ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT

FOR

PHASE 1: CONSTRUCTION OF MEDIUM INCOME APARTMENTS AS COMPONENT OF THE PROPOSED MIXED URBAN DEVELOPMENT AT CLAY WORKS ON LR NO 57/2055-KASARANI (NAIROBI CITY COUNTY)

For,
Agricultural and Industrial Holdings Ltd;
P.O. Box 502124-00200
Nairobi

Prepared by;
Oligerm Holdings Limited
P.O. Box 466-00100
Nairobi

NEMA Reg. No. 1753

OLIGERM HOLDINGS LTD
SUBMISSION LETTER

01st April 2016

Director General,
National Environmental Management Authority,
P.O Box 67839-00200,
Kapiti Road, South C,
Nairobi,
Kenya

Dear Sir,

RE: SUBMISSION OF EIA STUDY REPORT FOR PHASE 1: CONSTRUCTION MEDIUM INCOME APARTMENTS AS COMPONENT OF THE PROPOSED MIXED URBAN DEVELOPMENT AT CLAY WORKS ON LR NO 57/2055-KASARANI (NAIROBI CITY COUNTY)

We hereby submit the above report on behalf of the proponent Agricultural and Industrial Holdings Ltd for your consideration and approval. We confirm that this report has been done in accordance with the provisions of the Environmental Management and Coordination Act of 1999 as well as the Environmental Impact Assessment and Audit Regulations of June 2003 and other relevant environmental legislative provisions in Kenya.

Yours sincerely,

Charles Mbara
Nema Registered Lead Expert
Oligerm Holdings Limited
CERTIFICATION

This Study report has been prepared by Oligerm Holdings Ltd. The report has been done with reasonable skills, care and diligence in accordance with the Environmental Management and Co-ordination Act, 1999 and the Environmental (Impact Assessment and Audit) Regulations, 2003 and other relevant environmental legislative provisions in Kenya. We certify that the particulars contained in this report are correct to the best of our knowledge.

FIRM OF EXPERTS

Name of Firm of Experts: Oligerm Holdings Ltd

NEMA Registration No: 1753

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   Supervising Engineer

4. Gilbert Ochieng -
   Economist
**ADDITIONAL STUDIES**

1. Housing Survey - Chapter 6 of the Report
2. Geophysical Survey with 2D Resistivity Assessment at the Clay works Site
3. Draft Phase I Bill of Quantities

**PROJECT PROPOONENT**

Name: Agricultural and Industrial Holdings Ltd

**Nature of the Business:** Phase 1: Construction of 560 Medium Income Apartments as the first Component of the Proposed Mixed development at Clay Works Nairobi as indicated on ownership documents (attached)

**Date of assessment:** March 2016

**Site Location:** LR No.57/2055-KASARANI, Nairobi County.

Name: Michael Wandegwa

Designation: .............................................................

Signature of Proponent: ..............................Date...........

Rubber Stamp
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<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPs</td>
<td>Interested and Affected Parties</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>ESMP</td>
<td>Environment and Social Management Plan</td>
</tr>
<tr>
<td>EMCA</td>
<td>Environmental Management and Coordination Act</td>
</tr>
<tr>
<td>CPP</td>
<td>Consultation, Public Involvement and Participation</td>
</tr>
<tr>
<td>ToR</td>
<td>Terms of Reference</td>
</tr>
<tr>
<td>NEC</td>
<td>National Environment Council</td>
</tr>
<tr>
<td>NET</td>
<td>National Environment Tribunal</td>
</tr>
<tr>
<td>PCC</td>
<td>Public Complains Committee</td>
</tr>
<tr>
<td>KPLC</td>
<td>Kenya Power and Lighting Co. Ltd.</td>
</tr>
<tr>
<td>EMS</td>
<td>Environment Management Systems</td>
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<td>PPEs</td>
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NON TECHNICAL EXECUTIVE SUMMARY

E1: Background

E2: Purpose of the Report

The purpose of this assessment is first and foremost to ensure adequate identification of potentially negative environmental impacts. Secondly, to propose workable mitigation measures, and thirdly to formulate an Environmental Management and Monitoring Plan articulating envisaged impacts and mitigations, and to obtain an Environmental Impact Assessment licence.

E3: Methodology

This Environmental Impact Assessment (EIA) was carried out based on site inspection and assessment as well as the surrounding developments and public consultations with the staff of Agricultural and Industrial Holdings Ltd, the resident community neighbouring the proposed Project site, the client, the Surveyors, senior managers of SiS (Project Management /Development Financing and Advisory), relevant stakeholders and the proponent.

Relevant document reviews were undertaken by the consultants. The proposed project proponent provided the proposed project design details. The data collection was carried out through site inspection and assessments, administration of structured questionnaires during public consultations, interviews and observations during site visits in the manner prescribed and specified in Part V (Regulation 35) of the Environmental (Impact Assessment and Audit) Regulations, 2003. Potential negative impacts and mitigation measures during construction, operation and decommissioning of the proposed phase 1: construction of the medium income apartments were taken into consideration during the assessment.

E4: Impacts and mitigation measures

The implementation of this project in Kasarani will have significant positive and negative environmental and socio-economic impacts on the natural and socio-cultural
environment of the location. The proposed development activities will create employment and business opportunities for local communities and Nairobi City County at large. The eastern section of the city county including Kasarani, Githurai and Kahawa west sub-counties with high demand for residential accommodation will be the greatest beneficiaries.

The envisaged negative environmental and social impacts will mainly be the disruption to local biodiversity during construction phase and will include; soils disturbances, dust and noise pollution. There will be increase in the waste and sanitation menace symbolized by mounts of solid wastes and the pressure created on the already overloaded liquid wastes disposal systems in the general location. In addition to the above; impacts associated with operational phase of the apartments (rental and occupation) of the medium income apartments will emerge and will include; solid waste materials, human and wastewater.

The proponent (ie Agricultural and Industrial Holdings Ltd and the contractors), will be required to take the necessary mitigation measures addressed in the environmental and social management plans during the implementation of the project. The mitigation measures will be specific to each phase of the project implementation and will include; the protection of the biodiversity in the project area (ie the dam and fishes species identified therein) and ecosystems from degradation during the construction phase, the waste disposal in compliance with the required Kenyan Public Health standards, the proper use and conservation of water to minimize wastage and to minimize air emissions and noise; and adherence to occupational, health and safety rules at the work place in order to control risks and hazards. These measures will be taken in compliance with Water Quality, Waste management, Noise and vibration pollution guidelines as promulgated in the Environmental Management and Coordination Act of 1999.

**E5: Conclusion**
Based on the literature review, key contact interviews, and information and data gathered during the assessment (i.e., during the site visits/inspections and public consultations), the following can be summarized:

1. This EIA report has been prepared for the construction of phase 1: medium income apartments as the first component of the proposed urban development at Clay works for Agricultural and Industrial Ltd Holdings Ltd.

2. The report presents an overview on the development impacts on the biophysical and socio-economic environment of local communities in the project locations.

3. The report has incorporated views and concerns of all housing sector stakeholders consulted in the project location.

4. The housing sector stakeholders consulted included Kenya Government ministries and departments, the Nairobi City County government, the site location resident communities, affected parties and interest groups.

5. This assessment considered environmental, social, cultural, economic and legal aspects pertaining to the implementation of the project.

6. The report contains recommendations on protection of biodiversity and ecosystems, reduced soils disturbances, dust and noise pollution during construction phase and solid and liquid waste management during the apartment occupation.
CHAPTER 1

1 INTRODUCTION AND BACKGROUND

1.1 Introduction
The proponent, Agricultural and Industrial Holdings Ltd is proposing to construct a medium income residential apartment block comprising 560 units on 14 blocks. The need for this project is largely triggered by the need to improve residential housing conditions in Nairobi City County.

1.2 Background
The developing world as a whole remains on track to meet the first Millennium Development Goal to halve extreme poverty from its 1990 levels by 2015 and the newly launched Sustainable Development Goals. However, poverty is more pervasive than earlier estimated, and efforts to fight it will have to be redoubled, especially in Sub-Saharan Africa. It is against this background that this proposed medium income
residential apartment aims at establishing itself as a core ‘economic engine’ in line with alleviating residential housing inadequacies within the Nairobi City County.

An Environmental impact assessment (EIA) is a systematic analysis of projects, policies, plans or programmes to determine their potential environmental impacts, the significance of such impacts and to propose measures to mitigate the negative adverse ones.

The Environmental Management and Co-ordination Act (EMCA) of 1999 require that an Environmental Impact Assessment precedes all development activities with anticipated negative impacts. The EIA Study report will be submitted to National Environment Management Authority (NEMA) for consideration and approval and issuance of a license. This assessment was therefore carried out to fulfill this statutory requirement.

1.3 Preliminary prerequisite

A preliminary prerequisite to the commencement of the construction of the proposed medium income residential apartments project consist of an EIA report which is the main deliverable of this consultancy. Under Part VI Section 58 of the Environmental Management and Coordination Act 1999 No. 8, any person, being a proponent of a project is required to apply for and obtain an Environmental Impact Assessment (EIA) license from National Environment Management Authority (NEMA) before he/she can finance, commence, proceed with, carry out, execute, or conduct any undertaking specified in the 2nd Schedule of the Act.

Agricultural and Industrial Holdings Ltd being the project proponent therefore procured the services of the consultant on her behalf, to produce this Environmental Impact Assessment Report as required.

1.4 Scope of the EIA Report

The scope of this Environmental Impact Assessment Report conforms to Environment Management and Coordination Act of 1999 and the Environmental (Impact Assessment and Audit) Regulations of June 2003 and other related pieces of
Kenyan environmental legislation and guidelines and has been prepared for the sole purpose to enable environmental implications to be assessed during the implementation of the project.

1.5 **The objectives of the EIA report**

The main objectives of the report are to: to consider positive and adverse negative environmental impacts generated during implementation of the proposed project; determine the bio-physical and socio-economic impacts during construction, operational and decommissioning phases; design and develop mitigation measures and action plans to address the envisaged significant negative environmental impacts during the construction and operational phases and recommend mitigation measures in compliance with Environmental (Impact Assessment and Audit), Regulations of June, 2003 and other related Kenyan environmental legislation.

1.6 **Methodology for the EIA**

The EIA was carried out based on desk study, field surveys and public consultation followed by results analysis to determine the bio-physical, environmental and social impacts.

1.6.1 **Desktop study**

A desktop study was conducted to review relevant project documents, available published and unpublished reports, development plans and maps in order to compile relevant baseline biophysical, ecological and socio-economic information on the proposed project location. The bio-physical information was compiled on environmental aspects and the built environmental status of the proposed project location. On the socio-economic environment, the consultants compiled information on socio-economic activities prevalent in the location.

1.6.2 **Field survey**

Site inspection and field visits to the proposed project location were conducted to collect site-specific information on the biophysical and socio-economic
environment, and to cross-check the secondary data that had been compiled during the desktop studies. And while at the site, environmental data were recorded and potential impacts identified and the environmental and relevant socio-economic aspects within the site were noted and photographs taken as record of key features. The field work was conducted twice in December 2014 and December 2015 (Details in list of stakeholders consulted attached in the Annexes).

1.6.3 Public consultation

Public consultations were undertaken through a structured questionnaire and unstructured interviews. The consultations addressed the following:

a) Informed the relevant stakeholders of the proposed residential apartment development in Kasarani sub-county.

b) Established with stakeholders positive and negative environmental effects of the projects implementation.

c) Collected views, concerns and opinions of the stakeholders on the projects’ implementation process

The public consultation was done during the field work both in December 2014 and December 2015.

1.6.4 Impact assessment and analysis

The assessment and analyses methodologies for this EIA report are based on multi-disciplinary approaches and structured to allow for holistic assessment of the biophysical and socio-economic components.

1.7 Need for the proposed project

The demand for the proposed medium income residential apartment was largely influenced by;

• Kenya Government housing development policy to create an enabling socio-economic environment to provide adequate and descent housing for all Kenya citizens.
• The need to provide low income decent housing for Nairobi City County residents and reduce housing pressure in the County.

