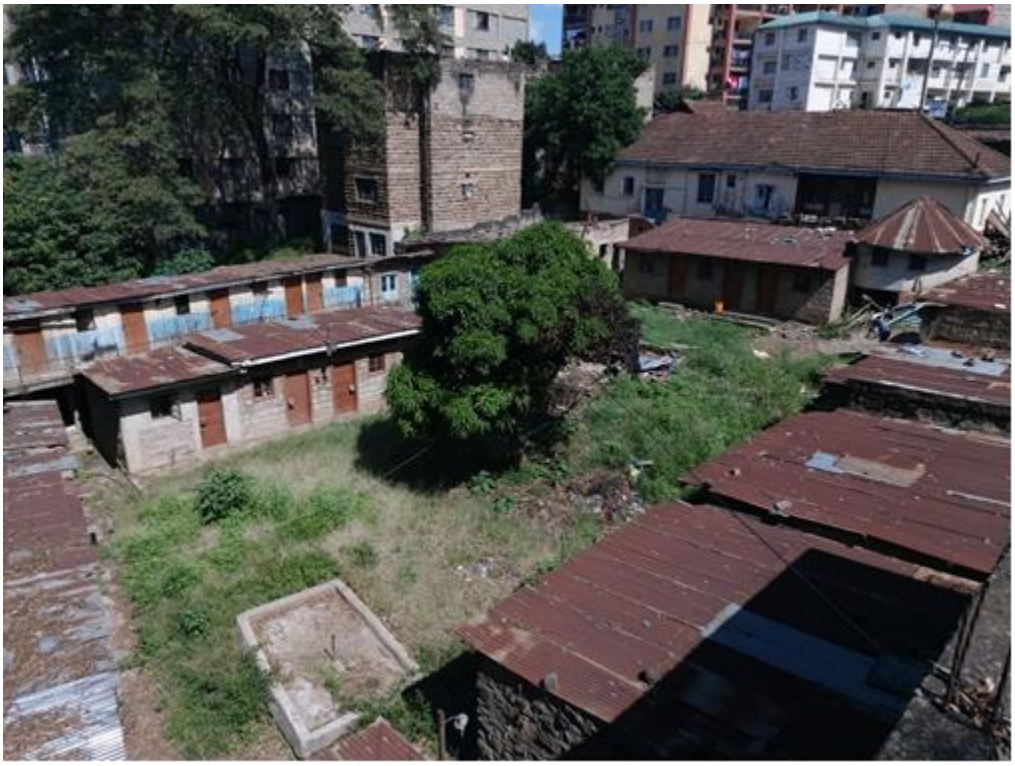
ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED BLOCK OF FLATS ON L.R NUMBER 209/2389/12, OFF AGOI ROAD, PANGANI AREA, STAREHE SUB COUNTY, IN NAIROBI COUNTY.



PROPONENT

Edwin Gicho Kinyanjui

P.O Box 6184 – 00100,

Nairobi, Kenya.

REPORT BY:

KINGS-LINK VENTURES KENYA LIMITED.

P.O. Box 13288– 00100

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DECLARATION

NEMA EXPERTS

Kings-Link Ventures Kenya Limited on behalf of the Proponent, submit the following Environmental Impact Assessment Study Report, for the **proposed Block of flats off Agoi road on L.R Number 209/2389/12, Pangani area, Starehe Sub County in Nairobi County**. The Environmental Impact Assessment Study has been carried out according to the Environmental Management and Coordination Act, 1999 and Environmental (Impact Assessment and Audit) Regulations, 2003.

FIRM OF EXPERTS:

Kings-link ventures Kenya limited.

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Signed: _____ **Date:** _____

For KINGS-LINK VENTURES KENYA LIMITED

PROPONENT

Edwin Gicho Kinyanjui
P.O Box 6184 – 00100,
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CONTACT PERSON
Robert Kinyanjui Gicho
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Signature_____Date _____

ACRONYMS

DGs	Diesel Generators
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMCA	Environmental Management Coordination Act
EMP	Environmental Management Plan
EMS	Environmental Management System
Ha	Hectare
HFCs	Hydro fluorocarbons
ICs	Inspection Chambers
ICT	Information Communication Technology
IEA	Initial Environmental Audit
KPLC	Kenya Power and Lighting Company
KRA	Kenya Revenue Authority
MDGs	Millennium Development Goals
MOH	Ministry of Health
NCC	Nairobi City County
NEAP	National Environment Action Plan
NEC	National Environment Council
NEMA	National Environment Management Authority
NPEP	National Poverty Eradication Plan
NW&SC0	Nairobi Water & Sewerage Company
PVC	Polyvinyl Chloride
SHE	Safety, Health and Environment
TOR	Terms of Reference
WRMA	Water Resources Management Authority
WSB	Water Services Board
WSRB	Water Services Regulatory Board

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EXECUTIVE SUMMARY

Introduction

Kings link ventures Kenya limited who are a NEMA registered experts and was contracted by the proponent Edwin Gicho Kinyanjui to carry out an Environmental Impact Assessment for a proposed block of flats in Pangani area of Nairobi County. This is to comply with the Legal requirement stipulated in the Environmental Management and Coordination Act 1999 and the subsequent Legal supplement of 2003.

The proponent is proposing to construct a sixteen floors block of flats with two basement parking. The proposed development will comprise of 135 No. Two bedroom Units, 60 No. one bedroom units and two level basement parking.

Environmental Impact Assessment is a tool for environmental Planning and has been identified as a key component in new project implementation. According to section 58 of the Environmental Management and Coordination Act (EMCA) No.8 of 1999 second schedule 9 (1), and Environmental (Impact Assessment and Audit) regulation, 2003, new projects must undergo Environmental Impact Assessment. The Report of the same must be submitted to National Environment Authority (NEMA) for approval and issuance of relevant certificates. 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.

Impacts and Mitigation Measures

Adequate environmental management systems will be incorporated during the entire planning, construction and operating stages of the project to minimize any adverse environmental impacts and assure sustainable development of the area. A Summary of major impacts and mitigation measures is presented in the Table below.

Positive impacts	Impact Description
Employment Opportunities	The construction and operation of the proposed Project are expected to offer employment opportunities; These range from unskilled, casual workers, semi-skilled and formal employees.
Impacts on local and national economy	Gains in the local economy will result from the utilization of locally available materials including: building stones, iron sheets, timber, bricks, paint, electrical cables, water storage equipments, water pipes, steel, glasses, fencing posts, sand, cement, fuels, etc. and paying of taxes to the government.
Optimal land use	Change in land use from underutilized land to land on which a modern development stands will optimize land use in the Area
Improved Infrastructure	The operation of the proposed Project may induce improvements in infrastructure around the facility e.g.:- improved roads, electricity connection, regular maintenance of roads, storm water drainages and power lines around the building and environs

Negative Impacts	Mitigation Measures

Noise and vibrations Generation	• Comply with maximum permissible noise levels for constructions sites as per Second Schedule of the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 • Apply for a License from NEMA whereby maximum permissible noise levels are to be exceeded • Prescribe noise reduction measures e.g. restricted working hours, transportation hours and noise buffering; • Install portable barriers to shield compressors and stationary equipment where necessary and locate stationary noise sources as far from existing sensitive receptors as possible; • Use quiet equipment (i.e. equipment designed with noise control elements such as mufflers)
Air pollution (dust and exhaust emissions)	• Provide 2.4 meter high hoarding along site boundary • Provide effective dust screen, sheeting or netting where a scaffolding is erected around the perimeter of the building • Any skip hoist for material transport shall be totally enclosed by impervious sheeting • Water all active construction areas when necessary • Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard; • Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction site; • Down wash of trucks (especially tyres) prior to departure from site • Use of electrically operated construction machinery to avoid externalities produced by diesel engines
Health and safety Risks	• Security shall be enhanced by ensuring security guards are always posted within and around the project site and strategic placement of security lights around the site. • A roster of all construction workers shall be kept while measures shall be put in place to ensure that loitering by itinerant workers is Discouraged • Unattended public access to the construction site shall be restricted and only one entry/exit point shall be used • Appropriate health and safety measures shall be implemented as per the OSHA Act 2007 • Warning signs should be placed in appropriate places. • Safety education and training of the construction workers should be undertaken. • Appropriate Personal Protective Gear shall be worn at all times by all within the construction site including visitors • Install appropriate fire management equipment
	• A barricade at least 3 feet high must be erected around a trench that is 1 meter or more deep

Deep trenching/ excavation risks	• Excavated material should not be placed less than 4 feet from the edge of a trench to minimize risk of collapse due to the weight of the spoil • Where a possibility of collapse or cave of an excavation exists, it should be shored, shielded , benched or battered to prevent the collapse or cave-in. • Ladders must be provided no more than 20 meters apart in the area where excavation works are being carried out
Soil erosion and water logging	• Terrace, level and rip off compacted areas of the project site to reduce run-off velocity and increase infiltration of storm water into the soil • Dig trenches and cut off drains to channel runoff into existing peripheral storm water drains • Surface runoff should be harvested where applicable for reuse during construction works
Waste generation	• Use durable, long-lasting materials that will not need to be replaced often, thereby reducing the amount of construction waste generated over time; • Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements; • Use building materials that have minimal packaging to avoid the generation of excessive packaging waste; • Use construction materials containing recycled content when possible and in accordance with accepted standards • Ensure adequate collection and storage of waste on site and safe transportation to licensed disposal sites by licensed waste Handlers
Increased traffic	• Any work that disturbs normal traffic signal operations shall be coordinated with the relevant authorities • Ensure that the Entry/Exit to the project site is located where it will cause minimal traffic along Agoi Road • Ensure all construction vehicles to and from the construction site use the designated Entry/Exit to the project site • All transportation of construction raw materials and excavated materials are to be conducted at traffic off peak hours only • Cover all trucks hauling soil, sand and other loose materials to avoid spillage and dust emissions that may interfere with smooth Motoring • "NO PARKING" signs will be posted around the building where Parking is prohibited and likely to cause obstruction as well as other necessary traffic signs • Traffic management/parking personnel shall be provided to monitor parking and ensure smooth motoring along the buildings adjacent roads
	• Promote awareness on water conservation and reducing water

Increased water Demand	Wastage • Reduce water delivery in taps, through the installation of low flow devices or aerators on taps • Press action taps, flush valves and urinal sensors shall be used to minimize water wastage in public washrooms • Install water efficient plumbing.
Increased Energy Demand	• Improve lighting efficiency by efficient window placement during project design (day-lighting) • Identify and use equipment/systems having minimum energy Consumption • Audit energy use occasionally use alternative energy sources such as solar power

Conclusion

Considering the proposed location, construction, management and mitigation measures that will be put in place and the project's contribution in the provision of quality facility and creating employment opportunities its implementation is considered important and beneficial.

The key effort should be geared towards safeguarding the environment. This can be effectively overcome through close following and implementation of the recommended Environmental Management Plan.

1 INTRODUCTION

1.1 Background and rationale for an Environmental Impact Assessment (EIA)

The proponent is proposing to construct a block of flats on L.R No 209/2389/12 located off Agoi road in Pangani area, Starehe Sub County Nairobi County. The proposed development will comprise of 135 No. Two bedroom Units, 60 No. one bedroom units and two level basement parking.

According to Sections 58 and 138 of the Environmental Management and Coordination Act (EMCA) of 1999 and Part II and III of the Environmental (Impact Assessment and Audit) Regulations 2003 (Legal No. 101), construction of the proposed development requires an Environmental Impact Assessment Report prepared and submitted to the National Environment Management Authority (NEMA) for review and eventual Licensing before the development commences.

1.2 Terms of reference (TOR)

The TOR for this assessment is based on the Environmental (Impact Assessment and Audit) Regulations dated June 2003. According to the Regulations the Study Report should where possible, contain description of the following: -

- Description of the nature of the proposed project;
- The location of the project including the physical area that may be affected by the project's activities;
- The activities that shall be undertaken during the project construction, operation and decommissioning phases;
- The design of the project;
- The materials to be used, products and by-products, including waste to be generated by the project and the methods of their disposal;
- The potential environmental impacts of the project and the mitigation measures to be taken during and after implementation of the project;
- An action plan for the prevention and management of possible accidents during the project cycle;
- A plan to ensure the health and safety of the workers and neighbouring communities;
- The economic and socio-cultural impacts to the local community and the nation in general;
- The project budget; and
- Any other information the Authority (NEMA) may require

1.3 Scope and objective of the environmental impact assessment

1.3.1 Scope

The Kenya Government policy on all new projects, programmes or activities requires that an environmental impact assessment be carried out at the planning stages of the proposed undertaking to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation and decommissioning of the facility. The scope of this Environmental Impact Assessment, therefore, covered:

- The baseline environmental conditions of the area,

- Description of the proposed project,
- Provisions of the relevant environmental laws,
- Identification and discussion of any adverse impacts to the environment anticipated from the proposed project,
- Appropriate mitigation measures,
- Provision of an environmental management plan outline.

1.4 Methodology of the environmental impact assessment

1.4.1 Data collection procedures

Data collection was carried out through administration of questionnaires, use of checklists, observations and photography, site visits and desktop environmental studies, where necessary, in the manner specified in Part V (Section 31-41) of the Environmental (Impact Assessment and Audit) Regulations, 2003.

1.4.2 Desktop study

This included documentary review on the nature of the proposed activities, project documents, Nairobi County Development Plan, and relevant legislative and regulatory frameworks among others. It also included discussions with the developer, project managers, architects and design engineers.

1.4.3 Site assessment

Field visits were carried out specifically for physical inspection of the proposed project site characteristics and the environmental status of the surrounding areas to determine the anticipated impacts. It also included taking photographs of the proposed site, access roads that will be used to access the site and other important features within the site and the surrounding areas.

1.4.4 EIA public consultation

To ensure adequate public consultation in the EIA process, the Consultant prepared questionnaires which were administered to the sites neighbours within a one Kilometer radius and the information gathered was subsequently synthesized and incorporated into the EIA Study Report. The appendices contain random sample copies of the completed questionnaires that were administered and the public meeting attendance register.

1.4.5 Reporting and documentation

A comprehensive EIA Study Report containing the findings has been compiled by the Consultant in accordance with NEMA guidelines and submitted to NEMA by the Firm of Experts on behalf of the proponent for consideration and approval. The Consultant ensured constant briefing of the client during the exercise. Description plans and sketches showing various activities are part of the Appendices.

1.5 Obligations of the consultant

The Consultant undertook all the works necessary to produce the Environmental Study Report and the supporting details for submission to NEMA. In order to do this, the Proponent provided a contact person to provide information required by the Consultant and background information of the proposed project. The Proponent also provided copies of land ownership, design drawings and estimated project cost. Copies of the land title deeds of the proposed site and design drawings are appended within the Appendix of this study Report.

2 PROJECT DESCRIPTION

2.1 Project brief

Edwin Gicho Kinyanjui is proposing to construct a block of flats at L.R Number 209/2389/12, off Agoi road Pangani area in Starehe Sub County, Nairobi County. The proposed development will comprise of 135 No. Two bedroom Units, 60 No. one bedroom units and two level basement parking.

2.2 Location and size of the project

The proposed project site is located in a Land Parcel identified as L. R. No. 209/2389/12 and covers a total area of Nought Decimal One Nine Four Three (0.1943) Hectares (approx. 0.4801 Acres). The proposed project site GPS coordinates are 1 15’ 50.61’’ S and 36 50’ 23.52’’ E and it is situated within Pangani area in Nairobi County. The projects plot fronts Agoi road.

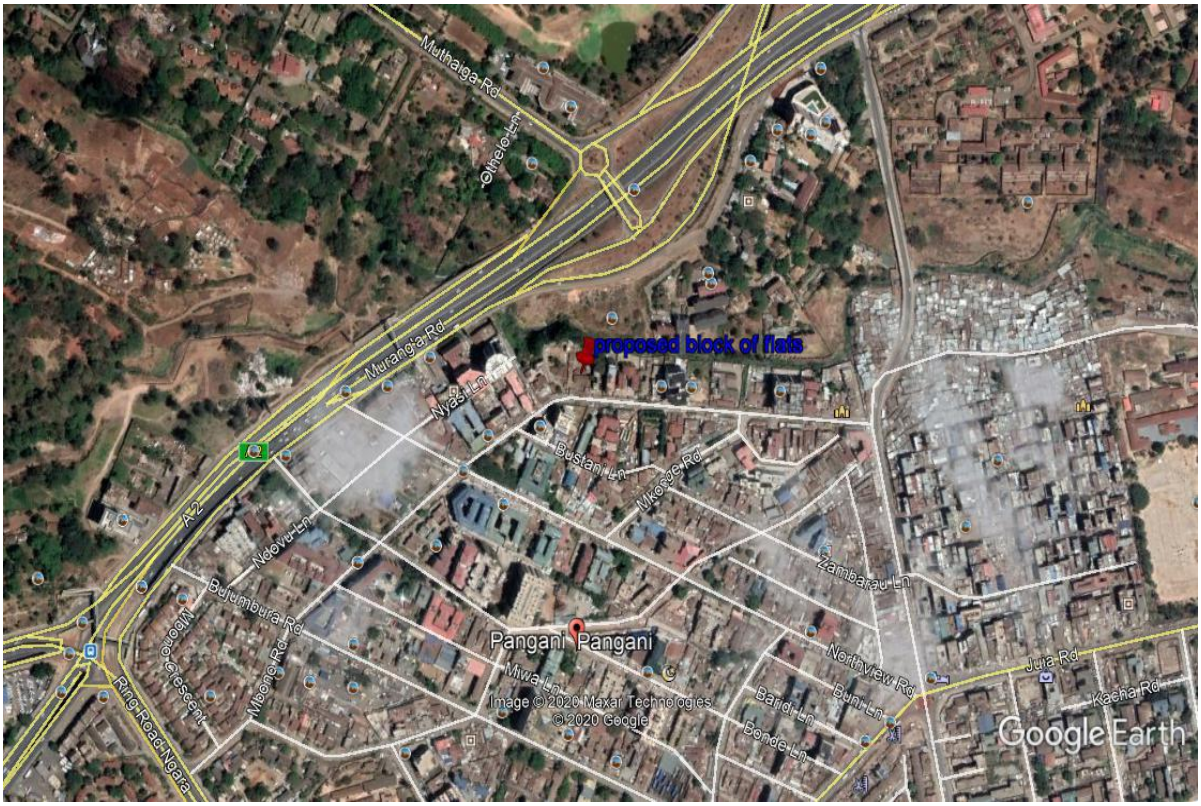

Figure 1: Google earth extract of the proposed project

Table 1: Project description and details

	ITEM		DETAILS
1	Proponent		**Edwin Gicho Kinyanjui**
2	Project Description		**Proposed block of flats**
3	Main components		**135 N0. Two bedroom Units, 60 No. one bedroom units and two level basement parking.**
6	Plot LR. No.		**209/2389/12**
7	Plot Size		**0.1943 Hectares**
8	Access road/street		**Agoi road**
9	General area		**Pangani area, Nairobi County**
10	GPS Coordinates	Latitude	**1 15' 50.61'' S**
		Longitude	**36 50' 23.52'' E**
11	Distance from Nairobi CBD		**4 km**
12	Notable neighbours		**Several block of flats, apartments, single dwellings, medium and small businesses.**
13	Available infrastructure		**Tarmac access road** **KPLC mains** **NW&SCo piped water mains** **NW&SCo sewer mains**
14	Structures on site		**Old residential houses**
15	Vegetation on site		**1 No. medium sized mango tree**

2.3 Existing Structures

There are existing vacant residential old houses in the compound which will be demolished to pave way for the proposed project.

