of the vegetation in the neighborhood and shield off the particular areas of construction with suitable materials. On completing the earthworks, 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

8.2.13 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 elected 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.

8.2.14 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.

8.2.15 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.

<u>Mitigation</u>

- 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

8.2.16 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 responsibly 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.

8.2.17 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
- Strategically install lighting as well as security alarms, CCTV cameras

8.2.18 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 2No. 30m hose reels on each floor and provide for adequate fire reserve water storage tanks with an automatic booster pump for hose reel and 4No. 9kgs water fire extinguisher. Provide 3No. powder or carbon dioxide extinguishers on the basement/ground floors (for the parking)
- Provide appropriate Fire Hydrant Ring main with suitable outlet points.
- All installation to follow Nairobi City County Government Fire Masters requirements approval.
- Conduct regular firefighting drills/simulations to sensitize workers/residents and adapt an emergency response plan for the entire project during occupational phase.
- 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.

8.2.19 Project Completion

At one point in time, the proposed 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.

9.0 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.

10.0 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 flats. The EMPs have considered both construction and occupation phases.

TABLE 2: EMMP FOR DEMOLITION OF THE EXISTING STRUCTURES

Environmental/ Social Impact	Proposed Mitigation and Aspects for Monitoring	Responsibility during demolition	Monitoring means	Estimated Costs (Kshs)	Monitoring indicators and frequency
Air pollution during demolition	• Dust suppression and other pollution control technologies will be implemented during the process to reduce emissions of dust and other contaminants. • Enclose the site with dust-proof nets during demolition • Water should be sprayed during demolition especially during dry conditions • Ensure sound condition of demolition machinery and equipment	Contractor	Inspection/ observation	100,000	• Type of machinery and equipment used • Amount of dust produced • Dust proof nets
Noise pollution	• Erect suitable barriers to control noise • Maintain any demolition plant equipment (if present) • Demolition activities to be restricted to daytime • Workers in the vicinity of /or involved in high-level noise to wear safety & protective gear.	Contactor	Inspection/ observation	100,000	• Provision of ear muffs/ buffers/mufflers
Public health, occupational health and safety	• Ensure the occupants vacate the existing house long before demolition begins. • Shield off the site to avoid falling objects to the neighboring plots • Disconnect any services to the building e.g. water, electricity • 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 demolition • Adopt sound waste management system to ensure proper solid waste disposal and collection facilities • Ensure use of standard demolition materials and to the specifications. Avoid	Proponent/contractor	Inspection/observation	200,000	• Training records, waste collection, First aid kits and training, sensitive workers

	undesirable, substandard, hazardous or unauthorized materials during demolition • 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 • Provide fully equipped First Aid kits & train staff on its use • Ensure adherence with the legal requirements- OSHA Act, 2007. • Acquire all the necessary permits before demolition commences • Demolition will be phased in such a way as to allow the removal of recoverable and/or waste materials, and to preserve the stability of the building structure during the demolition process • A clear and secure demarcation between operational activities and other areas would be maintained to ensure public safety				
Waste Management	• The Contractor must make all reasonable efforts to maximize recycling and minimize waste disposal • Ensure the laid down NEMA regulations are followed by adopting sound waste management system and ensure registration of contracted demolition waste handlers with NEMA for compliance with the prevailing regulations.	Contractor	Inspection/observation	30,000	• Sound waste management practices
Traffic management	• Demolition routes for vehicles transporting solid wastes should be marked • The transporters should avoid routes with heavy traffic	Contractor	Inspection	-	• Sound traffic management

Table 3: EMMP FOR CONSTRUCTION & 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 by water management, monitoring soil properties and equipment efficiency • Provide soil erosion control and conservation structures (landscape modifications, trap sediments, stabilize slopes) • Landscaping shall be done on project completion • Control and manage excavation soils by ensuring efficient removal from site • Control activities especially during rainy conditions by avoiding mud escalation during excavation activities	Contractor	Proponent	(c) Inspection (o) Routine maintenance (c) Inspection (o) Routine maintenance	1,000,000	• Vegetation cover • Type of machinery and equipment • Paved area • Clean roads
Changes in land use- extent	• The project shall be approved by the relevant government bodies before commencement • Ensure the open areas are not concreted for water percolation and ground recharge • Resource/infrastructure use to be evaluated with the service providers	Proponent and contractor	Proponent	Inspection and records inspection	500,000	• conserved vegetation • records
Changes in hydrology/ impended drainage/deep excavations	• A geotechnical survey has been conducted and the recommendations thereof to be followed. There shall be no blasting during excavation • A methodology for excavation shall be generated as required by NCA • Astute reference to the geotechnical survey report and Civil works designs • 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	900,000	• Amounts of storm water • Efficient storm water drains
Air pollution	• Stockpiles of earth shall be sprayed with water or covered during dry seasons • The site shall be enclosed with dust-proof nets/polythene dust sheets during construction.	Contractor	Proponent / Contractor	c) Inspection/ observation	1,500,000	• Amounts of dust • Extent of paved area • Type of

