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ENVIROMENTAL IMPACT ASSESSMENT STUDY REPORT FOR PROPOSED CONSTRUCTION OF RESIDENTIAL APARTMENTS ON PLOT L.R. NO. 1870/I/209 ALONG MKUNGU CLOSE, PARKLANDS AREA – NAIROBI CITY COUNTY.

This Environmental Impact Assessment (EIA) Project Report is submitted to Kenya National Environmental Management Authority (NEMA) in conformity with the requirements of the Environmental Management and Coordination Act, 1999 and the Environmental (Impact Assessment and Audit) Regulations, 2003.

PROJECT PROPONENT

WOODLAND VIEW LIMITED,

P.O. BOX 32705 - 00600,

NAIROBI

APRIL 2017

DOCUMENT AUTHENTICATION

This Environmental Impact Assessment project report has been prepared by **iPlan Consult (Intl) Limited** (registered and licensed EIA /EA lead Experts No. 7597) in accordance with the Environmental Management and Coordination Act (EMCA) 1999 and the Environmental (Impact Assessment) and Audit regulations 2003 which requires that every development project must have an EIA report prepared for submission to the National Environmental Management Authority (NEMA). We the undersigned, certify that the particulars in this report are correct and righteous to the best of our knowledge.

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EXECUTIVE SUMMARY

Kenya being a developing country is urbanizing very fast and hence experiencing the challenges of urbanization. Our client **Woodland View Limited** has identified an investment opportunity in Parklands area along Mkungu Close. They intend to develop a eighteen storied residential apartments with all attendant facilities such as parking and enough security on plot **L.R. No**. **1870/I/209.**

Currently the rates of urbanization and population growth worldwide are increasing fast and with it come the need for improvement in service provision especially in our urban areas. Kenya's rates of urbanization are escalating and being a developing country; most of its urban population is forced to live in slums. It's in line with this thus there's need for improved provision of housing services and especially low cost housing to cater for the low and middle income earners who can't afford to build their own houses. This is a goal that is to be achieved through deliberate policies and plans that are aimed at spurring economic growth and social development. With the ever increasing rates of urbanization and increasing population growth rates the housing sector in Kenya if not well addressed is bound to impact negatively on the environmental attributes of the project areas and its surroundings.

The Kenyan government has attempted to provide decent housing to its urban population through several strategies one of which is through the private sector. This is intended to stimulate economic and social development of the residents through the provision of social amenities and services that would make life both meaningful and honorable. This Environmental Impact Assessment examined the potential positive and negative impacts of the project on the immediate surroundings with due regard to all the phases from construction, occupation and decommissioning. It encompassed all aspects pertaining to the physical, ecological, socio-cultural, health and safety conditions at the site and its environs during and after construction.

Environment, Health and Safety (EHS) section addresses environmental, health and safety concerns during projects' cycle. The main objective of the EHS on the proposed project is to develop guidelines for protecting, managing and responding, processes, situations/conditions that might compromise health, safety and security of workers and ecological wellbeing. To avoid or reduce negative environmental impacts, mitigation measures were proposed and an environmental management plan (EMP) formulated. The proponent is also expected to observe recommendations in the Environmental Management Plan (EMP) and carry out annual environmental audits once the project is in operation.

Overview of the project

The primary objective of the proposed project is to develop Residential apartments with all attendant facilities. The main design components of the project include, but not limited to the following:

Development of **eighteen storied residential apartment with a total of two hundred and sixty three units (263) complete** with the following:

- **BASEMENT 1 TO 3;** Adequate parking space, 3 floors of parking **with 250 bays**
- **Ground plinth;** security desk, flower bed, basement entry and exits, daycare/children's' play area, boutique(2), salon, waiting areas(2), kiosks (2),pantry, counter, convenience store, toilets, garbage collection loading and unloading area, management office, chemist, cafeteria, DQ set and transformer.
- **PODIUM 1 AND 2:** 2 floors of parking with staff washrooms and showers.
- **3RD FLOOR (COURTYARD**); has sixteen units; fourteen(14) two bedroomed units and two(2) one bedroomed units
- **Fourth floor(4th) to 15th FLOORs (typical):** each floor has eighteen units; fourteen(14) two bedrooms , two(2) one point five (1.5) units and two (2) one bedrooms
- **16th floor;** has sixteen units **;** 14 three bedroomed units and two(2) four bedroomed units
- **17TH FLOOR:** has 15 units; fourteen(14) three bedroomed units and one four bedroomed unit
- **18TH FLOOR :** Residents lawn and party area, squash courts, gymnasium, yoga, swimming pool, buffet counters, kitchen services and utilities, ladies locker and changing rooms and gents locker.
- **19th Floor (Terrace);** solar panels (2), swimming pool, overhead water tank and buffet counters.

Environmental Impacts and Mitigation Measures

The potential negative environmental impacts of the proposed project and possible mitigation measures are summarized below:-

Potential Negative Environmental Impacts	**Mitigation Measures**
1. Architectural incompatibility leading to distortion of neighbourhood aesthetic image	• Harmonize building scale with existing development in neighbourhood. • Harmonize detail, material and finishes for roofs and walls with existing development in the neighbourhood.
2. Disruption of existing natural environment and	• Development restricted to follow zoning policy/approved density

modification of micro-climate – - Increased development density - Increased glare/solar reflection - Reduced natural ground cover - Obstruction of ventilating wind - Increased surface run-off	– building line, plot coverage and plot ratio. • Careful layout and orientation of buildings to respect wind and sun direction. • Adequate provision of green and open space planted with grass, shrub and tree cover. • Minimum use of reflective building material and finishes for roof, wall and pavement.
3. Pollution and health Hazards - Dust and other construction waste - Noise generation from construction activities.	• Damping down of site e.g. sprinkling water to dusty areas on construction site. • Containment of noisy operation, including locating noise operations away from sensitive neighbors. • Construction work limited to day time only and take shortest time possible.
4. Increased loading on Infrastructure services - Increased vehicular and/or pedestrian traffic - Increased demand on water, sanitation services etc. - Increase surface runoff	• Have paved local access road and walkway system • Encourage rainwater harvesting • Provision of increased water storage capacity • Provide adequate storm water drainage system
5. Worker accidents and health infection	• Employ skilled and trained workers, provide protective clothing. • Prepare clear work schedule and the organization plan. • Have adequate worker insurance cover • Enforce occupational health and safety standards.
6. Increased social conflict	• Increased Housing stock in the area and Kenya • Increased economic activities –employment generation, income earnings and housing capital stock formation • Encourage formation of community policing and formation of neighbouhood associations

Conclusions and Recommendations'

The EIA process started early in the pre-feasibility stage and environmental aspects were therefore considered during the project design stages. This proactive approach resulted in many significant environmental impacts being avoided, as the project team was able to amend design in order to manage environmental impacts, rather than manage the environmental impacts of particular designs.

In conclusion, results from EIA study show that the proposed residential development project has significant impacts on the environment. Implementation of an Environmental Management Plan will assist in dealing with environmental issues during the project cycle. There are also guidelines for addressing environmental health and safety. This project is recommendable for approval by the National Environment Management Authority (NEMA) for issuance of an EIA license subject to annual environmental audits after operating for one year. This will be in compliance with the Environmental Management and Coordination Act of 1999 and the Environmental Impact Assessment and Audit regulations, 2003.

Table of Contents

LIST OF ABBREVIATIONS

°C	Degrees Celsius
NCG	Nairobi County Government
EHS	Environmental Health and safety
EIA	Environmental Impact Assessment
EMAP	Environmental Management and Action Plan
EMCA	Environmental Management and Coordination Act
GoK	Government of Kenya
NEC	National Environmental Council
NEMA	National Environment Management Authority
KP	Kenya Power
OHSO	Occupational Health and Safety
TOR	Terms of Reference
WRMA	Water Resources Management Authority

APPENDICES

1. Questionnaires
2. Ownership Documents
3. Copies of Approved Building Plans

CHAPTER ONE: INTRODUCTION

1.1 Background and Rationale for the EIA

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

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

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

In this development proposal, the proponent intends to construct residential apartment on Plot **LR NO. 1870/I/209.** It has been established that such projects have a potential of causing significant

impacts on the environment. It is under this premise that the proponent deemed it necessary to carry out an Environmental Impact Assessment (EIA) for the proposed project.

Environmental Impact Assessment studies were carried out as per the provisions of Environmental (Impact Assessment and Audit) Regulations, 2003 .This report is a product of the entire study and will be used in various decision making platforms including consideration for issuance of an EIA license by the National Environment Management Authority (NEMA).

It is well known that there is a significant urban housing facilities deficit in Kenya with an estimated 100,000 housing units being required per annum just to meet the current demand over the next 10 years. Therefore this development shall be a welcome idea to help address the limitations of living space and shelter in the city and its suburbs.

1.2 Need for the project

Rapid urbanization is a trend seen across the developing world, with the fastest rates of growth seen in Sub-Saharan Africa. Much of this is due to rural urban migration of people in search of jobs and or higher education or higher standards of living. Urbanization rates in Kenya have mirrored those seen in other Africa countries and just like in other areas, the housing sector is not growing in tandem with the rates of urbanization.

It must be appreciated that there is scarcity of residential premises in our urban areas. This has seen more and more residential buildings coming up to cater for the increased demand. The result of this has seen more and more agricultural land being converted to residential use and most urban areas set aside/ low rise residential developments convert to high raise Multi-family dwelling development.There is a glaring gap between the demand and availability of affordable residential facilities in various sections of Nairobi and Nairobi and the large metro region. This has been largely so because most of the more recent large scale developments in areas near the major towns have tended to focus more on commercial and office use developments.

