REPUBLIC OF KENYA

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED SOCIAL HOUSING MET SITE, NAIROBI KENYA

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18th June 2020

PROPONENT

The Secretary of Housing

Ministry of Transport, Infrastructure, Housing, Urban Development & Public Works

State Department of Housing and Urban Development,

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CERTIFICATE OF DECLARATION AND DOCUMENT AUTHENTICATION

This document has been prepared in accordance with the Environmental (Impact Assessment and Audit) Regulations, 2003 of the Kenya Gazette Supplement No.56 of 13th June 2003, Legal Notice No. 101.

This report is prepared for and on behalf of:

The Proponent

The Secretary of Housing

Ministry of Transport, Infrastructure, Housing, Public Works & Urban Development

State Department of Housing and Urban Development,

P.O. Box 30130-00100,

Nairobi - Kenya.

Designation _____

Name _____

Signature _____

Date _____

Lead Expert

Eng. Stephen Mwaura is a registered Lead Expert on Environmental Impact Assessment/Audit (EIA/A) by the National Environment Management Authority –NEMA (Reg. No. 7284), confirms that the contents of this study report are a true representation of the Environmental & Social Impact Assessment of the proposed redevelopment of Kenya Meteorological Department land in Industrial Area of Nairobi City County into affordable housing units. This report is issued without prejudice.

Designation Lead Expert

Name Eng. Stephen Mwaura

Signature _____

Date _____

ABBREVIATIONS

CBD	Convention on Biological Diversity
CPP	Consultations and Public Participation
EA	Environmental Audit
EHS	Environmental Health and Safety
ESIA	Environmental and Social Impact Assessment
EMCA	Environmental Management and Coordination Act
ESMMP	Environmental & Social Management and Monitoring Plan
GRM	Grievance Redress Mechanism
GBV	Gender Based Violence
KPLC	Kenya Power and Lighting Company
MASL	Metres above Sea Level
NCCG	Nairobi City County Government
NEMA	National Environment Management Authority
NBSAP	National Bio-diversity Strategy and Action Plan
NEAP	National Environmental Action Plan
NWSC	Nairobi Water & Sewerage Company
PPE	Personal Protective Equipment
OHS	Occupational Health and Safety
OSHA	Occupational Safety and Health Act
TOR	Terms of Reference
WIBA	Work Injury Benefits Act

EXECUTIVE SUMMARY

Globalization, urbanization, migration and technological advancements have continued to drive cities forward right from their infant stages, the cyclic processes, growth, through to their renewal and regeneration. More and more people are moving and positioning themselves in cities for business, work, venturing forth and recreation. The demand for residential space development situation in Kenyan urban areas has remained under tremendous pressure, leading to the development of informal settlements that suffer challenges of congestion, poor sanitation and indecent housing, especially in big cities like Nairobi.

For some informal settlements in Nairobi including Mukuru slums, the congestion for such an informal settlement poses serious challenges in light of a pandemic like the covid-19. It is cognizance of this that the Government of Kenya through its State Department of Housing and Urban Development and Nairobi Metropolitan Services initiated the process of redeveloping the Mukuru Slum. This project is intended to provide decent housing and associated physical and social infrastructure for the Mukuru slum residents especially during the Covid-19 pandemic which was feared may spread rapidly in the slum as a result of poor sanitation and lack of basic social and physical infrastructure. The project is to be developed on land whose registration is 209/24794/81/A and whose title was under Meteorological Department. The Ministry of Lands and Physical Planning is in the process of planning and surveying this land with a view of having the title issued under the Cabinet Secretary for National Treasury as a trustee for the State Department of Housing and Urban Development. The works involves construction of 10,000 housing units including social amenities/infrastructure on the 56 acres piece of land.

In line with the Environmental Management and Coordination Act, EMCA 1999, this project requires an Environmental and Social Impact Assessment (ESIA) conducted for it to systematically examine the projects' positive and negative potential environmental and social impacts on the immediate surroundings. This examination is with due regard to all the phases of the project's development from construction, operations/occupation and decommissioning. This ESIA has encompassed all aspects of the project pertaining to the physical, ecological, socio-cultural, health and safety conditions at the site and its environs during and after construction. The environmental health and safety section has addressed 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 (ESMMP) formulated. The proponent is also expected to observe recommendations in the Environmental and Social Management and Monitoring 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 affordable housing units comprising of four floor levels. The main design components of the project include, but not limited to the following:

- The works for the project includes putting up social housing units on 56 Acres plot.
- The land where the project is located is in Industrial Area along Road A.
- The works involves construction of 10,000 housing units including social amenities/infrastructure
- The number of blocks to be put up is 375 No. with each block being 5 Levels (G+4)
- Each block has 40 units which translating to 8 units per floor.
- Each unit is 36 square metres (m2).
- The number of units projected for construction is between 3,000 - 5,000 per year

Environmental and Social Impacts and Proposed Mitigation Measures

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

Potential Negative Environmental and Social Impacts	Proposed Mitigation Measures
Vegetation disturbance	• Ensure proper demarcation and delineation of the project area to be affected by construction works • Specify locations for trailers, cranes and equipment and areas of the site which should be kept free of traffic, equipment, and storage • Designate access routes and parking within the site • Introduction of vegetation (trees, shrubs and grass) through landscaping open spaces and around the project site and their maintenance • As much as possible remove and destroy only that vegetation that has to be removed to allow construction and sparing and preserving that which must not be mandatorily removed or interfered with • Design and implement an appropriate landscaping program to help in re-vegetation of part of the project area after construction
High demand of raw materials	• Source building materials from local suppliers who use environmentally friendly processes in their operations • Ensure accurate budgeting and estimation of actual construction material requirements • Ensure that damage or loss of materials at the construction site is kept minimal through proper storage • Use at least 5% - 10% recycled, refurbished or salvaged materials.
Increased storm water run-off and soil erosion	• Surface run-off and roof water shall be harvested and stored in reservoir tanks for re-use • Devise a storm water management plan that minimizes impervious area infiltration • Apply soil erosion control measures such as leveling of the project site • Ensure that construction vehicles are restricted to set existing graded roads to avoid soil compaction within the project site • Ensure that any compacted areas are ripped to reduce run-off

Potential Negative Environmental and Social Impacts	Proposed Mitigation Measures
	• Site excavation works to be planned such that a section is completed and rehabilitated before another section begins • Roof catchments will be used to collect the storm water for some other uses • Construction of water storage tanks to collect storm water for construction use.
High water demand	• Harness rainwater for construction activities usage • Install water conserving tap that turn off automatically when not in use • Promote recycling and reuse of water as much as possible • Promptly detect and repair of water pipes and tank leaks • Ensure taps are not running when not in use • Install a discharge meter at all water outlets to determine and monitor total water usage
Increased energy consumption	• Ensure electrical equipment, machinery and lights are switched off when not in use • Install energy saving fluorescent tubes at all lighting points instead of bulbs which consume higher amounts of energy • Monitor energy used and set targets for reduction of energy use
Increased solid waste generation	• Use of an integrated solid waste management system • Through accurate estimation of the sizes and quantities of materials required, order materials in the sizes and quantities they will be needed • Ensure that damaged or wasted construction materials will be recovered for refurbishing and use in other projects • Use of durable, long-lasting materials that will not need to be replaced as often • Provide facilities for proper handling and storage of construction materials

Potential Negative Environmental and Social Impacts	Proposed Mitigation Measures
	• Use building materials that have minimal or no packaging to avoid packaging waste products • Dispose wastes more responsibly by dumping at designated dumping sites or landfills only • Wastes collection bins to be provided at designated points on sites • Private wastes disposal companies to be contracted to manage wastes and transport truck loads and dispose waste from site to licensed disposal places
Generation of wastewater	• Provide means for handling sewage generated by construction workers • Conduct regular checks for sewage pipe blockage or damages and replace as necessary • Assess the capacity of the adjacent public sewer to accommodate excess sewage and expand as necessary
Dust and exhaust emissions	• Provide effective dust screens, sheeting or netting where a scaffold is erected around the perimeter of the construction • Water all active construction areas where necessary especially for works in dry weather • Cover all trucks hauling soil, sand and other loose materials • Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at the construction site • Down wash of trucks, especially tyres, prior to departure from site • Post signs that limit vehicle speeds and construction machinery onto unpaved roads, parking areas and staging areas to avoid externalities produced by diesel engines • Erect bumps where necessary to limit vehicle speeds including even in the construction site • Personal protective equipment to be worn by all staff members and construction workers for no inhalation of dust and vehicular emissions • Minimization of vehicles idling time