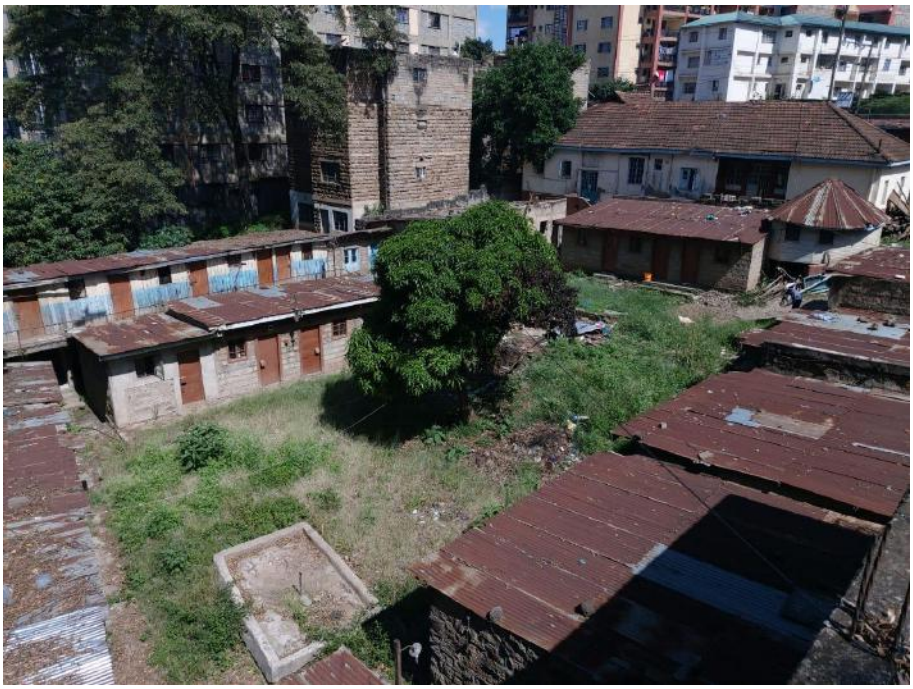

Figure 2: Proposed plot

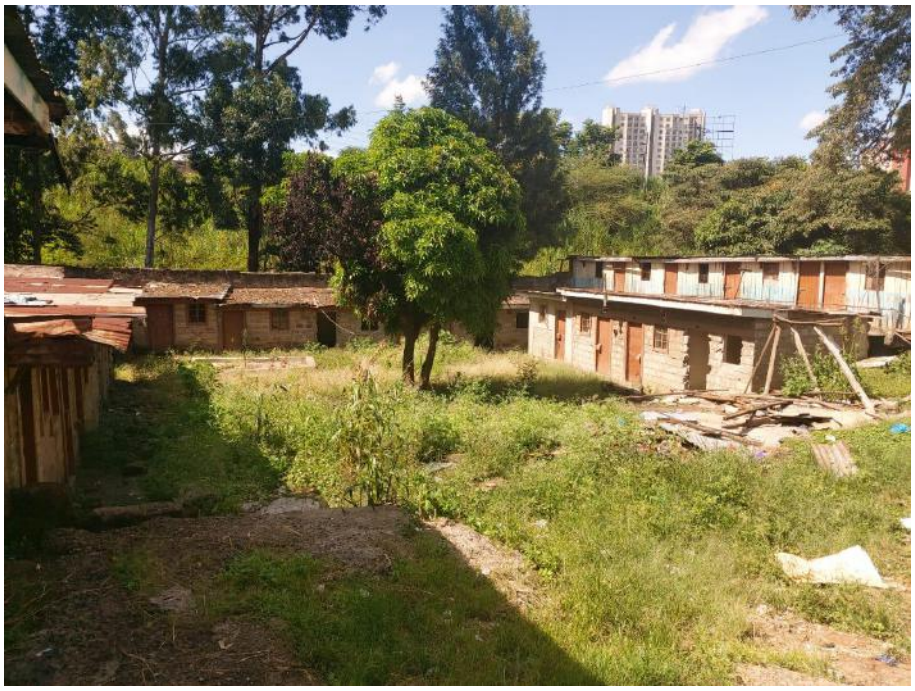

Figure 3: Other Views of the plot

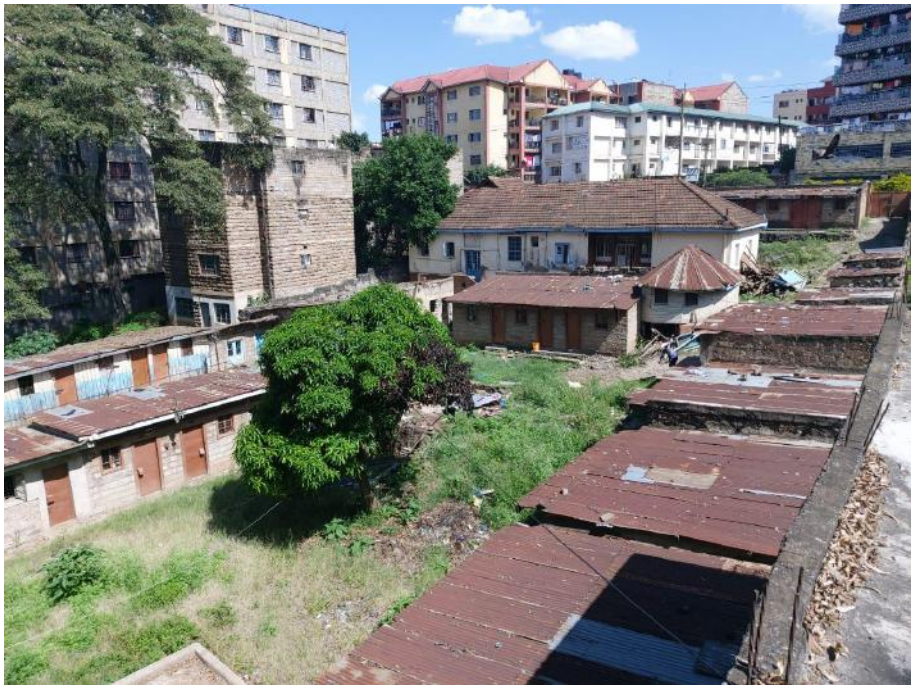

Figure 4: Showing existing structures on the plot

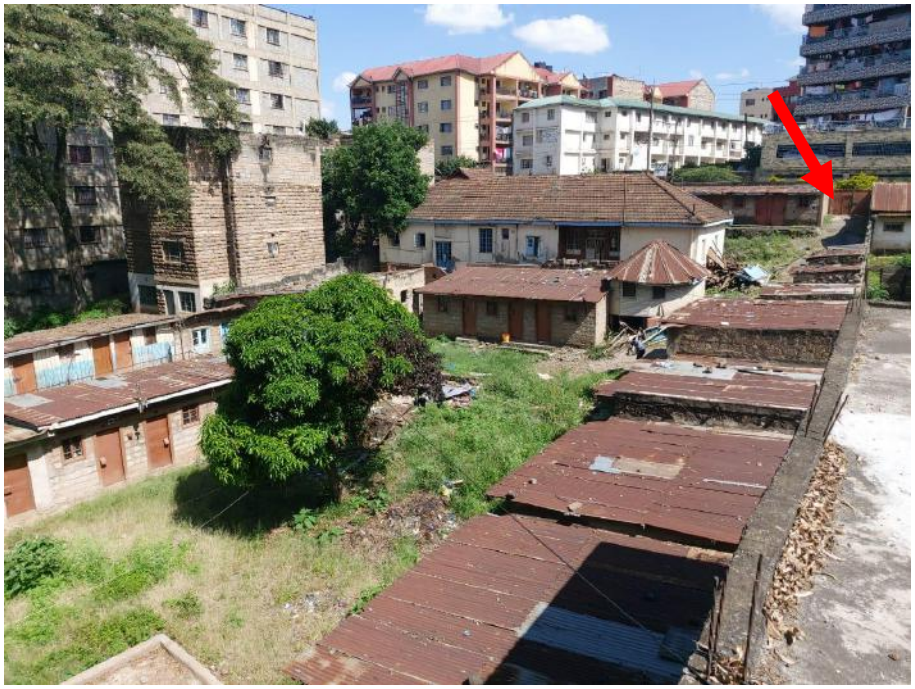

Figure 5: Access to the property

2.4 Character of surrounding environment

Pangani is characterized by multi and single dwelling units, small and medium business enterprises.

2.5 Building particulars

In general, the design of the project will essentially optimize the use of best available technology to prevent or minimize potentially significant environmental impacts associated with the project and to incorporate efficient operational controls together with trained staff, to ensure high level business and environmental performances.

Specific details of the proposed development are outlined in the proposed projects Architectural Drawings containing the site plan, layouts, sections, elevation and other plans that illustrate the development in more detail attached within the appendices.

2.5.1 Parking area and driveway

Parking will be provided in two basements of the building. All parking areas and driveways will be concrete screed or paved using concrete paving blocks. A gate house will also be provided at the building entry/exit for sentries to control and monitor the ins and outflow of vehicles.

2.5.2 Electrical system

The development will be connected to the electricity main line of the Kenya Power and Lighting Company which already exists within the project area and thus will be used in all phases of the project. It is also expected that a generator(s) will be installed within the development once complete. The necessary guidelines and precautionary measures relating to the use of electricity shall be adhered to.

2.5.3 Security

Security within and around the project during construction and during operational phases will be enhanced by security guards posted at the site and installation of security lighting around the project site. During operation, 24-hour security will be incorporated by having security guards on site, radio call security alarms systems, closed circuit television surveillance and security lighting around and within the premises.

2.5.4 Health and Safety systems

Several health and safety implements will be incorporated into the project design so as to boost the emergency response and preparedness index of the building. Hose reels shall be located at several strategic points.
Portable fire extinguishers and smoke detectors shall be incorporated at strategic points. Emergency response and “Emergency Exit” and fire exit notices will also be posted where applicable and appropriate.

2.5.5 Water reticulation system

Water from the Nairobi Water & Sewerage Company will be used during the construction phase of the project. Underground water reservoir tanks shall be built on site while overhead water tanks

shall also be used to increase water storage capacity within the project. Necessary pumps shall be installed to facilitate water pumping into overhead tanks.

2.5.6 Storm water run-off

All storm water drainage will be channeled into storm water drains which will be constructed within the project surroundings and within the basement car parks. The drains will then be channeled to the nearby existing peripheral NCC storm water drainage systems. All inspection chambers in the driveway and parking will have heavy duty covers.

2.5.7 Waste water/Sewerage

Foul water drainage from the building block will be connected to the Nairobi Water & Sewerage Company (NW&SCo) main sewer line running along the right bank of Mathare river. All sanitary works will be up to ministry of health standards.

2.5.8 Landscaping

The project site will be landscaped after construction, using plant species available locally.

2.6 Description of the project's construction activities

2.6.1 Pre-construction investigations

The implementation of the proposed project's design and construction phase will start with thorough investigation and studies of the site's biological, physical and socio-economic factors in order to minimize any unforeseen adverse impacts during the project cycle. Infrastructure assessment studies shall also be conducted so as to harmonize the proposed project with existing infrastructure and amenities.

2.6.2 Sourcing and transportation of building materials

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

2.6.3 Storage of materials

Building materials such as rough stones, ballast, sand and steel will be carefully piled on site. To

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

2.6.4 Site set up and management

This involves activities such as screening, fencing the project site, setting up temporary offices, construction of temporary roads, car parks, storage areas etc.

2.6.5 site clearance

Site clearance process entails any obstruction on the way of the intended construction activity. This entails clearing of obstructions including vegetation that may lie within the proposed project path. The existing structures will be demolished and this will result in significant generation of solid waste generation which should be disposed by using appropriate methods to be identified within this report.

2.6.6 Ground works

Ground works such as excavation and deep trenching, filling, and the construction of earth structures e.g. embankments, bunds and cuttings; will be carried out to prepare the site for construction of foundations and drainage systems. This may involve the use of machinery such as excavators, and also manual labour.

2.6.7 Construction of foundations and structural works;

The construction of the buildings foundations, walls, floors, pavements, drainage systems and parking area among other components of the proposed project will involve a lot of masonry work and related activities. General masonry and related activities will include concrete mixing, plastering, slab construction, construction of foundations, construction of the envelope of the building, the external facings, cladding, erection of building walls and curing of fresh concrete surfaces. These activities are known to be labour intensive and will be supplement by machinery such as concrete mixers, tower hoists, pavers, concrete vibrators.

2.6.8 Structural steel works and roofing

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

2.6.9 Mechanical and electrical installations and associated trades

Electrical work during construction of the buildings will include installation of electrical gadgets and appliances including transformers, generators, meters, electrical cables, lighting apparatus, sockets

etc. In addition, there will be other construction activities involving the use of electricity such as welding, metal cutting, running electrical gadgets etc.

Plumbing will entail the installation of pipe-work for water supply and distribution will be carried out within the building and associated facilities. In addition, pipe-work will be done to connect the building into the existing sewer system and for drainage of storm water from the rooftops and driveways into the peripheral storm water drainage system.

Other associated trades include as joinery, painting, window placement and plastering. These activities will include metal, wood, glass, plastic and ceramic tiles cutting, the use of adhesives, metal grinding and wall drilling among other activities.

2.6.10 Landscaping and habitat restoration or creation

To improve the aesthetic value or visual quality of the site once construction ceases, landscaping will be carried out. This will include establishment of flower gardens and sidewalks to improve the visual quality of the site. The use top soil and indigenous plant species that are available locally is preferable.

2.6.11 Site reinstatement, removal of site offices and final clear away

This includes site reinstatement, removal of temporary building structures such as scaffolds and props, removal of fittings machinery and equipment and final clear away of surplus spoil.

2.6.12 Winding up construction

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

2.7 Description of the project's operational activities

2.7.1 Emission and waste management

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

1) The proponent to provide refuse storage chambers for temporarily holding waste before final collection and disposal in compost pit or by a NEMA licensed contractor;

2) Sewage generated from the premise will be discharged into sewer line which will be upgraded.

3) The rooftop water can be harvested for use or channeled as part of storm water.

4) The storm water from the project area will be channeled into the drainage systems which will be upgraded in the whole area.

5) The building will also be cleaned regularly by the occupants and will involve sweeping, waste collection, and mopping among others.

2.7.2 Commercial activities

Once completed, the block of flats will offer two bedroom units for letting. It will also provide employment to various people including security guards, property manager and care taker, cleaners etc.

2.7.3 Partitioning, general repairs and maintenance

The building and associated facilities will be repaired and maintained regularly during the operational phase of the project. Such activities will include repair of building walls and floors, repair and maintenance of electrical gadgets and equipment, repairs of leaking water pipes, painting, maintenance of flower gardens and replacement of worn out materials among others. The buildings will be maintained regularly during the operation and will include activities such as repair of buildings walls and floors, altering and refurbishing of the building to the modern way, repair of electrical gadgets such as lighting apparatus and equipment, repairs of leaking water pipes, blocked sewage system, painting, among others.

2.7.4 Housekeeping

Regular cleaning (sweeping, mopping, vacuuming, polishing etc.) of the buildings floors, carpets, pavements and general compound is expected to be carried out during the operational phase of the project

2.7.5 Construction material handling

Most construction works take in considerable amounts of artificial and natural material. The materials to be used have to conform to KEBS requirements for quality. Some building materials such as building blocks, sand and ballast will be kept outdoors at the site while others such as cement, nails and paints will be kept in indoors in lockable stores to be established at the site since they are easily destroyed by rains or direct sunshine and are vulnerable to theft because they can easily be carried away. A store will be made of iron sheet walling and roof. The iron sheets will be supported on

wooden posts.

Handling of all hazardous chemicals will be done in accordance with their manufacturers' instructions as outlined on their material safety data sheets. Usage of materials has both beneficial and adverse impacts on the environment. Both on-site and off-site impacts are also anticipated from extraction and usage material. The most common of these impacts are income circulation in the economy, creation of employment opportunities, off-site depletion of materials, land degradation, pollution, excessive demand on materials and health hazards. Sources of construction materials depend on the contractual agreements between the proponent and the contractors, their availability and the priorities of the person sourcing the material. Provisional sources of construction material and their uses have been given remaining building materials from the site. The materials like sand and cements would be sieved to be used for other purposes such as the ground floor plastering.