The conceived project is designed to be within character of the current housing trend for garden estate area in particular, where this survey revealed that apartments are allowed and are guaranteed of attracting the desired clientele. A survey sponsored by the proponent has established that demand exists for such development and that the target clientele would cherish an environment that meets the following criterion:

- A residence within reasonable distances to Nairobi CBD and Nairobi
- An environment that will allow occupants to interact but with strict rules regarding

- Individual Privacy
- Security of residents

The need therefore exists for providing flexible, modern and cost effective Housing estate.

1.3 National Housing Policy and Housing Needs in Kenya

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

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

To alleviate the huge shortfall of urban housing mentioned above and to curb the mushrooming of informal settlements/slums, various interventions and strategies have to be adopted. In the Policy Paper, the government correctly accepts the fact that it cannot meet the housing shortfall on its own and that the best policy is to encourage the private sector (like the proponent) to chip in while the government provides an enabling environment for development. The government will provide an enabling environment by doing the following:

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

The promotion of this development is therefore well within the government current and long term policies of ensuring housing for all by 2030 (Vision 2030). The housing policy does not address the demand for affordable residential houses, which are addressed by this report.

1.4 Scope of the Project

The scope of the study includes carrying out of environmental investigations in line with current provisions on environmental legislations. This has been done in line with the requirements of Environmental Management and Coordination Act (EMCA) 1999 and Environmental (Impact Assessment) and Audit regulations 2003. The report is aimed at analyzing the physical extent of the project site and its immediate environs, implementation works of the proposed development (ground preparations, foundation, walling, roofing, fixtures and fitting among other activities) and installation of key utilities and other facilities required for the project to function optimally.

1.5 Overall objective of the project

The proposed project has the overall objective of developing a eighteen storey residential development along Mkungu close, Parklands area in Nairobi County. This will not only attempt to solve the current housing shortage but also is an attempt to meet the economic desires of the project proponents and the increasing housing needs in the Country.

1.6 Terms of Reference (TOR)

The TORs for this Project Report is the production of an EIA report to address the effects and impacts (Positive and Negative) of the proposed construction of residential development. The EIA firm of experts is under instructions from the project proponents to do a thorough environmental assessment with the aim getting approval from the National Environment Management Authority before commencement of the project. This report addresses the following key specific objectives:

- To review existing legal and institutional framework related to the proposed developments complex project development.
- To collect and collate baseline information relevant to the proposed housing development
- To collect primary data through the community participatory process.
- To identify and assess positive and negative impacts of the proposed project
- To identify and analyze alternative options for the proposed project
- To develop mitigation measures and cost estimates for the negative impacts of project.
- To design an Environmental Management Plan (including cost estimates) and a monitoring framework for the environmental impact of the project.

1.7 Content of project

The project assessment investigates and analyses the anticipated environmental impacts of the proposed development in line with the Environmental Impact Assessment and Audit regulations 2003 and in particular part II S 7[1] a-k. Consequently, the report will provide the following

- Nature of project
- The location of the project including the physical area that may be affected by the project's activities.
- The activities that shall be undertaken during the project construction operation and design of the project
- The materials to be used, products and by-product including waste to be generated by the project and the methods of disposal.
- The potential environmental impacts of the project and mitigation measures to be taken during and after the implementation of the project.
- An action plan for prevention and management of possible accidents during the project cycle
- A plan to ensure the health and safety of the workers and the neighbouring communities
- The economic and social cultural impacts to local community and the nation in general
- The project budget
- Any other information that the proponent may be requested to provide by NEMA.

All these aspects will be considered accordingly. This report also seeks to ensure that all the potential environmental impacts are identified and that workable mitigation measures are adopted. The report also seeks to ensure compliance with the provision of the EMCA 1999, and Environmental (Impact Assessment and Audit) Regulations 2003 as well as other regulations. The report emphasizes the duties of the proponent and contractor during the construction phase as well as the operation phase of this project.

1.8 methodology

1.8.1 Environmental Screening.

Environmental screening was carried out to determine whether an EIA study is necessary for this project and at what level of evaluation. This took into consideration the requirements of the Environmental Management and Coordination Act (EMCA), 1999, and specifically the second

schedule of the same act. From the screening process, it was understood that this project will cause significant impacts on the environment.

1.8.2 Environmental Scoping.

In scoping, focus was on environmental impacts of great concern. Environmental issues were categorized into physical, natural/ecological and social, economic and cultural aspects. Impacts were also classified as immediate and long-term impacts. This will include assessment of the proposed project in respect of but not limited to:

- Project Background: this will give the brief history of the proposed project site, the parties involved and justification of the project in terms of demand or lack of the same, the project area, relevant policy and legislation, identification of any associated project, or any planned projects including products within the region which may compete for the same resources; the project including products, by-products, processes both at implementation and operational level, resources required for successful implementation and operation of the project and the different options considered.
- The proposed project objectives; both in the short and long run; and how they are linked to the overall objectives.
- Present environmental conditions; description of the project site, ecological zoning as well as the state of the environment and its surroundings. Attempts will state if it is already suffering from degradation, causes of the original degradation if any established.
- Identification of Environmental Impacts; the report will distinguish between significant positive and negative impacts, direct and indirect impacts and immediate and long term impacts which are unavoidable and / or irreversible,
- Community/ Stakeholder Consultations: these will be undertaken to determine how the project will affect the local people / various stakeholders.
- Cost- Benefit Analysis; to evaluate the economics of the project and establish its viability in terms of the expected environmental concerns and measures.
- Development of an Environmental Management Plan (EMP); to mitigate negative impacts, recommending feasible and cost effective measures to prevent or reduce significant negative impacts to acceptable levels,
- Development of a Monitoring Plan; this will be used in monitoring the implementation of the mitigation measures and the impacts of the project during construction and operational

phases, including an estimate of capital and operational costs, and Make necessary recommendations pertaining to the proposed development.

1.8.3 Desktop Study.

This involved review of project documents, architectural drawings, past EIA, relevant policy, legal and institutional frameworks. Documents containing climatic, demographic and hydrological data for Nairobi City were also relied upon.

1.8.4 Site Visits and Public Participation.

Following the requirement by the National Environmental Management Authority that a public participation exercise be carried out at the preparation of every Environmental Impact Assessment (EIA), stakeholders' participation questionnaires were administered to the persons who would be affected by this housing development. At the stakeholders' participation consultation, the stakeholders were offered with appropriate information on the development intention and made aware of the anticipated environmental impacts and the plans that have been set to mitigate them. After thoroughly appraising the anticipated environmental impacts during construction, operation and decommissioning phases, the stakeholders felt that these impacts have been appropriately mitigated.

Generally, there was no objection from the stakeholders against the construction of the proposed residential apartments. The stakeholders felt that this development will be beneficial to them for it will create a better neighbourhood, and also employment to the locals during construction and operation phases.

The stakeholders' participation exercise was an indication that this residential development is appropriate for this site, and the study recommends its approval so the people may realize these benefits. Expedited approval by the National Environmental Management Authority will be essential at employment creation and national development.

1.8.5 Reporting.

In the entire exercise, the proponent and EIA experts contacted each other on the progress of the study and signing of various documents. The proponent will have to submit ten copies of this report alongside a CD to the National Environment Management Authority for review and issuance of an EIA license. All the materials and workmanship used in the execution of the work shall be of the best quality and description .Any material condemned by the architect shall be removed from the site at the contractors cost. Environmental concerns need to be part of the planning and

development process and not an afterthought. It is therefore advisable to avoid land use conflicts with the surrounding area through the implementation of the Environmental Management Plan (EMP).

CHAPTER TWO: POLICY, LEGAL AND LEGISLATIVE FRAMEWORK

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

2.1 Policy Framework.

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

2.1.1 National Environmental Action Plan (NEAP).

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

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

2.1.2 National Shelter Strategy to the Year 2000.

Kenya adopted this strategy following the International Year of Shelter for the Homeless in 1987.This advocates for the involvement of various actors to come in and assist the government in providing housing. This took cognizance of the governments' inability to provide sufficient shelter

for all its citizens. The government was to simply facilitate other actors such as developers to invest in shelter.

2.1.3 The National Poverty Eradication Plan (NPEP).

The objective NPEP is to alleviate poverty in rural and urban areas by 50 percent by the year 2015; as well as the capabilities of the poor and vulnerable groups to earn income. It also aims to narrow gender and geographical disparities and a healthy, better educated and more productive population. This plan has been prepared in line with the goals and commitments of the World Summit for the Sustainable Development (WSSD) of 1995. Since poor housing is among the indicators of poor societies, pursuits to address it build individuals capacity to relieve poverty.

2.1.4 National Policy on Water Resources Management and Development

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

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

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

The key objectives of the Policy include: -

i. To ensure that from the onset, all development policies, programmes and projects take environmental considerations into account,
ii. To ensure that an independent environmental impact assessment (EIA) report is prepared for any industrial venture or other development before implementation,
iii. To come up with effluent treatment standards that will conform to acceptable health guidelines.

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

Legal and Legislative Framework

2.2.1 Environmental Management and Coordination Act No.8 of 1999

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

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

The Environment Management and Coordination Act (EMCA), 1999 provides for the establishment of an umbrella legal and institutional framework under which the environment in

general is to be managed. EMCA is implemented by the guiding principle that every person has a right to a clean and healthy environment and can seek redress through the High court if this right has been, is likely to be or is being contravened.