Potential Negative Environmental and Social Impacts	Proposed Mitigation Measures
	• Sensitize truck and other vehicle drivers to avoid unnecessary racing of vehicle engines in site and at loading/offloading points and parking areas, and to switch off the engines at these points
Noise and Vibrations	• Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used • Use quiet equipment, that is equipment designed with noise control elements such as mufflers and attenuated generators • Sensitize construction drivers to avoid gunning of vehicles engines or hooting especially when passing through sensitive areas • Ensure that construction machinery is kept in good condition to reduce noise generation • Ensure that all generators and heavy-duty equipment are insulated or placed in enclosures to minimize ambient noise levels • Trees to be planted around the site to provide some buffer against noise propagation • Prescribe noise reduction measures e.g. restricted working hours and transport hours and noise buffering • Provide ear-muffs to construction workers in high noise areas • Strict adherence to the environmental management and coordination (noise and excessive vibration pollution control) regulations, 2009 [Legal Notice 61/2009]
Increased traffic and obstructions	• Ensure all construction vehicles to and from the construction site use the designated entry/exit to the project site • All transportation of construction raw materials and excavated materials are to be conducted at traffic off-peak hours only • Sensitize truck drivers to avoid unnecessary road obstructions • Work hours shall be restricted to the period between 8am and 6pm • Access to driveways will be maintained at all times unless other traffic arrangements are made

Potential Negative Environmental and Social Impacts	Proposed Mitigation Measures
	• Have in place a traffic management plan that allows for use of warning signs, diversions, flagmen and use of bumps and traffic cones
Occupational health and safety risks	• Ensure that all building plans are approved by the local authority and the local Occupational Health and Safety office • Registration of the project under the Occupational Safety and Health Act, OSHA 2007, laws of Kenya is mandatory • Ensure that the premises and workers are insured as per the statutory requirements (third party and workman's compensation under Work Injury Benefits Act No. 13 , 2007) • Hire the right number of trained and skilled workers with clear work schedules and appropriate PPE provided • Suitable, efficient, clean, well-lit and adequate sanitary conveniences should be provided for construction workers and separate for men and women • Mobile toilets, changed regularly, to be provided on site or latrines • Provide wholesome drinking water for workers • Ensure that equipment and work tasks are adapted to fit workers and their ability including protection against ergonomic challenges and mental strain • All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury • Arrangements must be in place to induct, train and supervise inexperienced workers regarding construction machinery use and other procedures/operations • Ensure provision for fire safety whilst ensuring any flammable products are handled and stored safely away from any sources of ignition. Fire extinguishers must be provided and examined by an authorized agency • Securely barricade any deep excavations and install warning signs to warn against fall hazards • Cover all openings to prevent falls

Potential Negative Environmental and Social Impacts	Proposed Mitigation Measures
	• Enough barriers must be erected at rooftop edges to protect materials falling from roofs and proper scaffolding provided to prevent workers working at a height (above 2m) from fall hazards • Design suitable and documented emergency response and disaster preparedness procedures including evacuation procedures to be used during any emergency. This includes designating a clearly labelled fire or emergency assembly point with clear direction signs • Adhere to Ministry of Health guidelines regarding Covid-19 including social-distancing, use of thermometer for measuring temperature at site, use of masks, regular hand-washing and use of sanitizers • Provide well stocked first aid boxes which are easily available and accessible in the construction site and ensure availability of a first aider at the construction site at all times • Provide restrooms for workers to rest during breaks • There should be no eating or drinking in areas where chemicals are stored or used • Ensure that all workers sign and adhere to a Code of Conduct regarding occupational health and safety • Regular tool-box meetings must be held weekly to sensitize workers • Avail a trained safety officer to man the site on occupational health and safety and enforce occupational health and safety standards at all times
HIV-AIDS	• Sensitize workers on responsible sexual behaviors and create awareness through engaging the Ministry of Health for assistance in provision of skilled trainers, brochures and protective devices • Provide protection against HIV-AIDS and other sexually transmitted diseases e.g. condoms, on the construction site
Increased social conflicts	• To prevent labour influx, engage through the use of local leaders (Chiefs; Assistant Chiefs; Political Leaders etc.) the locals as much as possible to provide both skilled and unskilled labour at the construction site

Potential Negative Environmental and Social Impacts	Proposed Mitigation Measures
	• Improve security both day and night by ensuring the construction site is sufficiently manned at all times and use armed security (armed police) especially at night • Ensure there is in place a robust Grievance Redress Mechanism (GRM) with a GRM Committee that meets at least monthly to address and close grievances • Sensitize the workers and all staff on Gender Based Violence and make adequate efforts to avoid it on site • Encourage formation and use of community policing, 'Nyumba Kumi' and other such neighborhood associations to manage any incidences of crimes at the construction site

Conclusions and Recommendations

In conclusion, results from the ESIA study show that the proposed redevelopment of Mukuru Informal Settlements project may have some environmental and social impacts but implementation of the proposed Environmental and Social Management and Monitoring Plan (ESMMP) will assist in dealing with these impacts in the project cycle. There are also guidelines for addressing environmental, occupational health and safety especially during project implementation. This project is recommended for approval by the National Environment Management Authority (NEMA) for issuance of an ESIA 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 and Social Impact Assessment and Audit Regulations, Legal Notice No. 101 of 2003.

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CHAPTER 1.: INTRODUCTION

1.1 Background and Rationale for the ESIA

Globalization, urbanization, migration and technological advancements have continued to drive cities forward right from their infant stages, the cyclic processes, growth, through to their renewal and regeneration. More and more people are moving and positioning themselves in cities for business, work, venturing forth and recreation. The demand for residential space development situation in Kenyan urban areas has remained under tremendous pressure, leading to the development of informal settlements that suffer challenges of congestion, poor sanitation and indecent housing, especially in big cities like Nairobi. For some informal settlements in Nairobi including Mukuru slums, the congestion for such an informal settlement poses serious challenges in light of a pandemic like the covid-19. It is cognizant of this that the Government of Kenya through its State Department of Housing and Urban Development and Nairobi Metropolitan Services initiated the process of redeveloping the Mukuru Slum. Initiation and development of this project requires conducting and submission of an ESIA study report to NEMA as required by the Environmental Management and Coordination Act, 1999 (EMCA) in its Second Schedule as this project is an Urban Development that include establishment of new housing developments exceeding 30 housing units.

1.2 Need for the project

This project is intended to provide decent housing and associated physical and social infrastructure for the Mukuru slum residents especially during the Covid-19 pandemic which was feared may spread rapidly in the slum as a result of poor sanitation and lack of basic social and physical infrastructure.

1.3 Scope of the Project

The scope of the works for the project is as follows:

- The works for the project includes putting up social housing units on 56 Acres plot
- The land where the project is located is in Industrial Area along Road A
- The works involves construction of 10,000 housing units including social amenities infrastructure

- The number of blocks to be put up is 375 No. with each block being 5 Levels (G+4)
- Each block has 40 units which translates to 8 units per floor
- Each unit is 36 square metres (m^2).
- The number of units projected for Construction is between 3,000 - 5,000 per year

1.4 Overall objective of the project

The overall objective of this project is to provide decent housing and associated physical and social infrastructure for the Mukuru slum residents especially during this Covid-19 pandemic which may spread rapidly in the slum as a result of poor sanitation and lack of basic social and physical infrastructure.

1.5 Terms of Reference (TOR)

The TORs for this study are the production of an ESIA study report to address the effects and impacts (Positive and Negative) of the proposed construction of residential affordable units to benefit Mukuru slum dwellers. The ESIA Lead Expert is under instructions from the project proponent to do a thorough environmental and social assessment with the aim of getting the 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 affordable units project development and propose ways of ensuring compliance
- To collect and collate baseline information relevant to the proposed development
- To collect primary data through the community participatory process and site visits
- 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 the project
- To design an Environmental and Social Management and Monitoring Plan (including cost estimates) and a monitoring framework for the environmental and social impacts of the project.

1.6 Content of project

The project assessment investigates and analyses the anticipated environmental and social impacts of the proposed development in line with the Environmental and Social Impact Assessment and Audit regulations, Legal Notice No. 10,1 2003 and in particular part II S 7[1] a-k. Consequently, the report will provide the following

- Nature of the 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 design, construction and operations (occupation)
- The materials to be used, products and by-products including wastes to be generated by the project and the methods of disposal
- The potential environmental and social 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 neighboring 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 and social 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 the Contractor during the construction phase as well as NMS during the operation phase of this project.

1.7 Methodology

1.7.1 Environmental Screening

Environmental screening was carried out to determine whether an ESIA 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, together with visits to the proposed site on 11th May 2020 and 13th May 2020 concluded that this project will require an ESIA done as per EMCA requirements and falls under one of the categories as indicated in Schedule 2 of this Act.

Figure 1-1: Site meeting on 11th May 2020

1.7.2 Environmental Scoping

In scoping, focus was on environmental and social 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 and Social 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 or will be affected by the local people / various stakeholders including the various commercial establishments in the neighborhood.
- 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 and Social Management and Monitoring Plan (ESMMP); 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.

1.7.3 Desktop Study

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

1.7.4 Site Visits and Public Participation.

Field visits were meant for physical inspections of the project site in order to gather information on the state of environment. Several photos of the project site were taken for inclusion in this report. The study also sought public opinion/views through Consultation and Public Participation (CPP) exercises.

Questionnaires were administered to the public and interviews held with neighboring community in the weeks starting 18th May 2020 and 25th May 2020. The questionnaires, meeting minutes and attendance sheets for the CPP exercise are included in the Annexure of this report. The CPP exercise also facilitated the Neighborhood Analysis report that is also part of this ESIA report.