Table 2: Summary of the main construction material input into the proposed project

Materials	Sources	Uses	Impacts	Mitigation
Sand	Suppliers near the proposed sites	Preparation of concrete for joining masonry stone and aggregate	Off-site depletion of raw materials and land degradation especially destruction of the river beds	Re-evaluation of the project to ensure that the design optimizes the use of sand A detailed material plan should be prepared as part of the initial design review
Stones	Suppliers near the proposed site	Reinforcement of the floor	Off-site land degradation Resultant solid wastes Excessive consumption of raw materials	Re-evaluation of the project to ensure that the design optimizes the use of blocks The structural engineer ensure all the stones used are fit for the project
Building stones	Suppliers near the proposed sites e.g Ndarugu	External walling works	Off-site land degradation Resultant solid wastes Excessive consumption of raw materials	Re-evaluation of the project to ensure that the design optimizes the use of blocks

Soil	From site after excavations	Levelling, refilling and landscaping works	Resultant solid wastes and dust pollution	Careful planning landscaping programme Spraying dusty areas with water. It should be done moderately to ensure the neighbours are not interfered.
Cement	Hardware shops near the proposed site	Preparation of concrete for joinery purpose and making ballast for reinforcement concrete	Excessive consumption of cement Off-site depletion of limestone Land degradation Air pollution	Re-evaluation of the project to ensure that the design optimizes the use of cement A detailed material plan should be prepared as part of the initial design review Careful use of cement to avoid unnecessary spills
Ballast and/or hard-core	Suppliers near the proposed site	Preparation of aggregate for making slabs and reinforcement concrete		
Timber	Timber yards near the proposed site	Roofing and making doors	Off-site deforestation and resultant soil erosion	Reforestation Programme Re-evaluation of the project to ensure that the design optimizes the use of timber A detailed material plan should be prepared as part of the initial design review

Poles	Timber yards near the proposed site	Supporting structural works	Off-site deforestation and Resultant soil erosion	Reforestation Programme Re-evaluation of the project to ensure that the design optimizes the use of poles A detailed material plan should be
				prepared as part of the initial design review
Murram	Suppliers near the proposed site	Backfilling of excavated sections		
Steel bars	Hardware shops near the proposed site	Reinforcement and casement	Health hazard Excessive demand on steel	Re-evaluation of the project to ensure that the design optimizes the use of steel bars Re-using and recycling of waste metals Practice effective occupational health and safety practices. Careful handling of glass

Glass	Hardware shops near the proposed site	For glazing windows	Health hazard Heavy demand of glass Resultant solid wastes	Re-evaluation of the project to ensure that the design optimizes the use of glass A detailed material plan should be prepared as part of the initial design review
PVC material such as pipes	Hardware shops near the proposed site	For water and waste water piping systems	Non-biodegradable solid wastes and resultant breeding grounds for rats and disease vectors such as mosquitoes	Re-using and recycling of wastes Proper handling of wastes

Nails	Hardware shops near the proposed site	For joinery and roofing purposes	Cause injuries to the workers if not stored in an enclosed room	Use of the nails careful to avoid accidents and injuries
Gravel	Quarries within Kiambu and Nairobi and its environs	Preparation of aggregate for making ballast	Off-site depletion of gravel land degradation	Re-evaluation of the project to ensure that the design optimizes the use of gravel A detailed material plan should be prepared as part of the initial design review
Paint	Hardware shops near the proposed site	For colourful external and internal finishes	Health hazard Excessive use of paint Resultant pollution	Careful use of paint to avoid unnecessary spills Re-evaluation of the project to ensure that the design optimizes the use of paint Practice effective occupational health and safety
Paving blocks	Will be made on site	Making pavements	Excessive use of cement, sand and gravel Solid waste from broken blocks	Re-evaluation of the project to ensure that the design optimizes the use of paving blocks Re-using wasted blocks to fill road potholes or other hollow area

Water	Borehole at the site and NCWSCO water supply	Input in the construction works for dust suppression and preparation of concrete and aggregate and cleaning	Excessive consumption in of water Waste water and pollution Conflicts with other water users in the area	Regular maintenance of pipes and taps to fix leakages Maximization on other sources of water such as rainwater harvesting and storage in larger tanks

2.8 Description of the project's decommissioning activities

2.8.1 Demolition works

Upon decommissioning, the proposed project components including the building, pavements, drainage systems, parking areas and perimeter fence will be demolished.

2.8.2 Dismantling of equipment and fixtures

All equipment including electrical installations, furniture partitions, pipe-work and sinks among others will be dismantled and removed from the site on decommissioning of the project.

3 BASELINE INFORMATION

3.1 Background information on the project area

Nairobi city is located at 1°17'S 36°49'E / 1.283°S 36.817°E / -1.283; 36.817 and occupies 684 square kilometers. Nairobi is situated between the cities of Kampala and Mombasa. As Nairobi is adjacent to the eastern edge of the Rift Valley, minor earthquakes and tremors occasionally occur. The Ngong hills, located to the west of the city, are the most prominent geographical feature of the Nairobi Area. Mount Kenya is situated north of Nairobi and Mount Kilimanjaro is towards the south-east. Both mountains are visible from Nairobi on a clear day.

Nairobi's western suburbs stretch all the way from the Kenyatta National Hospital in the south to the UN headquarters and Gigiri in the north, a distance of about 20 kilometres. The city is centred on the City Square, which is located in the Central Business District. The Kenyan Parliament buildings, the Holy Family Cathedral, Nairobi City Hall, Nairobi Law Courts and the Kenyatta Conference Centre all surround the square.

3.2 Physical and Topographic Features

The terrain in the eastern side of Nairobi County is gently rolling but divided by steep valleys towards the City boundaries. To the north, there is the Karura forest which is characterized by steep sided valleys. The Karen - Langata area is characterized by plains surrounded by Nairobi National Park on the east and Ngong Forest on the south. The Nairobi River and its tributaries traverse through the Nairobi County. Several streams with steep-sided valleys covered with vegetation are a dominant landscape feature of Nairobi County. The main rivers in are Nairobi River, Ngong River and Kabuthi River. These rivers are highly polluted as open sewers and industrial waste is directed towards them. The main types of soils are the black cotton and the red soils that form patches in different parts of the County.

3.3 Ecological Conditions

Nairobi County is predominantly a terrestrial habitat that supports a diverse web of biodiversity ecosystems. It is home to about 100 species of mammals, 527 bird species and a variety of plant species. Although it is endowed with some permanent rivers, the aquatic ecosystems are largely choked by the effects of pollution from different sources. Currently, efforts are underway to ensure a sustainable clean Nairobi River Basin.

3.4 Climatic Conditions

Nairobi County has a fairly cool climate resulting from its high altitude. Temperature ranges from a low of 10^0C to a high of 29^0C. It has a bi-modal rainfall pattern. The long rains season fall between March and May with a mean rainfall of 899 millimeters (mm) while the short rains season falls between October and December with a mean rainfall of 638 mm. The mean annual rainfall is 786.5 mm.

At 1,795 metres (5,889 ft) above sea level, Nairobi enjoys a moderate climate. The altitude makes for some chilly evenings, especially in the June/July season when the temperature can drop to 10 C. The sunniest and warmest part of the year are from December to March, when temperatures average the mid-twenties during the day. The mean maximum temperature for this period is 24 C.

There are two rainy seasons but rainfall can be moderate. The cloudiest part of the year is just after the first rainy season, when, until September, conditions are usually overcast with drizzle. As Nairobi is situated close to the equator, the differences between the seasons are minimal. The seasons are referred to as the wet season and dry season. The timing of sunrise and sunset varies little throughout the year, due to Nairobi's close proximity to the equator.

3.4.1 Average daily temperatures

The average daily temperature throughout the year (**See Table below**) varies slightly from month to month with average temperatures of around 17 degrees Celsius during the months of July and August to about 20 degrees Celsius in March. But, the daily range is much higher, with the differences between maximum and minimum temperatures each day around 10 degrees in May and up to 15 degrees in February. Between the months of June to September, southeast winds prevail in the coastal parts of Kenya and last up to several days without a break. The clouds cause day temperatures to remain low and most times the maximum temperature stay below 18 degrees Celsius. The minimum temperatures also remain low during cloudy nights, usually hovering around 8 degrees Celsius and sometimes even reaching 6 degrees Celsius. Clear skies in January and February also bring colder nights. The highest temperature ever reached in Nairobi was 32.8 degrees Celsius and the lowest was 3.9 degrees Celsius.

3.4.2 Average rain amounts

With these routinely high relative humidity figures, it is not surprising that the Nairobi climate is one that produces much rain annually. In fact, from the past 50 years, the expected amount of rain could be anywhere in the range of 500 to 1500 mm, with the average ringing in at 900 mm. The majority of these rainfall figures crash down in Nairobi in one major and one minor monsoon seasons respectively. The major monsoon season occurs within the months of March to May, and is called the “Long Rains” by the locals. The minor monsoon seasons emerges within the October to December Months, and is called the “Short Rains” by the Nairobi citizens. That is what the meteorologists as a whole know about the monsoon seasons. What they do not know is exactly when these seasons will start. There is usually not an indication of when these rainy seasons will start, since it is difficult to determine when one starts and when the other finishes. Consequently, a person may think there is only one rainy season when looking at the annual rainfall amounts

Table 3: Nairobi’s average temperature and Precipitation

Weather averages for Nairobi

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average high °C (°F)	24.5 (76)	25.6 (78)	25.6 (78)	24.1 (75)	22.6 (73)	21.5 (71)	20.6 (69)	21.4 (71)	23.7 (75)	24.7 (76)	23.1 (74)	23.4 (74)
Average low °C (°F)	11.5 (53)	11.6 (53)	13.1 (56)	14.0 (57)	13.2 (56)	11.0 (52)	10.1 (50)	10.2 (50)	10.5 (51)	12.5 (55)	13.1 (56)	12.6 (55)
Precipitation mm (inches)	64.1 (2.52)	56.5 (2.22)	92.8 (3.65)	219.4 (8.64)	176.6 (6.95)	35.0 (1.38)	17.5 (0.69)	23.5 (0.93)	28.3 (1.11)	55.3 (2.18)	154.2 (6.07)	101.0 (3.98)

Source: WorldWeather.org 2008

3.5 Administrative Units

Nairobi County is divided into nine sub-counties namely; Starehe, Kamukunji, Kasarani, Makadara, Embakasi, Njiru, Dagoretti, Langata and Westlands. The County has 27 divisions 64 locations and 135 sub-locations as shown in Table below.

Table 4: Areas of Nairobi County Administrative Units

Sub-County	Area(km^2)	Divisions	No. of Locations	No. of Sub-Locations
Starehe	10.6	3	6	12
Kamukunji	14.7	3	9	18
Kasarani	85.7	2	11	24
Makadara	20.1	3	5	11
Embakasi	52.1	3	6	13
Njiru	156.2	3	6	10
Dagoretti	38.7	3	8	16
Langata	223.4	4	7	16
Westlands	97.6	3	6	15
Total	696.1	27	64	135

Source: Provincial Commissioner, Nairobi, 2013

Nairobi is divided into seventeen constituencies; these are Westlands, Dagoretti North, Dagoretti South, Langata, Kibra, Roysambu, Kasarani, Ruaraka, Embakasi South, Embakasi North, Embakasi Central, Embakasi East, Embakasi West, Makadara, Kamkunji, Starehe and Mathare. Most of the upmarket suburbs are situated to the west of Nairobi; these include Karen, Langata, Lavington and Highridge, although Kangemi and Dagoretti are lower income areas. Most low and lower-middle income estates are located in eastern Nairobi and they include Kariokor, Dandora, Kariobangi, Embakasi and Huruma.

3.6 Energy Access

The use of various types of energy is influenced by its cost rather than access. For instance, 63.2% of the population use paraffin as cooking fuel. Other sources of energy for cooking include LPG gas (20.2%), charcoal (10.5%) and firewood (4.8%). About 68.2% of households use electricity as a means of lighting 28.8% use paraffin while 2.9% and 4.7% use grass and dry cells respectively.

3.7 Housing types

The housing type by wall materials in Nairobi County is mainly characterized by stone, brick/block, mud/wood and corrugated iron sheet. The stone and block walled houses account for 65.9 % while wood and corrugated iron sheet account for 34.1 %. The classification by floor type indicates that 75.8 % of household have cement floor, 14.2 % earthen floor, 7.5 % tiles and 2.2 % for those with wooden floor. Most of the households in Nairobi have corrugated iron sheet roofed houses which accounts for 56.6 %. Tiles and concrete roofs account for 12.4 % and 27.9 % respectively.

3.8 Infrastructure and Access

The current road network in Nairobi County is inadequate in terms of coverage to meet current and future demands as envisaged in the Vision 2030. There is heavy congestion on most of the City roads especially during the morning and evening peak hours. There has been increasing number of vehicles; in 2012 Kenya had 4.4 million registered vehicles and 400,000 motorcycles

with a greater number of 60% being used in Nairobi (KNHR, 2013). The total road network covers 553.7 Km: 423Km are of bitumen standard while 54Km and 76.7 Km are gravel and earth roads respectively. The current poor state of road network is a great impediment to socio-economic growth leading to high production costs and low productivity.

The city is a hub of road transport connecting other major towns in the country. The completion of Thika Super highway, by-passes and missing links within will help in reducing traffic congestion. Nairobi County hosts Jomo Kenyatta International Airport (JKIA) which is the biggest Airport in East and Central Africa, and is the focal point for major aviation activity in the region. Its importance as an aviation Centre makes it the pacesetter for other airports in the region. Jomo Kenyatta International airport makes it easy to transport goods from all over the world into the country and vice versa. Bus and train stations are within an easy walk of the City Centre.The County has a railway network of 298Km and a total of 10 functional railway stations which are: Embakasi, Makadara, and Nairobi main terminal, Dandora, Githurai, Kahawa, Kibera, Dagoretti, JKIA and Syokimau. The main railway line runs from Mombasa to Malaba though Nairobi City. This network facilitates transportation of agricultural products from western Kenya to the coast.

3.9 Land Use

The Table below shows the land use type and coverage in Nairobi County. Industrial and commercial land has dwindled in the last decade and most industries have been looking for land in Athi river part of Machakos County.

Table 5: Land use type by area and percentage cover

Land use type	Area (Km^2)	Cover (%)
Residential areas	175.6	25.22
Industrial/ commercial/ service centres	34.8	4.57
Infrastructure	15.9	2.28
Recreation	12	4.72
Water bodies and riverine areas	14.8	4.69
Urban agriculture	96.8	13.9
Open lands	198.8	28.55
Others (including protected areas)	153.6	22.06
Total	696.3	100

Source: GoK/UNEP 2007

In 2012 the projected housing land requirement was estimated to be 250 Km^2. Land meant for urban agriculture has been on the decline as more of it is turned to residential use with the City relying on other counties for supply of food items.

3.10 Industries

Nairobi is the home of major industries which accounts for about 80 % of the total industries in the country. This offers a wide range of employment opportunity for the people within and outside the County. The various industries play a significant role in employment creation. There are 2061 industries in Nairobi County with 422 being in manufacturing. Most of these industries are located in industrial area, Kariobangi and Baba Dogo areas.

3.11 Employment and other Sources of Income

The major economic activities in Nairobi include businesses in informal and formal lines. Some of the investments in the city are industries, farming and office complexes. The city also is a home of a number of international UN organizations for example United Nations Environmental Programme (UNEP) Agency. Due to its population, Nairobi provides numerous opportunities for trade at various scales.

Because of these characteristics, it is considered the commercial centre for Kenya and even East Africa. Owing to its huge economic potential, Nairobi was once the headquarters of the East African Community (EAC). Economic Activities within the proposed project site are Insurance brokers, Media consultancy, Estate holdings and Academic Institutions.

3.11.1 Wage earners

Nairobi commands the largest share of formal sector wage employment in Kenya with a total of 453,000 people. The manufacturing industry accounts for the highest wage employment followed by trade, restaurants and hotels. The construction, transport and communications industry also play key role in generation of wage employment. Other important sectors include finance, real estate and business services. The main formal employment zones in Nairobi are the Central Business District (CBD), Industrial area, along Mombasa Road, along Thika Road, Ngong road and Waiyaki way road.

3.11.2 Self-employed

A large segment of the labour force in Nairobi is self-employed largely in the informal sector with 1,548,100 being employed in this sector. This is about 3.5 times those in wage employment. The informal sector covers small scale activities that are semi-organized, unregulated and uses low and simple technologies while employing few people per establishment. The ease of entry and exit into the informal sector, coupled with the use of low level of technology at all makes it easy avenue for employment creation especially for the youth.

3.11.3 Labour force

According to the Kenya National Population and Housing Census 2009, Nairobi had a labour force of 2,148,605 comprising of 1,034,009 females and 1,114,596 males. Out of the 2,148,605 persons in the labour force, 1,832,751 were classified as employed while 315,844 were seeking for employment. The youthful proportion of the labour force consists of 561,457 males and 648,756 females.

3.11.4 Unemployment levels

The level of unemployment in Nairobi stands at 14.70 % with the female unemployment rate standing at 18.99 % while that of males is 14.55 %. Employment is a major source of income and an important determinant of social and economic outcomes. Holding all other factors constant, households that are most affected by unemployment are more often poor households. Urban poverty and labour force participation are strongly related because earnings in the labour market are the main source of income for urban dwellers. However, participation in the labour market does not guarantee being above the poverty line. The working poor account for a substantial proportion of all the poor in Nairobi. This reflects in part the fact that the poor are employed in low productivity industries, including the informal sector.

3.12 Water and Sanitation

3.12.1 Water Resources and Quality

Nairobi County has no main water tower; most of the supply is from the Tana Basin and is pumped to the City from distances of around 50 Km. This bulk water-supply is not reliable during periods of drought, and is also endangered by siltation of the reservoir due to deforestation in the catchment areas. The supply problem is further aggravated by the poor state of the distribution system, which results in about 50 % losses due to leakage, illegal connection and inefficient and wasteful use of water by some consumers.

3.12.2 Water sources

The main sources of water for the residents in Nairobi County are from Ndakaini Dam in Muranga, Sasumua Dam in Nyandarua, Kikuyu Springs, Ruiru Dam, Thika and Ngethu water works. Although Nairobi River is permanent, its water is unsafe for human consumption. There are residents that use borehole water, wells and roof catchments. Over 80 % of the residents have access to piped water. Various Nairobi enterprise owners and residents have however ventured into the sinking of boreholes within their premises or compounds so as to supplement the water supply whenever there is a shortage or for other credible reasons.

3.12.3 Sanitation

About 64.5 % of the population in Nairobi County use flush toilets as the main waste disposal method, while 32.1 % use pit latrines. The remaining 4.8 % of the population have no means of waste disposal. On garbage collection, 36.1 % of the communities have their garbage collected by private firms and similar percentage is collected by neighborhood community groups.

3.13 Population

Nairobi has experienced some of the highest growth rates of any city in Africa. Since its foundation in 1899, Nairobi has grown to become the largest city in East Africa, despite being the youngest large city in the region. The growth rate of Nairobi is currently 6.9%. It is estimated that Nairobi's day population will reach 5 million in 2015. Nairobi's current day population is estimated at about 3 million. According to the 1999 Census, in the administrative area of Nairobi, 2,143,254 inhabitants lived within 696 km^2. Nairobi is currently the 13th largest city in Africa.

3.14 Environment

Nairobi is well endowed with a pleasant environment that preserves much of its pristine natural beauty. Ponds, seasonal springs, rivers, flooded grasslands, and swamps abound. Unlike other major cities, Nairobi is not situated on a large river or near the sea. Nevertheless, several streams criss-cross the city. Streams running from the Ngong Hills to the south and the ridges to the north become the Athi and Nairobi Rivers.

Other important sources of water for Nairobi are the Chania and Thika Rivers. There is also the manmade Thika dam, which was constructed as a water reservoir. Natural springs feed a number of small swamps in secluded hollows. In addition, temporary wetlands are created with the coming of each rainy season. The planting of eucalyptus trees, however, has drained most of these springs. Nairobi National Park is another preservation of natural environment. It is covered by a highland forest of hardwoods. A spectrum of birds and animals find their home in the park. The park itself was established in 1948 as an effort by the government to preserve the remaining natural beauty of Nairobi.

Nairobi has a bustling population growth. Rapid urbanization and industrialization consume a lot of natural resources, causing alarming environmental degradation. Construction places a very heavy burden on natural resources. Sand is an important construction material; thus, all

rivers in Nairobi have been extensively excavated in search of sand. The result has been serious soil erosion. Timber is also used in construction, causing depletion of forests surrounding the city. Additionally, Nairobi attracts hundreds of new immigrants daily. This has an impact on the environment as service struggles to keep pace with rapid population growth. The city's sewage system frequently breaks down, adversely affecting the environment.

