ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT

FOR

THE PROPOSED MASTER PLAN DEVELOPMENT:

HOTEL AND AMUSEMENT PARK -COTTAGES, CONFERENCE AND RECREATIONAL FACILITIES; RESIDENTIAL - TOWNHOUSES, MAISONETTE AND APARTMENTS; COMMERCIAL CENTRE AND EDUCATIONAL DEVELOPMENT, RUIRU SUB-COUNTY, KIAMBU COUNTY

PREPARED BY:

ANTONY MUIRURI

EIA/EA LEAD EXPERT REG. NO. 5084

CELL: 0724117068

(SUBMITTED TO NEMA IN ACCORDANCE WITH THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT (EMCA ACT) OF CAP 387)

Cytonn INVESTMENTS

CYTONN INVESTMENT PARTNERS

P.O BOX 20695 - 00200

NAIROBI, KENYA

OCTOBER, 2017

CERTIFICATION

This Environmental Social Impact Assessment Study Report has been prepared and compiled by a team of experts commissioned by **Cytonn Investment Partners Five LLP** for the proposed comprehensive development in Kiambu County. This Study Report has been prepared and compiled in accordance with the Environmental Management and Coordination Act (EMCA), Cap 387 of 2015 and the Environmental (Impact Assessment and Audit) Regulations, 2003 for submission to the National Environmental Management Authority (NEMA).

The team submits this Environmental and Social Impact Assessment Report, to NEMA Kenya.

To the best of our knowledge, all the information in this report is true and correct.

PROPONENT: Cytonn Investment Partners Five LLP

Name ……. Position ……

…….. Date …….. October 2017

Signature/Official Stamp

EXPERTS DETAILS.

ANTONY MUIRURI

EIA/EA LEAD EXPERT

REG NO. 5084

……

Signature/Official Stamp

EUNICE WAHIGA KANYUNGU,

ASSOCIATE EXPERT …… Date …….. October 2017

REG. NO. 8064 Signature/Official Stamp

TEAM OF EXPERTS:

ANTONY MUIRURI

EIA/EA LEAD EXPERT

REG NO. 5084

EUNICE WAHIGA KANYUNGU,

ASSOCIATE EXPERT

REG. NO. 8064

ERIC MUIRURI

URBAN PLANNER.

JOHN KINUTHIA

ARCHITECT

ARCH REG NO. A1393

CIVIL AND STRUCTURAL ENGINEER

FRAME CONSULTANTS LTD.

MECHANICAL ENGINEER.

NORKUN INTAKES LTD

ELECTRICAL ENGINEER

NORKUN INTAKES LTD

ACRONYMS

CAP	Chapter
EIA	Environmental Impact Assessment
EMC	Estate Management Company
EMCA	Environmental Management Coordination Act
EMP	Environmental Management Plan
Ft	Feet
Ha	Hectare
IEA	Initial Environmental Audit
IMCE	Inter-Ministerial Committee on Environment
KM	Kilometres
KVA	Kilo Volts Amperes
NEC	National Environment Council
NEAP	National Environment Action Plan
NEMA	National Environment Management Authority
NES	National Environment Secretariat
NPEP	National Poverty Eradication Plan
PEC	Poverty Eradication Commission
PPE	Personal Protective Equipment
RUJUWASCO	Ruiru Juja Water and Sewerage Company
TOR	Terms of Reference
V	Volts
WRMA	Water Resources Management Authority
WSSD	World Summit for the Social Development

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

LIST OF PICTURES

EXECUTIVE SUMMARY

This Environmental Impact Assessment project report was prepared as per the provisions of Environmental Management and Coordination Act, Cap 387 and more specifically to Environmental (Impact Assessment and Audit) Regulations 2003, Legal Notice No. 101.

The proposed development will consist of hotel and amusement park -cottages, conference and recreational facilities; residential - townhouses, maisonette and apartments; commercial center and educational development (Quarters 14, Eighths 207, Sixteenths 177) Apartments will include (70 One bedroom and 140 Two bedroom) with associated amenities in River Run. The development may have significant impacts on the environment which has to be mitigated, if adverse, and optimized, if beneficial. The approval of the Strategic Environment Assessment (SEA) for the proposed development on L. R. NO. 5910 Master Plan prescribed that EIA will be undertaken for the various components of the Master Plan prior to commencement of construction works. Conformity to the master plan zoning scheme is up held in this process.

It is against this background that this study was commissioned as part of the preliminary planning stage of the proposed residential development. The firm of experts registered with the National Environmental Management Authority (NEMA) was contracted by the proponent to undertake the study with the objective of identifying both positive and negative impacts of the proposed project. Also identify areas that are likely to be impacted on the project and in accordance with laid down environmental legislation and guidelines, carry out a systematic EIA report that should contain among other issues, identification of key environmental aspects, and recommendations on appropriate mitigation measures to minimize or prevent adverse impacts, optimize on the positive impacts and develop an environmental management plan to guide the project planning, construction, operation and decommission phases. Below is a summary of the anticipated significant impacts and their proposed mitigation measures.

Anticipated Impacts	**Mitigation measures**
Noise & vibrations	-Provision of barriers such as walls around the site boundaries to provide some buffer against noise -Installation of portable barriers to shield compressors and other small stationary equipment where necessary -Silenced machinery and instruments should be employed where possible

	-Provide and enforce use of PPE among workers e.g. ear muffs -Proper servicing of machinery & equipment (oiling, greasing etc.) -Monitor noise levels as per NEMA guidelines
Soil Degradation	-Rocked construction entrance and exit to keep sediment from being tracked onto adjacent roads -Stock piles to be covered with tarpaulins and slope stability to be checked -Landscape all disturbed areas after construction phase
Air pollution	-Spray water on exposed areas twice daily during dry weather to suppress dust -Cover loads of friable materials during transportation and avoid pouring dust materials from elevated areas to ground -Provide dust screens where necessary -Control speed of construction vehicles and switch off machines when not in use -Regularly service and maintain vehicles, mobile plants and machinery -Provide PPE such as nose masks to the workers in dust generation areas. -All raw materials must be sourced as close as possible to the construction site thus reducing the emissions from vehicular traffic.
Loss of biodiversity	-Retain vegetation screens to reduce the visual effect of construction activities where possible -Clearance of vegetation should be done in necessary areas only - After project completion, proponent should carry out environmental compensation where harm cannot be avoided by use of indigenous plants
Increased solid waste	-Limit quantity by developing appropriate budgets for purchase of raw materials to reduce wastage through exposure to weather elements -Provision of a waste transfer station within the development -Segregation of waste at source through provision of separate bins -Contract a duly licensed waste handler to transport waste
Increased water demands	-Installation of flush toilets with low volume cisterns and high pressure

	-Efficient waste water recycling and rain water harvesting
River degradation	-Maintain a riparian buffer zone along the River as per WRMA recommendations -only permitted activities shall be undertaken within the full width of the river or within the riparian reserve as per Water Quality Regulations 2006 -To the extent possible, limit any modifications to natural streams Preserve and maintain the rivers, natural streams and drainage ways within the developed areas by designating them as part of the open space system. -To the extent possible, limit any modifications to natural streams and drainage ways, unless they are necessary for flood protection, to preserve water quality and protect aesthetic and biological resources.
River flooding	-Plant environmentally friendly trees on the riparian reserve to increase interception and storage while reducing surface run off - Discourage the planting of eucalyptus, sugarcane and invasive species in the water resource areas while giving alternative species such as bamboo. -Liaise with WRMA to decommission the weir in the river and further discuss all options with WRMA to prevent flooding. -
Public health and occupational safety and health	Adequate sanitary facilities should be provided and standard cleanliness maintained -Personnel to wear complete PPE -Only qualified personnel to operate the machinery -Designate a Health & Safety officer to be in-charge of enforcing site compliance with OSH rules & regulations -Provision of an adequately stocked first aid kit and at least one trained first aider on site -Display the contact numbers of the persons responsible for handling emergencies on the site Contractor should have workmen‘s compensation cover which should comply with workmen‘s compensation Act

	-Provision of firefighting equipment
Traffic snarl ups during construction	-A traffic marshal shall be stationed along the entry and exit points within the project boundary to control vehicles during transportation of materials. -Planned deliveries to make sure they do not coincide with heavy traffic -Provision of separate traffic routes for pedestrians , bikes and vehicles during operation phase -Proponent to engage KURA and KeNHA in developing access roads for the proposed project -Security checks to be conducted inside the development NOT at the entrance to reduce traffic -Provision of designated entry and exit points
Socio economic concerns	-Development of a Corporate Social Responsibility programme which could provide assistance to the community -Give priority to the neighboring local communities when providing employment opportunities -Where possible offer women equal opportunities as men - establish a complaint management system

Table 1: Summary of the anticipated significant impacts

The preparation of this report was done through consultation and public participation that included interviews and review of relevant materials. The potential environmental impacts are herein discussed, both the positive and negative. The negative environmental impacts, mainly concentrated during the construction phase include dust emissions, noise and vibrations, increased traffic (lorries transporting construction materials), increased runoff, occupational hazards, pressure on existing infrastructure, construction waste generation, and general nuisance to the neighboring facilities.

Adequate guidance is given to minimize nuisance caused to neighbors during the construction phase with emphasis being placed on:

- Provision of adequate sanitation to the construction workforce and strict enforcement of good behavior by the workforce.
- Transportation of building materials to site and construction debris from site has to be undertaken during off peak hours where possible.

- Construction activities at night shall obtain necessary authorization and shall be kept to minimum.
- Adequate dust screening and water sprinkling to control dust emissions
- Minimization of noise and vibrations by ensuring compliance with maximum permissible noise levels (day or night) in accordance with the Noise and excessive Vibration pollution control) Regulations 2009.
- Adhere to the provisions of Occupational Safety and Health Act, No. 15 of 2007 to ensure safety of the workforce.
- Establishment of complaint management system

Occupation/operation phase of the project presents lesser negative environmental impacts mainly restricted to the pressure on existing infrastructure (water, sewer, and road) and domestic waste generation. Furthermore protection of the Kinjibbe River riparian reserve has been factored in the project design. The proposed development on L. R. No. 5910 project shall blend well with the surrounding residential character.

The Environmental management plan of this report provides the project policy as a clean, green healthy and safe environment. Mitigation measures detailed out are minimizing land degradation, enhancing landscaping, aesthetics and revegetation, improving air quality, minimizing noise pollution, installation of water and energy saving fixtures, roof harvesting of rainwater for gardening and pavement washing, solid waste management plans, traffic management plan, protection of ecologically sensitive ecosystems such as river riparian reserve and provision of sanitary accommodation to the construction workforce.

The summary therefore posits that a number of environmental mitigation measures be implemented to minimize environmental degradation and enhance environmental quality. The proponent, contractor and the Environmental Consultant shall therefore ensure that adequate supervision is in place to implement the guidance in the Environmental Management Plan.

CHAPTER ONE

1.1 INTRODUCTION

This report serves to describe the proposed plan for the proposed development in compliance with the Environmental Management and Coordination Act (EMCA), Cap 387. The proposed development on plot **on plot L. R. No. 5910**, Ruiru Sub County, Kiambu County. The EIA process aims to further assess the current environment, the proposed works and its impact on the environment. The report has assessed the potential impacts and has addressed both the positive impacts of the project as well as the negative. The negative impacts have been evaluated and the necessary mitigation measures, which if followed, will serve to reduce or avoid those identified.

1.2 Objectives, Scope and Criteria of the Assessment

The overall objective of the EIA study report was to identify and assess the potential environmental impacts that would be associated with the master plan development (hotel and amusement park -cottages, conference and recreational facilities; residential - townhouses, maisonette and apartments; commercial center and educational development) and to recommend several mitigation measures for the negative impacts through a Comprehensive Environmental Management / Monitoring Plan (EMP).

1.1 Background

In compliance with the Environmental Management and Coordination Act (EMCA), Cap 387 NEMA Registered Expert was commissioned by the proponent to conduct Environmental Impact Assessment of the proposed development on plot L. R. No. 5910, Ruiru Sub-County, Kiambu County.

1.1.1 Objectives of the project

The objectives of the proposed development include:

- To create a high quality mixed use development containing residential units, recreational and commercial amenities.
- To meet economic desires of the proponent
- To put the current land into more productive and economic use
- To protect environmentally sensitive areas, to instill efficient use of the resources (water, energy and space) and ensure sustainable development.

The conceived project is designed to blend with current land-use trend for the area (currently replacing the original coffee plantations), where a survey revealed that such development (suburbanization) is guaranteed of attracting the desired clientele.

1.1.2 Objectives of the EIA Study

Compliance with Environmental Management and Coordination Act (EMCA), Cap387 which establishes a requirement for the environmental Impact Assessment (EIA) study for a project such as this ,in order to establish the potential positive and negative impacts of the project to the integrity of the environmental Impact Assessment study was to identify significant potential impacts of the proposed project to the environment and social aspects and formulate recommendations to ensure the project takes in to consideration appropriate measures to mitigate any adverse impacts to the environment in all phases of its implementation. The key objectives of this study include the following:

I. To identify and evaluate the significant environmental impacts of the proposed project
II. To determine the compatibility of the proposed development with neighboring land uses;
III. To assess and analyze the environmental costs and benefits associated with the proposed project.
IV. To evaluate and select the best project alternative from the various options available
V. To address any concerns raised by the public on the proposed project
VI. To incorporate environmental management plans and monitoring mechanism during implementation and operational phases of the project.

1.1.3 Duties of the Proponent

It will be the duty of the proponent to ensure that all legal requirements as pertaining to the development are met as specified by the law.

- The proponent shall provide the contractor with a site office complete with all the furniture and sanitary facilities to facilitate site meetings and inspections.
- The proponent will also provide the contractor with stores for his own use and for use by the subcontractors.

1.1.4 Duties of the Contractor

- Prepare and maintain an approved time and progress chart, showing clearly the period allowed for each section of the work
- The contractor is to comply with all regulations and by-laws of the local Authority including serving of notices and paying of the fees.
- During the night, public holidays and any other time when no work is being carried out onsite, the contractor shall accommodate only security personal and some critical personnel on site
- The contractor shall make good at his own expense any damage he may cause to public and private roads and pavements in the course of carrying out his work.
- The architect shall define the area of the site, which may be occupied by the contractor for use as storage, on the site.
- The contractor shall make his own arrangement for sanitary conveniences for his workmen. Any arrangements so made shall be in conformity with the public health requirements for such facilities and the contractor shall be solely liable for any infringement of the requirements.
- The contractor shall be responsible for all the action of the subcontractor in first instance.
- The contractor shall take all possible precaution to prevent nuisance, inconvenience or injury to the neighboring properties and to the public generally, and shall use proper precaution to ensure that safety of wheeled traffic and pedestrian.
- All work operations, which may produce under level of noise, dust vibration, or any other discomfort to the workers and/or guest of the client must be undertaken with care, with all necessary safety precautions taken.
- Workers will not be allowed to assemble or wait around the premises main gate.
- Workers will be picked from elsewhere and transported through the main entrance to the internal perimeter of the project site.
- The contractor shall take all effort to muffle the noises from his tools, equipment and workmen to not more than 90 Decibels
- The contractor shall upon completion of working, remove and clear away all plant, rubbish and unused materials and shall leave the whole of the site in a clean and tidy state to the satisfaction of the Construction Manager He shall also remove from the site all rubbish and dirt as it is produced to maintain the tidiness of the premises and its immediate environs.
- No shrubs, trees, bushes or underground shall be removed except with the express approval of the Construction Manager

- No blasting shall be permitted without the prior approval of the Construction Manager and the local authorities.
- Borrow pits will only be allowed to be opened up on receipt of permission from the Construction Manager
- The standard of workmanship shall not be inferior to the current British codes of practice and /or the Kenya Bureau of Standards where existing.
- No materials for use in the permanent incorporation into the works shall be used for any temporary works or purpose other than that for which it is provided. Similarly, no material for temporary support may be used for permanent incorporation into the works.