1.7.5 Reporting

In the entire exercise, the proponent and ESIA expert contacted each other on the progress of the study and signing of various documents. The proponent will have to submit 10 copies of this report alongside a CD to the National Environment Management Authority for review and issuance of an ESIA 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 Contractor's cost. Environmental and social concerns will be part of the planning and development process and not an afterthought. It is expected that the works will continue without any conflicts and there will be implementation of the Environmental and Social Management and Monitoring Plan (ESMMP).

CHAPTER 2. : POLICY, LEGAL AND LEGISLATIVE FRAMEWORK

Environmental and Social 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 and Social Impact Assessment (ESIA) 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 and Social Impact Assessment study 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 and social 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 and Social Impact Assessments were introduced targeting the industrialists, business community and local authorities.

2.1.2 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.

2.1.3 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 ESIAs that will provide suitable measures to be taken to ensure environmental resources and people's health in the immediate neighborhood and further downstream are not negatively impacted by the emissions. As a follow-up to this, EMCA, 1999 requires annual environmental audits to be conducted in order to ensure that mitigation measures and other improvements identified during ESIAs are implemented.

In addition, the policy provides for charging levies on 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.

2.1.4 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, programs and projects take environmental considerations into account,

(ii) To ensure that an independent Environmental and Social Impact Assessment (ESIA) 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.

2.2 Legal and Legislative Framework

2.2.1 Environmental Management and Coordination Act No.8 of 1999

This study 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 and Social 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 and Social 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 ESIA process. Section 58 of the Act makes it mandatory for an Environmental and Social 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 ESIA study. The proponent is required to submit the ESIA 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 local 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 program are implemented and maintained throughout the project cycle. As well the; proponent will have to ensure that appropriate measures to prevent pollution of underground and surface water are implemented throughout the project cycle.

2.2.2 The Environmental Management and Co-ordination (Waste Management Regulations 2006) Legal Notice No. 121: Section 4-6

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

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

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

5. (1) a waste generator shall 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)Enabling the recovery and re-use of the product where possible;

c). Incorporating environmental concerns in the design and disposal of a product. 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 local authority. (23) No person shall engage in any activity likely to generate any hazardous waste without a valid Environmental and Social 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 to the NCC sewer line for proper management of liquid waste.

2.2.4 Public Health Act Cap 242

Part IX section 115 of the Act states that no person or institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires that local Authorities take

all lawful necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to injuries or dangerous to human health.

The plans for the above project have been submitted for approval at 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 local 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 local authority to submit any plans to then minister for approval, steps should

be taken as may be necessary to acquire the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should be submitted, which intends to reduce conflict of interest with other socio-economic activities.

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 local authority for permit to connect to the sewer line and all the wastewater must be discharged in to sewers. The code also prohibits construction of structures or building on sewer lines.

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 main channel just like the units in the surrounding neighborhood.

2.2.9 County Government Act (2012)

The County Government act was formed after promulgation of the new constitution of Kenya (2010). The constitution calls for devolution of duties in the counties for effective results. These county governments may manage and let land besides regulating and licensing trade activities including construction in their areas of jurisdiction besides provision and maintenance of roads, footways, street lighting and sewerage in their areas.

Section 160 of the act empowers counties 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 local 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 neighborhood, and to prescribe conditions subject to which such business shall be carried on. It is in this vain that section 165 mandates the County 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 local 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 County, erects a building on; excavate or opens-up; or injures or destroys a sewer, 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 local 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 and Social Management and Monitoring Plan throughout the project cycle in order to mitigate against any possible negative impact.

2.3 Other Relevant Provisions

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

- Montreal Protocol on Substances that Deplete the Ozone Layer (1987) ratified 9 November 1988
- United Nations Convention to Combat Desertification (1994), ratified 12 June 1994United 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 County (NEC), National Environmental Management Authority (NEMA), the Forestry Department, Kenya Wildlife Services (KWS) and others. There are also local and international NGOs involved in environmental activities that impact on the environment in one way or the other in the country.

2.4.1 National Environmental Management Authority (NEMA)

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

2.4.3 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.

2.4.4 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.

2.4.5 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.

2.4.6 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 County 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.

2.4.7 Noise and Excessive Vibrations 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 3. : DESCRIPTION OF THE PROJECT

3.1 Introduction and project objectives

The motivation for establishment of the project is the need to ensure affordable units in the Mukuru Area of Nairobi City County to cater for the slum dwellers in the Mukuru informal settlements. This would go a long way in helping to reduce congestion in light of the outbreak of covid-19 disease. Besides the congestion in these informal settlements, the lack of water has made it difficult to provide the necessary emergency and hygiene interventions including the establishment of isolation facilities, health facilities in the informal settlements. The conceived project is designed to be within character of the current housing trend of the project area, where a survey revealed that flats and affordable units are common within the industrial commercial premises.

3.2 Project location

The proposed project is located on L.R. No. 209/24794/81/A in Industrial Area of Nairobi City County along Road A. The site falls within an industrial area as per zoning regulations but change of use is being sought to allow the land be used for residential purposes. The subject land is adjacent to Road A, Road B and Road C that adjunct from Enterprise Road of Industrial Area. Enterprise Road in turn connects Likoni Road and Mombasa Road. The location is mainly surrounded by commercial plots and also has Diamond Park and Mukuru Informal Settlements in the neighborhood both of which are residential areas. A key stakeholder on the boundary is Kenya Veterinary Vaccines Production Institute, KEVEVAPI, under the Ministry of Agriculture and Livestock.

The redevelopment of the housing units will be on the land that initially belonged to the Kenya Meteorological Department and is being transferred for this use and to be under the National Treasury as its trustee. There will also be change of user for this specific piece of land from a zoning perspective from industrial to residential. The following conditions shall also apply to the development;

- That the proponent provides adequate measures against environmental degradation.
- That the proponent is bound by any other conditions that may be imposed by the county government in its by-laws.

The development drawings will also be submitted for approval by the relevant departments in the County Government with the following conditions in mind:

- That the proponent shall adhere to the drawing specification as they will be approved plus all condition included in the approval letter.

The land size is 56 acres.

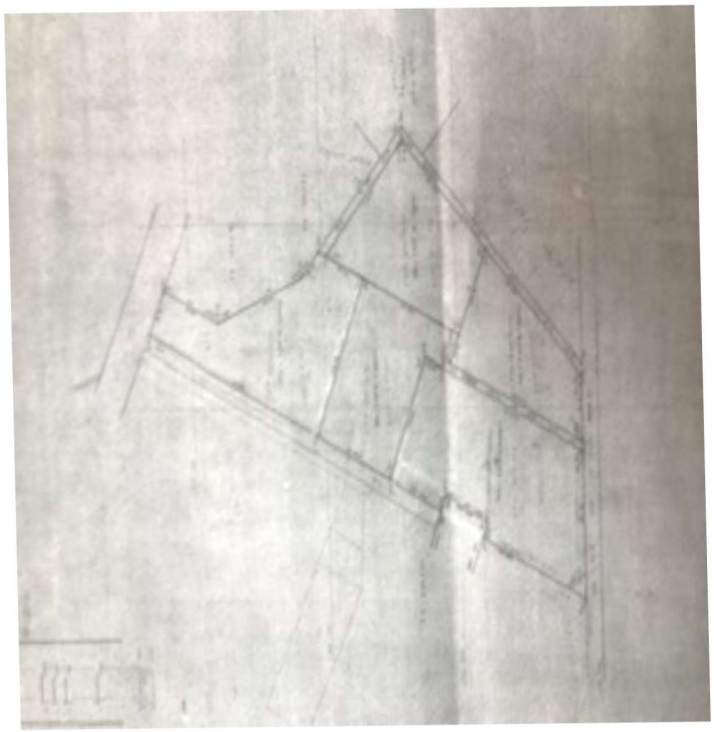

Figure 3-1: Land layout that will involve amalgamation of 5 parcels of land

Proposed Site– downloaded on 18th May 2020

- Source: Google Earth

Land for the proposed development currently virgin land with no developments

Figure 3-2: Google earth map showing site location and a photo of the proposed location

Figure 3-3: Neighboring Developments to Project Site

3.3 Scope of Project

The main design components of the project include, but not limited to the following:

- The works for the project includes putting up social housing units on 56 Acres plot.
- The land where the project is located is in Industrial Area along Road A, off Enterprise Road
- The works involves construction of 10,000 housing units including social amenities/infrastructure
- The number of blocks to be put up is 375No. with each block being 5 Levels (G+4)
- Each block has 40 units which translating to 8 units per floor in five floors

- Each unit is 36 square metres (m2).
- The number of units projected for Construction is between 3,000 - 5,000 per year

To commence the project implementation, the State Department of Housing and Urban Development identified three informal settlements for the purpose of improvements:-

- ❖ Mukuru Kwa Njenga;
- ❖ Mukuru Kwa Ruben;
- ❖ Viwandani;
- ❖ Fuata Nyayo Estate

The total size of the land transferred to Housing as per the letter dated 7th May 2020 (Annexed) is 56 acres located is in Industrial Area along Road A, off Enterprise Road.

3.4 Infrastructure

The development will have a comprehensive and robust infrastructure including access roads, parking areas, water storage, electricity distribution and waste disposal mechanisms. There will also be sewerage disposal system that will be connected to the adjacent public sewer system.

3.4.1 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. An electrical engineer or professional is part of the project team.