Pursuant to section 25 (4) of EMCA, National Environmental Management Authority (NEMA) is required to restore degraded environmental sites using the National Environmental Restoration Fund. Currently, the restoration fund consists of 0.1 % levied from industries and other project proponents through the EIA process. Section 58 of the Act makes it mandatory for an Environmental Impact Assessment study to be carried out by proponents intending to implement projects specified in the second schedule of the Act which are likely to have a significant impact on the environment. Similarly, section 68 of the same Act requires operators of existing projects or undertakings to carry out environmental audits in order to determine the level of conformance with statements made during the EIA study. The proponent is required to submit the EIA and environmental audit reports to NEMA for review and necessary action.

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

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

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

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

Legal Notice No. 121: Section 4-6*Part II* of the Environmental Management and Co-ordination (Waste Management) Regulations, 2006 states that: - 4. (1) No person shall dispose of any waste on

a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.

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

(3) Without prejudice to the foregoing, any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose off such waste in a designated waste disposal facility. In addition, the Regulations state that:

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

a). Improvement of production process through:-

i. Conserving raw materials and energy;
ii. Eliminating the use of toxic raw materials; and
iii. Reducing toxic emissions and wastes

b). monitoring the production cycle from beginning to end by:-

i. Identifying and eliminating potential negative impacts of the product;
ii. Enabling the recovery and re-use of the product where possible;
iii. Reclamation and recycling

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

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

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

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

2.2.3 Waste Water Management;

Legal Notice No. 120; Part II – Protection of Sources of Water for Domestic Use. 4. (1) every person shall refrain from any act which directly or indirectly causes, or may cause immediate or

subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of these Regulations

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

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

The proponent and project Architect as well as engineer are urged to ensure that drainage channels are well designed during the construction phase of the project, and upon completion the entire project is supposed to be connected the septic tank.

2.2.4 Public Health Act Cap 242

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

The plans for the above project have been approved by Nairobi City County

2.2.5 Physical planning act, 1999

The said Act section 29 empowers the local Authorities to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section allows for prohibition or control of the use and development of an area. Section 30 state that any person who carries out development without development permission will be required to restore the land to its original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective County Authority.

2.2.6 Land planning act cap 303

Section 9 of the subsidiary legislation (the development and use of land Regulations 1961) under which it requires that before the County authority to submit any plans to then minister for approval, steps should be taken as may be necessary to acquire the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should be submitted, which intends to reduce conflict of interest with other socio economic activities.

2.2.7 Building code 2000

A person who erects a building or develops land or changes the use of a building or land, or who owns or occupies a building or land shall comply with the requirements of these by- laws. For the purpose of this by- laws and the following operations shall be deemed to be the erection of a building:-

a) The alteration or extension of a building.
b) The changing of the use or uses to which land or building is put.
c) The formation or lying out of an access to a plot.

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

2.2.8 Water Act

The water act No. 8 of 2002 provides for the management, conservation, use and control of water resources and for acquisition and regulation of rights to use water; to provide for the regulation and management of water supply and sewerage services. Section 18 of this Act provides for national monitoring and information systems on water resources. Following on this, sub-Section 3 mandates the Water Resources Management Authority to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a site operator and the information thereof furnished to the authority.

Section 73 of the Act provides that a person who is licensed to supply water has a responsibility of safeguarding the water sources against degradation. According to section 75 (1) such a person is required 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 pollution of water sources within his/her jurisdiction.

On the other hand section 76 makes it an offence for any person to discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee which should be sought by making an application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary. The consent shall be issued on conditions including payment of rates for the discharge as provided under Section 77 of the same Act.

Section 94 of the Act also makes it an offence to throw or convey or cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive or unwholesome matter or thing into or near to water resource in such a manner as to cause, or be likely to cause, pollution of the water resource

The main contractor will be required to implement necessary measures to ensure water conservation and also to prevent potential for water contamination during the construction phase to comply with this the developer will use a channel to direct water to the improved septic tank.

2.2.9 County Government Act

Section 160 of the act empowers municipal authorities to establish and maintain sanitary services for the removal and destruction of, or otherwise deal with all kinds of refuse and effluent and where such service is established, compel its use by persons to whom the service is available.

Similarly, section 163 (e) empowers the County Authorities to prohibit businesses which by reason of smoke, fumes, chemicals, gases, dust, smell, noise , vibration or other cause , may be or become a source of danger, discomfort or annoyance to the neighbourhood, and to prescribe conditions subject to which such business shall be carried on. It is in this vain that section 165 mandates the council to grant or to renew business licenses or to refuse the same.

In order to discharge its duties effectively, section 170 of the act allows the right of access to private property at all times by County authorities, its officers and servants for purposes of inspection, maintenance and alteration or repairs of sewers. According to section 173, any person who, without prior consent in writing from the council, erects a building on; excavate or opens-up; or injures or destroys a sewers, drains or pipes shall be guilty of an offence. Any demolitions and repairs thereof shall be carried out at the expense of the offender. The Act, by virtue of section 176 also empowers the County authority to regulate sewerage and drainage, fix charges for use of sewers and drains and ensure that connecting premises meets the related costs.

2.2.10 The Electricity Power Act, 1997

Section 55 (1) in the execution of works in connection with the construction, modification, maintenance or operation of an electric supply line or apparatus or conductor connected thereto, every licensee shall:-

In no way injure the works, conveniences or property belonging to any such other such authority, company or person, nor obstruct or interfere with public traffic, except with the previous consent of the board. Take adequate precautions to protect from danger any person engaged upon such works

by the provision and maintenance in safe and efficient conditions of the necessary safety appliances for the use of such persons and by ensuring their proper use, or by other means approved by the board.

2.2.11 The Penal Code (Cap. 63)

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

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

2.3 Other relevant Provisions

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

- Montreal Protocol on Substances that Deplete the Ozone Layer (1987) ratified 9 November 1988
- United Nations Convention to Combat Desertification (1994), ratified 12 June 1994
- United Nations Framework Convention on Climate Change (1992), ratified 30 August 1994
- Convention on Biological Diversity (1992), ratified 11 September 1994
- Bamako Convention (1991), ratified 17 December 2003
- Kyoto Protocol (2004), ratified 25 February 2005

2.4 Institutional Framework

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

2.4.1 National Environmental Management Authority (NEMA).

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

- Co-ordinate the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations into development policies, plans, programmes and projects with a view to ensuring the proper management and rational utilization of the natural resources environment on a sustainable yield basis for the improvement of the quality of human life in Kenya.
- Take stock of the natural resources in Kenya and their utilization and consultation, with the relevant lead agencies, and develop land use guidelines.
- Examine land use patterns to determine their impact on the quality and quantity of the natural resources among others. Moreover NEMA mandate is designated to the following committees:

2.4.2 County and District Environment Committees.

According to EMCA, 1999, the Minister by notice in the gazette appoints County and county Environment Committees of the Authority in respect of every province and district respectively.

2.4.3 County Environment Committee.

The County Environment Committee has an oversight and decision making role at the County level. Like in the case of County Environment Committees, the County Environment Committees are responsible for the proper management of the environment within the province, which they are appointed. They are also to perform such additional functions as are prescribed by this Act or as may from time to time be assigned by the Minister by gazette notice.

2.4.4 Public Complaints Committee.

The Committee is charged with the following functions:

Investigating allegations/ complaints against any person or against the Authority (NEMA) in relation to the condition of the environment and its management, Prepare and submit to the Council periodic reports of its activities which shall form part of the annual report on the state of the environment, and to perform such other functions and excise such powers as may be assigned to it by the Council.

2.4.5 National Environment Action Plan Committee.

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

Analysis of the Natural Resources of Kenya with an indication as to any pattern of change in their distribution and quantity over time, and Analytical profile of the various uses and value of the

natural resources incorporating considerations of intergenerational and intra-generational equity among other duties as the EMCA specifies.

2.4.6 Standards and Enforcement Review Committee.

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

2.4.7 National Environmental Tribunal.

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

2.4.8 The Occupational Safety and Health Act, 2007.

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

a. General duties including duties of occupiers, self-employed persons and employees
b. Enforcement of the act including powers of an occupational safety and health officer
c. Registration of workplaces.
d. Health General Provisions including cleanliness, ventilation, lighting and sanitary conveniences
e. Machinery safety including safe handling of transmission machinery, hand held and portable power tools, self-acting machines, hoists and lifts, chains, ropes & lifting tackle, cranes and other lifting machines, steam boilers, air receivers, refrigeration plants and compressed air receiver
f. Safety General Provisions including safe storage of dangerous liquids, fire safety, evacuation procedures, precautions with respect to explosives or inflammable dust or gas

g. Chemical safety including the use of material safety data sheets, control of air pollution, noise and vibration, the handling, transportation and disposal of chemicals and other hazardous substances materials
h. Welfare general provisions including supply of drinking water, washing facilities, and first aid
i. Offences, penalties and legal proceedings.

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

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

To ensure machinery safety, every hoist or lift – section 63 and/or all chains, ropes and lifting tackles – section 64 (1d), shall be thoroughly examined at least once in every period of six months by a person approved by the Director of Occupational Health and Safety Services. Similarly, every steam boiler - section 67 (8) and/or steam receiver - section 68 (4) and all their fittings and/or attachments shall be thoroughly examined by an approved person at least once in every period of twelve months whereas every air receiver shall be thoroughly cleaned and examined at least once in every period of twenty four months or after any extensive repairs - section 69 (5). According to section 71 (3), every refrigeration plant capable of being entered by an employee also needs to be examined, tested and certified at least once in every period of twelve months by an approved person.