1.8 Structure of the EIA Report

This report is structured as follows:

◦ Non-technical executive summary
◦ Abbreviations and Acronyms
◦ Table of contents
◦ List of Tables
◦ List of Figures
◦ Acronyms

1.9 Report format

Chapter 1: Gives a brief introduction and background

Chapter 2: Gives the project description

Chapter 3: Describes the project area/setting

Chapter 4: Analyses the project alternatives

Chapter 5: Explains the study methodology

Chapter 6: Gives a record of public consultation

Chapter 7: Gives legislative and regulatory framework

Chapter 8: summarizes anticipated impacts and their mitigation

Chapter 9: Environment and Social Management Plan

Chapter 10: Conclusions and recommendations
CHAPTER 2

PROPOSED PROJECT DESCRIPTION

2.1 Proposed Project objectives
The objectives of the proposed medium income residential apartments include;

- To offer residential facility to the Kasarani resident community.
- To meet resident housing demand and reduce housing pressure in the area.
- To promote community wellbeing through better provision of housing to meet diverse community needs.
- To provide housing in a way that contributes to the sustainability of communities and is compatible with the goal of environmental sustainability.
- To provide housing that allows people the opportunity to pursue goals related to family, work, education, creativity, recreation or other pursuits.
- To encourage adaptable and accessible housing that can respond to the changing needs of residents

2.2 Proposed Project Site location and Access
The proposed medium income residential apartments will be constructed on LR No.57/2055 –KASARANI, in the Nairobi City County. The proposed project site is located along the Thika Super Highway 15 kilometers from Nairobi city centre and is surrounded by residential housing estates. Zimmerman and Githurai 44 Estates lie across the superhighway to the North West; Moi Sports Centre complex is to the extreme north west, Kasarani and Clay Eden Estates to the north, Mwiki Estate to the south east and Githurai 45 to the east.
(For the details see the site layout attached in annex 4 of this report.)
Table 1: Proposed site neighbors and their activities

<table>
<thead>
<tr>
<th>Direction</th>
<th>Neighbour</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>East</td>
<td>Githurai 45 Estate</td>
<td>Currently occupied by residents</td>
</tr>
<tr>
<td>West</td>
<td>Githurai 45 Estate</td>
<td>Currently occupied by residents</td>
</tr>
<tr>
<td>North</td>
<td>Kasarani and Clay Eden estate</td>
<td>Currently occupied by residents</td>
</tr>
<tr>
<td>South</td>
<td>Mwiki Estate</td>
<td>Currently occupied by residents</td>
</tr>
</tbody>
</table>

2.3 Propose Project Design

The proposed project will involve construction of 560 apartment units on 14 blocks on a piece of land measuring 16 acres on LR No.57/2055–Kasarani in Nairobi County. The drawings are attached for ease of reference as Annexes

2.3.1 Housing Phasing

There will be housing Phase 1. Related auxiliary developments will include the Driveway, Main gate and Community center

2.3.2 Housing Phase 1

The housing phase 1 will consist of the following developments:

- 560 units on 14 blocks
- The blocks have:
  - Paved access road
  - Entry gate & Gate House
  - Full boundary with electric fence
  - Sewer connection to trunk
  - Substation
  - Water reservoir & Borehole
  - Area street lighting

2.3.3 3 Bedroom apartments:

The 3 bedroom apartment will comprise lounge, dining; master ensuite and shared bathroom (Details in the attached drawings)
- Net area 104.6M²
- Gross area 109.6M²
- Lounge & dining area
- Master en-suite
- 2 Bedroom with Shared bathroom
- Kitchen & Utility

2.3.4 **2 Bedroom apartments:**

The 2 bedroom apartments will comprise lounge, dining and Master ensuite (Details in the attached drawings)

Type 1:

- Net area 81M²
- Gross area 85.75M²
- Lounge & dining
- Master en-suite
- 1 Bedroom with shared bath
- Kitchen & Utility

Type 2:

- Net area 70.3M²
- Gross area 73.0M²
- Lounge & dining
- Master en-suite
- 1 Bedroom with shared bath
- Kitchen & Utility

2.4 **Proposed Project Activities**

For purposes of better understanding and analysis, the project development shall be discussed in terms of its activity component format. These activity components include
design, construction, operation, and decommissioning phases. During different activity components of the project cycle, several development activities, as well as operational activities shall be discussed in the proceeding section.

2.4.1 Planning and design activity phase

This phase entails designing of the residential apartment building taking into consideration type and nature of materials to be employed. It also involved careful consideration and balancing of the building, physical conditions of the site/plot and ergonomics in line with total costs as well as economic value of the project. The services of an architect who is responsible for developing the plans and various other important parties were involved; Physical Planner, Quantity Surveyor, EIA expert and Structural Engineer.

2.4.2 Construction phase activities

Construction works will involve the following activities.
- Excavation and site clearing
- Sub-structure (foundation) construction
- Wall erection (superstructure)
- Roofing
- Fittings
- Plumbing
- Electrical fittings
- Finishes and Cladding
- Landscaping

2.4.3 Operational phase activities

Activities in the operational phase of the project will include;
- General residential activities
- Gardening and beautification activities including planting of trees and flowers to enhance the compound general scenic view.
• Cleaning the premises
• Repair and maintenance of the premises

2.4.4 The Proposed Project Cost

The Construction of the proposed medium income residential apartments will cost Ksh
2,951,536,048.58
CHAPTER 3

3 BASELINE INFORMATION OF THE PROPOSED PROJECT AREA

3.1 Introduction

The proposed project is located in Kasarani sub-county in Nairobi County. Nairobi occupies an area of about 700 km\(^2\) at the south-eastern end of Kenya’s agricultural heartland. It is divided into 8 administrative sub-counties including Kasarani, Embakasi, Westlands, Central Nairobi, Pumwani, Makadara, Dagoreti and Kibera. At 1 600 to 1 850 m above sea level, it enjoys tolerable temperatures year round (CBS 2001, Mitullah 2003). The western part of the county is the highest, with a rugged topography, while the eastern side is lower and generally flat.

The Nairobi, Ngong, and Mathare rivers traverse numerous neighborhoods and the indigenous Karura forest still spreads over parts of northern Nairobi. The Ngong hills are close by in the west, Mount Kenya rises further away in the north, and Mount Kilimanjaro emerges from the plains in southern Tanzania to the south-east. Minor earthquakes and tremors occasionally shake the county since Nairobi sits next to the Rift Valley, which is still being created as tectonic plates move apart.

The County’s brief development was planned by the colonial authorities assigning different functions to specific zones. Thus the Central Business District (CBD) occupies the original triangular site contained between the Nairobi River, Uhuru Highway and the railway (34Y and Z) south and then 5 km east across the plains stretches the industrial Area (50–54), a remarkable concentration of manufacturing enterprise although subsidiary centers have arisen at Ruaraka (11) and Dandora (27).

In contrast, the 117 sq km National Park (one fifth of the county’s area) harbors some of the nation’s famous wildlife for the convenient enjoyment of residents and visitors alike. This is an utterly unique feature of which the county is justly proud. Between the National Park and City Centre is Wilson Airport (62) from which all light aircraft operate.
Further out on South – eastern plains, scheduled national and international flights fly from Jomo Kenyatta International Airport.

### 3.2 Geology/Soils

Nairobi is close to the eastern border of the Rift valley and is on a large depression filled with volcanic rocks and sediments of Cainozoic times, which lie on basement complex rocks. In earlier times volcanic activities dominated the county. The volcanic rocks deposited by the solidification of flowing lavas (Nairobi phonolites) have gentle slope flowing eastwards from the Rift valley. Below the phonolites are series of sediments (upper Athi), which is underlain by lower Athi series. Below the lower Athi are the Kapiti phonolites lying on the oldest rock in the country; the basement rocks and old metamorphic rocks of sedimentary origin.

Nairobi Trachytes extend from Dagoretti and Karen up to the east of the county, and towards north of Kiambu and Githunguri; the Nairobi phonolites extend between the Nairobi National Park and Kiambu. They are directly on the Athi series and Kapiti phonolites are also overlain by the Athi series.
3.2.1 **Physical Drainage**

Drainage for storm water will be created during the construction work.

3.2.2 **Climate**

Although the Nairobi County is situated quite close to the Equator, its altitude of about 5,500 feet (1700 meters) results in enjoying an equable as opposed to a tropical climate, with temperatures neither uncomfortably low at night. The main features of the climate are the existence of definite wet and dry seasons, and the absence of any large seasonal change in temperature. For convenience the year can be subdivided into four seasons as follows:

- Mid-December to Mid-March: Warm, sunny, dry.
- Mid-March to May: Main rainy season.
- June to Mid-October: Cool, rather cloudy (especially July-August), dry.
- Mid-October to Mid-December: Secondary rainy seasons.

The only period of the year when the weather can be rather trying is during the hot, dry period shortly before the rains break in March. At this time mid-day temperatures rise to nearly 32°C, the relative humidity may fall to 10%, and a moderately strong easterly wind tends to raise the dust. The average annual rainfall in the county is about 900m, but the actual amount in any one year may vary from less than 500 mm to more than 1500 mm. As already mentioned, there are two rainy seasons, from mid-March to the end of May (the so-called "Long Rains"), and from mid-October to mid-December (the "Short Rains"). The dates on which these rainy seasons start and end are very variable; in fact the beginning and end of a wet season are seldom, if ever, well defined. These seasons coincide approximately with the time of changeover of the monsoon currents, which affect East Africa, the South-West Monsoon becoming established in April, and northeast monsoon in November.
3.2.3 Water resources

The project site is connected to piped water from the Nairobi Water and Sewage Company (NWSC). Nairobi City County currently gets its water from six sources; Ruiru and Kikuyu springs, which are on the Athi River drainage basins; Sasumua, Chania, Thika dam and Ndakaine dam on the Tana River catchments. The water from these sources is treated at three plants, Sasumua, Kabete and Ngethu, all operated by the Nairobi Water and Sewage Company.

3.2.4 Atmospheric condition

The air quality in the vicinity is not polluted and this may explain why the area is predominantly a residential area. It’s void of factories or activities that would compromise the air quality. The common air pollutant in this area is exhaust fumes from vehicles especially those using the Thika Super Highway nearby road. The development of the proposed site will translate to an increase in air pollution in the project area, which in any case; may be arguably insignificant.

3.3 Biological Environment

3.3.1 Flora / Vegetation

The area on the proposed site is covered with built structures; mainly houses. Trees and shrubs are very few. During construction these houses will be demolished, the shrubs and trees will be cleared. However after completion of the project enough vegetation will be planted at the site to reestablish the aesthetic value. The proposed site is in an already developed residential area. There are no natural ecosystems nearby except established crop gardens, trees, flowers and grass. Among the vegetation seen at the proposed project site include grass, eucalyptus and few shrubs.
3.3.2  **Fauna/Animals**

There is no wildlife inhabiting the site since the proposed project is in a built environment with lots of human activities. However, micro organisms, insects, birds, lizards and snakes are found in abundance. Also the existing dam is known to contain some fish species which residents are occasional try their luck on by fishing lines. The proposed project site is not in a protected area and is not home to any endangered species. Trees in the project site harbor a few bird species and residential compounds in the neighborhood have few domestic animals. Some domestic animals seen within the proposed project site include dogs. In general there is limited biological diversity since the site is in an already developed residential area.

3.4  **Land Use**

Major land uses in the project area include;

- Residential area
- Commercial area eg presence guest house near the site area.
3.5 **Environmental Conservation and Management.**

Currently, Nairobi City County is facing a number of environmental challenges including indiscriminate development without proper regard to environmental and physical plan requirements. This is a worrying trend that is courting a disaster. Plots are being subdivided and developments taking place rapidly without benefit of a regular plan. This means that approvals for subdivision do not consider the infrastructure capacity of the county.

Waste management is a growing problem in Nairobi City County. Increasing urbanization, rural-urban migration, rising standards of living, and rapid development associated with population growth have resulted in increased solid waste generation by industrial, domestic, and other activities. This increase has not been accompanied by an equivalent growth in the capacity to address the problem. In 1992, from 800 to 1 000 tonnes of solid waste was generated in Nairobi every day, of which less than ten per cent was collected; by 2002, the amount had grown to 1 530 tonnes per day of which 40 per cent was either uncollected, or disposed of by burning or illegal dumping (Syagga 1992, CCN 2007). The proper management of waste has thus become one of the most pressing and challenging environmental problems in the county.
Waste in Nairobi City County comes from a variety of household, service, and industrial processes in the following proportions: domestic sources: 68 per cent; industrial: 14 per cent; roads: 8 per cent; hospitals: 2 per cent; markets: 1 per cent; and 7 per cent from other sources (NEMA 2003). Food waste, plastic, and paper are the most dominant forms of solid waste in Nairobi City County. One of the most ubiquitous forms of visible waste is the plastic bag.

Nairobi City County faces an enormous challenge in providing adequate public sanitation facilities, sewage disposal, and refuse collection, a problem that is compounded as the population increases. Improperly treated sewerage and uncollected garbage have contributed to a vicious cycle of water pollution, water-borne diseases, poverty, and environmental degradation.

Ndakaini, Ruiru, and Susumua dams are the principal sources of water for Nairobi. These dams are all on rivers emanating from the Aberdare Forest (one of Kenya’s five “water towers”). Several factors compromise the county’s water quality, ranging from natural phenomena such as the high fluoride content in groundwater, to anthropogenic factors such as poor wastewater treatment and environmental degradation both within the city and in the surrounding countryside.

The main sources of atmospheric pollution are vehicles, industries, emissions from the use of charcoal and firewood, and other sources such as the open burning of waste. The increasing number of cars in the county intensifies traffic and pollution problems. Vehicles emit significant levels of air pollutants, including greenhouse gases and the precursors of smog. Charcoal burning, a very prevalent energy source in the county, emits methane (CH4) and carbon monoxide (CO) and sends tiny particulates into the air. The proposed site exhibits the problems of waste management.
4 ANALYSIS OF PROJECT ALTERNATIVES

4.1 Introduction
This section outlines the main alternatives considered by project proponent, an evaluation of impacts of each alternative with clear information on the criteria used to assign significance and an indication of the main reasons for choosing the proposed development taking into account the environmental effects.

4.2 No Action Alternative
The no development option entails leaving current status of the proposed project site as it is. Environmental effects of the proposed development will be avoided making the option desirable considering the state of the environment. This being the case, one of the reasons for construction of residential building will not be realized. A significant investment of approximately Ksh 2,951,536,048.58 which is to be spent in the project construction and short term employment opportunities will not be used. This will invariably prevent injection of this amount into the Kenyan economy. No action option may also result to continued poverty in Kasarani sub-county due to loss of foreseeable employment opportunities.

4.3 Alternative Site
A pursuant of a change of site alternative will require that the project be implemented at an alternative site other than the proposed site. Change of site will mean the proponent has to purchase an alternative piece of land.

The result will be an increase in time and resources required to complete the transactions. The unpredictability of financial resources and the lag time required in acquiring and completing official transaction on it may take a long period. The proposed site was chosen because of its proximity to the market and access to social amenities.
There is no guarantee that an appropriate and accessible land will be available at a reasonable cost within the project area.

4.4 **Alternative Construction materials and technology**

The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security, environmental and aesthetic requirements. Equipment that saves energy and water will be given first priority without compromising on cost or availability factors. The building will be constructed using locally sourced bricks, cement, river sand (washed and clean), twisted metal that meet the Kenya Bureau of Standards requirements.

4.5 **Alternative building design**

The proponent has evaluated various alternative designs, materials to be used and technology. Various professionals were involved including Architects, Engineers, surveyors and environmental consultants. After extensive discussions, the various options were assessed and the optimal design, materials and technology were agreed as per the proposed plan, materials and technology.