3.4.2 Water Reticulation system

Water from NCWSC 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 affordable units. Two boreholes will also be drilled to supplement the supply by NCWSC.

3.4.3 Sewerage

The area has a conventional public sewer line and waste water will be disposed of through this sewer line. The proponent will also apply for the expansion of the sewer line if need be.

3.4.4 Solid Waste

Solid waste management facilities will consist of dustbins stored in the affordable units protected from rain, rodents and any animals. The solid wastes from each block will be assembled in the garbage collection point ready for disposal by a NEMA licensed waste disposal company. The waste will then be collected by a NEMA licensed private waste management company contracted by the County Government 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. Short of this, the wastes will be taken to a registered disposal site.

3.4.5 Security

There will be the main manned entrance for ease of security operations. Around the affordable units' compound will be a boundary wall that will be erected. The project will also be connected with security alarms, entry control, and quick response systems to enhance security

3.4.6 Fire safety

The redevelopment will provide for firefighting facilities such as fire extinguishers in the form of hydrants and fire extinguishers.

3.4.7 Parking area

The drive way and parking area, which will be paved, will be spacious and will be provided.

3.4.8 Landscaping

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

3.4.9 Buildings Construction

The technology used in the design and construction of the affordable units will be based on international standards, which have been customized by various housing units in Kenya. The project will consist of affordable units with associated facilities, parking and infrastructure as presented in the architectural drawings in the Annexure.

The buildings will be constructed as per the respective Structural Engineer's detail as provided for in the drawings presented in the Annexure. 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 unit.

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 industrial area and is busy with commercial buildings and has various public drainage channels. However, it is recommended that the roof water is harvested and stored in tanks for use.

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.

3.5 Description of the Project's Construction Activities

3.5.1 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.

3.5.2 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 City County and neighboring areas such as Athi River. 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.

3.5.3 Clearance of Vegetation.

The site has some vegetation cover including grass growing in it and a few mature trees that include acacia trees. The proponent shall ensure as many trees as possible are conserved and tree planting is done after project completion.

3.5.4 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.

3.5.5 Excavation and Foundation Works

A geotechnical survey is currently planned to be conducted on site to give more information about the soil and underground conditions. The site visits to the site have revealed that the area has a layer of black cotton soil in most of the sections. However, this shall be excavated and disposed off in approved sites (preferably exhausted quarries).

3.5.6 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 elements. These activities are known to be labour intensive and will be supplemented by machinery such as concrete mixers. It is also proposed that local labour is engaged mainly targeting the youth and taking cognizance of gender parity where appropriate.

3.5.7 Structural Steel Works

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

3.5.8 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.

3.5.9 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.

3.5.10 Plumbing

Installation of pipe-work for water supply and distribution will be carried out within the entire blocks. In addition, pipe-work will be done to connect sewage from the premises to the NWSC mains sewer line.

3.5.11 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 a theme garden 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.

3.6 Description of the Project's Operational Activities

3.6.1 Residence

A total of 10,000 affordable units are planned in the long term meaning about such number of families will be accommodated in the long-term. 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, both solid and liquid.

3.6.2 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. The solid wastes from each block will be assembled in the garbage collection point ready for disposal by a NEMA licensed waste disposal company. Private waste

disposal companies that are approved by NEMA and County Government will be responsible for solid waste disposal.

3.6.3 Waste Water and Storm Water Management

Sewage generated from each unit will be discharged into the existing sewer lines and then to the NWSC mains sewer line available on the site/area. Storm water will be properly channeled to improve drainage within the development.

As much as possible, it is recommended that roof water harvesting is facilitated.

3.6.4 Cleaning

The proponent will be responsible for regular washing and cleaning of the pavements and communal areas. Individual tenants will be responsible for washing and cleaning their own premises/ residences. Cleaning operations will involve the use of substantial amounts of water, disinfectants and detergents.

3.6.5 General Repairs and Maintenance

The units 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.

3.7 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

3.7.1 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 this 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.

3.7.2 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 trees and grass plants species.

3.7.3 Building Materials and Energy Used

Several building materials will be required for construction of the units 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 be 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.

3.7.4 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.

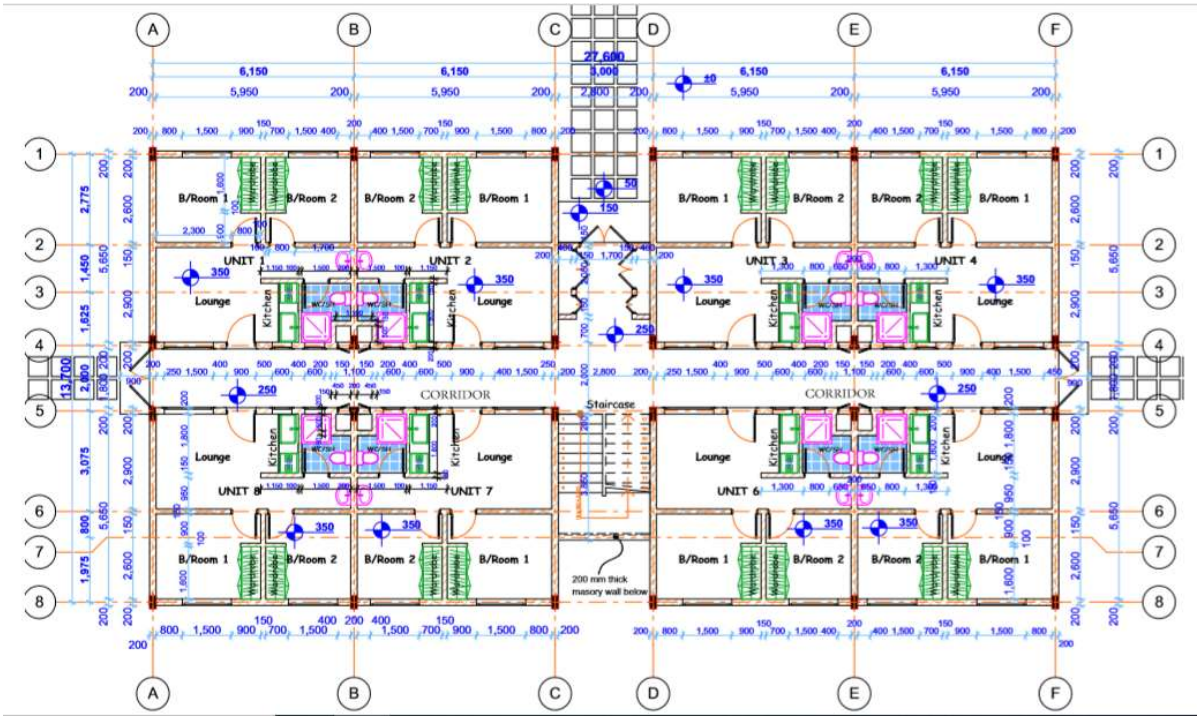

Figure 3-4: Ground Floor Plan of Proposed Affordable Units

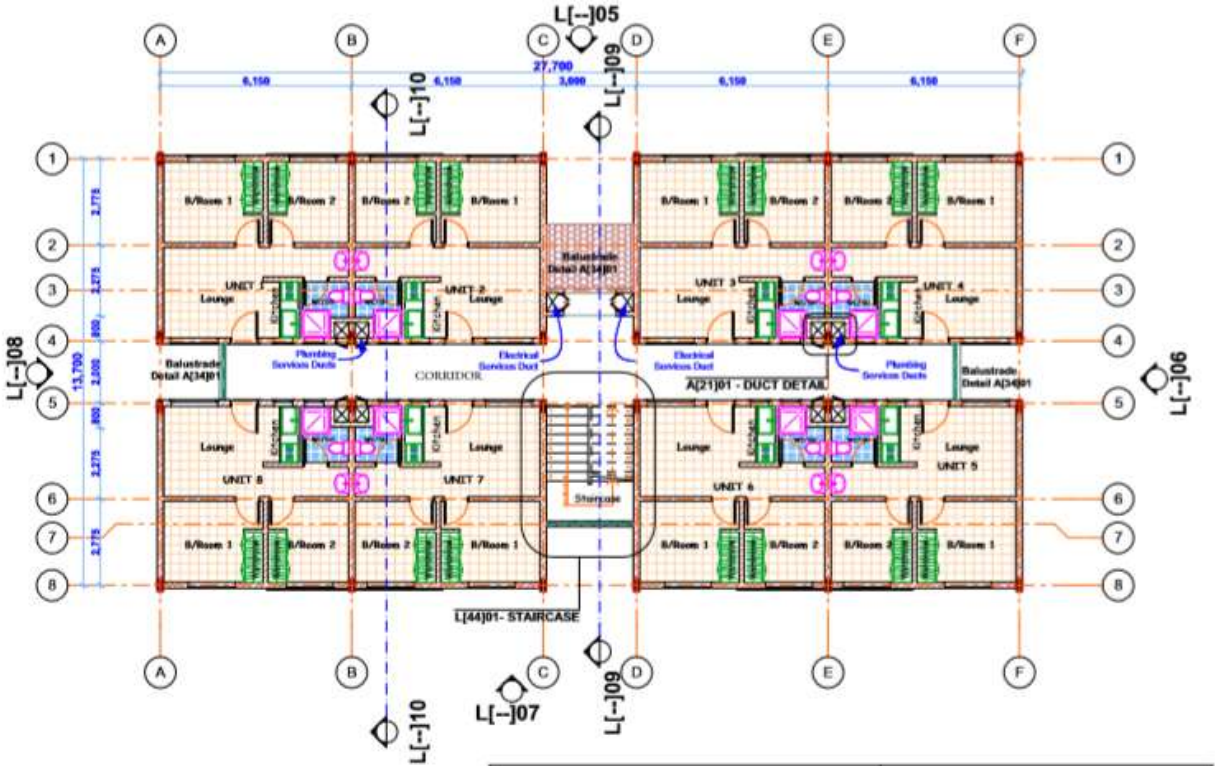

Figure 3-5 : Typical Floor Plan for Levels 1, 2, 3 & 4 of the Proposed Affordable Units

CHAPTER 4. : BASELINE INFORMATION OF THE PROJECT AREA

4.1 Introduction

This chapter has information on the location, bio- physical, socio and economic aspects of the project area. These are elaborately discussed in order to identify areas likely to be affected as a result of project activities. This study therefore considered the physical location, climatic data, geology, drainage, infrastructure, demography and socioeconomic information.