4 RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORK

4.1 Introduction

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 No. 101), new projects 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.

4.2 Environmental Policy Framework

Environmental Impact Assessment (EIA) is a methodology used to identify the actual and probable impacts of the projects and programmes on the environment and to recommend alternatives and mitigating measures. The assessment is required at all stages of project development with a view to ensuring environmentally sustainable development for both existing and proposed public and private sector development ventures. The National EIA regulations were issued in accordance with the provisions of Environmental Management and Coordination Act (EMCA) of 1999. The EIA Regulations must be administered, taking into cognizance provisions of EMCA 1999 and other relevant national laws. The intention is to approve and license only those projects that take into consideration all aspects of concern to the public as they impact on health and the quality of the environment.

4.3 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 issues in the country.

4.3.1 National Environmental Management Authority (NEMA)

The object and purpose for which NEMA is established is to exercise general supervision and co-ordinate over all matters relating to the environment and to be the principal instrument of the government in the implementation of all policies relating to the environment.

a) Provincial and County Environment Committees

According to EMCA, 2015 No. 8, the Ministry by notice in the gazette appoints Provincial and County Environment Committee of the Authority in respect of very province and County respectively. The Provincial and County Environment Communities are responsible for the proper management of the environment within the County in respect of which they are appointed. They are also to perform such

additional functions as are prescribed by the Act or as may, from time to time be assigned by the Minister by Notice in the gazette.

b) Public Complaints Committee

The committee performs the following functions:-

- Investigate any allegations or complaints against any person or against the authority in relation to the condition of the environment in Kenya and on its own motion, any suspected case of environmental degradation and to make a report of its findings together with its recommendations thereon to the Council.
- Prepare and submit to the Council periodic reports of its activities which shall form part of the annual report on the state of the environment under section 9 (3) and
- To perform such other functions and exercise such powers as may be assigned to it by the Council.

c) National Environment Action Plan Committee

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

- Contain an analysis of the Natural Resources of Kenya with an indication as to any pattern of change in their distribution and quality over time.
- Contain an analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational and intra-generational equity.
- Recommend appropriate legal and fiscal incentives that may be used to encourage the business community to incorporate environmental requirements into their planning and operational processes;
- Set out operational guidelines for the planning and management of the environment and natural resources;
- Identify actual or likely problem as may affect the natural resources and the broader environmental context in which they exist;
- Identify and appraise trends in the development of urban and rural settlements, their impacts on the environment, and strategies for the amelioration of their negative impacts.
- Identify and recommend policy and legislative approaches for preventing, controlling or mitigating specific as well as general diverse impacts on the environment
- Prioritize areas of environmental research and outline methods of using such research findings;
- Without prejudice to the foregoing, be reviewed and modified from time to time to incorporate emerging knowledge and realities and
- Be binding on all persons and all government departments, agencies, state Corporation or other organ of government upon adoption by the national assembly.

d) Standard and Enforcement Review Committee

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

e) National Environmental Tribunal

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

f) National Environment Council (NEC)

EMCA 2015 No. 8 part iii section 4 outlines the establishment of the NEC. NEC is responsible for policy formulation and directions for purposes of EMCA; set national goals and objectives and determines policies and priorities for the protection of the environment and promote co- operation among public department, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes.

4.4 Environmental Legal Framework

Environmental Management and Co-ordination Act No. 8 of 1999, provide a legal and institutional framework for the management of the environmental related matters. It is the framework law on environment, which was enacted on the 14th of January 1999 and commenced in January 2002. Topmost in the administration of EMCA is National Environment Council (NEC), which formulates policies, set goals, and promotes environmental protection programmes. The implementing organ is National Environment Management Authority (NEMA). EMCA comprises of the parts covering all aspects of the environment.

Part VIII, section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into aquatic environment. Section 73 requires that operators of projects which discharge effluent or other pollutants submit to NEMA accurate information about the quantities and quality of the effluent. Section 74 demands that all effluent generated from point sources are discharged only into the existing sewages system upon issuance of prescribed permit from the Local Authorities.

4.4.1 Environmental Management and Coordination Act (EMCA), 1999

Environmental Management and Co-ordination Act No. 8 of 1999, provides a legal and institutional framework for the management of the environmental related matters. It is the framework law on environment, which was enacted on the 14th of January 1999 and commenced in January 2002. Topmost in the administration of EMCA is National Environment Council (NEC), which formulates policies, set goals, and promotes environmental protection programmes. The implementing organ is National Environment Management Authority (NEMA). EMCA comprises of the parts covering all aspects of the environment.

The Second Schedule to the Act specifies the projects for which an EIA and environmental audit must be carried out. According to the Act, Section 68, all projects listed in the Second Schedule of the Act must undertake an Environmental Impact

Assessment, keep accurate records and make annual reports to NEMA or as NEMA may, in writing, require. The Environmental (Impact Assessment and Audit) Regulations, 2003, provide the basis for procedures for carrying out Environmental Impact Assessments

(EIAs) and Environmental Audits (EAs).

The main objectives of the Act are to:

- Provide guidelines for the establishment of an appropriate legal and institutional framework for the management of the environment in Kenya;
- Provide a framework legislation for over 70 statutes in Kenya that contain environmental provisions;
- Provide guidelines for environmental impact assessment, environmental audit and monitoring, environmental quality standards and environmental protection orders.

4.4.2 The Environmental (Impact Assessment and Audit) Regulations, 2003

The Environmental (Impact Assessment and Audit) Regulations, 2003 state in Regulation 3 that "the Regulations shall apply to all policies, plans, programmes, projects and activities specified in Part IV, Part V and the Second Schedule of the Act".

Regulation 4(1) further states that:

''…no proponent shall implement a project:

a) likely to have a negative environmental impact; or

b) for which an environmental impact assessment is required under the Act or these Regulations; unless an environmental impact assessment has been concluded and approved in accordance with these Regulations…''

Compliance

- **The Proponent has commissioned the carrying out of an Environmental Impact Assessment for submission to NEMA for approval.**
- **The Proponent undertakes to protect the environment during the implementation (Construction and Operation) of the project and also carry out annual Environmental Audits.**

4.4.3 Waste Management Regulations, 2006

Part II of the Waste Management Regulations 4 (1) states that no person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated receptacle. Regulation 4 (2) further states that a waste generator shall collect, segregate and dispose such waste in the manner provided for under the regulations.

Compliance

- **The proponent has undertaken to ensure that all waste generated is collected and handled appropriately and disposed-off at a designated waste disposal sites**

4.4.4 Noise and Excessive Vibrations Pollution Control Regulations, 2009

Part II section 3(I) of these Regulations states that: no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys,

disturbs, injures or endangers the comfort, repose, health or safety of others and the environment and section 3(2) states that in determining whether noise is loud, unreasonable, unnecessary or unusual. Part II Section 4 also states that: except as otherwise provided in these Regulations, no person shall (a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations which exceed 0.5 centimeters per second beyond any source property boundary or 30m from any moving source. Part III, Section 11(1) states that any person wishing to (a) operate or repair any machinery, motor vehicle, construction equipment or other equipment, pump, fan, air-conditioning apparatus or similar mechanical device; or (b) engage in any commercial or industrial activity, which is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels prescribed in the First Schedule to these Regulations.

Any person who contravenes this Regulation commits an offence. Section 13(1) states that no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations. These purposes include emergencies, those of a domestic nature and /or public utility construction. Section 14 relates to noise, excessive vibrations from construction, demolition, mining or quarrying sites, and states that: where defined work of construction, demolition, mining or quarrying is to be carried out in an area, the Authority may impose requirements on how the work is to be carried out including but not limited to requirements regarding
(a) machinery that may be used, and
(b)the permitted level of noise as stipulated in the Second and Third Schedules to these Regulations. It further states that the relevant lead agency shall ensure that mines and quarries where explosives and machinery used are located in designated areas and not less than two kilometers away from human settlements and any person carrying out construction, demolition, mining or quarrying work shall ensure that the vibration levels do not exceed 0.5 centimeters per second beyond any source property boundary or 30 Metres from any moving source. Regulation 4 of the Noise and Excessive vibrations: - states that except as otherwise provided in the Regulations, no person shall-

(a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or

(b) cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source;

Regulation 11 on Machinery: - states that any person wishing to

(a) operate or repair any machinery, motor vehicle, construction equipment or other equipment, pump, fan, air-conditioning apparatus or similar mechanical device; or

(b) Engage in any commercial or industrial activity, which is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels prescribed in the First Schedule to the Regulations as shown in the table below

Table 6: Maximum permissible noise levels

ZONE		**Sound Level Limits dB(A) (Leq,14 h)**		**Noise Rating Level (NR) (Leq,14 h)**	
A	Silent Zone	40	35	30	25
B	Places of worship	40	35	30	25
C	Residential : Indoor	45	35	35	25
	Outdoor	50	35	40	25
D	Mixed residential (with some commercial and places of entertainment)	55	35	50	25
E	Commercial	60	35	55	25

Compliance

- **The proponent has undertaken to ensure that all noise and vibration are kept below the maximum allowable threshold**

4.4.5 Water Quality Regulations, 2006

Part II of the Water Quality Regulations 4 (1) states that 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 the Act. Regulation 4 (2) further states 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.

Regulation 6 (b) further states that no person shall abstract ground water or carry out any activity near any lakes, rivers, streams, springs and wells that is likely to have any adverse impact on the quantity and quality of the water, without an Environmental Impact Assessment license issued in accordance with the provisions of the Act; or (C) cultivate or undertake any development activity within a minimum of six meters and a maximum of thirty meters from the highest ever recorded flood level, on either side of a river or stream, and as may be determined by the Authority from time to time.

Compliance

- **The proponent undertakes to safeguard any natural water bodies within or near the project site.**

4.4.6 Water Act, 2002

Section 25 (1) of this Act states that a permit shall be required for any of the following purposes:

- any use of water from a water resource, except as provided by Section 26;
- the drainage of any swamp or other land;
- the discharge of a pollutant into any water resource; and
- Any purpose, to be carried out in or in relation to a water resource, which is prescribed by rules made under this Act to be a purpose for which a permit is required.

Part II, Section 18, of this Act provides for national monitoring and information system on water resources. Following on this, Sub-section 3 of the same Section, allows the Water Resources Management Authority (WRMA) to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may be required to be kept by a facility operator and the information thereof furnished to the Authority.

Compliance

- **The proponent undertakes to safeguard any natural water bodies within or near the project site.**

4.4.7 Water Resources Management Rules , 2007 Guideliness

Part IX Section 116 to 118 determines, demarcates and proscribes activities in relation to riparian land. In section 116 (2) Unless otherwise determined by a Water Resources Inspector, the riparian land on each side of a watercourse is defined as a minimum of six metres or equal to the full width of the watercourse up to a maximum of thirty metres on either side of the bank.

Section 117(3) In demarcating the riparian boundary, the Authority shall require the land owner to place permanent recognizable beacons at his or her cost at sufficient interval to adequately represent the line of the riparian boundary. 118 (2) A riparian land owner or user may, showing good cause, request the Authority in writing to undertake a proscribed activity. 118 (3) The Authority shall respond in writing within 30 days stating its decision. 118 (4) Any person who undertakes any of the proscribed activities on riparian land without approval by the Authority shall be guilty of an offence. National Policy on Water Resources Management and Development

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

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

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

Compliance

- **The proponent has requested the authority in writing to undertake a proscribed activity and Water Resources Authority has demarcated a ten-meter riparian reserve and has issued a letter on the same as attached on the appendices.**

4.4.8 Sessional Paper No. 6 of 1999 on Environment and SustainableDevelopment

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

a. To ensure that from the onset, all development policies, programmes and projects take environmental considerations into account,

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

c. To ensure that effluent treatment standards which will conform to acceptable health standards.

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

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

4.4.9 The Energy Act, 2006

The Act establishes an Energy Regulatory Commission mandated to perform all function that pertains to energy production, transmission, setting and enforcing of energy policies, Public education and enforcing energy conservation strategies, prescribing the energy

licensing process and issuing of licenses that pertain to energy sector in Kenya. Section 30 of the Act provides the factors that shall be taken into consideration prior to issuance of license.

It states the need and expression of an entity to conserve and protect the environment and natural resources in accordance to the Environmental and Coordination Act of 1999 (No. 8 of 1999), moreover, the Act gives provisions for the need to protect health and safety of users of energy by providing an enabling environment of operation that protects the health and safety of users of the service for which the license or permit is required and other members of the public affected by the undertaking.

4.4.10 The Occupational Safety and Health Act, 2007

This is an Act of Parliament to make provision for health, safety and welfare of persons employed in factories and other places, and for matters incidental thereto and connected therewith.

4.4.11 Air Quality Regulations

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

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

4.4.12 Biodiversity Regulations

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

4.4.13 Building Operations and Works of Engineering Constructions

The provisions of the Factories and Other Places of Work Act relevant to engineering construction works are contained in the Abstract of the Act for

Building Operations, and Works of Engineering Construction Rules. These are summarized in the Table below.

Table 7: Minimum health and safety requirements for engineering construction works

Legal Requirements	Description
General Requirements	
Give notice of particular operations or works	Notice should be sent in writing to the Occupational Health and Safety Officer, not later than seven days after commencement of construction and building works except where the construction works will be complete in less than six weeks or notice had already been given to the Occupational Health and Safety Officer
General Register	A general register of every person undertaking building operations or construction works is kept in adherence to the prescribed form. This register is kept at the site of operations or at the office of the person undertaking the operations or works. The register should contain: • The certificate of registration of the workplace; • Every other certificate issued by the Chief Inspector under this Act; • The prescribed particulars as to the finishing (washing, white washing, colour washing ,painting or varnishing) of the facility; • The prescribed particulars as to every accident and case of occupational disease occurring in the workplace of which a notice is required to be sent to a labour officer under the provisions of any law for the time being in force; • All reports and particulars required by any other provision of this Act to be entered in or attached to the general register; • Such other matters as may be prescribed in the Occupational Safety and Health Act, 2007.
Safety Requirements	
Air receivers	These should be of sound construction and be properly maintained. They should be thoroughly examined by a competent person at intervals of 24 months and the reports of such examinations attached to the General Register
Cylinders for compressed, liquefied and dissolved gases	Such cylinders should be of good construction, sound material, and adequate strength and free from patent defect. The cylinders should conform to standards specified under the Standards Act or to a prescribed standard specification, approved in writing, by the Director, Kenya Bureau of Standards. They should be thoroughly examined by a competent person at regular intervals and a maintenance register kept
Notification of Accidents	The particulars of an accident causing death or disablement of a worker for more than three days from earning full wages at the work place where he was employed must be sent in the prescribed form to the Occupational Health and Safety Officer and entered in the General Register. Certain dangerous occurrences must also be reported whether or not they cause Disablement
Health Requirements	

Sanitary accommodation	Sufficient and suitable sanitary conveniences must be available for persons employed. These must be kept clean and well lit
Miscellaneous Requirements	
Prohibition of deduction from wages	The occupier must not make a deduction from wages in respect of anything he has to do or provide in pursuance of the Factories Act or permit any person in his employment to receive payment from other employees for such services
Duties of persons employed	An employee must not willfully interfere with or misuse any means, appliance, convenience or other thing provided in pursuance of the Act for securing health, safety or welfare provided for his use under the Act. He must not willfully and without reasonable cause do anything likely to endanger himself or others
Inspection	The Occupational Health and Safety Officer has the power to inspect every part of the premises by day or by night. He may require the production of registers, certificates and other papers. May examine any person alone or in the presence of any other person as he thinks fit and may require him to sign a declaration of truth of the matters about which he is examined. Every person obstructing an Occupational Health and Safety Officer is liable to a penalty

4.4.14 Public Health Act (Cap. 242)

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

Such nuisance or conditions are defined under section 118 as waste pipes, sewers, drainers or refuse pits in such state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health. Any noxious matter or waste water flowing or discharged from any premises into the public street or into the gutter or side channel or watercourse, irrigation channel, or bed not approved for discharge is also deemed as nuisance. Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbor rats or other vermin.

4.4.15 Occupational safety and health Act, 2007 OSHA

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

An occupier shall ensure that his workplace shall not, while work is carried on, be so overcrowded as to cause risk of injury to the health of the persons employed therein. An occupier shall ensure that effective and sustainable provision is made for securing and maintaining, by the circulation of fresh air in each workroom, adequate ventilation of the room. An occupier shall ensure that effective provision is made for securing and maintaining sufficient and suitable lighting, whether natural or artificial, in every part of his workplace in which persons are working or passing. Sufficient and suitable sanitary conveniences for the persons employed in the workplace shall be provided, maintained and kept clean, and effective provision shall be lighting the conveniences; and, where persons of both sexes are or are intended to be employed (except in the case of workplaces where the only persons employed are members of the family dwelling there), such conveniences shall afford proper accommodation for persons of each sex. Other important provisions in the act include:

a) Registration of workplaces

Before any person occupies or uses any premise as a workplace, he shall apply for the registration of the premises by sending to the Director a written notice containing the particulars set out in the

Fourth Schedule. All workplaces which we registered under the Factories and Other Places of Work Act (now repealed) shall be deemed to have been registered under this Act.

b) Cleanliness

Each workplace shall be kept in a clean state and free from effluvia arising from any drain, sanitary convenience or nuisance, and, without prejudice to the generality of subsection.

c) Lighting

An occupier shall ensure that effective provision is made for securing and maintaining sufficient and suitable lighting, whether natural or artificial, in every part of this workplace in which persons are working or passing. All glazed windows and skylights used for the lighting of workrooms shall, so far as practicable be kept clean on both the inner and outer surface and free from obstruction. Provided that this subsection shall not affect the white-washing or shading or windows and skylights for the purpose of mitigating heat or glare. An occupier who contravenes the provisions of this commits an offence.

d) Sanitary convenience

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

e) Ventilation

An occupier shall ensure that effective and suitable provision is made for securing and maintaining, by the circulation of fresh air in each workroom, the adequate ventilation of the room.

f) Overcrowding

Without prejudice to the generality of subsection (1) a workplace shall be of sufficient size for work to be carried out with ease and shall further have free spacer and , having regard to the nature of the work, an adequate amount of air for each employee, the minimum permissible being cubic metres per person.

g) Drainage of floors

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

4.4.16 Way-leaves Act (Cap. 192)

According to the Way-leaves Act Cap. 292, Section 2, private land does not include any land sold or leased under any act dealing with government lands. Section 3 of the act states that the government may carry any sewer, drain or pipeline into, though, over or under any lands whatsoever, but may not in so doing interfere with any existing building.
Section 8 further states that any person who, without the consent of the Permanent Secretary to the Ministry responsible for works (which consent shall not be unreasonably withheld), causes any building to be newly erected over any sewer, drain or pipeline or on property of the government shall be guilty of an offence and liable to a fine of one hundred and fifty Kenya shillings, and a further fine of sixty shillings for every day during which the offence is continued after written notice in that behalf from the Permanent Secretary; and the Permanent Secretary may cause any building erected in contravention of this section to be altered, demolished or otherwise dealt with as he may think fit, and recover any expense incurred by the government in so doing from the offender.