All the materials and workmanship used in the execution of the work shall be of the best quality and description. Any material condemned by the architect shall be immediately be removed from the site at the contractors cost.

All contractor and sub-contractor personnel will be required to be briefed on environmental and social requirements to be observed during construction, operation and even maintenance of the development on L. R. No. 5910 infrastructure. The main contractor must do these briefings before his staff will be allowed to work on the project.

1.2 Project Description and Design

The proposed project components and design will entail phases as shown in the table below.

Phasing				
	Phase 1	*Phase 2*	*Phase 3*	*Phase 4*
No. of Units in each Phase				
1/4 acre villas	*14.0*	*16.0*		
1/8 acre townhouses	*91.0*	*90.0*	*80.0*	
2 bedroom apartments				*309.0*
3 bedroom apartments				*463.0*

Table 2: Phasing of the project

1.3 Environmental Concerns

The following were issues of concern during this Environmental Impact Assessment study.

- The site topography, vegetation, soil type, and general scenery
- How are the site maps, structure distribution
- The construction material to be used

- The proposed method to dispose the effluents and solid wastes
- Water supply system
- Traffic management
- Area zoning specifications and/or River Run Master Plan, a critical planning framework to guide on project level ESIA and the need to adhere to the same.
- If some of the materials will be obtained from within and where exactly, quantity, site regeneration program
- Whether any de-vegetation will take place
- The power sources to be used

1.4 Positive Impacts

Positive environmental impacts during construction activities include: - Creation of employment opportunities for construction workers, creation of market for supply of building materials, increased business opportunities for small-scale traders such as food vendors.

Positive environmental impacts of operational phase of the project will include: Availability of luxurious residential houses, promote business and contribution of revenue to the National and County governments through payment of taxes and rates, improved security in the area.

The positive environmental impacts during decommissioning will include: Rehabilitation of the project site, and employment opportunities for demolition workers.

1.5 Recommended Actions

Several measures have been suggested to prevent or minimize the negative environmental impacts and to maximize the positive ones using a comprehensive Environmental Management Plan as discussed here under this report. The measures mainly focus on the following points: -

i. Use of alternative materials or products which are less damaging to the environment.
ii. Reduction of impacts of waste through minimization of waste generation, recycling, reuse and responsible disposal iii. Energy and water conservation.

iii. Use of appropriate technologies to mitigate environmental impacts of various activities.
iv. Ensuring compliance with relevant safety, health and environmental regulations

1.6 Objective

The objective of this report is to define the proposed project, examine various characteristics of the site - specifically the geological, hydrological and ecological makeup of the site. In so doing, all the potential impacts of the site that may arise from the construction of the development will be identified. It is therefore the intention of the report to furnish all the findings, discuss all the recommendations and measures which will be taken to protect the environment as well as ensure that these options are recognized and implemented.

1.7 Scope, Objectives, Terms of Reference (TOR) for the EIA Process

1.7.1 Scope of the EIA

The study was conducted to ensure that significant impacts on the environment and socio-economic aspects are taken into consideration at all times during project implementation and operation phases. The scope of the study was mainly in the subject project and the immediate environs; and to some extent on the possible far reaching effects of the proposed activities. The following was therefore covered:

- Description of the proposed project
- Design of the proposed project construction materials and methodology
- Evaluation of the location, Land ownership and use
- Baseline information; biophysical and socio-economic impacts of the proposed project.
- A review of the policy, legal and administrative framework
- Potential environmental impacts during project implementation and operation phases
- Potential mitigation measures and future monitoring plans.
- Social Impact Assessment; involvement of neighbors/general public in the area.

1.7.2 Environmental Management and Monitoring plans. Terms of Reference (TOR)

The consultant on behalf of the proponent conducted the assessment by incorporating the following terms of reference:

- Project description
- Description of physical characteristics of site
- Policy, legal and administrative framework
- Physical assessment: geology; hydrology; climatic and meteorological conditions of area and ecological assessment.
- Analyses of sewage and drainage system

- Identification of impacts: pre–construction, during construction and post construction.
- Appendices

1.8 Data Collection Procedures

First, the consultant undertook collection of data, which was carried out through questionnaires/standard interview schedules, use of checklists, observations, site visits, desk top environmental studies and scientific tests, where necessary in the manner specified in Part V (section 31-41) of the Environmental (Impact Assessment and Audit) Regulations, 2003. Then data collected underwent environmental screening and scooping to avoid unnecessary data

1.9 Reporting and Documentation

The Environmental Impacts Assessment study report from the findings was compiled in accordance with the guidelines issued by NEMA for such works and was prepared and submitted by the proponent for consideration and approval. The Consultant ensured constant briefing of the client during the exercise.

1.10 Responsibilities and Undertaking

The Consultants undertook to meet all logistical costs relating to the assignment, including those of production of the report and any other relevant material. The consultants arranged for own transport and travels during the exercise. On the site of the proposed development, the proponent provided a contact person(s) to provide information required by the Consultants. The proponent also provided site plan(s) showing roads, service lines, buildings layout and the actual sizes of the sites, details of raw materials, proposed process outline, future development plans, operation permits and conditions, land-ownership documents and site history, and estimated investment costs.

The output from the consultants includes the following:

- An Environmental Impact Assessment study report comprising of an executive summary, assessment approach, baseline conditions, anticipated impacts and proposed mitigation measures,
- An Environmental Management Plan outline, which also forms part of the report recommendations.

1.11 Methodology Outline

The general steps followed during the assessment were as follows:

- Environment screening, in which the project was identified as among those requiring environmental impact assessment under schedule 2 of EMCA, Cap 387
- Environmental scoping that provided the key environmental issues
- Desk Stop studies and interviews
- Physical inspection of the site and surrounding areas
- Reporting.

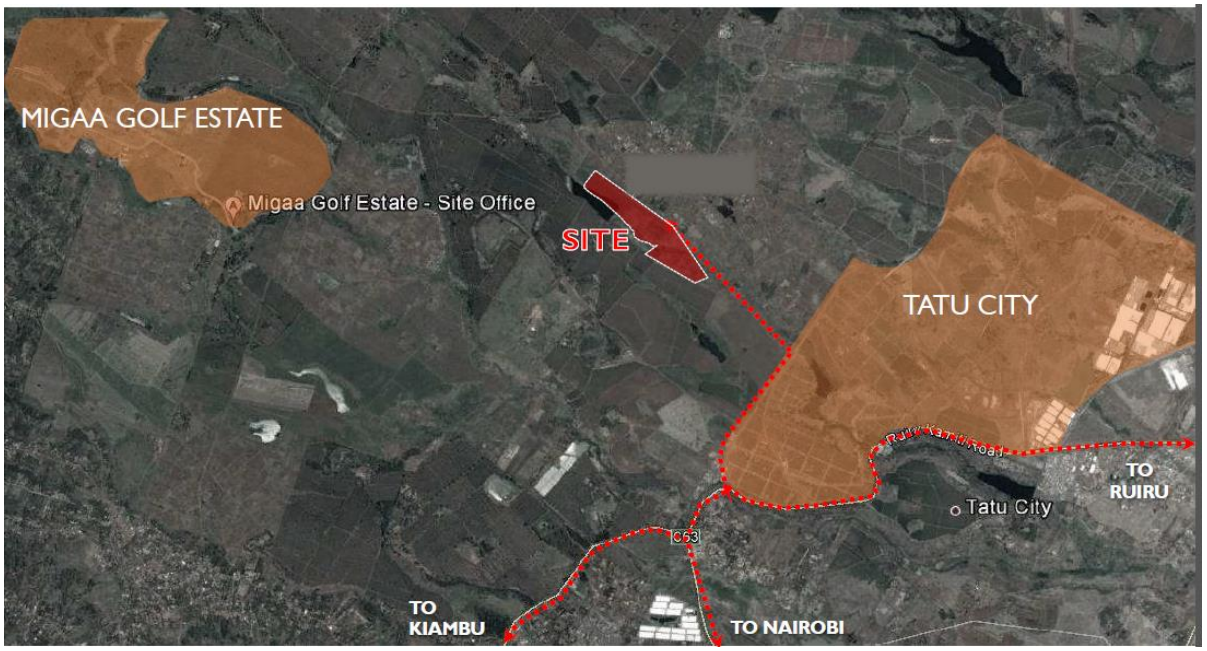
CHAPTER TWO:

2 DESCRIPTION OF THE PROJECT

An assessment of potential environmental impacts can only be possible after a thorough investigation of the current conditions. Documenting these prevailing conditions as they relate to the project is the first step in setting the stage for the proposed development.

2.1 Location of the Project

The parcel is approximately 100 acres located North of Nairobi in Ruiru, Kiambu County. The site is currently a coffee plantation with farm houses and a factory. A key feature within the site is a water reservoir occupying approximately 8 acres over a length of 500 m. The land has red soil and slopes gently towards the stream.



Map 1: Site Location

2.2 Nature of the project

The development on L. R. NO. 5910 is approximately 100 acres located North of Nairobi in Ruiru, Kiambu County (-1.132598, 36.874653) Ruiru is a town in Kiambu County in Kenya. The site is served by good road network from both the Eastern By-pass and Thika Highway. The site is currently a coffee plantation with farm houses and a factory. The land has red soil and slopes gently towards the stream

2.3 Project Description and Design

The EIA report is based on information and consultations with the proponent, the Architects and details contained in the Architectural drawings of the proposed project.

The proposed projects basic components and design will involve the following:

- Development utilities (water, drainage, electricity etc.).
- Construction of an internal water reticulation system as a waste collection center which will be connected to the septic tank.

The following is a breakdown of the projects design.

2.3.1 Residential

This will be the residential aspect of the development with various house types with beach house type having different numbers, this is outlined in the table below. The total area covered by the residential aspect will be 53.11 acres representing 53.33%.

HOUSE TYPES	**NUMBER**
Quarters	14
Eighths	207
Sixteenths	177

RESIDENTIAL TOWN HOUSEUNITS	TYPOLOGIES		
	SIXTEENTHS	EIGHTHS	QUARTERS
CLUSTER 1	51	33	
CLUSTER 2	43	34	
CLUSTER 3		47	5
CLUSTER 4		42	8
CLUSTER 5	40	27	
CLUSTER 6	32	16	
CLUSTER 7	16	9	
SUB TOTALS	182	208	13
TOTAL UNITS	403 Total Units		

Table 3: Residential Town House units.

RESIDENTIAL APARTMENTS

CLUSTER 8	BLOCK	NO. OF FLOORS	TYPOLOGIES 2 BED APARTMENTS	3 BED APARTMENTS
	A	4	4	12
	B	5	5	15
	C	5	10	10
	D	5		10
	E	5		20
	F	6		24
	G	6		30
	H	8		24
	I	8		16
	J	8		16
	K	4	4	12
	L	5	5	15
	M	5	10	10
	N	5		10
	O	5		20
	P	6		24
	Q	6		30
	R	8		24
	S	8		16
	T	8		16
	SUB TOTALS		**38**	**354**

BLOCK	NO. OF FLOORS	TYPOLOGIES 2 BED APARTMENTS	3 BED APARTMENTS
U	5	10	20
V	5	10	20
W	5	10	20
X	5	10	20
Y	5	10	20
Z	5	10	20
Z1	5	10	20
SUB TOTALS		**70**	**140**

TOTAL UNITS	**602 Total Units**

Table 4: Residential Apartments.

OPTION 1

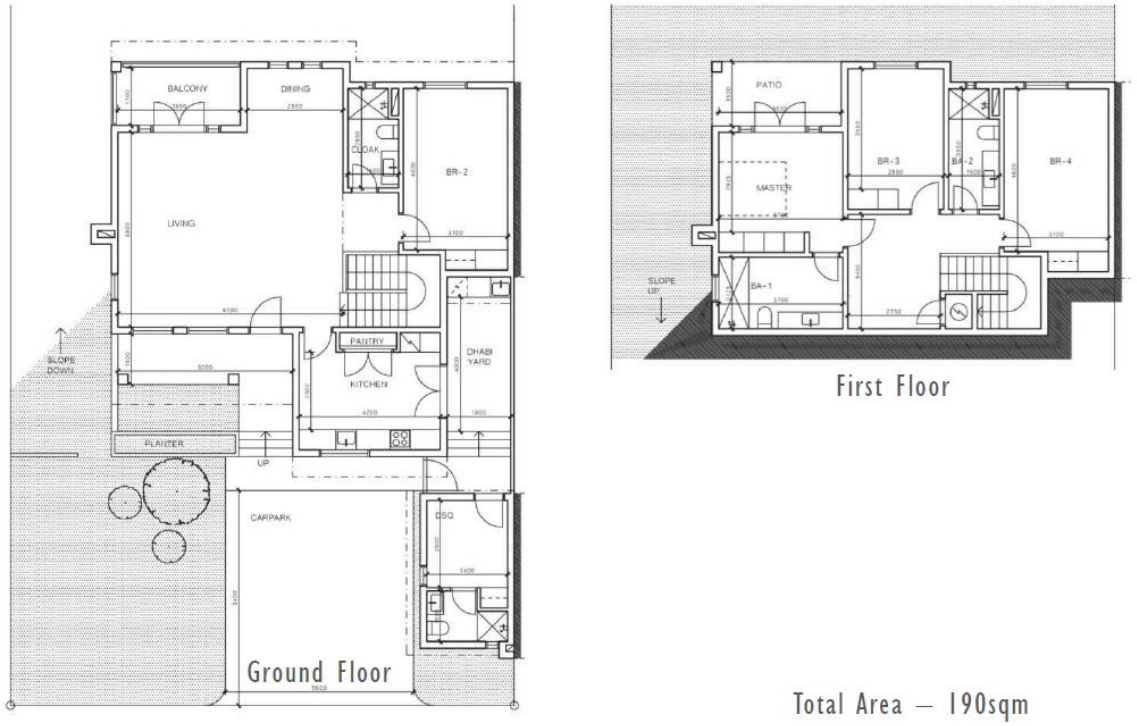


Figure 1: Houses on 1/4th

OPTION 2

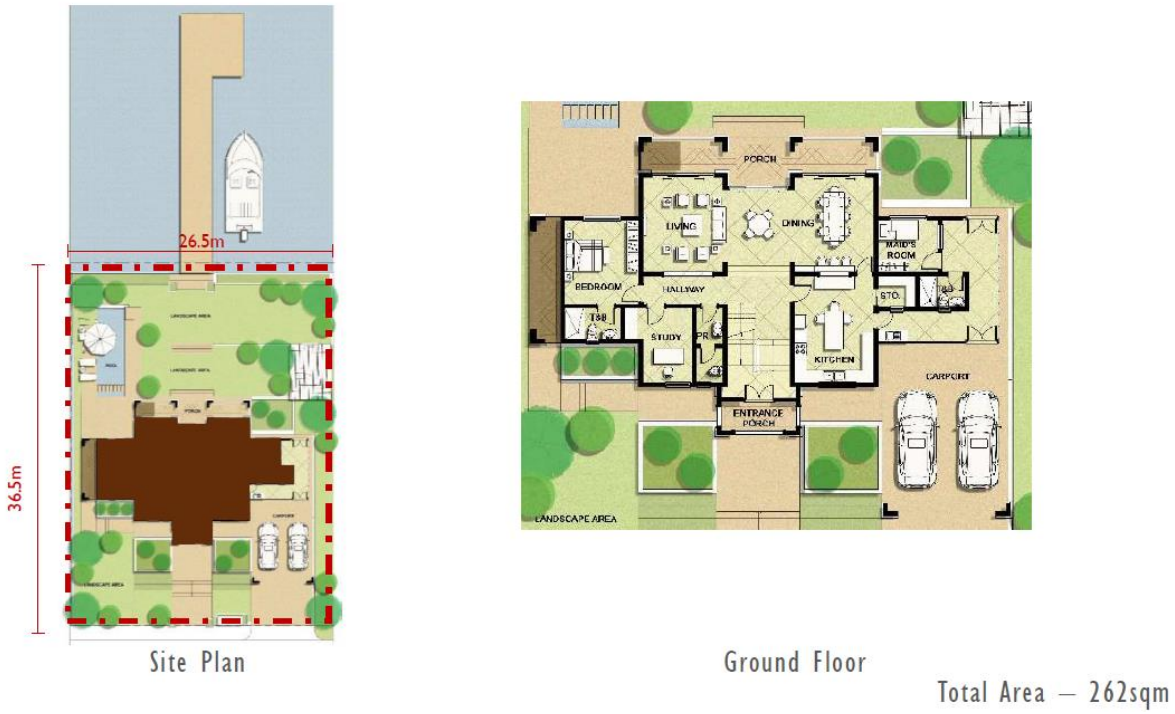


Figure 2: Houses on 1/8th

Figure 3: Houses on 1/16th

APARTMENTS (8&5 storeys)