The proposed residential building design was chosen on the basis of the needs of the project including garage, laundry and games room. The proposed project design was the most preferred since it was able to meet all the above requirements.
CHAPTER 5

5 APPROACH AND METHODOLOGY

5.1 Introduction
For the purpose of this assessment report a number of tools and methods were applied to arrive at the desired information. A checklist was formulated and used to identify significant impacts. The checklist identified the various possible impacts that may emanate from this project and their level of significance. This assisted in prioritizing the impacts and hence dealing more in–depth with those viewed as being significant.

Baseline data was collected through desktop studies and site visit and evaluations. This was mainly through literature review of past works in the area where field studies had been carried out and documented. Data assembled was to a large extent on the natural setting i.e. vegetation, climate, soils, geology and socio-economic setup.

The task of impact prediction and evaluation was done in a qualitative manner. This embraced on methods such as expert advice and threshold level approaches. During impact analysis expert advice, matrix and computer generated models such as software for environmental awareness. This exercise resulted in an estimate or projection of the possible level of interruption.

5.2 Scope of the assessment
This assessment covered the whole project site and its surrounding areas that are likely to be impacted by the development. The physical environment covered included landscape, air quality; microclimate; and water. On the other hand the socio-cultural environment considered land use, population perception, space, safety, and ambient environment. Manmade environment covered the socio-economic infrastructure (roads, traffic flow, electricity, sewerage, telephone and space). While the biological environment covered sensitive ecosystem, important ecosystems and ecological processes.
The assessment also covered both direct and indirect impacts of the project. In addition, it also examined the impacts in terms of: short term and long-term; cumulative impacts and impact interaction. The impacts were characterized as positive or negative.

An Environment and Social Management Plan (ESMP) was formulated to provide viable and environmental friendly options to mitigate adverse impacts of the development as well as enhance the positive ones. In addition, a plan for prevention of accidents was prepared.

5.3 The Assessment Objectives

The main objectives of the report are to: to consider positive and adverse negative environmental impacts generated during implementation of the proposed project; determine the bio-physical and socio-economic impacts during construction, operational and decommissioning phases; design and develop mitigation measures and action plans to address the envisaged significant negative environmental impacts during the construction and operational phases and recommend mitigation measures in compliance with Environmental (Impact Assessment and Audit), Regulations of June, 2003 and other related Kenyan environmental legislation.

5.4 Methodology for the EIA

The EIA was carried out based on desk study, field surveys and public consultation followed by results analysis to determine the bio-physical, environmental and social impacts.

5.4.1 Desktop study

A desktop study was conducted to review relevant project documents, available published and unpublished reports, development plans and maps in order to compile relevant baseline biophysical, ecological and socio-economic information on the proposed project location. The bio-physical information was compiled on environmental aspects and the built environmental status of the proposed project.
location. On the socio-economic environment, the consultants compiled information on socio-economic activities prevalent in the location.

5.4.2 **Field survey**

Site inspection and field visits to the proposed project location were conducted to collect site-specific information on the biophysical and socio-economic environment, and to cross-check the secondary data that had been compiled during the desktop studies. And while at the site, environmental data were recorded and potential impacts identified and the environmental and relevant socio-economic aspects within the site were noted and photographs taken as record of key features. The field work was conducted over a period of one month in March 2016 (Details in list of stakeholders consulted attached as Annex ).

5.4.3 **Public consultation**

Public consultations were undertaken through a structured questionnaire, public baraza, radio announcement, postas and unstructured interviews. The consultations addressed the following:

- **d)** *Informed the relevant stakeholders of the proposed residential apartment development in Kasarani sub-county.*
- **e)** *Established with stakeholders positive and negative environmental effects of the projects implementation.*
- **f)** *Collected views, concerns and opinions of the stakeholders on the projects’ implementation process*

The public consultation was done during the field work in March 2016.

5.4.4 **Impact assessment and analysis**

The assessment and analyses methodologies for this EIA report are based on multi-disciplinary approaches and structured to allow for holistic assessment of the biophysical and socio-economic components.
CHAPTER 6

6 HOUSING SURVEY IN KENYA

6.1 Background

The Kenya National Housing Survey (KNHS) was carried out in 2012/2013 in 44 Counties of the Republic of Kenya. It was undertaken through the NASSEP (V) sampling frame. The survey targeted different players in the housing sector including renters and owner occupiers, housing financiers, home builders/developers, housing regulators and housing professionals. The key objective for the survey was to improve the base of housing statistics and information knowledge. Some of the key findings include;

- Renting households spend more than 30% of their income on rent monthly. This percentage increases to 47% when housing related utilities are included.
- Over 90% of the financial institutions interviewed indicated that they did not have specific products geared towards savings for mortgage.
- Average banks mortgage interest rates in December 2010 and December 2011 stood at 14.36 per cent and 16.36 per cent respectively
- Housing developers quoted, access to affordable land (45.9%), high returns on investment (43.7%), and prospective future returns on investment (41.4%) as the key factors in determining where to develop.

Based on the survey findings, a one stop shop system is proposed where all approving bodies will sit together to analyze development applications received and give feedback on the applications within a reasonable time.

Kenya is experiencing rapid population growth as a result of increased fertility rates. Over time, the number of urban households has increased mainly due to rural urban migration and natural population growth, leading to an upsurge in demand for housing in the urban areas. However, this demand cannot be accurately quantified because the housing sector has for a long time been deficient of comprehensive, continuous,
detailed, accurate and timely data to verify and confirm actual annual production of houses both in the urban and rural areas. The last comprehensive housing survey was undertaken in 1983. However, the results were never published. Whereas Kenya has consistently undertaken population and housing censuses, the data only provides benchmark information that needs to be regularly complemented and enriched by specialized housing surveys. The need for conducting a national housing survey was informed by the following factors:

(i) Lack of comprehensive data from households, key informants and the institutional and regulatory framework.
(iii) Need to update the otherwise out-dated housing data in the national statistical system.
(iv) Need to fill in the data gaps relating to housing which have existed for a very long time in the national statistical system.
(v) Need to regularly monitor and evaluate development goals set out in the Government blueprints particularly the Vision 2030.
(vi) Need to provide data to guide Housing Policy formulation as well as Housing development programs designed for implementation at both the National and County Governments level.

6.2 **Key challenges to the housing sector**

(i) High Population growth rate:
Kenya’s population has been growing rapidly over the years. For instance, the country’s population in 1999 was 28.7 million with urban population being 5.4 million, and by 2009 this population had grown to 38.6 million and 12.5 million, respectively (KNBS). It is projected that by the year 2030, about 50 per cent of the Kenyan population will be urban residents. The rapid rate of urbanization continues to put more pressure on services to meet the needs of the growing population.

(ii) Rapid urbanization:
The urban population increased from 19 per cent in 1999 to 32 per cent in 2009 and is expected to increase to 50 per cent by the year 2030. This has resulted in the need to increase the number of housing stock in the urban areas.

(iii) High poverty levels:

Over 50 per cent of Kenyans live below the poverty line. The median income levels for employed people in this country are between KSh 20,000 and KSh 25,000 (Statistical Abstract, 2013). This means that apart from the population living below the poverty line, an average income earner cannot access housing from the market. For instance, if one was to buy a house on mortgage of KSh 1.5 million repayable in 15 years at an interest rate of 15 per cent, the monthly repayment rate would be about KSh 21,000. This amount is way above what the middle income earners can afford based on the international recommendation that one should only spend one third of gross income on housing. In view of this, the vulnerable and low income segments of Kenyan population may never access housing from the open market. In addition, they may continue living in inhuman conditions in the slum areas, unless deliberate measures are taken by the government to address their housing plight.

(iv) High cost of financing housing development:

In the year 2012, interest rates stood at an average of 18 per cent resulting in very low proportion of Kenyans being able to borrow money for outright purchase of housing or for construction (Economic survey, 2012). According to the Kenya Integrated Household Budget Survey 2005/06, only 4.2 per cent of Kenyan households were able to borrow money for purchase or construction of housing. This explains why the number of households paying rent rose from 17.25 per cent in 1994 to 23.8 per cent in 2005/06. Those paying rent in the rural areas increased from 4 per cent in 1994 to 6.7 per cent in 2005/06 while those paying rent in the urban areas increased from 68.1 per cent in 1994 to 75.4 per cent in 2005/06. Most housing is financed primarily through borrowed funds from various sources. Considering the time needed for construction, potential delays during construction as well as high and fluctuating interest rates, the cost of debt can weigh negatively on the total financing structure of developments. In addition, access to
equity for construction is a challenge due to the conditions imposed by the lenders who are mostly banks.

**(v) Low investment in housing by government:**
The Government investment in the sector between 2009 and 2012 amounted to approximately KSh4.5 billion (Ministry of Housing, 2012). This amount of money could only help develop 3,000 housing units for the plan period assuming a cost of KSh 1.5 million per unit. This does not include the cost of related infrastructure and development licensing charges. On the other hand, investment by private sector players in low income housing has been minimal because returns are not as high as in the high income bracket. The private sector has tended to concentrate on the high end of the market.

**(vi) High cost of building materials:**
It is estimated that building materials account for approximately 40 per cent of the construction costs. Between 2007 and 2009, costs of building materials had increased by as much as 40 per cent resulting in increased cost of housing.

**(vii) Shortage of planned Land:**
There is an acute shortage of planned land for housing development. This is a fundamental challenge especially in the urban areas. In some circumstances, public land has been occupied by squatters who have developed slums with no requisite infrastructure.

**(viii) Lack of planning:**
Kenya has not adopted a planning culture. Many developers do not bother to consult physical planners to be guided on the most economical and environmentally friendly developments to be placed on their land. Where local physical development plans are in existence, they are not fully implemented. The end result is conflicting land users especially in the urban areas.
6.3 **The Built Environment Professionals and Housing Development**

6.3.1 **Measures to reduce housing development cost**

The survey invited ideas and constructive opinions from BEPs on what needs to be done to improve on housing delivery with regard to legislation, financing, incentives, management systems, use of appropriate technology, building plan approval processes and procedures etc.

Table below presents the percentage responses with respect to the different categories of BEPs and their aggregated responses on steps to be taken to reduce costs of housing construction. Almost 40.0 per cent of the BEPs responses were in favour of adoption and encouragement of use of affordable construction materials. A further 23.0 per cent of the responses were in favour of provision of incentives and (tax) concessions to enable construction of low-cost housing by builders/developers.

*Table: Proportions of responses of BEPs views on measures to reduce costs of housing construction?*

<table>
<thead>
<tr>
<th></th>
<th>Provision of affordable construction materials</th>
<th>Government subsidiary</th>
<th>Incentives and (tax) concessions</th>
<th>Adequate infrastructure</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valuers</td>
<td>35.0</td>
<td>13.0</td>
<td>28.0</td>
<td>20.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Architects</td>
<td>37.0</td>
<td>20.0</td>
<td>20.0</td>
<td>18.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Planners</td>
<td>45.0</td>
<td>15.0</td>
<td>18.0</td>
<td>15.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Land Surveyors</td>
<td>41.0</td>
<td>22.0</td>
<td>23.0</td>
<td>11.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Quantity Surveyors</td>
<td>39.0</td>
<td>18.0</td>
<td>21.0</td>
<td>19.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Building Surveyors</td>
<td>35.0</td>
<td>20.0</td>
<td>25.0</td>
<td>17.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Engineers (Civil, Structural, Mechanical, Electrical)</td>
<td>41.0</td>
<td>17.0</td>
<td>22.0</td>
<td>15.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Other BEPs</td>
<td>43.0</td>
<td>10.0</td>
<td>25.0</td>
<td>18.0</td>
<td>5.0</td>
</tr>
<tr>
<td>All BEPs</td>
<td>39.0</td>
<td>17.0</td>
<td>23.0</td>
<td>17.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

6.3.2 **Measures to Improve Housing Development**

Table below presents combined and specific suggestions by BEPs on steps to be taken to improve housing development.
**Table: Proportions of proposals/suggestions by BEPs to improve housing development**

<table>
<thead>
<tr>
<th>BEP Type</th>
<th>Improve mechanisms for monitoring, regulation and enforcement of standards of housing by the government</th>
<th>Promote awareness on housing rights eg access to portable water among citizens</th>
<th>Provide access to enabling finance</th>
<th>Upgrade all slums</th>
<th>Other Actions</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valuers</td>
<td>40</td>
<td>16</td>
<td>34</td>
<td>7</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Architects</td>
<td>42</td>
<td>15</td>
<td>26</td>
<td>16</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Physical Planners</td>
<td>35</td>
<td>16</td>
<td>23</td>
<td>26</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>Land Surveyors</td>
<td>45</td>
<td>15</td>
<td>25</td>
<td>13</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Quantity Surveyors</td>
<td>43</td>
<td>16</td>
<td>30</td>
<td>8</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Building Surveyors</td>
<td>44</td>
<td>18</td>
<td>28</td>
<td>8</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Engineers</td>
<td>46</td>
<td>22</td>
<td>19</td>
<td>10</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Other BEPs</td>
<td>45</td>
<td>18</td>
<td>25</td>
<td>7</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>All BEPs</td>
<td>43</td>
<td>17</td>
<td>27</td>
<td>11</td>
<td>2</td>
<td>100</td>
</tr>
</tbody>
</table>

On the overall, a majority of the responses from BEPs were in favour of “Improve mechanisms for monitoring, regulation, and enforcement of standards of housing by the government” and “Provide access to enabling financing” as key steps to improving housing conditions.

6.3.3 Challenges to Housing Development

In aggregate BEPs cited the following issues as key challenges facing the housing sector/housing development in Kenya. High cost of land, high cost of building materials and high cost of finance emerged as the most critical challenges which impede development of housing in Kenya. These results are presented in Figure below.

