ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED RESIDENTIAL APARTMENTS ON PLOT L.R NOs. 7149/144 &145 ALONG MUTHAMA ACCESS ROAD OFF MOMBASA ROAD IN SYOKIMAU AREA WITHIN MACHAKOS COUNTY.

SITE GPS COORDINATES:

Latitude: **-1.384427**°S

Longitude: **36.9221777**°E

Prepared in Accordance With:

- Environmental Management and Co-ordination Act 1999
- Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019

PROJECT PROPONENT

ACME WANJI INVESTMENT LIMITED

P.O. BOX 59083-00200,

NAIROBI.

APRIL 2021

DOCUMENT AUTHENTICATION

This Environmental Impact Assessment study report has been prepared by **Green Builders & Planning Consultants Limited** (NEMA Reg No. **9571**) in accordance with the Environmental Management and Coordination Act 1999 and the Environmental (Impact Assessment and Audit) (amendment) regulations 2019 legal notice 31 & 32 which requires every proponent undertaking a project specified in second schedule as high risk to undertake Environmental Impact Assessment(EIA) study report for submission to the National Environmental Management Authority (NEMA) for licensing. We the undersigned, certify that the particulars in this report are correct and righteous to the best of our knowledge.

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Signature……Date…..…...……

PROJECT PROPONENT:

ACME WANJI INVESTMENT LIMITED

P.O. BOX 59083-00200,

NAIROBI.

Signature…….……Date……..…….

FACT SHEET

Assignment Name	Environmental Impact Assessment Study Report		
Type of Facility	Proposed residential apartments		
County	Machakos		
Location	Plot L.R Nos. 7149/144 &145 along Muthama access road off Mombasa road in Syokimau Area		
GPS Coordinates	-1.384427 °S, 36.9221777 °E		
Proponent	Acme Wanji Investment Limited		
Address of the Proponent	P.O. BOX 59083-00200, Nairobi, Kenya.		
Project description	The proposed development comprises of eight (8) blocks of ground plus fourteen (14) floors residential apartments (Block A, B, C, D and Duplex A, B, C, D). Block A will have a total of one hundred and ninety two (192) 3 bedroom units, Block B will have one hundred and ninety two (192) 2 bedroom units, Block C will have ninety six (96) 2 bedroom units and Block D will have ninety six (96) 3 bedroom units. Duplex A will have sixteen (16) 6 bedroom units, Duplex B will have sixteen (16) 3 bedroom units, Duplex C will have eight (8) 3 bedroom units and Duplex D will have eight (8) 5 bedroom units. The total number of units will be six hundred and twenty four (624); Three hundred and twelve (312) 3 bedroom units, two hundred and eighty eight (288) 2 bedroom units, eight (8) 5 bedroom units and sixteen (16) 6 bedroom units.		
EIA firm of experts	Green Builders & Planning Consultants Limited 0704 707 633	**NEMA Firm Reg No:**	9571

ACRONYMS AND ABBREVIATIONS

EIA - Environmental Impact Assessment

EA - Environmental Audit

EHS - Environmental Health and Safety

EMCA - Environmental Management and Coordination Act

EMP - Environmental Management Plan

EPZ - Export Processing Zone

GCI - Galvanized Corrugated Iron

HA - Hectares

ITCZ - Inter-tropical Convergence Zone

KM – Kilometres

KPLC - Kenya Power and Lighting Company

MOH - Ministry Of Health

NEAP - National Environmental Action Plan

NEMA - National Environment Management Authority

NPEP - National Poverty Eradication Plan

OHS - Occupational Health and Safety

PEC - Poverty Eradication Commission

PPE - Personal Protective Equipment

PRSP - Poverty Eradication Strategies Paper

SQM – Square Metres

SWM – Solid Waste Management

TOR - Terms of Reference

UFL - Noise level lower the lower operating limit (50 dB) of the Mark

VAT - Value Added Tax

WRA - Water Resources Authority

DEFINITION OF ANALYTICAL TERMS

Environmentally Sound Design: Is the design and implementation of activities and projects such that the environmental harm associated with a particular development objective is kept to a practicable minimum.

Positive Impact: A change which improves the quality of the environment (for example by increasing species diversity; or improving the reproductive capacity of an ecosystem; or removing nuisances; or improving amenities).

Neutral Impact: A change which does not affect the quality of the environment.

Negative Impact: A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem, or property or by causing nuisance.

Significant impact: An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.

Profound impact: An impact which obliterates sensitive characteristics.

Do-Nothing Impact: The environment as it would be in the future should no development of any kind be carried out.

Indeterminable Impact: When the full consequences of a change in the environment cannot be described.

Irreversible Impact: When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.

Residual Impact: The degree of environmental change that will occur after the proposed mitigation measures have taken effect.

Synergistic Impact: Where the resultant impact is of greater significance than the sum of its constituents.

Worst Case Impact: The impacts arising from a development in the case where mitigation measures substantially fail.

Cumulative impacts: Are identified as impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions.

Indirect impacts: Are defined as impacts on the environment which are not a direct result of the project, possibly produced some distance away from the project or as a result of a complex pathway.

EXECUTIVE SUMMARY

Globalisation, urbanisation, migration and technological advancements have continued to drive cities forward right from their infant stages, the cyclic processes, growth, through to their renewal and regeneration. More and more people are moving and positioning themselves in cities for business, work, venturing forth and recreation. The demand for residential developments in Kenyan urban areas has remained under tremendous pressure. Both the government and private sector have had a role to play with the government servicing the land and leaving it to private entrepreneurs to develop. However, the provision of residential housing has not kept pace with the said phenomenon.

For a long time, the world over, policy makers directed all the efforts in economic development without due regard to the resource base on which the economic development depend on. As a result, there has been unprecedented environmental degradation due to lack of environmental conservation resulting to unsustainable development. More recently, investors and developers, spurred on by regulators world over, have recognized the need for change in order to safeguard the environment.

Reference to this, environmental concerns have now been integrated in the planning and implementation processes of any proposed projects in Kenya. The key objective is to mitigate conflicts with the environment at the vicinity during implementation and operation phases. In addition, it is now mandatory for Environmental Impact Assessment (EIA) to be undertaken on projects of such magnitude and nature; to enhance Sustainable Environmental Management as well as controlling and revitalizing the much-degraded environment. The environmental management is regulated by the National Environmental Management Environment (NEMA) in Kenya.

Pursuant to the prevailing legal requirements as envisaged in the Environmental Management and Coordination Act (EMCA), CAP 387 and to ensure sustainable environmental management, the proponent undertook this EIA on the proposed project's site; and incorporated substantial environmental aspects as advised by NEMA. This EIA report thus provides relevant information and environmental considerations on the project proponent's intention to seek approval from NEMA for the development of the proposed project. Environmental Experts who are registered by the Authority conducted the assessment

Acme Wanji Investment Limited herein referred to as "**the proponent**" are proposing to develop eight (8) blocks of ground plus fourteen (14) floors residential apartments (Block A, B, C, D and Duplex A, B, C, D) comprising of six hundred and twenty four units (624) on Plot L.R Nos. 7149/144 &145 (measuring approximately 2.428Ha) along Muthama access road off Mombasa road in Syokimau area, Machakos County. The proposed site is situated approximately 1 Km off Mombasa road along Muthama access road. The project neighbourhood is characterized by residential apartments (i.e. Apple Tree apartments, Tofina Muthama apartments, Prissy apartments, Shaba village, Almasi apartments, Loneview apartments etc), residential town houses (i.e. Fairfield Park, Muthama Heights Estate, Yamin estate, Loneview phase 1 etc.,) single dwelling residential maisonettes, bungalows and social amenities i.e. Grace Baptist church, 67 Airport hotel etc. The GPS coordinates are: -1.384427°S and 36.9221777oE

The proposed development comprises of eight (8) blocks of ground plus fourteen (14) floors residential apartments (Block A, B, C, D and Duplex A, B, C, D).

Block A will have a total of one hundred and ninety two (192) 3 bedroom units, **Block B** will have one hundred and ninety two (192) 2 bedroom units, **Block C** will have ninety six (96) 2 bedroom units and **Block D** will have ninety six (96) 3 bedroom units.

Duplex A will have sixteen (16) 6 bedroom units, **Duplex B** will have sixteen (16) 3 bedroom units, **Duplex C** will have eight (8) 3 bedroom units and **Duplex D** will have eight (8) 5 bedroom units.

The total number of units will be six hundred and twenty four (624); Three hundred and twelve (312) 3 bedroom units, two hundred and eighty eight (288) 2 bedroom units, eight (8) 5 bedroom units and sixteen (16) 6 bedroom units.

Other amenities include; a gatehouse, parking lots, swimming pool, swimming pool changing rooms, a shopping center and waste cubicle, management office, KPLC room (switch room), store and a pump room.

The facility will rely on water supply by EPZA. The proponent also plans to connect the waste water to the existing sewer line. The land where the proposed development will be located is undeveloped and unused consisting of thorny shrubs with some portions bare and others having grass vegetation.

The main project components include the following:

a. Clearing and preparation of the project site.
b. Development of perimeter wall and gatehouse

c. Development of residential apartments
d. Development driveways roads, walkways and parking
e. Development of utilities services i.e. drainage systems, wastewater and electricity supply
f. Site landscaping especially tree planting and landscaped gardens

Socio-Economic (Positive) Impacts of the Project

The proposed development has positive impacts to both the proponent and society in general. The benefits will be experienced during construction and occupation phases. They include the following:

(a) Provision of residential housing to the growing urban population

(b) The optimal use of land i.e. increased utility of the parcel of land, which is currently underutilised.

(c) Boost local investment; to both government and the proponent.

(d) Creation of market for goods and services. Many secondary businesses are also likely to spring up during the construction phase especially those providing foods and beverages to the construction workers.

(e) Provision of employment during both construction and occupational phases.

Issues of concern associated with project implementation

Against the background of the above positive impacts, there are a few issues of concern anticipated from the implementation of the subject project. These shall be experienced during implementation/construction phase, operation/occupation phase and decommissioning phase. They include soil degradation; air quality; noise; oil wastes; water resources; solid and liquid waste management; drainage, terrestrial ecology, visual and landscape; traffic; public comfort; occupation, health and safety (OHS); and energy.

The impacts have been elaborated as follows:

(a) Impact to soil (including soil erosion) especially when laying the foundation

(b) Increased noise and vibration mostly during construction phase.

(c) Impact (constraints/pressure) to the existing infrastructure i.e. water, power, surface drains, sewer, roads among others.

(d) Increased waste generation (both solid and liquid) during construction and operational/occupation.

(e) Increased storm water/ runoff resulting from the roof catchments and as a result of decreased recharge areas, after pavement of most areas.

(f) Air pollution as a result of dust particles emanating from cement, excavation and construction activities. Exhausts from the involved machinery will lead to increased levels of noxious gases.

(g) The health and safety of workers and immediate neighbours may be compromised in case of occurrence of incidences, pollution and disturbance

Proposed potential mitigation measures

To minimise the occurrence and magnitude of the negative impacts, mitigation measures have been proposed against each of the anticipated impacts. Other measures have been integrated in the project designs with a view to ensuring compliance with applicable environmental laws and guidelines. The measures include the following:

i. During Construction Phase

(a) Minimising air pollution (suppressing dust) and erosion by the agents of soil erosion through soil compaction and utilisation of water sprays (on loose soils on all unpaved access paths/roads, cleared surfaces), utilisation of covered trucks, and netting of construction site.

(b) Erection of warning / informative signs at the site during the implementation phase, and traffic control along the connecting road.

(c) Minimising strain on water supply (surface and groundwater sources) by, employing water conservation measures such as water reuse, rainwater harvesting, use of runoff, and reduction or avoidance on misuse of water.

(d) Reducing noise pollution through: i) installation of portable barriers to shield compressors and other small stationary equipment (where necessary); ii) sensitising workers on the need to switch off engines whenever possible; iii) ensuring machinery are well maintained through regular tuning and maintenance to minimise or avoid noise emanating from friction of rubbing metal parts; iv) installation of silencers whenever possible; and, v) ensuring work is carried out between specified time i.e. 7a.m. to 6p.m.

(e) Minimising emission of noxious fumes through: i) proper and regular tuning and maintenance of construction machinery/equipment; and, ii) reduction/control of vehicle/machinery idling.

(f) Construction machinery and vehicles maintenance should be conducted in appropriate and designated service bays to reduce chances of contaminating the environment by resulting oils and greases. Any of such oils should be collected and disposed appropriately.

(g) Workers should be provided with full personal protective gear (PPE) to safeguard their health and safety; and, they should be sensitised on health, safety and environmental conservation aspects.

(h) The site should be fenced off during construction to keep off animals and the general public, so as to safeguard their health and safety.

(i) Provision of sound waste management systems and procedures. During implementation phase, the contractor should put in place effective and efficient waste management systems in compliance with the legal framework of Kenya. This includes providing acceptable sanitary conveniences to the workers during the construction.

(j) Developer will work with the immediate neighbours to ensure air, noise and land pollution levels are either avoided or kept to the minimal, and the overall health and safety of the immediate environment is safeguarded.

ii. During Operation Phase

(a) Minimising strain/pressure on the water supply infrastructure by promoting water efficiency through rainwater harvesting, minimising water consumption/ misuse and using recycled water.

(b) Managing surface drainage by developing and implementing a storm water management design that closely emulates the existing natural "pre-development" hydrological systems, as well as applies the principal of managing (the quantity and quality of) storm water at the source. With respect, emphasis should be on:

i. Storm water drainage, on-site infiltration, and ground water recharge by making use of methods which closely emulate natural system by incorporating revegetation of the site and porous paving in the design.

ii. Maximising recycling and reuse of water. This includes designing a storm water management system which, excludes discharge into the designed sewerage system so as

not to put extra burden on this system; but harvests, stores and reuses the rainwater falling within the site. This would greatly enhance efficient use of portable water within the site, as well as contribute to the project's compliance with the Country's provision on climate change adaptation and mitigation measures.

Lastly, where drain channels are considered in the design, they should be well-designed and installed to harmonise management of the resulting storm water within the site. During operation phase, they should be regularly maintained and covered with gratings to avoid accidents and dirt entry.

(c) Comprehensive landscaping on completion of the proposed development to prevent soil erosion and upgrade the site to its appropriate environmental standard.

(d) There is presence of a public sewerage infrastructure approximately 1 km from the proposed construction site. In compliance with the applicable legal framework of Kenya, the sewage generated from the completed development shall be managed by connecting to the existing public sewer. Due to the difference in elevation/gradient, the proponent will pump the waste water to the existing gradient public sewer line. This system shall be regularly maintained and closely monitored and evaluated to ensure its efficiency.

iii. During both construction and operation phases

(a) Careful siting, planning and implementation processes- to ensure that it is sympathetic to its surroundings and is in line with County Government's Physical Planning and Construction standards.

(b) To safeguard against environmental and human health and safety risks, effective emergency response plans should be adapted during both construction and operation phases. There should be a specific area for hazardous material storage, machinery maintenance activities and refuelling; and, these should be clearly indicated and adhered to.

(c) Adapt the proposed Environmental Management and Monitoring Plans involving all relevant stakeholders during implementation phase and inhabitants, during operation phase.

Conclusion and Recommendations

The analysis of the EIA study indicates that the proposed project has significant benefit to the local and national housing sector. The analysis reveals that the benefits far outweigh the associated costs and negative impacts. The benefits include availability of quality modern residential units, creation of employment opportunities, increased utility of the land, creation of

employment opportunities especially during project implementation phase, increase in government revenue and improvement of local standards of living. Nevertheless, the project will come with some negative impacts such as increased pressure on existing infrastructure, pollution (to Air, Water, soil) mostly during construction phase, increased waste (solid and liquid) generation and effect on ecology (flora) and fauna.

In relation to the proposed mitigation measures that will be incorporated during implementation and occupation phases; the project's input to the Kenya's housing sector; and cognizance of the fact that the project proponent is environmentally conscious**,** the subject project is beneficial and important for a developing country (like Kenya). It is our recommendation that the proponent be granted EIA license to implement the project. Major concerns should nevertheless be geared towards minimising the occurrence of impacts that would degrade the general environment. This will however be overcome through close following and implementation of the outlined Environmental Management and Monitoring Plans (EMPs); which have been strategically packaged with key environmental sustainability elements, tailored toward enhancing the adoption of *Integrated Ecosystem Management (IEM)*. This will form the (now) widely accepted keystone of the environmental action agenda

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CHAPTER ONE: INTRODUCTION

1.1 Background and Rationale of Environmental Impact Assessment

Currently the rates of urbanization and population growth worldwide are increasing fast and with it come the need for improvement in service provision especially in our urban areas. Kenya's rates of urbanization are escalating and being a developing country; most of its urban population is forced to live in slums. Increased population due to rural-urban migration in search of job opportunities and or higher education in major towns of Kenya has increased demand for buildings, especially residential houses.