PARKING+GROUND+4

2BED UNITS	284
3BED UNITS	568

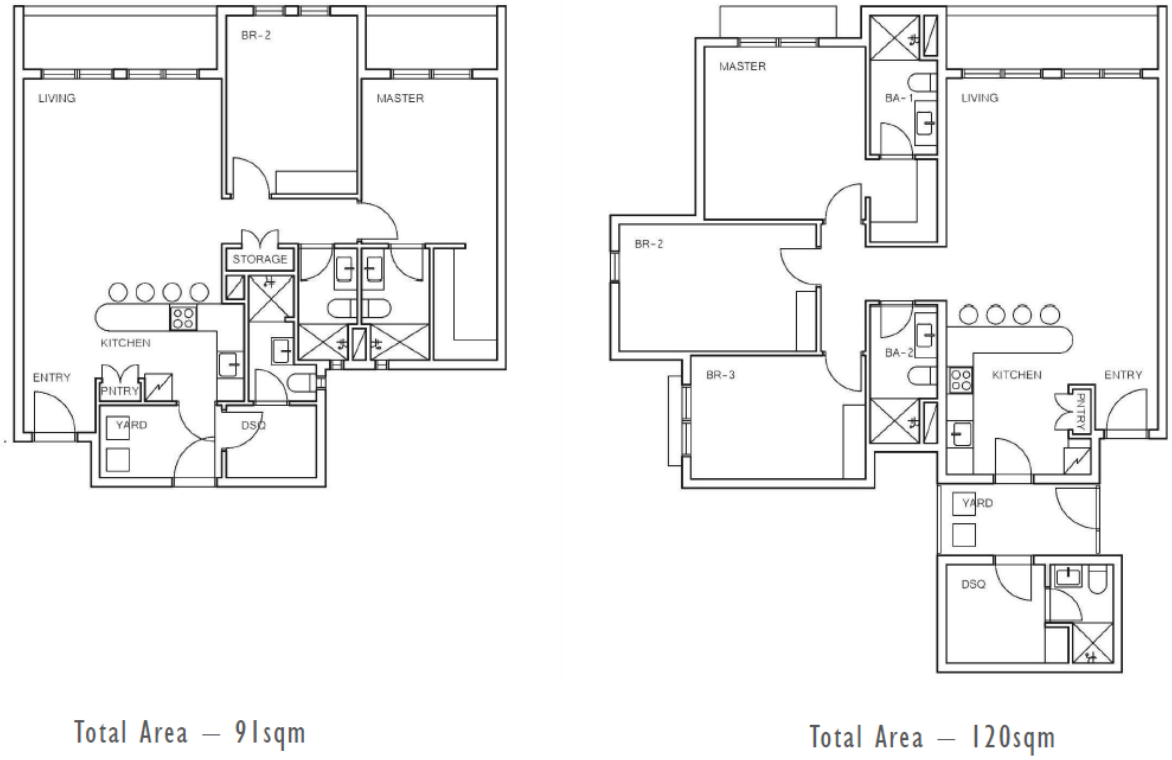


Figure 4: Apartments

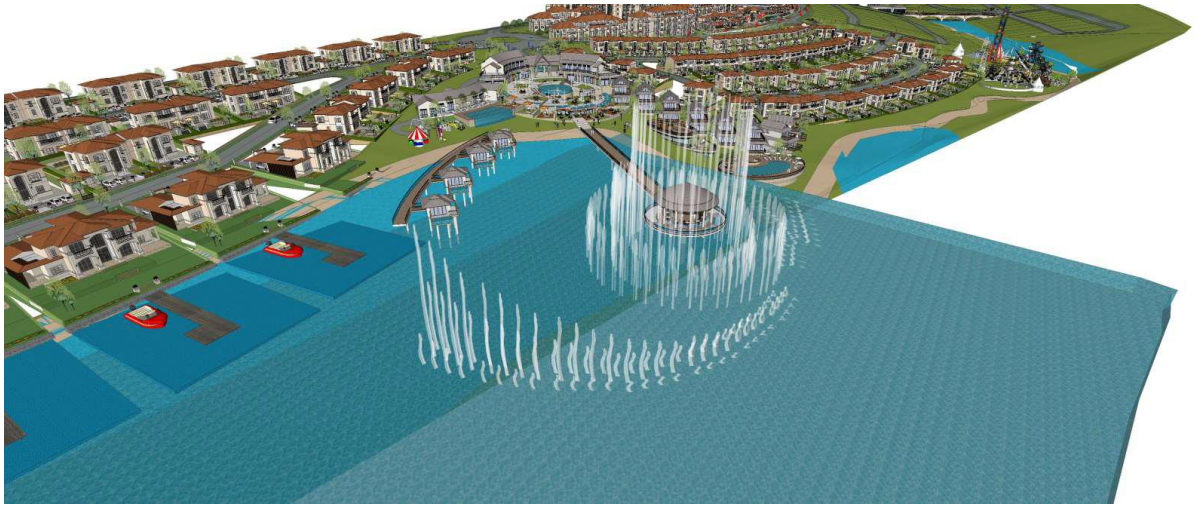
2.3.2 Hotel

This part of the development will involve a hotel which will have both private and water cottages with a total of 74 rooms. The total coverage of the hotel space will be 1.97 acres covering 1.98% of the total land.

ROOMS	34
PRIVATE COTTAGES	9UNITS (of 4 rooms each)
WATER COTTAGES	4

HOTEL		
	TYPOLOGIES	TOTALS
	CONFERENCE(4 MEETING ROOMS)	2
	SPA	1
	ROOMS	24
	COTTAGES-TYPE A	10 or 20
	COTTAGES-TYPE B (LAKE)	4
	BAR	2
	RESTAURANTS	2
	LAKE BAR	1

Table 5: Hotel Amenities.



2.3.3 Educational

This aspect of the development will be covered by a school which will have 20 classrooms, a hall and a recreational facility.

20 Classrooms+ Hall + Recreation = 4.91 acres translating to a 4.94% coverage.

SCHOOL		
	CLASSROOMS	16
	AUDIRORIUM/HALL	1
	RESOURCE AREAS (LIBARARY,LABS)	1
	LAVATORIES/TOILETS	1
	OFFICES/ADMINISTRATION	2

Table 6: School Amenities.

2.3.4 Commercial

This will form the hub of activities within the development which aims at bringing the goods and services closer to the people this is through the presence of a commercial precinct . This will cover a total of 1.45 acres this translates to 1.46% coverage.

RETAIL		
	MINI MART	1
	F & B OUTLETS	5
	RETAIL UNITS	5

Table 7: Retail Distribution.

2.3.5 Road

The development will be served and connected effectively through the access roads and the collector roads which will connect the land uses within the site, the roads will cover a total of 17.03 acres translating to 17.11% coverage.

2.3.6 Water

The development on L. R. NO. 5910 is covered by some water spaces which are in the form of a stream which runs across the site and also the presence of a dam which sits on 8 acres of land. These water pockets account for a total of 11.55 acres which translates to 11.61% coverage.

Picture 1: Stream running through the site.

2.3.7 Open Space

This is the most important aspect of the development since it will create a break from the built environment of the project, this will create that necessary space for multiple uses .This will account for 6.43 acres covering 6.46%.

2.3.8 Land Use within Ruiru Masterplan Development (RiverRun Estates)

The development on L. R. NO. 5910 is expected to carry put a mixed use development which entails various land uses which include Hotel and Amusement park, Cottages, Conference and recreational facilities; Residential - Townhouses, Maisonette and Apartments; Commercial Centre and Educational Development. All these will be distributed in space covering various percentages of the 100 acres which is the size of the site.

The table below shows the expected land use distribution of the various land use.

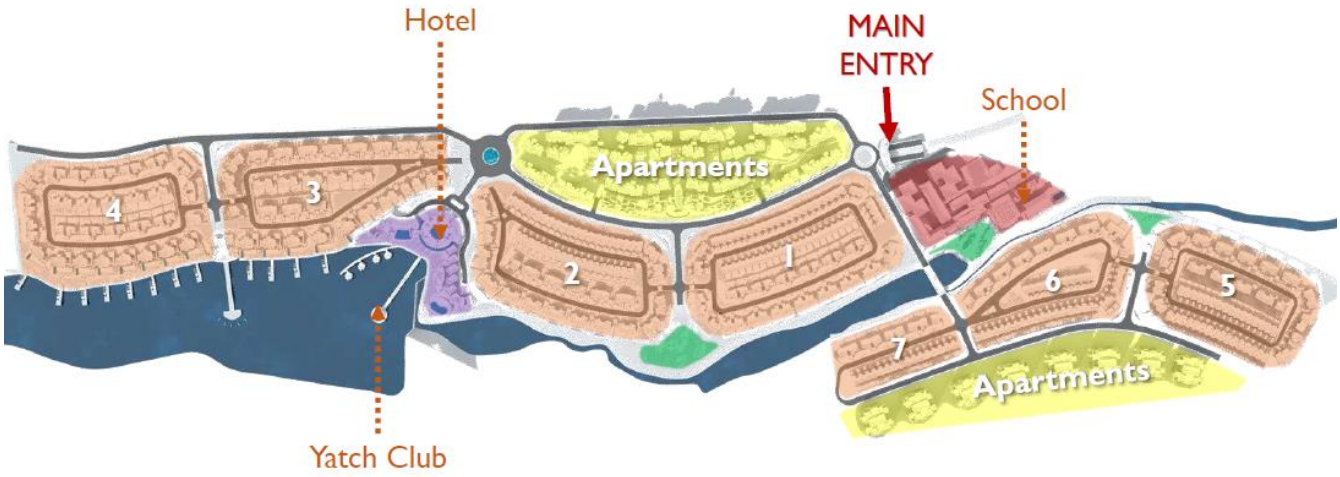


Figure 5: Representation of the land use plan.

LAND USE LEGEND

LAND USE	ACRES	COVERAGE(%)
RESIDENTIAL, DETACHED OR SEMI-DETACHED HOUSING	37.97	38.16%
RESIDENTIAL, APARTMENTS	15.14	15.17%
HOTEL	1.97	1.98%
COMMERCIAL	1.45	1.46%
ROAD	17.03	17.11%
UTILITY	0.71	0.72%
SCHOOL	4.91	4.94%
OPEN SPACE	6.43	6.46%
WATER	11.55	11.61%
PROTECTION ZONE	2.35	2.36%

2.4 The Associated services to the proposed development site

2.4.1 Infrastructure

The premises will have a comprehensive and robust infrastructure including access road, water storage, electricity distribution and waste disposal system.

2.4.2 Electrical System

There is electricity supply in the plot neighborhood. The proponent will make extensions from the current supply connection line of the Kenya power and lighting company (KPLC).

The necessary guidelines and precautionary measures relating to the use of electricity shall be adhered to.

2.4.3 Water Reticulation System

Ruiru Juja Water and Sewerage Company (RUJUWASCO) and will be the source of water supply during construction and operation phases. More so there will be on site storage tanks to

increase water capacity at the site to the required amount. After completion there will be several overhead water tanks on the buildings which will be used during low water pressure periods.

The developer will also drill a borehole to supplement the already existing one, with the developer currently in possession of the NEMA license for the same

2.4.4 Waste/Sewerage

The area is not under sewer system hence the building will be connected with the Tatu sewer system to direct the waste to the main sewer.

Wastewater estimates have been based on the World Health Organization (WHO) Report No. 9 for selection and design Criteria for Sewerage Projects. The adopted daily wastewater production rates are as follows;

a. High Class Housing – 220 liters/person/day
b. Average Urban Housing – 120 liters/person/day
c. Day Schools – 21 liters/person/day
d. Boarding Schools – 35 liters/person/day
e. Hotels – 240 liters/bed/day
f. Medium Density Average Housing Residential Developments – 15,000 liters/Ha/day
g. Areas of unknown Future Development – 20,000 liters/Hectares/day

	Neighbourhood	Anticipated Sewage Flows	
		m^3/d	l/s
1	**RiverRun Estates**		
	- Residential Area	679.32	7.86
	- Hotel	9.60	0.11
	- School	8.40	0.10
	- Commercial Center	10.20	0.12

Estimated Waste Water Flows for the Project Area.

It is taken that the above indicated flows will be the ultimate flows (20 years horizon) as they have fully considered the future development plans for the project area.

The Average Daily Dry Weather Flow within the project area is calculated to be 16,054.48m3/d. The Peak Flow Rate calculated using peak flow factors recommended in the Nairobi Sewerage Masterplan is 631.77 liters per second.

It is noteworthy that the development on L. R. NO. 5910 and Tatu City will only contribute an average dry weather flow of 5,109.13m3/d translating to a peak flow rate of 201.05 l/s.

2.4.5 PROPOSED SEWERAGE SYSTEM

The main existing Trunk Sewers for the project area are;

i. Kamiti River Trunk Sewer,

ii. Kianjibe River Trunk Sewer.

The Kamiti River Trunk Sewer is a 4.2km long DN400mm uPVC pipeline within the project area but the size of the sewer is larger downstream of the project area as it crosses the Nairobi-Nanyuki Railway line and the Thika (A2) Highway. The Average slope of the sewer between Tatu City and the Railway Crossing is 0.45%. The Hydraulic Capacity of the sewer taking 85% depth of flow in the sewer pipe is calculated to be 187.09 liters/second.