In relation to fire safety, section 78 (3) requires spillage or leaks of any flammable liquid to be contained or immediately drained off to a suitable container or to a safe place, or otherwise treated

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

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

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

Other precautionary measures include: issuance of a permit to work to any employee, likely to be exposed to hazardous work processes or hazardous working environment, including such work processes as the maintenance and repair of boilers, dock work, confined spaces, and the maintenance of machinery and equipment, electrical energy installations, indicating the necessary precautions to be taken – section 96 (1); provision and maintenance for the use of employees, adequate, effective and suitable protective clothing including suitable gloves, footwear, goggle and head coverings in any workplace where employees are likely to be exposed to wet, injurious or offensive substance – section 101 (1). The proponent will be required to ensure that the main contractor includes in the contract document, adequate measures to promote safety and health of workers.

2.4.9 Trade Licensing Act (Cap 497)

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

2.4.10 Environmental Vibration Pollution (Control) Regulations, 2009

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

i. Prohibition of excessive noise and vibration
ii. Provisions relating to noise from certain sources
iii. Provisions relating to licensing procedures for certain activities with a potential of emitting excessive noise and/or vibrations and
iv. Noise and excessive vibrations mapping.

According to regulation 3 (1), no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. Regulation 4 prohibits any person to (a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations which exceed 0.5 centimeters per second beyond any source property boundary or 30 metres from any moving source.

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

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

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

Regulation 16 (1) stipulates that where a sound source is planned, installed or intended to be installed or modified by any person in such a manner that such source shall create or is likely to emit noise or excessive vibrations, or otherwise fail to comply with the provisions of these Regulations, such person shall apply for a License to the Authority. According to regulation 18 (6)

the license shall be valid for a period not exceeding seven (7) days. Regulation 19 (1) prohibits any person to carry out activities relating to fireworks, demolitions, firing ranges or specific heavy industry without a valid permit issued by the Authority. According to sub regulation 4, such permit shall be valid for a period not exceeding three months. The project proponent will be required to comply with the above mentioned regulations in order to promote a healthy and safe working environment.

CHAPTER THREE: PROJECT DESCRIPTION

3.1 Project Background

3.1.1 Location of project site

The proposed construction site is located along Mkungu Close. It lies on Plot L.r. no. 1870/I/209 in Parklands area – Nairobi City County.

Cadastral image showing the location of the plot

SOURCE; NAIROBI CADASTRAL

3.1.3 Neighbourhood Characteristics

The plot is located in an area that is compatible with other neighbouring land uses e.g residential (Mkungu apartments), religious institutions (luthern church), other educational facilities include oshwal primary school and library, Westlands film school among others. The strategic location of this plot has however changed with the increasing demand for housing forcing the proponent to construct more accommodation facilities for the growing population.

Figure 2: An aerial view of the neighbourhood

Source; Google earth image

3.1.4 Proposed Development

The motivation for establishment of the project is the existing high demand for affordable houses in Parklands area. The conceived project is designed to be within character of the current housing trend of the project area, where a survey revealed that Maisonettes/Town Houses/flats and apartments are common. Thus such developments are guaranteed of attracting the desired clientele. Development of **eighteen storied residential apartment with a total of two hundred and sixty three units (263) complete** with the following:

- **BASEMENT 1 TO 3;** Adequate parking space, 3 floors of parking **with 250 bays**
- **Ground plinth;** security desk, flower bed, basement entry and exits, daycare/children's' play area, boutique(2), salon, waiting areas(2), kiosks (2),pantry, counter, convenience

store, toilets, garbage collection loading and unloading area, management office, chemist, cafeteria, DQ set and transformer.

- **PODIUM 1 AND 2:** 2 floors of parking with staff washrooms and showers.
- **3RD FLOOR (COURTYARD**); has sixteen units; fourteen(14) two bedroomed units and two(2) one bedroomed units
- **Fourth floor(4th) to 15th FLOORs (typical):** each floor has eighteen units; fourteen(14) two bedrooms , two(2) one point five (1.5) units and two (2) one bedrooms
- **16th floor;** has sixteen units **;** 14 three bedroomed units and two(2) four bedroomed units
- **17TH FLOOR:** has 15 units; fourteen(14) three bedroomed units and one four bedroomed unit
- **18TH FLOOR :** Residents lawn and party area, squash courts, gymnasium, yoga, swimming pool, buffet counters, kitchen services and utilities, ladies locker and changing rooms and gents locker.
- **19th Floor (Terrace);** solar panels (2), swimming pool, overhead water tank and buffet counters.

3.2 Infrastructure

The development will have a comprehensive and robust infrastructure including access roads, parking areas, water storage, electricity distribution and waste disposal mechanism.

3.2.1 Electrical system

There will be connection to the existing electricity main line of the Kenya Power Company, which will be used in all phases of the project. The necessary guidelines and precautionary measures relating to the use of electricity shall be adhered to.

3.2.2 Water Reticulation system

Water from NCCWSC line will be used during construction and operation phases. More over there will be water storage tanks to increase water supply to various components of the houses.

3.2.3 Sewerage

The area has no sewer line thus all wastewater will be channeled to a septic tank/treatment plant.

3.2.4 Solid Waste

Solid waste management will consist of dustbins stored in cubicles protected from rain and animals. The waste will then be collected by a NEMA licensed private waste management company and be

composited, palletized or re-cycled depending on the waste management strategy to be adopted in line with the Environmental Management and Co-ordination (Waste Management) Regulations, 2006.

3.2.5 Security

There will be the main entrance for easy security operations around the compound a boundary wall connected with security alarms, entry control, and quick response systems will be used within the project area.

3.2.6 Fire safety

The development will provide firefighting facilities such as fire extinguishers in the form of hydrants and carbon dioxide gas extinguishers. Fire breaks have also been provided for.

3.2.7 Parking area

The drive way and parking area, which will be paved, will be spacious and provided with facilities such as drainage.

3.2.8 Perimeter Fence

A concrete boundary wall will be erected around the project site.

3.2.9 Landscaping

The site will be landscaped after construction, using plant species available locally. This will include establishment of flower gardens and lush grass lawns to improve the visual quality of the site where pavements will not have taken space.

3.2.10Buildings Construction

The technology used in the design and construction of the apartments will be based on international standards, which have been customized by various housing units in Kenya.

The project will consist of residential apartments complete with associated facilities, parking's and infrastructure as presented in the architectural drawings in the appendix.

The buildings will be constructed as per the respective structural engineer's detail as provided for in the drawings presented in the Appendix. Basically, the building structures will consist of concrete appropriately reinforced with metal (steel and iron). The roof will consist of structural timber and

steel members and roofing tiles. The buildings will be provided with a well-designed concrete staircase for every house.

The buildings will be provided with facilities for drainage of storm water from the roof through peripheral drainage systems into the drainage channels provided and out into the natural drainage channel/system. Drainage pipes will be of the PVC type and will be laid under the buildings and the driveway encased in concrete. This is a sparsely build area and such no need for public drainage channel. The buildings will have adequate natural ventilation through provision of permanent vents in all habitable rooms, adequate natural and artificial light, piped water stored in above ground water tanks and firefighting facilities.

3.3 Description of the Project's Construction Activities

3.3.1 Pre-construction Investigations

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

3.3.2 Sourcing and Transportation of Building Materials

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

3.3.3 Clearance of Vegetation.

The site has vegetation such as grass and mature trees growing in it and other scanty shrubs. The proponent shall ensure as many indigenous trees as possible are used for revegetation.

3.3.4 Storage of Materials

Building materials will be stored on site. Bulky materials such as rough stones, ballast, sand and steel will be carefully piled on site. To avoid piling large quantities of materials on site, the proponent will order bulky materials such as sand, gravel and stones in bits. Materials such as

cement, paints and glasses among others will be stored in temporary storage structures, which will be constructed within the project site for this purpose.

3.3.5 Excavation and Foundation Works

The soil cover in the proposed area is thin and the rocks are exposed to the surface in some areas, with a thin layer of black cotton soil about 4 inches deep. However this shall be excavated and disposed off in approved sites (preferably exhausted quarries).

3.3.6 Masonry, Concrete Work and Related Activities

The construction of the building walls, foundations, floors, pavements, drainage systems, perimeter fence and parking area among other components of the project will involve a lot of masonry work and related activities. General masonry and related activities will include stone shaping, concrete mixing, plastering, slab construction, construction of foundations, and erection of building walls and curing of fresh concrete surfaces. These activities are known to be labour intensive and will be supplemented by machinery such as concrete mixers.

3.3.7 Structural Steel Works

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

3.3.8 Roofing and Sheet Metal Works

Roofing activities will include sheet metal cutting, raising the roofing materials such as clay roofing tiles and structural timber to the roof and fastening the roofing materials to the roof.

3.3.9 Electrical Work

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

3.3.10 Plumbing

Installation of pipe-work for water supply and distribution will be carried out within the entire building. In addition, pipe-work will be done to connect sewage from the premises to the septic tanks.

3.3.11 Landscaping

To improve the aesthetic value or visual quality of the site once construction ceases, the proponent will carry out landscaping. This will include establishment of flower gardens and lush grass lawns

where applicable and will involve replenishment of the topsoil. It is noteworthy that the proponent will use plant species that are available locally preferably indigenous ones for landscaping.

3.4 Description of the Project's Operational Activities

3.4.1 Residence

A number of families will reside within the project site once its construction is complete. Several domestic activities such as cooking, washing, use of vehicles, and leisure and recreational activities will thus accompany residence. In addition, there will be production of domestic and sanitary wastes.

3.4.2 Solid Waste

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

3.4.3 Waste Water and storm water Management

Sewage generated from each house/unit will be discharged into the existing and proposed septic tanks in the plot.

3.4.4 General Repairs and Maintenance

The Houses and associated facilities will be repaired and maintained regularly during the operational phase of the project. Such activities will include repair of building walls and floors, repairs and maintenance of electrical gadgets and equipment, repairs of refrigeration equipment, repairs of leaking water pipes, painting, maintenance of flower gardens and grass lawns, and replacement of worn out materials among others.