The principle measure of sustainable development is that all activities which are carried out to achieve development must take into account the needs of environmental conservation. The sustainability of the ecosystem requires the balance between human settlement development and the natural ecosystem, which is a symbiotic relationship. This can be achieved through careful planning and the establishment of appropriate management systems. In modern times, the need to plan activities has become an essential component of the development process. Consequently a number of planning mechanisms have been put in place to ensure that minimum damage is caused to the environment. Environmental planning is also integrated with other planning processes such as physical planning, economic planning, and development planning. Environmental Impact Assessment (EIA) is considered part of environmental planning. EIAs are undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority. In Kenya, the competent authority is the National Environment Management Authority (NEMA).

As part of the EIA process, it is necessary to devise alternatives to avoid undesirable impacts. Besides the alternative, identification of impacts may also lead to the development of mitigation measures i.e. means of reducing the impacts. As a tool of environmental planning, E.I.A is therefore precautionary in nature. E.I.A is neither antidevelopment nor does it stop actions which impact the environment. It only requires that those impacts be considered. Most development activities impact the environment hence a "no impact" interpretation of environmental impact assessment could lead to no development. But a "considerable impact" interpretation of E.I.A will lead to better development. If environmental impacts are ignored, the project may not be sustainable in the long-run, in which case the money invested in it will have been wasted.

Pursuant to the prevailing legal requirements as envisaged in the EMCA 1999 and to ensure sustainable environmental management, the proponent contracted the services of Registered NEMA consultants to carry out an environmental impact assessment study for the proposed development. This EIA study report thus provides relevant information and environmental considerations on the project proponent's intention to seek approval from NEMA.

1.2 Objectives of the EIA

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

(a) To determine environmental compatibility of the project

(b) To identify and evaluate the significant environmental impacts of the project

(c) To evaluate and select the best project alternative from the options available

(d) To incorporate environmental management plans and monitoring mechanisms

(e) To assess the environmental costs and benefits of the project to the society

This objectives is based on ensuring that the environmental concerns are integrated in the proposed project activities in order to contribute to the overall sustainable development .Other objectives include;

- To identify potential environmental impacts of proposed project; both positive and negative
- To assess the significance of these impacts to the environment and other stakeholders
- To assess the relative importance of the impacts of alternative plans to the proposed project.
- To propose mitigation measures for the significant negative impacts of the proposed project on the environment and all involved stakeholders.
- To propose measures that will enhance the positive impacts of the proposed project to the environment and all involved stake holders
- To generate baseline data for monitoring and evaluation of how well the mitigation measures are being implemented during the proposed project cycle;
- To present information on the impact of alternatives;
- To present results of the EIA in such a way that they can guide informed decision

1.3 Terms of Reference (TOR)

This Environmental Impact Assessment considered the following aspects and others that proved of significance during the study.

(a) To hold appropriate meetings with the project proponent to establish the procedures, define requirements, responsibilities and a time frame.

(b) To produce an EIA study report that contains among other issues potential negative and positive impacts and recommendations of appropriate mitigation measures to minimize or prevent adverse impacts

(c) To carry out a systematic environmental assessment study at the proposed project site and the surrounding area.

(d) To provide a description of the proposed activities throughout the entire implementation process of the project with a special focus on potential impacts to the surrounding environment and facilities.

(e) To develop an Environmental Management Plan for the proposed project.

1.4 Scope of EIA Study

The study was conducted to evaluate the potential and foreseeable impacts of the proposed development. The physical scope is limited to the proposed site and the neighbouring areas/environment as they may be affected by or may affect the proposed project. Any potential impacts (localized or delocalized), are also evaluated as guided by EMCA 1999 and the Environmental (*Impact Assessment and Audit*) Regulations 2003.This study report includes an assessment of impacts of the proposed sites and its environs with reference to the following;

(a) Description of the proposed project

(b) Baseline information (Biophysical and Socio-Economic environment, land use and zoning approval, etc.).

(c) Assessment of the potential environmental impacts on the project area.

(d) A review of the policy, legal and administrative framework.

(e) Development of the mitigation measures and future monitoring plans.

(f) Proposition of alternatives.

(g) Occupational Health and Safety -OHS

1.5 Methodology

Following a preliminary visit of the proposed site, the following was undertaken:-

(a) Screening of the project, a process that identified the project as being among those requiring EIA under schedule 2 of the Environmental Management and Coordination Act CAP 387

(b) A scoping exercise that identified the key issues to be addressed in the assessment.

(c) Documentary review on the nature of the proposed activities, policy and legal framework, environmental setting of the area and other available relevant data/information.

(d) Public participation and consultation-detailed discussions with the immediate neighbours, proponent and architects.

(e) Physical investigation of the site and the surrounding areas using a pre-prepared checklist identifying possible environmental and human safety issues that are likely to be affected,

(f) Reviewing the proposed project designs and implementation plan/schedules with a view to suggesting suitable alternatives,

(g) Developing an environmental management plan outline with responsibilities, schedules, monitorable indicators and time frames among other aspects,

A comprehensive report including issues as listed in the Environmental (Impact Assessment) Regulations 2003.

1.6 Need for the Project

Increase in population and urbanization within and around Nairobi City has led to rapid increase in demand for residential houses which has led to people moving out of city centre and staying in the satellite towns within the vicinity of the city or staying in shanties. The satellite areas like Syokimau, Mlolongo, Athiriver, Machakos and specifically Mavoko sub county where the proposed project falls are currently experiencing enormous housing demand as dormitory areas of Nairobi City County population.

Mavoko area, where the project falls is also home to a number of education, industrial, commercial, administrative and health institutions that require accommodation for their staff members. The housing needs of these people can only be taken care of through construction of facilities like the proposed Residential apartments. The scheme is planned to cater for housing

demand for middle class. More importantly, it is vital to optimally utilize the land that has been undeveloped.

There are also similar apartments within the area i.e. Apple Tree, Almasi, Tofina Muthama,Prissy, Easy park, Shaba village, Loneview, links, zenruby, ideal and lynn which have been operational without significant negative impacts to the environment and the neighboring populations. This land use is in harmony with the land use class of the area. The project will lead to economic empowerment not only to the project proponent but also to a host of other people who will both directly and indirectly benefit from jobs and business opportunities resulting from the presence of the project within the neighborhood. Revenue generation to the central government through land rates and taxes as a result of the implementation of this project will lead to the much needed economic development.

In terms of environmental degradation, the project is likely to lead to very minimal negative impacts, which shall be easily taken care of in the design and the proposed mitigation measures as suggested in Chapter 8 of this project study report.

1.7 National Housing Policy and Housing Needs in Kenya

In August 2003, the government of Kenya through a Sessional Paper spelt out a Housing Policy whose overall goal was to facilitate the provision of adequate shelter and healthy living environment at an affordable cost to all socio-economic groups in Kenya in order to foster sustainable human settlements. The aim is to minimize the number of citizens living in shelters that are below the habitable living conditions.

Among other things, the policy aims at facilitating increased investment by the formal and informal private sector, in the provision of housing units for low and middle-income dwellers. The estimated current urban needs are 150,000 units per year, which can be achieved if the existing resources are fully utilized by the private sector with the enabling hand of the government. It is estimated that the current production of new housing in urban areas is only 20,000-30,000 units annually, giving a short fall of over 120,000 units per annum. The shortfall in housing has been met through the proliferation of squatter and informal settlements and overcrowding.

To alleviate the huge shortfall of urban housing mentioned above and to curb the mushrooming of informal settlements/slums, various interventions and strategies have to be adopted. In the Policy Paper, the government correctly accepts the fact that it cannot meet the housing shortfall on its own and that the best policy is to encourage the private sector (like the proponent) to chip

in while the government provides an enabling environment for development. The government will provide an enabling environment by doing the following:

- Facilitating the supply of serviced land at affordable prices in suitable locations
- Expanding and improving infrastructure facilities and services e.g. the current construction of expressway (ongoing)
- Using research findings as well as innovative but cheap conventional building materials and technologies to improve production of housing units.
- Harmonizing the Banking Act, the Building Society Act, the Insurance Act and the various Acts that have so far proved to be a hindrance to the sourcing of housing finance.
- Generally easing the path of funds from the private investor/government to the development project.
- Issuing workable guidelines on Estate Management and maintenance.

The promotion of this development is therefore well within the government current and long term policies of ensuring decent housing for all by 2030 (Vision 2030).

1.8 Methodology

Following a preliminary visit of the proposed site, the following was undertaken:-

(h) Screening of the project, a process that identified the project as being among those requiring EIA under schedule 2 of the Environmental Management and Coordination Act CAP 387

(i) A scoping exercise that identified the key issues to be addressed in the assessment.

(j) Documentary review on the nature of the proposed activities, policy and legal framework, environmental setting of the area and other available relevant data/information.

(k) Public participation and consultation-detailed discussions with the immediate neighbours, proponent and architects.

(l) Physical investigation of the site and the surrounding areas using a pre-prepared checklist identifying possible environmental and human safety issues that are likely to be affected,

(m) Reviewing the proposed project designs and implementation plan/schedules with a view to suggesting suitable alternatives,

(n) Developing an environmental management plan outline with responsibilities, schedules, monitorable indicators and time frames among other aspects,

A comprehensive report including issues as listed in the Environmental (Impact Assessment) Regulations 2003.

CHAPTER TWO: POLICY, LEGAL AND LEGISLATIVE FRAMEWORK

Environmental Impact Assessment is an instrument for environmental management and development control. It is now accepted that development projects must be economically viable, socially acceptable and environmentally sound. It is a condition of the Kenya Government for developers to conduct Environmental Impact Assessment (EIA) on the development Projects. According to Sections 58 and 138 of the Environmental Management and Coordination Act (EMCA) No. 8 of 1999 and Section 3 of the Environmental (Impact Assessment and Audit) Regulations, 2003 (Legal Notice No.101), construction of buildings require an Environmental Impact Assessment project report prepared and submitted to the National Environment Management Authority (NEMA) for review and eventual licensing before the development commences. This was necessary as many forms of developmental activities cause damage to the environment and hence the greatest challenge today is to maintain sustainable development without interfering with the environment.

2.1 Policy Framework.

Environmental policies cut across all sectors and government departments. As such policy formulation should be consultative steered by interdisciplinary committees. Recent policies which the government is working on include; Draft Wildlife Policy; Draft National Land Policy; and Wetlands Management and Conservation Policy among others.

2.1.1 National Environmental Action Plan (NEAP).

National Environmental Action Plan was a deliberate policy effort to integrate environmental concerns into the country's development initiatives/plans. This assumed a consultative and multi-sectoral approach. Such an approach ensured that environmental management and the conservation becomes integral in various decision-making platforms.

As a result of its adoption and implementation, establishment of appropriate policies and legal guidelines as well as harmonisation of the existing ones have been accomplished and/or are in the process of development. Under the NEAP process, Environmental and Social Impact Assessments were introduced targeting the industrialists, business community and County authorities.

2.1.2 National Climate Change Response Framework

Climate is a major driving factor for most of the economic activities in Kenya. It had however, until recently, not been adequately factored in most of the sectors of the Country's economy including Government development policies and plans – not even *Kenya Vision 2030*. In recognition of the gap and the threats posed by climate change, which includes threat in realisation of *Kenya Vision 2030* goal, the Government of Kenya has taken action to address them. Following is the national climate change response framework, which are used to assess the Project's potential risks and impacts, as well as propose mitigation measures to enable compliance. As will be noted, the framework promotes the green building concept. Thus, it is important the Project complies with this from design, during construction and at operation phases respectively.

2.1.2.1 National Climate Change Response Strategy (2010)

In 2010, the Ministry of Environment and Forestry coordinated the development of the National Climate Change Response Strategy (NCCRS). The purpose of this NCCRS "is to put in place robust measures needed to address most, if not all, of the challenges posed by climate variability and change". To-date, this Strategy is the key Government climate change agenda guide in the Country and, it informs nationwide climate change programmes and development activities, including the formulation of documents such as the National Climate Change Policy and efforts towards the attainment of *Vision 2030*. Following all present and future climate change programmes and projects are and are to be developed in line with provisions of this Response Strategy.

Vis-à-vis, on mitigation interventions, the Response Strategy recommends "efforts that seek to prevent or slow down the increase of atmospheric greenhouse gas (GHG) concentrations by limiting current and future GHG emission and enhancing potential sinks for GHGs". These efforts include:

(a) Restoring the country's forest cover by growing about 7.6 billion trees on 4.1 million hectares of land during the next 20 years: The efforts are targeted to not only gazetted forests, but private forests, on-farm trees and any other areas in which trees can be grown.

(b) Pursuing an energy mix that greatly relies on carbon-neutral energy sources such as geothermal and other renewables (wind, solar and renewable biomass), in order to achieve

the goal of low-carbon developed society: At present, Kenya's power generation capacity is grossly inadequate to meet demand. Her main source of electricity is hydropower generation which is vulnerable to climate variability. Other sources are wind, geothermal and, recently, solar. To bridge the electricity generation shortfall from these, the Country occasional rents leases thermal generation units. These are expensive, require large subsidies, and are major contributor of GHG emissions. To counter these and other potential threats to the energy sector, two of the measures the Country has taken are:

(i) Accelerating development of green energy including wind, solar and renewable biomass. With respect, the Country: 1) has reviewed and gazetted regulations for mandatory installation of solar hot water systems in residential and commercial houses; and, 2) is encouraging development of waste-to-energy projects, where municipal solid waste is converted to energy for domestic supply. This has the additional benefits including improving health and lowering demand for both landfilling waste and fossil fuels; and,

(ii) Promoting embracement of energy efficiency, i.e. use of less energy to provide the same service without compromising the quality of service. With respect, the Country has enacted The Energy Management Regulations (2012), which enforces mandatory energy audits on large consumers of energy - commercial, industrial and other large institutions. And in 2009, the Country reviewed its building codes. The revised building code, "Planning and Building Regulations (2009)", incorporate modern measures on 'climate-proofing' and the construction of energy-efficient buildings.

2.1.2.2 Kenya National Adaptation Plan (NAP) 2015-2030

This NAP builds on the foundation laid by the NCCRS and the National Climate Change Action Plan (NCCAP) 2013-2017. Additionally, it is the basis for the adaptation component of Kenya's Intended Nationally Determined Contribution (INDC) that has been submitted to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat. The aim of the NAP is to consolidate the Country's vision on adaptation supported by macro-level adaptation actions that relate with the economic sectors and country level vulnerabilities to enhance long-term resilience and adaptive capacity. The NAP presents adaptation actions that cover the time frame 2015-2030.

With respect, the adaptation actions the NAP describes and are relevant to the proposed project include those related to:

(a) Enhancing climate proofing of infrastructure (through use of appropriate designs and building materials);

(b) Mainstreaming climate change adaptation in the environment sector. On this, relevance is the adaptation sub-action "Review and update existing Environmental Impacts Assessment (EIA) regulations with climate change adaptation considerations";

(c) Mainstreaming of climate change adaptation in the water sector, as Kenya requires adequate water management strategies that take into account the sector's vulnerability to climate change. The strategies and plans are to manage, among others, water supply and wastewater. As regards, of relevance to the project is adaptation sub-action that promotes water conservation (recycling, wastewater management) and efficient water use.

(d) Enhancing the adaptive capacity of the population, urbanisation, and housing sector. This is toward "ensuring that continued population growth is matched with climate resilient urban development and green housing programmes". This is "critical for Kenya's sustainable development and providing a foundation for improving health and safety". Respecting, of relevance to the project are the following two sub-actions: 1) strengthening enforcement of building codes by national and county governments; and, 2) integrating adaptation into relevant building and urban planning.

(e) Enhancing the resilience of the tourism value chain; and,

(f) Creating enabling environment for the resilience of private sector investment. This is in recognition of the private sector being of "critical importance in eradicating poverty and hunger, and developing global partnerships for development. In addition, the sector can help build climate change resilience through its products and services, whilst robust national and international trade will become a crucial instrument to alleviate weather-induced food supply shortages. Climate change has the potential to curtail the success of private sector development (which is crucial to the Kenyan economy and underpins *Vision 2030*), through, for instance, supply chain disruptions, leading to the need of specific adaptation actions.