	• Water shall be sprayed during the construction phase of excavated areas and road network during dry conditions. • Provision of dust masks for personnel in dusty areas • Workers shall be sensitized on pollution control measures • Covering of trucks hauling soil, sand and other loose materials • The developer shall use a humidifier to control residual dust					machinery • Amounts of emission
Noise pollution	• The project will follow the NEMA approved work timings only • Suitable barriers to shield compressors and other small stationary equipment shall be installed • Adherence to provisions of Noise Prevention and Control Rules 2005, Legal Notice no. 24 regarding noise limits at the workplace as well as NEMA Noise Excessive Vibration Pollution Control Regulations, 2009	Contactor	Proponent / Contractor	c) Inspection/ observation	840,000	• Ear muffs/ Buffers/ Mufflers
Water quality and sewerage infrastructure	• The design of the entire sewerage system should consider the estimate discharges from individual sources and the cumulative discharge of the entire project even during peak volumes. • Provide for adequate drainage systems. • Ensure effluents are discharged responsibly to the sewerage system. • The proponent shall seek approval from NCWSC before connecting to the existing public mains • Monitor quality of wastewater to ensure compliance with the Environmental Management & Coordination (Water Quality) Regulations, 2006 and other relevant Laws.	Contractor	Contractor / Proponent	(c) Inspection/ observation	3,000,000	• 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	960,000	• Incidences of spillage • Poorly disposed wastes • Composition of runoff
Road safety	• Enforce speed limits for construction vehicles especially along roads leading to the site	Contractor	Proponent , Traffic &	(c) Inspection/ observation	400,000	• Bill boards • Safe access

	• Provide bill boards at the site/entrance to notify motorists about the development		roads Dept/transporters			
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 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 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.	Contractor, supervising Foreman	Proponent where relevant	(o) Observation (o) Observation	3,600,000	• Training records • Waste receptors • Clean sanitary facilities • First aid kits and training • Sensitive workers
Vegetation	• Avoid unnecessary removal of vegetation. • Landscaping and planting vegetation in all disturbed areas.	Contractor Contractor	Proponent	(o) Observation (o) Observation	670,000	• 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	490,000	• 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	720,000	• Firefighting equipment • Training records • Display of emergency numbers
Water quality	• The design of the entire sewerage system should consider the estimate discharges from individual sources and the cumulative discharge of the entire project even during peak volumes. • Provide for adequate drainage system. • Ensure effluents are discharged responsibly to the sewerage 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. • Monitor quality of wastewater to ensure compliance with the Environmental Management & Coordination (Water Quality) Regulations, 2006 and other relevant Laws.	Proponent/contractor	Proponent	Data Collection	300,000 per year	• Records
Waste Management	• During construction phase, designate an area for temporarily holding waste materials. • All wastes should be disposed of 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	Proponent	Proponent	Records	200,000 per year	• Protected environment

	phase.					
Traffic Management	• No overloading of trucks and good driving practices to be practiced. • Suitable junction/access point shall be provided. • Use of appropriate & legible signage; proper design of access and exits including foot paths • Employment of formal flagmen/ women to ensure the public safety. • The proponent shall conduct a traffic Impact Assessment and generate a traffic management plan • The Traffic management plan shall be followed throughout the project cycle • The road network shall be regularly repaired during the construction period • Construction trucks shall be parked at designated location to avoid traffic congestion during project implementation stage	Traffic Engineer	Proponent	Records	500,000	• Perfect flow of traffic
Power sources	• Power supply requirements shall be calculated and shared with KPLC as is the requirement. A dedicated transformer for the entire project shall be a consideration. • Alternative power sources (solar) shall also be installed for lighting and heating					•
Security and social impacts	• Provide security guards, CCTV cameras and other security apparatus during the entire project cycle. • Construction work timings shall only be in line with the NEMA licensing conditions	Contractor	Proponent	(o) Observation	700,000	• Security guards • Security lights and records