4.2 Climatic Conditions

At 1636 meters (5367 ft) above sea level, Nairobi enjoys a moderate climate. Under the Koppen climate classification, Nairobi has a subtropical highland climate. The altitude makes for some chilly evenings, especially in the June/July season when the temperature can drop to 10 °C (50 °F). There are two rainy seasons but rainfall can be moderate. The cloudiest part of the year is just after the first rainy season, when, until September, conditions are usually overcast with drizzle. Temperature fluctuates between 15°C and 32°C in most areas including the project area.

4.2.1 Temperatures

The sunniest and warmest part of the year is from December to March, when temperatures average the mid-twenties during the day. The mean maximum temperature for this period is 24 °C (75 °F). The minimum temperature also remains low during cloudy nights, usually hovering around 8 °C and at times reaching 6°C. Clear skies in January and February also bring colder nights. The highest temperature ever registered in Nairobi was 32.8 degrees Celsius and the lowest was 3.9 degrees Celsius. The mean maximum temperature for this period is 24 °C (75 °F).

4.2.2 Rainfall

There are two rainy seasons but rainfall can be moderate. The cloudiest part of the year is just after the first rainy season, when, until September, conditions are usually overcast with drizzle. Mean annual rainfall range is 500-1000mm/year. Relative humidity means values range from 70 to 80%.

4.2.3 Wind Flows

The lower winds throughout the year are of the easterly type. Between October and April, they shift to the northeast while as from May to September they move to the southeast. Prior to the “Long Rain “season strong winds prevail with an average speed of 22.5 Miles/hour. The rest of

the year has wind speed varying from 10 to 15 Miles/hour. However, during night, the winds are usually calm.

4.2.4 Sun shine.

Early mornings in Nairobi in general are often cloudy, but the sun peeks through by midmorning. Throughout the year, there is an average of seven hours of sunshine per day. Thirty percent more sunlight reaches the ground during the afternoon than in the morning. Of course, there is more sun shine during the summer months, when the sun is more overhead in the southern hemisphere. Infrequently during the rainy season, the sun never shows through the clouds. Even in August, the cloudiest month, there is an average of four hours of sunshine.

4.3 Topography and Drainage

Nairobi main drainage follows the regional slope of the volcanic rocks towards the east, while subsidiary internal drainage into the Rift region is confined to the western part. The lava plains east of the line Ruiru-Nairobi-Ngong are underlain by a succession of lava flows alternating with lakebeds, streams deposits, tuffs and volcanic ash. These plains, comprising mainly the Athi plains and the northern section of the Kapiti plain, extend westwards, rising from 4900 feet (1493 m) at the Athi River to 6000 feet (1829 m) in the faulted region near Ngong. The lava plains are crisscrossed with steep-walled gullies and canyon-like gorges, such as those along the Mbagathi valley. Further east this valley widens slightly where soft material is being actively eroded (Saggerson, 1991). The land of the project is reasonably flat and more details of its geotechnical nature will be known after the geotechnical survey whose report will be part of this ESIA report.

4.4 Hydrogeology and Soils

In general groundwater in volcanic rocks is limited to fractures and erosion levels within the volcanic succession. Fresh lavas are usually not water bearing because of their massive and impervious nature. The most significant aquifer system west of the project area is the Upper Athi Series aquifer system. This is the main aquifer for boreholes in Nairobi area and is composed of tuffs, lakebeds and sediments. Other aquifers in this area are found in the weathered inter-lava layers and in fractured zones.

The rocks in the Nairobi area mainly comprise a succession of lavas and Pyroclastic of the Cainozoic age and overlying the foundation of folded Precambrian schist's and gneisses of the Mozambique belt (Saggerson, 1991). The crystalline rocks are rarely exposed but occasionally fragments are found as agglomerates derived from former Ngong volcano. The soils of the Nairobi area are products of weathering of mainly volcanic rocks. Weathering has produced red soils that reach more than 50 feet (15m) in thickness (Saggerson, 1991). A geotechnical investigation of the soil within the project site will be conducted and the findings and recommendations were made be part of this report.

4.5 Biological Environment

This section describes key biological elements, including the identification and distribution of dominant, rare and unique flora and faunal species within the region of concern (proposed project site and other potentially affected areas).

4.5.1 Flora

Natural vegetation in Nairobi has been cleared to pave way for the establishment of both residential and commercial developments. The natural vegetation in the project area has thus been greatly modified. The remnants of the natural vegetation of the site and its environs are few scattered trees, mainly acacia shrubs as well as grass. The site has exotic plants and the project proponent is encouraged to do a lot of landscaping to provide greenery and maintain a healthy environment.

Figure 4-1: Current state of project site with Acacia shrubs and natural grass

The project site is situated within a commercial zone in Industrial Area of Nairobi City County where human activities have altered the natural habitat for animals over the years. The project's effect may seem insignificant to such lives but it is of great concern to the environment at large. It is expected that the area may be populated by small mammals such as mice, rats, moles and other members of the rodent family. Bird species were also observed at the site during the site meetings. None of the faunal species observed are rare or endangered.

4.6 Socio-economic Environment

A socio-economic survey is being conducted and will be part of this report. The project site is within Industrial Area of Nairobi City County and it is expected that the affordable units will afford better livelihoods for the slum dwellers with reduced congestion and improved housing and sanitation.

4.6.1 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 - Residential use, industrial, commercial and service centers, infrastructure land use, recreational areas, urban agriculture as well as water bodies and riverine areas. The current land-use of the project area is mainly commercial and a change of user approval will be procured to allow the proposed residential developments.

4.6.2 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). The project area is in a commercial environment that will be boosted by improved livelihoods of persons who can be engaged in these commercial activities through employment.

4.6.3 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).

4.6.4 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 was 2 .3 per cent per annum, less than half that of the rate of population growth (Post Buckley International Inc.1998). It is

estimated that about 500,000 people join the labour force annually. Most of these are unable to secure employment and thus remain unemployed or end up in traditional agriculture and in the informal sector (Odhiambo and Manda 2003). The 1997–1998 labour force survey showed that 9 per cent of people in Nairobi were employed and 24 per cent unemployed (CBS 2003b). It is possible that most of the beneficiaries of this proposed project are employed in casual jobs within the industrial commercial area.

4.6.5 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 settlement in the region by investing in the construction industry; 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 proponent will sell or rent the residential development to the slum dwellers. The proposed project will therefore serve as a source of income to the proponent and also improve the living standards of the occupants of the affordable units
- The proposed project will indirectly contribute towards enhancement of security in the neighborhood of the area
- The proposed project will generate revenue to the County through payment of connection and service fees.

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.
- The government will also get some impressive increase in V.A.T. and other taxes levied on cement.
- 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 benefit greatly.

4.7 Water Resources

Although Nairobi City County relies mainly on piped water supplies, the sources of these supplies lie outside the city. The surface streams and rivers are heavily contaminated by domestic and industrial effluents and solid wastes. Naturally rivers are expected to cleanse themselves as they move downwards, but this is not the case with the Nairobi River and its tributaries, because there are many sources of organic pollution along the river. Water supply in the area of the project is from Nairobi Water and Sewerage Company (NWSC) though the supply is not regular and water shortage is experienced some days of the week in the project area. The natural groundwater quality is generally good and reaches the drinking water standards for most constituents, except for fluoride, which often exceeds 1 mg/l (Foster and Tuinh of 2005). There is planned that there will be two boreholes constructed to supplement the water from NWSC for use in the affordable units.