2.1.2.3 National Climate Change Action Plan (NCCAP) 2018-2022

This is a five-year iterative tool for the integration of low carbon climate resilient initiatives across different socio-economic sectors. It builds on the foundation laid during the implementation of the *National Climate Change Action Plan (NCCAP) 2013-2017*, and the *Climate Change Act (No. 11 of 2016)*. And, it sets out bold measures to ensure that the Country's

development remains sustainable in the event of any adverse climate change impacts. Recognised in the Action Plan is that collective contributions by all (the National and County Governments, private sector, civil society, faith-based organisations, other non-state actors, and individual citizens) will help deliver the expected transformational outcomes as relates to climate change. Thus, from this plan, the key priority climate change actions of relevance to the Project, and which it is advisable the project complies with prior to commencement and completion of construction, are as follows:

(a) Priority 3: Water and the Blue Economy. Kenya is a water scarce Country, and this is one of the Country's largest challenges. This water situation has been exacerbated by among others, climate change, deforestation and a growing demand for water. The consequence of this is decreased access to quality water. This priority climate change action seeks to increase annual per capita water availability by June 30th 2023. To achieve this target, among the actions proposed under it, and are relevant to the Project are:

    (i) Promoting water efficiency (monitor, reduce, re-use, recycle and modelling); and,

    (ii) Enabling actions (policies and regulations). Those proposed are: 1) zero rate taxes on water harvesting and storage equipment; 2) development of a water harvesting policy for institutions and households; 3) reviewing by-laws that prohibit water harvesting in urban areas such as Nairobi; and, 4) formulating a policy for recycled water pricing and beneficiary sectors such as construction, watering flower beds and car washes.

(b) Priority 4: Forests, Wildlife and Tourism. At present, the Country's tree cover is less than 10% of the total land area; and, Chapter 5 of the Constitution of Kenya (2010) stipulates that this ten-percentage cover should be attained. This Action Plan commits to contribute to the restoration, preservation, and sustainable management of forests and other ecosystems that play an essential role in Kenya's economy.

(c) Priority 5: Health, Sanitation and Human Settlements. The rate of solid waste generated across urban centres has been faster than its management. Additionally, solid waste dumping sites are open in Kenya, making them exposed to runoff during heavy rains. And, further compounding the solid waste challenge in Kenya is inappropriate disposal and wastewater. The consequences are adverse environmental and human health impacts, including GHG emissions. In seeking to protect the human and environmental challenges posed by solid waste, the main guiding approach the Government of Kenya has taken is the "zero waste principle" as set out in the National Solid Waste Management Strategy (NSWMS). Recycling,

compositing, waste minimisation, and industrial symbiosis are important elements of this strategy. As regards to this Climate Change Action Priority 5, among the actions under it is "Promoting recycling to divert collected waste away from disposal sites".

(d) Priority 7: Energy and Transport. This priority is with regard to reducing GHG emissions in energy and transport; and among the actions it promotes, that are relevant to the Project are: i) improved energy efficiency and energy conservation; ii) uptake of clean cooking, whereby clean fuels such as LPG, and ethanol are promoted and used; and, iii) enabling actions (technology) whereby uptake of climate change resilient technologies, such as modern coolers and scrubbers, are promoted.

2.1.3 National Solid Waste Management Strategy (2015)

Development of this strategy was guided by the provisions of the Environmental Management and Coordination Act (1999) and Environmental Management and Coordination (Waste Management) Regulations (2006), in order to ensure a clean and healthy environment for all, keeping in line with Article 42 of the Constitution of Kenya 2010. With respect, this strategy was reviewed here so as to assess and propose measures that will assist the Project to comply with the **7R** orientation of the Strategy, namely "**R**educing, **R**ethinking, **R**efusing, **R**ecycling, **R**eusing, **R**epairing, and **R**efilling its waste", which is a "zero waste principle".

2.1.4 National Policy on Water Resources Management and Development

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

In addition, the policy provides for charging levies on wastewater on the basis of quantity and quality. The "polluter-pays-principle" applies in which case parties contaminating water are required to meet the appropriate cost of remediation. Consequently, to ensure water quality, the policy provides for establishment of standards to protect water bodies receiving wastewater, a process that is on-going. The standards and measures to prevent pollution to water resources are provided for in the Environmental Management and Coordination (Water Quality) Regulations, 2006 which is a supplementary legislation to EMCA, 1999.

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

The key objectives of the Policy include: -

(a) To ensure that from the onset, all development policies, programs and projects take environmental considerations into account,

(b) To ensure that an independent environmental impact assessment (EIA) report is prepared for any industrial venture or other development before implementation,

(c) To come up with effluent treatment standards that will conform to acceptable health guidelines.

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

2.2 Legal and Legislative Framework

2.2.1 Climate Change Act (2016)

This is an Act of parliament to provide a regulatory framework for enhanced response to climate change at both the National and County Government levels, to provide for mechanisms and measures to achieve low carbon climate development, and for connected purposes. The Act was

promulgated in line with Kenya's responsibility to mitigate the effects of climate change, and in keeping with the objective of the *Paris Agreement*. Consequently, climate change is now recognised as a crosscutting thematic area in the Country's planning process.

2.2.2 Environmental Management and Coordination Act No.8 of 1999

This project report has been undertaken in accordance with the Environment (Impact Assessment and Audit) Regulations, 2003, which operationalizes the Environmental Management and Coordination Act, 1999. The report is prepared in conformity with the requirements stipulated in the Environmental Management and Coordination Act No. 8 of 1999 (EMCA) and the Environmental Impact Assessment and audit Regulations 2003, Regulation 7 (1) and the Second Schedule.

Part II of the said act states that every person is entitled to a clean and healthy environment and has the duty to safeguard the same. In order to achieve the goal of a clean environment for all, new projects listed under the second schedule of Section 58 of EMCA No. 8 of 1999 shall undergo an Environmental Impact Assessment. This includes development activities such as this new housing development. In addition to the legal compliance above, the following legal aspects have also been taken into consideration or will be taken into consideration before commencement of construction:

The Environment Management and Coordination Act (EMCA), 1999 provides for the establishment of an umbrella legal and institutional framework under which the environment in general is to be managed. EMCA is implemented by the guiding principle that every person has a right to a clean and healthy environment and can seek redress through the High court if this right has been, is likely to be or is being contravened.

Pursuant to section 25 (4) of EMCA, National Environmental Management Authority (NEMA) is required to restore degraded environmental sites using the National Environmental Restoration Fund. Section 58 of the Act makes it mandatory for an Environmental Impact Assessment study to be carried out by proponents intending to implement projects specified in the second schedule of the Act which are likely to have a significant impact on the environment. Similarly, section 68 of the same Act requires operators of existing projects or undertakings to carry out environmental audits in order to determine the level of conformance with statements

made during the EIA study. The proponent is required to submit the EIA and environmental audit reports to NEMA for review and necessary action.

Section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into aquatic environment. According to section 73 of the act, operators of projects which discharge effluent or other pollutants into the aquatic environment are required to submit to NEMA accurate information on the quantity and quality of the effluent. Section 76 provides that all effluent generated from point sources are to be discharged only into the existing sewerage system upon issuance of prescribed permit from the County authorities.

Section 87 (1) makes it an offence for any person to discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any person.

The proponent will have to ensure that environmental protection facilities or measures to prevent pollution and ecological deterioration such as water treatment plant connections, solid waste management plans, and landscaping and aesthetic improvement program are implemented and maintained throughout the project cycle. As well the; proponent will have to ensure that appropriate measures to prevent pollution of underground and surface water are implemented throughout the project cycle.

2.2.2 The Environmental Management and Co-ordination (Waste Management Regulations 2006)

Legal Notice No. 121: Section 4-6

Part II of the Environmental Management and Co-ordination (Waste Management) Regulations, 2006 states that: - 4. (1) No person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.

(2) Any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed off such waste in the manner provided for under these Regulations.

(3) Without prejudice to the foregoing, any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and

dispose off such waste in a designated waste disposal facility. In addition, the Regulations state that:

5. (1) a waste generator shall minimise the waste generated by adopting the following cleaner production methods

(a) Improvement of production process through:-

(i) Conserving raw materials and energy;

(ii) Eliminating the use of toxic raw materials; and

(iii) Reducing toxic emissions and wastes

(b) Monitoring the production cycle from beginning to end by:-

(i) Identifying and eliminating potential negative impacts of the product;

(ii) Enabling the recovery and re-use of the product where possible;

(iii) Reclamation and recycling

(c) Incorporating environmental concerns in the design and disposal of a product.

6. A waste generator shall segregate waste by separating hazardous wastes from non-hazardous waste and shall dispose of such wastes in such facility as shall be provided by the relevant County authority.

(23) No person shall engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment license issued by Authority under the provisions of the Act.

The proponent shall ensure that the main contractor adopts and implements all possible cleaner production methods during the construction phase of the project. During the construction phase of the project, the proponent shall ensure that the main contractor implements the above-mentioned measures as necessary to enhance sound Environmental Management and Coordination (Noise management of waste).

The proponent will connect the facility to the existing public sewer line

2.2.3 Wastewater Management;

Legal Notice No. 120; Part II – Protection of Sources of Water for Domestic Use.

4. (1) every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of these Regulations

(2) No person shall throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution

5. All sources of water for domestic uses shall comply with the standards set out in the First Schedule of these Regulations.

The proponent and project Architect as well as engineer are urged to ensure that drainage channels are well designed during the construction phase of the project, and upon completion the entire project is supposed to be connected to public sewer line for proper management of liquid waste.

2.2.4 Public Health Act Cap 242

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

The plans for the above have been submitted for approval at Mavoko sub-county offices.

2.2.5 The Physical and Land Use Planning Act (2019)

This is an Act of Parliament to make provision for the planning, use, regulation and development of land; and for connected purposes.

The objects of this Act are to provide:

(a) The principles, procedures and standards for the preparation and implementation of physical and land use development plans at the national, county, urban, rural and cities level;

(b) The administration and management of physical and land use planning in Kenya;

(c) The procedures and standards for development control and the regulation of physical planning and land use;

(d) A framework for the co-ordination of physical and land use planning by county governments;

(e) A mechanism for dispute resolution with respect to physical and land use planning;

(f) A framework for equitable and sustainable use, planning and management of land;

(g) The functions of and the relationship between planning authorities;

(h) A robust, comprehensive and responsive system of physical and land use planning and regulation; and

(i) A framework to ensure that investments in property benefit local communities and their economies.

Thus, this Act mandates a developer to adhere to an officially approved physical and land use plan of the site to be developed, as well as seek approval to develop the site. This service is accessed from a county planning authority - in the case of the proposed Project, the "Lands, Urban Planning, Urban Renewal, Housing and Building Services" Sector of the Machakos County Government this sector deals with, among others, development control, urban design and enforcement. Of significant note, by this Law, public participation is a requirement in the preparation of a physical and land use development plan.

2.2.6 Planning and Building Regulations, 2009

These regulations replace the Building Code 2000, which had been applied in Kenya since 1968. The Building Code 2000 was revised in order to encourage the use of innovative design, new materials and new construction methods; to optimise on resources and to enhance adherence to planning and building standards. Today, any building designed and constructed with the principles and norms of good building practice is mandated to comply with the Planning and Building Regulations (2009). These Regulations are a guide on good planning and building practice. They set out, in the simplest and shortest way possible, requirements to ensure that planning will be so undertaken and buildings are designed and built in such a way that persons may live and work in a healthy, safe and convenient environment.

The overall aim of the Regulations is to promote and enhance planning and its enforcement at all levels; to encourage optimal use of resources; enhance safety, health and convenience; and, to improve acceptability and compliance of these Regulations. On their scope, they cover provisions for national, regional and local physical planning, siting, site operations, building

design, building and infrastructure services, disaster risk management on construction sites and maintenance of all buildings as contained in the Regulations.

2.2.7 Water Act (2016)

The purpose of this Water Act 2016 is to provide for the regulation, management and development of water resources and water and sewerage services in line with the Constitution of Kenya (2010). The Cabinet Secretary, the Water Resources Authority (established under Section 11 of the Act), the Water Services Regulatory Board (established under Section 70 of the Act), county government and any person administering or applying this Act shall be guided by the principles and values set out in Articles 10, 43, 60 and 232 of the Constitution.

This Act guides on the optimal and sustainable behaviour the developer shall observe with respect to these two issues, both during construction and operation phases of the development.. Following, as per Section 7, upon commencement of the Act in 2017, no conveyance, lease or other instrument shall convey, assure, demise, transfer or vest in the developer or any other person any property, right, interest or privilege in respect of river except as may be prescribed under the Act. Other sections of the Act worth highlighting, as regards to the water resource include:

(a) Section 9 which provides on the administration of this national water resource. Accordingly, every person has the right to access the water resource, whose administration is the function of the national government as stipulated in the Fourth Schedule to the Constitution.

(b) Sections 24 to 28: Accordingly, the Water Resources Authority has most likely designated a basin area covering River. This basin area is a defined area from which rain water flows into water resources within the basin. The management of water resources within the basin area is under a Basin Water Resources Committee. This Committee is required, and should have by now developed the Basin Area's Water Resources Management Strategy. It is in the interest of the Developer to locate and collaborate with this Basin Area's Water Resources Committee, both during construction and operation phases of the development.

(c) Section 143: Section 143(1) provides that the developer shall not, without authority conferred under the Act: (a) wilfully obstruct, interfere with, divert or obstruct water from Rivers or any water resource, or negligently allow any such obstruction, interference, diversion or abstraction; or, (b) 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 River and any water resource in such a manner as to cause, or be likely to cause, pollution of the water resource. Should the developer contravene this section, according to Section 143(2), he commits an offence. A water resource, according to the act, includes any stream, watercourse, aquifer, and other water bodies below ground; which implies ground water as regards to boreholes and wells.

Regarding water services, worth highlighting is the following Sections of the Act:

(a) Section 85, which is on provision of water services. Accordingly, it is an offence for the Developer to provide water services without a license issued by the Water Services Regulatory Board. Nothing under the Section, however prohibits the Developer from providing water services: i) to his employees, ii) on the premises of the development in cases where the source of supply of water is lawfully under the control of the development, or where the water is supplied to the development in bulk by a licensee; and, iii) in circumstances which are prescribed by the Regulations made by the Water Services Regulatory Board to be exempt from the requirement of a license.

(b) Sections 86 to 87. Section 86 provides for the procedure and requirements for the Developer obtaining the license. Application for this license, however, by Section 87, is subject to public consultation, whereby any person opposed to the grant of a licence may object in writing to the Water Services Regulatory Board. Thereafter, the subsequent Sections provide for the process of determining on an application.

(c) Section 107. This section provides for execution of works for protection of water. The Developer, on obtaining a license, may on land belonging to it construct and maintain drains, sewers and other works for intercepting, treating or disposing any foul water arising or flowing upon its land or otherwise for preventing water belonging to the development, or which it is for the time being authorised to take, from being polluted. And, if the works will affect or a likely to affect any water resource, the Developer shall obtain consent of the Water Resources Authority and the Water Services Regulatory Board.

(d) Section 108, which provides for control of trade effluent. Should the developer obtain a license to receive trade effluent into its sewerage system, it is his duty to ensure that the system has in place measures for the receipt and handling of the effluent without causing: i) pollution of the environment, ii) harm to human health, iii) damage to the sewerage system, or iv) a contravention of applicable laws or standards set by the Water Services Regulatory

Board. The Section also provides that the Developer shall not discharge any trade effluent from the development into the sewers of a licensee without the consent of the licensee.

(e) Fourth Schedule (and Section 56), which apply to abstraction of ground water should the developer construct a borehole Respecting, the Developer shall not construct or begin to construct a borehole or well without having first given to the Water Resources Authority notice of intention to do so, as well as applying to the Authority for a permit. This permit shall have such requirements as may be imposed by the Authority. And, the Developer shall allow any person authorised by the Authority, at any reasonable time to: i) have access to the groundwater source, ii) inspect the ground water works and the material excavated from it, iii) take specimens of such material and of water abstracted from the ground water source, and iv) inspect and take copies of or extracts from the record required to be kept.