3.5 Description of the Project's Decommissioning Activities

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

- Remove all underground facilities from the site

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

3.5.1 Dismantling of Equipment and Fixtures

All equipment including electrical installations, furniture partitions, pipe-work and sinks among others will be dismantled and removed from the site on decommissioning of the project. Priority will be given to reuse of these equipment in other projects. This will be achieved through resale of the equipment to other building owners or contractors or donation of this equipment to schools, churches and charitable institutions.

3.5.2 Site Restoration

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

3.5.3 Building Materials and Energy Used

Several building materials will be required for construction of the Houses and associated facilities. These will include sand, ballast, hard core, timber, cement, clay tiles, metal sheets, electrical gadgets, and steel, plumbing materials, glass and paints among others. Most of these materials will be obtained locally within Athi River and Nairobi as well as surrounding areas. The main sources of energy that will be required for construction of the project will include mains electricity and fossil fuels (especially diesel). Electricity will used for welding, metal cutting/grinding and provision of light. Diesel will run material transport vehicles and building equipment/machinery such as bulldozers and concrete mixers.

The proponent intends to promote efficient use of building materials and energy through proper planning to reduce economic and environmental costs of construction activities.

3.5.4 Solid Waste Generated

Large amounts of solid waste will be generated during construction of the project. These will include metal cuttings, rejected materials, surplus materials, surplus oil, excavated materials, paper bags, empty cartons, empty paint and solvent containers, broken glass among others. The proponent will take steps to minimize the generation of such waste and to ensure proper disposal procedures.

A lot of domestic waste such as waste from foodstuffs, empty plastic containers, cartons, etc will be generated during the operational phase of the project. The proponent will be responsible for waste management within the Housing Project and will put in place measures such as provision of waste handling facilities and ensuring prompt and regular waste disposal. On decommissioning, large quantities of solid waste will be generated from demolition works and equipment dismantling. The proponent will provide measures for recycling, reuse or disposal of such wastes.

3.6 Public participation

Public participation basically involves engaging members of the public to express their views about a certain project. Public participation tries to ensure that due consideration will be given to public values, concerns and preferences when decisions are made. Public participation in this project was facilitated through interviews with the project proponent and neighbors of the facility. They however reiterated that more emphasis should be put towards ensuring that the proposed project and its infrastructure would not negatively interfere with the environmental integrity of the surrounding areas. Most of those interviewed welcomed the development of this project in the area. A sample of the neighbor's comments, occupation, contacts and signatures has been appended in this report.

Public involvement is a fundamental principle of the EIA process. Timely, well planned and appropriately implemented public involvement programmes will contribute to EIA studies and to the successful design, implementation, operation and management of proposals. Specifically public involvement is a valuable source of information on key impacts, potential mitigation measures and the identification and selection of alternatives. It also ensures the EIA process is open, transparent and robust, characterized by defensible analysis. Nearly all EIA systems make provision for some type of public involvement. This term includes public consultation (or dialogue) and public participation, which is a more interactive and intensive process of stakeholder engagement. Most EIA processes are undertaken through consultation rather than participation. At a minimum, public involvement must provide an opportunity for those directly affected by a proposal to express their views regarding the proposal and its environmental and social impacts. The purpose of public involvement is to:

- Inform the stakeholders about the proposal and its likely effects;
- Canvass their inputs, views and concerns; and
- Take account of the information and views of the public in the EIA and decision making.

The key objectives of public involvement are to:

- obtain local and traditional knowledge that may be useful for decision-making;
- facilitate consideration of alternatives, mitigation measures and tradeoffs;
- ensure that important impacts are not overlooked and benefits are maximized;
- reduce conflict through the early identification of contentious issues;
- provide an opportunity for the public to influence project design in a positive manner (thereby creating a sense of ownership of the proposal);
- improve transparency and accountability of decision-making; and
- Increase public confidence in the EIA process.

Experience indicates that public involvement in the EIA process can and does meet these aims and objectives. Many benefits are concrete, such as improvements to project design. Other benefits are intangible and incidental and flow from taking part in the process. For example, as participants see their ideas are helping to improve proposals, they gain confidence and self-esteem by exchanging ideas and information with others who have different values and views.

Public participation exercise for the assessment was carried out. Interviews were carried out in the neighbourhood by the use of questionnaires (sample attached), to find out all the views from the neighbours' towards the housing project. Neighbouring the site are several apartments. All of the interviewed had no objection to the proposed project save for a few environmental issues such as noise during construction and dust which have been addressed below and in the EMP.

CHAPTER FOUR: BASELINE INFORMATION

This section provides detailed information of the site where the project is undertaken. It broadly examines the physiographic factors, social and economic forces both visible and invisible as they operate and the stimuli the new project is likely to inject. All major parameters are assessed to establish their capacities and abilities. Baseline information provides a basis to ascertain the implication of the development process and determine the mitigation measures to be undertaken or suitable to ameliorate the identified impacts.

4.1 Location

The proposed development project on Plot **L.R. NO. 1870/I/209** in Parklandsarea – Nairobi city county.The parcel of land measures approximately **0.3302Ha.** The area is served with key infrastructure such as power (electricity), good road networks, communication facilities to mention but a few. Liquid waste will handled by use of a well maintained septic tank to be constructed on site. The proposed development is therefore in harmony with the existing neighbourhood. The project is designed to merge well with the environment by ensuring excellent state of the art architectural works. The project proponent will be bound by the entire existing relevant legislature and their consequent amendments.

4.1.1 Proposed Site & Zone Character

The project falls in an area that has been undergoing great transformation. Most developments abutting the project access road are residential and educational facilities. From the foregoing mixed use within the zone provides urban services to many residents of Westlands. Development of proposed residential apartments is bound to improve the land value of the subject plot ultimately contributing to growth and economic development of the zone, Parklandsarea and by extension Nairobi City County.

4.2 Physical Environment

4.2.1 Climate

The climate of the area is characterized by a bimodal rainfall pattern where short rains are experienced from October to December, and long rains from March to May. April is the wettest month in the year. During the year, the area temperature varies from 12°C to 28°C and is rarely below 9°C or above 30°C. During the months of late January to late march the area experiences warmest seasons with an average daily high temperature above 27°C. The June to august period is characterized by a cold spell with an average daily high temperature below 24°C. August is the coldest month in the year. The mean annual rainfall is about 900 mm and an annual potential

evaporation of about 1600 mm. Although the potential evaporation appears to be high compared to the rainfall, it is noted that the rainfall seasons are relatively cool and evaporation values are thus low. This condition gives way to adequate rain for run-off, percolation for replenishment of ground water and sufficient moisture for crops and vegetation growth.

4.2.3 Soils

The site is characterized with both red loamy soils and black cotton soils.

4.3 Biological Environment

4.3. 1 Flora

The site is located within an area characterised by mixed land uses where human activity has altered the flora. The land where the development will take place is currently used for residential purposes. There are various crops such as maize, bananas and Napier grass. Remnants of the natural vegetation are weeds, green grass and dry grass. There are few trunk trees onsite thus minimal interference of the natural flora is envisaged as the seasonal water weeds onsite shall be cleared to pave way for proposed construction works without affecting the micro climate of the area

4.3.2 Fauna

The site is situated within a mixed land use zone where human activities have altered the natural habitat for animals over the years. The project site is in an urban setting and thus the site does not serve as a unique habitat for any threatened native species except may be small insects, birds and lizards. As a result the proposed project does raise grave concerns in relation to displacement of fauna.

4.4 Socio-Economic Environment

Kenya's real gross domestic product (GDP) grew by 5 .8per cent in 2005 against a revised growth of 4.9 percent in 2004 (CBS 2006).The major growth sectors were agriculture and forestry; transport and communications; manufacturing; and wholesale and retail trade. Economic growth is expected to be sustained in 2006. Nairobi is a major contributor to Kenya's economy: it generates over 45 per cent of GDP; employs 25 per cent of Kenyans and 43 per cent of the country's urban workers (UN-Habitat 2006).The paradox is that the financial capacity of the Nairobi City County is extremely limited, largely because of poor resource management and a weak revenue collection system. As a result, there is a 200 per cent shortfall between the revenue collected per capita ($7 on average) and per capita expenditure ($21) (UN Habitat 2006).

3.4.1 Land use:

Urban land use refers to spatial distribution of social and economic activities. Accordingly, an up-to-date land use inventory is frequently required to facilitate urban planning and growth patterns as well as monitoring of urban expansion. A study by the Department of Resource Surveys and Remote Sensing (DRSRS 1994) identified eight major land-use classes in Nairobi. These include Residential use Industrial, commercial and service centres, Infrastructure land use, Recreational areas, urban agriculture as well as Water bodies and riverine areas.

3.4.2 Economic Activity:

The economy and the environment are closely linked, as natural resources are the basis of production, manufacturing and waste disposal. Environmental resources such as forests, water and land have a vital role to play in boosting economic growth and reducing poverty. While it may be argued that economic growth brings many benefits to people, the attendant pollution loading and resource depletion poses great risks to human health and the environment.

If not managed properly this may even jeopardize the viability of the economic activities being supported. Nairobi is a major contributor to Kenya's economy: it generates over 45 per cent of GDP; employs 25 per cent of Kenyans and 43 per cent of the country's urban workers (UN-Habitat 2006).The paradox is that the financial capacity of the Nairobi City County is extremely limited, largely because of poor resource management and a weak revenue collection system. As a result, there is a 200 per cent shortfall between the revenue collected per capita ($7 on average) and per capita expenditure ($21) (UN Habitat 2006).