4.8 Waste Management

Waste management is a growing problem in Nairobi. Increasing urbanization, rural-urban migration, rising standards of living and rapid development associated with population growth have resulted in increased solid waste generation by industrial, domestic and other activities. The increase in solid waste generation has not been accompanied by an equivalent increase in the capacity of the relevant urban authorities to deal with this problem. Only about 40 per cent of the waste generated in Nairobi is collected by the City County of Nairobi, the private sector collects about 20 per cent and the balance is left uncollected, or is disposed off through other means, including by burning, dumping in pits and other unauthorized places, or is collected by the numerous nongovernmental organizations, community- based groups and other ad hoc or voluntary groups (Ikiara 2006). It is estimated that there are at least

60 private companies engaged in solid waste collection services in the city (JICA 1998 in UNEP/NEMA 2005). The existing waste management practice in the neighborhood of the proposed project site and within the Nairobi City County in general includes collection by contracted companies and dumped at dumping sites, mainly Dandora dumpsite in Eastlands in Nairobi City County. Therefore, the neighborhood of the proposed site relies on private garbage collectors to dispose of solid wastes. The proponent will be required to contract a licensed solid waste transporter to collect and transport solid waste from the site for dumping at approved sites.

On liquid wastes management, there is a public sewer line adjacent to the project site where the affordable units can be connected for the domestic waste water to be discharged for downstream wastewater treatment.

CHAPTER 5. : CONSULTATIONS AND PUBLIC PARTIIPATION

5.1 Stakeholder Mapping

The project area is surrounded by the following primary key stakeholders;

- Kenya Veterinary Vaccines Production Institute, KEVEVAPI
-

5.2 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 involvement is a fundamental principle of the ESIA process. Timely, well planned and appropriately implemented public involvement programs will contribute to ESIA 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 ESIA process is open, transparent and robust, characterized by defensible analysis. Nearly all ESIA 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 ESIA 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 ESIA and decision making.

The key objectives for the consultations and public participation for this proposed project were 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 ESIA process.

Consultations and public participation exercise for the assessment was carried out in the months of May 2020 and June 2020. Interviews were carried out in the neighborhood by the use of questionnaires to find out all the views from the neighbors towards the affordable units project. Neighboring the site are several commercial establishments. They also 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 had no objection to the proposed project save for a few environmental issues such as noise during construction and dust which have been addressed in the ESMMP. Annexed to this report are the attendance sheets, minutes of meetings and questionnaires that were employed in the consultations and public participation.

5.3 Issues of Concern during the CPP Exercise and Responses

The following table shows the issues that were raised during the Consultations and Public Participation activities and how the matters were addressed

Table 5-1:

No	Issue / Concern	Response
1.		
2.		
3.		

No	Issue / Concern	Response
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		

CHAPTER 6. : IMPACT ASSESSMENT METHODOLOGY & ANALYSIS OF ALTERNATIVES

6.1 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.

6.2 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 – the spatial scale 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. The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word 'mitigation' means not just 'compensation', but also the ideas of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.
4. The **likelihood** of the impact is 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. The criterion is then considered in two categories, viz.

- Effect of the activity and the likelihood of the impact.

The total scores recorded for the effect and likelihood are then read off the matrix presented to determine the overall significance of the impact.

- The overall significance is either negative or positive.

6.3 Analysis of Alternatives

6.3.1 The No Project Alternative

The No Action Alternative in respect to the proposed project implies that the status quo is maintained, that is no construction/redevelopment activity takes 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 redevelopment is high and the anticipated environmental and social impacts resulting from construction have already been experienced. This option will however involve an acceptance of the vulnerability of slum dwellers in Mukuru and other informal settlements exacerbated by the covid-19 pandemic that can turn out to be disastrous and costly to the Government of Kenya. The land 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 construction 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 the slum dwellers and local people would remain unchanged.

- The local skills would remain under utilized
- No employment opportunities will be created for Kenyans who will work in the project area.
- Discouragement for investors to produce this level of standard and affordable developments in future.

6.3.2 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 does not 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 is also worth noting that the said project is already underway in terms of seeking development approvals in various government departments and conducting of various other essential activities like socio-economic surveys, neighborhood analysis and geotechnical surveys. Therefore, 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 or Relocation Alternatives are not the appropriate alternatives to the slum dwellers and the Government of Kenya.

6.3.3 Alternative Land Use Activities

The area is in a commercial zone i.e. used for commercial establishments and some residential development like the Diamond Park that is nearby. Alternative land use activities may conflict with surrounding land use activities. For uniformity purposes, the proponent is interested in redevelopment of affordable units similar both in form and character to what is existing in the nearby neighborhood.

6.3.4 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/equipment 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.

6.3.5 Solid Waste Management Alternatives

Throughout the 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.

6.3.6 Project Design

This Environmental and Social Impact Assessment Study 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. These are included in the Annexure. The project entails redevelopment of affordable housing units to benefit the slum dwellers of Mukuru informal settlements.

CHAPTER 7. : POTENTIAL ENVIRONMENTAL IMPACTS

7.1 Introduction

This chapter outlines the potential negative and positive impacts that will be associated with the housing project. The impacts will be related to activities to be carried out during construction of the project. The operational phase impacts of the project will be associated with the activities carried out by the residents/tenants, which will mainly be domestic. In addition, closure and decommissioning phase impacts of the project are also highlighted.

The impacts of the housing project during its life cycle stages (construction, operation and decommissioning) can be categorized into: impacts on the biophysical environment; health and safety impacts; and socio-economic impacts. Construction of the proposed residential apartment's development is likely to present several environmental impacts. These can be either positive or negative.

7.2 Anticipated Environmental Impacts

During the field survey, key impacts both positive and negative relating to the proposed residential development was identified. They were obtained by making physical observations at the project site as well as existing land use in the neighborhood.

7.3 Positive Environmental Impacts of Construction Activities

7.3.1 Creation of Employment Opportunities

Several employment opportunities will be created for construction workers during the construction phase of the project. This will be a significant impact since unemployment is currently quite high in the country at large.

7.3.2 Provision of Market for Supply of Building Materials

The project will require supply of large quantities of building materials most, of which will be sourced locally. This provides ready market for building material suppliers such as quarrying companies, hardware shops and individuals with such materials.

7.3.3 Increased Business Opportunities

The large number of project staff required will provide ready market for various goods and services, leading to several business opportunities for small-scale traders such as food vendors around the construction site.

7.3.4 Individual Investment

Economically, the project will be an investment to the proponent. The proposed project once complete can also be used as a collateral asset.

7.3.5 Optimal Use of Land

The housing development leads to optimal use of land. Considering the scarcity of serviced land in Nairobi, the project enhances the returns on the limited land space in the city.

7.3.6 Revenue to Government

Value Added Tax (VAT) on construction materials/ tools to be purchased and NEMA fees among others will be sources of revenue for the government and its institutions.

7.3.7 Enhanced Security

During the operation of the project, security will be enhanced in the premise and the units through distribution of suitable security lights and presence of a security guard. This will lead to improvement in the general security in the surrounding area.

7.3.8 Improved Infrastructure

Project activities will lead to improvement of transport, sewerage, water supply and telecommunication networks. Such services are a prerequisite to development in any region.

7.4 Negative Environmental Impacts of Construction Activities

7.4.1 Extraction and Use of Building Materials

Building materials such as hard core, ballast, cement, rough stone and sand required for construction of the housing project will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as rivers and land. Since substantial quantities of these materials will be required for construction of the buildings, the availability and sustainability of such resources at the extraction sites will be negatively affected,

as they are not renewable in the short term. In addition, the sites from which the materials will be extracted may be significantly affected in several ways including landscape changes, displacement of animals and vegetation, poor visual quality and opening of depressions on the surface leading to several human and animal health impacts.

7.4.2 Dust Emissions

During construction, the project will generate substantial quantities of dust at the construction site and its surrounding. The sources of dust emissions will include site preparation and levelling works, and to a small extent, transport vehicles delivering building materials. Emission of large quantities of dust may lead to significant impacts on construction workers and the local residents, which will be accentuated during dry weather conditions.

7.4.3 Exhaust Emissions.

The trucks used to transport various building materials from their sources to the project site contribute to increases in emissions of CO2, NO2 and fine particulate along the way as a result of diesel combustion. Such emissions can lead to several environmental impacts including global warming and health impacts. Because large quantities of building materials are required, some of which are sourced outside Nairobi, such emissions can be enormous and may affect a wider geographical area. The impacts of such emissions can be greater in areas where the materials are sourced and at the construction site as a result of frequent gunning of vehicle engines, frequent vehicle turning and slow vehicle movement in the loading and offloading areas.

7.4.4 Traffic flow during construction

There is a likelihood of increase in traffic on road adjacent to the site during construction (Donyo lane). The trucks used to transport various building materials from their sources to the project site will contribute to increases in emissions of CO_2, NO_x and fine particulate along the way as a result of diesel combustion. Such emissions can lead to several environmental impacts including global warming and health impacts. Because large quantities of building materials are required, some of which are sourced outside Nairobi, such emissions can be enormous and may affect a wider geographical area. The impacts of such emissions can be greater in areas where the materials are sourced and at the construction site as a result of frequent running of vehicle engines, frequent

vehicle turning and slow vehicle movement in the loading and offloading areas such trucks may slow down traffic flow.

7.4.5 Noise and Vibration

The construction works, delivery of building materials by heavy trucks and the use of machinery/equipment including bulldozers, generators, metal grinders and concrete mixers will contribute high levels of noise and vibration within the construction site and the surrounding area.

Elevated noise levels within the site can affect project workers and the residents, passers-by and other persons in within the vicinity of the project site.