The Kianjibi River Trunk Sewer is a 2.1km DN300mm uPVC pipeline. The Average slope of the sewer is 0.70%. The hydraulic capacity of the sewer taking 85% depth of flow in the sewer pipe is calculated to be 108.35 l/s.

IMPLEMENTATION PROPOSALS

It is proposed as follows;

i. The DN300mm uPVC Kianjibi River Trunk Sewer is adequate to handle the sewage flow from within River Run Estates and Tatu City areas draining in to it directly. The sewage generated in this catchment area is 2,171.88m3/d (85.46 l/s at Peak Flow Rate) against a capacity of 108.35 l/s. No work is proposed for this sewer section.

ii. The 830m long section of the DN400mm uPVC sewer along the Kianjibi River from the Kamiti River – Kianjibi River Confluence has also been found to be adequate to handle the sewage flows generated within its catchment. The flow generated is 4057m3/d (159.68 l/s at peak discharge) against a capacity of 193.22 l/s.

The 1,050m long section of the DN400mm uPVC sewer along the Kamiti River from the Northern Bypass to the Kamiti-Kianjibi Rivers Confluence has a capacity of 212.40 l/s against an estimated peak sewage flow of 525.64 l/s.

iii. It is proposed that this section of the sewer be upgraded in the future so as to enable it to handle the projected excess flows originating from the undeveloped areas South of the Kamiti River and the areas between L. R. NO. 5910 and Kijani Ridge.

This is proposed to be achieved by either;

a. Upgrading the existing pipe sewer from from DN400 to DN575.

b. Duplicating of the DN400mm sewer on the opposite side of the Kamiti river.

iv. The 2.3km section of the DN400mm uPVC sewer along the Kamiti River starting from the Nairobi-Nanyuki Railway Crossing to the Northern By-Pass has a calculated capacity of 165.00 l/s against a generated peak flow of 631.77 l/s.

It is proposed that this section be upgraded so as it can handle the anticipated sewage flows to be generated in the project area. This can be achieved by either;

a. Upgrading the existing sewer pipe from DN400 to DN600.

b. Duplicating of the DN400mm sewer on the opposite side of the Kamiti river and laying it at a slope not less than 0.75%.

Proposed River Run Development							
Water Calculations							
Description		**mansion nettes**	**Hotel**	**Hotel-private cottages**	**Water cottage**	**TOTAL**	**Remarks**
1	No of House units	105	34	36	4		
2	No of bedrooms per person	5	1	1	1		
3	Total Population=No of units *1.5*no of bedrooms per person	788	51	54	6	899	
4	H_2O requirement per person /day per bedroom	120	200	200	200		
5	Minimum Total daily Water demand *(item 3x item 4)*	94,560	10,200	10,800	1,200	116,760	
6	Total Allow storage for 2day tower tank (item 5x2)	#######	20,400	21,600	2,400	233,520	Elevated tank
7	Allow storage for 4days underground tank (item 5 x4)	#######	40,800	43,200	4,800	**467,040**	Underground tank

Table 8 : Zone A

Proposed River Run Development						
Water Calculations						
	Description	**mansion nettes**	**School**	**Commercial**	**TOTAL**	**Remarks**
1	**No of house units**	**158**	**20**	**20**		
2	No of bedrooms per person	5	20	1		
3	Total Population=No of units *1.5*no of bedrooms per person	1,185	600	30	1,815	
4	H_2O requirement per person /day per bedroom	120	18	45		
5	Minimum Total daily Water demand *(item 3x item 4)*	142,200	10,800	1,350	154,350	
6	Total Allow storage for 2day tower tank (item5x2)	284,400	21,600	2,700	308,700	Elevated tank
7	Allow storage for 2day underground tank (item5x4)	568,800	43,200	5,400	**617,400**	Underground tank

Table 9: Zone B

Proposed River Run Development						
Water Calculations						
	Description	**Apartment 2bdr per block**	**Apartment 3bdr per block**	**TOTAL (Liters) per block**	**NO OF APARTMENTS**	**Remarks**
1	No of units per apartment	**16**	**32**		**20**	
2	No of bedrooms per person	2	3			Page 2
3	Total Population=No of units *1.5*no of bedrooms per person	48	144		3,840	
4	H_2O requirement per person /day per bedroom	120	120			
5	Minimum Total daily Water demand *(item 3x item 4)*	5,760	17,280		460,800	
6	Total Allow storage for 2day tower tank (item 5x2)	11,520	34,560	**46,080**	**921,600**	Elevated tank
7	Allow storage for 4days underground tank (item 5 x4)	23,040	69,120	**92,160**	**1,843,200**	Underground tank

Table 10: Zone C-Apartments

Proposed River Run Development				
Water Calculations				
	Description	**Mansionettes**	**TOTAL**	**Remarks**
1	**No of units**	**105**		
2	No of bedrooms per person	5		
3	Total Population=No of units *1.5*no of bedrooms per person	788	788	
4	H_2O requirement per person /day per bedroom	120		
5	Water required per day per bedroom *(item 3x item 4)*	94,500	94,500	
6	Total Allow storage for 2day tower tank (item 5x2)	189,000	189,000	Elevated tank
7	Allow storage for 4days underground tank (item 5 x4)	378,000	**378,000**	Underground tank

Table 11: Zone C- Mansionettes

Proposed River Run Development				
Water Calculations				
	Description	**Minimum Daily water demand**	**Storage Capacity for elevated tanks**	**Storage Capacity for under ground tanks**
1	Zone A	116,760	233,520	467,040
2	Zone B	154,350	308,700	617,400
3	Zone Apartments (FOR NO.20 Blocks)	460,800	921,600	1,843,200
4	Zone C Mansionettes	94,500	189,000	378,000
5	Add 25% for water loss and other miscellaneous use	206,603		
6	**Total water**	**1,033,013**	**1,652,820**	**3,305,640**

Table 12: Total Capacities.

2.4.6 Storm water run-off

There will be a storm water drainage running within the development along the residential units and also along the roads within. All other storm water galleys will link and thus drain out efficient. There shall be soil water pipes (SVP) to be provided at the heads of all drainage systems. All drains passing beneath buildings and driveways will be encased in concrete surround. All storm water drainage will be channeled into the appropriate open storm water drain.

2.4.7 Security

The proponent will hire a private firm to provide security in the premises. All the security details that will make the premises secure will be included. The proponent is recommended to include a guard house at the gate. This will be replicated at each entrance to the various zones within the development.

2.4.8 Road works

There will be a drive way that is used by cars into and out of the different zones within the development with the roads observing the road hierarchy for all the roads used within the development.

2.5 PROJECT ACTIVITIES

The building will be constructed based on applicable building standards of Kenya. Other building standards will be incorporated. They include Building Code and the British Building Standards BS 8110, BS 5950, BS4449, BS4461 etc. The constructions will as well incorporate environmental guidelines, health and safety measures. (Detailed structural plans are provided in the architectural drawings in the Annex).

2.5.1 Construction Inputs

The project inputs include the following:

- Construction raw materials i.e. sand, cements stones, crushed rock (gravel/ ballast), ceramic, steel metals, roofing materials-tiles, painting materials among others. All these will be obtained from licensed dealers and especially those that have complied with the environmental management guidelines and policies.
- Construction machines will include trucks, concrete mixers, and other relevant construction tools and equipment. These will be used for the transportation of materials and clearing of the resulting construction debris. Most of the machinery will use petroleum products to provide energy.
- A construction labour force of both skilled and non-skilled workers.
- Water for construction purposes. It will be supplied from plains view borehole.

Power from the mains grid or provided by generators.

- Security to take care of the site during construction period.

2.6 Description of the Project's Construction Activities

2.6.1 Pre-construction Investigations

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

2.6.2 Sourcing and Transportation of Building Materials

Building materials will be transported to the site from their extraction, manufacture, or storage sites using transport trucks. The building materials to be used in construction of the project will be sourced from Sub-County and other neighboring areas. Greater emphasis will be laid on procurement of building materials from within the local area, which will make both economic and environmental sense as it will reduce negative impacts of transportation of the materials to the project site through reduced distance of travel by the materials transport vehicles.

2.6.3 Storage of Materials

Building materials will be stored on site. Bulky 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 proponent will order bulky materials such as sand, gravel and stones in bits. Materials such as cement, paints and glasses among others will be stored in temporary storage structures which will be constructed within the project site for this purpose.

2.6.4 Excavation and Foundation Works

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

2.6.5 Masonry, Concrete Work and Related Activities

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

construction of foundations, and erection of building walls and curing of fresh concrete surfaces. These activities are known to be labour intensive and will supplement by machinery such as concrete mixers.

2.6.6 Structural Steel Works

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

2.6.7 Roofing

Roofing activities will include concrete roof make provision for water reservoirs/water tanks that would assist during water shortages and also concern of the residents on water shortages.

2.6.8 Electrical Work

Electrical work during construction of the premises will include installation of electrical gadgets and appliances including electrical cables, lighting apparatus, sockets etc. In addition, there will be other activities involving the use of electricity such as welding and metal cutting.

2.6.9 Plumbing

Installation of pipe-work for water supply and distribution will be carried out within the development and associated facilities. In addition, pipe-work will be done to make the necessary sewer connections and for drainage of storm water from the rooftop into the peripheral storm water drainage system. Plumbing activities will include metal and plastic cutting, the use of adhesives, metal grinding and wall drilling among others.

2.7 Description of the Project's Operational Activities

2.7.1 Residence

Residence will thus be accompanied by several domestic activities such as cooking, washing, use of vehicles, and leisure and recreational activities. In addition, there will be production of domestic and sanitary wastes.

2.7.2 Solid Waste Management

The proponent will provide facilities for handling solid waste generated within the facility. These will include dust bins for temporarily holding waste within the premises before final disposal at the town's designated dumping site.

2.7.3 Cleaning

The residents will be responsible for the cleanliness of their own house, regular washing and cleaning of the pavements; cleaning operations will involve the use of substantial amounts of water, disinfectants and detergents.

2.7.4 General Repairs and Maintenance

The residential development 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 the parking area, repairs and maintenance of electrical gadgets and equipment, repairs of refrigeration equipment, repairs of leaking water pipes, painting, maintenance of flower gardens and grass lawns, and replacement of worn out materials among others.

2.8 Description of the Project's Decommissioning Activities

2.8.1 Demolition Works

Upon decommissioning, the project components including buildings, pavements, drainage systems, parking areas and perimeter fence are usually demolished. This may produce a lot of solid waste, which will be reused for other construction works or if not reusable, disposed of appropriately by a licensed waste disposal company. The proposed site is not developed and hence little or no decommissioning work.

2.8.2 Dismantling of Equipment and Fixtures

All equipment including electrical installations, furniture, partitions, pipe-work and sinks among others are usually dismantled and removed from the site on decommissioning of the project. Priority will be given to reuse of these equipment in other projects. This will be achieved through resale of the equipment to other building owners or contractors or donation of these equipment to schools, churches and charitable institutions. This will not be necessary as the site is not developed.

2.8.3 Site Restoration

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

2.9 Project Budget

The proposed project under study is estimated not to exceed a budget of approximately thirteen Billion Kenyan shillings (**Ksh. 13 billion).**

.

CHAPTER THREE

3 BASELINE INFORMATION OF THE PROJECT AREA

3.1 Location and Size

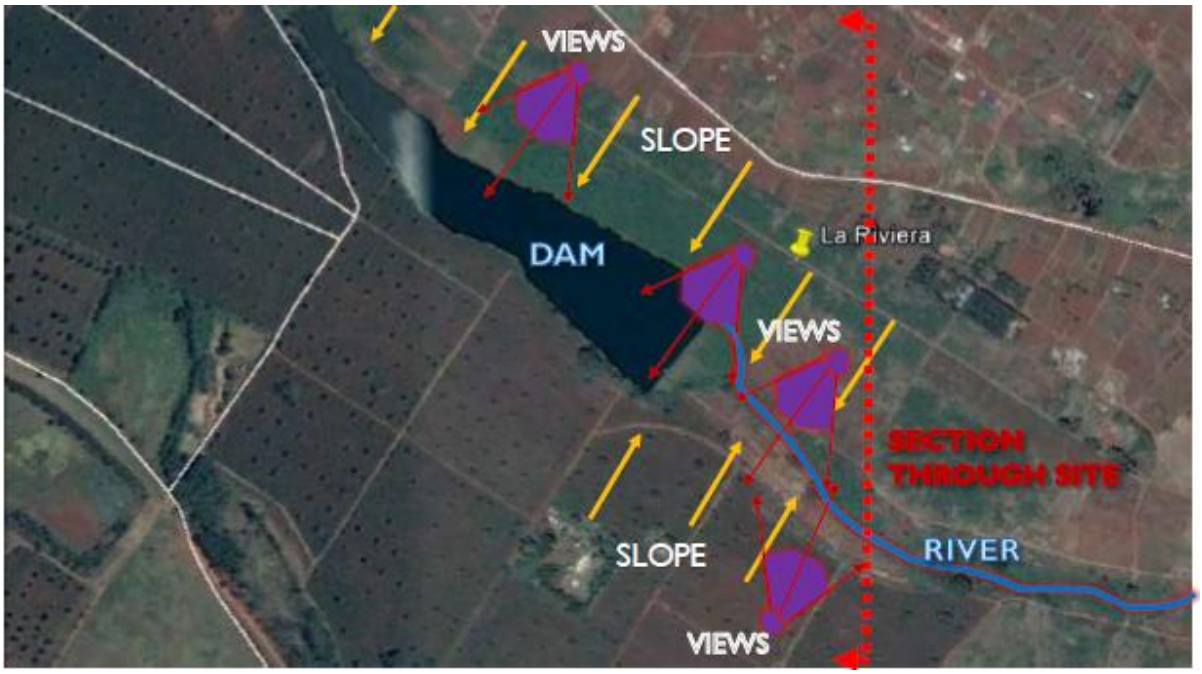
The parcel is approximately 100 acres located North of Nairobi in Ruiru, Kiambu County (-1.132598, 36.874653). The site is currently a coffee plantation with farm houses and a factory. A key feature within the site is a water reservoir occupying approximately 8 acres over a length of 500 m. The land has red soil and slopes gently towards the stream.

The proposed development is expected to improve its value and that of the land and also for the surrounding property.

3.2 Site Conditions

The current land use is Agricultural and it is gently sloping .The land has red soil and slopes gently towards the stream. The site is currently a coffee plantation with farm houses.

Picture 2: ***Houses within the site currently***



Map 2: The representation of the slope views of the site in relation to the dam and river.