*Figure: Proportions of BEPs responses on key challenges facing housing development in Kenya*
6.3.4 Addressing the key challenges to housing development

The Figure below presents information on suggestion by BEPs on how to address challenges facing housing development. About 15.0 per cent of the interviewed BEPs were in favour of both subsidizing cost of building materials by government and review institutional and legal framework as ways of addressing the challenge of housing development. Only 5.0 per cent of the BEPs felt that promoting awareness on approval requirements is a key challenge facing housing development.

*Figure: Percentage distribution of BEP proposals to address key challenges facing housing development in Kenya*
6.3.5 Measures to reduce housing maintenance costs

Maintenance is often overlooked, side-lined, or neglected altogether by clients and professionals. This is detrimental to the performance and appearance of the housing unit(s) in the long run. The survey sought views of BEPS on how to minimize maintenance costs as indicated in table below, 34.0 per cent of the interviewed BEPs indicated that ensuring use of good quality building materials. A further 25.0 per cent recommended the engagement of sound workmanship.

Table: Proportional distribution of proposals by BEPs towards reducing buildings/homes maintenance cost of

<table>
<thead>
<tr>
<th></th>
<th>Valuers</th>
<th>Architects</th>
<th>Physical Planners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensuring use of good quality building materials</td>
<td>32</td>
<td>33</td>
<td>38</td>
</tr>
<tr>
<td>Sound workmanship</td>
<td>26</td>
<td>27</td>
<td>19</td>
</tr>
<tr>
<td>Using locally available materials whose replacement parts are also locally available</td>
<td>20</td>
<td>17</td>
<td>25</td>
</tr>
<tr>
<td>Using materials and techniques that are well understood by local workmen/artisan</td>
<td>18</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Quantity</td>
<td>Engineering</td>
<td>Other BEPs</td>
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<tr>
<td>----------------</td>
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</tr>
<tr>
<td>Land Surveyors</td>
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<td>Engineers</td>
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<td>Other BEPs</td>
<td>34</td>
<td>25</td>
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</tr>
<tr>
<td>All BEPs</td>
<td>34</td>
<td>18</td>
<td>19</td>
</tr>
</tbody>
</table>
CHAPTER 7

7 LEGISLATIVE AND REGULATORY FRAMEWORK

Construction of the proposed residential building was guided and governed by a number of laws and policies of the area local authority. These determine the nature of project in terms of the site, height of the structure as well as its use.

The government has long been concerned with environmental conservation and protection of human health. EMCA, 1999 was enacted to comprehensively address environmental issues which were being governed differently by various Sectoral acts in place.

National Environment Management Authority (NEMA) is the National body charged with coordinating matters and implementing policies relating to the environment. This body was established under the Environmental Management and Coordination Act (EMCA), 1999. National Environmental Council (NEC), National Environmental Tribunal (NET) and Public Complaints Committee (PCC) were also set up under the same act.

In this section main items to be discussed are the institutional and legal framework that governs development of this kind of project in Kenya and some of the international legislations that may apply. The following is a summary of some laws and regulations that protect the environment from environmental degradation. The Sectoral acts are still applicable, however, for the purpose of this report; special attention was given to the provisions in EMCA.

7.1 Kenya Constitution, 2010

Article 43 1(b) recognizes housing as a social right for every Kenyan and as result, the government is committed to making sure that this right is achieved progressively.

7.2 Kenya Vision 2030

Kenya Vision 2030 aims to transform the country into a newly industrializing, “middle-income country providing a high quality life to all its citizens by the year 2030”. The 2020
vision for housing and urbanization is “an adequately and decently housed nation in a sustainable environment.

7.3 **Sectional Properties Act, 1987**

In view of shortage of designated land for housing, it has become necessary for developers to put up high-rise apartments. This type of development requires that a structure of property ownership be put in place which would take care of both the interests of individual apartment owners and the jointly owned common space. The Sectional Properties Act, 1987 has provided for efficient ownership of apartments in urban areas. The Act has also encouraged the formation of communities, through the management companies in new settlements.

7.4 **The Physical Planning Act, Cap 286**

The enactment of the Physical Planning Act Cap 286 in 1996 was a milestone in the planning practice in Kenya. The Act gave legal authority to the preparation of the local and regional physical development plans. It also ushered a new approach to plan preparation process by incorporating public participation. The promulgation of the Kenya Constitution 2010 called for a review of the Physical Planning Act Cap 286 to align it with the Constitution. A physical planning Bill has been prepared and is with the office of the Attorney General ready to be forwarded to Parliament for discussion.

This Act provides for the preparation and implementation of physical development plans for connected purposes. It establishes the responsibility for the physical planning at various levels of Government in order to remove uncertainty regarding the responsibility for regional planning.

It provides for a hierarchy of plans in which guidelines are laid down for the future physical development of areas referred to in specific plan. The ostensible intention is that the three-tier order plans, the national development plan, regional development plan, and the local physical development plan should concentrate on broad policy issues.
The Act also promotes public participation in the preparation of plans and requires that in preparation of plans, proper consideration be given to the potential for economic development, socio-economic development needs of the population, the existing planning and future transport needs, the physical factors which may influence orderly development in general and urbanization in particular, and the possible influence of future development upon natural environment. The innovation in the Act is the requirement for Environmental Impact Assessment (EIA). Any change of use of the actual development without authority constitutes an offence.

7.5 **The Housing Bill, 2014**

The objective of the Housing Bill is to create an Act of Parliament to provide for the effective coordination, facilitation and monitoring of the housing and human settlements sector; to provide for capacity building within the housing sector and to establish the National Housing Development Fund for the provision of the right to accessible and adequate housing. The bill is in the process of being enacted.

7.6 **The Landlord and Tenant Bill, 2007**

The Bill has been approved by the Cabinet and is awaiting finalization by the State Law office for subsequent tabling in parliament. This Bill will merge the Rent Tribunal and the Business Tribunal to create a Landlord and Tenant Tribunal that will be able to execute its own orders. The new Act is expected to enhance efficiency in dealing with cases between landlord and tenants.

7.7 **Built Environment Bill, 2011**

The Bill was approved by Cabinet and seeks to consolidate the professional functions of the built environment in order to bring order, safety and harmony in the built environment.

7.8 **Building Laws and Regulations**

Together with the private sector stakeholders, the government has reviewed building laws and regulations that constitute the Building Code. The objective is to make laws and regulations that are in line with our aspirations as Kenyans in terms of
measurements, building materials, technologies and values. These are awaiting debate in Parliament.

7.9 **Building Surveyors Bill, 2011**

The Bill seeks to professionalize building surveying services in the country in order to bring accountability in the sub sector.

7.10 **National Housing Policy, 2004**

The policy recognizes and appreciates the fact that housing programs are much more effective when they take into account the different roles and needs of their targeted population consisting of men, women and youth. For instance, the Government will endeavour to: facilitate the creation of credit institutions and lending mechanisms that will be accessible to all vulnerable groups. In addition, housing cooperatives will be supported and encouraged to initiate community based credit systems. The Government, therefore, anticipates that through the cooperative movement vulnerable groups, both in rural and urban areas will be able to tackle problems related to shelter more effectively and that they will be able to improve their bargaining power through collective effort. The National Housing Policy was formulated in 2004. The promulgation of the Kenya Constitution, 2010 made it necessary for the policy to be reviewed to align it with the constitutional provisions relating to housing. The reviewed draft National Housing Policy is now ready for adoption by Parliament.

7.11 **The Draft National Slum Upgrading and Prevention Policy, 2014**

With the increase in urban population, the urban poor have been forced to live in slums and informal settlements. In the past, these settlements were considered illegal and development control institutions always tried to stop their existence. Experience shows that rather than reducing, the settlements have continued to increase not just on government land but also on freehold land in peri-urban areas. The National Slum Upgrading and Prevention Policy is focused on upgrading the existing slums and suggests mechanisms to prevent the development of more of these types of settlements. The draft policy also addresses pertinent issues relating to
social exclusion, infrastructure provision, tenure security and participation of all in sustainable urbanization process.

7.12 Estate Management and Maintenance Policy

The real estate market as it exists today lacks coordination and professional standards hence the need for a policy. In this respect, the Ministry developed an Estate Management and Maintenance Policy, 2012 which is awaiting adoption by Parliament. The Policy aims at setting standards for building maintenance in all organizations in order to preserve and prolong the life of the building stock. Besides, a draft Leasing Policy, 2014 for Government buildings and houses has been finalized. The policy will guide standardization and streamlining of Government office accommodation and also help in reducing wastage on office space.

7.13 Civil Servants Housing Scheme Fund

Civil Servants Housing Scheme Fund (CSHSF) was established through Legal Notice No. 98 of 15th September, 2004. The main objective of the scheme was to advance loans to civil servants to either purchase or build their own residential houses. It is a best practice to be emulated by other employers as envisaged by the Housing Policy which encourages employers to facilitate their own employees to acquire affordable houses.

7.14 The Kenya Slum Upgrading Programme (KENSUP)

KENSUP aims at addressing housing challenges affecting majority of the urban population who live in slums and informal settlements. The Programme begun after the Government and UN-HABITAT entered into a Memorandum of Understanding (MoU) on 15th February 2003 to upgrade slums and informal settlements. It aims at improving the lives of people living and working in the slums and informal settlements in all urban areas of Kenya. It also aims at contributing to poverty reduction and the fulfillment of the Millennium Development Goals, specifically Goal No 7 target 11- of improving the lives of 100 million slum dwellers by the year 2020.
**7.15 Kenya Informal Settlements Improvement Project (KISIP)**

This is a World Bank funded programme that is now at the implementation stage having been launched in June, 2011. The programme is undertaking tenure regularization and installation of social and physical infrastructure in informal settlements in the following towns: Nairobi, Mombasa, Kisumu, Nakuru, Eldoret, Malindi, Naivasha, Kitui, Machakos, Thika, Nyeri, Garissa, Kericho, Kakamega, and Embu.

**7.16 Appropriate Building Materials and Technologies Centres (ABMTCs)**

The Government is promoting use of locally available low cost appropriate building materials and technologies in order to reduce the cost of housing through establishment of Appropriate Building Materials and Technologies Centres countrywide. These centres are used to disseminate and train on existing and new technologies that enhance affordability of housing. By the year 2012, one Regional ABMTC had been established at Mavoko while 80 Constituency Centres had been established in other parts of the country. The Centres are designed to provide the following services: - collaborative research, evaluation and certification of technologies; training and skills development; documentation, dissemination and demonstration of technologies; hiring out of equipment to wananchi; technical assistance and consultancy and; quality control and maintenance of standards.

**7.17 Approved Housing Sector Incentives**

The Government has approved a number of incentives aimed at attracting investment from the private sector. These are intended to spur growth in the housing sector and to encourage partnerships. The incentives include:-

(a) Incentives under the income tax:

- Tax deductibility on interest paid by a mortgagor against his/her taxable income up to a maximum of KSh 150,000/-.
- Contributions to Home Ownership Savings Plan (HOSP). This implies that there is no withholding tax on interest earned for balances up to KSh. 3 million under this plan.
• Lower taxation of Housing Bonds. This implies that there is withholding tax of only 10 per cent
• Prescribed dwelling house for employees or as an industrial building
• Tax deductibility for expenditure for social infrastructure
• Industrial building deduction
• Tax deductibility of interest from infrastructure and social services bonds.

(b) Assignment of retirement benefits
It has been made possible for members of the retirement schemes to assign 60 per cent of their benefits for mortgages. Loans guarantees in effect shall serve four purposes namely:- to acquire property outright, to construct a home, to carry out repairs, alterations and improvements, and to secure financing for deposits, stamp duty, valuation fees and other incidentals associated with home ownership (excluding arrangement fees, commitment fees etc.).

(c) Incentives under Value Added Tax (VAT) Act
The Minister for Finance may:
• Remit VAT payment in respect of construction or expansion of private universities (excluding student hostel and staff housing) on the recommendation from Education Minister
• Remit VAT payment in respect of construction of not less than 20 housing units for low income earners on the recommendation of the Housing Minister
• Tax exempt official aid funded projects

7.18 The Cooperative Movement
Cooperatives have been a major driver of economic growth in Kenya. In the urban areas, Savings and Credit Cooperative Organizations (SACCOs) have assisted people raise funds to get into commerce, construct housing and raise deposit to buy houses. The SACCOs continue to play an important role in realization of housing and in mobilizing funds for purchase of land to put up housing besides raising capital for housing development.
7.19 National Secretariat for Housing and Human Settlements Matters

Through the executive orders occasionally issued by the government, Ministry of Land, Housing and Urban Development is mandated as the National Secretariat for coordination of stakeholders on housing and human settlement matters. It does this through; National observance of World Habitat Day (WHD), African Ministerial Conference on Housing and Urban Development (AMCHUD), Governing Council (GC) and Documentation of best practices on housing and human settlement. World Habitat Day is an international day observed on the first Monday of October every year. This Day was designated by United Nations General Assembly Resolution 40/202A of 17 December 1985. The Day accords United Nations Member States an opportunity to share and reflect on their experiences, successful initiatives, and challenges encountered in their efforts to provide shelter, and related basic services in a sustainable manner. It is also intended to remind the world of its collective responsibility for the future of the human habitat. In addition, it provides a forum for governments and stakeholders to take stock of achievements and take actions aimed at improving housing and human settlements. AMCHUD is a bi-annual forum where African ministers in charge of housing and urban development congregate together to discuss issues related to housing and urban development. The Governing Council is also a bi-annual meeting that was established by the General Assembly resolutions 32/162 of 19 December 1977 and 56/206 of 21 December 2001. It is high level forum of governments at the ministerial level that sets UN-HABITAT’s policy and approves the agency’s work programme and budget for the next two years. Documentation of Best Practices entails profiling outstanding initiatives which have demonstrated tangible impacts in improving the quality of life in cities and communities around the world, as well as the living environment. The original call for best practices was launched in 1995 during preparation for the second United Nations Conference on Human Settlements (Habitat II) as a means of identifying what works in improving living conditions on a sustainable basis.
7.20 Environmental Management and Coordination Act (EMCA), 1999

The law is based upon the principle that everybody is entitled to a healthy and clean environment. Section 42, pertinent to the implementation of this project deals with:

7.20.1 Discretionary approvals required

The Act requires that projects acquire approval before their commencement. NEMA approves and issues a license after an Environmental Impact Assessment or a Study report depending on the scale of the project is carried out. This is also in compliance with the requirements of the Environmental Management and Coordination Act (EMCA) Part VI section 58 (1) and (2) which states:

1) 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.