3.4.3 Population

Population is a major driver of environmental change in Nairobi and as such is a determinant of other parameters such as solid-waste-generation rates, land-use patterns and settlement, and water consumption. The population of Nairobi grew from 8,000 in 1901 to 118,579 in 1948 (Rakodi 1997). By 1962, the city had a population of 343,500 people, although some of this could be attributed to extension of the city's boundaries. Between the 1948 and 1962 censuses, the population grew at an average rate of 5 .9 per cent per annum, compared with 7 .6 per cent in the previous 12-year period. Taking the 1999 census figures as a baseline, it is projected that the city's population by the next census in 2009 will be about 3 .1 million, and 3 .8 million by 2015 (CBS 2001).

3.4.4 Employment Trend

As Nairobi's population increases, so does the demand for jobs. Currently, 56 .6 per cent of women and 68 .6 per cent of men aged between 15 and 50 are economically active (CBS et al. 2004).Between 1989 and 1997, the combined formal and informal sector employment growth.

3.5 Socio-economic Importance of the proposed project

The proposed project is in line with the governments' housing policy that aims to facilitate the attainment of adequate shelter and healthy living environment to all socioeconomic groups in Kenya. The project will therefore help to increase learning opportunities in the region by investing in the housing facility; the proponent will also contribute towards the economic growth of our nation through revenue collection. In particular, the proposed project will generate the following positive socio-economic impacts:

- The proposed project will serve as a source of income to the proponent thereby improving their living standards
- During the operation phase of the project, the proponent will be required to pay tax to the government hence contributing to the economic growth of our nation
- The proposed project will indirectly contribute towards enhancement of security in the neighbourhood of the area
- The proposed project will generate revenue to the County council through payment of connection and service fee.

Apart from the direct employment of construction workers, the proposed project will also benefit the following categories of individuals:

- Transporters. Investors on lorry and trailer transport will benefit greatly from the project. This benefit will extend to vehicle dealers and manufacturers, lorry drivers and turn boys.
- Cement Manufacturers. The local cement manufacturers and their employees and shareholders are direct beneficiaries of the development.
- Manufacturers and dealers of other building materials. Most of the building materials to be used are locally manufactured. Relevant companies, their workers and shareholders will be direct beneficiaries of the development.

- Sand Harvesters. Locals involved in sand harvesting in sand harvesting are to be major beneficiaries' of the project. The benefit will extend to the local authority entitled to levy taxes on sand transporters.
- Ballast Quarries. There will be massive use of ballast. These will ensure that the Quarry owners and workers benefits greatly.

CHAPTER FIVE: IMPACT ASSESSMENT METHODOLOGY & ANALYSIS OF ALTERNATIVES

5.1 Introduction

This chapter will describe the impact assessment methodology to be used for this project. The methodology has been developed by the consultant and aims to provide a relatively objective approach for the assessment of potential impacts.

5.2 Methodology

To ensure a direct comparison between various impacts, standard rating scales have been defined for assessing and quantifying the identified impacts. This is necessary since impacts have a number of parameters that need to be assessed. Five factors need to be considered when assessing the significance of impacts, namely:

1. Relationship of the impact to **temporal** scales – the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
2. Relationship of the impact to **spatial** scales – it defines the physical extent of the impact.
3. The severity of the impact – the **severity/beneficial** scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party.
4. The **likelihood** of the impact occurring – the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance. Each criterion is ranked with scores assigned to determine the overall **significance** of an activity.

5.3 Analysis of Alternatives

5.3.1 The No Action Alternative

The No Action Alternative in respect to the proposed project implies that the status quo is maintained i.e. no construction/development activity to take place. This option is most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. However, the need for such development is high and the anticipated insignificance environmental impacts resulting from construction have already been experienced.

This option will however, involve several losses both to the project proponent/land owner and the Kenya society and Government. The property will remain under-utilized or neglected. The No Project Option is the least preferred from the socio-economic and partly environmental perspective since if the project is not done: -

- ❖ The economic benefits especially during constriction i.e. provision of jobs for skilled and non-skilled workers will not be realized.
- ❖ There will be no generation of income by the developer and the Government.
- ❖ The social-economic status of Kenyans would remain unchanged.
- ❖ The local skills would remain under utilized
- ❖ No employment opportunities will be created for Kenyans.
- ❖ Discouragement for investors to produce this level of standard and affordable developments.

5.3.2 The relocation Alternative

Relocation option to a different site is an option available for the project implementation. At the moment, there are no alternative sites for the proposed development (i.e. the project proponent doesn't have an alternative site). This means that the proponent has to look for the land if relocation is proposed. Looking for the land to accommodate the scale and size of the project and completing official transaction on it may take a long period. In addition, it is not a guarantee that such land would be available. It's also worth noting that the said project is already underway in terms of seeking development approvals in various government departments. The project proponent would spend another long period of time on design and approvals of the plans by the relevant government departments. The project design and planning before the stage of implementation would call for costs; already incurred in the proposed development i.e. whatever has been done and paid to date would be counted as a loss to the proponent. In consideration of the above concerns and assessment of the current proposed site, relocation is not a viable option. From the analysis above, it becomes apparent that the No Project Alternative is not the appropriate alternative to the local people, Kenyans, and the Government of Kenya.

5.3.2 Alternative Land Use Activities

The area is in a residential zone i.e. used for residence. Alternative land use activities such as farming, grazing land and car repairs will conflict with surrounding land use activities. For uniformity purposes, the proponent is interested in construction of residential houses similar both in form and character to what is existing in the neighbourhood (residential apartments).

5.3.3 Alternative to Construction Materials and Technology

There is a wide range of construction and furnishing materials which can be sourced locally and internationally. In this construction, certified raw materials/equipments and modern technology will be used. Also, electrical appliances that save energy will be given first priority. The concrete pillars and walls will be made using locally sourced stones, cement, sand (washed and clean), metal bars and fittings that meet the Kenya Bureau of Standards requirements.

5.3.4 Solid Waste Management Alternatives

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

5.3.5 Project Design

This Environmental Impact Assessment Project Report is based on information and consultations with the project proponent, the Architect and details contained in the architectural plans and drawings of the project. The project will entail construction of residential apartments.

CHAPTER SIX: ANTICIPATED IMPACTS AND MITIGATION MEASURES

A number of processes that may impact negatively on the environment, workers, neighbors, pedestrians and society at large are anticipated. The impacts may be positive or negative. This report proposes mitigation measures for the negative impacts and identifies the desirable social and economic benefits as discussed in the following paragraphs.

6.1 Negatives factors

6.1.1 Solid waste

The activities during excavation and construction will generate considerable solid waste in the form of soil, stones, tiles, timber, metal, glass, plastics and other debris. The soil generated from excavation and other solid waste will be disposed off at sites approved by the local authority. Useful wastes such as building stones, roofing tiles and timber will be recycled. Useful material not required will be stored in the contractor's yard. Waste storage receptacles will be provided within the premises to deposit solid waste before it is transported to designated disposal site by the county government. Organic waste generated by school activities should be composted for use within the schools gardens and flower beds.

6.1.2 Liquid and human waste

Liquid waste is anticipated from wastewater during construction and water supply pipes during operation. The proponent has confirmed that the site engineers will closely supervise related activities to ensure that leakages are avoided. Storm water will be channeled to storm drainage channels. After construction, wastewater will be channeled to the sewage treatment facility or sewer. The sewage treatment will be connected to the sewer line and the waste will be pumped to the sewer line which is on the upper side of the plot due to the gradient difference.

6.1.3 Biodiversity

Some vegetation will be cleared at the development site. Grasses dominate the specific development site. Proper mitigation measures will be put in place to ensure that there will be landscaping upon completion of the project.

During construction, disturbed birds and insects will find refuge in the neighbourhood where there is sufficient vegetation to accommodate them. The proponent has confirmed that he will implement a landscaping programme after construction that will rehabilitate the disturbed areas.

6.1.4 Increased water demand

Demand for water will increase during construction and occupation. The contractor and the house occupants are expected to use water conservatively during construction and occupation respectively to avoid wastage. It is expected that the Nairobi City Water And Sewerage Company will continuously monitor water demand and improve supply with the new developments taking place in the area. The proponent is advised to drill a borehole and harvest rainwater to supplement the NCWSC water supply.

6.1.5 Air pollution

Air quality will be affected by dust during excavation for the foundation, burning material, hydrocarbons, nitric/nitrous and sulphuric/sulphurous oxides from vehicles and other automotive machinery in use. The proponent has been advised to fence the site during construction, to spray water on all loose soil and debris, to provide workers with masks, and to properly service all automotive machinery to reduce emission of exhaust fumes. If these measures are implemented, the amount and harmful effects of air pollutants will be minimal and temporary. As stated earlier, excavation of the foundation and other air pollution generating activities will have minimal impact; in any case, most of the pollutants will be dissipated widely by the wind, thus reducing concentration at the source and in the immediate neighbourhood.

6.1.6 Noise pollution

Increased noise levels are anticipated, mostly from excavation of the foundation, heavy vehicles supplying construction material and workers' generated noise. However, all machines that will not be in use should be switched off to minimize amount of noise generated.

6.1.7 Traffic hazard

Vehicular traffic will comprise of Lorries supplying building material to the site and more traffic is anticipated during occupation. Erection of warning signs that construction is in progress, and strict observation of highway safety code will greatly reduce chances of vehicle accidents.

6.1.8 Health and safety of workers, students and neighbours

Health and safety of the workers, students and neighbours is of critical concern. The main concerns are physical injuries, site accidents, exhaust fumes and noise. Workers will be exposed to possible machinery injury, dust, gaseous emissions from transport vehicles and other automotive machinery on site, noise, and falling material such as masonry stones, timber, and steel. Health risks associated with gas emissions from exhaust are considered to be relatively low. Dust and fumes will have a

bigger impact on workers, as they will be working at the sources of emission. The amount of dust so generated will be minimal if buffer fences are erected and water sprayed on all loose soil and other debris.