All in all, it would be advisable for the Developer to properly acquaint self with the Act, to ensure compliance with the provisions of this Act, its subsidiary legislation, and other government plans and strategies developed in compliance with Act. Vis-à-vis, by the Act, the main contractor will be required to implement necessary measures to ensure water conservation and also to prevent potential for water contamination during the construction phase.

2.2.8 County Governments Act, 2012

This Act came into operation upon the final announcement of the results of the first elections under the Constitution of Kenya (2010). It is an Act of Parliament: i) to give effect to Chapter Eleven of the Constitution; ii) to provide county governments powers, function and responsibilities to deliver services; and, iii) for connected purposes. By this Act, the Counties within Kenya are as provided in the First Schedule of the Constitution (2010). Machakos, where the proposed development is to take place, is one of the Counties. By Section 5 of the Act, Machakos County is responsible for any function assigned to it under the Constitution or by an Act of Parliament. This includes, in accordance with Article 185 of the Constitution,

(a) Making any laws that are necessary for, or incidental to, the effective performance of the functions and exercise of the powers of the County Government under the Fourth Schedule; and,

(b) Receiving and approving plans and policies for: i) the management and exploitation of the county's resources; and, ii) the development and management of its infrastructure and institutions.

However, should the laws made and plans approved conflict with of the national legislation, in respect of matters falling within the concurrent jurisdiction of both levels of Government, as per Article 191 of the Constitution, the national legislation prevails if the national legislation: i) applies uniform throughout Kenya (and any of the conditions specified in Clause 191(3) is satisfied); and, ii) is aimed at preventing unreasonable action by a County that is prejudicial to the economic, health, or security interests of Kenya or another county, or impedes implementation of national economic policy.

Lastly, by Section 5 of the Act, the functions of Machakos County are as provided for in Article 186 and as assigned in the Fourth Schedule of the Constitution (2010). From the list provided in the Fourth Schedule, that of particular relevance to the development during construction phase include: i) Clause 2, in particular: a) licensing and control of undertakings that sell food to the public; and, g) refuse removal, refuse dumps and solid waste disposal; ii) Clause 3, which is on control of air pollution, noise pollution, other public nuisances and outdoor advertising; iii) Clause 8, on county planning and development; iv) Clause 10, on implementation of specific national government policies on natural resources and environmental conservation, including: a) soil and water conservation; and, b) forestry; v) Clause 11, on county public works and services, including: a) storm water management systems in built-up areas; and, b) water and sanitation services; and, vi) Clause 12, on firefighting services and disaster. As regards during operation phase, all the above and the following: i) Clause 4, on cultural activities, public entertainment and public amenities, including: c) licensing liquor; and, i) sports and cultural activities and facilities; and, ii) Clause 7 on trade development and regulation including: b) trade licenses; and, d) local tourism.

As to Clause 8, Part XI of the Act (County Planning) operationalizes it. Vis-à-vis, Section 103 provides the objectives of planning Machakos County. These include: a) ensuring productive use of scarce land, water and other resources for economic, social, ecological and other functions across the County; b) maintaining a viable system of green and open spaces for a functional eco-system; c) protecting the historical and cultural heritage, artefacts and sites within the County; d) making reservations for public security and other critical national infrastructure and other utilities and services; e) working towards the achievement and maintenance of a tree cover of at least ten percent of the land area of Kenya as provided in Article 69 of the Constitution; and, e) developing the human resource capacity of the County. And, Section 107 of the Act provides for the types of plans Machakos County has, namely: Machakos County Integrated Development

Plan, Machakos County Sectoral Plans, Machakos County Spatial Plan, and Cities and Urban Areas Plans as provided for under the Urban Areas and Cities Act (2011). By Section 104, all the approved plans of the Country are binding. Thus, there is a plan for the area within and around the development site; and, the development is bound by this (also refer to sub-section 2.2.5 - The Physical and Planning Act, 2019 – above). The development shall comply with this as well as the licensing requirements of the County, as to the services the County Government provides.

2.2.10 Energy Act (2019)

This is an Act of Parliament to consolidate the laws relating to energy, to provide for National and County Government function in relation to energy, to provide for the establishment, powers and functions of the energy sector entities; promotion of renewable energy; exploration, recovery and commercial utilisation of geothermal energy; regulation of midstream and downstream petroleum and coal activities; regulation, production, supply and use of electricity and other energy forms; and for connected purposes.

2.2.11 The Penal Code (Cap. 63)

Section 191 of the Penal Code makes it an offence for any person or institution that voluntarily corrupts, or foils water for public springs or reservoirs rendering it less fit for its ordinary use. Similarly, section 192 of the same act prohibits making or vitiating the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighbourhood or those passing along a public way.

The proponent will be required to ensure strict adherence to the Environmental Management Plan throughout the project cycle in order to mitigate against any possible negative impact.

2.3 Other relevant Provisions

The following are the relevant environmental treaties to which Kenya is signatory in order of ratification:

(a) Montreal Protocol on Substances that Deplete the Ozone Layer (1987) ratified 9 November 1988

(b) United Nations Convention to Combat Desertification (1994), ratified 12 June 1994

(c) United Nations Framework Convention on Climate Change (1992), ratified 30 August 1994

(d) Convention on Biological Diversity (1992), ratified 11 September 1994

(e) Bamako Convention (1991), ratified 17 December 2003

(f) Kyoto Protocol (2004), ratified 25 February 2005

2.4 Institutional Framework

At present there are over twenty (20) institutions and departments which deal with environmental issues in Kenya. Some of the key institutions include the National Environmental Council (NEC), National Environmental Management Authority (NEMA), the Forestry Department, Kenya Wildlife Services (KWS) and others. There are also local and international NGOs involved in environmental activities that impact on the environment in one way or the other in the country.

2.4.1 National Environmental Management Authority (NEMA).

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

(a) Co-ordinating the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations into development policies, plans, programs and projects with a view to ensuring the proper management and rational utilisation of environmental resources on a sustainable yield basis for the improvement of the quality of human life in Kenya;

(b) Taking stock of the natural resources in Kenya and their utilisation and conservation; and, audit and determine the net worth or value of the natural resources in Kenya and their utilisation and conservation;

(c) Making recommendations to the relevant authorities with respect to land use planning;

(d) Examining land use patterns to determine their impact on the quality and quantity of the natural resources;

(e) Undertaking research, investigation and surveys in the field of environment and collect, collate and disseminate information about the findings;

(f) Initiating and evolving procedures and safeguards for the prevention of accidents which may cause environmental degradation and evolving remedial measures where accidents occur;

(g) Monitoring and assessing activities, including activities being carried out by relevant lead agencies, in order to ensure that the environment is not degraded by such activities;

(h) Undertaking, in co-operation with relevant lead agencies, programmes intended to enhance environmental education, public awareness and public participation;

(i) Developing, publishing and disseminating manuals, codes or guidelines relating to environmental management and prevention or abatement of environmental degradation;

(j) Rendering advice and technical support, where possible, to entities engaged in natural resource management and environmental protection;

(k) Encouraging voluntary environmental conservation practices; and,

(l) Working with other lead agencies to issue guidelines and prescribe measures to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya.

Moreover, NEMA mandate is designated to the following committees:

2.4.3 County Environment Committee (2015)

County Environment Committees are responsible for the proper management of the environment within the County in respect of which they are appointed to. They are also to perform such additional functions as are prescribed by the Act or as may, from time to time be assigned by the Minister by gazette notice. The decisions of these committees are legal and it is an offence not to implement them. The County Environment Committee has an oversight and decision-making role at the County level. The County Environment Committees are responsible for the proper management of the environment within the County, which they are appointed. They are also to perform such additional functions as are prescribed by this Act or as may from time to time be assigned by the Minister by gazette notice.

2.4.5 Public Complaints Committee.

The Committee is charged with the following functions:

Investigating allegations/ complaints against any person or against the Authority (NEMA) in relation to the condition of the environment and its management, Prepare and submit to the Council periodic reports of its activities which shall form part of the annual report on the state

of the environment, and to perform such other functions and excise such powers as may be assigned to it by the Council.

2.4.6 National Environment Action Plan Committee.

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

Analysis of the Natural Resources of Kenya with an indication as to any pattern of change in their distribution and quantity over time, and Analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational and intra-generational equity among other duties as the EMCA specifies.

2.4.7 Standards and Enforcement Review Committee.

This is a technical Committee responsible for environmental standards formulation methods of analysis, inspection, monitoring and technical advice on necessary mitigation measures. Standards and Enforcement Review Committee consists of the members set out in the third schedule to the Environmental Management and Co-ordination Act.

2.4.8 National Environmental Tribunal.

This tribunal guides the handling of cases related to environmental offences in the Republic of Kenya. The Tribunal hears appeals against the decisions of the Authority. Any person who feels aggrieved may challenge the tribunal in the High Court.

2.4.9 The Occupational Safety and Health Act, 2007.

This is an act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act was published in the Kenya Gazette Supplement No. 111 (Acts No.15). It received presidential assent on 22nd October, 2007 and became operational on 26th October, 2007. The key areas addressed by the Act include:

(a) General duties including duties of occupiers, self-employed persons and employees

(b) Enforcement of the act including powers of an occupational safety and health officer

(c) Registration of workplaces.

(d) Health General Provisions including cleanliness, ventilation, lighting and sanitary conveniences

(e) Machinery safety including safe handling of transmission machinery, hand held and portable power tools, self-acting machines, hoists and lifts, chains, ropes & lifting tackle, cranes and other lifting machines, steam boilers, air receivers, refrigeration plants and compressed air receiver

(f) Safety General Provisions including safe storage of dangerous liquids, fire safety, evacuation procedures, precautions with respect to explosives or inflammable dust or gas

(g) Chemical safety including the use of material safety data sheets, control of air pollution, noise and vibration, the handling, transportation and disposal of chemicals and other hazardous substances materials

(h) Welfare general provisions including supply of drinking water, washing facilities, and first aid

(i) Offences, penalties and legal proceedings.

Under section 6 of this act, every occupier is obliged to ensure safety, health and welfare of all persons working in his workplace. The occupier shall achieve this objective by preparing and as often as may be appropriate, revising a written statement of his general policy with respect to the safety and health at work of his employees and the organisation and arrangements for the time being in force for carrying out that policy (Section 7).

He is also required to establish a safety and health committee at the workplace in a situation where the number of employees exceeds twenty (section 9) and to cause a thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a registered safety and health Advisor (Section 11). In addition, any accident, dangerous occurrence, or occupational poisoning which has occurred at the workplace needs to be reported to the occupational safety and health officer of the respective area by an employer or self-employed person (section 21). According to section 44, potential occupiers are required to obtain a registration certificate from the Director for all premises intended for use as workplaces. Such places shall be maintained in a clean state during the operation phase (section 47).

To ensure machinery safety, every hoist or lift – section 63 and/or all chains, ropes and lifting tackles – section 64 (1d), shall be thoroughly examined at least once in every period of six

months by a person approved by the Director of Occupational Health and Safety Services. Similarly, every steam boiler - section 67 (8) and/or steam receiver - section 68 (4) and all their fittings and/or attachments shall be thoroughly examined by an approved person at least once in every period of twelve months whereas every air receiver shall be thoroughly cleaned and examined at least once in every period of twenty-four months or after any extensive repairs - section 69 (5). According to section 71 (3), every refrigeration plant capable of being entered by an employee also needs to be examined, tested and certified at least once in every period of twelve months by an approved person.

In relation to fire safety, section 78 (3) requires spillage or leaks of any flammable liquid to be contained or immediately drained off to a suitable container or to a safe place, or otherwise treated to make it safe. Furthermore, a clear and bold notice indicating that smoking is prohibited should be conspicuously displayed in any place in which explosive, highly flammable or highly combustible substances, are manufactured, used, handled or stored-section 78 (5). In addition, necessary precautions for dealing with fire incidents should be implemented including provision of means for extinguishing fire and means for escape, in case of fire, for the persons employed in any workplace or workroom – section 81. As far as disaster preparedness and emergency response program is concerned, section 82 (1) makes it a mandatory requirement for every occupier of a workplace to design evacuation procedures to be used during any emergency situation and to have them tested at regular intervals.

To promote health and safety of employees who are at risk of being exposed to chemical substances, section 84 (3) and 85 (4) requires every employer to maintain at the workplace material safety data sheets and chemical safety data sheets respectively for all chemicals and other hazardous substances in use and ensure that they are easily available to the employees.

The employers' positive contribution towards the welfare of the employees include provision and maintenance of adequate supply of wholesome drinking water - section 91 and a first aid box or cupboard of the prescribed standard – section 95 at suitable point (s) conveniently accessible to all employees.

Other precautionary measures include: issuance of a permit to work to any employee, likely to be exposed to hazardous work processes or hazardous working environment, including such work processes as the maintenance and repair of boilers, dock work, confined spaces, and the maintenance of machinery and equipment, electrical energy installations, indicating the necessary

precautions to be taken – section 96 (1); provision and maintenance for the use of employees, adequate, effective and suitable protective clothing including suitable gloves, footwear, goggle and head coverings in any workplace where employees are likely to be exposed to wet, injurious or offensive substance – section 101 (1). The proponent will be required to ensure that the main contractor includes in the contract document, adequate measures to promote safety and health of workers.

2.4.10 Trade Licensing Act (Cap 497)

Section 5 of the Act makes it mandatory for all businesses to obtain trading licenses.

2.4.11 Environmental Vibration Pollution (Control) Regulations, 2009

These regulations were published as legal Notice No. 61 being a subsidiary legislation to the Environmental Management and Co-ordination Act, 1999. The regulations provide information on the following:

(a) Prohibition of excessive noise and vibration

(b) Provisions relating to noise from certain sources

(c) Provisions relating to licensing procedures for certain activities with a potential of emitting excessive noise and/or vibrations and

(d) Noise and excessive vibrations mapping.

According to regulation 3 (1), 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. Regulation 4 prohibits any person to (a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source.

Regulation 5 further makes it an offence for any person to make, continue or cause to be made or continued any noise in excess of the noise levels set in the First Schedule to these Regulations, unless such noise is reasonably necessary to the preservation of life, health, safety or property.

Regulation 12 (1) makes it an offence for any person to operate a motor vehicle which- (a) produces any loud and unusual sound; and (b) exceeds 84 dB(A) when accelerating. According to sub regulation 2 of this regulation, no person shall at any time sound the horn or other warning device of a vehicle except when necessary to prevent an accident or an incident.

Regulation 13 (1) provides that except for the purposes specified in sub-Regulation (2) there under, no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations.

Regulation 16 (1) stipulates that where a sound source is planned, installed or intended to be installed or modified by any person in such a manner that such source shall create or is likely to emit noise or excessive vibrations, or otherwise fail to comply with the provisions of these Regulations, such person shall apply for a License to the Authority. According to regulation 18 (6) the license shall be valid for a period not exceeding seven (7) days. Regulation 19 (1) prohibits any person to carry out activities relating to fireworks, demolitions, firing ranges or specific heavy industry without a valid permit issued by the Authority. According to sub regulation 4, such permit shall be valid for a period not exceeding three months.

The project proponent will be required to comply with the above-mentioned regulations in order to promote a healthy and safe working environment

CHAPTER THREE: PROJECT DESCRIPTION

3.1 Project Proponent

The project proponent is Acme Wanji Investments Limited of P.O. Box P.O. BOX 59083-00200, Nairobi, Kenya. The company was incorporated under the companies act (cap 486) on 26th July two thousand and ten.

3.2 The location of the project

The proposed project is located on Plot L.R Nos. 7149/144 &7149/145(amalgamated Plots measuring approximately 2.428 Ha) along Muthama Access Road approximately 1 KM off Mombasa road in Syokimau area within Machakos County. The project site lies within geographical coordinates -1.384427°S, 36.9221777°E.

The project neighbourhood comprises of;

a) Residential apartments; some of the neighbourhood apartments include;
   - Apple Tree Apartments (phase I) by Acme Wanji Investment Limited. These are modern 2, 3, 4&5 bedroom residential apartments comprising of ground plus thirteen floors. The proposed development (Phase II) is adjacent and will share amenities such as swimming pool, children amusement park, gymnasium and the shopping centre with Phase 1.

b) town houses: some of the estates include;
   - Fairfield park ; its the adjacent estate with a total of 80 town houses
   - Muthama Heights Estate
   - Loneview town houses and
   - Yamin Estate

c) The Nairobi National Park; Nairobi National Park is unique by being the only protected area in the world with a variety of animals and birds close to a capital city. It covers a 117 km2 area including a diverse range of habitats with a wealth of flora and fauna with vast tracts of open grass plains with scattered acacia bush.
   The proposed development boarders NNP offering fantastic views to the residents.

d) Single dwelling maisonettes and bungalows; there are few single dwelling units within the project neighborhood. They were all consulted during the public consultation exercise.

e) Social amenities. The proposed development is strategically located near facilities such as; churches i.e. Grace Baptist Church, Hotels i.e. 67 Airport Hotel, Hilton garden inn , Tommys airport lounge, lux airport inn and shopping malls such as Gateway mall and Signature mall.