7.4.6 Risks of Accidents and Injuries to Workers

Because of the intensive engineering and construction activities including erection and fastening of roofing materials, metal grinding and cutting, concrete work, steel erection and welding among others, construction workers will be exposed to risks of accidents and injuries. Such injuries can result from accidental falls from high elevations, injuries from hand tools and construction equipment cuts from sharp edges of metal sheets and collapse of building sections among others.

7.4.7 Solid Waste Generation

Large quantities of solid waste (soil) will be generated as a result of excavation of the site. In addition, additional solid waste will be generated at the site during construction of the building and related infrastructure. Such waste will consist of metal cuttings, rejected materials, surplus materials, surplus oil, excavated materials, paper bags, empty cartons, empty paint and solvent containers, broken glass among others. Such solid waste materials can be injurious to the environment through blockage of drainage systems, choking of water bodies and negative impacts on human and animal health. This may be accentuated by the fact that some of the waste materials contain hazardous substances such as paints, cement, adhesives and cleaning solvents, while some of the waste materials including metal cuttings and plastic containers are not biodegradable and can have long-term and cumulative effects on the environment.

7.4.8 Energy Consumption

The project will consume fossil fuels (mainly diesel) to run transport vehicles and construction machinery. Fossil energy is non-renewable and its excessive use may have serious environmental

implications on its availability, price and sustainability. The project will also use electricity supplied by supplied by Kenya Power Company (KP) Ltd. Electricity in Kenya is generated mainly through natural resources, namely, water and geothermal resources. In this regard, there will be need to use electricity sparingly since high consumption of electricity negatively impacts on these natural resources and their sustainability.

7.4.9 Water Use

The construction activities will require large quantities of water. Water will mainly be used for concrete mixing, curing, sanitary and washing purposes. Excessive water use may negatively impact on the water source and its sustainability.

7.5 Positive Environmental Impacts of Operational Activities

7.5.1 Provision of Housing Facilities

The project will provide modern Housing with new and state of the art infrastructure to Nairobi residents. This impact will be significant since Nairobi is currently experiencing a shortage of Housing facilities for its residents.

7.5.2 Employment Opportunities

Some people will be employed by the project as management agents, caretakers, cleaners, security personnel and technicians.

7.5.3 Revenue to National and Local Governments

Through payment of relevant taxes, rates and fees to the government and the local authority, the housing project will contribute towards the national and local revenue earnings.

7.5.4 Improved Security

Security will be ensured around the Units through distribution of suitable security lights and presence of 24-hour security guards. This will lead to improvement in the general security in the surrounding area.

7.6 Negative Environmental Impacts of Operational Activities

7.6.1 Solid Waste Generation

The project is expected to generate enormous amounts of solid waste during its operation phase. The bulk of the solid waste generated during the operation of the project will consist of paper, plastic, glass, metal, textile and organic wastes. Such wastes can be injurious to the environment through blockage of drainage systems, choking of water bodies and negative impacts on animal health. Some of these waste materials especially the plastic/polythene are not biodegradable may cause long-term injurious effects to the environment. Even the biodegradable ones such as organic wastes may be injurious to the environment because as they decompose, they produce methane gas, a powerful greenhouse gas known to contribute to global warming. Energy Consumption

During operation, the family units will use a lot of electrical energy mainly for domestic purposes including lighting, cooking, running of air conditioning equipment, running of refrigeration systems, pumping water into reservoirs. Since electricity generation involves utilization of natural resources, excessive electricity consumption will strain the resources and negatively impact on their sustainability.

7.6.2 Water Use

The domestic activities during the operation phase of the project will involve the use of large quantities of water.

7.7 Negative Environmental Impacts of Decommissioning Activities

7.7.1 Solid Waste

Demolition of the project small buildings and related infrastructure will result in large quantities of solid waste. The waste will contain the materials used in construction including concrete, metal, drywall, wood, glass, paints, adhesives, sealants and fasteners. Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment. In addition, even the generally non-toxic chemicals such as chloride, sodium, sulphate and ammonia, which may be released as a result of leaching of demolition waste, are known to lead to degradation of groundwater quality.

7.7.2 Noise and Vibration

The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas.

7.8 Positive Environmental Impacts of Decommissioning Activities

7.8.1 Rehabilitation

Upon decommissioning the project, rehabilitation of the project site will be carried out to restore the site to acceptable status. This will include replacement of topsoil and re-vegetation that will lead to improved visual quality of the area.

7.8.2 Employment Opportunities

Several employment opportunities will be created for demolition and construction staff.

CHAPTER 8. : IMPACTS MITIGATION MEASURES

8.1 Introduction

This chapter highlights the necessary mitigation measures that will be adopted to prevent or minimize significant negative environmental, health and safety impacts associated with the activities of the project during its construction, operation and decommissioning phases. Allocation of responsibilities, time frame and estimated costs for implementation of these measures are presented in the environmental and social management and monitoring plan (ESMMP) in Chapter 9.

8.2 Mitigation of Construction Phase Impacts

8.2.1 Efficient sourcing and Use of Raw Materials

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

To reduce the negative impacts on availability and sustainability of the materials, the proponent will only order for what will be required through accurate budgeting and estimation of actual construction requirements. This will ensure that materials are not extracted or purchased in excessive quantities. Moreover, the proponent will ensure that wastage, damage or loss (through run-off, wind, etc.) of materials at the construction site is kept minimal, as these would lead to additional demand for and extraction or purchase materials.

In addition to the above measures, the proponent shall consider reuse of building materials and use of recycled building materials. This will lead to reduction in the amount of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.

8.2.2 Minimization of Run-off

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

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

8.2.3 Minimization of Construction Waste

It is recommended that demolition and construction waste be recycled or reused to ensure that materials that would otherwise be disposed off as waste are diverted for productive uses. In this regard, the proponent is committed to ensuring that construction materials left over at the end of construction will be used in other projects rather than being disposed of. In addition, damaged or wasted construction materials including cabinets, doors, plumbing and lighting fixtures, marbles and glass will be recovered for refurbishing and use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents or homeowners. The proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal.

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

(i) Use of durable, long- lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time

(ii) Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements

(iii) Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials

(iv) Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste

(v) Use of construction materials containing recycled content when possible and in accordance with accepted standards.

8.2.4 Reduction of Dust Generation and Emission

Dust emission during construction will be minimized through strict enforcement of onsite speed controls as well as limiting unnecessary traffic within the project site. In addition, it is recommended that excavation works be carried out in wet weather; and traffic routes on site be sprinkled with water regularly to reduce amount of dust generated by the construction trucks.

8.2.5 Minimization of impacts on traffic flow

The proponent will put in place measures to address such concerns by ensuring that construction vehicles preferably deliver materials during off-peak hours when traffic volume is low. There will also be provision for caution signs on the access road to alert users on construction activities in progress in order to prevent occurrence of accidents. This will be achieved through proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road. In addition, truck drivers will be sensitized to avoid unnecessary racing of vehicle engines at loading/offloading areas, and to switch off or keep vehicle engines at these points.

8.2.6 Minimization of Noise and Vibration

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

8.2.7 Health and safety of Workers on site

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

8.2.8 Reduction of Energy Consumption

The proponent shall ensure responsible electricity use at the construction site through sensitization of staff to conserve electricity by switching off electrical equipment or appliances when they are not being used.

In addition, proper planning of transportation of materials will ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts. Complementary to these measures, the proponent shall monitor energy use during construction and set targets for reduction of energy use.

8.2.9 Minimization of Water Use

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

8.3 Mitigation of Operation Phase Impacts

8.3.1 Ensuring Efficient Solid Waste Management

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

8.3.2 Minimization of Sewage Release

The proponent will ensure that there are adequate means for handling the large quantities of sewage generated by the units being directed to the NCWCC sewer line.

8.3.3 Ensure Efficient Energy Consumption

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

8.3.4 Ensure Efficient Water Use

The proponent will install water-conserving automatic taps and toilets. Moreover, any water leaks through damaged pipes and faulty taps will be fixed promptly by qualified staff. In addition, the occupants of the affordable units will be sensitized to use water efficiently.

8.4 Mitigation of Decommissioning Phase Impacts

8.4.1 Efficient Solid Waste Management

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

8.4.2 Reduction of Dust Concentration

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

8.4.3 Minimization of Noise and Vibration

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

CHAPTER 9. : ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (ESMMP)

9.1 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 seek to improve and protect environmental quality for both the project site and the neighborhood through segregation of activities that are environmentally incompatible. Environmental planning and management integrate land use structure, social systems, regulatory law, environmental awareness and ethics.

Environmental management plan (EMP) for development projects such as the proposed residential apartment 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 and Social 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 **9-1** has addressed the identified potential negative impacts and mitigation measures for the proposed residential development.