Table 4: Occupational Health and Safety EMP for the proposed project during construction and operational phase

KEY ISSUES	MITIGATION MEASURE	RESPONSIBILITY	TIME FRAME	COST KSH.
Registration of the premises	Register the premises under the Occupational Health and Safety Act 2007.	Proponent	One-off	5,000
General register	Keep a general register of all workers within the facility as stipulated in Sec 62 (1) of the Occupational Health and Safety Act.	Proponent, contractor	Construction	500
Incidents and accidents	Report any incidents and accidents using prescribed forms obtainable from the Occupational Health and Safety Office.	Site Safety Officer	Continuous	1000/month
	Conduct regular safety education and training.	Site Safety Officer	Quarterly	10,000
	Prepare a contingency plan for emergency response before the start of the project.	Site Safety Officer	One-off	10,000
Insurance	Insure the premises as per statutory requirements (third party and workman's compensation).	Proponent and all occupants	Annually	-
Safety healthy environment (SHE) policy	Develop, document and display prominently an appropriate Safety and Healthy Environment policy.	Site Safety Officer	One-off	5,000
Sanitary conveniences	Provide suitable, efficient, clean, well-lit and adequate sanitary amenities at the site taking care of gender division.	Contractor, proponent and all occupants	One-off	100,000
Machinery/equipment safety	Ensure that machinery, equipment, PPE, appliances and tools to be used comply with the prescribed safety and health standards and be appropriately installed, maintained and safeguarded.	Contractor, proponent and all occupants	One-off	-
Storage of materials	Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse.	Contractor, proponent and all occupants	Continuous	-
Safe of access in the buildings	All floors, steps, stairs and lift of the premises must be of sound construction and be properly maintained.	Contractor, proponent and all occupants	Continuous	-
Emergency preparedness and evacuation procedures	Design suitable documented emergency preparedness and evacuation procedures for emergencies.	Site Safety Officer	One-off	1,000
First Aid	On site a stocked first aid box which is easily available and accessible	Site Safety Officer	One-off	10,000
Fire protection	Regularly inspect and service fire-fighting equipment by a reputable service provider and maintain inspection records.	Site Safety Officer	Every 3 months	5,000

	Prominently display signs such as "NO SMOKING" at the site especially in parts where inflammable materials are stored.	Site Safety Officer	One-off	1,000
Ventilation	Provide adequate space within the premises to allow for adequate natural ventilation through circulation of fresh air.	Contractor, occupants	One-off	-
Lighting	Provide adequate artificial or natural lighting in all parts of the premises where persons are working or passing.	Contractor, occupants	One-off	-
Electrical safety	Do not overload circuits. Clearly mark distribution board switches to indicate respective circuits and pumps. Ensure that no live electrical wires are exposed. Earth all electrical equipment	Proponent and Contractor	Continuous One-off Continuous One-off	- - - 10,000
Diseases	Provide complete refuse collection and handling service.	Proponent and Contractor	Continuous	10,000
Security	Fence the site and employ security personnel operating 24 hours. Install security alarms and/or surveillance systems.	Proponent and Contractor	Continuous	50,000

Table 5: EMMP FOR DECOMMISSION 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 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	-

11.0 SITE SAFETY AND ACCIDENT PREVENTION MEASURES

11.1 Project Employee Responsibilities

a) Project Manager – must lead project team by setting an example for safety awareness as well as developing, communicating and supervising the safety program. The project manager must enforce and set the tone for all safety related issues during and prior to the planning of each project phase. They must provide leadership and show commitment to a safe and healthy environment. Responsibilities shall include reviewing inspection reports, safety meeting reports and addressing health and safety issues on the jobsite.

c) Site Agent – must lead, oversee and manage all site work, including safety. The superintendent must ensure that safety procedures are applied in an effective manner and that all employees are conforming to established rules and regulations. Duties include establishing a pre-job assessment prior to the start of the project, ensuring site foremen comply with safety regulations, conducting safety orientations for all new employees, reviewing all incident & corrective action reports, pre-task plans and enforcing disciplinary action when necessary. The site agent will also work with the site safety representative overseeing regular site inspections, developing a site-specific emergency plan and implementing weekly tool box topics with subcontractors.

d) Project Engineer – Responsibilities include collecting all subcontractor safety programs, material safety data sheets (MSDS) and ensuring all site foreman have access to site plans.

e) Site Safety Representative – will act as the designated safety manager and will inspect the jobsite weekly, conducting safety inspections. Responsibilities include providing education and training opportunities to all employees, conducting safety audits, discussing & providing weekly tool box topics, developing an emergency action plan and procedures, reviewing all safety programs and safety data sheets (SDS), scheduling Pre-Task planning meetings & overseeing implementation, issuing violation notices, issuing corrective action reports.