3.3 Site Description

The site is falls within Mavoko Sub-county which shares the vegetation of Athi Kapiti plains that is constituted of grasslands, shrub vegetation with sections of rocky ridges. A view of the proposed project site is illustrated in Figure below.

Proposed construction site

Proposed construction site and the adjacent developments on the western edge

Google earth photo showing the location of the proposed project

Source (Goggle Earth Map Imagery Extract, 2021)

3.4 Site ownership, size, zoning and land use

3.4.1 Site Ownership and Size

The proposed site falls within Land Reference Number 7149/144&145(amalgamated) measuring 2.428 hectares and will all be utilized to develop the proposed development. The project site lies within geographical coordinates -1.384427°S, 36.9221777°E.

The copies of land ownership documents are annexed.

3.4.2 Site Zoning and Land use

The proposed site is within an area formerly zoned for single dwelling use and due to the nature of the project the proponent has already obtained an approval for Extension of use from Single Residential to Multi-dwelling residential use. The Structural and Architectural drawing have already been submitted to Mavoko Sub County offices for approval.

Fairfield park town houses (northern edge)

Tofina Muthama Apartments on the Eastern Edge

3.5 Nature and Design Components of the Project

3.5.1 Project description

The proposed development comprises of eight (8) blocks of ground plus fourteen (14) floors residential apartments (Block A, B, C, D and Duplex A, B, C, D).

Block A will have a total of one hundred and ninety two (192) 3 bedroom units,

Block B will have one hundred and ninety two (192) 2 bedroom units,

Block C will have ninety six (96) 2 bedroom units and

Block D will have ninety six (96) 3 bedroom units.

Duplex A will have sixteen (16) 6 bedroom units,

Duplex B will have sixteen (16) 3 bedroom units,

Duplex C will have eight (8) 3 bedroom units and

Duplex D will have eight (8) 5 bedroom units.

The total number of units will be six hundred and twenty four (624); Three hundred and twelve (312) 3 bedroom units, two hundred and eighty eight (288) 2 bedroom units, eight (8) 5 bedroom units and sixteen (16) 6 bedroom units.

The actual components of the proposed development project include:

a. Clearing and preparation of the proposed project site.
b. Development of perimeter wall fences
c. Development of apartments
d. Development of community facilities
e. Development all weather access roads, parking and walkways
f. Development of utilities services including drainage systems, wastewater and electricity supply
g. Site landscaping especially tree planting and landscaped gardens
h. Development common gates and gate houses to constitute a gated community estate

3.5.2 Clearing and Preparation of the Project Site

The existing ground situation will be altered through clearing of existing vegetation and other barriers to pave way for development of various proposed development projects on the site. The proponent plans to plant trees and flower gardens to create a green cool environment

3.5.3 Development of Perimeter Wall /Fence

Before the commencement of the construction within the site, a perimeter wall will be laid around the project site with one wide gate. This has been recommended to minimize dust and also noise impacts to the surrounding during construction. It will also ensure safety of materials during construction.

3.5.4 Residential apartments development

The project will include construction of 8 blocks of ground plus fourteen floors, which will conform to existing developments in the area. The housing development will provide accommodation for the increasing population.

3.5.5 Community Facilities

The proposed development will share the community facilities with Phase 1. These includes; gymnasium, swimming pool, children amusement park, shops and restaurants.

3.5.6 Local Access Roads, Parking and Walkways

The proposed housing estate development has provision for adequate width access roads. A 6 metre main road has been provided to access both sides of the proposed estate. The walkways will be at least 2.5 m wide. Car parking spaces will also be provided at the communal facility areas.

3.5.7 Trunk Infrastructure and Utilities

Water Supply: The proposed development will be served water by EPZA.water storage tanks, harvesting rain water and recycling water will be highly practiced by the management.

Foul Water Drainage: The proposed development will generate substantive amount of waste water per day. The wastewater generated will be discharged into the existing trunk sewer by EPZA

Storm Water Drainage: The proposed development will generate enormous surface water. It is therefore recommended that adequate and well drainage channels be provided to accommodate the increased discharge. The flow of the storm water has been well captured in the plans and the proponent plans to develop a storage tank for storage and use.

Solid Waste Disposal: The proposed development will generate enormous solid waste. It is recommended that private waste management contractors be contracted to collect the waste. It is further recommended to have one common point on the plot to store the waste before final collection.

Electricity Supply: The proposed development will be connected to the Kenya Power and Lighting Company power supply line. The KPLC electricity supply lines are already available within the neighbourhood of the proposed project site.

3.5.8 Landscaping and Tree Planting

The project will involve clearing of vegetation and excavation of soil material. The site development involves cut and fill arrangement, whereby excavated material is used for backfilling. Any excess material will be disposed off-site.

The project site will be landscaped according to scheme plan. This will entail establishment of flower gardens, planting of trees, grass and related ground cover to compensate for any cleared vegetation and to improve general aesthetics of the estate.

3.6 Construction Activities and Inputs

All the construction inputs shall be obtained from licensed dealers. The following will be required for successful implementation of construction activities. Construction tools and equipment including machinery mainly transportation vehicles will be used for the transportation of materials and in the execution of the proposed works.

3.6.1 Inputs during Construction

Typical inputs which will be used in construction phase are land and water which will be readily available. The materials that shall be used include building sand, aggregates, natural stones, either hand or machine cut construction stones, steel and timber for making structural formwork and interior design, tiles for roofing and floor tiles. Others include concrete block for constructing selected internal and external pavements, precast units for drains, PVC pipes for sewer and water reticulation, paints, electrical wiring and fitting, barbed wires, wire mesh, water tanks and gutters. Window casement and glasses, spades, pick axes, and other hand held tools will also be needed.

3.6.2 Construction Activities

The construction activities shall begin from the time NEMA gives approval of the Environmental Impact Assessment Study. Site clearing, setting out and excavations for laying of various housing units and ancillary facilities will then proceed. Materials from the excavations of the ground and foundation work will be reused for earth works and landscaping.

3.6.3 Project implementation sequencing/Phasing

i. Pre-construction stage

a) Plan preparation and seeking of the appropriate approvals from the relevant authorities which has been done
b) Appraisal of baseline condition to determine supply and demand for required infrastructural utility services.
c) EIA Project Report preparation including the necessary approvals.

ii. Construction stage

a) ***Establishment of related works and all support infrastructure that are significant***

for the construction work*:* This would involve the transportation of machinery and deployment of the workers to the construction site. The machinery would be used for ground breaking and transportation of materials from the sources to the site. The major machineries that will be used include mixers, welding machines and transmission machines. The contractor will also mobilize human workforce at casual, permanent, skilled and unskilled levels.

b) ***Acquisition and transportation of building materials:*** The contractor shall source for materials for construction from the various available suppliers. Supply of materials will be a continuous activity throughout the project life since different materials will be needed at different phases of the construction. The materials that shall be used in the construction include among others building stones, sand, ballast, cement, timber, reinforced concrete frame, steel, bars, G.I pipes, PVC pipes, pavement blocks, concrete slabs, murram, hardcore, insulated electrical cables and timber among others.

c) ***Excavation and land filling works:*** Excavation will be carried out to prepare the site for construction of foundations to lay the residential houses and all other proposed facilities and utilities. This will involve the use of heavy earthmoving machinery such as tractors, tippers and bulldozers

d) ***Masonry, Concrete Work and Related Activities:*** The construction of the perimeter walls, building walls, foundations, floors, pavements, drainage systems among other components of the project will involve a lot of masonry work and related activities. General masonry and related activities will include stone shaping, concrete mixing, plastering, slab construction, construction of foundations, and erection of building walls and curing of fresh concrete surfaces. These activities are known to be labour intensive and will be supplemented by machinery such as concrete mix

e) ***Structural Steel Works:*** The buildings will be reinforced with structural steel for stability. Structural steel works will involve steel cutting, welding and erection.

f) ***Roofing and Sheet Metal Works:*** Roofing activities will include slab roofing

g) ***Transportation of the construction wastes from the site:*** Construction waste that cannot be used for either back filling or landscaping work at the site will be deposited in approved dumpsites by a contracted licensed waste handler.

h) ***Electrical Work:*** Electrical work during construction of the premises will include installation of electrical gadgets and appliances including electrical cables, lighting

apparatus, sockets etc. in addition, there will be other activities involving the use of electricity such as welding and metal cutting.

i) ***Power distribution:*** The position for location of power transformer to serve the proposed estate will be determined by experts from KPLC. The project will increase power demand in the area and it is proposed that the proponent should consider other power sources like solar to reduce on the power demand. The proposals include solar power especially for water heating purposes and to supplement power supply when experiencing power outage problems.

j) ***Plumbing:*** Installation of pipe work for water supply and distribution will be carried out within the proposed residential houses and associated facilities. In addition, pipe work will be done to connect sewage from the premises to the main waste water disposal lines, and for drainage of storm water. Plumbing activities will include metal and plastic cutting, the use of adhesives, metal grinding and wall drilling among others.

k) ***Fire protection:*** Self-contained fire detection and alarm system complete with manual call points, optical smoke detectors, heat detectors and electronic sounders will be proposed especially in the kitchen areas. Hose reel fire protection system will be provided to cover the buildings. The system will comprise of a water storage tank, distribution of pipe work and fire hose reels and portable fire extinguishers will be provided at convenient spots. Additional provision will be made for special hazards and high risk areas.

m) **Landscaping and tree planting:** To improve the environmental and aesthetic value or visual quality of the site once construction ceases, the proponent will carry out landscaping and tree planting. This will include establishment of flower gardens and lush grass lawns and will involve replenishment of the top soil. It is noteworthy that the proponent will use plant species that are available locally preferably indigenous ones for landscaping. The proponent has already established a tree nursery in preparation of the trees to be used for landscaping and tree planting.

3.6.4 Occupation/Operational stage

This stage shall involve running and managing the facility as per the laid down rules and procedures.

a) ***Residential activities:*** Once construction is complete, the houses will be ready for

occupied by respective owners/tenants.

b) ***Solid waste and waste water management:*** The proponent will provide facilities for handling solid waste generated within the facility. These will include dust bins/skips for temporarily holding waste within the premises before final disposal by the contracted licensed waste handler at the designated dumping site. Sewage generated from the residential buildings will be discharged into the main trunk sewer line, while the storm water drainage system will also consist of a network of Inverted Block Drains, manholes and road gullies which will discharge to the proposed artificial water reservoir.

c) ***Compound Cleaning:*** The management will be responsible for regular washing and cleaning of the paved and non-paved areas. Cleaning operations will involve the use of substantial amounts of water, disinfectants and detergents, blooms, rakes, wheelbarrows among others.

d) ***General Repairs and Maintenance:*** The residential and other facilities buildings will be repaired and maintained regularly during the operational phase of the project. Such activities will include repair of building walls and floors, repairs and maintenance of electrical gadgets and equipment, repairs of leaking water pipes, painting, maintenance of the gardens and grass lawns and replacement of worn out materials among others.

3.7.5 Decommissioning Phase

Decommissioning of operations is here taken to mean that the buildings cease to operate and the premises are closed down or reverted to another use. Under such circumstance, the house owners will be expected to adhere to the legislation applicable to such undertaking in the laws of Kenya but in general the decommissioning shall be staggered through a number of steps and measures to rehabilitate the site to its status before the commencement of the buildings occupancy or to a suitable state for its next use. This will involve looking for alternative uses for the site that is compatible to the surrounding and to the former use. An environmental impact assessment shall be commissioned to advice on the environmental aspects with respect to the identified new use if found necessary. If no other use(s) are found for the site, rehabilitation measures to revert it to its former use a state shall be implemented that include:-

i. Building stones, paving slabs, and other installations of economic use can be sold-off

in the market through a biding or auction sale.

ii. Dug up areas should be backfilled with uncontaminated earth.

iii. All solid wastes including debris shall be disposed in a designated dumpsite.

iv. The site shall be re-vegetated with vegetation capable of protecting the soil from erosion

The owners will then, deregister its operations and legal requirements such as the certificates of operations will be surrendered to the relevant issuing bodies.

3.7 Air Emissions

Relative air emission is expected during construction when dust from demolition/ construction activities and smoke from construction machinery will be emitted. It is recommended that watering the site especially during dry periods be enforced to keep dust at minimal levels. The employees at the site especially during construction activities shall be provided with dust masks to protect them from dust and fumes associated with construction activities.

3.8 Waste Management

The principle objective of waste management program is to minimize the pollution of the environment as well as to utilize the waste as a resource. This goal should be achieved in a way that is environmentally and financially sustainable.

3.8.1 Solid Waste Management

The technologies for the management of the solid wastes will incorporate the collection of the waste from the source, transportation of the waste to the place of storage and final disposal through a contracted waste handler. The following waste management techniques shall be used in the different stages of the project.

a) ***During construction:*** The main wastes from the construction site will consist of material residues of the construction materials. These include pieces of concrete, heaps of sand and aggregate, bits and pieces of various pipe types, cans of paint, polythene sheets, paper packaging materials, pieces of timber, and off cuts of metals among others. They shall be managed as follows:

Express condition shall be put in the contract that before the contractor is issued with a completion certificate; he will clear the site of all debris and restore it to a state acceptable by the supervising architect and environmental consultant.

Materials from excavation of the ground and foundation works shall be reused for earth works and landscaping.

b) ***During operation:*** During operation phase, residents will contract a licensed waste handler who will collect their household waste at agreed intervals and dump them at licensed waste dumping sites.

CHAPTER FOUR: BASELINE INFORMATION FOR THE STUDY AREA

4.1 Location

The proposed project is located on Plot L.R Nos. 7149/144 &7149/145(amalgamated Plots measuring approximately 2.428 Ha) along Muthama Access Road approximately 1 KM off Mombasa road in Syokimau area within Machakos County. The project site lies within geographical coordinates -1.384427°S, 36.9221777°E.

4.2 Site Conditions

4.2.1 Climate

The climatic conditions of an area highly influences the land use patterns, levels of productivity and general development decisions of the area. The climate of the proposed project site in Syokimau identifies with that of the Athi River-Mavoko area and wider Athi Kapiti plains. The climatic of this area is of semi-humid, cool temperate, tropical highland type. Below is a summary of the climatic conditions the proposed residential housing estate development is located:

i) Rainfall

The average annual rainfall is 875 mm, which may actually vary from 500mm to more than 1500 mm. The rainfall pattern exhibits a bi-modal distribution, with wet seasons in March – May and October – December corresponding to the long and short rains respectively. Between 70% to 85% of precipitation falls during the rainy seasons.

ii) Temperature

The average annual temperature of the area ranges between 16° C to 18° C, with average minima and maxima of 10° C to 12° C and 22° C to 28° C respectively. The warmest period occurs from January to March with coolest period falling between months of May to August.

iii) Wind Patterns

The area experiences occasional dry season, hot sun with strong winds. A significant feature of the climate of Athi River/ Mavoko area is the frequency with which the wind comes from the North East and to a somewhat lesser degree to the South East. These are the North East and South East Monsoon, which blow very steadily but without high intensity. Both wind run and mean wind speed are at a maximum in December. Winds also remain high during January, February and March which coincides with the period of higher potential evaporation.

iv) Sunshine and Solar Radiation

Solar radiation and sunshine is considered together since they are so closely connected. The area experiences a total of about 2,500 hours of bright sunshine per annum, which is equivalent to annual mean of approximately 6.8 hours of sunshine per day. July and August are characterized by cloudiness and during these months the average daily sunshine in the area is about 4 hours. Frequently there are several days in succession when the sun fails to penetrate the thick stratocumulus cover, although on other days the cloud does break to a greater or lesser extent for a short period. There is about 30% more sunshine in the afternoon than in the morning and it follows that westerly exposures receive more isolation than easterly one.

v) Evaporation

The annual variation of evaporation is as expected from consideration of temperature and sunshine factors. The mean annual evaporation as measured by the pan is seen slightly to exceed the mean rainfall at the altitude of area but it would be expected that at higher altitudes this position would be reversed. The peak evaporation values are during March, followed by January, February and October. The average annual evaporation ranges between 1550 to 2200mm per year.