4.4.17 The International Framework

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

4.4.17.1 The World Commission on Environment and Development

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

4.4.17.2 The Rio Declaration on Environment and Development

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

Compliance

- **The Proponent undertakes to safeguard the environment ensuring that all solid waste or waste water effluent emanating from the proposed project is discharged appropriately.**

4.4.18 Physical Planning Act, 1999

The Local Authorities are empowered under Section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section, therefore allows for the prohibition or control of the use and development of land and buildings in the interest of proper and orderly development of an area.

Section 30 states that any person who carries out development without development permission will be required to restore the land to its original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective Local Authority.

Finally, section 36 states that if connection with a development application, Local Authority is of the opinion that the proposed development activity will have injurious impact on the environment, the application shall be required to submit together with the application an environment impact assessment EIA report. EMCA, 1999 echoes the same by requiring that such an EIA is approved by the NEMA and should be followed by annual environmental audits. Land Planning Act (Cap. 303).

Section 9 of the subsidiary legislation (The Development and Use of Land Regulations, 1961) under this Act requires that before the Local authorities submit any plans to then Minister for approval, steps should be taken as may be necessary to acquire the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should be submitted. This

is intended to reduce conflict with the interest such as settlement and other social and economic activities.

Compliance

- **The Proponent has launched and obtained and shall apply for any other required approvals of the project development and licences from all relevant Local Authority Offices.**

4.4.19 Building Code 2000

Section 194 requires that where sewer exists, the occupants of the nearby premises shall apply to the Local Authority for a permit to connect to the sewer line and all the wastewater must be discharged into sewers.

4.4.20 Urban and Cities Act No 13 of 2011

The Act came into function with regard to Article 184 of the Constitution providing regulations on the classification, governance and management of urban areas and cities and further providing the criteria of establishing urban areas. Part III of the Act gives the regulations and functions of every city or municipality with regard to integrated development plans, which shall include but not limited to environmental plans and disaster preparedness, within the area of jurisdiction in achieving objects of devolved governments under section 174 of the constitution while maintaining the socio-economic rights of the people.

Moreover, in the first schedule, the Act enlists the services the services that the any municipality shall provide to its residents which include but not limited to traffic control and parking, water and sanitation, refuse collection, solid waste management, pollution abatement services among others.

4.4.21 Public Roads and Roads of Access Act (Cap. 399)

Sections 8 and 9 of the Act provides for the dedication, conversion or alignment of public travel lines including construction of access roads adjacent lands from the nearest part of a public road. Section 10 and 11 allows for notices to be served on the adjacent land owners seeking permission to construct the respective roads.

4.4.22 The Environment and Land Court Act, 2011

This Act is in place to give effect to Article 162(2) (b) of the Constitution; to establish a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land, and to make provision for its jurisdiction functions and powers, and for connected purposes.

4.4.23 Licenses and permits

Ideally, the Proponent should demonstrate compliance to the legislation through acquiring of the appropriate licenses and permits. Further all contractors and consultants who will be engaged

during the planning and design, construction, operation and maintenance and decommissioning should demonstrate compliance to the necessary pieces of legislation.

Those who will be involved should therefore provide the Proponent with all legal documents that shows that they are legally in the business or services that they intend to deliver to the Proponent. These includes: NEMA registration certificates and licenses, trade licenses, etc.

Compliance

- **The Proponent has launched and obtained and shall apply for any other required approvals of the project development and licences from all relevant Local Authority Offices.**

5 PREDICTED ENVIRONMENTAL, HEALTH AND SOCIAL-ECONOMIC IMPACTS

5.1 Existing Impacts

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

5.2 Anticipated Impacts

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

These qualities are indicated in the assessment tables as follows:

Table 8: Impacts assessment scale

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

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

Table 9: Anticipated Environmental Impacts

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

			and safety effects will be expected.
Disturbance of the public	- t ir sp	-	Disturbance to the public/neighbours would occur due to noise and dust during construction and traffic movement. This will be minimal since the developing works undergoing are regulated and less noise is observed. After construction, noise levels compared to the current situation will be negligible.
Visual intrusion	- t/p	+/- p	During construction, visual intrusion is attributed to construction works including construction traffic. After construction of the project, the situation will be permanent. In line with this, the proposed project should be blend in a way to merge with the existing environment and approvals by the local council. Visual impacts can be mitigated through controlling the operating hours of construction traffic, clearing debris after construction and landscaping the site.
Construction materials	-	0	Building stones, sand and ballast will be required for the construction of the project. Other materials will include steel, cement, timber, plumbing materials etc. All these should be sourced from credible commercial suppliers who are sensitive to the general environment. Undesirable, hazardous or unauthorized materials will not be used
Construction waste	- sh sp	0	Construction waste will be minimal. Proper disposal of wastes generated is necessary; the waste should be disposed into the approved dumpsites, by licensed waste handlers.
Clean on completion	- sp	0	The contractor should ensure that when works are completed, the site is left clean and tidy.
Positive impacts	++, t	++, L	Construction activities will create jobs for skilled and non- skilled workers. Job opportunities for skilled and non-skilled personnel during operation phase i.e. more engineers, masons and technicians and others who will be working on the project

5.2.1 Direct and Indirect Effects

Employment and Income

The facility will create employment opportunities both during construction and operation phases, thus generating wealth and livelihoods. Besides the direct employment, other forms of employment are likely to result from the multiplier effects, such as increased urbanization, local markets for providing goods and services during both the implementation and operational phases. Source of revenue through the payment of taxes and levy.

Impacts of Construction Activities

During the construction phase, sources of negative environmental impacts will emanate from the site preparation activities including excavation of soils, and other

geological formations, levelling of landscape and the subsequent construction activities.

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

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

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

Utility of the site

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

5.3 Products, By-Products and Waste generated by the Project during construction

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

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

5.4 Products, By-Products and Waste generated during Operations.

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

6 PUBLIC CONSULTATIONS

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

For the subject project, a questionnaires and interviews were used to collect the views of the various stakeholders and neighbours. Majority of the respondents indicated that they had no problem with the project in the area so long as the proposed works will follow the laic on guidelines and regulations. The interviews and questionnaires were carried out to different stakeholders in the area.

The people consulted through interviews and questionnaires generally welcomed the proposed project saying it will provide more job opportunities to the youth both during construction and operational phases of the project. It will increase more luxurious apartments working in areas around and the ones in the CBD. It will help and increase the business in the Pangani estate.

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

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

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

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

6.1 Sources of Information

Views from the general public, local leaders, surrounding institutions and development partners who in one way or the other would be affected by the proposed project were sought through oral interviews, administering of questionnaires and meetings and the findings were comprehensively analyzed. The various concerns and proposed

mitigation measures suggested by the public, neighbours and other stakeholders have been integrated in the report.

The exercise was conducted by a team experienced registered environmental experts. The objective of the consultation and public participation was to:-

1. Disseminate and inform the stakeholders about the project with special reference to its key components and location
2. Gather comments, suggestions and concerns of the interested and affected parties
3. Incorporate the information collected in the Report

The Consultation and Public Participation Process is a policy requirement by the Government of Kenya and a mandatory procedure as stipulated by EMCA 1999 section 58, on Environmental Impact Assessment for the purpose of achieving the fundamental principles of sustainable development.

6.2 Issues raised

This Sub-Section covers the views and opinions of the key stake holders (local leaders, surrounding, institutions/organizations, interested persons or groups). It highlights both positive and negative socio-economic and environmental impacts anticipated during the construction and operational phases of the project. This is followed by suggested mitigation measures that the developer should incorporate to minimize environmental degradation and promote sustainable development.

6.2.1 Positive comments

Several positive impacts shall emanate from the proposed project as both directly and directly as viewed by the public. They include: -

- The project shall lead to the creation of employment during both the construction and operational phases both directly and indirectly
- The currently idle land (unoccupied) shall be used optimally through the implementation of the project
- The construction shall create demand for construction material and other electronic installations
- Increased business opportunities
- Security will improve. The construction will secure the huge storm drain as well as install security lighting and cameras

6.2.2 Negative concerns

6.2.2.1 Noise and Dust emissions

Noise and Dust emissions will be generated at the project site during construction which if unmitigated can interfere with neighbours comfort and health

6.2.2.2 Obstruction and traffic increase

Obstruction by construction transport vehicles during the construction phase and increased number of vehicles coming to and from the project during the operational phase will lead to increase in traffic.

6.2.2.3 Dilapidation of existing roads

Heavy trucks transporting excavated materials and raw materials to and from the project site may lead to dilapidation of existing roads and also cause spillage of these materials on roads hence interfering with smooth motoring.

6.2.2.4 5.2.2.4 Insecurity

The proposed project may cause an increase in insecurity during the construction phase due to the increased number of transient workers and suppliers within and around the project site.

6.2.2.5 Overstretching of infrastructure

It was feared by some that the conversion of idle land to a mixed use commercial building may lead to the overstretching of public utilities and infrastructure such as sewer lines, water mains supply and roads

6.2.2.6 Storm water drainage

Channeling of large volumes of storm water to the end of project plot boundaries without taking consideration of the effects on neighbouring establishments. It was suggested that planning should incorporate neighbouring institutions especially those through which these storm drains are channeled through such that cases of flooding during rainy season and destruction of property are curbed.

6.2.2.7 Clearing of existing vegetation

Several sections of the project site earmarked for construction of the proposed project is currently occupied by mature trees and shrubs. The construction of the proposed development will thus inevitably lead to loss of some of this vegetation. It is recommended that all necessary permits be acquired before land clearing such that some of the vegetation that does not fall on the buildings footprint will be spared and incorporated into the projects landscaping plan.

6.2.2.8 Increased water and electricity demand

It is expected that both the workers and the construction works will create an increased demand for water and electricity in addition to the existing demand.

6.3 Suggestions and recommendations

- Conduct a Traffic Assessment Survey so as to aid in appropriate planning of traffic flow within and around the project site and adjacent roads
- Consult all relevant service providers and relevant authorities (i.e. KURA, KPLC, NCC, NW&SCo, NEMA amongst others) so as to harmonize the projects infrastructural and socio-economic developments with existing facilities
- Ensure an elaborate landscaping program is put in place as the construction phase is being concluded so as to replenish vegetation around the project site by planting trees, flowers and lawns where applicable
- Increase security during construction and operational phases by ensuring security guards are always posted within and around the project site and strategic placement of security lights around the site
- Adhere to all relevant construction, occupational, health and safety regulations and any other relevant law.
- It was also suggested that renewable energy should be used where applicable

7 PROJECT COMPLETION AND DECOMMISSIONING

7.1 Project Completion

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

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

7.2 Project Decommissioning

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

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

7.2.1 Existing Condition Evaluation

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

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

7.2.2 Facility Demolition

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

7.2.3 Preparation for the site reuse

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

7.2.4 Materials Recycling and Reuse

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

7.2.5 Integrated Safety Design and Review

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

8 ANALYSIS OF PROJECT ALTERNATIVES

8.1 No project alternative

The No Project 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 non-interference 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 land rent on the plot while the property remains underutilized. 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 local people would remain unchanged.
- No employment opportunities will be created for Kenyans who will work in the project area.
- Increased urban poverty and crime in Kenya.
- No development shall be provided to alleviate a critical shortage.
- Discouragement for investors
- Development of infrastructural facilities (roads, electrical etc.) will not be undertaken.

From the analysis above, it becomes apparent that the No Project alternative is not an alternative to the local people, Kenyans, and the government of Kenya.

8.2 Relocation option

Relocation option to a different site is an option available for the project implementation. However, at present the landowner/developer does not have an alternative site. This means that he has to look for land. Looking for the land to accommodate the project and completing official transaction on it may take up to two (2) years although there is no guarantee that the land would be available. The developer will spend more time 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 a large sum of money. Whatever has been done and paid to date will be counted as a loss to the developer.

The time wasted on these deliberations would cause delays that the proponent and 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 commercial development sector. In consideration of the above concerns and assessment of the current proposed site, relocation of the project is not a viable option.

8.3 Carrying on with the proposed development alternative

Under the proposed project alternative, the Proponents of the proposed project would be issued with an EIA License. In issuing the license, NEMA would approve the Proponent's proposed development, provided all environmental measures are complied with during the construction period and occupation phases. This alternative consists of the applicant's final

proposal with the inclusion of the NEMA regulations and procedures as stipulated in the environmental impacts to the maximum extent practicable. This is the most suitable option.

8.4 Analysis of alternative construction materials and technology

The block of flats will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment and materials that save energy and water will be given first priority without compromising on cost or availability factors. The concrete pillars and walls will be made using locally sourced stones, cement, sand, metal bars and fittings that meet the Kenya Bureau of Standards requirements.

8.5 Domestic waste water management alternatives

Three suitable technologies are discussed below:

8.5.1 Alternative one: Connection to the sewer system

Connection to an existing main sewer line will solve the waste water management issue at a very minimal cost and in an environmental efficient manner. Currently this option is available and considered the best option since the existing sewer line runs along the plot boundary.

8.5.2 Alternative two: Construction of a treatment plant

This involves the construction of a treatment plant. A Net Work of Plant Effluent Drains, Aeration Pits, Tanks etc., It is very expensive to construct and not suitable for the domestic waste water to be generated from the building and in a town setup. Centralized treatment plants can cause a nuisance of bad odour to tenants near the plant and are usually neglected after a few years leading to breakdowns and malfunctions which may also lead to other environmental problems such as emission of raw effluent to the environment. This option is thus not suitable.

8.5.3 Alternative three: Use of septic tanks

This involves the construction of underground concrete-made tanks to store the sludge with soak pits. It is not expensive to construct however regular empting in large discharge points like the large scale commercial building development is required. Given the kind of liquid waste emanating from the proposed project this option is not preferred since it will be uneconomical and inefficient.

8.5.4 Alternative three: Use of Bio-digester

Bio digester is an on-site sanitation unit that utilizes anaerobic technology for the disposal of toilet (black) wastewater as well as of kitchen and bathroom (grey) water, in a closed system. This is a sanitation technology, which treats wastewater in an environmentally friendly manner, facilitating its use for irrigation or its return to water bodies without polluting them. The process also generates organic fertilizer and biogas (a form of fuel) by allowing naturally occurring bacteria to break down solid waste. From the analysis and economic as well as environmental; considerations use of bio digester system is a viable option for the proponent to adopt in order to supplement connection to the sewer system.

8.6 Solid waste management alternatives

A lot of solid wastes will be generated from the proposed project. An integrated solid waste management system is recommendable. First, the proponent will give priority to Reduction

at Source of the materials. This option will demand a solid waste management awareness programme in the management and the residents.

Secondly, Recycling, Reuse and composting of the waste will be the second alternative in priority. This will call for a source separation programme to be put in place. The waste will be sold to waste buyers within the surrounding area or be collected by a private waste management company. The third priority in the hierarchy of options is combustion of the waste that is not recyclable. Finally, sanitary land filling will be the last option for the Proponent.

9 ASSESSMENT OF ENVIRONMENTAL IMPACTS

9.1 Introduction

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

9.2 Negative impacts during construction phase

The following negative impacts are also associated with the construction of the proposed project.

9.2.1 Loss of vegetation

Before the construction process begins clearing of some of the existing vegetation cover has to occur, especially within the areas where the buildings and driveways are to be constructed. The project designers have taken great care to ensure that the portions earmarked for construction of the proposed project buildings avoid areas currently occupied by mature trees/vegetation. However, construction activities will inevitably lead to loss of vegetation in some areas hence leading to degradation of natural and aesthetic environment. In the proposed site there is minimal vegetation cover that will be affected by the project.

9.2.2 Extraction and use of building materials

Building materials such as hard core, ballast, cement, rough stone and sand required for the construction of the proposed project will be obtained from quarries, sand harvesters etc. Since substantial quantities of these materials will be required for construction of the proposed project, the availability and sustainability of such resources at the extraction sites will be negatively affected-as they are not renewable in the short term. In addition, the sites from which the materials will be extracted may be significantly affected in several ways including landscape changes, displacement of animals and vegetation, poor visual quality and opening of depressions on the surface leading to several human and animal health impacts.

9.2.3 Noise pollution and vibration

Significant increases in noise and vibration levels may be expected during construction of the proposed project. Such noise and vibrations may be generated from excavators, movement; loaders; concrete mixer trucks; concrete pumps; concrete vibrators; dump trucks; hammering; vibrators; compactors, diesel generators (DGs); water pumps and even construction workers.

The impact of noise and vibrations on the surrounding community depends upon:

- Characteristics of the noise and vibrations source (instantaneous, intermittent, or continuous in nature);
- Time of day at which noise and vibrations occur; and
- Location of noise and vibrations source with respect to sensitive receptor.

Though the level of discomfort caused by noise and vibrations is subjective, the most commonly reported impacts of increased noise levels are interference in oral communication, hearing loss, anxiety and disturbance of sleep. Vibration impacts may include the cracking of nearby existing structures such as foundations, walls and swimming pools.
Noise and vibrations may also have an impact on the workers in the proposed project. Nonetheless, all the noise and vibrations generating activities shall be undertaken during day hours and appropriate measures shall be instituted to counter the said pollution.

9.2.4 Impact on air quality (generation of exhaust and dust emissions)

Potential impacts on the air quality during the construction stage will be due to the fugitive dust and the exhaust gases generated in and around the construction site. The sources of air emission can be grouped into three categories of point, area and line sources:

- A point source is a single source of emission with an identified location, such as an industry;
- An area source is when the sources of emission are many widely distributed point sources having relatively comparable significance; and
- A line source is when the sources of emission from a number of fixed or moving facilities have relatively comparable significance, such as roads.

Fugitive dust (depending on the timing of construction) and vehicular emissions are the major components of air pollution. The following construction related activities are generally associated with these emissions:

- Site clearance, excavation and use of heavy vehicles and machinery/equipment at construction site;
- Transportation of construction materials such as sand, cement, steel, masonry stone to the construction site; and
- Operating of construction machinery and equipments

During the period of maximum construction activity, the fuel consumption is expected to rise significantly and the background concentrations of suspended particulate matter (SPM), respirable particulate matter (RPM), sulphur dioxide (SO2), nitrogen dioxide (NO2) and both carbon monoxide (CO) and lead (Pb) are also expected to rise.