11.2 Project Safety Orientation

Each employee working on the site are required to complete the Employee Safety Orientation. This must be complete within one week of any employee beginning work on site.

11.3 Job site Inspections

a) Site Safety Representative will conduct weekly site inspections, and review all safety documents (pre-task plan, crane plan, etc.).
b) Contractors shall perform daily safety inspections of their work area and equipment per OSHA, 2007 requirements.
c) After inspecting a job site/work area, the site safety representative and superintendent will identify and evaluate all potential hazards for:

a. Possibility for severe injury.
b. Probability of accident occurrence.

d) This site safety representative will also consider the skill and knowledge level demonstrated by exposed workers.

e) This site safety representative shall then take the following actions: a. Discuss all hazards with the necessary parties. B. Explain appropriate recommendations and precautions. C. Assist with any necessary training (i.e. provide appropriate Tool Box Talks), in accordance with the level of hazard. D. Issue citations & corrective actions.
f) Records shall be maintained for all recommendations, precautions, and training for each hazard identified.
g) All incidents, regardless of severity, will be discussed at the next project safety meeting, with an emphasis on eliminating future occurrences.

11.4 Emergency Procedures, Investigation, and Reporting

- Contractors/employees shall report all work-related injuries, illnesses, first aid cases, near misses, property damage, and environmental incidents such as a spill or release of hazardous materials, regardless of severity, immediately to the Project Superintendent and Safety Manager.
- The contractor shall investigate all incidents and forward copies of the incident report to the Safety Manager within 4 hours of the incident. An incident report must be provided for: near misses, first aid, recordable injuries, third party property damage or personal injury, and builders risk claims.
- Corrective actions will be implemented and any worker compensation or liability claims shall be reported to project manager.
- Follow-up information on personal injuries (doctor's reports, insurance or worker's compensation reports etc.), shall be forwarded to the Safety Manager within a reasonable time frame.

11.5 Emergency Signals and Procedures

1. Serious Emergency – A single long blast from an air horn shall be given by the Project Superintendent in the event of a serious emergency on the site. These include serious or life-threatening injury, severe weather or other impending natural disaster, or other emergencies not requiring immediate evacuation of the site. Please discontinue working and report to your foreman. Foremen shall report to the Project Superintendent for further instructions. Two quick blasts from an air horn shall signal the all clear.
2. Evacuation – Three or more long blasts from an air horn shall be given by the Project Superintendent in the event that total evacuation of the site is necessary. Immediately discontinue working and evacuate to a safe location (designated by project superintendent). Foremen shall account for all workers in their crew and shall report to the Project Superintendent. The Superintendent shall instruct the foremen according to circumstances to remain at the gathering location or retreat to a safer distance. Two quick blasts from an air horn shall signal the all clear.

11.6 Fire Prevention Program

1. There should be a program committed to minimizing the threat of fire to employees, visitors, and property. It is the responsibility of the contractor to have their own Fire Prevention Program (FPP) and to instruct and train all employees in fire prevention and fire response.
2. When Cutting, Welding, and Open Flame Work are performed, the contractor shall at minimum ensure the following:
a) All cutting and welding equipment is inspected and operated by competent, trained personnel.
b) No cutting or welding shall take place on metal walls, ceilings, or roofs built of combustible sandwich-type panel construction or having combustible covering.

c) A fire extinguisher shall be located within 10' of all cutting, welding, or other hot work.
d) Proper PPE must be utilized.
3. All combustible materials must be properly secured and stored outdoors.
4. Smoking is prohibited at the site projects.
5. The contractor must establish and maintain a means of proper egress, and all exits must be marked by a readily visible sign.
6. Fire Extinguishers must comply with the following:
    a) Readily available every 3,000sf.
    b) Require quarterly inspection tag. Any defective device must be removed from service immediately.
    c) Shall be located & labeled so it can be readily seen and accessible along normal paths of travel. In multi-storey buildings, at least one extinguisher must be adjacent to a stairway.

11.7 Hazard Communication Program

1. Hazard Determination

a. SDS supplied by the contractors and manufacturers shall be utilized in identifying hazardous materials.
b. Subcontractors must submit all appropriate MSDS documentation to project manager office prior to beginning work on project site.