Vi) Water resource

The surface water and sub-surface water resources in the county are a bit scarce. Most natural rivers and wells in the area and its neighbourhood are seasonal in nature. Therefore the only most reliable source of water in the area are boreholes. This underground water resources are greatly exploited and boreholes drilled in most major developments within the area. A substantial percentage of households in the area also harness rain water through roof catchment .Mavoko water supply in the area is unreliable hence it is received averagely two days per week and sometimes disappear for a whole week.

4.2.2 Geology and Soils

The geology and soils of an area have a great influence on the type of physical development and also determine the type of land use appropriate for the area. The site has generally Clay s loamy soils with plenty of silt. The areas lying at altitudes above 1800m are majorly constituted by rocky structures made of Athi tuffs and Kapiti phonolites.

4.3 Land Use Zoning in the Area

4.3.1 Current Physical Development Planning Policy

There is not current physical development plan for the area. There is no current local physical

development plan and no regional physical development plan for the area.

4.3.2 Land Uses Adjacent to the Site

The neighbourhood, where the proposed development is located is characterized by residential apartments, town houses, single dwelling units and social amenities.

i. The existing apartments include;

- Apple tree Apartments; comprises of ground plus thirteen (13) floors.
- Tofina Muthama Apartments: ground plus four floors
- Prissy apartments: ground plus four floors
- Shaba village: ground plus five floors
- Almasi apartments: ground plus five floors
- Tinika apartments
- Lynn apartments
- Ideal apartments
- Links apartments
- Loneview residential apartments(estate)
- Ongoing construction of ground plus ten floors apartments along Muthama access road

ii. Existing town houses

- Fairfield Park: phase one has twenty six houses (complete). Phase two; ongoing construction of fifty four units
- Muthama Heights Estate
- Yamin estate
- Loneview phase 1

Other land uses within the neighbourhood include commercial business outlets and shopping centre and religious institutions i.e. Grace Baptist churchThe proposed development would hence easily blend with the character of the area.

4.4 Socio-Economic Profile

Development of the proposed residential apartments project will be influenced by two important socio-economic aspects, i.e. population/demography and economic trends in the neighbourhood, Mavoko area, Machakos County, and Nairobi City County.

4.4.1 Population Demography

The City County of Nairobi and Machakos County at large are among the key county areas in Metropolitan region that have continued to experience high rates of demographic transition over time. This is mainly due to the urban rural migration as well as natural population increase. The increased population in these areas has led to sprawl of increased housing demand into Syokmau, Athi River/Mavoko area, which acts as a dormitory zone for these adjoining counties. The dynamisms of population growth of Nairobi City County and Machakos County has been analysed in the below Table

4.4.2 Housing Demand in Machakos and Nairobi City Counties

In the year 2009 census, with inter-census population growth rate of about 3.8%, the two counties had a total population of 3,581,299 persons, with 1,102,889 households, which also represents the housing demand. This is projected to 15,919,694 persons, with 4,902,594 households/housing demands in the year 2049. Therefore, the proposed residential housing development will significantly contribute towards meeting this increasing housing demand for the rapidly growing population within Nairobi and Machakos counties.

4.4.3 Employment Trends in the Area

Currently numerous educational facilities, recreational facilities, industrial establishment and commercial outlet businesses are located in vicinity to this proposed development project. Some of these people would prefer to live close to their places of work. This further justifies the relevance of the proposed development project in Syokimau area.

4.4.4 Trunk Infrastructure, Utilities and Community Social Services

a) Transport Network

Machakos County, where the proposed project falls is served by a well-established network of all-weather access roads. The main access road connecting the project site to Mombasa road is all weather murram surface and evenly graded. The area is served by the public motor Vehicles but most residents have their own vehicles. A railway station is also well established in Syokimau area which are all well accessible at distances of about 4KM from project site. The Jomo Kenyatta International Airport is also well accessible at a distance of about7 KM from the project site.

b) Water Supply

The area has existence of natural water sources including underground water.Due to unreliability of the seasonal natural water sources, most existing major development in the area have

exploited underground water sources through drilling of boreholes which have proofed as adequate and reliable source of water.

The project proponent will connect to the existing water supplied by EPZ

c) Foul and Storm Water Drainage Systems

Movoko Sub County has a major trunk sewer line running from Kitengela/Athiriver EPZ to the sewerage treatment plants at Kinanie. Most developers within the project area, who are at long distances from existing sewer line, have adopted septic tanks system for foul waste management. Storm water drainage channels for all surface run off are well provided in existing roads within the area. Storm water generated from existing housing developments in the area is usually harnessed and consumed by the community.

The proponent will pump waste water the existing trunk sewer line

d) Solid Waste Disposal

The solid wastes generated by existing communities in the area is disposed to farm compost pits with some developers especially within organized or gated estates seeking private NEMA and County licensed waste handlers. Mavoko town area waste disposal trucks also collect damped solid wastes for final disposal especially in areas close to commercial Centres along Mombasa road.

The proponent will seek services of licensed garbage handlers

e) Energy Supply

The area is well developed and has proper network of Kenya Power and Lighting Company power supply lines. Some development in the area have also exploited solar energy as an alternative or back up source of electricity. The community in the area mostly use charcoal, LPG and firewood as sources of cooking energy.

f) Communication Facilities

The project area is well served with communication network and facilities. This has a strong implication on the socio- economic development activities of the area. Mobile phone services like Safaricom and Airtel are present in the area

CHAPTER FIVE: PUBLIC CONSULTATION AND PARTICIPATION

5.1Introduction

Public/stakeholders participation is basically concerned with involving, informing and consulting the public in planning, management and other decision-making activities for the project. Public participation ensures that due consideration is given to public values, concerns and preferences when decisions are made. It encompasses the public actively, sharing in the decisions that government and other agencies make in their search for solutions to issues of public interest. Public consultation in this project was done with the following aims:

- To inform the neighbours and other stakeholders about the proposed project and its objectives.
- To seek views, concerns and opinions of local community and other people around the area concerning the project.
- To establish if the local people foresee any positive or negative environmental effects from the proposed project and if so, how they would wish the perceived impacts to be addressed.

5.2 Methodology in Public Consultation

Public participation was mainly achieved through direct interviews, observations and questionnaire administration. Mostly, the tool used to collect information is the administration of open ended questionnaires where the respondent is free to comment on the identified issues.
Respondents were selected among the individual households, institutions surrounding the proposed project site. Most of those consulted were happy to fill the questionnaire freely. The following is a detailed discussion of public consultation methodology used by the EIA team.

5.2.1 Direct Interviews

Direct interviews were used to get responses from the project proponent whose comments were sought through engaging the project unit in discussions about the proposed project and other related issues. We also had direct discussion with architect and engineer who will be implementing the project. Some respondents chose to give their views/concerns through interviews rather than filling a questionnaire.

5.2.2 Questionnaire Administration within the project Neighbourhood

Questionnaires were uniformly distributed around the proposed project site. The local people and neighbours were informed of the proposed project and requested for their views concerning the project. The sample area covered up to a radius of about 900 Metres within the project area which provided view of the immediate neighbours. The questionnaires were used to capture views in terms of the positive and negative impacts that the locals anticipate from the project and the mitigation measures. They were also requested to provide information about the area, focusing on aspects such as sensitive ecosystems, provision of various infrastructure facilities and socioeconomic environmental impacts of the project in the area amongst other issues. The dully filled questionnaires administered have been annexed in this report.

5.3 Socio-economic Impacts

The local communities were keen to talk to the EIA field team on the proposed project and they were appreciative of the fact that the field team involved them in responding to the questionnaire in a consultative manner. The people encountered participated actively in raising their concerns and they expressed their hope that lawful procedures will be taken into consideration during the project implementation. In addition, below are the various social economic aspects that the community members raised:

Obstructed view to the park: many residents were concerned about the height of the proposed residential flat. Majority were of the opinion that the project will obstruct their view to the Nairobi National park which borders the said property.

***Employment*:** Most respondents pointed that the proposed project will create employment to people and especially youth in the area in all phases of the project. This will also directly contribute to the economy of Machakos County and the wider Kenya.

5.4 Environmental views

Waste Management: Waste disposal was highlighted by the local communities as one component from the project activities that will pollute the environment if not properly handled. Respondents proposed waste management methods such as private contractor, dust bin installing within estate, waste recycling, county government disposal services, use of septic tanks, connection to main sewer line, and construction of own sewerage treatment plant.

Air quality: Majority of the respondents were of the opinion that the proposed project will affect level of air quality in the area. The rest of respondents were of the opinion that the project will affect air quality of the project area in terms of dust generation during construction phase. A number of respondents proposed planting of trees to minimize deterioration of air quality. They also recommended sprinkling of water to reduce dust. The waste water during borehole drilling and construction will be disposed in the project site to reduce the dust. In addition the Concrete perimeter wall will minimize effects of dust to the immediate neighbourhood.

Traffic: Five out of twenty respondents were of the opinion that the proposed project will lead to an increase in both vehicular traffic generation with the area during transportation of materials. These respondents proposed that the project proponent should ensure that materials are not transported during rush hours (Before 8am). The rest of respondents were of the opinion that the proposed project will have nil impact in relation to traffic generation within the area. Some respondents also noted that the anticipated increase in traffic will necessitate improvement of roads in the area leading to convenient access to various community facilities and services during all-weather seasons.

5.5 Support for the Proposed Project

A 90 percent of the total respondents interviewed were in support of the project. Most of these respondents argued that the proposed development was good and recommendable for general development and basically it conformed to other developments in the area. Some quoted that increased development will necessitate services such as sewer lines and water supply from the EPZA.

CHAPTER SIX: PROJECT ALTERNATIVES

6.1 Introduction

In deciding on the type of developments to be included in the project, the proponents considered various alternatives. Three options were considered as outlined below. Note that for some issues, little data is available on which to base the assessment, and that many of the judgments are subjective. Also, despite a number of detailed technological alternatives at project proponent's discretion, the technology adopted in this project is informed by conventional building trend in the project area. It's worth noting also that only those alternatives with the potential to materially affect the outcome of the environment have been discussed here.

6.1.1 Zero Option/ No Development

The zero option 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 noninterference with the existing conditions. This option will however, involve several losses both to the landowner and the community as a whole. The landowner will continue to pay rent on the plot while the property remains underutilized. The Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

The landowner will continue to pay rent on the plot while the property remains idle. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The economic status of the Kenyans and the local people would remain unchanged.
- The local skills would remain underutilized.
- Reduced interaction both at county, national and international levels
- No employment opportunities will be created for Kenyans who will work in the project.
- No housing provided to alleviate a critical shortage high standard commercial use
- Development of infrastructural facilities (roads, electrical etc.) will not be undertaken. From the analysis above, it becomes apparent that the No Project alternative is no alternative to the local people, Kenyans, and the Government of Kenya.

6.1.2 Relocation Option

Relocation option to a different site is an option available for the project implementation. At present the landowner/developer does not have an alternative site. This means that he has to look for the land. Looking for the land to accommodate the scale and size of the project and completing official transaction on it may take up to three (3) years although there is no guarantee that the land would be available. The developer will spend another two years on design and approvals since design and planning has to be according to site conditions. Project design and planning before the stage of implementation will cost the developer hundreds of thousands of Kenya shillings. Whatever has been done and paid to date will be counted as a loss to the developer. Assuming the project will be given a positive response by the relevant authorities including NEMA, this project would have been delayed for about two (2) years period before implementation. This is a delay that our economy can ill afford. This would also lead to a situation like No Project Alternative option. The other consequence of this is that it would be a discouragement for private/local investors especially in the housing sector that has been shunned by many public and private investors already aggravating our critical housing shortages. In consideration of the above concerns and assessment of the current proposed site, relocation of the project is not a viable option.

6.1.3 Alternative Land use

The proponent has no option to use the land for other purposes other than proposed residential apartments.

6.1.4 Proposed Alternative

Various alternative methods for development of the proposed project were considered, however in all instances the outstanding difference was either material or technology used but development of the residential development emerged as the most plausible option according to the project area setting and primacy.

CHAPTER SEVEN: IDENTIFICATION OF ENVIRONMENTAL AND SOCIAL IMPACTS

7.1 Basis of Identification of Impacts

In order to accurately identify the environmental impacts the following environmental Issues were considered pertinent and important as per the Terms of Reference.

7.1.1 Physical Environment (Biophysical Impacts)

a) Water quality aspects for both surface water sources like piped water, storm water, and other related aspects.
b) Soil conditions, soil contamination and landscape alterations/degradation (based on aesthetic aspects) associated with the proposed project.
c) Drainage patterns especially in relation to wastewater effluents
d) Air quality aspects especially atmospheric emissions and related discharges from machinery like diesel run equipment etc.
e) Noise and vibrations where applicable

7.1.2 Natural Environment

f) Flora and fauna from the adjacent ecosystem (i.e. effects to natural plants and animals where applicable).
g) River pollution indicators, impacts on water flow patterns and quality aspects, user interference and contamination.
h) Topography: effects on soil and landscape.

7.13 Social welfare, Economic and Cultural Environment

i) Determination of implications to the human society distribution, demographic details, settlement patterns, changes to the cultural lifestyle and indigenous knowledge of the local society/public where applicable.
j) Notable changes in land use systems and the general land utilization types where applicable.
k) Aesthetic, landscape alterations and changes to infrastructural facilities, among others.
l) Effects associated with the construction and operation activities and related handling and disposal of wastes generated during the operations.
e) Effects associated with income generation opportunities created by the project due to the upcoming operations.

f) Implications on the employees, visitors and public health, safety and related hazards/risks such as HIV/AIDS, consumption of contaminated intravenous infusions products due to disease outbreaks, sanitary facilities, etc.

g) Introduction of nuisances, such as pests, invasive species and related multiplication breeding sites

7.2Description of the Existing and Anticipated Impacts

7.2.1 Existing impacts

There were no major environmental impacts at the time of the study.

7.2.2 Anticipated impacts

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

Table 1. Assessment criteria for significant impacts

Key	Type of impact	Key	Type of impact
++	Major positive impact.	+	Minor positive impact
--	Major negative impact	-	Minor negative impact
0	Negligible/Zero impact	NC	No change
Sp	Specific/Localized impact	W	Widespread impacts
R	Reversible impacts	Ir	Irreversible impacts
Sh	Short term impacts	L	Long term impacts
T	Temporary impacts	P	Permanent impacts

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

7.3 Positive Impacts

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

Table 7-3; Positive Impacts of the Proposed Development and Justification

No	Positive Impacts	Justification
1	Provision of high class and affordable housing to the Residents.	The proposed project will provide affordable housing to the residents with emphasis on their safety and well being
2	Generation of direct and indirect employment and Income	Besides the direct employment by the proposed development, other forms of employment are likely to result from the spillover effects, through indirect services During the construction and operation phases. The employment opportunities will generate income and improve the living standards of the local population and its Environs.
3 **4**	Contribution To Government Revenue Economic investment.	Through payment of relevant taxes, rates and fees to the national and county governments, the project will Contribute towards the national and local revenue earnings. The proponent will receive returns on his Investments hence increases in wealth.
5	Improved Security.	Security will be ensured around the proposed development Through distribution of suitable security lights and presence of 24 hour . This will lead to improvement in the general security in the surrounding area.
6 **7**	Social amenities such as Schools, Club houses Creation of market for local goods and services.	The proposed project will boost social amenities in the general area and this will stimulate more development. The proposed project will create demand for local produce and this will greatly benefit small scale businesses within the project area.

7.4 Specific Negative Impacts during Construction and Operational Phases and Mitigation Measures

The issues that are seen as likely to negatively affect the environment and population therein Include the following:

7.4.1 Air quality

Construction Phase

Dust is likely to be generated due to excavation activities, during building construction and deliveries of raw materials. There will be minimal air pollution due to combustion of fossil fuels expected from transportation and construction machinery and dust from excavation activities. The proponent will ensure that plant and equipment which will be acquired for on site preparation of pre-cast materials and concrete mixing will utilize the latest technology to have minimum emission.

Operational Phase

During operational phase, air quality is not likely to be affected.

Potential mitigation measures

Provision of full protective gear for workers. Workers shall also be sensitized on hazards encountered in such work environment and shall undergo regular health check-ups.