2) The proponent of the project shall undertake or cause to be undertaken at his own expense an environmental impact assessment study and prepare a report thereof where the Authority, being satisfied, after studying the report submitted under Subsection (1), that the intended project may or is likely to or will have a significant impact on the environment, so directs.

7.20.2 EMCA (Waste Management Regulations 2006)

This regulation gives guidelines on both operational and administrative activities that are used in handling, packaging, treatment, condition, storage and disposal of waste and is implemented by NEMA.
It prohibits anyone from disposing any waste on any part of the environment except in designated waste receptacle or facility provided by the relevant local authority which may be legitimate dump sites or landfills.

Since the proposed project will generate both solid and liquid wastes during construction, operation and decommissioning phase, this act provides for the waste generator to be responsible for collection, segregation at source and proper disposal of their wastes.

**7.20.3 EMCA (Noise & Excessive Vibration Pollution Control Regulations, 2009) Legal Notice 61.**

This regulation prohibits any person from causing unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. Part 11 section 6 (1) provides that no person shall cause noise from any source which exceeds any sound level as set out in the First Schedule of the regulations.

It gives standards for maximum permissible noise levels for construction sites, mines and quarries. It also gives maximum permissible noise levels for silent zones, places of worship, residential (indoor/outdoor), mixed residential; and commercial.

During construction and operation phase, the proposed project is expected to comply with the following permissible levels of noise.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Maximum noise level permitted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day</td>
</tr>
<tr>
<td>1 Health facilities, educational institutions, homes for disabled etc.</td>
<td>60</td>
</tr>
<tr>
<td>2 Residential</td>
<td>60</td>
</tr>
<tr>
<td>3 Areas other than those prescribed in (i) and (ii)</td>
<td>75</td>
</tr>
</tbody>
</table>
Maximum Permissible Noise Levels for construction sites

NEMA maximum permissible noise levels

<table>
<thead>
<tr>
<th>Zone</th>
<th>Sound level limits dB(A) (\text{Leq}_{14h})</th>
<th>Noise rating level (NR) (\text{Leq}_{14h})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>Night</td>
<td>Day</td>
</tr>
<tr>
<td>A Silent zone</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>B Places of worship</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>C Residential: indoor</td>
<td>45</td>
<td>35</td>
</tr>
<tr>
<td>C Outdoor</td>
<td>50</td>
<td>35</td>
</tr>
<tr>
<td>D Mixed residential (with some commercial and places of entertainment)</td>
<td>55</td>
<td>35</td>
</tr>
<tr>
<td>E Commercial</td>
<td>60</td>
<td>35</td>
</tr>
</tbody>
</table>

7.21 Public Health Act Cap 242

Part IX section 115 of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires Local Authorities to take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 and include nuisances caused by accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin.

Section 118 provides what constitutes nuisance. These includes: Any dwelling or premises or part thereof which is or are of such construction or in such state or so situation or so dirty or so verminous as to be dangerous to health; any street, road or any part thereof, any stream, pool, ditch, gutter, watercourse, sink, water tank, cistern, septic tank waste pipe, drain, sewer, garbage receptacle, dustbin, refuse pit in such a way or so situated to be offensive or to be injurious or dangerous to health; any noxious matter or waste water flowing or discharged from premises; any accumulation or
deposit of refuse; any accumulation of stones, timber or other material and any dwellings or premises which is so overcrowded, among other provisions.

The public health act makes it an offence for any landowner or occupier to allow nuisance or any other condition liable to be injurious to health to prevail on his land. The nuisance includes any obstruction, smell, accumulation of wastes or refuse, smoky chimneys, dirty dwellings or premises used without proper sanitation, factories emitting smoke or smell, and improperly crowded or unkempt cemetery or burial place, so long as it can be demonstrated that the situation endangers or is liable to endanger health.

The primary purpose of this Act is to secure and maintain public health. Section 116 provides that: “It shall be the duty of every local authority to take all lawful, necessary and reasonably practicable measures for maintaining its district at all times in clean and sanitary condition, and for preventing the occurrence therein of, or for remedying or causing to be remedied, any nuisance or condition liable to be injurious or dangerous to health, and to take proceedings at law against any person causing or responsible for the continuance of any such nuisance or condition.”

The following shall be deemed to be nuisances liable to be dealt with in the manner provided in the part:

a) Any noxious matter or waste water, flowing or discharged from any premises wherever situated, into any public street, or into the gutter or side channel of any street or into any water course, irrigation channel or bed thereof not approved for the reception of such discharge.

b) Any accumulation or deposit of refuse, offal manure or other matter whatsoever which is offensive or which is injurious or dangerous to health;

c) Any chimney sending forth smoke in such quantity or in such manner as to be offensive or injurious or dangerous to health

d) Any factory or trade premises causing or giving rise to smells or effluvia which are offensive or which are injurious or dangerous to health; and
e) Any act, omission or thing, which is, or may be dangerous to life or injurious to health.

7.22 The Occupational Health and Safety Act, 2007

The Occupational Safety and Health Act, 2007 require that workplaces be kept safe for the workers therein. Workers who are exposed to wet or any injurious or offensive substances are required under Section 101 of the Act to be provided with suitable protective clothing. The Act requires the management to appoint a competent person who is a member of the management staff to be responsible for safety, health and welfare in the factory or workplace. The Act also generally provides for safety and health policies and programmes, workplace safety health and welfare conditions, occupational health and hygiene and welfare conditions. This Act was found relevant for reference in this EIA since construction, operation and decommissioning phase of the project will involve workers who will be exposed to various occupational hazards.

7.23 The Water Act 2002

Section 94 subsection 1 (a) of the Act stipulates that no person shall willfully obstruct, interfere, divert or abstract from any watercourse or any water resource, or negligently allow any such obstruction, interference, diversion or abstraction; or throw or convey, or cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive matter or thing into or any water resource in such a manner as to cause, or likely to cause, pollution of the water resource.

- Section 25 of the Act requires a permit to be obtained for among others any use of water from a water resource, discharge of a pollutant into any water resource. According to section 29 of the same Act, application for such a permit shall be subject to public consultation as well as an environmental impact assessment as per the Environmental Management and Coordination Act, 1999. The conditions of the permit may also be varied if the authority feels that the water so used is causing deterioration of water quality or causing shortage of water for other purposes that
the authority may consider has priority. This is provided for under section 35 of the Act.

- Section 75 and sub-section 1 allows a licensee for water supply to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing water belonging to the licensee or which he is authorized to take for supply from being polluted. However, if the proposed works will affect or is likely to affect any body of water in the catchments, the licensee shall obtain consent from the Water Resources Management Authority.

- Section 76 states that no person shall discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information through a drainage system. The storm water is directed into the council drainage system and none is discharged in to any water courses. The consent shall be issued on conditions including the payment rates for the discharge as may be provided under section 77 of the same Act.

7.24 The Land Planning Act Cap 303

The Land Planning Act Cap 303 of 1968 of the Laws of Kenya makes provision for planning the use and development of land. Sec 6 (1) of the subsidiary legislation provides that "a local authority may, after consultation with, and with the agreement of the Minister, prepare and submit to the Minister for his approval an area plan, as the case may be, for that part of the area under its jurisdiction to which these regulations apply."

7.25 Land Control Act Cap 406

This law provides for the control of transactions in agricultural land, especially the machinery of the Land Control Boards. However it is of environmental interest that one of the points to consider in granting or refusal of consent by the Board is what
impact the transaction is likely to have on the maintenance or improvement of standards of good husbandry within the specific agricultural area.

Government land is land owned by the government of Kenya under the Government Lands Act (cap. 280). This includes, for example, gazetted national parks and reserves. The government lands act allows the President, through the Commissioner of Lands, to allocate any unalienated government land to any individual. In practice, such allocations have often been made without proper regard to social and environmental factors.

Trust land is land held and administered by various local government authorities as trustees under the constitution of Kenya and the trust land act (cap. 288). National reserves and local sanctuaries as well as county council forest reserves, fall on trust land. Individuals may acquire leasehold interest for a specific number of years in trust land can (in theory) be posed by the local authorities should the need arise. Local authorities should retain regulatory powers over trust land. Private land is land owned by private individuals under the registered land act (cap. 300). On registration as the landowner, an individual acquires absolute ownership on a freehold basis. The use of private land may, however, be limited by provisions made in other legislation, such an agriculture act (cap. 318).

7.26 National Construction Authority Act 2011 (NCA)
The Act provides that the National Construction Authority has the following mandates:

a) Promote and stimulate the development, improvement and expansion of the construction industry;

(b) Advise and make recommendations to the Minister on matters affecting or connected with the construction industry;

(c) Undertake or commission research into any matter relating to the construction industry;

(d) Prescribe the qualifications or other attributes required for registration as a contractor under this Act;
(e) Assist in the exportation of construction services connected to the construction industry;

(f) Provide consultancy and advisory services with respect to the construction industry;

(g) Promote and ensure quality assurance in the construction industry;

(h) Encourage the standardization and improvement of construction techniques and materials;

(i) Initiate and maintain a construction industry information system;

(j) Provide, promote, review and co-ordinate training programmes organized by public and private accredited training centers for skilled construction workers and construction site supervisors;

(k) Accredit and register contractors and regulate their professional undertakings;

(l) Accredit and certify skilled construction workers and construction site supervisors;

(m) Develop and publish a code of conduct for the construction industry; and

(n) Do all other things that may be necessary for the better carrying out of its functions under the Act.

7.27 International Conventions and Agreements

7.27.1 Kyoto Protocol

The Kyoto Protocol is an international and legally binding agreement to reduce greenhouse gases emissions worldwide which came into force on 16 February 2005. The Protocol encourages improvements in energy efficiency, reform the energy and transportation sectors, promote renewable forms of energy (wind and hydro and geothermal), phase out inappropriate fiscal measures and market imperfections, limit methane emissions from waste management and energy systems, and protect forests and other carbon "sinks". The measurement of changes in net emissions (calculated as emissions minus removals of CO₂) from forests is methodologically complex and still needs to be clarified.
Under the Convention, both developed and developing countries agree to take measures to limit emissions and promote adaptation to future climate change impacts; submit information on their national climate change programmes and inventories; promote technology transfer; cooperate on scientific and technical research; and promote public awareness, education, and training. The Protocol also reiterates the need to provide "new and additional" financial resources to meet the "agreed full costs" incurred by developing countries in carrying out these commitments. This protocol was found important to mention in this EIA due to the need to minimize greenhouse gas emission in every way possible by designing projects that are energy efficient and pollute less.
CHAPTER 8

8 ENVIRONMENTAL IMPACT PREDICTION AND MITIGATION MEASURES

8.1 Impact prediction

The project’s components have already been designed therefore making it easier to be more specific on the particular impacts expected from its development. Recommendations from this study may result in alteration of some or all aspects of the development depending on the findings.

The impacts were examined under two categories i.e. negative environmental impacts and positive environmental impacts. Various impacts in these two categories were then examined in order of their level of importance and significance. They were also examined in categories of their time of occurrence (construction or operational phase).

For impact identification a checklist was employed to identify possible impacts from the project development and the matrix to determine the significance of each identified impacts formed. A questionnaire with structured questions was used to get public opinions and concerns, concerning the project at hand. Expert opinion was vital to interpret the acquired information. The following possible impacts were determined.

Table 3: Impact Prediction Checklist

<table>
<thead>
<tr>
<th>Impact Generated</th>
<th>Project Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Design</td>
</tr>
<tr>
<td>Water</td>
<td></td>
</tr>
<tr>
<td>1. pollution</td>
<td></td>
</tr>
<tr>
<td>2. Increased demand</td>
<td></td>
</tr>
<tr>
<td>3. surface flow</td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td></td>
</tr>
<tr>
<td>1. pollution</td>
<td></td>
</tr>
<tr>
<td>2. increased noise</td>
<td></td>
</tr>
</tbody>
</table>
Climate
1. temperature change
2. increased evaporation

Soil
1. soil loss
2. toxicity/contamination
3. compaction

Bio-diversity
1. loss of flora
2. loss of fauna
3. habitat alteration

Population
1. cultural alterations
2. increase in population
3. insecurity
4. Employment
5. Social (occupational)

Others
1. landscape
2. economy

8.1.1 Positive Impacts

8.1.1.1 Design Phase

Table 4: Positive Impacts Design Phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Remarks</th>
<th>Significance Rating of impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>The project will create short term employment opportunities to the architects and Engineers and a local contractor who will implement the project. The same applies to environmental expert involved in Environmental Impact Assessment of the proposed development</td>
<td>High during planning and low after completion of construction <em>(positive short term impact)</em></td>
</tr>
<tr>
<td>Generation of Income and Source for Government Revenue</td>
<td>The project has offered a market for consultancy services e.g consultancy services for undertaking Environmental Impact Assessment on the proposed project activities, architectural and Engineering services. Income will accrue to professionals in favor of their</td>
<td>High during project planning and construction but low during operation phase</td>
</tr>
</tbody>
</table>
activities in the design phase of the proposed project and this will attract taxes by the state. In addition, some fees will be levied for submission of plans to the local authority for approval. These will be a source of government revenue to be used to meet the various governmental goals and objectives.