These emissions if not appropriately mitigated can have significant respiratory and cardio-pulmonary effects on the local population, the health effects may range from subtle biochemical and physiological changes to difficulty in breathing, wheezing, coughing and aggravation of existing respiratory and cardiac conditions. The impacts of such emissions can be greater in areas where the materials are sourced and at the construction site as a result of frequent gunning of vehicle engines,

activities associated with site clearance, excavations, spreading of the topsoil during construction, frequent and fast vehicle movement in the loading and offloading areas. Because large quantities of building materials are required, some of which are sourced outside far from the project site, such emissions can be enormous and may affect a wider geographical area.

9.2.5 Disposal of solid waste

Construction activities create solid wastes that need to be disposed. Such wastes include: Sand, Concrete, Gravel, Stones, Bricks, Plastics, Paper, Wood, Metals, Glass, and Cleared biomass among others. These wastes if handled inappropriately may have a direct impact on the local community. Disposal of the same solid wastes off-site could also be a social inconvenience if done in wrong places. The off-site effects could be un-aesthetic view, pest breeding, unhygienic conditions, choking of nearby drains and pollution of physical environment. The severity of such impacts will depend upon the magnitude and type of construction waste. All construction waste should be disposed in sites approved by the Nairobi City County by NEMA licensed firms.

9.2.6 Soil erosion and water logging

Soil erosion is likely to occur during construction at the site once exposed by excavation works especially during rainy and windy seasons due to the slope gradient of the proposed project plot. Considering the land clearing, excavation and other construction processes, soil will be exposed to erosion agents leading to soil/land degradation hence impacting negatively on the environment. Water logging of the proposed site may also occur in the event of heavy rainfall after excavation.

9.2.7 Surface and ground water hydrology and water quality degradation

Construction activities for the proposed development can have impacts on hydrology and ground water quality of the area. Changes in surface hydrology can occur due to landscaping; construction of impervious surfaces such as parking lots, roads and buildings (buildings increase the volume and rate of runoff, resulting in habitat destruction, increased pollutant loads, and flooding); blockage of existing drainages can also influence groundwater hydrology (i.e. recharge rates, flow, conditions).
Potential sources of impacts on hydrology and ground water quality during the construction phases are as follows:

- Soil run-off from the site leading to off-site contamination- particularly during rainy season: The excavated area, if linear, could act as a conduit to extend groundwater contamination to new areas.
- Improper disposal of construction debris leading to offsite contamination of water resources or blocking of drainages leading to flooding.
- Spillage of oil and grease from the vehicles and wastewater stream generated from on-site activities.

9.2.8 Increased water demand

During the construction phase, both the construction works and the construction workers will create additional demand for water in addition to the existing local demand. Water will mostly be used in

the creation of concrete for construction works and for wetting surfaces or cleaning completed structures. It will also be used by the construction workers for washing and drinking.

9.2.9 Energy consumption

The proposed project will consume fossil fuels for construction machines (mainly Concrete mixers, heavy and light trucks; concrete pumps; concrete vibrators; dump trucks; compactors, diesel generators; water pumps) to run.

Fossil energy is non-renewable and its excessive use may have serious environmental implications on its availability, price and sustainability. The proposed project will also use electricity supplied by Kenya Power and Lighting Company (KPLC) Ltd. Electricity in Kenya is generated mainly through natural resources, namely, water and geothermal resources. In this regard, there will be need to use electricity sparingly since high consumption of electricity negatively impacts on these natural resources and their sustainability.

9.2.10 Increased insecurity

The proposed project may cause an increase in insecurity during the construction phase due to the increased number of transient workers and suppliers within and around the project site. Construction sites are known to attract large numbers of semi-skilled and un-skilled labour searching for job openings and may also use the opportunity to scout for potential robbery or terror targets.

9.2.11 Increased traffic

Obstruction by construction transport vehicles and construction activities adjacent to the nearby roads during the construction phase may lead to the increase in traffic along Agoi Road and adjacent access roads. This may be exacerbated if these activities time/schedule coincide with Peak Traffic hours.

9.2.12 Workers accidents and public safety

In any civil works, public as well as construction staff safety risks can arise from various construction activities such as: -

- Deep excavations;
- Operation and movement of heavy equipment and vehicles;
- Injuries from falling objects; and
- Injuries from hand tools.

Because of the duration and complexity of the construction phase of the proposed project, such activities need to be controlled and consequently the associated risks will be reduced. Proper supervision, high workmanship performance, and provision of adequate safety measures will suppress the likelihood of such impacts on the public and ensure enhanced occupational safety.

9.2.13 Occupational Health and Safety (OHS)

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

9.3 Positive impacts during construction phase

A number of positive impacts are associated with the proposed project during construction phase. These are as discussed below.

9.3.1 Employment opportunities

The construction of the proposed project is expected to provide direct and indirect employment to a number of workers. However, the exact number cannot be predetermined at this stage. These range from unskilled casual workers, semi-skilled and skilled employees.

9.3.2 Provision of market for supply of building materials

The proposed project will require supply of large quantities of building materials most of which will be sourced locally in the surrounding areas. Producers and suppliers of materials such as: masonry stone, iron sheets, timber, paint, electrical cables, water storage equipments, water pipes, steel, glass, sand, cement, fuel, will thus get a ready market for their merchandise.

9.3.3 Improving growth of the economy

Through the use of locally available materials during the construction phase of the project including cement, concrete and ceramic tiles, timber, sand, ballast electrical cables etc, the project will contribute towards growth of the economy by contributing to the gross domestic product. The consumption of these materials, fuel oil and others will attract taxes including VAT which will be payable to the government hence increasing government revenue while the cost of these raw materials will be payable directly to the producers.

9.4 Negative impacts during operation phase

The following negative impacts are associated with the proposed project during its operation phase.

9.4.1 Increased traffic

It is expected that the number of vehicles around the project site shall increase hence leading to the possibility of commensurate increase in traffic around Agoi Road. This shall be dependent on the location of the car park entry/exit, traffic control measures in place, number of tenants/visitors to the project, the nature of businesses within the premises amongst other factors.

Water use

During operation of the proposed project, a lot of water will be used. Water use is driven by the number of uses and users within the premises. Water will be sourced from the Nairobi Water and Sewerage Company mains supply line and several rain water storage tanks.

9.4.2 Electricity consumption

During operation, the project will use a lot of electrical energy mainly for purposes which include lighting, running of electrical gadgets including office equipments, air conditioning equipment, refrigeration systems, air compressors, pumping water into reservoirs. Since electricity generation involves utilization of natural resources, excessive electricity consumption will strain the resources and negatively impact on their sustainability.

9.4.3 Increased storm water flow

The building roofs and pavements will lead to increased volume and velocity of storm water around the project site. This will lead to increased amounts of storm water entering the peripheral storm water drains.

9.4.4 Solid waste generation

During the operation phase, solid waste generation is expected to occur from various sources and activities carried out within the premises. Solid waste impacts are expected to be minor but their impact maybe significant in the absence of a proper waste management plan i.e. improper disposal of waste may have adverse environmental effects.

9.4.5 Increased noise level

There will be increased noise pollution due to traffic from visitors who will be coming to the premises.

9.5 Positive impacts during operation phase

Just as in the construction phase, there are positive impacts associated with the proposed project during operation phase. These positive impacts are discussed below.

9.5.1 Employment opportunities

Employment opportunities are one of the long-term major impacts of the proposed project. A number of people will be employed in various capacities in different professional and non-professional areas at the premises.
This will include property managers, caretakers, security guards, cleaners etc.

9.5.2 Increase in revenue to national and local governments

The commissioning of the proposed project will result in positive gains for numerous authorities- Kenya Revenue Authority (KRA), KPLC, and Nairobi City County through payment of relevant taxes, rates and fees to the respective institutions.

9.5.3 Optimal use of land

Change in land use from single dwelling land to multi-dwelling land on which a modern residential flat will optimize land use.

9.5.4 Provision of residential units

Demand for housing units in Kenya is very high and especially in capital city Nairobi. Once complete the project will offer residential units in the market for letting.

9.6 Negative impacts during decommissioning phase

The negative impacts discussed below are associated with the proposed project during decommissioning phase.

9.6.1 Noise and vibration

The demolition works will lead to significant deterioration of the acoustic environment within the proposed Project site and the surrounding areas. This will be as a result of the noise and vibrations that will be experienced during demolition.

9.6.2 Air quality

Dust will be generated during demolition works of the proposed project from the demolition activities. This will mainly affect demolition workers. In addition, soil will be used in rehabilitation and re-instatement to pre-project status, this will add to the amount of dust that will be generated during rehabilitation. However, it will be minimal.

Exhaust emission will also be experienced during decommissioning from the trucks that will be transporting the demolished objects to the disposal sites and storage areas. Large quantities of dust will be generated during demolition works. This will affect both demolition staff as well as the neighbouring establishments.

9.6.3 Solid waste generation

Demolition of the proposed project will result in large quantities of solid waste. Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment. In addition, even the generally non-toxic chemicals such as chloride, sodium, sulphate and ammonia which may be released as a result of leaching of demolition waste, are known to lead to degradation of groundwater quality.

9.6.4 Health and safety

Risk of accidents and ill health as a result of the demolition activities is likely to be experienced. This could be as a result of accidents involving construction equipment.

9.6.5 Positive impacts during decommissioning phase

In the event that the project is to be relocated, found to be economically unviable or condemned as structurally unstable. It can be abandoned and/or demolished. The following are positive impacts associated with decommissioning of the proposed project.

9.6.6 Rehabilitation

Decommissioning will involve phasing out the envisaged operations of the project. This may involve conversion of the facility to other uses or rehabilitation of the project site in line with the projected plans. This may involve new landscaping schemes and demolition of some structures within the facility.

9.6.7 Employment opportunities

For demolition to take place properly and in good time, several people will be involved. As a result, large number of jobs will be created in various positions both in supervisory and non-supervisory positions.

9.7 Summary of Positive Impacts of the Proposed Project

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

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

9.8 Summary of Negative Impacts of the proposed Project

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

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

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

10 IMPACTS MITIGATION AND MONITORING

10.1 Introduction

This Chapter highlights the necessary mitigation measures that will be adopted to prevent or minimize significant negative environmental, health and safety impacts associated with the activities the proposed project during its construction, operation and decommissioning phases. Allocation of responsibilities, time frame and estimated costs for implementation of these measures are presented in the Environmental Management Programme (EMP) in Chapter 8.

10.2 Mitigation of construction phase impacts

10.2.1 Minimizing vegetation disturbance

To minimize effects and mitigate vegetation disturbance the proponent shall: -

- Ensure proper demarcation of the project area to be affected by the construction works. This will be aimed at ensuring that any disturbance to flora is restricted to the actual project area and avoid spillover effects on the neighbouring areas.
- Ensure strict control of construction vehicles to ensure that they operate only within the area to be disturbed by access routes and other works.
- Re-vegetate of some of the disturbed areas through implementation of a well-designed landscaping programme.

10.2.2 Efficient sourcing and use of raw materials

The Proponent will source building materials such as sand, ballast and hard core from registered quarry and sand mining firms, whose projects have undergone satisfactory environmental impact assessment/audit and received NEMA approval. Since such firms are expected to apply acceptable environmental performance standards, the negative impacts of their activities at the extraction sites are considerably well mitigated.

To reduce the negative impacts on availability and sustainability of the materials, the Proponent will only order for what will be required through accurate budgeting and estimation of actual construction requirements. This will ensure that materials are not extracted or purchased in excessive quantities. Moreover, the Proponent will ensure that wastage, damage or loss (through run-off, wind, etc) of materials at the construction site is kept minimal, as these would lead to additional demand for and extraction or purchase materials.
In addition to the above measures, the Proponent shall consider reuse of building materials and use of recycled building materials where applicable. This will lead to reduction in the amount of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.

10.2.3 Minimization of noise and vibration

The Contractor of the proposed project shall put in place several measures that will mitigate noise and vibration pollution arising during the construction phase. The proponent shall ensure that he complies with all relevant requirements in the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 by:-

- Apply for a License from NEMA whereby maximum permissible noise levels are to be exceeded

In this regard the following noise-suppression techniques will be employed to minimize the impact of temporary construction noise at the project site.

- Prescribe noise reduction measures if appropriate e.g. restricted working hours and transport hours and noise buffering;
- Install portable barriers to shield compressors and other small stationary equipment where necessary and locate stationary noise sources as far from existing sensitive receptors as possible;
- Use quiet equipment (i.e. equipment designed with noise control elements such as mufflers);
- Co-ordinate with relevant agencies regarding all construction activities in the project site;
- Limit trucks and other small equipment to minimize idling time and observe a common-sense approach to vehicle use such as switching off idle engines whenever possible; and
- Ensure use of well serviced and maintained vehicles and equipment.

10.2.4 Minimization of dust generation and emission

Controlling dust during construction is useful in minimizing nuisance conditions and consequently health (respiratory and eye) complications. It is recommended that a standard set of feasible dust control measures be implemented for all construction activities. Emissions of other contaminants (Nitrogen oxides, Carbon dioxide, Sulphur oxides, and diesel related Particulate Matter PM10) that would occur in the exhaust from heavy equipment are also included.
The Proponent shall be committed to implementing measures that shall reduce air quality impacts associated with construction. Dust emissions will be controlled by the following measures: -

- Provide 2.4 metres high hoarding along site boundary
- Provide effective dust screen, sheeting or netting where a scaffolding is erected around the perimeter of a building under construction any skip hoist for material transport shall be totally enclosed by impervious sheeting;
- Water all active construction areas when necessary;
- Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard;
- Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction site;

- Down wash of trucks (especially tyres) prior to departure from site;
- Use of electrically operated construction machinery to avoid externalities produced by diesel engines. This procedural change may reduce problems related to emission, idling and maintenance; and
- Rapid on-site construction so as to reduce duration of traffic interference and therefore reducing emissions from traffic delays.

All personnel working on the proposed project will be trained prior to starting construction on methods for minimizing air quality impacts during construction. Specific training will be focused on minimizing dust and exhaust gas emissions from heavy construction vehicles.

Minimization of exhaust emissions will be achieved through proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road. In addition, truck drivers will be sensitized to avoid unnecessary racing of vehicle engines at loading/offloading areas, and to switch off or keep vehicle engines at these points.

The following measures shall be implemented during construction: -

- The engine size of the construction equipment shall be the minimum practical size;
- The number of construction equipment operating simultaneously shall be minimized through efficient management practices;
- To ensure that the smallest practical number is operating at any one time;
- Construction equipment shall be maintained in tune per the manufactures specifications;
- Idling of heavy duty diesel trucks during loading and unloading shall be minimized; and
- Alternatively, fuelled construction equipment shall be used where feasible.

10.2.5 Minimization of construction waste

It is recommended that construction waste be recycled or reused to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses. In this regard, the Proponent shall be committed to ensuring that construction materials left over at the end of construction will be used in other projects rather than being disposed of.

In addition, damaged or wasted construction materials including cabinets, doors, plumbing and lighting fixtures, marbles, ceramic tiles and glass will be recovered for refurbishing and use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents or homeowners.

The Proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal.

It is further recommended that the Proponent should consider the use of recycled or refurbished construction materials. Purchasing and using once-used or recovered construction materials will lead to financial savings and reduction of the amount of construction debris disposed of as waste.
Additional recommendations for minimization of solid waste during construction of the proposed project include: -

- Use of durable, long- lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time;
- Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements;
- Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste; and
- Use of construction materials containing recycled content when possible and in accordance with accepted standards.

10.2.6 Minimization of insecurity

The Proponent shall be committed to implementing measures that shall reduce security threats by the following measures: -

- The proposed project plot has shall be accessed through a designated entry/exit point during the transportation of all raw materials in and out the construction phase of the project.
- Security shall be enhanced by ensuring security guards are always posted within and around the project site and strategic placement of security lights around the site.
- A roster of all construction workers shall be kept while measures shall be put in place to ensure that loitering by itinerant workers is discouraged.
- Unattended public access to the construction site shall be restricted and only one entry/exit point shall be used.

10.2.7 Controlling soil erosion, water logging

The Proponent will put in place some measures aimed at minimizing soil erosion and associated water logging from the proposed project site during construction. These measures will include: -

- Terracing, levelling and ripping off compacted areas of the project site to reduce run-off velocity and increase infiltration of storm water into the soil
- Digging trenches and cut off drains to channel runoff into drainages
- Proper planning of site excavation works such that a section is completed and rehabilitated before another section begins
- Ensuring that construction vehicles are restricted to existing graded roads to avoid soil compaction within the project site

- Surface runoff and roof water shall be harvested and stored in underground reservoir for reuse
- A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structures will be designed.

10.2.8 Minimization of surface and groundwater contamination

Several measures shall be put in place to mitigate the impacts that are likely to lead to surface and groundwater quality degradation. The Proponent will prepare a hazardous substance control systems and emergency response plans that will include preparations for quick and safe cleanup of accidental spills. It will prescribe hazardous-materials handling procedures to reduce the potential for a spill during construction, and will include an emergency response programme to ensure quick and safe cleanup of accidental spills. The plan will identify areas where refueling and vehicle maintenance activities and storage of hazardous materials, if any, will be permitted.

10.2.9 Minimization of water use

A combination of water saving appliances and water management measures will be planned in the proposed project. Rain water harvesting can serve as a solution to the water problem by capturing the run off. Rainwater harvesting will help in utilizing the primary source of water and prevent the runoff from going into sewer or storm drains.

10.2.10 Minimization of energy consumption

The Proponent shall ensure responsible electricity use at the construction site through sensitization of staff to conserve electricity by switching off electrical equipment or appliances when they are not being used. In addition, proper planning of transportation of materials will ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts. Complementary to these measures, the Proponent shall monitor energy use during construction and set targets for reduction of energy use.

10.2.11 Minimization of construction related traffic

The following measures shall be put in place so as to manage traffic along surrounding roads during construction: -

- Ensure that the Entry/Exit to the project site is located where it will cause minimal traffic along Agoi Road
- Ensure all construction vehicles to and from the construction site use the designated Entry/Exit to the project site
- All transportation of construction raw materials and excavated materials are to be conducted at traffic off peak hours only
- Sensitize truck drivers to avoid unnecessary road obstruction
- Cover all trucks hauling soil, sand and other loose materials to avoid spillage and dust emissions that may interfere with smooth motoring

- Work hours shall be restricted to the period between 8:00 a.m. and 5:00 p.m., Monday through Friday, unless approved otherwise. When night work is required, work hours shall be 9 p.m. to 5 a.m.
- Access to driveways will be maintained at all times unless other arrangements are made

10.2.12 Minimization of risks of accidents and injuries to workers and construction safety

To reduce the construction worker's accidents and hazards during the construction phase of the proposed project, the Proponent shall be committed to adherence to the occupational health and safety rules and regulations stipulated in Occupational, Safety and Health Act, 2007. In this regard, the Proponent shall be committed to provision of appropriate personal protective equipment, as well as ensuring a safe and healthy environment for construction workers as outlined in the EMP. This section provides general guidelines and procedures for construction safety during project implementation process.