Watering access roads and the site to suppress dust

Covering truck loads using tarpaulins

Personnel will be also provided with dust masks to avoid inhalation of the same.

7.4.2 Soil Erosion

Construction Phase

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

Operational phase

The building roofs and pavements will lead to increased volume and velocity of storm water or runoff flowing across the area covered by the buildings. This will lead to increased amounts of storm water

entering the drainage systems, resulting in overflow and damage to such systems in addition to increased erosion or water logging in the neighboring areas.

Potential mitigation measures

Excavation should be done under controlled conditions which will include minimizing vegetation removal, avoiding creating large open expanses of bare soil, creating wind breaks, using of single or few designated tracks to bring vehicles into the area and watering using water.

Landscaping should be done on the land during the operation phase and de-commissioning phase to ensure that the same is returned to its original state. The contractor should also provide adequate soil conservation structures to ensure that areas prone to soil erosion are protected from runoff.

7.4.3 Solid Waste

Construction Phase

A significant amount of solid waste will be generated in this phase through the clearing of vegetation. The other activities that will generate related solid wastes include stones, wood, broken glasses, containers, rods of metal, cement bags, sharp objects (nails) etc. This will therefore have a major negative short-term impact on solid waste collection in the area. The proponent should take the initiative of removal of the solid waste which is expected to be generated during this phase of the development.

Operational phase

The project is expected to generate enormous amounts of solid waste during its operation phase. Solid waste will be generated from the residential houses and the associated facilities. The accumulation of solid waste can cause the proliferation of domestic pests such as rats (*Rattusnorvegicus*and *Rattusrattus*. These vermin are very destructive and can rapidly multiply especially where garbage collection is infrequent and therefore food is abundant. This phase may also encourage stray animals such as dogs which can be nuisance species because they may bring with them ecto-parasites such as fleas (*Ctenocephalidescanis*) and ticks (*Ixodes sp.*) which can create health problems for domestic pets.

The bulk of the solid waste generated during the operation of the project will consist of domestic waste such as paper, plastic, glass, metal, textile and organic wastes. Such wastes can be injurious to the environment through blockage of drainage systems, choking of water bodies and negative impacts on animal health. Some of these waste materials especially the plastic/polythene is not biodegradable may cause long term injurious effects to the environment. Even the biodegradable ones such as organic wastes may be injurious to the environment because as they decompose, they produce methane gas, a

powerful greenhouse gas known to contribute to global warming.

Potential mitigation measures for solid waste

Express condition shall be put in the contract that before the contractor is issued with a completion certificate; he will clear the site of all debris and restore it to a state acceptable to the supervising architect and environmental consultant.

Materials from excavation of the ground and foundation works shall be reused for earth works and landscaping.

Bins/ receptacles shall be placed at strategic locations within the site as collection centers to facilitate separation and sorting of the various types of wastes.

The contractor and proponent shall work hand in hand with licensed private refuse handlers and Mavoko Sub-County to facilitate sound waste management.

The wastes shall be properly segregated and separated to encourage recycling of some useful waste materials i.e. some demolished stone and concrete materials can be used as backfills.

Use of an integrated solid waste management system through a hierarchy options i.e. source reduction, recycling, composting and reuse shall be encouraged. This will facilitate proper handling of solid waste during operation stage.

7.4.4 Noise pollution

Construction phase

This phase of the development may likely have the most negative impact to the ambient noise and vibration in the development area. A number of measures may be undertaken by the developer to reduce the impact of noise on the existing and potential residents as well as the workers involved in the project. This is temporary, however, and the aim at this point is to make the increase in noise as small as possible until this phase is complete. The cumulative impact of the construction activities occurring simultaneously with the other proposed developments for the area may increase the noise and vibration levels in the area significantly.

Operation Phase

This phase is not likely to cause noise pollution as residential activities do not cause any significant noise.

Proposed mitigation measures

Equipment to be used should be selected on the basis of the noise minimization during acquisition.

Equipment should also be properly maintained while in use during the construction phase.

The equipment to be used should be located far away from the receivers and also so as to prevent interference, the proponent should ensure that construction is done between 8:00am - 5:00pm.
The proponent should also establish the noise levels during construction and install appropriate noise barriers and acoustic screens.
Buffer zones of undeveloped land should be maintained between the project area and the neighbors.

7.4.5 Increased Water Demand

Construction Phase

This phase of the development might place a strain on an already limited supply through the construction of buildings and other infrastructural works proposed for the development. This will create additional demand to the water supply within the project vicinity as most people source water from EPZ which is unreliable. The impact on water availability will therefore be compatible and short-term.

Operational phase

The operation phase of the proposed development might place a strain on the water availability in the area. Even with the use of recycled water for irrigation, the current supply will have a cumulative major negative impact on already limited supply. This phase of the development will therefore have a major negative long-term impact on the water availability in the area.

Potential mitigation measures

Drilling a borehole.
Provision of notices and information signs within the project site to notify on means and needs to conserve water resource.
Installation of water conserving taps will be done.
Encourage water recycling during both construction and occupation phases of the project.
During operational phase, water abstraction will be according to the amount stated in the abstraction permit.
Practice rain water harvesting to supplement the borehole water.

7.4.6 Surface Drainage/storm water

Construction phase

Clearance of land and excavation works will lead to increased soil erosion at the project site and release of sediments into the drainage systems.

Operational phase

The building roofs and pavements will lead to increased volume and velocity of storm water or runoff lowing across the area covered by the buildings. This will lead to increased amounts of storm water entering the drainage systems, resulting in overflow and damage to such systems.

Potential mitigation measures

Leveling the project site to reduce run-off velocity and increase infiltration of rainwater into the soil.

Drainage channels shall be installed in all areas that generate or receive surface water. The channels will be covered with gratings or other suitably approved materials to prevent occurrence of accidents and dirt entry that may compromise flow of run-off.

The channels shall be designed with regard to peak volumes.

Paving of the sidewalks, parking and other open areas shall be done using pervious materials i.e. concrete blocks to encourage water percolation thus reducing run-off volume.

7.4.7 Oil Leaks and Spills

It is important to note that oil/grease spills are prevalent in construction sites and in most areas that make use of petroleum products. Such products contain detrimental elements to the environment. They contain such heavy metals as mercury, lead, and sulphur among others. Though this may not be common at the site, it is wise to control and observe the little that could occur especially during maintenance of the involved machinery.

Potential Mitigation Measures

All machinery must be keenly observed not to leak oils on the ground. This can be affected through regular maintenance of the machinery.

Maintenance must be carried out in a designated area (protected service bays) and where oils are completely restrained from reaching the ground. Such areas should be covered to avoid storm from carrying away oils into the soil or water systems. Waste water/ wash water from these areas should be properly disposed.

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

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

7.5 Socio-Cultural and Socio-Economic Impacts

7.5.1 Increase in Population

There is currently no evidence of overcrowding around the development area and therefore there will be minimal variations on its demography. The population growth rates in the area are not expected to be consistent in the future however, as there has been a significant increase in the number of approved and proposed developments for the Syokimau/Mavoko areas. These proposed developments will serve to attract migrants to the area who will be seeking employment during construction phase. This will result to an increase in population.

In the operational phase, the area will experience immigrants who will become the new residents of the constructed houses and this will impact on the population of the area.

Proposed mitigation measures

Planned settlement, ensuring that adequate social and other infrastructure meet the needs of migrants.

7.5.2 Employment and Income

Majority of the residents highlighted job opportunities as a major positive impact. Any available jobs will provide an immediate positive impact on the employment and income situation at the level of the study area as well as at the county and national levels. This phase of the development will provide the most benefits in terms of sustained employment and increase in income. Initially, the site preparation phase will employ specific vehicles and equipment in order to clear vegetation, for landscaping and grading and leveling and the cutting of access roads for these vehicles and laborers to access the site. This means that many skilled workers will be necessary to operate front-end loaders, excavators, bulldozers and backhoes and other vehicles. In addition to this semi-skilled labourers will still be necessary for other tasks. This phase of the development will therefore have a short-term major positive impact on the employment and income at the local level. During operation phase, employment opportunities will be created e.g. at the laundry and maintenance personnel.

Proposed mitigation measures

The proponent should encourage recruitment of labour from the locals for unskilled and semi-skilled labour. For skilled labour this will depend on how much is available locally and the shortfall shall be supplemented by artisans from outside.

The proponent will give equal opportunities to women where possible.

7.5.3 Increased Energy Demand

The construction and operation phases of the development will impact slightly on the electricity supplying the area as well as demand will increase.

Proposed mitigation measures

All electrical appliances should be switched off when not in use during construction and operation phases.

Use of energy conserving electric lamps for general lighting during operational phase.

Residents should utilize natural light when inside their houses to avoid using electricity for lighting during the day.

The contractor should ensure that all buildings have access to natural light during the day.

The proponent should consider installation of renewable energy sources such as solar panels.

7.5.4 Workplace Accidents

Workers at the site may be exposed to various workplace accidents especially during construction period. These include being hit by falling objects and falling off from elevated heights among others. During operation period, accidents may include exposure to exposed electrical parts.

Potential mitigation measures

Occurrences of accidents may be prevented by observing the following:

Ensuring that the operational manuals are available and accessible for every equipment/machinery used at the site.

Proper maintenance of all machinery and equipment to prevent premature failure or possible accidents

Ensuring all electrical equipment and machinery are properly grounded

Only properly trained employees to operate equipment or machinery and proper instructions in their safe operation is provided.

Workers to wear personal protective equipment (PPE)

Naked wires should always be sealed

7.5.5 Site Security

Security of the site and those working within is of utmost significance and those operating within the facility must be assured of their security at all times. Security lapses that may lead to injury of occupants of the building and loss of personal property should be taken care of.

Potential mitigation measures

The management shall strategically install lighting as well as security alarms and backup systems

including surveillance of the area on a 24 hours basis.

Security guards shall guard the property in a 24-hour basis and document any suspicious movement within the facility and its environs.

The proposed project site will be secured with a perimeter wall.

7.5.6 Fire Hazards

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

Potential mitigation measures

In this regard, the design of the project has provided and recommended implementation of firefighting measures and control facilities. These include the following:

Installation of an automatic fire alarm system for the estate

Provision of firefighting equipment and hydrant points

Display fire evacuation procedures and emergency at the buildings

Regular maintenance of fire electrical and first aid equipment

Provision of sufficient fire exit points and fire assembly points

7.5.7 Road Infrastructure

Traffic along the access road may increase during construction phase since vehicles will be accessing the site to deliver construction materials, to take away waste materials and experts coming for supervision purposes. The roads in their current states will be able to handle this increased traffic including for heavy-duty equipment traffic. This phase of the development may have a major negative impact of surface status deterioration on the present road network in the study area.

Operational Phase: During the operation phase of the project, there might be a major negative impact on the road network in the area as the volume of traffic associated with the development will increase significantly, therefore placing a strain on the existing road network. Within the immediate environs of the project site the following traffic measures and rules will be observed:

- Maximum speed limit within this area will be 20km/hr for both operation and personal vehicles
- Speed limits and all other road signs and traffic rules shall be strictly observed.
- Vehicles will be used for the purposes to which they are intended only.

7.5.8 Occupational Health and Safety (OHS)

Construction phase

During the proposed project construction works, there may be increased risks to health and safety such as dust, air, and noise pollution. The workforce and general public involved would be more subjected to these possible environmental hazards and disturbances. Food for the construction workforce is usually provided by individuals most of who in most cases operate without public health licenses. This can compromise health of the workers especially if such foodstuff is not prepared following strict hygiene standards. Flammable substances including diesel and motor oil may be stored or used within the project site for heavy-duty equipment. These substances are precursors for fires and explosions, which may range from small incipient to larger fires of great intensity, which generates heat causing damage to property, injuries or loss of human life.

Operational phase

It is expected that most residents will use LPG for cooking which is also highly flammable, which may increase the vulnerability of the operation to a fire or an explosion.

Potential mitigation measures

During construction, the contractor will be required to prepare a waste management plan for the worksites and equipment camp at the start of the project. The site is to be kept clean, neat and tidy at all times. The contractor shall implement measures to minimize waste and develop a waste management plan to include the following:

All personnel shall be instructed to dispose off waste in designated waste baskets.

At all places of work, the contractor shall provide litter collection facilities.

The final disposal of the site waste shall be done at the location that shall be approved by the engineer on site. This must be in full recognition of the existing legal requirements.

There shall be provision of sufficient bins to store the solid waste produced on a daily basis.

Wherever possible, materials used or generated by construction shall be recycled. Provision shall also be made of responsible management of any hazardous waste generated during the construction works.

Workmen shall be provided with suitable protective gear (such as dust masks, ear muffs, helmets, overalls, industrial boots etc.) particularly during construction. There must be fully equipped First Aid kits on site and a safety officer who has First Aid training and knowledge of safety procedures. In addition, the contractor must have insurance for the workmen.

The contractor will be required to adhere to Occupational Safety and Health Act (OSHA) 2007, especially the building operations and works of engineering construction rules and its subsidiary and supplementary regulations on safety and public health in the construction activities.

7.5.9 Social Conflict with the Community

Projects of such magnitude usually attract public uproar (especially from the neighboring residents and community) if they are not made to own the project. Conflicts usually arise mostly from the foreseen negative impacts and increased interactions from the increase in population levels.

Potential Mitigation measures

Consultation with neighbors on the mitigation measures prescribed for the negative impacts as a way of conflict resolution and neighborhood association.

The proponent will give women equal employment opportunities as men whenever possible.

The proponent will give priority to the local community in allocation of jobs at both skilled and unskilled levels.

CHAPTER EIGHT: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

8.1 introduction

Integrating environmental issues in business management, such as those related to development increases efficiency while enhancing the project proponent financial and environmental management. These issues, which are normally of financial concern, are: costs, product quality, investments, level of productivity and planning. Environmental planning and management as a concept seeks to improve and protect environmental quality for both the project site and the neighbourhood through segregation of activities that are environmentally incompatible. Environmental planning and management integrates land use structure, social systems, regulatory law, environmental awareness and ethics.

Environmental management plan (EMP) for development projects such as the proposed residential apartments aims at providing a logical framework within which identified negative environmental impacts can be mitigated and monitored. In addition, EMP assigns responsibilities for action to various actors, and provides time frame within which mitigation measures can be done. EMP is a vital output for an environmental impact assessment as it provides a checklist for project monitoring and evaluation. A number of mitigation measures are already incorporated into the project design. The EMP outlined in Table 8-1 has addressed the identified potential negative impacts and mitigation measures for the proposed hotel development.

8.2 Environmental Monitoring and Evaluation

Environmental monitoring and evaluation are essential in the project lifespan as they are conducted to establish if the project implementation has complied with the set environmental management standards as articulated in the Environmental Management and Coordination Act (EMCA) No. 8 of 1999, and its attendant Environmental (Impact Assessment and Audit) Regulations, 2003.