The following are the predictable negative impacts with the proposed mitigations,

PREDICTABLE NEGATIVE IMPACTS	**IMPACT STAGE**	**SIGNIFICANCE**	**PROPOSED MITIGATIONS**
Air and dust pollution	C, D	Moderate	➢ Fence the site to minimize the amount of dust generated during excavation, construction and demolition during project decommissioning. ➢ Buildings under construction should be covered with dust arrestors during construction. ➢ Spray water on loose soil and debris during excavation and construction phases. ➢ Minimize emission of exhaust fumes through servicing of machinery in use. ➢ Provide site workers with nose masks.
Noise Pollution	C, D	Low	➢ Provide workers with ear plugs and muffs. ➢ Ensure Lorries supplying building materials and other site machinery are well serviced to reduce noise emission. ➢ Machinery that makes excessive noise should fixed with silencers. ➢ Designate one gate exclusively for material delivery and deliver materials during non-school hours and weekends.
Solid waste	C, O, D	Moderate	➢ Dispose solid waste and construction debris at dumping sites approved by the county government. ➢ Reuse/Recycle useful material in the construction. ➢ Store unused useful materials in the contractor's yard. ➢ Compost or incinerate waste as appropriate.
Liquid & Human waste	C,O,D	Moderate	➢ Provide toilets for workers during construction. ➢ Channel all wastewater and human waste during occupation to the sewage treatment facility. From the sewage treatment facility the waste will be pumped to the sewer line which passes near the plot.

Vehicle accidents	C,D	Low	➢ Erect warning signs that construction is in progress. ➢ Vehicles to drive carefully and observe road safety rules. ➢ Pedestrians to observe road safety rules and regulations. ➢ Remove all objects that would obstruct visibility or pose site accident risks. ➢ Designate one gate exclusively for material delivery and deliver materials during non-school hours and weekends.
Increased traffic	O	Low	➢ Designate one gate exclusively for material delivery and deliver materials during non-school hours and weekends. ➢ Provide adequate on plot parking for the occupants
Occupational health and safety of students & workers	C, D	Moderate	➢ Sensitize workers on safety measures required during construction. ➢ Provide workers with appropriate personal protective clothing, helmets & boots. ➢ Provide well stocked first aid kits ➢ Fence off construction sites ➢ Buildings under construction should be covered with dust and debris arrestors during construction.
Increased water consumption	C, O	Moderate	➢ Harvest rainwater and dig a borehole to supplement NWSC water supply. ➢ Use water conservatively.
Fire	C, O, D	High	➢ Install fire alarms and firefighting equipment. ➢ Drill the workers, students and occupants on firefighting skills.
Surface water pollution	C, O, D	High	➢ Channel liquid and human waste to the sewage treatment facility. From the sewage treatment facility waste should be pumped to the sewer line which passes near the plot.
Soil erosion	C,O,D	High	➢ Spray soil with water during excavation and construction ➢ Contain soil erosion ➢ Landscape the site with grass, flowers, ornamentals and other vegetation on project completion

Legend: C: Construction phase; O: Operation phase; D: Decommissioning phase.
Source: Consultants Compilation.

6.2 Positive Impacts

6.2.1 Employment during Construction and Operation

Employment for different cadre of professionals and other workers will be created during, construction, occupation and decommissioning phases. These workers include professionals (e.g. architects and engineers, technicians, electricians, artisans, masons, carpenters, plumbers) and manual workers. As is usual at the construction sites, kiosk-type food providers will feed workers and earn a living. These activities will create employment and generate incomes for the workers and their families. These outcomes are desirable and are in line with government goals of employment and wealth creation.

6.2.2 Improved Business

The project will improve income of various suppliers of construction material such as building stones, hard-core, ballast, sand, cement, steel, tiles, timber, glass, sanitary ware and paints. Business around the area will also realize increased sales.

6.2.3 Increased education facilities.

This project when completed will ensure more modern housing facilities in the neighbourhood. This will greatly help at solving the current shortage of housing.

6.2.4 Land Use Intensification

The development will result to a more economical use of the land without significant environmental degradation.

CHAPTER SEVEN: ENVIRONMENTAL MANAGEMENT PLAN (EMP) GUIDELINES

7.1 Introduction

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

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

Environmental management plan (EMP) for development projects such as the proposed residential development complex development is aimed at providing a logical framework within which identified negative environmental impacts can be mitigated and monitored. In addition, EMP assigns responsibilities for action to various actors, and provides time frame within which mitigation measures can be done.

EMP is a vital output for an environmental impact assessment as it provides a checklist for project monitoring and evaluation. A number of mitigation measures are already incorporated into the project design. The EMP outlined in Table 8-1 has addressed the identified potential negative impacts and mitigation measures for the proposed residential development.

7.2 Environmental Monitoring and Evaluation

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

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

- Disruption of natural environment and modification of microclimate
- Air and noise pollution
- Workers accidents and health infections during construction process

Table 6.1- 1: Environmental Management and Monitoring Plan

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES)	MONITORING MEASURES
Commissioning of the Construction Works	- Site hand-over and Ground breaking	Project team (Lead Consultant/Architect, contractor Proponent)	Part of/Covered in the Project Cost	Presence of the project Team
Securing the Construction Site	- Construction of Perimeter Wall and Hoarding	Contractor	Part of/Covered in the Project Cost	Presence of Perimeter Fence
Housing for Construction/ Site staff	Construction of Labour Camp	Contractor	200,000	Presence of Labour Camp
Security for Construction Material	- Construction of Site Stores - Construction materials to be delivered in small quantities to minimize storage problems	Contractor	100,000	Presence of Site store
Extraction and Use of Building Materials	- Availability and sustainability of the extraction sites as they are non-renewable in the short term - Landscape changes e.g. displacement of animals and vegetation, poor visual quality and opening of depressions on the surface	Contractor/Proponent/project team	Part of/Covered in the Project Cost	Material site rehabilitation
Collapse of Building during Construction	- Ensuring Building Strength and stability - Use of appropriate construction materials and reinforcements as per specifications - Ensuring building components are as per designs - Ensure proper timelines are followed e.g. curing time	Contractor/project team	Part of/Covered in the Project Cost	Presence of the project Team
Disturbance of Traffic flow during construction **Construction phases**	- Proper signage - Awareness creation - Education to truck drivers	Contractor/Project team and general public	450,000	- Presence of site Notice Board /Hoarding - Presence of Security guards to control traffic - Presence of warning signs
ENVIRONMENTAL IMPACT	**MITIGATION MEASURES**	**RESPONSIBILITY**	**COST (KES)**	**MONITORING MEASURES**
Soil Excavation leading to site disturbance	- Excavate only areas to be affected by buildings - Dumping of excess excavated materials to sites designated by NEMA and Council - Restoration of sites Excavated	Contractor	2,000,000	Landscaping after completion of construction
Soil Erosion	- Create and Maintain soil traps and embankments.	Contractor/Proponent	400,000	Lack/Absence of Soil

	- Landscaping after completion of construction	Architect/Site engineer Landscape Architect		Erosion
Noise Pollution and Vibration	- Ensure use of serviced and greased equipment - Switch off engines not in use - Construction work to be confined to between 8am to 5pm - Ensure use of earmuffs by machine operators	Proponent and Contractor	Part of Routine operation procedure	Lack of complaints
Air Quality	- Water sprinkling of driveways or the use of biodegradable hydrant e.g. Terrasorb polymer will reduce dust emission during construction - Ensure servicing of vehicles regularly	Proponent and Contractor	Part of Routine operation procedure	- Lack of complaints - Workers wearing protective clothing and earmuffs
Risks of Accidents and Injuries to Workers	- Education and awareness to all construction workers - Ensure use of appropriate personal protective clothing - Provide First Aid Kits on site - Ensuring Building Strength and stability - Proper supervision	Proponent Contractor	Part of Routine operation procedure	- Presence of well equipped First Aid kit - Presence of Security Guards on site - Presence of a register on the site
Health and Safety	- Provide First Aid Kits on site - Proper signage and warning to public of heavy vehicle turning - Ensuring Building Strength and stability - Provide clean water and food to the workers - The contractor to abide by all construction conditions especially clause B12 which stipulates health safety and workforce welfare	Proponent Contractor	Part of Routine operation procedure	- Presence of well equipped First Aid kit - Presence of Security Guards on site - Presence of a register on the site
ENVIRONMENTAL IMPACT	**MITIGATION MEASURES**	**RESPONSIBILITY**	**COST (KES)**	**MONITORING MEASURES**
Solid Waste Generation	- Ensure waste materials are disposed of on County and NEMA approved sites - Ensure re-use of materials that can be re-used - Use of the 3rs – Reduce, Re-use, Re-cycle	Proponent Contractor	500,000	- Absence of Solid waste on the site
Energy Consumption	- Use electricity sparingly since high consumption of electricity negatively impacts on these natural resources and their sustainability - Use of Standby Generators	Proponent Contractor	800,000	- Presence of KPLC power lines - Presence of Generators
Excessive Water Use	- Excessive water use may negatively impact on the	Proponent	900,000	- Presence of NCWSC