2. Labeling

a. All containers on the jobsite shall be properly labeled by the responsible contractor.
b. All labels shall clearly indicate: 1. Identity 2. Hazard 3. Precautionary Statement 4. Name and address of responsible party.

3. Safety Data Sheets (SDS)

a. SDS for all hazardous chemicals to which employees may be exposed will be kept at the corporate office and the jobsite field office.
b. SDS will be available for review to all workers and employees.
c. Notification of new or revised MSDS shall be posted.

4. Employee Information

a. All known hazardous substances present on the site and location of SDS shall be disclosed to the workers in the mandatory Project Safety Orientation.
b. When workers are required to perform work in areas known to contain hazardous materials, it is the subcontractor's responsibility to identify: 1. Specific chemical hazards. 2. Protection/safety measures the employee is required to take to lessen risks. 3. Potential hazard reduction measures
c. The main contractor will work with the subcontractor to the greatest extent feasible to limit exposure to the hazard(s).

5. Training

a. Employers must provide employees with effective information and training on hazardous chemicals in their work area, and whenever a new hazardous chemical is introduced. B. Employees are required to wear and have appropriate training on PPE associated with each hazardous chemical being used.

11.8 General Safety

11.8.1 Personal Protective Equipment (PPE)

- All personal protective equipment shall be provided by contractors prior to the start of job.
- Personal protective equipment including hard hats, safety glasses, work boots and high visibility shirts must be worn 100% of the time.
- Proper work attire.
- Fall protection is required for all trades when working at heights of 6' or more.
- Protective gloves or clothing shall be worn when required to protect against a hazard.
- A face shield or safety goggles are required when cutting, grinding, welding or power washing.
- Hearing protection is required when working in areas where noise levels exceed 85 decibels, or normal conversation cannot be conducted, or when the area is posted as a noise hazard.
- Dust masks or respirators shall be worn in all dusty environments. Pulmonary testing, fit tests and written respiratory programs are required for respirator use.
- All personal protective equipment must be inspected daily as per OSHA, 2007 standards.

11.8.2 Moving Equipment

- All operating equipment shall be equipped with rollover guards per OSHA 2007 standards.
- Operating equipment shall be equipped with an audible notification, strobes and/or beacons per manufacturer's requirements.
- A spotter is required whenever a vehicle has a restricted view while operating on site.
- Properly set-up barricades or traffic control zones when operating equipment near public roadways. When construction activities are at a peak level, the use of a spotter/traffic controller is permitted to help direct and control traffic.
- Contractor/Sub-contractors is required to conduct daily inspections of all equipment.
- Employees assigned to traffic control duties must wear high visibility clothing per OSHA 2007 standards.

11.8.3 Excavating/ Site Utilities

1. The competent person must inspect the excavation:
a) Daily before work activities commences.
b) After a heavy rainfall.
c) At depths greater than 4" for oxygen deficiencies or hazardous atmospheres.
d) For failures of protective systems, equipment and adjacent structures.
2. Miss Dig must be contacted prior to starting any excavating.
3. When working in a trench 4 feet or more in depth, proper sloping, shoring, or other cave in protection methods shall be utilized.
4. Ladders shall be provided at least every 25 feet for access to trenches exceeding 4 feet in depth.
5. Material and spoil piles shall be kept a minimum of 2 feet away from the edge of a trench.
6. All open holes, trenches, and excavations shall be barricaded and clearly marked to alert the public and other workers in the area.
7. Excavations and trenches may be confined spaces where air monitoring could be required.
8. All vehicles hauling soil from site must pull into site and turn around.

11.8.4 Crane & Rigging Safety

- Must be included in a pre-task plan.
- All operators shall be certified and cards submitted to project supervision before start of work.

- All cranes are to be inspected on a daily basis.
- All cranes must have proof of annual inspection.
- Outriggers must be manufactured and be fully extended and on stable ground.
- The swing radius of all cranes must be properly barricaded.
- Contractor must submit a copy of the crane plan (operation, swing radius, etc.) to superintendent prior to the start of the project.