8.1.1.2 Construction Phase

Table 5: Positive Impacts Construction phase

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Remarks</th>
<th>Significance rating of impact</th>
</tr>
</thead>
</table>
| Employment                    | • The construction of residential apartments will generate short term employment i.e. employees involved in building and construction, sale and transportation of the building materials will benefit.  
• The project will create indirect employment through onsite demand for goods and services e.g. food for the casual laborers involved in construction. | High impact during construction and low during operation  
(Positive short term impact)                                                                                      |
| Market for goods and services | For construction to take place smoothly it requires goods and services including cement, bricks, transportation services etc. Construction phase will offer market for goods and services thus promoting a variety of sectors. | High impact during construction and low during operation  
(Positive short term)                                                                                           |
| Economic growth               | Use of locally available materials including cement, structural steel, concrete, ballast, river sand and bricks during construction phase of the project will promote economic growth by contributing to the gross domestic product. Consumption of these materials, fuel oil and others will attract taxes including VAT which will be payable to the government hence increasing government revenue while cost of these raw materials will be payable directly to producers | High impact during construction and low during operation  
(Positive short term)                                                                                           |
### 8.1.1.3 Operation Phase

**Table 6: Positive Impacts Operation phase**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Remarks</th>
<th>Significance rating of impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>The project will create direct long term employment to several people including managers, Cooks, domestic servants on completion.</td>
<td>Major impact during project operation (Positive Long term Impact)</td>
</tr>
<tr>
<td></td>
<td>The facility will provide indirect employment to security guards, cleaners and other service providers</td>
<td>Positive long term impact</td>
</tr>
<tr>
<td>Improvement of living standards of local community</td>
<td>The proposed project will lead to improvement of people’s lives through increased income.</td>
<td>High Long term positive impact</td>
</tr>
<tr>
<td>Empowering of Women</td>
<td>The residential building will empower women by engaging them in gainful economic activity of domestic workers and house help.</td>
<td>Positive Long term Impact</td>
</tr>
</tbody>
</table>

### 8.1.1.4 Decommissioning Phase

**Table 7: Positive Impacts decommissioning phase**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Remarks</th>
<th>Significance rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Conservation</td>
<td>On decommissioning, waste materials generated will be recovered and reused. These materials will be used as raw materials in other construction processes hence reducing the demand for raw materials. This in turn will reduce potential impact to the environment that would have been felt if demand for raw materials hadn’t reduced. For instance destruction of habitat as a result of mining activities will reduce.</td>
<td>Minor short term impact</td>
</tr>
<tr>
<td>Income Generation</td>
<td>Sale of debris and building materials recovered from residential building plant will generate additional income to the property owner. These materials will be recycled and used in other construction processes</td>
<td>Minor short term impact</td>
</tr>
</tbody>
</table>
thereby reducing the need for sourcing other materials.

Employment
Demolition process and rehabilitation of the area will create short term employment to the workers involved. Minor short term impact

Rehabilitation of project site
Upon decommissioning of the proposed project, rehabilitation of the project site will be carried out to restore the site to its original status or to a better state than it was originally. This will include replacement of topsoil and re-vegetation which will lead to improved visual quality of the area. This will also mean that alternative options can be utilized within the project site. Major long term impact

8.1.2 Negative Impacts

8.1.2.1 Negative Impacts Construction phase

Table 8: Negative Impacts Construction phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Remarks</th>
<th>Significance rating of impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flora</td>
<td>It is anticipated that this development will interfere with present vegetation and trees on site. Construction works will entail clearance of vegetation within the project site. Construction activities will also result to vegetation trampling by workers and involved motor vehicles.</td>
<td>(Major) Negative short term impact</td>
</tr>
<tr>
<td>Fauna</td>
<td>Trees and Vegetation act as habitat for various animals, birds and insects. It also serves as a source of food for these organisms. Clearance of trees and vegetation will result to destruction of fauna due to loss of food and habitat. Construction activities will also create temporary disturbance to birds, insects and other small animals inhabiting the proposed site</td>
<td>Minor Negative short term impact</td>
</tr>
<tr>
<td>Air pollution</td>
<td>Construction of the proposed residential apartment block is</td>
<td>Negative Short term impact</td>
</tr>
</tbody>
</table>
expected to affect the ambient air quality in the following ways;

- It is expected that trucks will require access to site to deliver or remove material. This and excavation activities will result to dust emissions.

| Machinery including generators, earth moving equipments, mobile and machinery will be a major source of exhaust emissions at the proposed site during construction phase |

<table>
<thead>
<tr>
<th>Noise Pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td>There will be an increase in noise levels around construction site owing to the nature of machinery in use, workers and vehicles involved in material transportation to site. Construction activities will add to background noise of the project location. Noisy machinery are expected to include concrete mixers and excavators</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Soil Erosion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth breaking during excavation will disturb soils at the project site. Heavy machinery used will cause compaction of soil, this will increase soil bulk density, reduce infiltration rate of storm water consequently affecting the underground water recharge.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Soil and ground water Contamination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving vehicles at site will require oil and other lubricants change. Possibilities of such oils spilling and contaminating the soil and water within the project site are real.</td>
</tr>
<tr>
<td>The excavated area, if linear can act as a conduit to extend groundwater contamination to new areas. Spills of hazardous materials in excavated areas during construction could introduce contaminants to ground water.</td>
</tr>
<tr>
<td>Maintaining the machinery in specific designated areas designed for this purpose can substantially contain these dangers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amenities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movement of trucks laden with heavy building materials in and out of the site might damage access roads in this area. This can result to depressions that may contribute to pot holes on the access roads.</td>
</tr>
</tbody>
</table>
| **Visual Intrusion** | During construction, visual intrusion will be attributed to construction works including construction traffic.  
It is also expected that there will be food vending, littering and haphazard parking of vehicles induced by presence of construction site. | Minor short term impact |
|---------------------|-------------------------------------------------------------------------------------------------|------------------------|
| **Increased Traffic** | During construction phase Thika Road will serve additional vehicles used for transportation of materials to site.  
Heavy trucks, when used, will impact on infrastructure through destruction of operational road network especially near project site and turning points. | Minor long term impact. |
| **Occupational Hazards** | Construction works will inevitably expose workers and the public to occupational health and public safety risks: in particular, working with heavy equipment, handling and use of tools engender certain risks. The construction workers are also likely to be exposed to risk of accidents and injuries resulting from accidental falls, falling objects, injuries from hand tools and other equipment. | Major short term impact |
| **Increased Demand for Resources** | Building materials such as hard core, ballast, cement, and sand required for construction of the project will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as rivers and land. Since substantial quantities of these materials will be required for construction of the proposed vegetable processing plant the availability and sustainability of such resources at the extraction sites will be negatively affected as they are not renewable in the short term. | Major long term impact |
| **Solid Waste generation** | • Excavation stage is expected to result to large amounts of soil. If these materials are not disposed according to the law, then the resultant stock piles can cause visual intrusion  
• Other solid wastes likely to be generated during construction phase include metal cuttings, rejected materials, surplus | Major short term impact |
materials, surplus soil, and cement bags. These materials will require disposal.

- The workers on site will also generate faecal waste during their day-to-day operations. The generated waste needs proper handling to prevent diseases such as cholera, typhoid and diarrhoea outbreak at the site. Unless this is addressed, it can prove to be an environmental/health hazard.

<table>
<thead>
<tr>
<th>Increased water demand</th>
<th>Increased demand for water</th>
<th>Major short term impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both workers and construction works will create additional demand for water in addition to the existing demand. Water will mostly be used in the making of concrete, wetting surfaces and cleaning completed structures. This will create additional pressure on the existing boreholes.</td>
<td>Both workers and construction works will create additional demand for water in addition to the existing demand. Water will mostly be used in the making of concrete, wetting surfaces and cleaning completed structures. This will create additional pressure on the existing boreholes.</td>
<td>Major short term impact</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surface water pollution</th>
<th>Increased demand for energy</th>
<th>Major long term impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nairobi river flows on the northern border of the proposed project site. There is possibility that excavations and site vegetation clearance may loosen soils and expose them to agents of erosion. When it rains, the soils may be carried away by runoffs into the Nairobi river hence causing turbidity of the water. This may interfere with the users downstream as well as the ecological functions of the River.</td>
<td>Various operations within the residential building including lighting, machines will require electricity. This will create additional demand for electricity.</td>
<td>Major long term impact</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Waste generation</th>
<th>Waste generation</th>
<th>Major long term impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>During operation phase of residential building, the wastes expected include biodegradable household waste, solid waste and liquid wastes.</td>
<td>During operation phase of residential building, the wastes expected include biodegradable household waste, solid waste and liquid wastes.</td>
<td>Major long term impact</td>
</tr>
</tbody>
</table>

8.1.2.2 Negative Impacts Operation phase

Table 9: Negative Impacts Operation Phase

<table>
<thead>
<tr>
<th>Impact</th>
<th>Remarks</th>
<th>Significance rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased demand for water</td>
<td>The project area is connected to piped water system from Nairobi Water and Sewerage Company (N.W.S.C).</td>
<td>Major long term impact</td>
</tr>
<tr>
<td>Increased demand for energy</td>
<td>Various operations within the residential building including lighting, machines will require electricity. This will create additional demand for electricity.</td>
<td>Major long term impact</td>
</tr>
<tr>
<td>Waste generation</td>
<td>During operation phase of residential building, the wastes expected include biodegradable household waste, solid waste and liquid wastes.</td>
<td>Major long term impact</td>
</tr>
</tbody>
</table>
Paper and general office wastes are expected

Ablution wastes including general waste water from sanitary facilities are expected. The ablution wastes will however be directed to the septic tank.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Remarks</th>
<th>Significance rating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Solid Waste generation</strong></td>
<td>Demolition of the residential building will result in large quantities of solid waste. The wastes are expected to comprise materials used in construction including concrete, metal, drywall, rubble etc which will require disposal</td>
<td>Major Short term impact</td>
</tr>
<tr>
<td><strong>Noise Pollution</strong></td>
<td>The decommissioning related activities will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas. This will be as a result of the noise and vibration that will be experienced during demolition of the residential building</td>
<td>Major Short term impact</td>
</tr>
<tr>
<td><strong>Air pollution</strong></td>
<td>Large quantities of dust will be generated during demolition works. Particulate matter pollution is likely to occur during demolition and transportation of waste debris from site. There is a possibility of suspended and settle-able particles affecting site workers and the surrounding neighbours’ health. Exhaust emissions are likely to be generated during the demolition period by the various machinery and equipment to be used as well as motor vehicles used for the exercise. The impact will be short term and will last with duration of demolition process.</td>
<td>Major Short term impact</td>
</tr>
<tr>
<td><strong>Occupational Hazards</strong></td>
<td>Demolition works will inevitably expose workers and the public to occupational health and public safety risks: in particular, working with heavy equipment, handling and use of tools engender certain risks. Construction workers are also likely to be exposed to risk of accidents and injuries resulting from accidental falls, falling objects, injuries from hand tools and other equipment.</td>
<td>Major Short term impact</td>
</tr>
<tr>
<td><strong>Loss of Employment</strong></td>
<td>Decommissioning phase will result to loss of employment to the people who will be working at the residential building</td>
<td>Major Long term impact</td>
</tr>
</tbody>
</table>
### 8.2 Mitigation Measures

The following mitigation measures should be employed to ameliorate any potential anticipated impacts from the project activities. Other important mitigation areas are listed in the table below.

*Table 11: Mitigation Measures*

#### CONSTRUCTION PHASE

<table>
<thead>
<tr>
<th>No.</th>
<th>ENVIRONMENTAL IMPACTS DURING CONSTRUCTION PHASE</th>
<th>PROPOSED MITIGATION MEASURES</th>
</tr>
</thead>
</table>
| 1   | Loss of Flora and Fauna                      | The contractor should minimize vegetation disturbance by clearing necessary areas only.  

Upon completion of the project the site should be landscaped using appropriate vegetation. |
| 2   | Air pollution                                 | • The contractor should limit traffic movement and operations to efficient and necessary activities during construction.  

• Carry out routine maintenance of vehicles & other machinery to ensure minimized emission of nitrogen and sulphur oxides from vehicle and machinery exhaust systems.  

• Set Maximum on-site speed at 10Km/h to reduce dust emission  

• Ensure strict enforcement of onsite speed limit regulation.  

• During dry weather conditions, sprinkle water, on graded access road each day to reduce dust generation by construction vehicles.  

• Provide appropriate dust screens to reduce dust exposure  

• Provide dust masks to workers in extreme dust producing operations  

• Maximize the use of manual labor and hand tools.  

• Avoid spillage of loose soil to the road where it will be disturbed and blown away by traffic.  

• Sensitize drivers to avoid off road driving. |
| 3   | Noise Pollution                               | • Limit the construction activities to day time only from 0800hrs to 1800hrs.  