In the context of the proposed project, design has made provisions for an elaborate operational monitoring framework for the following among others:

(a) Disruption of natural environment and modification of microclimate

(b) Air and noise pollution

(c) Proliferation of related businesses

(d) Workers accidents and health infections during construction process

(e) Table 8.1: Environmental Management Plan

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES) ESTIMATE	MONITORING MEASURES
IMPLIMENTATION PHASE				
Commissioning of the Construction Works	- Site hand-over and Ground breaking	Project team (Lead Consultant/Architect, contractor Proponent)	Part of/Covered in the Project Cost	Presence of the project Team
Securing the Construction Site	- Construction of Perimeter Wall and Hoarding	Contractor Proponent	Part of/Covered in the Project Cost	Presence of Perimeter Fence
Security for Construction Material	- Construction of Site Stores - Construction materials to be delivered in small quantities to minimise storage problems	Contractor Proponent	200,000	Presence of Site store
Extraction and Use of Building Materials	- Availability and sustainability of the extraction sites as they are non-renewable in the short term - Landscape changes e.g. displacement of animals and vegetation, poor visual quality and opening of depressions on the surface - Ensure suppliers are licensed by NEMA	Contractor/Proponent /project team	Part of/Covered in the Project Cost	Material site rehabilitation
Collapse of Building during Construction	- Ensuring Building Strength and stability - Use of appropriate construction materials and reinforcements as per specifications - Ensuring building components are as per designs - Proper supervision - Ensure proper timelines are followed e.g. curing time	Contractor Proponent project team	Part of/Covered in the Project Cost	Presence of the project Team
Disturbance of Traffic flow during construction	- Proper signage - Awareness creation - Education to truck drivers - The proponent to come up with a traffic management plan	Contractor/Project team and general public	200,000	- Presence of site Notice Board /Hoarding - Presence of Security guards to control

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES) ESTIMATE	MONITORING MEASURES
				traffic - warning signs
CONSTRUCTION PHASE				
Soil Excavation leading to site disturbance	- Excavate only areas to be affected by buildings - Dumping of excess excavated materials to sites designated by NEMA and County - Restoration of sites Excavated	Contractor	5,000,000	Landscaping after completion of construction
Soil Erosion	- Create and Maintain soil traps and embankments. - Landscaping after completion of construction - Excavated soil to be used for back filling - Develop soil erosion management measure.	Contractor/Proponent, Architect/Site engineer Landscape Architect	500,000	Lack/Absence of Soil Erosion
Noise Pollution and Vibration	-Switch off engines not in use - Construction work to be confined to between 7am to 5pm -Ensure use of earmuffs by machine operators - Provide and enforce use of PPE e.g ear muffs - Proper servicing of machinery and equipment (oiling and greasing) - Monitor noise levels as per NEMA guidelines	Proponent and Contractor	500,000	Lack of complaints from the immediate neighbours
Air emissions	- Water sprinkling of driveways or the use of biodegradable hydrant e.g. Terraform polymer will reduce dust emission during construction - Ensure servicing of vehicles regularly - Cover loads of friable materials during transportation. - Control speed of construction vehicles and switch off machines when not in use. - Provide PPE to workers.	Proponent and Contractor	700,000	- Lack of complaints - Workers wearing protective clothing and earmuffs
Risks of Accidents and Injuries to Workers	- Education and awareness to all construction workers - Ensure use of appropriate personal protective clothing	Proponent Contractor	1,000,000	- Presence of well-equipped First Aid kit

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES) ESTIMATE	MONITORING MEASURES
	- Provide First Aid Kits on site - Ensuring Building Strength and stability - Proper supervision			Presence of Security Guards on site Presence of a register on the site
Health and Safety	- Provide First Aid Kits on site - Proper signage and warning to public of heavy vehicle turning - Ensuring Building Strength and stability - Provide clean water and food to the workers - The contractor to abide by all construction conditions especially clause B12 which stipulates health safety and workforce welfare - Personnel to stick to standard operation procedures - Personnel to wear complete protection gear - Provision of firefighting equipment - Put in place an emergency response plan. - Put in place guideline for operation of machinery and appliances and ensure workers are aware of the same. - Comply with Kenyan safety policy and safe working procedures, laws and regulations	Proponent Contractor	1,000,000	- Presence of well-equipped First Aid kit - Presence of Security Guards on site - Presence of a register on the site
Solid Waste Generation	- Ensure waste materials are disposed of on County and NEMA approved sites - Use of the 3rs – Reduce, Re-use, Re-cycle - Solid waste to be put in designated areas for appropriate disposal(waste cubicle) - Waste segregation to at source - Engage a licensed, competent and effective waste handler	Proponent Contractor	1,000,000	- Absence of Solid waste on the site
Energy Consumption	- Use electricity sparingly since high consumption of electricity negatively impacts on these natural resources and their sustainability - Use of Standby Generators - Use of renewable sources of energy i.e. solar panels	Proponent Contractor	1,000,000	- Presence of KPLC power lines - Presence of generator
Excessive Water Use	- Excessive water use may negatively impact on the water source and its sustainability	Proponent	1,000,000	- Metering of water

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES) ESTIMATE	MONITORING MEASURES
	- Connecting to EPZA supply - Getting supplementary source of water - Drilling a borehole - Abstract as indicated in the WRMA permit - Installation of toilet flushes with low volume cisterns - Recycling of water	Contractor WRA		
		OCCUPATION PHASE		
Architectural incompatibility leading to distortion of neighbourhood aesthetic image	- Harmonise building scale with existing developments in neighbourhood i.e. Apple Tree apartments. - Harmonise detail, material and finishes for roofs and walls with existing development in the neighbourhood.	Architect Proponent Contractor	Part of/Covered in the Project Cost	- Compatibility with the neighbourhood
Solid Waste Generation and Management	- Regular inspection and maintenance of the waste disposal systems during operation phase - Establish a collective waste disposal and management system - Provide waste disposal bins to each suite well protected from adverse weather and animals - Ensure waste materials are disposed off on County approved sites - Engage a NEMA licensed waste handler to transport the waste - Use of the 3rs – Reduce, Re-use, Re-cycle	Proponent Contractor	1,500,000	- Presence of NEMA registered waste management companies - Presence of waste handling bins - Absence of wastes
Liquid Waste Generation and Management	-Regular inspection and maintenance of the waste disposal systems during the operation phase - Proper connection to the wastewater treatment plant - Routine check-ups and monitoring of the waste water treatment plant to avoid leakages and blockages. - The proposed capacity of the WWTPs should be sufficient to accommodate the anticipated people. - Proper construction of WWTPs will be done to meet the standards required by Mavoko Sub County.	Proponent Contractor	1,000,000	- Absence of liquid wastes

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES) ESTIMATE	MONITORING MEASURES
	- Construction of separate storm water drainage channel			
Increased loading on Infrastructure services - Increased vehicular and/or pedestrian traffic - Increased demand on water, sanitation services	- Have paved road drainage system - Encourage rainwater harvesting - Provision of increased water storage capacity - Provide adequate storm water management system	Contractor Proponent	1,000,000	- Absence of runoff - Presence of good roads - Pavements and drainage channels
Traffic	- Come up with traffic management plan - Provide adequate parking facilities within the project site	Contractor Proponent	Routine operation procedure	- Presence of amble parking in the premises
Increased social conflict	- Increased economic activities –employment generation and income earnings - Encourage good relation with the neighbours through neighbourhood associations	Contractor Proponent		-Good relationship with neighbours -absence of conflicts
Storm water impacts	- Provide roof gutters to collect and direct roof water to drains - Construct drains to standard specifications - Develop a storm water drainage system and linkage to natural drains	Proponent Contractor	900,000	Absence of Flooding and dampness in the hotel

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES) ESTIMATE	MONITORING MEASURES
Disruption of existing natural environment and modification of micro-climate: - Increased development density - Increased glare/solar reflection - Reduced natural ground cover/surface runoff - Obstruction of ventilating winds	- Development restricted to follow zoning policy/approved density – building line, plot coverage and plot ratio. - Careful layout and orientation of buildings to respect wind and sun direction. - Adequate provision of green and open space planted with grass, shrub and tree cover. - Minimum use of reflective building material and finishes for roof, wall and pavement. - The balconies should have garden	Project team (Contractor Proponent, Architect or Lead Consultant, etc)	600,000	Proper orientation Planted trees/Landscaping
Insecurity	- secure the premise with a perimeter wall and an electric fence - Installation of CCTV cameras at strategic points - Have a entry point that is manned 24 hours - Construction of gate house	Contractor Proponent	2, 000,000	Presence of perimeter wall Presence of day and night security guards
DECOMMISSIONING PHASE				
Building Safety	Assess the condition of buildings to ascertain usefulness	Engineer Proponent	1,000,000	Engineer and Tests on the building
Land and Building use	Ascertain the Planning development policy	County Physical Planner	200,000	Consultants present
Accidents/Injuries	Securing the Site by fencing off	Contractor Proponent	1,000,000	Presence of perimeter fence
Un-disconnected Services e.g. Power, Water, telephone,	Ensure disconnection of all services Remove all surface and underground cables and wiring	Contractor	2,000,000	Absence of cabling

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES) ESTIMATE	MONITORING MEASURES
sewer etc				
Solid Waste Generation (demolition waste)	Ensure waste materials are disposed of on County and NEMA approved sites Ensure re-use of materials that can be re-used -Use of the 3rs – Reduce, Re-use, Re-cycle	Proponent/Contractor	2,000,000	Absence of Debris
Noise and Vibration	- Ensure use of serviced equipment - Switch off engines not in use - Demolition work to be confined to between 8am to 5pm - Ensure use of earmuffs by workers	Proponent Contractor	100,000	Lack of complaints from the neighbours

CHAPTER NINE: ENVIRONMENTAL HEALTH AND SAFETY (EHS)

9.1 EHS Management and Administration

The EHS is a broader and holistic aspect of protecting the worker, the workplace, the tools / equipment and the biotic environment. It is an essential tool in determining the EIA study. The objective of the EHS on the proposed project is to develop rules that will regulate environmentally instigated diseases and occupational safety measures during construction and the operation phases of the proposed project by:

- Avoidance of injuries
- Provision of safe and healthy working environment for workers comfort.
- Control of losses and damages to plants, machines, equipment and other products.
- Enhance environmental sustainability through developing sound conservation measures.

9.2 Policy, Administrative and Legislative Framework

It is the primary responsibility of the contractor to promote a safe and healthy environment at the workplace and within the neighbourhood in which the proposed project will be constructed by implementing effective systems to prevent occupational diseases and ill-health, and to prevent damage to property. The EHS Management Plan when completed will be used as a tool and a checklist by the contracted engineers in planning and development of the construction of this project.

9.3 Organisation and implementation of the EHS Management Plan

The contactor shall use the EHS plan at the proposed project site both during construction and operation. The engineer will use it during construction phase with the assistance of an EHS consultant.

9.4 The Guiding Principles to be adopted by the contractor

The company will be guided by the following principle: -

- It will be a conscious organisation committed to promotion and maintenance of high standards of health and safety for its employees, the neighbouring population and the public at large.
- Ensuring that EHS activities are implemented to protect the environment and prevent pollution.
- Management shall demonstrate commitment and exercise constant vigilance in order to provide employees, neighbours and the environment, with greatest safeguards relating to EHS.

- Employees will be expected to take personal responsibility for their safety, safety of colleagues and of the general public as it relates to the EHS management plan.

9.5 EHS management strategy to be adopted by the contractor

The following strategies will be adopted to achieve the above objectives

- Create an Environment Health and Safety Management committee and incorporate EHS as an effective structure at various levels and units to manage and oversee EHS programs in all construction and operation phases of the project
- Maintain an effective reporting procedure for all accidents.
- Provide appropriate tools and protective devices for the success of the project.
- Encourage, motivate and reward employees to take personal initiatives and commitment on EHS.

9.6 Safety Agenda for both the proponent and contractor

There will be a permanent EHS agenda during construction.

(a) Contractors

The EHS management plan code of practice shall be applicable to the contractors working in the premises, and shall be read and signed. This should also remind the contractor of his/her;

- Legal requirements.
- Statutory obligations.
- Obligation to lay-down a system for reporting accidents
- Responsibility to ensure that his/her employees are supplied with personal protective equipment
- Obligation to ensure that he obtains detail of jobs and areas where permit-to-work must be issued

(b) All residents' and workers' responsibility

- Know the location of all safety equipment, and learn to use them efficiently.

9.7 Safety requirement at the project site during construction and operation Period

(a) The contractor

The contractor will ensure that:

- Safe means of entry and exit at the proposed project site.
- Ensure adequate briefing of job at hand on the safe system before commencement of work.
- The EHS coordinator must be in attendance at all times throughout the duration of the project.
- The EHS consultant must maintain constant assessment of the risk involved
- A safety harness must be worn before entry into all confined spaces
- An EHS consultant must be posted at the entrance at the project site to monitor

(b) The Traffic / Drivers

Within the construction premises, the following traffic rules will be observed: -

- Observe speed limits and all other signs and obey traffic rules.
- Use the vehicle for the purpose to which it is intended only.

c) Fire hazard at the construction site,

Workers at the site shall ensure that: -

- Oxy-acetylene cylinders are not contaminated with grease or oil.
- Oxy-acetylene cylinders are not subjected to direct sunlight or heat.
- Oxy-acetylene cylinders are not to be used or stored standing in a vertical position.
- When in use, ensure the inclination should never be over 30° from the vertical.

9.8 Welding at the construction site

It is the responsibility of the contractor during construction to: -

- Ensure that welding clamp is fixed such that no current passes through any moving parts of any machine.
- Ensure that all welding clamps are in good operating condition
- Ensure that welding clamps are free from any contact with explosive vapours.
- Ensure that any slag or molten metal arising from welding activities does not start up fires by:
    - ✓ Clearing combustible material to distance of at least 3 meters away from working area.
    - ✓ Appropriate fire extinguisher is to be kept available for immediate use at all times

9.9 Emergency procedure during construction and operation

An emergency situation means:

- Unforeseen happening resulting in serious or fatal injury
- Fire or explosion.
- Natural catastrophe.

In the event of such an emergency during construction, the workers shall:

- Alert other persons exposed to danger.
- Inform the EHS coordinator.
- Do a quick assessment on the nature of emergency.

Call for ambulance on standby.

CHAPTER TEN: DECOMMISSIONING

10.1 Introduction

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

- Remove all underground facilities from the site
- The site should be well landscaped by flattening the mounds of soil and
- Planting indigenous trees and flowers
- All the equipment should be removed from the site
- Fence and signpost unsafe areas until natural stabilization occurs
- Backfill surface openings if practical

The table below shows the proposed decommissioning plan:

Table 10.1. EMP for Decommissioning

Expected Negative Impacts	Recommended Measures	Responsible Party	Time Frame	Cost (KShs)
1. Construction Machinery/Structure & Wastes				
Scraps material and other debris	Use of an integrated solid waste management system i.e. through a hierarchy of options. Wastes generated as a result of facility decommissioning activities will be characterised in compliance with standard waste management procedures. The contractor will select disposal locations and the county based on the properties of the particular waste generated.	Project Manager & Contractor	During decommissioning	3,000,000
	All buildings, machinery, equipment, structures and partitions that will not be used for other purposes should be removed and reused or rather sold/given to scrap material dealers.	Project Manager & Contractor	During decommissioning	-
	Where recycling/reuse of the machinery, equipment, structures and other waste materials is not possible the materials should be taken to approved dumpsites.	Project Manager & Contractor	During decommissioning	-
Rehabilitation of project site				
Vegetation disturbance Land deformation: soil erosion, drainage problems	-Implement an appropriate re-vegetation program to restore the site to its original status. -During the vegetation period, appropriate surface water runoff controls will be taken to prevent surface erosion; -Monitoring and inspection of the area for indications of erosion will be conducted and appropriate measures taken to correct any occurrences; -Fencing and signs restricting access will be posted to minimise	Project Manager & Contractor	During decommissioning	4,000,000

Expected Negative Impacts	Recommended Measures	Responsible Party	Time Frame	Cost (KShs)
	disturbance to newly-vegetated areas;			
Social- Economic impacts				
-Loss of income -Loss of housing facilities	The safety of the workers should surpass all other objectives in the decommissioning project. -Adapt a project – completion policy; identifying key issues to be considered. -Compensate and suitably recommend the workers to help in seeking opportunities elsewhere. -offer alternative housing facilities	Project Manager & Contractor	During decommissioning	3,000,000

CONCLUSION AND RECOMMENDATIONS

Overview

From the foregoing analysis, the social and economic rating for this project is highly positive. Evaluation of alternatives has already shown that options are limited and costly. Already the proponent has sunk substantial amount of money in the project up to design stage. Further delay of the project is denying all stakeholders the anticipated benefits of the investment. On the other hand, redesigning or relocation will lead to loss of time and money that is already tied in the preliminary costs of the project. The project does not pose major negative environmental impacts. Adequate mitigation measures have been proposed to address any of the anticipated negative impacts arising from the project. The project will create employment and improve income earnings. The project will boost the diminishing housing supply in the country and more in urban areas.

During the preparation of this report for the proposed development it is observed and established that most of the negative impacts on the environment are rated low and short term with no significant effect. The positive impacts are highly rated and will benefit all stakeholders and the Syokimau residents at large. The project proponents have proposed to adhere to prudent implementation of the environmental management plan. They are obtaining all necessary permits and licenses from the relevant authorities and have qualified and adequate personnel to do the project as proposed. They have proposed adequate safety and health mitigation measures as part of the relevant statutory requirements

Conclusion

This study is recommendable and should be approved by NEMA for issuance of an EIA license subject to annual environmental audits after it has been completed and occupied. This will be in compliance with the Environmental Management and Coordination Act of 1999 and the Environmental Impact Assessment and Audit regulations, 2003. Above all the proponent should carry out Environmental Audit 12 months after the project is completed.

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