9.2 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
- Proliferation of kiosks
- Workers accidents and health infections during construction process
- Solid and liquid wastes management

Table 9-1: Environmental & Social Management and Monitoring Plan - Implementation Phase

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES)	MONITORING MEASURES
PLANNING PHASE				
Commissioning of the Construction Works	- Site hand-over and Ground breaking	Projectteam(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 the project Team
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

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES)	MONITORING MEASURES
Collapse of Building during Construction	- Ensuring Building Strength and stability - Use of appropriate construction materials and reinforcements as per specifications - Ensuring building components are as per designs - Proper supervision - Ensure proper timelines are followed e.g. curing time	Contractor/project team	Part of/Covered in the Project Cost	- Presence of the project Team
Disturbance of Traffic flow during construction	- Proper signage - Awareness creation - Education to truck drivers	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 and education - materials
CONSTRUCTION PHASES				
Soil Excavation leading to site disturbance	- Excavate only areas to be affected by buildings - Dumping of excess excavated materials to sites designated by NEMA and County - Restoration of sites Excavated	Contractor	2,000,000	- Landscaping after completion of construction

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES)	MONITORING MEASURES
Soil Erosion	- Create and Maintain soil traps and embankments. - Landscaping after completion of construction	Contractor/Proponent Architect/Site engineer Landscape Architect	400,000	- Lack/Absence
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 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 and 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
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 and 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
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 and Contractor	400,000	- 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 and Contractor	800,000	- Presence of KPLC power lines - Presence of - Generators

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES)	MONITORING MEASURES
Excessive Water Use	- Excessive water use may negatively impact on the water source and its sustainability	Proponent and Contractor	900,000	- Presence of - NCWSC water lines - Metering of - water
OCCUPATION PHASE				
Architectural incompatibility leading to distortion of neighborhood aesthetic image	- Harmonize building scale with existing developments in neighborhood. - Harmonize detail, material and finishes for roofs and walls with existing development in the neighborhood.	Architect Proponent Contractor	Part of/Covered in the Project Cost	- Compatibility with the neighborhood
Solid Waste Generation and Management	- Regular inspection and maintenance of the waste disposal systems during operation phase - Establish a collective waste disposaland management system - Provide waste disposal bins to each unit well protected from adverse weather and animals - Ensure waste materials are disposed of on County 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

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES)	MONITORING MEASURES
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
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 conflict social	- 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 neighborhood associations	Contractor Proponent Neighborhood Associations Estate Managers		-

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES)	MONITORING MEASURES
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
Insecurity	- Ensure secure perimeter wall where applicable	Contractor, Proponent	200,000	- Presence of perimeter wall -

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST (KES)	MONITORING MEASURES
	- Have a single-entry point that is manned 24 hours	Neighborhood Associations Estate Managers		- Presence of day and - night security guards
DECOMMISSIONING PHASE				
Building Safety	- Assess the condition of buildings to ascertain usefulness	Engineer/Proponent	600,000	- Engineer and Tests on the building
Land and Building use	- Ascertain the Planning development policy	Local Authority Physical Planner	650,000	- Consultants present
Accidents/Injurie	- 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 off 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	200,000	- Absence of Debris

CHAPTER 10. : ENVIRONMENTAL HEALTH AND SAFETY (EHS)

10.1 EHS Management and Administration

The EHS is a broader and holistic aspect of protecting the worker, the workplace, the tools/ equipment and the biotic environment. It is an essential tool in determining the ESIA 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.

10.2 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.

10.3 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.

10.4 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.

10.5 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.

10.6 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

10.7 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.

10.8 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

10.9 Emergency procedure during construction and operation

An emergency situation means:

- Unforeseen happening resulting in serious or fatal injury to employed persons or the neighboring 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”

CHAPTER 11. : DECOMMISSIONING

11.1 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

Table 11-1 below shows the proposed decommissioning plan:

Table 11-1: ESMMP for Decommissioning

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	Time Frame	COST (KES)
1.	**2. 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 local County based on the properties of the particular waste generated -	Project Manager & Contractor	During decommissioning	3,000,000
	- All buildings, machinery, equipment, structures and partitions that will not be used for other purposes should be removed and reused or rather sold/given to scrap material dealers	Project Manager & Contractor	During decommissioning	
	- Where recycling/reuse of the machinery, equipment, structures and other waste materials is not possible the materials should - be taken to approved dumpsites	Project Manager & Contractor	During decommissioning	

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	Time Frame	COST (KES)
Rehabilitation of project site				
Vegetation disturbance Land deformation: soil erosion, drainage problems	- Implement an appropriate re-vegetation program to restore the site to its original status. - During the vegetation period, appropriate surface water runoff controls will be taken to prevent surface erosion; - Monitoring and inspection of the area for indications of erosion will be conducted and appropriate measures taken to correct any Project Manager & Contractor 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. Offer alternative housing facilities	Project Manager & Contractor	During decommissioning	3,000,000

CHAPTER 12. : CONCLUSION AND RECOMMENDATIONS

12.1 Overview

From the foregoing analysis, the social and economic rating for this project is highly positive. Evaluation of alternatives has already shown that options are limited and costly. Already the proponent has sunk a substantial amount of resources in the project up to the design stage. Further delay of the project is denying all stakeholders the anticipated benefits of the investment especially the slum dwellers of the informal settlements who owing to congestion may have a hard time in the event of a breakout of covid-19 pandemic in their dwelling places. On the other hand, redesigning or relocation will lead to loss of time and money that is already tied in the preliminary costs of the project. The project does not pose any serious negative environmental and social impacts. Adequate mitigation measures have been proposed to address any of the negative impacts arising from the project. The project will create employment during construction. More importantly, the project will afford units for accommodation for slum dwellers currently living in congested informal settlements who are at the risk of the covid-19 outbreak.

During the preparation of this ESIA report for the proposed affordable units' development, it is observed and established that most of the negative environment and social impacts are rated low and short term with no major significant effects. The positive impacts are highly rated and will benefit all slum dwellers and the Government of Kenya at large. The project proponents have proposed to adhere to prudent implementation of the ESMMP. They are obtaining all necessary permits and licenses from the relevant authorities and have qualified and adequate personnel to do the project as proposed. They have proposed adequate safety and health mitigation measures as part of the relevant statutory requirements. Above that will also be conducted essential neighborhood analysis as well as geotechnical surveys and soil investigations that can also be applied in future undertakings of whatever nature.

12.2 Conclusion

This study is recommendable and should be approved by NEMA for issuance of an ESIA license subject to annual environmental audits after it has been completed and occupied. This will be in compliance with the Environmental Management and Coordination Act of 1999 and the Environmental and Social Impact Assessment and Audit regulations, Legal Notice No. 101 of

2003. Above all the proponent should carry out Environmental Audit 12 months after the project is completed.

The proponent should therefore be licensed to implement this project subject to adherence to the environmental and social management and monitoring plan proposed in this report and the statutory requirements.

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xi. Steinneman, 2000 Environmental and Social Impact Assessment, a Guide for Reviewers

ANNEXES

Annex 1: Letter of Land Transfer from Ministry of Lands & Physical Planning

REPUBLIC OF KENYA

MINISTRY OF LANDS AND PHYSICAL PLANNING
Office of the Cabinet Secretary

Tel: +254(0)20 2718050
Fax: +254(0)20 2724470
Email: cs@ardhi.go.ke
Web: www.ardhi.go.ke
When replying please quote:

Ardhi House
1st Ngong Avenue
P.O.BOX 30450-00100
Nairobi, KENYA

Ref. No. MOLPP/ADMIN/20/04/20 (42) **May 7, 2020**

Dr. Joseph K. Kinyua, EGH
Executive Office of the President
Head of the Public Service
P.O Box 40530 -00100
NAIROBI

HS / ASUMD / ASCM
For noting.
8/5/2020

Dear PS

RE: REQUEST FOR APPROVAL TO TRANSFER LAND REFERENCE NUMBER 209/24794/81/A FOR REDEVELOPMENT OF MUKURU SLUM

Reference is made to the above captioned subject matter.

The above quoted land reference number refers to parcel of land that was reserved for use by Kenya Meteorological Department. Developments on the land include high frequency masts and a weather transmission station.

His Excellency the President has directed the State Department of Housing and Urban Development and Nairobi Metropolitan Services to initiate the process of re-developing the Mukuru Slum. This particular parcel of land which measures 53 acres has been identified as suitable for initiating phase one of the project. The plan includes setting up affordable houses for resettling the slum dwellers.

In light of the above, the Ministry is desirous of allocating and transferring the parcel of land to the Cabinet Secretary of the National Treasury as a trustee for the State Department of Housing and Urban Development.

The parcel of land was irregularly allocated to private entities. However, these titles have since been cancelled and the Ministry is in the process of planning and surveying with a view to having the title issued.

The purpose of this letter is therefore to request for your approval to initiate the allocation and transfer of the parcel of land to the Cabinet Secretary for the National Treasury as a trustee for the State Department of Housing and Urban Development.

Yours Sincerely

Farida Karoney, EGH
CABINET SECRETARY

Copy to: **Mr. James W. Macharia, EGH**
Cabinet Secretary
Ministry of Transport, Infrastructure, Housing,
Urban Development and Public Works
NAIROBI

Mr. Keriako Tobiko, CBS
Cabinet Secretary
Ministry of Environment and Forestry
NAIROBI

Major General Mohammed Abdalla Badi
Director General
Nairobi Metropolitan Services
NAIROBI

Charles M. Hinga, CBS
Principal Secretary
Ministry of Transport, Infrastructure, Housing,
Urban Development and Public Works
State Department of Housing and Urban Development
NAIROBI

Annex 2: Site Lay-Out Plan

Annex 3: Elevations of Proposed Blocks Housing the Affordable Units