11.8.5 Fall Protection

1. Fall protection systems are required when exposed to heights of 6' or more. Systems include:
a) Guardrails
b) Safety nets
c) Personal fall arrest systems. All systems must be inspected, constructed and installed per OSHA, 2007 requirements.
2. When conducting roofing work, contractors are required to submit a pre-task analysis.
3. All holes/ floor openings greater than 2" in depth or diameter are required to be properly barricaded/covered or secured, and clearly marked with high visibility paint as a "hole". All hole/openings that are barricaded and covered shall be securely/mechanically fixed in place.
4. Contractors are required to maintain all fall protection devices.
5. If an employer can demonstrate conventional fall protection methods are infeasible or present a greater hazard, a fall protection plan may be implemented. The fall protection plan must comply with OSHA standards and include the following:
a) Site specific requirements/unique circumstances.
b) Prepared by a qualified person.
c) Supervised by a competent person.
d) Explain why conventional methods are infeasible.
e) Discuss the safety measures that will be taken to reduce or eliminate the fall hazard of the workers.
f) Describe all controlled access zones.
g) Require training for all employees.

11.8.6 Electrical

- Cords and tools must be inspected on a daily basis. If the insulation or casing of the cord is damaged, or the ground prong is missing, the cord will be cut by project supervision.
- All cords must be 3 prong heavy duty cords and be protected from indoor/ outdoor traffic.
- Portable generators must be provided with ground fault circuit interrupters.
- Temporary lighting must be protected with safety guards.
- Stairwells, corridors & work areas shall be properly illuminated with either temporary or permanent lighting.

11.8.7 Scaffolding Safety

- All scaffolds must be erected and inspected daily by a competent person.
- Each work level of the scaffold system shall be full planked and overhang the end supports by a minimum of 6 inches and a maximum of 12 inches. Planking which does not meet this requirement must be cleated.
- The scaffold system must have a ladder provided for access. Climbing the bracing is not acceptable unless the system has a built-in ladder for that purpose.
- Scaffolding height must never exceed 4 times their minimum base dimension. If this is exceeded, the scaffold must be tied into the structure.

- All working and walking levels must be fully planked and not overloaded.
- Planks must be scaffolding grade lumber. Cracks shall not penetrate more than 12 inches.
- Riding of wheeled scaffolding is prohibited.
- The footing or anchorage for scaffolds must be sound, rigid and capable of carrying the maximum intended load without settling or displacement.

11.8.8 Ladder Safety

- Only type 1A ladders with a heavy-duty rating are required.
- No painted or aluminum ladders are allowed on site.
- All ladders must extend a minimum of three (3) feet above the landing and be secured. If the ladder cannot be secured, it must be held at the bottom by another worker.
- Keep ladder bases clear from debris, hoses, wire, materials, etc.
- Use the "four and one" rule when positioning a ladder – one foot of base for every four feet of height.
- Step ladders must be fully extended and locked into place. Placement shall be on stable surfaces.
- Workers shall not straddle or stand on the top two rungs of a ladder, and shall work facing the ladder.

11.8.9 Aerial Work Platforms

- Must be inspected daily.
- Operated by trained and authorized personnel. Employees must have operator's certification readily available.
- All employees must wear a body harness and be tied off inside the basket when elevated at all times.
- Lifts should only be operated in accordance with the manufacturer's manual.

11.8.10 Housekeeping

- Contractor/Subcontractors must properly dispose of all waste materials on a daily basis.
- Contractor/Subcontractors must properly store and secure all work material and equipment.
- Site clean-up is required on a daily basis.
- Stairways and passageways must be kept clear of debris.

11.9 Site Specific Safety Requirements

Site Work

- Employees must wear proper PPE.
- Contactor/Subcontractors must maintain a clear path through the jobsite.
- Storing of materials and goods will be located in a way as to prevent site congestion. Concrete.
- All exposed rebar will be capped, or covered to protect against impalement or injury.
- Employees operating equipment such as vibrators pump nozzles, and/ or buggies will wear appropriate clothing and PPE, such as boots, eye protection and hearing protection. Long sleeve shirts will be worn to protect against the exposure of concrete.
- Concrete contractor must appropriately barricade working area during concrete forming and after concrete has been poured.
- Material used for formwork must be removed and properly disposed of. Subcontractor will remove all debris and conduct a clean-up of the work area daily.

Steel Erection

- Subcontractor must conduct a pre-task analysis with the superintendent before all overhead hoisting activities take place.
- The area of erection must be securely barricaded. If necessary, a controlled access zone may be permitted.
- All steel erectors must wear appropriate PPE, including fall protection at heights greater than 6 feet and a face mask when welding.
- Contractor must provide the following when using a crane: Crane operator certification. Crane plan, including staging area, swing radius and required barricades.