3.3 Ecological Conditions

Water in the county is from two principal sources- surface and sub-surface. About 90 percent of the county‘s water resource comprises of both surface water resources and ground water potential. The county is divided into several sub-catchments areas. The first one is Nairobi River Sub-catchment which occupies the southern part of the county with the major rivers being Nairobi, Gitaru, Gitahuru, Karura, Ruirwaka, and Gatharaini. The second one is Kamiti and Ruiru Rivers Sub-catchment which is located to the north of the Nairobi river sub-catchment. It has eight permanent rivers which include Riara, Kiu, Kamiti, Makuyu, Ruiru, Bathi, Gatamaiyu and Komothai. The third one is the Aberdare plateau that contributes to the availability of two sub-catchments areas comprising of Thiririka and Ndarugu Rivers. The main streams found in the two areas include Mugutha, Theta, Thiririka, Ruabora, Ndarugu and Komu. They flow from Nairobi, Kamiti, Ruiru, Thiririka, and Ndarugu sub-catchments to form Athi River sub-catchment. The fourth is the Chania River and its tributaries comprising of Thika and Kariminu Rivers which rise from the slopes of Mt. Kinangop in the Aberdares range. Last one is Ewaso Kedong sub catchment which runs in the North-South direction and occupies the western part of the county. It has several streams that normally form swamps.

3.4 Topography and Physical Features

Kiambu County is divided into four broad topographical zones, Upper Highland, Lower Highland, Upper Midland and Lower Midland Zone. The Upper Highland Zone is found in Lari Constituency and it is an extension of the Aberdare ranges that lies at an altitude of 1,800-2,550 metres above sea level. It is dominated by highly dissected ranges and it is very wet, steep and important as a water catchment area. The lower highland zone is mostly found in Limuru and some parts of Gatundu North, Gatundu South, Githunguri and Kabete constituencies. The area is characterized by hills, plateaus, and high-elevation plains. The area lies between 1,500-1,800 metres above sea level and is generally a tea and dairy zone though some activities like maize, horticultural crops and sheep farming are also practiced. There are also large plantations of pineapples owned by Del Monte in parts of Thika Sub County.

The upper midland zone lies between 1,300-1,500 metres above sea level and it covers mostly parts of Juja and other constituencies with the exception of Lari. The landscape comprises of volcanic middle level uplands. The lower midland zone partly covers Thika Town (Gatuanyaga), Limuru and Kikuyu constituencies. The area lies between 1,200-1,360 metres above sea level. The soils in the midland zone are dissected and are easily eroded. Other physical features include steep slopes and valleys, which are unsuitable for cultivation. Large parts of Lari, Gatundu north and south sub counties are covered by forests.

The county is covered by three broad categories of soils which are: high level upland soils, plateau soils and volcanic footbridges soils. These soils are of varying fertility levels with soils from high-level uplands, which are from volcanic rocks, being very fertile. Their fertility is conducive for livestock keeping and growth of various cash crops and food crops such as tea, coffee, horticultural products, pyrethrum, vegetables, maize, beans, peas and potatoes. These soils are found in the highlands, mostly in Gatundu South, Gatundu North, Githunguri, Kiambu, Kiambaa, Lari, Kikuyu, Kabete and Limuru Constituencies. Low fertility soils are mainly found in the middle zone and the eastern part of the county which form part of the semi-arid areas. The soils are sandy or clay and can support drought resistant crops such as soya beans and sunflower as well as ranching. These soils are mostly found in parts of Juja, Thika Town, Ruiru, Kabete, Limuru, Gatundu North and Gatundu South Constituencies.

Most parts of the county are covered by soils from volcanic footbridges. These are well drained with moderate fertility. They are red to dark brown friable clays, which are suited for cash crops

like coffee, tea and pyrethrum. However, parts of Thika Town, Ruiru, Juja and Lari constituencies are covered by shallow soils, which are poorly drained, and these areas are characterized by low rainfall, which severely limits agricultural development, although they are suitable for ranching and growth of drought resistant crops.

3.5 Climatic Conditions

The county experiences bi-modal type of rainfall. The long rains fall between Mid-March to May followed by a cold season usually with drizzles and frost during June to August and the short rains between Mid-octobers to November. The annual rainfall varies with altitude, with higher areas receiving as high as 2,000 mm and lower areas of Thika Town constituency receiving as low as 600 mm. The average rainfall received by the county is 1,200 mm.

The mean temperature in the county is 26o C with temperatures ranging from 7oC in the upper highlands areas of Limuru and some parts of Gatundu North, Gatundu South, Githunguri and Kabete constituencies, to 340C in the lower midland zone found partly in Thika Town constituency (Gatuanyaga), Kikuyu, Limuru and Kabete constituencies (Ndeiya and Karai). July and August are the months during which the lowest temperatures are experienced, whereas January to March are the hottest months. The county‘s average relative humidity ranges from 54 percent in the dry months and 300 percent in the wet months of March up to August.

3.6 Neighborhood Land Use and Developments

The site is surrounded by developments including A.C.K Anima Primary school, Migaa Golf Estate and other developments which are being undertaken the upcoming Tatu city which is the main development in the area with some of the developments under its name including Kijani Ridge , Lifestyle Heights , Nova Pioneer (Tatu City Campus) which is an educational institution. Also with the area being agricultural, the site is also surrounded by large coffee farms.

Picture 3: ACK Anima Primary School

Picture 4: Similar ongoing project within the area

Picture 5: Newly Developed Nova Pioneer within Tatu City

Picture 6: Other upcoming developments within the neighborhood

3.7 Site Availability, Utilities and Relationship with other Developments

1. The proposed site is a large and well located and offers excellent site for mixed-use development as it has never been used before for industrial purposes or some commercial uses with no retrofits required.
2. The site has no any legal land ownership disputes and in very good physical condition.
3. The site is located connected and easily accessed to three towns of Kiambu, Juja, and Nairobi which will promote its vibrancy.
4. The site has not been identified and or safeguarded by the government for a possible development public.
5. The site is located within the proximity of existing water, electrical and telecommunication systems.

Picture 7: Existing electricity lines through the site

3.8 Land Tenure

The land on which the development is proposed is held on freehold basis. The current registered owners are **Cytonn Investment Partners Five LLP. (See attached copy of ownership details.)**

3.9 Accessibility and Connectivity

The site is very favorably located on the connectivity point of view, because it is can be accessed from two main roads. The site can be easily accessed from the access road which connects to the Ruiru-Kamiti Road.

3.10 Water supply and Sewerage Services

The site will get its water from Ruiru Juja Water and Sanitation Company (RUJUWASCO) and in addition to that, an extra borehole will be sunk to supplement the already existing one.

3.11 Electricity

Within the site there is the electricity lines that traverse through the site.

3.12 Communication

The site is located within the proximity of existing services which include telecommunication systems.

CHAPTER FOUR

4 RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORKS

4.1 Policy framework

The Kenya Government's constitution (Article 42, 69 & 70), environmental policy aims at integrating environmental aspects into national development plans. The broad objectives of the national environmental policy include:

- Optimal use of natural land and water resources in improving the quality of the human environment;
- Sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations;
- Integrate environmental conservation and economic activities into the process of sustainable development;
- Meet national goals and international obligations by conserving bio-diversity, arresting desertification, mitigating effects of disasters, protecting the ozone layer and maintaining an ecological balance on earth.

4.2 Legal framework

4.2.1 Environmental Management and Coordination Act No 8, Cap 387

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

Relevance to the proposed project

Environmental Management and Coordination Act, Cap 387 provides a legal and institutional framework for the management of the environmental related matters. This report has been written pursuant to section 58 (1) of this Act.

4.2.2 Environmental Impact Assessment and audit regulations 2003

These regulations stipulate how an EIA project report should be prepared and specifies all the requirements that must be complied with. It highlights the stages to be followed, information to

be made available, role of every stakeholder and rules to be observed during the whole EIA project Report making process. It also requires that during the EIA process a proponent shall in consultation with the Authority seek views of persons who may be affected by the project or activity.

Relevance to the proposed project

The proponent and consultants shall seek the views of the project neighbors through the use of questionnaires so as to ensure that their concerns are addressed in this report.

4.2.3 Water Quality Regulations (2006)

The Water Quality Regulations (2006) are contained in the Kenya Gazette Supplement No. 68, Legal Notice No. 120. Water Quality Regulations apply to water used for domestic, industrial, agricultural, and recreational purposes; water used for fisheries and wildlife purposes, and water used for any other purposes. Different standards apply to different modes of usage. These regulations provide for the protection of lakes, rivers, streams, springs, wells and other water sources. It is an offence to contravene the provisions of these regulations with a fine not exceeding five hundred thousand shillings. In addition, of immediate relevance to the proposed project for the purpose of this Project Report is Part II Sections 4-5 as well as Part V Section24.

Part II Section IV states that ―Every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution. Part IV Section 24 states that ―No person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive wastes, or other pollutants or permit any person to dump any such matter into water meant for fisheries, wildlife, recreational purposes or any other uses. According to these regulations, ―Every person shall refrain from any action which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of the Act.

Relevance: *All waste water shall be channeled to the main drain so as not to pollute the ground and surface water and if a pollution incidence occurs the contractor/proponent shall notify the authority immediately.*

Parameter	Guide Value (max allowable)
pH	6.5 – 8.5
Suspended solids	30 (mg/L)
Nitrate-NO3	10 (mg/L)
Ammonia –NH3	0.5 (mg/L)
Nitrite –NO2	3 (mg/L)
Total Dissolved Solids	1200 (mg/L)
Scientific name (E.coli)	Nil/100 ml
Fluoride	1.5 (mg/L)
Phenols	Nil (mg/L)
Arsenic	0.01 (mg/L)
Cadmium	0.01 (mg/L)
Lead	0.05 (mg/L)
Selenium	0.01 (mg/L)
Copper	0.05 (mg/L)
Zinc	1.5 (mg/L)
Alkyl benzyl sulphonates	0.5 (mg/L)
Permanganate value (PV)	1.0 (mg/L)

Table 13: **Quality standards for domestic water sources**

Nil means less than limit of detection using prescribed sampling and analytical methods and equipment as determined by the Authority. And any other parameters as may be prescribed by the Authority from time to time

Table 14: Quality standards for recreational water

PARAMETER	MAXIMUM PERMISSIBLE LEVEL
Arsenic (mg/l)	0.05
Fecal coliform (Counts/100 ml)	Nil
Total coliform (Counts/100 ml)	500
Cadmium	0.01
Chromium	0.1
Colour (True Colour Units)	100
Light Penetration (meters)	1.2
Mercury (mg/L)	0.001
Odour (Threshold Odour Number, TON)	16
Oil and Grease (mg/L)	5
pH	6 – 9
Radiation, Total (Bq/L)	0.37
Surfactant, MBAs (mg/L)	2
Temperature (^{0}C)	30
Turbidity (NTU)	50

And any other parameters as may be prescribed by the Authority from time to time

4.2.4 EMCA (Wetlands, riverbanks, lakeshores and Sea shore management) regulations, 2009

PART III – MANAGEMENT OF RIVER BANKS, LAKE SHORES AND SEA SHORE

General Principles.

17. The following principles shall be observed in the management and conservation of river banks, lake shores and the seashore; (a) Resources on the river banks, lake shores and the sea shore shall be utilized in a sustainable manner; (b) Environmental impact assessment as required under the Act shall be mandatory for all major activities on river banks, lake shores and the seashore; and (c) Special measures, including prevention of soil erosion, siltation and water pollution are essential for the protection of river banks, lake shores and the seashore.

Relevance: *The Proponent has engaged WRMA in pegging the riparian reserve in an effort to conserve it and all efforts shall be put in place to protect the Kinjibe River from degradation.*

4.2.5 EMCA (Waste management) Regulation, 2006

The Waste Management Regulations (2006) are contained in the Kenya Gazette No. 69, Legal Notice No. 121. The Waste Management Regulations are meant to streamline the handling, transportation and disposal of various types of waste. The aim of the Waste Management Regulations are to protect human health and the environment. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source. The regulation requires licensing of transporters of wastes and operators of disposal site (sections 7 and 10 respectively). Of immediate relevance to proposed development for the purposes of this project report is Part II Sections 4(1-2), 5 and 6. Section 4 (1) states that ―No person shall dispose of any waste on a public highway, street, road, recreational area or any other public place except in a designated waste receptacle. Section 4(2) and 6 explain that the waste generator must collect, segregate (hazardous waste from non-hazardous) and dispose waste in such a facility that shall be provided by the relevant local authority.

Section 5 provides method of cleaner production (so as to minimize waste generation) which includes the improvement of production processes through conserving raw materials and energy. Section 11 provides that any operator of a disposal site or plant shall apply the relevant provisions on waste treatment under the local government act and regulations to ensure that such waste does not present any imminent and substantial danger to the public health, the environment and natural resources. Section 12 provides that every licensed owner or operator shall carry out an annual environmental audit pursuant to the provision of the act In section 14 (1) every trade or industrial undertaking is obliged to install anti- pollution equipment for the treatment of waste emanating from such trade or industrial undertaking.

Relevance: *The Developer is expected to take all responsibility to ensure that solid waste is properly disposed by a solid waste collection company that has a valid license from the National Environment Management Authority (NEMA).*

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

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

Time of the day;

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

These regulations also relate noise to its vibration effects and seek to ensure no harmful vibrations are caused by controlling the level of noise. Part II Section 4 state that: except as otherwise provided in these Regulations, no person shall

a) Make or cause to be made excessive vibrations annoys, disturbs, injures or endangers the comfort, response, health or safety of others and the environment; or

b) Cause to be made excessive vibrations which exceed 0.5 centimeters per second beyond any source property boundary or 30 meters from any moving source.

Part III Section 2 (1) states that any person wishing to a) operate or repair any machinery, motor vehicle, construction equipment, pump, fun, air conditioning apparatus or similar mechanical device; or b) engage in any commercial or industrial activity, which is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels provided in the First Schedule to these Regulations. Any person who contravenes this Regulation commits an offence.

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

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

*First schedule of (**Noise and Excessive Vibration Pollution Control) Regulations, 2009,*** Regulation 6(1) *shows the permissible Noise limit. See the table below;*

Table 15: Maximum Permissible Noise Levels for General Environment

Zone	Sound level limit dB(A) Leq, 14h)		Noise Rating Level (NR) (leq, 14h)	
	Day	Night	Day	Night
Residential indoor	45	35	35	25
Residential outdoor	50	35	45	25
Places of worship	40	35	30	25
Silent Zone	40	35	30	25
Commercial	60	35	55	25
Mixed residential (with some commercial and places of entertainment)	55	35	50	25

Time Frame: use duration Day: 6.00 a.m - 10.00p.m., Night: 10.00p.m - 6.00a.m

The time frame takes into consideration human activity

Relevance of the regulation: *The contractor shall be required to implement these measures, ensure that all machineries are in good working condition to reduce noise. Also construction activities shall be between 0800Hrs-1700Hrs where possible obtain necessary authorization to extending working hours while ensuring that the neighbors are not disturbed.*

4.2.7 Environmental Management and Coordination (Air Quality) Regulations, 2014

The objective of these Regulations is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The general prohibitions state that no person shall cause the emission of air pollutants listed under First Schedule (Priority air pollutants) to exceed the ambient air quality levels as required stipulated under the provisions of the Seventh Schedule (Emission limits for controlled and non-controlled facilities) and Second Schedule (Ambient air quality tolerance limits).

4. (l) These Regulations shall apply to-

a. All internal combustion engines;
b. All premises, places, processes, operations, or works to which the provisions of the Act and Regulations made there under apply; and
c. any other appliance or activity & at the Cabinet Secretary may by order in the Gazette, specify

(3) Notwithstanding paragraph (1) the following operations shall be permissible under this regulation provided that they are not used for the disposal of refuse

a) Back-burning to control or suppress wildfires;
b) Firefighting rehearsals or drills conducted by fire service agencies
c) Traditional and cultural burning of savanna grassland
d) Burning for the purpose of public health protection; and
e) Emission of air pollutants from all stationary and mobile sources as set out under part1 of the fifth schedule

PART II - GENERAL PROHIBITIONS

5. (1) No person shall-

(a) Act in a way that directly or indirectly causes, or is likely to cause immediate or subsequent air pollution; or

(b) Emit any liquid, solid or gaseous substance or deposit any such substance in levels exceeding those set out in the First Schedule.