General Construction Guidelines

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

Follow these guidelines when visiting or working at construction sites:

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

Barriers and Guards

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

NOTE:

Barriers, guards, and warning signs are required to ensure safety against existing hazards. Types of Barriers and Guards

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

NOTE:

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

Any area that poses a physical threat to workers and/or pedestrians requires barriers or guards. Areas that typically require permanent or temporary protection include the following:

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

10.3 Mitigation of operation phase impacts

10.3.1 Traffic management

The following measures shall be put in place so as to manage traffic along surrounding roads during operational phase of the project: -

- "NO PARKING" signs will be posted around the building where Parking is prohibited and likely to cause obstruction as well as other necessary traffic signs
- Traffic management/parking personnel shall be provided to monitor parking and ensure smooth motoring along the buildings adjacent roads
- Access to driveways will be maintained at all times
- Any work that disturbs normal traffic signal operations shall be coordinated with the relevant authorities

10.3.2 Ensure efficient water use

The Proponent should install water-conserving automatic taps and toilets. Moreover, any water leaks through damaged pipes and faulty taps will be fixed promptly by qualified staff. In addition, the occupants will be sensitized to use water efficiently. The following water saving investments should be taken into consideration: -

- Reduce water delivery in taps, through the installation of low flow devices or aerators on taps
- Press action taps and flush valves shall be used to minimize water wastage Sensors on urinals, which ensure flushes, occur only when required in public areas of the proposed project; and
- Install water efficient plumbing.

10.3.3 Ensure efficient energy consumption

The Proponent plans to install an energy-efficient lighting system at the building as well as solar power equipment. This will contribute immensely to energy saving during the operational phase of the proposed project. In addition, all staff members will be sensitized to ensure energy efficiency in their operations. To complement these measures, it will be important to monitor energy use during

the operation and set targets for efficient energy use. The following energy saving techniques can be applied: -

- Staff shall be sensitized to switch off machinery, equipment and lights when not being used
- Install energy saving bulbs and fluorescent lights
- Use of variable-speed motors to optimize the basement car park ventilation system performance
- Install alternative energy such as solar power and/or consider use of a highly efficient, inverter-type split-cycle system for heating and cooling, which also uses a more environmentally friendly refrigerant

10.3.4 Ensuring efficient solid waste management

During the operation phase of the proposed project, waste will be generated. All these waste should be handled according to the Environmental Management and Coordination (Waste Management) Regulations, 2006.

The Proponent of the proposed project will be responsible for efficient management of solid waste generated by the proposed project during its operation. In this regard, the Proponent will provide waste handling facilities such as waste bins and skips for temporarily holding of waste generated at the site. In addition, the Proponent will ensure that such wastes are disposed of regularly and appropriately.

Since the proposed project will be generating a substantial amount of waste, an integrated solid waste management system is recommended. First, the Proponent will give priority to reduction at source of the materials. This option will demand a solid waste management awareness programme in the management and the employed staff

Secondly, recycling, reuse and composting of the waste will be the second alternative in priority. This will call for a source separation programme to be put in place. The third priority in the hierarchy of options is combustion of the waste that is not recyclable in order to produce energy. Finally, sanitary land filling will be the last option for the Proponent to consider.

In order to achieve the above three recommendations, the following will be done.

Public awareness

- Sign boards and information notices informing the public to dispose waste appropriately shall be posted within the premises.

Waste segregation

- Segregation or sorting of waste at its source should be practiced in order to encourage reuse/recycling and to maximize the negative effects of the waste and increase its economic

value. With segregation at source recyclables do not lose their commercial value due to cross contamination; and

-
- Dedicated bins will be placed to collect biodegradable and non-biodegradable wastes.

Collection bins

- Daily collection of wastes shall take place from all the bins;
- Daily sweeping and collection of waste from common areas such as lobbies, staircases, entrances shall be done daily by management appointed cleaners; and
- Wastes shall be collected daily from all bins to a transfer station awaiting final collection. Separate collection for bio-degradable and non-biodegradable wastes will be ensured.

Waste treatment and disposal

- Solid waste generated by the proposed project would be collected and disposed of by a licensed private firm.

10.4 Fire hazards and Fighting

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

- Install an automatic fire alarm system for the entire project mostly on operation.
- Install firefighting equipment as approved by the County Council.
- All fire control and fighting facilities to be installed as per the requirements stipulated in the approved plans.

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

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

10.5 Mitigation of decommissioning phase impacts

10.5.1 Efficient solid waste management

Solid waste resulting from demolition or dismantling works will be managed as described in Section 7.2.5.

10.5.2 Reduction of dust concentration

High levels of dust concentration resulting from demolition or dismantling works will be minimized as described in Section 7.2.4.

10.5.3 Minimization of noise and vibration

Significant impacts on the acoustic environment will be mitigated as described in Section 7.2.3.

10.5.4 Health and safety

Risk of accidents and ill health as a result of demolition activities, shall be mitigated by ensuring that appropriate health and safety measures are applied in all activities; fence all unsafe and dangerous areas; and continue to monitor environmental health (air quality, water quality, vegetation, noise) at all main receptor points around the site until site handover.

10.6 Summary of the Mitigation Measures

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

- A code of practice to minimize construction noise, vibration dust and disturbance of the site.
- Planting of trees, and wild flowers to supplement the ground cover on the excavated area.
- Application of soil conservation measures to reduce surface runoff during wet seasons and especially during construction phase.
- Recovery of all debris generated and reuse of materials where possible e.g. the stone chippings which can be used as hardcore.
- Recycling and reuse of appropriate materials.
- Provision of security measures to deter intruders and protect them from the risk of injury; and fitting of noise mufflers on generator exhausts.
- Installation of oil/diesel separators on site especially where there is storage of machinery or petroleum products etc. to keep oils from storm runoff.
- Predetermined route to the site, oil spillages will be minimized by using right machinery that are regularly serviced and operators who are qualified following the operations instructions strictly.
- The contractor will ensure management of excavation activities, if any- the activities will be controlled especially if construction will take place during rainy season.
- After construction the proponent shall rehabilitate the land by removing any unnecessary materials that shall be covering the land and preventing natural biodiversity.
- To minimize potential impacts to bio diversity, grass cover that does not interfere with the sitting of the project will be left intact,

- Sensitize drivers of construction machinery on effects of noise; billboards will be suitably erected on the start of the project to psychologically prepare the people in the vicinity.
- Signs must indicate and inform the public when the works start and when it will be completed, construction activities to be restricted to daytime to avoid accidents and possible harm to gears provide barriers such as walls around site boundaries to provide some buffer against noise propagation.
- Vehicle speeds in the construction area will be limited to minimize dust in the area, discourage idling of vehicles i.e. vehicle and equipment engines will be turned off when not in direct use to reduce exhaust emissions.
- Regular maintenance of construction plant and equipment, engage sensitive construction workers.
- Provide personal protective Equipment such as nose masks to the workers on site, the construction contractor will water the site with exposed soil surface twice each day during dry weather.
- All residual waste materials to be recycled sold or disposed in an environmentally friendly manner. Wastes will be properly segregated and separated to encourage recycling of some useful wastes; dustbins will be provided at the construction site.
- A first aid kit will be provided within the site and it will be fully equipped at all times.
- Sanitary facilities will be provided, local individuals preparing food for the workers at the site will be controlled to ensure that food is hygienically prepared
- Construction crew at the site will be sensitized on social issues such as drugs, alcohol, diseases, ensuring proper solid waste disposal and collection facilities, ensure effective waste water management.
- Provision of safe drinking water, contractor to take an insurance cover for workers in case of major accidents on site.
- Unauthorized persons will be restricted from construction site, enforce speed limits for construction vehicles especially along roads leading to the site, provide bill boards at the site/entrance to notify motorists about the development, put up warning signs like “speed limit 10kph”, “heavy vehicles” etc.
- For the prevention of accidents, the contractor shall adhere to the guidelines under the factories and other places of work act.

11 ENVIRONMENTAL AND SOCIAL IMPACTS MITIGATION/ MANAGEMENT PLAN

11.1 Introduction

The proposed project Proponent realizes that its development and operational activities will have some impacts on the biophysical environment, health and safety of its staff, clients and members of the public, and socio economic well-being of the local community.

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

An environmental management plan has been developed to assist the Proponent in mitigating and managing environmental impacts associated with the life cycle of the project. The EMP has been developed to provide a basis for an Environmental Management System (EMS; ISO 14001 principles) for the project. It is noteworthy that key factors and processes may change through the life of the project and considerable provisions have been made for dynamism and flexibility of the EMP. As such, the EMP will be subject to a regular regime of periodic review.

Tables 10, 11 and 12 form the core of this EMP for the construction, operational and decommissioning phases of the project. In general, the Tables outline the potential safety, health and environmental risks associated with the project and detail all the necessary mitigation measures, their financial costs, as well as the persons responsible for their implementation and monitoring. The EMP will be used as checklist in future environmental audits.

11.1.1 Construction Phase EMP

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase of the project are outlined in Table 10 below.

Table 10: Environmental management plan for the construction phase of the proposed project

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Minimize extraction site impacts and ensure efficient use of raw materials in construction				
High demand of raw material	**1.** Source building materials from local suppliers who use environmentally friendly processes in their operations.	Project Manager & Contractor	Throughout construction period	
	2. Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered.	Project Manager & Contractor	Throughout construction period	
	3. Ensure that damage or loss of materials at the construction site is kept minimal through proper storage.	Project Manager & Contractor	Throughout construction period	200,000
	4. Use at least 5%-10% recycled, refurbished or salvaged materials to reduce the use of raw materials and divert material from landfills	Project Manager & Contractor	Throughout construction period	0
2. Minimize vegetation disturbance at and or around construction site				
Vegetation disturbance	**1.** Ensure proper demarcation and delineation of the project area to be affected by construction works.	Contractor, Civil engineer & Project Manager	3 Days	20,000
	2. Specify locations for trailers, cranes & equipment, & areas of the site which should be kept free of traffic, equipment, and storage.		10 Days	20,000
	3. Designate access routes and parking within the site.		5 Days	-
	4. Introduction of vegetation (trees, shrubs and grass) on open spaces and around the project site and their maintenance.	Architect & Landscape specialist	Monthly to Annually	20,000
	5. Design and implement an appropriate landscaping programme to help in re-vegetation of part of the project area after construction.	Architect & Landscape specialist	2 months	150,000
3. Avoid encroaching on road reserves				
	1. Comply with the Public Roads and Roads of Access Act (Cap. 399) by ensuring no development is within the 30 meter Road Reserve running along the plot boundary	Project proponent, architect & Contractor	During planning and throughout construction period	

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)

4. Reduce storm-water, runoff and soil erosion				
Increased storm water, runoff and soil erosion	**1.** Surface runoff and roof water shall be harvested and stored in underground reservoir tanks for reuse.	The Civil Engineer, Mechanical Engineer and Project Manager	2 months	10,000 per unit
	2. A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure will be designed.		1 month	
	3. Apply soil erosion control measures such as leveling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil.		1 months	
	4. Ensure that construction vehicles are restricted to existing graded roads to avoid soil compaction within the project site.	The Civil Engineer, Mechanical Engineer and Project Manager	Throughout construction period	
	5. Ensure that any compacted areas are ripped to reduce run-off.		2 months	
	6. Site excavation works to be planned such that a section is completed and rehabilitated before another section begins.	Project Manager	Throughout construction period	5,000 per unit
	7. Open drains all interconnected will be provided on site.	Civil Engineer	Throughout construction period	5,000 per unit
	8. Roof catchments will be used to collect the storm water for some other uses.	Civil Engineer	Throughout construction period	
	9. Construction of water storage tanks to collect storm water for construction use.	Civil Engineer	Throughout construction period	
5. Minimize deep trenching and excavation hazards				
Persons falling	**1.** A barricade at least 900mm high must be erected around a trench that is 1 meter or more deep unless it is not possible only workers involved in the trench will be in the area; or another form of barrier exists (such as excavated materials near the trench).	The Civil Engineer and Project Manager	Throughout excavation works period	

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	1. Excavated material should not be placed less than 600mm from the edge of a trench to minimize risk of collapse due to the weight	The Civil Engineer	Throughout excavation works	

Trench collapse or cave-in	of the spoil.	and Project Manager	period	
	2. An excavation where a possibility of collapse or cave-in exists should be shored, shielded , benched or battered to prevent the collapse or cave-in.	The Civil Engineer and Project Manager	Throughout excavation works period	
Safe access and exit	Ladders must be provided no more than 9 meters apart in the area where work will be carried out	The Civil Engineer and Project Manager	Throughout excavation works	20,000
6. Minimize solid waste generation and ensure efficient solid waste management during construction				
Increased solid waste generation	**1.** Use of an integrated solid waste management system i.e. through a hierarchy of options including: Source reduction, Recycling, Reuse, Combustion and Sanitary land filling.	Project Manager & Contractor	Throughout construction period	300,000
	2. Through accurate estimation of the sizes and quantities of materials required, order materials in the sizes and quantities they will be needed	Project Manager & Contractor	One-off	0
	3. Ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed of.	Project Manager & Contractor	One-off	0
	4. Ensure that damaged or wasted construction materials will be recovered for refurbishing and use in other projects.	Project Manager & Contractor	One-off	-
	5. Donate recyclable/reusable or residual materials to other users where applicable	Project Manager & Contractor	One-off	0
	6. Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time	Project Manager & Contractor	Throughout construction period	-

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	7.Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements	Project Manager & Contractor	One-off	30,000

	8. Use building materials that have minimal or no packaging to avoid packaging waste	Project Manager & Contractor	Throughout construction period	0
	9. Use construction materials containing recycled content when possible and in accordance with accepted standards.	Project Manager & Contractor	Throughout construction period	0
	10. Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at the site	Project Manager & Contractor	Throughout construction period	0
	11. Dispose waste more responsibly by dumping at designated dumping sites or landfills only.	Project Manager & Contractor	Throughout construction period	50,000/month
	12. Waste collection bins to be provided at designated points on site	Project Manager & Contractor	Throughout construction period	4,000 per truckload
	13. Private waste disposal company to be contracted to transport and dispose the solid waste from site	Project Manager & Contractor	Throughout construction period	
7. Reduce dust emissions				
Dust emission	**1.** Provide 2.4 m high hoarding along site boundary	Project Manager & Contractor	Throughout construction period	15,000
	2. Provide effective dust screen, sheeting or netting where a scaffolding is erected around the perimeter of a building	Project Manager & Contractor	Throughout construction of building envelope	
	3. Water all active construction areas when necessary;	Project Manager & Contractor	Throughout construction period	3,000
	4. Cover all trucks hauling soil, sand and other loose materials	Project Manager & Contractor	Throughout construction period	0

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (Ksh)**
	5. Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction site	Project Manager & Contractor	Throughout construction period	20,000
	6. Sweep daily (with water sweepers) all paved access roads,	Project Manager &	Throughout	

	parking areas and staging areas at construction sites;	Contractor	construction period	
	7. Down wash of trucks (especially tyres) prior to departure from site;	Project Manager & Contractor	Throughout construction period	-
	8. Post signs that limit vehicle speeds onto unpaved roads and over disturbed soils;	Project Manager & Contractor	One off	5,000
	9. Use of electrically operated construction machinery to avoid externalities produced by diesel engines	Project Manager & Contractor	Throughout construction period	
	10. Personal Protective equipment to be worn by all staff members	Project Manager & Contractor	Throughout construction period	100,000
8. Minimization of exhaust emissions				
Exhaust emission	**1.** Vehicle idling time shall be minimized	Project Manager & Contractor	Throughout construction period	0
	2. Alternatively fuelled construction equipment shall be used where feasible equipment shall be properly tuned and maintained			
	3. Sensitize truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, and to switch off or keep vehicle engines at these points	Project Manager & Contractor	Throughout construction period	0
9. Minimization of noise and vibration				
Noise and vibration	**1.** Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Project Manager & Contractor	Throughout construction period	1,000
	2. Use quiet equipment (i.e. equipment designed with noise control elements such as mufflers);	Project Manager & Contractor	Throughout construction period	-

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	3. Install portable barriers to shield compressors and other small stationary equipment where necessary and locate stationary noise sources as far from existing sensitive receptors as possible;	Project Manager & Contractor	Throughout construction period	-
	4. Sensitize construction drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as	Project Manager & Contractor	Throughout construction period	1,000

	churches, residential areas and schools			
	5. Ensure that construction machinery are kept in good condition to reduce noise generation	Project Manager & Contractor	Throughout construction period	25,000
	6. Ensure that all generators and heavy duty equipment are insulated or placed in enclosures to minimize ambient noise levels.	Project Manager & Contractor	Throughout construction period	15,000
	7. Trees to be planted around the site to provide some buffer against noise propagation	Project Manager & site foreman	Throughout construction period	4,000
	8. Prescribe noise reduction measures if appropriate e.g. restricted working hours and transport hours and noise buffering;	Project Manager & site foreman	Throughout construction period	0
10. Minimization of energy consumption				
Increased energy consumption	**1.**Ensure electrical equipment, machinery and lights are switched off when not being used	Project Manager & Contractor	Throughout construction period	0
	2. Install energy saving fluorescent tubes at all lighting points instead of bulbs which consume higher electric energy	Project Manager & Contractor	Throughout construction period	5,000
	3. Ensure planning of transportation of materials to ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts	Project Manager & Contractor	Throughout construction period	10,000
	4. Monitor energy use during construction and set targets for reduction of energy use	Project Manager & Contractor	Throughout construction period	5,000
11. Minimize water consumption and ensure more efficient and safe water use				
High water demand	**1.** Connect to the existing NW&SCo main supply	Mechanical Engineer and Project Manager	One-off	50,000

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (Ksh)**
	2. Harness rainwater for construction activities usage	Mechanical Engineer and Project Manager	Throughout construction period	
	3. Install water conserving taps that turn-off automatically when water is not being used	Project Manager & Contractor	One-off	10-40 % higher than price of ordinary taps
	4. Promote recycling and reuse of water as much as possible	Project Manager & Contractor	Throughout construction period	2,000

	5. Install a discharge meter at all water outlets to determine and monitor total water usage	Project Manager & Contractor	One-off	2,000 per unit
	6. Promptly detect and repair of water pipe and tank leaks	Project Manager & Contractor	Throughout construction period	1,000 per month
	7. Ensure taps are not running when not in use			1,000
12. Minimize release of liquid effluent				
Generation of wastewater	**1.** Provide means for handling sewage generated by construction workers, e.g. mobile toilets	Mechanical Engineer & Project Manager	One-off	40,000 per month
	2. Conduct regular checks for sewage pipe blockages or damages	Mechanical Engineer & Project Manager	Throughout construction period	2,000/month
13. Ensure the general safety and security of the construction site and surrounding				
Safety and security	Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the construction site.	Project Manager & Contractor	Continuous	50,000/month
14.Mininize hydrology and water quality degradation				
Surface and groundwater contamination	**1.** Hazardous substance control and emergency response plan that will include preparations for quick and safe clean up of accidental	The Mechanical Engineer, Project Manager, Contractor & the Developer	Continuous	30,000 spills.