	water source and its sustainability	Contractor		water lines - Metering of water - Bore-hole presence
OCCUPATION PHASE				
Architectural incompatibility leading to distortion of neighbourhood aesthetic image	- Harmonize building scale with existing developments in neighbourhood. - Harmonize detail, material and finishes for roofs and walls with existing development in the neighbourhood.	Architect Proponent Contractor	Part of/Covered in the Project Cost	- Compatibility with the neighbourhood
- **Solid Waste Generation and Management**	- Regular inspection and maintenance of the waste disposal systems during operation phase - Establish a collective waste disposal and management system - Provide waste disposal bins to each house well protected from adverse weather and animals - Ensure waste materials are disposed of on Council and NEMA approved sites - Use of the 3rs – Reduce, Re-use, Re-cycle	Proponent Estate Managers	800,000	- Presence of NEMA registered waste management companies - Presence of waste handling bins - Absence of wastes
Liquid Waste Generation and Management	- Regular inspection and maintenance of the waste disposal systems during the operation phase - Connection to Sewer system/septic tank	Proponent Estate Managers	800,000	- Conventional sewer line and or septic tank - Presence of waste handling bins - Absence of wastes
ENVIRONMENTAL IMPACT	**MITIGATION MEASURES**	**RESPONSIBILITY**	**COST (KES)**	**MONITORING MEASURES**
Increased loading on Infrastructure services - Increased vehicular and/or pedestrian traffic - Increased demand on water, sanitation services	- Have paved local access road and walkway system - Encourage rainwater harvesting - Provision of increased water storage capacity - Provide adequate storm water drainage system	Contractor Proponent Estate Managers	900,000	- Absence of run-off - Presence of good roads - Pavements and drainage channels
Traffic	- Provide adequate parking facilities within the project site	Contractor/Proponent Residents	Routine operation procedure	- Presence of amble parking in the premises
Increased social conflict	- Increased Housing stock in the area and Kenya - Increased economic activities –employment generation. - Encourage formation of community policing and formation of neihgbouhood associations	Contractor Proponent Neighbourhood associations Estate Managers		

Storm Water impacts	- Provide roof gutters to collect and direct roof water to drains - Construct drains to standard specifications - Develop a storm water drainage system and linkage to natural drains	Proponent Contractor	340,000	Absence of Flooding and dampness in the building
Disruption of existing natural environment and modification of micro-climate – - Increased development density - Increased glare/solar reflection - Reduced natural ground cover/surface run-off - Obstruction of ventilating winds	- Development restricted to follow zoning policy/approved density – building line, plot coverage and plot ratio. - Careful layout and orientation of buildings to respect wind and sun direction. - Adequate provision of green and open space planted with grass, shrub and tree cover. - Minimum use of reflective building material and finishes for roof, wall and pavement.	Project team (Contractor Proponent, Architect or Lead Consultant, etc)	1,200,000	Proper orientation Planted trees/Landscaping
ENVIRONMENTAL IMPACT	**MITIGATION MEASURES**	**RESPONSIBILITY**	**COST (KES)**	**MONITORING MEASURES**
Insecurity	- Ensure secure perimeter wall where applicable - Have a single entry point that is manned 24 hours	Contractor, Proponent Neighbourhood associations Estate Managers	400,000	Presence of perimeter wall Presence of day and night security guards
DECOMMISSIONING PHASE				
Building Safety	Assess the condition of buildings to ascertain usefulness	Engineer/Proponent	900,000	Engineer and Tests on the building
Land and Building use	Ascertain the Planning development policy	County Authority Physical Planner	1,000,000	Consultants present
Accidents/Injuries	Securing the Site by fencing off	Contractor/Proponent	1,000,000	Presence of perimeter fence
Un-disconnected Services e.g. Power, Water, telephone, sewer etc	Ensure disconnection of all services Remove all surface and underground cables and wiring	Contractor	600,000	Absence of cabling
Solid Waste Generation (demolition waste)	- Ensure waste materials are disposed of on Council and NEMA approved sites - Ensure re-use of materials that can be re-used	Proponent/Contractor	800,000	Absence of Debris

	-Use of the 3rs – Reduce, Re-use, Re-cycle			
Noise and Vibration	- Ensure use of serviced equipment - Switch off engines not in use - Demolition work to be confined to between 8am to 5pm - Ensure use of earmuffs by workers	Proponent/Contractor	800,000	Lack of complaints from the neighbours

ENVIRONMENTAL HEALTH AND SAFETY (EHS)

8.1 EHS Management and Administration

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

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

8.2 Policy, Administrative and Legislative Framework

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

8.3 Organization and implementation of the EHS Management Plan

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

8.4 The Guiding Principles to be adopted by the contractor

The company will be guided by the following principle: -

- It will be a conscious organization committed to the promotion and maintenance of high standards of health and safety for its employees, the neighboring population and the public at large.
- Ensuring that EHS activities are implemented to protect the environment and prevent pollution.

- Management shall demonstrate commitment and exercise constant vigilance in order to provide employees, neighbors of the project and the environment, with the greatest safeguards relating to EHS.
- Employees will be expected to take personal responsibility for their safety, safety of colleagues and of the general public as it relates to the EHS management plan.

8.5 EHS management strategy to be adopted by the contractor

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

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

8.6 Safety Agenda for both the proponent and contractor

There will be a permanent EHS agenda during construction.

(a) Contractors

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

- Legal requirements.
- Statutory obligations.
- Obligation to lay-down a system for reporting accidents
- Responsibility to ensure that his/her employees are supplied with personal protective equipment and where applicable as per the EHS management plan for the whole project.
- Responsibilities as it relates to contracting an EHS consultant in liaison with the proponent
- Obligation to ensure that he obtains detail of jobs and areas where permit-to-work must be issued

(b) All residents' and workers' responsibility

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

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

(a) The contractor

The contractor will ensure that:

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

(b) The Traffic / Drivers

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

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

c) Fire hazard at the construction site,

Workers at the site shall ensure that: -

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

8.8 Welding at the construction site

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

- Ensure that welding clamp is fixed such that no current passes through any moving parts of any machine.
- Ensure that all welding clamps are in good operating condition and conduct current without arcing at the point of contact.

- Ensure that welding clamps are free from any contact with explosive vapors i.e. Oil spillage, Fuel tanks, Coal dusts and miscellaneous combustible material (e.g. Cotton rags filter bags, rubber belting, and wood shavings).
- Ensure that any slag or molten metal arising from welding activities does not start up fires by:
    - ✓ Clearing combustible material to a distance of at least 3 meters away from the working area or covering area with metal or asbestos sheet.
    - ✓ Appropriate fire extinguisher is to be kept available for immediate use at all times

8.9 Emergency procedure during construction and operation

An emergency situation means:

- Unforeseen happening resulting in serious or fatal injury to employed persons or the neighbouring communities.
- Fire or explosion.
- Natural catastrophe.

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

- Alert other persons exposed to danger.
- Inform the EHS coordinator.
- Do a quick assessment on the nature of emergency.
- Call for ambulance on standby.
- When emergency is over the EHS coordinator shall notify the workers by putting a message: "ALL CLEAR"

In the event of such an emergency during operation the workers shall: -

- Alert other persons exposed to danger.
- Ring the nearest police station
- Call for ambulance.

CHAPTER NINE: DECOMMISSIONING

9.1 Introduction

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

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

The table below shows the proposed decommissioning plan:

Table 9.1 EMP for Decommissioning

Expected Negative Impacts	**Recommended Measures**	**Responsible Party**	Time Frame	Cost (KShs)
1. Construction Machinery/Structure & Wastes				
Scraps material and other debris	Use of an integrated solid waste management system i.e. through a hierarchy of options. Wastes generated as a result of facility decommissioning activities will be characterized in compliance with standard waste management procedures. The contractor will select disposal locations and the County council based on the properties of the particular waste generated.	Project Manager & Contractor	During decommissioning	3,000,000
	All buildings, machinery, equipment, structures and partitions that will not be used for other purposes should be removed and reused or rather sold/given to scrap material dealers.	Project Manager & Contractor	During decommissioning	-
	Where recycling/reuse of the machinery, equipment, structures and other waste materials is not possible the materials should be taken to approved dumpsites.	Project Manager & Contractor	During decommissioning	-
Rehabilitation of project site				
Vegetation disturbance Land deformation: soil erosion, drainage problems	-Implement an appropriate re-vegetation programme to restore the site to its original status. -During the vegetation period, appropriate surface water runoff controls will be taken to prevent surface erosion; -Monitoring and inspection of the area for indications of erosion will be conducted and appropriate measures taken to correct any occurrences; -Fencing and signs restricting access will be posted to minimize disturbance to newly-vegetated areas;	Project Manager & Contractor	During decommissioning	2,000,000
Social- Economic impacts				
-Loss of income -Loss of housing facilities	The safety of the workers should surpass all other objectives in the decommissioning project. -Adapt a project – completion policy; identifying key issues to be considered. -Compensate and suitably recommend the workers to help in seeking opportunities elsewhere.	Project Manager & Contractor	During decommissioning	3,000,000

CHAPTER TEN: RECOMMENDATIONS AND CONCLUSION

The report provides an overview of potential impacts occasioned by implementation of the project. Each impact identified has corresponding mitigations. The project falls in a category of low impact projects. There are many benefits expected from the proposed development to Nairobi County, and the country at large. The proposed development is an important housing facility to Parklandsand the entire Nairobi City County. The project is environmentally safe and does not interfere negatively with the spatial development of the area. Its operation is least likely to disrupt or interfere with other operations in the neighbourhood.

This report established that the proposed project is a timely venture with positive and significant contribution to the government housing sector. It is with these considerations that I recommend this project for approval and issuance of NEMA license to facilitate commencement of works on site.

Major concerns should nevertheless be focused towards minimizing the occurrence of impacts that would degrade the general environment. This will however be overcome through close following and implementation of the recommended Environmental Management and Monitoring Plans (EMPs). Annual audits shall also be executed to establish efficiency and adequacy of operational systems.

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