6. No person shall cause emission of the priority air pollutants prescribed in the Second Schedule to exceed the ambient air quality limits prescribed in the First Schedule.

7. No person shall cause the Ambient Air Quality levels specified in the First Schedule of these Regulations to be exceeded

8. (1) No person shall cause or allow particulate emissions into the atmosphere from any facility listed under the Fourth Schedule to these Regulations in excess of those limits stipulated under the Third Schedule

9. Any person, being an owner of premises, who causes or allows the generation, from any source, of any odour which unreasonably interferes, or is likely to unreasonably interfere, with any other person's lawful use or enjoyment of his property shall use recognized good practices and procedures to reduce such odours to a level determined by the odour panel, including any guidelines published by the Authority \for reducing odours

Relevance: *The contractor shall implement the mitigation measures provided in the EMMP to prevent air pollution especially during construction phase.*

4.2.8 Occupational Safety & Health Laws and Regulations

The following pieces of legislation form the basis for occupational safety and health matters in Kenya:

4.2.8.1 The Occupational Safety and Health Act, No. 15 of 2007

His Excellency the President assented to this Act on 22nd October 2007 and the date of commencement declared as 26th October 2007. This is the main operational law for health and safety in Kenya today. Its enactment led to the repeal of the Factories and Other Places of Work Act, Chapter 514 of the Laws of Kenya.

4.2.8.2 Work Injury Benefits Act, No. 17 of 2007

This law was assented to by His Excellency the President on 22nd October 2007 and the date of commencement is still contentious and the matter on various other sections is in court. This is an act of parliament designed to provide for compensation to employees for work-related injuries and diseases contracted in the course employment and for connected purposes. This is the law whose enactment led to the demise of the Workmen Compensation Act.

4.2.9 Rules and Regulations

The following rules have been promulgated by the Minister for Labor as provided for in the statues in the furtherance of the safety & health agenda in various applicable workplaces, processes, occupations and branches of the economy:

i. The Factories and Other Places of Work(Safety & Health Committee) Rules, 2004
ii. The Factories and Other Places of Work(Fire Risk Reduction) Rules, 2007
iii. The Factories and Other Places of Work(Hazardous Substances) Rules, 2007
iv. The Factories and Other Places of Work(First Aid) Rules, 1977
v. The Factories (Eye Protection) Rules
vi. The Factories and Other Places of Work(Electric Power(Special) Rules, 1979
vii. The Factories (Docks) Rules, 1962
viii. The Factories (Building Operations and Works of Engineering Construction) Rules, 1984.
ix. The Factories and Other Places of Work(MEDICALEXAMINATION) Rules, 2007

These rules apply in all workplaces where The Occupational Safety and Health Act, No. 15 of 2007 applies.

4.2.9.1 Health and Safety Committee Rules

These rules are described in Legal Notice No. 31 of the Kenya Gazette Supplement No. 25 of 14th May 2004. The rules apply to all factories and other places work that regularly employ twenty or more employees. Among other items, the rules state that:

- The occupier of every factory or other workplace shall establish a health and safety committee;
- The committee shall consist of safety representatives from the management and the workers;
- The factory occupiers shall appoint a competent person from the management staff to be responsible for safety, health and welfare in the factory or workplace; and the person appointed shall be the secretary to the committee.
- Every member of the Health and Safety Committee shall undertake a prescribed basic training course in occupational health and safety within a period of six months from the date of appointment or election, and thereafter further training from time to time;

- The occupier of every factory or workplace shall cause a health and safety audit of the workplace to be carried out at least once in every period of twelve months by a registered health and safety adviser.

The Legal Notice also describes the functions and duties of the health and safety committee, the purpose of meetings and recording minutes, and the roles of the office bearers. It further describes the duties of the occupier and those of the Health and Safety Adviser.

4.2.9.2 Noise

Kenya's Noise Prevention and Control Rules were passed in Legal Notice No. 296, dated 1996, as a subsidiary legislation of the Factories Act, and state that '*No worker shall be exposed to noise level excess of the continuous equivalent of 90 dBA for more than 8 hours within any 24 hours duration'*.

4.2.10 The Traffic Act, 2012

The Traffic Act, 2012 gives provisions and guidelines that govern the Kenya roads transport sector. These guidelines are essential to private, public and commercial service vehicles in ensuring safety and sanity on the roads hence ensuring the environment; the human being a component is safeguarded. In section 41 The Act demands for installation and certification of speed governors for the commercial vehicles ferrying goods adjusted to the loading condition of such vehicles to a limit of 80 KPH, registration and competence of drivers.
Moreover, the owner of commercial vehicles or trailer shall ensure clear markings on their vehicles in English language on the right side of the vehicle showing ownership details, tare weight of vehicle and maximum authorized weight.
Section 26 and 27 of the same discourages engines that emit exhaust gases to the atmosphere without passing via a silencer or expansion chamber

In ensuring safety of all the persons in transit section 56 encourages that every public and commercial vehicle be fitted with inspected and first class first aid box and fire extinguisher. In ensuring compliance to this Act the contractor and developer shall ensure that all site drivers and all material suppliers to the site satisfy the provisions as stipulated in Act.

4.2.11 The Land Act, 2012

This is an ACT of Parliament to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land based resources, and for connected purposes. The Land Act of 2012 subsection (1) states that 'any land may be converted from one category to another in accordance with the provisions of this Act or any other written law.' it continues to state in subsection (2) that

Without prejudice to the generality of subsection (1)

a) Public land may be converted to private land by alienation
b) Subject to public needs or in the interest of defense, public safety, public order, public morality, public health, or land use planning, public land may be converted to community land
c) private land may be converted to public land by
    i. Compulsory acquisition;
    ii. Reversion of leasehold interest to Government after the expiry of a lease; and
    iii. Transfers; or
    iv. Surrender.

(d) Community land may be converted to either private or public land in accordance with the law relating to community land enacted pursuant to Article 63(5) of the Constitution.

It is important to note that any substantial transaction involving the conversion of public land to private land shall require approval by the National Assembly or county assembly as the case may be.

Part I of the same Act states that title to land may be acquired through—

(a) Allocation;
(b) Land adjudication process;
(c) Compulsory acquisition;
(d) Prescription;
(e) Settlement programs;
(f) Transmissions;
(g) Transfers;
(h) Long term leases exceeding twenty-one years created out of private land; or
(i) Any other manner prescribed in an Act of Parliament.

Part viii of this ACT provides procedures for compulsory acquisition of interests in land. Section 111 (1) States that if land is acquired compulsorily under this Act, just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. The Act also provides for settlement programmes. Any dispute arising out of any matter provided for under this Act may be referred to the Land and Environment Court for determination.

In ensuring that no contravention to this Act is done, the proponent acquired the land through a 99 years leasehold and has applied for necessary approvals requisite to the proposed development i.e. amalgamation and change of user approvals.

4.2.12 The Energy (Solar Water Heating) Regulations, 2012 Installation and use of solar water heating systems

All premises within the jurisdiction of a local authority with hot water requirements of a capacity exceeding one hundred liters per day shall install and use solar heating systems.

A person who contravenes the provisions of this regulation commits an offence and shall, on conviction, be liable to a fine not exceeding one million shillings, or to imprisonment for a term not exceeding one year, or to both.

Responsibility for compliance

6. (1) A developer of a housing estate, a promoter of the construction, an owner of the premises or an Architect or an Engineer engaged in the design or construction of premises shall comply with these Regulations.

(2) An owner of premises, Architect and an Engineer engaged in the design, construction, extension or alteration of premises shall incorporate solar water heating systems in all new premises designs and extensions or alterations to existing premises.

(3) An owner or occupier of premises that has a solar water heating system shall use and carry out the necessary operational maintenance and repairs required to keep the installation in good and efficient working condition.

(4) An electric power distributor or supplier shall not provide electricity supply to premises where a solar water heating system has not been installed in accordance with these Regulations.

Relevance:

In compliance to these regulations solar energy shall be adopted for water heating.

4.2.13 The County Government Act, 2012

The Act empowers County Governments to make by-laws in respect of suppression of nuisances, imposing fees for any license or permit issued in respect of trade or charges for any services. In compliance, EIA project report has proposed potential mitigation measures (in the EMP and monitoring plan; and the environmental management Framework in the report.

Section 160 helps local authorities ensure effective utilization of the sewerage systems. It states in part that municipal authorities have powers to establish and maintain sanitary services for the removal and destruction of, or otherwise deal with all kinds of refuse and effluent and where such service is established, compel its use by persons to whom the service is available.

Relevance to the proposed project: *The appointed contractor and the Proponent will mitigate against such impacts by ensuring strict adherence to the Environmental Management Plan provided in this project report throughout the project cycle*.

4.2.14 Persons with Disability Act (PWD), 2003

Kenya has a Person with Disabilities Act (PWD), 2003 which is a comprehensive law covering rights, rehabilitation and equal opportunities for people with disabilities.

- It creates the National Council of Persons with Disabilities as a statutory organ to oversee the welfare of persons with disabilities.
- The Act aims to ensure that Persons with Disabilities' issues and concerns are mainstreamed.
- Requires establishment of DMCs in all public institutions

Section 21 of this Act entitles Persons with disabilities 'to a barrier-free and disability-friendly environment to enable them to have access to buildings, roads and other social amenities, and assistive devices and other equipment to promote their mobility'.

The Proponent shall ensure that the main contractor adopts implements and mainstream PWD Provisions throughout the project phases.

4.2.15 Water Act, 2002

This Act of Parliament provides for the management, conservation, use and control of water resources and for the acquisition and regulation of rights to use water; to provide for the regulation

and management of water supply and sewerage services; to repeal the Water Act (Cap. 372) and certain provisions of the Local Government Act. Section 25 (1) states that a permit shall be required for any of the following purposes:— (a) Any use of water from a water resource, except as provided by section 26; (b) The drainage of any swamp or other land; (c) The discharge of a pollutant into any water resource; (d) 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.

Relevance: *Not applicable as the proponent will not be abstracting water from the dam or river.*

4.2.16 Land Planning Act cap 303

Section 9 of the subsidiary legislation (the development and use of land Regulations 1961) under which it require that before the local Authority to 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, which intends to reduce conflict of interest with other socio economic activities.

Relevance to the proposed project: *The proponent shall submit architectural plans to Kiambu County Government for approval.*

4.2.17 Physical Planning Act, 1999

Part V—Control of development 30. (1) No person shall carry out development within the area of a local authority without a development permission granted by the local authority under section 33. (2) Any person who contravenes subsection (1) shall be guilty of an offence and shall be liable to a fine not exceeding one hundred thousand shillings or to an imprisonment not exceeding five years or to both. (3) Any dealing in connection with any development in respect of which an offence is committed under this section shall be null and void and such development shall be discontinued. (4) Notwithstanding the provisions of subsection (2) — (a) The local authority concerned shall require the developer to restore the land on which such development has taken place to its original condition within a period of not more than ninety days; (b) If on the expiry of the ninety days' notice given to the developer such restoration has not been effected, the concerned local authority shall restore the site to its original condition and recover the cost incurred thereto from the developer.

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

The application shall be accompanied by such plans and particulars as are necessary to indicate the purposes of the development, and in particular shall show the proposed use and density, and the land which the applicant intends to surrender for— (a) Purposes of principal and secondary means of access to any subdivisions within the area included in the application and to adjoining land; (b) Public purposes consequent upon the proposed development. 36. If in connection with a development application a local authority is of the opinion that proposals for industrial location, dumping sites, sewerage treatment, quarries or any other development activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an environmental impact assessment report.

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

4.2.18 Building Code 2000

Section 194 requires that where sewer exists, the occupants of the nearby premises shall apply to the local Authority for permit to connect to the sewer line and all the wastewater must be discharged in to sewers. The code also prohibits construction of structures or building on sewer lines.

4.2.19 The Penal Code (Cap. 63)

Section 191 of the Penal Code states, that any person or institution that voluntarily corrupts or foils water of public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same act says a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighborhood or those passing along public way commit an offence.

Relevance to the proposed project:

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

CHAPTER FIVE

5 PUBLIC PARTICIPATION

5.1 Overview

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 EIA for the purpose of achieving the fundamental principles of sustainable development. This chapter describes the process of the public consultation and public participation followed to identify the key issues and impacts of the proposed project. Views from the local residents and the business community who in one way or another would be affected or have interest in the proposed project were sought through interviews and structured questionnaires as stipulated in the Environment Management and Coordination Act, 1999.

5.2 Objectives of the Consultation and Public Participation (CPP) Exercise

The objectives of the Consultation and Public participation exercise were to:

1. Disseminate and inform the stakeholders about the project with special reference to its key components and location.

2. Create awareness among the public on the need for the EIA for the proposed project.

3. Gather comments, suggestions and concerns of the interested and affected parties.

4. Incorporate the information collected in the EIA study.

The purpose of the public participation exercise was to enable the establishment of a communication channel between the general public and the team of consultants, the project proponents and NEMA. The process also enabled the concerns of the stakeholders to be known to the decision making bodies at an early phase of project development.

5.3 Methodology used in the CPP

The environmental and social assessment public participation exercise was conducted by a team of experienced registered environmental experts through Key informants interviews and discussions, Field surveys and observations and Structured Questionnaires. In general, the following steps were followed in carrying out the entire CPP process:-

- Identification of stakeholders interested in the project
- Compiling a database of the interested and affected parties

- Administration of questionnaires to different target groups and local community members neighboring the proposed project site.
- Carrying out interviews and discussions with the key informants representing the affected neighborhoods and also members of the neighborhood.

5.4 Neighbor consultation strategy

The views and comments of neighbors regarding the development were obtained in the following two key methods.

These included;

1. Administration of semi-structured questionnaires with major headings on the environmental impacts of the development on neighbors. The questionnaires also collected information on the profile of neighbors including proximity to the site and whether there were any benefits associated with the development. The questionnaires will be distributed to the public by personnel employed by the consultants.
2. Collection of additional information from neighbors to the project site, through correspondence.

5.5 Issues Raised

5.5.1 Security

The residents urged the developer to join hands with the neighbors so as to improve security in the area, citing that already with the development coming up there would be increased security.

5.5.2 Accessibility

The residents also requested the possibility of leaving a footpath along the boundary wall of the site which will ease access to various public institutions like the church, school and also the various work stations by the residents of the area.

The proponent assured the residents that they would ensure that they would explore all the possible roads within the area so as to provide the best avenue for the proposal.

The proponent will also upgrade the access road leading to the site from its current condition to a well level road during construction, them after construction they will upgrade to the KeRRA Standards.

5.5.3 Traffic congestion and dust pollution

The residents were concerned about the traffic/vehicular movement in the area during the whole project cycle especially along the access especially by heavy trucks while frequenting the site. The residents raised concerns that the construction of the project would increase the number of vehicles operating along the dusty road especially during construction and operational phases. They suggested that the constructor/proponent consider suppressing dust emission from the site and also consider sprinkling water at 2 hour intervals along the road to reduce the amounts of dust that will be emitted along the road.