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (Ksh)**
	2. Hazardous-materials handling procedures to reduce the potential for a spill during construction to be prescribed	The Mechanical Engineer	Continuous	2,000
	3. Identify areas where refueling and vehicle maintenance activities and storage of hazardous materials, if any, will be permitted	The Mechanical Engineer	Continuous	-
	4. Ground water, will be collected during construction contained and disposed of in accordance with all applicable regulations	The Mechanical Engineer	Continuous	
15. Increased pressure on infrastructure				

Dilapidation of existing infrastructure	**1.** Coordinate relevant service providers and authorities (i.e. KPLC, NCC, NW&SCo, NEMA amongst others) so as to harmonize the projects infrastructural and socio-economic developments with existing facilities	Architect, Project Manager, Contact or and the Developer	Continuous	200,000
	2. Upgrade existing infrastructure and services, if and where feasible.	Architect, Project Manager, Contactor and the Developer	Continuous	300,000
16. Minimize traffic around the project site and adjacent roads				
Increased traffic, obstruction	**1.** Ensure all construction vehicles to and from the construction site use the designated Entry/Exit to the project site	Project Manager and Site Foreman	Throughout construction period	-
	2. All transportation of construction raw materials and excavated materials are to be conducted at traffic off peak hours only	Project Manager and Contactor	Throughout construction period	-
	3. Sensitize truck drivers to avoid unnecessary road obstruction	Project Manager, Contactor & site foreman	Throughout construction period	-
	4. Cover all trucks hauling soil, sand and other loose materials to avoid spillage and dust emissions that may interfere with smooth Motoring	Project Manager, Contactor & site foreman	Throughout construction period	-

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (Ksh)**
	5. Work hours shall be restricted to the period between 8:00 a.m. and 5:00 p.m., Monday through Friday, unless approved otherwise.	Project Manager, Contactor & site foreman	Throughout construction period	
	6. Access to driveways will be maintained at all times unless other arrangements are made	Project Manager, Contactor & site foreman	Throughout construction period	
17. Minimize occupational health and safety risks				
Approval of building plans	Ensure that all building plans are approved by the Local Authority and the Local Occupational Health and Safety Office	Developer	One-off	50,000

Registration Of the premises	Registration of the project under the Occupational Safety and Health Act,2007 Laws of Kenya is mandatory	Developer	One-off	5,000
General register	A general register should be kept within the facility as stipulated in Occupational Safety and Health Act,2007.	Project Manager & Contractor	One-off	1,000
Incidents, accidents and dangerous occurrences.	**1.** Ensure that provisions for reporting incidents, accidents and dangerous occurrences during construction using prescribed forms obtainable from the local Occupational Health and Safety Office (OHSO) are in place.	Project Manager, Developer & Contractor	Continuous	500/month
	2. Enforcing adherence to safety procedures and preparing contingency plan for accident response in addition safety education and training shall be emphasized.	The Contractor, Project Manager& Site Safety Officer	Continuous	20,000
Insurance	Ensure that the premises are insured as per statutory requirements (third party and workman's compensation)	Developer	Annually	-
Site organization	Develop a clear site organization plan and construction schedule	The Contractor, Project Manager& Site Safety Officer	Continuous	5,000

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (Ksh)**
	Deliver and store materials at appropriate locations	The Contractor, Project Manager & Site Safety Officer	Continuous	10,000
	Hire the right number of workers with clear work schedule and appropriate dress gear	The Contractor, Project Manager & Site Safety Officer	Continuous	2,000
Safety, health and environment (SHE) policy	Develop, document and display prominently an appropriate SHE policy for construction works	Project Manager, Developer & Contractor	One-off	1,000
Health and safety committee	Provisions must be put in place for the formation of a Health and Safety Committee, in which the employer and the workers are represented	Project Manager	One-off	10,000

Sanitary conveniences	**1.** Suitable, efficient, clean, well-lit and adequate sanitary conveniences should be provided for construction workers	Project Manager	One-off	20,000
	2. Mobile toilets, changed regularly, to be provided on site or Latrines	Project Manager	Throughout construction period	10,000-30,000 per unit
Medical examination	Arrangements must be in place for the medical examination of all construction workers before, during and after termination of employment	Project Manager, Developer & Contractor	Continuous	1,000 per examination
Machinery/equipment safety	**1.** Ensure that machinery, equipment, personal protective equipment, appliances and hand tools used in construction do comply with the prescribed safety and health standards and be appropriately installed maintained and safeguarded	Project Manager, Developer & Contractor	One-off	0
	2. Ensure that equipment and work tasks are adapted to fit workers and their ability including protection against mental strain	Project Manager, Developer & Contractor	Continuous	0

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (Ksh)**
	3. All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury	Project Manager	One-off	0
	4. Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/operations	Project Manager	Continuous	5,000 per training
	5. Equipment such as fire extinguishers must be examined by an authorized agency. The equipment may only be used if a certificate of examination has been issued	Project Manager	Continuous	5,000 per examination
	6. Reports of such examinations must be presented in prescribed forms, signed by the examiner and attached to the general register	Project Manager	Continuous	5,000 per examination
Storage of materials	**1.** Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse	Project Manager	Continuous	15,000
	2. Ensure that items are not stored/stacked against weak walls and partitions	Project Manager	Continuous	0
	1. floors, steps, stairs and passages of must be of sound	Project Manager &	Continuous	-

	construction and properly maintained	Contractor		
	2. Securely fence or cover all openings in floors	Project Manager & Contractor	One-off	-
	3. Provide all staircases within the building with suitable handrails on both sides	Project Manager & Contractor	One-off	-
Safe means of access and safe place of employment	**4.** Ensure that construction workers are not locked up such that they would not escape in case of an emergency	Project Manager & Contractor	Continuous	-
	5. All ladders used in construction works must be of good construction and sound material of adequate strength and be properly maintained	Project Manager & Contractor	One-off	0
	6. All of scaffolds and work platforms shall be erected, altered and dismantled by competent persons	Project Manager & Contractor	Throughout construction period	-

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Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	7. All uprights must be provided with base plates (and, where necessary, timber sole plates) or prevented in some other way from slipping or sinking	Project Manager & Contractor	Throughout construction period	-
	8. All scaffolds must be secured to the building in enough places to prevent collapse	Project Manager & Contractor	Throughout construction period	-
	9. Guard rails or equivalent protection to be in place to stop falls from open edges on scaffolds, mobile elevating work platforms, buildings, gangways, excavations, etc	Project Manager & Contractor	Throughout construction period	-
	10. Enough barriers must be erected at rooftop edges to protect workers or materials falling from roofs	Project Manager & Contractor	Throughout construction period	
Emergency preparedness and evacuation procedures	**1.** Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency	Project Manager & Contractor	One-off	2,000
	2. Such procedures must be tested at regular intervals	Project Manager & Contractor	Every 3 months	2,000
	3. Ensure that adequate provisions are in place to immediately stop any operations where there in an imminent and serious danger to health and safety and to evacuate workers	Project Manager & Contractor	One-off	10,000

	4. Ensure that the most current emergency telephone numbers posters are prominently and strategically displayed within the construction site	Project Manager & Contractor	One-off	1,000
	5. Provide measures to deal with emergencies and accidents including adequate first aid arrangements	Project Manager & Contractor	Continuous	5,000
First Aid	**1.** Well stocked first aid box which is easily available and accessible should be provided within the construction site	Project Manager & Contractor	One-off	5,000
	2. Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body.	Project Manager & Contractor	One-off	10,000

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (Ksh)**
Fire protection	**1.** Firefighting equipment such as fire extinguishers should be provided at strategic locations such as stores and construction areas.	Project Manager & Contractor	One-off	30,000
	2. Regular inspection and servicing of the equipment must be undertaken by a reputable service provider and records of such inspections maintained	Project Manager & Contractor	Every 3 months	5,000
	3. Signs such as “NO SMOKING” must be prominently displayed within the construction site, especially in parts where inflammable materials are stored	Project Manager & Contractor	One-off	2,000
Ventilation	Enough space must be provided within the premises to allow for adequate natural ventilation through circulation of fresh air	Project Manager & Contractor	One-off	0
Lighting	There must be adequate provision for artificial or natural lighting in all parts the super structure in which persons are working or passing	Project Manager & Contractor	One-off	0
Electrical Safety	**1.** Circuits must not be overloaded	Project Manager & Contractor	Continuous	0
	2. Distribution board switches must be clearly marked to indicate respective circuits and pumps	Project Manager & Contractor	One-off	0
	3. There should be no live exposed connections	Project Manager & Contractor	Continuous	0

	4. Electrical fittings near all potential sources of ignition should be flame proof	Project Manager & Contractor	One-off	0
	5. All electrical equipment must be earthed	Project Manager & Contractor	One-off	0
Chemical Safety	**1.** Develop a suitable system for the safe collection, recycling and disposal of chemical wastes, obsolete chemicals and empty chemical containers to avoid their reuse for other purposes and to eliminate or minimize the risks to safety, health and environment	Project Manager & Contractor	One-off	10,000

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Time Frame**	**Cost (Ksh)**
	2. Ensure that all chemicals used in construction are appropriately labeled or marked and that material safety data sheets containing essential information regarding their identity, suppliers classification of hazards, safety precautions and emergency procedures are provided and are made available to employees and their representatives	Project Manager & Contractor	One-off	0
	3. Keep a record of all hazardous chemicals used at the site, cross-referenced to the appropriate chemical safety data sheets	Project Manager & Contractor	Continuous	0
	4. There should be no eating or drinking in areas where chemicals are stored or used	Project Manager & Contractor	Continuous	0
	5. Provide workers in areas with elevated noise and vibration levels, with suitable ear protection equipment such as ear masks	Project Manager & Contractor	One-off	5,000
Supply of clean drinking water	Ensure that construction workers are provided with an adequate supply of wholesome drinking water which should be maintained at suitable and accessible points.	Project Manager & Contractor	One-off	5,000/month
Washing facilities	Ensure that conveniently accessible, clean, orderly, adequate and suitable washing facilities are provided and maintained within the Site	Project Manager & Contractor	One-off	5,000
Ergonomics	**1.** Provision for repairing and maintaining of hand tools must be in Place	Project Manager & Contractor	One-off	5,000
	2. Hand tools must be of appropriate size and shape for easy and	Project Manager &	One-off	0

	safe use	Contractor		
	3. Height of equipment, controls or work surfaces should be positioned to reduce bending posture for standing workers	Project Manager & Contractor	One-off	0

11.1.2 Operational Phase EMP

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the operational phase of the project are outlined in **Table 11**.

Table 11: Environmental management plan for the operation phase of the proposed project

Expected Negative impact	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Minimization of solid waste generation and ensuring more efficient solid waste management				
Solid waste generation	1. Provide solid waste handling facilities such as waste bins and skips	Proponent/Building management	One-off	10,000
	2. Ensure that solid waste generated at the building is regularly disposed of appropriately at authorized dumping sites	Proponent/Building management	Continuous	50,000/month
	3. Ensure that building occupants manage their waste efficiently through recycling, reuse and proper disposal procedures.	Proponent/Building management	Continuous	–
	3. Donate redundant but serviceable equipment to charities and institutions	Proponent/Building management	Continuous	0
2. Minimize risks of sewage release into environment				
Sewage disposal	1. Provide adequate and safe means of handling sewage generated (i.e. NW&SCo sewer mains)	Building management	One-off	-
	2. Conduct regular inspections for sewage pipe blockages or damages and fix appropriately	Building management	Continuous	500 per inspection
3. Minimize energy consumption				

Energy resource utilization	1. Switch off electrical equipment, appliances and lights when not being used	Staffs/ Building management	Continuous	–
	2. Install occupation sensing lighting at various locations such as storage areas which are not in use all the time	Building management	One-off	10-40 % higher than ordinary lighting

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Expected Negative impact	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	3. Install energy saving fluorescent tubes at all lighting points within the building instead of bulbs which consume higher electric energy	Building management	One-off	10-40 % higher than ordinary lighting
	4. Monitor energy use during the operation of the project and set targets for efficient energy use	Building management	Continuous	2,000/month
	5. Sensitize tenants & employees to use energy efficiently	Building management/Staffs	Continuous	500/month
4. Minimize water consumption and ensure more efficient and safe water use				
Water consumption	1. Promptly detect and repair water pipe and tank leaks	Building management	Continuous	2,000/month
	2. Encourage tenants and staffs to conserve water	Building management/Staffs	Continuous	500/month
	3. Ensure taps are not running when not in use	Building management/Staff	Continuous	500/month
	4. Install water conserving taps that turn-off automatically when water is not being used	Building management	One-off	10-40 % higher than ordinary taps
	5. Install a discharge meter at water outlets to determine and monitor total water usage	Building management	One-off	2,000
6. Minimize Traffic around adjacent road				
Traffic generation	1. "NO PARKING" signs will be posted around the building where Parking is prohibited and likely to cause obstruction as well as other necessary traffic signs	Building Management & Traffic/Parking Attendant	Continuous	-

	2. Traffic management/parking personnel shall be provided to monitor parking and ensure smooth motoring along the buildings adjacent roads	Building Management	Continuous	15,000/ month

Expected Negative impact	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	3. Access to driveways will be maintained at all times	Traffic/Parking Attendant	Continuous	-
	4. Any work that disturbs normal traffic signal operations shall be coordinated with the relevant authorities	Building Management & Traffic/Parking Attendant	Continuous	-
5. Minimization of health and safety impacts				
1. Implement all necessary measures to ensure health and safety of the workers and the general public during operation of the project as stipulated in Occupational Safety and Health Act, 2007		Proponent	Continuous	_
6. Ensure the general safety and security of the premises and surrounding areas				
1. Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises.		Proponent	Continuous	50,000-100,000/month
7. Environmental monitoring of the project				
The Firm of Experts (Stalin Environment) will undertake continuous environmental monitoring of the project in liaison to the National Environment Management Authority and the Proponent. This will ensure that environmental concerns are integrated into the project at every stage of implementation. An Initial Environmental Audit will be conducted in the first year of operation/occupation to confirm the efficacy and adequacy of the EMP and to propose a comprehensive operational Phase EMP in harmony with the buildings custom fittings		Proponent, Firm of Experts and NEMA	Continuous	-

11.1.3 Decommissioning Phase EMP

In addition to the mitigation measures provided in **Tables 10** and **11** it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the project have ceased. The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project are outlined in **Table 12**.

Table 12: Environmental management plan for the decommissioning phase of the proposed project

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Demolition waste management				
Demolition waste	**1.** Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3.Composting and reuse 4. Combustion 5. Sanitary land filling.	Project Manager & Contractor	One-off	-
	2. All buildings, machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible	Project Manager & Contractor	One-off	0
	3. All foundations must be removed and recycled, reused or disposed of at a licensed disposal site	Project Manager & Contractor	One-off	0
	4. Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site	Project Manager & Contractor	One-off	0
	5. Donate reusable demolition waste to charitable organizations, individuals and institutions	Project Manager & Contractor	One-off	0
	6. Rehabilitate accordingly	Architect, Project Manager		

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12 CONCLUSION AND RECOMMENDATION

12.1 Conclusion

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

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

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

12.2 Recommendation

This report recommends that the project be allowed to go ahead provided the outlined mitigation measures are adhered to. Major concerns should nevertheless be focused towards minimizing the occurrence of impacts that would degrade the general environment. This will however be overcome through close follow-up and implementation of the recommended Environmental Management and Monitoring plans (EMPs). We recommend these:

- The proponent should follow the guidelines as set by the relevant departments to safeguard and envisage environmental management principles during construction and operations/occupation phases of the proposed project.
- It is important that warning or informative sign (bill boards) be erected at the site. These should indicate the operation hours and when works are likely to be started and completed. The signs should be positioned in a way to be easily viewed by the public and mostly motorists.

- All solid waste materials and debris resulting from construction activities should be disposed off at approved dumpsites.
- All construction materials and especially pipes, pipe fittings, sand just to mention a-few should be sourced/procured from bonafide /legalized dealers.
- During construction all loose soils should be compacted to prevent any erosion by water and wind.
- Other appropriate soil erosion control measures can be adapted. Any stock piles of earth should be enclosed, covered or sprinkled with water during dry or windy conditions to minimize generation of dust particles into the air.
- Once earthworks have been done, restoration of the worked areas should be carried out immediately by backfilling, landscaping/leveling and planting of suitable tree species.
- Proper and regular maintenance of construction machinery and equipment will reduce emission of hazardous fumes and noise resulting from friction of metal bodies. Maintenance should be conducted in a designated area and in a manner not to interfere with the environment.
- A fully equipped first aid kit should be provided within the site
- Workers should get food that is hygienically prepared. The source of such food should be legalized or closely controlled.
- The contractor should have workmen's compensation cover and is required to comply with workmen's compensation Act as well as other relevant ordinances, regulations and Union Agreements
- The contractor should provide adequate security during the construction period.

12.2.1 Statutory Compliance

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

- Consult all relevant service providers and authorities (i.e. Nairobi County County Planning Department, Kenya Urban Roads Department, National construction Authority,KPLC, NW&SCo, NEMA, amongst others) to harmonize the projects infrastructural and socio-economic developments with existing facilities
- Adhere to all relevant construction, occupational, health and safety regulations and any other relevant law.
- Ensure Water and Energy Management Systems are put in place as outlined within the report and incorporate rain water harvesting facilities
- Solid waste management during construction and operational phases of the project must adhere to the Environmental Management and Coordination (Waste Management) Regulations, 2006

- Ensure strict adherence to provisions of Environmental Management and Coordination (Noise and Excessive Vibrations Pollution) Regulations, 2009
- Ensure strict adherence to provisions of Water Resource and Management Rules 2007 Guideliness
- Ensure waste water is disposed off as per standards set in the Environmental Management and Coordination (Water Quality) Regulations, 2006
- Ensure strict adherence to Occupational Health and Safety Act, 2007
- Ensure an elaborate landscaping program is put in place as the construction phase is being concluded so as to replenish vegetation around the project site by planting trees, flowers and lawns where applicable.

13 REFERENCES

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14 APPENDICES

14.1 APPENDIX I: SOCIAL IMPACT REPORT

14.2 APPENDIX II: OWNERSHIP DOCUMENTS

14.3 APPENDIX III: APPROVED ARCHITECTURAL DRAWINGS AND APPROVED CHANGE OF USE

14.4 APPENDIX V: WATER RESOURCE AUTHORITY LETTER ON RIPARIAN RESERVE DEMARCATION

14.5 APPENDIX VI: PUBLIC PARTICIPATION