• Construction should take the shortest time possible. |
<table>
<thead>
<tr>
<th>Section</th>
<th>Requirement</th>
</tr>
</thead>
</table>
| 4 Soil and Water contamination  | • Proper storage, handling and disposal of new oil and used oil wastes  
  • Maintenance of construction vehicles should be carried out in the contractors yard                                                                 |
| 5 Solid Wastes generated        | • Construction debris/excavated material should be disposed at sites approved by Nairobi City County Government Engineer and in accordance with Waste Management Regulations 2006.  
  • Cement bags should be sold to Waste Paper Recyclers  
  • Waste should be minimized by avoiding unsustainable construction practices.  
  • Ensure all waste is sorted before proceeding with disposal  
  • Provide adequate sanitary convenience/pit latrines in a clean state to construction workers.  
  • Minimize waste generation by ordering only what is needed in terms of quality and quantity  
  • Undertake building material recycling where practicable  
  • Use locally available resources                                                                                      |
| 6 Increased water demand        | • The design of this building has already considered rain water harvesting to supplement tap water  
  • Recycle water at the construction phase where practicable                                                                 |
| 7 Increased Energy Demand       | • The design of residential building ensures maximum use of natural lighting.  
  The high roofs and large windows will minimize use of electricity during the day.  
  • Use energy saving bulbs during operation phase                                                                   |
| 8 Occupational Health and Safety Hazards | The contractor should;  
  • Provide suitable PPEs to all workers  
  • Reserve 1 PPE for every worker to avoid sharing  
  • Provide adequate sanitary convenience in a clean state for workers  
  • Provide wholesome drinking and bathing water and facilities for workers  
  • Minimize soil disturbance and sprinkle water regularly to reduce dust.                                             |
<table>
<thead>
<tr>
<th>No.</th>
<th>ENVIRONMENTAL IMPACTS DURING OCCUPATION PHASE</th>
<th>MITIGATION MEASURES DURING THE OCCUPATIONAL PHASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Solid Waste generation during operation phase</td>
<td>Provide waste bins</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Practice waste Minimization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Practice waste segregation, recovery and re-use where practicable</td>
</tr>
<tr>
<td>2</td>
<td>Occupational Health and Safety Hazards</td>
<td>The proponent should;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comply with all occupational health and safety requirements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide suitable PPEs to workers depending on task</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enforce health and safety requirements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide first Aid Kit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Put in place measures to deal with emergencies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carry out fire preparedness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formulate and implement an Environment, Health and Safety Policy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Train workers on safe practices</td>
</tr>
<tr>
<td>9</td>
<td>Surface water pollution</td>
<td>Remove vegetation only in areas affected by the project to minimize soil erosion. Construct drainage channels for run offs. Soil excavated from site should be ferried away and spread in areas approved by area local authority engineer Landscape the compound by planting suitable grass and trees after construction of the vegetable processing centre</td>
</tr>
<tr>
<td>10</td>
<td>Visual intrusion</td>
<td>Expedite construction as far as technically viable so as to minimize visual impacts</td>
</tr>
<tr>
<td>11</td>
<td>Increased Traffic</td>
<td>The overall increase in traffic along as a result of the proposed development may be estimated to be around 5 vehicles per day. This is insignificant. However, the contractor should ensure that access roads are properly rehabilitated before and after construction is completed.</td>
</tr>
</tbody>
</table>
3  Increased water demand
  The design of this building has already considered rain water harvesting to supplement tap water
  Recycle water at the construction phase where practicable

4  Increased Energy Demand
  The design of residential building ensures maximum use of natural lighting.
  Use energy saving bulbs during operation phase
  The high roofs and large windows will minimize use of electricity during the day.

DECOMMISSIONING PHASE

<table>
<thead>
<tr>
<th>NO.</th>
<th>ENVIRONMENTAL IMPACTS DURING DECOMMISSIONING PHASE</th>
<th>MITIGATION MEASURES DURING THE DECOMMISSIONING PHASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Occupational Health and Safety Hazards</td>
<td>Comply with all occupational health and safety requirements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide suitable PPEs to workers depending on task</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enforce health and safety requirements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide first Aid Kit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Put in place measures to deal with emergencies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carry out fire preparedness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formulate and implement an Environment, Health and Safety Policy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Train workers on safe practices</td>
</tr>
</tbody>
</table>
9 ENVIRONMENT AND SOCIAL MANAGEMENT PLAN (ESMP)

9.1 Significance of an ESMP
As a requirement in the Environmental Management and Coordination Act (EMCA), 1999 the report should provide for a detailed EMP. This Chapter therefore complies with the requirements of EMCA, 1999 and Environmental (Impact Assessment and Audit) Regulations, 2003 and takes into consideration the applicable local and international standards and best practices.

It should be noted that there is no universally accepted standard format for EMPs. However, the format needs to fit the circumstances in which the EMP is being developed and the requirements which it is designed to meet. The EMPs should contain the following which are in line with the NEMA requirements:

- **Summary of impacts**: The predicted negative environmental impacts for which mitigation is required should be summarized;
- **Description of mitigation measures**: The EMP identifies feasible and cost effective mitigation measures to reduce significant negative environmental impacts to acceptable and legal levels;
- **Description of monitoring programme**: Environmental performance monitoring should be designed to ensure that mitigation measures are implemented. The monitoring programme should clearly indicate the linkages between impacts, indicators to be measured, measurement methods and definition of thresholds that will signal the need for corrective actions;
- **Institutional arrangements**: Responsibilities for mitigation and monitoring actions should be clearly defined;
- **Legal enforceability**: The key legal considerations with respect to EMPs are:
  - Legal framework for environmental protection; and
- Legal basis for mitigation.

- **Implementation schedule and reporting procedures:** The timing, frequency, and duration of mitigation measures should be specified; and

- **Cost estimates:** Costs should be calculated for both the initial investment and recurring expenses for implementing the mitigation measures.

The benefits of including the EMP as part of the EIA are:

- Encouraging applicants to be more systematic and explicit in the design and development of mitigation measures and the intended means of implementation;

- Encouraging authorities to check the practicality and likelihood of implementation of mitigation and monitoring measures;

- Ensuring that the mitigation measures are properly incorporated into the project design and contract documentation after authorization is granted;

- Encouraging the project proponent to meet the requirements of the EMP which now form the basis for the conditions attached to authorization of the project; and

- Forcing the project proponent to internalize environmental impacts that would otherwise become a social cost.

The EMPs presented in this Chapter therefore summarize the key impact elements identified and the remedial measures, the actions to be taken by various parties and the monitoring activities. An indication of the time scale for implementation and cost involved is also provided. The EMP tables can be further expanded with documented procedures and guidelines for work practices so as to be as responsive to the situations that various contract parties will encounter. The parties should formulate procedures and practices and maintain records as required by EMCA.

The implementation of the EMP should be done within the provisions of the law and for the ultimate benefit of the stakeholders in the Project area. The effectiveness of the
EMP shall be monitored and assessed during spot checks, formal inspections and at the end of the Project when an overall audit of the works shall be carried out.

9.2 **Types of environmental management plans**

There are three broad categories of EMPs in the project lifecycle: The construction EMP, the operation EMP and the decommissioning EMP.

The objectives of these EMPs are all the same, namely to:

- Identify the possible environmental impacts of the proposed activity; and
- Develop measures to minimize, mitigate and manage these impacts.

The difference between these EMPs is related to the difference in mitigation actions required for the different stages of the project cycle.

9.2.1 **Construction environmental management plan**

A construction environmental management plan is a practical and achievable plan of management to ensure that any environmental impact during construction phase is minimized. Construction environmental management plan provides specific environmental guidance for the implementation and construction phase of a project. It is intended to enable the management and mitigation of construction activities so that environmental impacts are avoided or reduced. These impacts range from those incurred during start up to construction activities. Table 9-I below shows the construction environmental management plan for the proposed Clay City Medium Income Apartments.

**Table 9-I: Environmental management plan during construction phase**
<table>
<thead>
<tr>
<th>Environmental issue</th>
<th>Recommended mitigation measures</th>
<th>Responsible party</th>
<th>Monitoring means</th>
<th>Time frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
</table>
| Minimize extraction site impacts and Demand for raw materials in construction | • Source construction materials are extracted from registered firms whose facilities have undergone satisfactory environmental impact assessment/audit and received NEMA approval.  
• Source construction materials from local suppliers who use environmentally friendly processes in their operations.  
• Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered.  
• Ensure that damage or loss of materials at the construction site is kept minimal through proper storage.  
• Consider reuse of construction materials and use of recycled materials. | Project Manager and Contractor | Inspection and Observation | Throughout construction period | No added cost |
| Minimization of local increase in construction traffic        | • Construction vehicles should enter and leave the site at appropriate times.  
• Using signs and barriers the Contractor will direct vehicles and pedestrian traffic as needed around the construction site.  
• Some activities may be scheduled in off-peak traffic times to minimize impacts. | Contractor | Observation and Inspection | Throughout construction period | No added cost |
| Increased solid waste generation and efficient solid waste management during construction | • Use of an integrated solid waste management system i.e. through a hierarchy of options: ie, Source reduction; Recycling; Reuse; and Land filling.  
• Order materials in the sizes and quantities they will be needed, rather than cutting them to size, or having large quantities of residual materials.  
• Damaged/ wasted construction materials to be recovered for refurbishing and use in other projects.  
• Use of durable, long-lasting materials to reduce the amount of construction waste generated over time.  
• Provide facilities for proper handling and storage of construction materials.  
• Use construction materials that require minimal or no packaging.  
• Use construction materials containing recycled content where possible and in accordance with accepted standards.  
• Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers. | Project Manager, and Contractor | Inspection and Observation | Throught construction period | 45,000.00 per month |
<table>
<thead>
<tr>
<th>Dust emission</th>
</tr>
</thead>
</table>
| - Dispose waste more responsibly by dumping at designated dumping sites or landfills only. 
- Waste collection bins to be provided at designated points on site. |
| - Downwash of trucks (especially tyres) prior to departure from site. 
- Cover stockpiles of sand, soil and similar materials or surround them with wind breaks. 
- Cover trucks hauling dirt and debris to reduce spillage on to paved roads surface or have adequate free board to prevent spillage. 
- Post signs that limit vehicles speed onto unpaved roads and over disturbed soils. Rapid onsite construction so as to reduce duration of traffic interference and therefore reduce emissions from traffic delays. 
- Ensure strict enforcement of on-site speed limit regulations. 
- Avoid excavation works in extremely dry weathers. 
- Sprinkle water on access routes when necessary to reduce dust generation by construction vehicles. 
- Personal protective equipment to be worn. |
| Contractor | Inspection and Observation | Throughout construction period | 5,000.00 |

<table>
<thead>
<tr>
<th>Noise and vibration</th>
</tr>
</thead>
</table>
| - Install portable barriers to shield compressors and other small stationery equipment where necessary. 
- Prescribe noise reduction measures if appropriate e.g. restricted working hours, transport hours and noise buffering 
- Consult with the surrounding community on the permissible noise levels and best working hours. 
- Use quiet equipment (i.e. equipment designed with noise control elements). 
- Co-ordinate with relevant agencies regarding all construction activities in the project area. 
- Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used. 
- Sensitize construction drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, offices, hospitals, residential houses and schools. 
- Ensure that construction machinery is kept in good condition to reduce noise generation. |
<p>| Contractor | Inspection | One-off | 50,000.00 |</p>
<table>
<thead>
<tr>
<th>Increased energy consumption</th>
<th>Contractor</th>
<th>Inspection and Observation</th>
<th>Throughout construction period</th>
<th>No added cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>The noisy construction works will be planned to be during the day.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ensure electrical equipment and appliances are switched off when not being used.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Install energy saving fluorescent tubes and bulbs at all lighting points instead of bulbs which consume higher electric energy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ensure planning of transportation of materials to ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development of energy management plan.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor energy use during construction and set targets for reduction of energy use.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Increased water demand</th>
<th>Contractor</th>
<th>Observation</th>
<th>Throughout construction period</th>
<th>15,000.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promptly detect and repair of water pipe and tank leaks.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitize construction workers to conserve water.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Install a discharge meter to determine and monitor total water usage.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Promote recycling and reuse of water as much as possible.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Install water conserving taps.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Increased storm water run-off</th>
<th>Proponent</th>
<th>Inspection and Observation</th>
<th>During rainy season</th>
<th>50,000.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface runoff and roof water shall be harvested and stored for reuse.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apply soil erosion control measures such as leveling of the project site to reduce run-off velocity and increase infiltration of storm water.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design a storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oil Spills</th>
<th>Contractor</th>
<th>Inspection</th>
<th>Throughout construction period</th>
<th>100,000.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>A designated garage section of the site fitted with oil trapping equipments to be planned for changes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prompt cleaning of oil and fuel spills.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proper disposal of clothing or rags contaminated with oil.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minimize occupational health and safety risks</th>
<th>Contractor</th>
<th>Inspection</th>
<th>Throughout construction period</th>
<th>150,000.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration of the Project as per Section 43 and 44 of the Occupational Safety and Health Act, 2007.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A general register should be kept within the facility</td>
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<tr>
<td>Safety, health and environment (SHE) policy</td>
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<tr>
<td>• Develop, document and display prominently an appropriate SHE policy for construction works</td>
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<tr>
<td>• Suitable, efficient, clean, well-lit and adequate sanitary conveniences should be provided for construction workers as per Section 52 of the Occupational Safety and Health Act, 2007.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Machinery/equipment safety</th>
</tr>
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<tbody>
<tr>
<td>• Ensure that equipment and work tasks are adapted to fit workers and their ability including protection against mental strain.</td>
</tr>
<tr>
<td>• All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury as stated in Section 56 of the Occupational Safety and Health Act, 2007.</td>
</tr>
<tr>
<td>• Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/operations</td>
</tr>
<tr>
<td>• Equipment such as fire extinguishers must be examined by a government authorized person as indicated in Section 72 of the Occupational Safety and Health Act, 2007. The equipment may only be used if a certificate of examination has been issued.</td>
</tr>
<tr>
<td>• Reports of such examinations must be presented in prescribed forms, signed by the examiner and attached to the general register.</td>
</tr>
</tbody>
</table>

as stipulated in Section 122 and 123 of the Occupational Safety and Health Act, 2007.