5.5.1 Opening up the place to other investors

The entire area where the proposed project site is located has not yet been developed and with the establishment of the proposed project, several absentee land owners in the area may also plan to invest in several other ventures hence opening up the place. With the ever increasing value for land in the area, the land owners may also opt to sell their land to other serious investors who are more than willing to put up ventures in the area creating employment opportunities and business ventures hence improved living standards of the people in the area.

5.5.2 Increased Market/ business opportunities

Throughout the construction period, the proposed project shall provide a sustained market for the supply of various building materials by various businessmen and women from the area such as ballast, sand, building blocks, cement and steel metals among others. This will help improve their businesses as well as improve their living standards.

5.5.3 Sewer and Foul water Discharge

The proponent is going to do a sewer connection from the development then connect to Tatu City sewer system and also the locals will be part of the connection so as to also accommodate them .

5.5.4 Water Sources

The proponent will drill boreholes to supplement the already existing borehole and will also get water connections from RUJUWASCo to supplement the existing water sources. The proponent also made it clear that they will not be drawing any water from the dam.

5.5.5 Fauna

The residents said there are hippos that drink water from the dam and they have however been on the decrease with the coming up of Tatu City, with the proposed development coming up and utilizing the dam the hippos will no longer be a problem.

Picture 8: Initial Presentation of the project and Public Baraza

Picture 9: 2nd Public Baraza and Presentation of the project

Picture 10: Stakeholder Meeting and Consultations

CHAPTER SIX

6 POTENTIAL ENVIRONMENTAL IMPACTS

6.1 Impacts during Construction Process

Potential impacts of the proposed project have been considered and the assessment of the various parameters carried out in accordance with NEMA guidelines. Potential impacts of the proposed project have been considered and the assessment of the various parameters carried out in accordance with NEMA guidelines.

6.1.1 Positive Impacts

i) Income Opportunities

The development of the proposed comprehensive development will create business opportunities by providing market to suppliers during the construction process. It will also lead to creation of employment both directly and indirectly during the construction phase. Casual laborers, semi-skilled and skilled labor professionals such as town planners, supervising engineer, contractor staff and architects among others will benefit from the employment opportunities created by the proposed project.

ii) Optimal Use of Land

The construction activities will promote the local economy and inter-linkages. Construction materials and operating the project have associated fees levied. The fees are paid to different parties like the local government and individuals and in return it is used to boost the local economy.

iii) Revenue Generation

The various payments for permits, licenses and approvals for the project are direct revenue to the local and national governments.

6.1.2 Negative Impacts

i) Noise Pollution

This will mainly be from the common construction machinery used at the site. Continuous exposure to noise levels above 85db can cause damage to hearing leading to occupation deafness.

However, the level of noise from common construction machineries is expected to be low in this threshold. Regardless, all construction activity will be carried out during the day and sound-attenuated equipment will be used.

ii) Air Pollution

There is likely to be pollution in terms of air and dust during the project's operational phase. Air pollution is likely to be from vehicle exhausts during transportation of materials to the site. The movement of tracks is also likely to cause excess dust.

iii) Sanitation and Health Hazards

There is likely to be littering during loading of refuse and uncontrolled human waste from workers on site. This can affect human and animal health, and will be appropriately mitigated.

iv) Accidents and Safety Risks

On any construction site, the risk of accidents and other related safety concerns is high. This danger is posed to the workers on site as well as the adjacent residents and passers-by. Thus, there is need to put in place measures to protect them against falling debris and construction waste.

v) Mushrooming of Food Kiosks

Usually, such development projects have the potential of attracting unplanned commercial activities that come to take advantage of the increased trade prospects. This often leads to mushrooming of kiosks, which are attracted by the prospects of increased business, especially selling food. Some have a potential to pollute the environment owing to lack of sanitation infrastructure. The proposed project intends to provide room for onsite provision of such support services.

vi) Disturbance of Flora and Fauna

In order to develop the proposed development, excavation and earth works will be involved. The main method of excavation to be used is trenching in order to accommodate the building foundation/footing. This will mean cutting down of the existing trees and vegetation within the site. During earthworks, there will be disturbances and displacement of small animals and birds that have inhibited the vegetation in the property.

vii) Visual Intrusion

During construction, the main visual impacts would occur during earthworks for the foundation of the building. This impact would be generally be confined to the site.

viii) Soil Disruption

Since the proposed project development involves digging up of trenches (earthwork) for laying out the foundation and hard landscaping, this is likely to disrupt the soil compaction and layout leading to poor water infiltration and seepage. It might also lead to poor drainage.

6.2 Impacts during Operational Phase

6.2.1 Positive impacts

As discussed in the earlier sections, there are numerous positive impacts that will be realized as a result of the successful execution of the proposed project. Some of these positive impacts include:

i) Strengthening of Local Economy

On completion, the development will lead to an influx of people in the area, hence bolstering local trade. This will have a positive impact on the economy and livelihoods of local communities.

ii) Overall Development

The proposed project will attract various support services, as well as create linkages to other necessary services. This in turn will promote the overall development of the project area.

iii) Optimal Use of Land

The proposed comprehensive development ensures optimal use of land. Considering that the proposed project site is currently vacant, and the scarcity of developed land in the area, the project enhances the returns on the limited developed land in this area. The project will promote sustainable development by providing a live-work and play environment.

6.2.2 Negative Impacts

i) Pressure on Existing Facilities

The proposed development is also likely to increase pressure on existing infrastructure such as roads, electricity and water supply. This would be due to increased human and vehicular densities in the project area.

ii) Proliferation of Uncollected Solid Waste

The proposed development is likely to contribute to an increased generation of solid waste. This has a potential of attracting disease vectors such as rats, flies, and cockroaches.

6.3 Impacts during Decommissioning Phase

The wastes produced during the decommissioning phase, if not well disposed off, can pose a threat to the environment and can be hazardous to both the people and kill the aesthetic nature of the area. These wastes include but not limited to:

- Paint
- Cement and soil

- Sand, gravel and cement
- Crashed stones and ballast
- Glass
- Concrete tiles and slabs

The above wastes will be adequately cleared from the site to mitigate against any negative impacts.

Table 16: Types of Impacts

Key	**Type of Impact**	**Key**	**Type of Impact**
++	Major positive impact	+	Minor positive impact
--	Major negative impact	-	Minor negative impact
0	Negligible/zero impact	NC	No change
SP	Specific/localized	W	Widespread
R	Reversible	ir	Irreversible
sh	Short Term	L	Long term
T	Temporary	P	Permanent

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

6.4 Summary of impacts

Table 17: Anticipated Environmental Impacts

Impacts on or due to	Construction	Occupation	Remarks
Pollution: - Air/dust - Noise	 T ir T ir	 0 0	During construction air, dust and noise pollution will increase as a result of construction activities After construction, noise from traffic is not likely to significantly affect the current neighborhood
Site Drainage	0	++	Storm water from the proposed development shall drain along the fronting access road.
Flora and Fauna	-	0	There will be minor destruction to flora and fauna habitat during excavation and landscaping
Public Health	-t ir	-	During construction increased dust, noise and air pollution levels could adversely impact public health, particularly in the direct impact zone During occupation health and safety guidelines setup will be adhered to
Disturbance to the public	-t ir	-	Disturbance to the public would occur due to noise and dust during construction and traffic movement
Sites of Cultural,	0	0	There are no sites of cultural, historic or traditional significance.

Historic or Traditional significance			
Visual Intrusion	-t/p	+P	During construction, visual intrusion is attributed to construction works including construction traffic After construction the visual intrusion will be permanent. However this will be positive as the building will improve the aesthetic value of the neighborhood
Income generating opportunities	+t	++	During construction, there will be employment opportunities available to contractors and consultants. A significant amount of employees will also be employed during occupation e.g. solid waste management staff, guards, caretakers etc.
Construction Materials	+/-	0	Building stone will be required for construction. Other materials will include steel, tiles, pipes, etc. All materials must be sourced from bona fide commercial suppliers, and undesirable, hazardous or otherwise banned materials should not be used.

Solid Waste	-sh sp	-	Construction waste will be disposed of at approved County Government of Nairobi dump sites. During occupation, the generated solid wastes will be collected by a private contractor.
Clean up on completion	-sp	0	The contractor should ensure that when works are completed, the site is left clean and tidy.

CHAPTER SEVEN

7 IMPACTS IDENTIFICATION, ANALYSIS AND MITIGATION MEASURES

7.1 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 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).

7.2 Mitigation of Construction Phase Impacts

7.2.1 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. This will lead to reduction in the amount of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.

7.2.2 Minimization of Run-off

The proponent will put in place some measures aimed at minimizing soil erosion and associated sediment release from the project site. These measures will include terracing and levelling the project site to reduce run-off velocity and increase infiltration of rainwater into the soil. In

addition, construction vehicles will be restricted to designated areas to avoid soil compaction within the project site, while any compacted areas will be ripped to reduce run- off.

7.2.3 Minimization of Construction Waste

It is recommended that demolition and construction waste be recycled or reused to ensure that materials that would otherwise be disposed off as waste are diverted for productive uses. In this regard, the proponent is 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 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 project include:-

i. 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
ii. 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
iii. Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials
iv. Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste
v. Use of construction materials containing recycled content when possible and in accordance with accepted standards.

7.2.4 Reduction of Dust Generation and Emission

Dust emission during construction will be minimized through strict enforcement of onsite speed controls as well as limiting unnecessary traffic within the project site. In addition, it is

recommended that excavation works be carried out in wet weather; and traffic routes on site be sprinkled with water regularly to reduce amount of dust generated by the construction trucks.

7.2.5 Minimization of impacts on traffic flow

The proponent will put in place measures to address such concerns by ensuring that construction vehicles preferably deliver materials during off-peak hours when traffic volume is low. There will also be provision for caution signs on the access road to alert users on construction activities in progress in order to prevent occurrence of accidents. This 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.

7.2.6 Minimization of Noise and Vibration

Noise and vibration will be minimized in the project site and surrounding areas through sensitization of construction truck drivers to switch off vehicle engines while offloading materials. In addition, they will be instructed to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, schools and hospitals. In addition, construction machinery shall be kept in good condition to reduce noise generation. It is recommended that all generators and heavy-duty equipment be insulated or placed in enclosures to minimize ambient noise levels.

7.2.7 Health and safety of Workers on site

The proponent is committed to adherence to the occupational health and safety rules and regulations stipulated in Occupational Health and Safety Act (Cap 514). In this regard, the proponent is committed to provision of appropriate personal protective equipment such as gloves; helmets, overall as well as ensuring a safe and healthy environment for construction workers by providing sanitary facilities (toilets) and portable water while food will be bought by workers from the nearby hotels.

7.2.8 Reduction 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.

7.2.9 Minimization of Water Use

The proponent shall ensure that water is used efficiently at the site by sensitizing construction staff to avoid irresponsible water usage.

7.3 Mitigation of Operation Phase Impacts

7.3.1 Ensuring Efficient Solid Waste Management

The proponent will be responsible for efficient management of solid waste generated by the project during its operation. In this regard, the proponent will provide waste handling facilities such as waste bins and skips for temporarily holding domestic waste generated at the site. In addition, the proponent will ensure that such disposed of regularly and appropriately. It is recommended that the proponent put in place measures to ensure that the occupants of the Houses manage their waste efficiently through recycling, reuse and proper disposal procedures.

7.3.2 Ensure Efficient Energy Consumption

The proponent plans to install an energy-efficient lighting system for the project. This will contribute immensely to energy saving during the operational phase of the project. In addition, occupants of the apartments will be sensitized to ensure energy efficiency in their domestic operations. To complement these measures, it will be important to monitor energy use during the occupation of the houses and set targets for efficient energy use.

7.3.3 Ensure Efficient Water Use

The proponent will 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 of the apartments will be sensitized to use water efficiently.

7.4 Mitigation of Decommissioning Phase Impacts

7.4.1 Efficient Solid Waste Management

Solid waste resulting from demolition or dismantling works will be managed as previously described.

7.4.2 Reduction of Dust Concentration

High levels of dust concentration resulting from demolition or dismantling works will be minimized.

7.4.3 Minimization of Noise and Vibration

Significant impacts on the acoustic environment will be mitigated as described above.

CHAPTER EIGHT

8 CHAPTER EIGHT: ENVIRONMENTAL MANAGEMENT PLANS

The EMPs outlined in here below the identified issues of concern (potential negative impacts) and mitigation measures as well as roles, costs that can help to determine the effectiveness of actions to upgrade the quality of environment; as regards the proposed project. The EMPs have considered both construction and occupation phases).

Integrating environmental issues in business management, such as those related to real estate development is that it increases efficiency while enhancing the project proponent financial and environmental management. These issues, which are normally of financial concern, are: costs, product quality, investments, level of productivity and planning.

Environmental planning and management as a concept seeks to improve and protect environmental quality for both the project site and the neighbourhood through segregation of activities that are environmentally incompatible. Environmental planning and management integrates land use structure, social systems, regulatory law, environmental awareness and ethics.

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

8.1 Environmental Monitoring and Evaluation

Environmental monitoring and evaluation are essential in the project lifespan as they are conducted to establish if the project implementation has complied with the set environmental management standards as articulated in the Environmental Management and Coordination Act (EMCA) No. 8 of 1999, and its attendant Environmental (Impact Assessment and Audit) Regulations, 2003. In the context of the proposed project, design has made provisions for an elaborate operational monitoring framework for the following among others:

- Disruption of natural environment and modification of microclimate
- Air and noise pollution

- Proliferation of kiosks
- Workers accidents and health infections during construction process

The analysis shows that the implementation of the recommended mitigation measures would substantially reduce/minimize the negative impacts and enhance positive ones.