Block Masonry

- Mason contractor must provide, if applicable, wall bracing plan prior to start of work.
- Competent person (foreman) must conduct daily inspections of scaffold equipment.
- Employees working within restricted fall zone must be trained and certified to work in restricted fall zone area.
- Masonry block walls at heights of 8 feet or greater, not tied into the structure, must be adequately braced.
- Restricted fall zone areas must be established prior to the construction of the wall, and will be restricted to employees who are actively engaged in constructing the wall.

Truss & Deck Framing

- All walkways and working surfaces must be clear of debris to prevent tripping hazards.
- Employees are required to wear appropriate PPE, including fall protection at heights greater than 6 feet.
- Contractors must establish a controlled access zone to prevent other contractors from entering work area.
- Trusses/Joists must be adequately braced to prevent falling or tipping.
- Contractor must barricade crane swing radius when loading and setting trusses in place.

Window Installation

- All window openings require a guardrail if the window sill measures a height below 39" and a width greater than 18".
- When installing windows on the upper floors, the area below (ground level) must be properly barricaded.
- Employees are required to wear a personal fall arrest system when installing windows on the upper floors.
- If using any lifting devices (rough terrain, aerial), employees must: A. Wear a personal fall arrest system B. Have operator's license to use equipment. C. Inspect equipment daily.

Roofing

- Employees are required to use a method of fall protection. Slide guards are no longer permissible.
- Employees are restricted from throwing material from roof. Contractor must set up a drop zone, which requires a barricade and a spotter.
- Employees working on roofs must wear appropriate footwear that provides good traction.
- Working surfaces must be free of tripping hazards (tools, cords, etc.) and must be clean to prevent material from falling below.

- A written pre-task analysis is required and must be submitted to superintendent prior to start of work.
- Employees must have proper and safe access to roofing surface. The use of any temporary ladder must be constructed and properly secured to prevent movement.
- Employees should refrain from working on the roof during inclement weather conditions.

Drywall

- Daily cleanup is required.
- A clear path must be maintained.
- Proper storing methods are required.
- Employees must wear proper PPE at all times.

Paint Primer

- Contractor must submit all required MSDS.
- Employees must wear appropriate work attire and PPE, including face masks/ respirators when spraying paint. A written respiratory program is required as well.
- Employees must use ladders/ lifts to reach difficult areas.
- While painting/ priming, contractor must make sure work area is properly ventilated.
- Contractor is permitted to set up a restricted work zone when spraying paint.
- Properly store all paint material, and dispose of empty paint buckets daily.

11.10 Sexual Harassment

Discrimination against any employee or applicant on the basis of the person's sex is strictly prohibited. Sexual harassment is a violation of state law and will not be tolerated. Any unwelcome sexual advances, requests for sexual favors and other verbal or physical conduct of a sexual nature constitute sexual harassment when:

a) It is stated or implied that submission to such conduct is a term or condition of a person's employment; or

b) Submission to or the rejection of such conduct by a person is used as a basis for any employment decision affecting such person, such as, but not limited to, pay increases, work assignments, promotions, performance evaluation, etc. or;

c) Such conduct has either the purpose or effect of interfering with a person's work performance or creates an intimidating, hostile or offensive work environment.

Any employee or applicant who feels that he or she has been subjected to sexual harassment should report any incidents of sexual harassment to his or her supervisor, or any member of management, without fear of reprisal. The totality of the circumstances, the nature of the alleged harassment and the context in which the alleged incidents occurred should be investigated in determining whether alleged conduct constitutes sexual harassment. Every reasonable effort will be made to maintain confidentiality. Sexual harassment case shall be reported to police for further investigation and prosecution.

11.11 Grievance Redress Mechanism (GRM)

The main objective of a Grievance Redress Mechanism (GRM) is to assist an entity to resolve complaints and grievances in a timely, effective and efficient manner that satisfies all parties involved. Specifically, it provides a transparent and credible process for fair, effective and lasting outcomes. It also builds trust and cooperation as an integral component of broader community consultation that facilitates corrective actions.

Specifically, and for this project the GRM:

- shall provide affected people with avenues for making a complaint or resolving any dispute that may arise during the course of the implementation of project. They shall include site visits, Telephone contacts/communications, Emails conversations

- Shall Ensure that appropriate and mutually acceptable redress actions are identified and implemented to the satisfaction of complainants; and

- shall avoid the need to resort to judicial proceedings.