• Ensure that provisions for reporting incidents, accidents and dangerous occurrences during construction using prescribed forms obtainable from the local Occupational Health and Safety Office (OHSO) are in place.
• Reporting should also be as stated in Section 21 of the Occupational Safety and Health Act, 2007.
• Enforcing safety procedures and preparing contingency plan for accident response in addition safety training shall be emphasized
<table>
<thead>
<tr>
<th>Section</th>
<th>Requirements</th>
<th>Contractor Inspection and Observation</th>
<th>Througout construction period</th>
<th>Contractor Inspection and Observation</th>
<th>Througout construction period</th>
<th>No added value</th>
</tr>
</thead>
</table>
| **Storage of materials**        | • Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse.  
• Ensure that items are not stored/stacked against weak walls and partitions.                                                                                                                               |                                        |                                 |                                        |                                 | No added value |
| **Safe means of access and safe place of employment** | • All floors, steps, stairs and passages of the rooms must be of sound construction and properly maintained.  
• Securely fence or cover all openings in floors.  
• All ladders used in construction works must be of good construction and sound material of adequate strength and be properly maintained as indicated in Section 77 of the Occupational Safety and Health Act, 2007. |                                        | One-off 50,000.00               |                                        |                                 | No added value |
| **Emergency preparedness and evacuation procedures** | • Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency.  
• Such procedures must be tested at regular intervals.  
• Ensure that adequate provisions are in place to immediately stop any operations where there is an emergency.  
• Provide measures to deal with emergencies and accidents including adequate first aid arrangements.                                                                                      |                                        | One-off 75,000.00               |                                        |                                 | No added value |
| **First Aid**                  | • Well stocked first aid box which is easily available and accessible should be provided within the premises as stated in Section 95 of the Occupational Safety and Health Act, 2007.  
• Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body.                                                                                       |                                        |                                 |                                        |                                 | No added value |
<table>
<thead>
<tr>
<th>Category</th>
<th>Requirements</th>
<th>Responsible Party</th>
<th>Inspection and Observation</th>
<th>Payment</th>
</tr>
</thead>
</table>
| **Fire Protection** | - Fire fighting equipment such as fire extinguishers and hydrant systems should be provided at strategic locations.  
- Regular inspection and servicing of the equipment must be undertaken and records of such inspections maintained.  
- Signs such as “NO SMOKING” must be prominently displayed within the construction site. | Contractor                 | One-off                     | 75,000.00 |
| **Electrical Safety** | - Distribution board switches must be clearly marked to indicate respective circuits and pumps.  
- There should be no live exposed connections.  
- Electrical fittings near all potential sources of ignition should be flame proof.  
- All electrical equipment must be earthed | Project Manager and Contractor | One-off                     | 50,000.00 |
| **Chemical Safety** | - Collection, recycle and dispose chemical wastes, obsolete chemicals and empty chemical containers as per the Environmental Management and Coordination (Waste Management) Regulations, 2006. | Contractor                 | One-off                     | 75,000.00 |
| **Supply of clean drinking water** | - Ensure that construction workers are provided with an adequate supply of wholesome drinking water. | Contractor                 | One-off                     | 10,000.00/Month |
| **Washing facilities** | - Ensure that conveniently accessible, clean, orderly, adequate and suitable washing facilities are provided and maintained within the site. | Contractor                 | One-off                     | 90,000.00 |
| **Ergonomics** | - Provision for repairing and maintaining of hand tools must be in place.  
- Height of equipment, controls or work surfaces should be positioned to reduce bending posture for standing  
- Hand tools must be of appropriate size and shape for easy and safe use. | Contractor                 | One-off                     | 85,000.00 |
Ensure the general safety and security of the proposed Project and surrounding areas

- Ensure the general safety and security at all times by providing day and night security and adequate lighting within and around the construction site.

Developer and Contractor | Observatio n | Throug hout constru ction period | 10,000.00/ Month

9.2.2 Operational phase EMP

An operational environmental management plan provides specific guidance related to the operational activities associated with a particular project. It is focused on sound environmental management practices that will be undertaken to minimize adverse impacts on the environment through normal operation of a facility. The operational management plan further identifies what measures should be taken in the event of emergencies or incidents during the operation of the proposed Project. The roles and responsibilities for mitigation, monitoring and performance assessment for the operational life of the development are specified in the EMP. Table 9-II below shows the operation phase of the proposed Clay City Medium Income Apartments.

Table 9-II: Environmental management plan for the operational phase

<table>
<thead>
<tr>
<th>Environmental issue</th>
<th>Recommended mitigation measures</th>
<th>Responsible party</th>
<th>Monitoring means</th>
<th>Time frame</th>
<th>Cost (Ksh)</th>
</tr>
</thead>
</table>
| Increased solid waste generation and efficient solid waste management during operational phase | ▪ Ensure use of an integrated solid waste management system i.e. through a hierarchy of options: ie, source reduction; recycling; reuse; and Land filling.  
▫ Ensure solid wastes are disposed more responsibly by dumping at designated dumping sites or landfills only.  
▫ Provide waste collection bins at designated points at the water intake and at the Power house | Project Manager/ Contracted solid waste management company | Inspection and Observation | During the operational phase | 45,000.00 |
<p>| High demand for energy | ▪ Select the most efficient lighting system design and minimum lighting level appropriate for the | Project manager | Inspection | One-off | 75,000.00 |</p>
<table>
<thead>
<tr>
<th>High water demand</th>
<th>Project manager</th>
<th>Inspection</th>
<th>One-off</th>
<th>50,000.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reduce toilet cistern in single flash models.</td>
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<tr>
<td>• Sweep with a broom and pan where possible, rather than hose down external areas.</td>
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<tr>
<td>• Quick fixing of licking pipes and toilet cistern.</td>
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<tr>
<td>• Reduce water delivery in taps, through the installation of low flow devices or aerators on taps.</td>
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<tr>
<td>• Install a manually pressed button flush valve which stops on release of button</td>
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<tr>
<td>• Install a discharge meter at water outlets to determine and monitor total water usage.</td>
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<tr>
<td>• Promote awareness on water conservation and reducing water wastage.</td>
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<tr>
<td>• Consider water efficient plumbing fixtures to save water and energy</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sewage treatment and disposal</th>
<th>Project manager</th>
<th>Inspection and Observation</th>
<th>Throughout operation phase</th>
<th>50,000.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor the efficiency of the effluent treatment plant to ensure that the sewage released from the facility do not pollute the environment and affect the general public during operation of the proposed Project.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Increased storm water run-off</th>
<th>Project manager</th>
<th>Inspection</th>
<th>One-off</th>
<th>80,000.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provision of slit traps in storm water drains.</td>
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<tr>
<td>• Good housekeeping to avoid contamination of storm water</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>• Regular inspection and cleaning of storm drains.</td>
<td></td>
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</tr>
<tr>
<td><strong>Increased general safety and security impacts</strong></td>
<td>Ensure the general safety and security at all times by providing day and night security and adequate lighting within and around the proposed the Hydro power project</td>
<td><strong>Proponent</strong></td>
<td><strong>Inspection and Observation</strong></td>
<td><strong>Throughout operation phase</strong></td>
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</tr>
<tr>
<td><strong>Increased occupational health and safety risks</strong></td>
<td>▪ Adherence to the Occupational Health and Safety Rules and Regulations stipulated in the Occupational Safety and Health Act, 2007. ▪ Provision of appropriate personal protective equipment as well as ensuring a safe and healthy environment for workers</td>
<td><strong>Health and Safety Manager</strong></td>
<td><strong>Inspection, Meeting and Observation</strong></td>
<td><strong>Throughout operation phase</strong></td>
</tr>
<tr>
<td><strong>Increased air emissions</strong></td>
<td>Use and Monitor the efficiency of the TARDIS in trapping and neutralizing air emissions</td>
<td><strong>Health and Safety Manager</strong></td>
<td><strong>Inspection, Meeting and Observation</strong></td>
<td><strong>Throughout operation phase</strong></td>
</tr>
<tr>
<td><strong>Machinery/equipment safety</strong></td>
<td>▪ Ensure that equipment and work tasks are adapted to fit workers and their ability including protection against mental strain. ▪ All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury as stated in Section 56 of the Occupational Safety and Health Act, 2007. ▪ Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/operations ▪ Equipment such as fire extinguishers must be examined by a government authorized person as indicated in Section 72 of the Occupational Safety and Health Act, 2007. The equipment may only be used if a certificate of examination has been issued. ▪ Reports of such examinations must be presented in prescribed forms, signed by the examiner and attached to the general register.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safe means of access and safe place of employment</td>
<td>Contractor</td>
<td>Observation and Inspection</td>
<td>One-off</td>
<td>75,000.00</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
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</tbody>
</table>
| ▪ All floors, steps, stairs and passages of the rooms must be of sound construction and properly maintained.  
  ▪ Securely fence or cover all openings in floors.  
  ▪ All ladders used in construction works must be of good construction and sound material of adequate strength and be properly maintained as indicated in Section 77 of the Occupational Safety and Health Act, 2007. | | | | |

<table>
<thead>
<tr>
<th>Emergency preparedness and evacuation procedures</th>
<th>Contractor</th>
<th>Inspection and Observation</th>
<th>One-off</th>
<th>60,000.00</th>
</tr>
</thead>
</table>
| ▪ Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency.  
  ▪ Such procedures must be tested at regular intervals.  
  ▪ Ensure that adequate provisions are in place to immediately stop any operations where there is an emergency.  
  ▪ Provide measures to deal with emergencies and accidents including adequate first aid arrangements. | | | | |

<table>
<thead>
<tr>
<th>First Aid</th>
<th>Contractor</th>
<th>Observation and Inspection</th>
<th>One-off</th>
<th>75,000.00</th>
</tr>
</thead>
</table>
| ▪ Well stocked first aid box which is easily available and accessible should be provided within the premises as stated in Section 95 of the Occupational Safety and Health Act, 2007.  
  ▪ Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body. | | | | |

<table>
<thead>
<tr>
<th>Fire Protection</th>
<th>Contractor</th>
<th>Inspection and Observation</th>
<th>One-off</th>
<th>125,000.00</th>
</tr>
</thead>
</table>
| ▪ Fire fighting equipment such as fire extinguishers and hydrant systems should be provided at strategic locations.  
  ▪ Regular inspection and servicing of the equipment must be undertaken and records of such inspections maintained.  
  ▪ Signs such as “NO SMOKING” must be prominently displayed within the construction site. | | | | |
10 CONCLUSION AND RECOMMENDATIONS

10.1 Conclusion

Based on the field assessment and public consultation this assessment report has concluded that the proposed project will generate positive and negative environmental impacts. The positive impacts will numerous and will include employment during the planning, construction and operational (apartment occupation) phases. In addition to the above the proposed project will provide residential accommodation and will greatly reduce the pressure on residential housing in Kasaraini sub-county and Nairobi City County as a whole.

The envisaged negative environmental impacts will be generated; however, these will be few and insignificant and will be mitigated adequately by the contractor during construction and the apartment management by the facility management during the apartment occupation.

The assessment also established that; the proposed project location does not have priority forests, natural habitats; original species of vegetation and wildlife or historical or cultural heritage of significance that could be in danger as result of the project.

Further the assessment has concluded that; unavoidable construction effects such as safety risk to the workers and the community and noise and nuisance dust will be adequately dealt with. Solid and liquid wastes generated during construction and occupation phases of the proposed project will be dealt with adequately to minimize the pollution hazards and sanitation threats that may emanate from such menaces.

The consultants have therefore concluded that; overall, positive socio-economic impacts (economic benefits) which will accrue from the proposed project are deemed to largely outweigh the envisaged negative impacts.
10.2 Recommendations

Implementation: It is recommended that the proposed project be implemented in compliance with all the relevant legislation and planning requirements of Kenya at all times. In line with this, the proponent and the contractor must take the legislative framework provided in this report into consideration, during and after the implementation of the project, as will be appropriate.

Adherence to ESMP: In addressing the environmental issues, the contractor and/or proponent must follow the mitigation guidelines provided under ESMP. This will ensure the Environmental and safety of the neighboring communities. It is also recommended that an Environmental and Safety officer should be stationed in the proposed project site, during the construction phase. The safety officer will make sure that all the workers follow the safety rules.

Annual Environmental Monitoring and Audit: During Construction phase, the Consultant and the Contractor is required to undertake Environmental Monitoring to ensure that the Construction is done in compliance with the provisions of the EIA License and during Operations. The proponent should undertake an environmental audit as provided in the environmental legislation.
REFERENCES


IFC, 1998: *Environmental Assessment (OP 4.01)*

International Association of Impact Assessment (IAIA), 1999: *Principles of Environmental Impact Assessment Best Practice*

International Institute of Infrastructure, Hydraulic and Environmental Engineering (IHE, Delft) (lecture Notes): *Environmental Impact Assessment*

International standards for environmental management systems (e.g. ISO 14000 standard series, life cycle analysis etc)


Material data sheets, production process outlines, site plans and permits provided by the Client.

Republic of Kenya Statutory Legislations (Act):

*The Building Code 2000*

*The Environmental Management and Coordination Act, 1999. No. 8 of 1999 and the Environmental (Impacts Assessment and Audit) regulations of June 2003 - Legislative Supplement No. 31 of 13th June 2003*

*The Factories and other Places of Work Act (Cap 514)*

*The Local Government Act (Cap. 265)*

*The Nairobi City Council: - Water and sewerage Department; Industrial Effluent Standard 2000*

*The Penal Code (Cap 63)*

*The Public Health Act (Cap. 242)*

*The Water Act (Cap. 372)*

*The Water Act 2002*


World Bank, (1993): *Environment Screening (Environmental Assessment Source Book No.2*

World Bank, (1999): *Environmental Assessment Source Books and Updates operational manuals*
ANNEXES

**Annex 1:** Site Photos

**Annex 2:** NEMA /PR/5/2/15,179 dated 4th February, 2016

EIA Study Requirements for Phase 1: Construction of 560 Medium Income Apartment Units as a Component of the Proposed Mixed Urban Development at Clayworks Ltd on Plot No.57/2055, Kasarani, and Nairobi City County

**Annex 3:** NEMA/TOR/5/2/15,179 dated 1st March, 2016

Acknowledgement and approval for ToR for the EIA study for Mixed Urban Development at Clayworks Ltd on Plot LR No.57/2055 Kasarani, Nairobi County

**Annex 4:** Proponent PIN, Certificate of Change of Name and Certificate of Incorporation

**Annex 5:** Copy of approval to the change of user

**Annex 6:** Land ownership documents for the proposed development

**Annex 7:** Proponents (CLAYWORKS LTD) Company Profile

**Annex 8:** Oligerm NEMA Licenses

**Annex 9:** Copy of Approved Architectural Designs and Drawings
Annex 1: Site photos