8.1.1 SEVERITY RATING OF IMPACTS

Phase	**Activities**	**Environmental Concerns**	**Mitigation/Enhancements**	**Severity Ranking before Mitigatio**	**Severity Ranking after Mitigatio**
Construction Phase	Excavation and transport of materials	• Generation of noise, dust, exhaust emissions • Soil erosion • Energy consumption	• Enforcement of onsite speed controls • Road on site regularly sprinkled with water to reduce dust • Switching vehicle engines off during loading and unloading. • Proper planning of transportation	-2	-1

	Construction of offices & auxiliary works	• Availability and sustainability of building materials- hard core, ballast, stones, sand etc. • Risk of accidents and injuries to workers • Water use	• Efficient sourcing and use ofand use of construction machinery raw materials, • Provision of protective equipment and clothing to workers, • Training of workers, Adherence to OHS Act rules & regulations, • Construction of adequate drainage systems, • Efficient & economical use of water.	-3	-2

	Landscaping	Aesthetics Rain water use for irrigation during dry season	• Proper planning of landscaping, • Planting appropriate grass, flowers,& trees, • Storage of rain water to irrigate during the dry season	-1	+1
Operational Phase	Occupation of the of the apartment blocks	Solid waste generation Increased demand for sanitation, Increased storm water Energy consumption Increased water use.	• Provision of appropriate solid waste handling facilities such bins & waste containers. • Contracting a solid waste collection private company to be collecting regularly, • Use of appropriate sewage pipes, • Installation of water conserving taps and toilets.	-2	-1

Decommissioning Phase	Demolition works	Generation of solid waste Noise and dust pollution	• Usable recovered materials, equipment, & machineries to be recycled. • Unusable materials to be taken to a licensed waste disposal	-3	-2
	Rehabilitation	Restoration to original state	Use of indigenous plant species.	+1	+3
				-10	-2

8.1.2 Table Environmental Management Plan - Construction phase EMP

Project Activities	Environmental concern	Mitigation measures	Time frame	Responsibility	Estimated Cost	Frequency
Excavation, landscaping and apartment construction	Soil erosion	Application of soil • conservation measures	Construction stage	Contractor	30,000.00	During & after const.
	Air/Dust pollution	• Regular sprinkling with water	"	"	70,000.00	During road &parking Bay const. Period
	Solid waste disposal	• Excavation of soil to be transported to designated and approved disposal sites	"	Contractor and hire transporters	250,000.00	During Excavation Period

	Risk of injuries and accidents to workers	• Provision of protective clothing	“	Contractor	63,000.00	Beginning Of project for People at risk

		• Training of workers & supervisors • Adherence to OHS Act rules	“	Contractor	18,000.00	Beginning of project
	Water use	and regulations Installation of water efficient taps and toilets	“	Contractor	0	Already on site
Operations of the Hotel	Energy consumption	Installation of energy conserving bulbs and equipment for lighting, cooking and running hotel equipment such as	Operational stage	Management	3500.00 p.m.	as needed

8.2 Operation phase EMP

The necessary objectives, activities, mitigation measures, and allocation of responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the operational phase of proposed apartments are outlined in table below.

8.2.1 Table Environmental management/monitoring Plan for the operational phase

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Estimated Cost
Solid waste generation	1) Use of an integrated solid waste management system i.e. through a hierarchy of options: a) Source separation and reduction b) Recycling c) Composting and reuse d) Combustion e) Sanitary land filling.	Resident Project Manager & Contractor	Throughout construction	30, 000.00 per month
	2) Provide solid waste handling facilities such as rubbish bags and skips	Resident Project Manager	One-off	
	3) Ensure that solid wastes generated at the housing units are regularly disposed off appropriately at authorized dumping sites	Resident Project Manager	Continuous	

	4) Ensure that occupants of each family unit manage their waste efficiently through recycling, reuse and proper disposal procedures.	Resident Project Manager	Continuous	
	5) Donate redundant but serviceable equipment to charities.	Resident Project Manager	Continuous	
	6) A private company to be contracted to collect and dispose solid waste.	Resident Project Manager	Continuous	
Release of sewage into the environment	**1.** Provision of adequate and safe means of handling sewage generated at the apartments inform of proper connection to the proposed sewer line connection.	Resident Project Manager & Mechanical Engineer	One-off	9, 000.00 per month
	2. Conduct regular inspections for sewage pipe blockages or damages and fix appropriately	Resident Project Manager & Mechanical Engineer	Continuous	
	3. Ensure regular monitoring of the sewage discharged from the apartments to ensure that the stipulated sewage/effluent discharge rules and standards are not violated	Resident Project Manager & Mechanical Engineer	Continuous	
High demand for energy	**1.** Switch off electrical equipment, appliances and lights when not being used	Resident Project Manager & Occupants of the housing units	Continuous	Part of the main budget

	2. Install occupation sensing lighting at various locations such as storage areas which are not in use all the time	Resident Project Manager & Contractor	One-off	
	3. Install energy saving fluorescent tubes at all lighting points within the apartment instead of bulbs which consume higher electric energy	Resident Project Manager & Occupants	One-off	
	4. Monitor energy use during the operation of the project and set targets for efficient energy use	Resident Project Manager	Continuous	
	5. Sensitize suite occupants to use energy efficiently	Resident Project Manager	Continuous	1.5,000,000.00
	6. Explore the possibility of using renewable sources of energy such as wind and solar energy	Resident Project Manager & Occupants	One-off	
High water demand	**1.** Promptly detect and repair water pipes and tank leaks	Resident Project Manager & Mechanical Engineer	Continuous	10,000.00 month
	2. Residents to conserve water e.g. by avoiding unnecessary toilet flushing.	Resident Project Manager & Mechanical Engineer	Continuous	

	3. Ensure taps are not running when not in use	Resident Project Manager & Mechanical Engineer	Continuous	
	4. Install water conserving taps that turn-off automatically when water is not being used	Resident Project Manager & Mechanical Engineer	One-off	
	5. Install a discharge meter at water outlets to determine and monitor total water usage	Resident Project Manager & Mechanical Engineer	One-off	
	6. Create water conservation awareness	Resident Project Manager & Mechanical Engineer	Continuous	
Increased health and safety impacts	1. Implement all necessary measures to ensure health and safety of workers and the general public during operation of the project as stipulated in Factories and Other Places of Work Act Cap 514	Resident Project Manager, Mechanical Engineer, & Developer	Continuous	25, 000.00
Increased	**1.** Coordinate with other planning goals and objectives for the region	Architect, Project Manager, and the	Continuous	125, 000.00

Pressure on Infrastructure	**2.** Upgrade existing infrastructure and services, if and where feasible.	Architect, Project Manager and the	Continuous	
Insecurity	**1.** Appoint security personnel operating 24 hours	Security Officer, Resident Project	Continuous	Part of the general
	2. Body-search the workers on entry, to avoid getting weapons on site, and leaving site to ensure nothing is stolen.	Security Officer	Continuous	
	3. Ensure only authorized personnel get to the site	Security Officer	Continuous	
Air Pollution	**1.** Suitable wet suppression techniques need to be utilized in all exposed areas	Site Safety Officer	Continuous	50, 000.00 per month
	2. All unnecessary traffic must be strictly limited on site speed controls are to be enforced	Site Safety Officer	Continuous	
	3. Use of unleaded fuel to be encouraged	Residents project manager	Continuous	
Emergence of new environmental concerns	Undertake an environmental audit within 12 months after operation commences as required by law	EIA Experts	Continuous	250,000

8.3 Decommissioning Phase

In addition to the mitigation measures provided above, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the proposed apartment 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 housing project are outlined in the next page .

Table 18: Environmental Management/Monitoring Plan for the decommissioning phase of the project

Recommended Mitigation Measures	Responsible Party	Time Frame	cost
1. Demolition waste management			
1. 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	Contractor, Proponent	One-off	400,000
2. All foundations must be removed and recycled, reused or disposed of at a licensed disposal site			70,000
3. Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should collected by a licensed waste disposal site	Contractor, Proponent	One-off	150,000
4. Donate reusable demolition waste to charitable organizations, individuals and institutions	Contractor, Proponent	One-off	0
2. Rehabilitation of project site			
1. Implement an appropriate re-vegetation programme to restore the site to its original status	Contractor, Proponent	One-off	70,000
2. Consider use of indigenous plant species in re-vegetation	Contractor, Proponent	One-off	55,000
3. Trees should be planted at suitable locations so as to interrupt slight lines (screen planting), between the adjacent residential area and the development.	Contractor, Proponent	Once-off	

8.4 EHS Management and Administration

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

8.4.1 Avoidance of injuries

8.4.2 Provision of safe and healthy working environment for workers comfort so as to enhance maximum output.

8.4.3 Control of losses and damages to plants, machines, equipment and other products.

8.4.4 Enhance environmental sustainability through developing sound conservation measures.

8.5 Policy, Administrative and Legislative Framework

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

8.6 Organization and implementation of the EHS Management Plan.

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

8.7 The Guiding Principles to be adopted by the contractor

The company will be guided by the following principle: -

8.7.1 It will be a conscious organization committed to the promotion and maintenance of high standards of health and safety for its employees, the neighboring population and the public at large.

8.7.2 Ensuring that EHS activities are implemented to protect the environment and prevent pollution.

8.7.3 Management shall demonstrate commitment and exercise constant vigilance in order to provide employees, neighbors of the project and the environment, with the greatest safeguards relating to EHS.

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

8.8 EHS management strategy to be adopted by the contractor

The following strategies will be adopted to achieve the above objectives:

8.8.1 Create an Environment Health and Safety Management committee and incorporate EHS as an effective structure at various levels and units to manage and oversee EHS programs in all construction and operation phases of the project

8.8.2 Maintain an effective reporting procedure for all accidents.

8.8.3 Provide appropriate tools and protective devices for the success of the project.

8.8.4 Encourage, motivate, reward and support employees to take personal initiatives and commitment on EHS.

8.9 Safety Agenda for both the proponent and contractor

There will be a permanent EHS agenda during construction.

a) Contractors

The EHS management plan code of practice shall be applicable to the contractors working in the premises, and shall be read and signed. It shall be incorporated into the contract to perform work. This should also remind the contractor of his/her legal requirements.

- Statutory obligations.
- Obligation to lay-down a system for reporting accidents
- Responsibility to ensure that his/her employees are supplied with personal protective equipment and where applicable as per the EHS management plan for the whole project.
- Responsibilities as it relates to contracting an EHS consultant in liaison with the proponent

- Obligation to ensure that he obtains detail of jobs and areas where permit-to- work must be issued

b) All residents' and workers' responsibility

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

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

a) **The contractor**

The contractor will ensure that:

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

b) **The Traffic / Drivers.**

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

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

c) **Fire hazard at the construction site,**

Workers at the site shall ensure that: -

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

8.11 Welding at the construction site

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

8.11.1 Ensure that welding clamp is fixed such that no current passes through any moving parts of any machine.

8.11.2 Ensure that all welding clamps are in good operating condition and conduct current without arcing at the point of contact.

8.11.3 Ensure that welding clamps are free from any contact with explosive vapors. I.e. Oil spillage, Fuel tanks, Coal dusts and miscellaneous combustible material (e.g. Cotton rags filter bags, rubber belting, and wood shavings).

8.11.4 Ensure that any slag or molten metal arising from welding activities does not start up fires by: Clearing combustible material to a distance of at least 3 meters away from the working area or covering area with metal or asbestos sheet.

8.11.5 Appropriate fire extinguisher is to be kept available for immediate use at all times

8.12 Emergency procedure during construction and operation and emergency situation means:

8.12.1 Unforeseen happening resulting in serious or fatal injury to employed persons or the neighboring communities.

8.12.2 Fire or explosion.

8.12.3 Natural catastrophe.

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

8.12.4 Alert other persons exposed to danger.

8.12.5 Inform the EHS coordinator.

8.12.6 Do a quick assessment on the nature of emergency.

8.12.7 Call for ambulance on standby.

8.12.8 When emergency is over the EHS coordinator shall notify the workers by putting a message: "ALL CLEAR"

8.12.9 In the event of such an emergency during operation the workers shall: - Alert other persons exposed to danger.

8.12.10 Ring the nearest police station

8.12.11 Call for ambulance.

9 CHAPTER NINE

9.1 PROJECT ALTERNATIVES, UNCERTAINITIES AND CONCLUSION

In terms of the EIA Regulations, feasible alternatives are required to be considered as part of the environmental investigations. An alternative in relation to a proposed activity refers to the different means of meeting the general purpose and requirements of the activity which may include alternatives to:

- The property on which or location where it is proposed to undertake the activity;
- The type of activity to be undertaken;
- The design or layout of the activity;
- The technology to be used in the activity;
- The operational aspects of the activity.

All identified feasible alternatives are required to be evaluated in terms of social, biophysical, economic and technical factors.

9.2 Do-nothing Alternative

The do-nothing option would entail not using the site and maintaining the site as is. From certain perspectives this is not a viable option as the site is situated within an agricultural area surrounded by either upcoming or already existing residential communities. By not developing the site, the site will be anomalous in the context of the surrounding land uses, and some of the direct and indirect socio-economic benefits (i.e. job creation, housing shortages, provision of further housing aimed at the mature living market, etc.) will not materialize.

The ecological linkages between the site and surrounding natural areas will be better maintained by increased development around the site. Not developing the site will leave the site lying idle and unutilized and resulting into under development of the area.

9.3 Layout Alternatives

The layout alternatives have been investigated and assessed within the Environmental Impact Assessment Phase. These are detailed in the report as the *Preferred Layout* with the *Alternative Layout* being the second option. Both options were investigated in terms of the layout for the proposed flats development establishment to accommodate the proposed project. Due to the surrounding access roads, accessibility and convenience of the proposed

site, the alternative (non-preferred) layout was not deemed a feasible option for the proposed site.

9.4 Analysis of Alternative Construction Materials and Technology

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

9.5 Solid Waste Management Alternatives

A lot of solid wastes will be generated from the proposed Project. An integrated solid waste management system is recommendable. The Proponent will also manage the wastes generated in accordance with the Environmental Management and Coordination Waste Management Regulations of 2006. 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. Recycling, Reuse and compositing of the waste will be the 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 local area or be collected by a private waste management company. The other 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 to consider.

9.6 Uncertainties in the cycle of the proposed development

Uncertainties may arise during the project cycle from a variety of aspects in any development and include the following:

- Changes that may occur in baseline conditions due to external factors over the lifetime of the project.
- Uncertainties related to policy initiatives that might influence the assessment of future baseline and post development conditions
- Uncertainties in design information, which in the current state is dealt with by a good definition of design parameters for the development.

- Uncertainty with respect to project implementation and planning, since the detailed program and means of construction may be influenced by the choice of contactor, and the detailed design of the development

9.7 Conclusions and Recommendations

This development is timely and is supported by the local and wider community. Since the previous development, the developers have shown that they can develop quality developments with reduced environmental impacts. The area has previously made development that are not only quality buildings but efficient infrastructure (drains, roads, etc.), with little or no environmental impacts. A significant benefit being the major positive socio-economic impacts on the surrounding communities, as well as greening of area, which will invariably increase the biodiversity in the area.

10 REFERENCES

i. Kenya gazette supplement Acts 2000, Environmental Management and Coordination Act Number 8 of 1999. Government printer, Nairobi

ii. Kenya gazette supplement Acts Building Code 2000 by government printer, Nairobi

iii. Kenya gazette supplement Acts Land Planning Act (Cap. 303) government printer, Nairobi

iv. Kenya gazette supplement Acts County Government Act, 2012 government printer, Nairobi

v. Kenya gazette supplement Acts Penal Code Act (Cap.63) government printer, Nairobi

vi. Kenya gazette supplement Acts Physical Planning Act, 1999 government printer, Nairobi

vii. Kenya gazette supplement Acts Public Health Act (Cap. 242) government printer, Nairobi

viii. Kenya gazette supplement number 56. Environmental Impact Assessment and Audit Regulations 2003. Government printer, Nairobi.

ix. Nairobi District Development plan (2004-2008). Ministry of Planning and National Development. Government printers, Nairobi

x. UNEP and ACTS (2001). The making of a framework Environmental law in Kenya. ACTS press, Nairobi

xi. World Bank (1991). Environmental Assessment sourcebook volume I: Policies, procedures and cross-sectoral issues. World Bank, Washington.

xii. Kenya gazette supplement number 69. Environmental Management and Coordination (Waste Management) Regulations 2006. Government printer, Nairobi

xiii. Kenya gazette supplement number 68. Environmental Management and Coordination (Water Quality) Regulations 2006. Government printer, Nairobi

APPENDICES

- Public participation forms
- Copy of Architectural drawings/designs for the proposed development
- Copy of land ownership documents.
-

PHOTOS OF THE PROPOSED SITE