The proposed GRM framework shall include the following steps:

1. The project sociologist shall receive and register grievances or complaints.
2. Acknowledge, assess and assign (Acknowledge receipt of grievance, outline how grievance will be processed, assess eligibility and assign responsibility).
3. Propose Responses and communication structures to the affected parties
4. Discuss with affected parties to reach agreements.
5. If agreement is reached, implement agreement resolutions and monitoring by both parties
    (i) If agreement is not reached, review case and discuss further
    (ii) If no agreement is reached under the review/engagement process, then the discussions are escalated and details shared with NEMA for further guidance.

12.0 CONCLUSION AND RECOMMENDATIONS

The necessity for housing can never be overemphasized. Unfortunately, its supply has since time immemorial lagged behind the supply of the same and the gap seems to widen. In view of this, the government focuses on facilitating production of approximately 150,000 new house units per annum and thereby calling for partnership with the private sector in providing housing facilities/infrastructure to bridge the gap.

This study indicates that the construction and occupation/operation of the proposed (housing) project will have positive impacts, which include employment, increase in the national/local housing stock and quality, increase in Government revenue, and improvement of standards of living. However, despite the outlined positive impacts, the proposed development will come up with some negative impacts mainly increased pressure on existing infrastructure. Other impacts include potential pollution (to air, water, and soil) mostly during construction phase, enhanced security risks and social crimes, and increased waste (solid and liquid) generation among others.

The proposed project design has integrated mitigation measures with a view to ensuring compliance with the applicable laws and procedures. The structures should be built to the required planning/architectural/structural standards of the County Government. During project implementation and occupation, sustainable environmental management should be ensured; avoiding inappropriate use of natural resources, conserving nature and guaranteeing health and safety and security of all people, working on the project, general public and inhabitants of the project.

From the foregoing and taking into consideration of all the foreseeable and relevant aspects, the proposed project is a timely venture with a positive and significant contribution to the government housing policy and development goal. It is thus our recommendation that the project be allowed to go ahead with the implementation provided the outlined mitigation measures are adhered to. Major concerns should nevertheless be focused towards avoidance or minimizing the occurrence of impacts that would degrade the general environment. This will however be overcome through close following and implementation of the recommended Environmental Management and Monitoring Plans (EMPs).

We also recommend that the proponent also work closely with the Environmental Assessment Experts, the County Government, NEMA, DOSH, NCA and other bodies to enhance the facilitation of the issues of concern identified. This will also help in solving any problem arising and which may not have been foreseeable during the EIA study report. This will ensure that environmental concerns are integrated into the project at every stage of the implementation phase. It will enhance the co-existence of the proposed project with the environment, during the entire project cycle. The various service providers (power, sewer, water, garbage collection etc.) must assess the respective requirements. The proposed design has met the basic requirements such as the minimum habitable room sizes and basic social services; the reason why they have been approved by the relevant authorities. It is recommended that that on Licensing, the proponent should implement the project on the proposed drawings and if alterations are necessary, approval should be sought. Conservation resources such as energy and water within the project during construction and occupation phases should be encouraged. Sound construction practices aimed at environmental conservation should also be adopted and special attention should be paid to the extended sources of raw materials such as water, sand, stones, and energy. Some construction 'waste' materials can be re-used in other areas and forms.

Wastes should be reduced to the minimum as this will save on costs and at the same time preventing environmental pollution. The operators during both the construction and operational phases should exercise diligence in all activities to ensure environmental sustainability.

REFERENCES

Dharani N. 2002. Field guide to common Tree & Shrubs of East Africa*. Struck Publishers, Cape Town, South Africa*

Environmental Assessment Sourcebook Volume I (Policies, procedures, and cross-sectoral issues), Volume II (sectoral guidelines) Volume III (guidelines for Environmental assessment of energy and industry projects) *by, World Bank, Washington, 1991*

Environmental Management and Coordination Act, CAP 387

Exploratory Soil Map and Agro-Climate Zone Map of Kenya, 1980, Scale 1:1 *by Sombroek W. G., Braun H. M. M. and Van der Pouw B. J. A., 1982*

Kenya gazette supplement County Governments Act, 2012. Government printer, Nairobi

Kenya gazette supplement Acts, The Physical and Land Use Planning Act, 2019 (No. 13 2019). Government printer, in Nairobi.

Relevant Government Acts.

The Making of a Framework Environmental Law in Kenya, *by ACTS press, UNEP-ACTS, 2001*

ATTACHMENTS

1. Minutes of the Public Participation Meetings
2. Traffic impact Assessment Report
3. Geotechnical Survey Report
4. Bills of Quantities
5. Change of Use Copy
6. Architectural Drawings
7. Ownership documents
8. ESMP