

ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT

FOR

THE PROPOSED DEVELOPMENT OF GREAT WALL
GARDEN ESTATE ON PLOT NUMBER L.R 12581/14,ATHI
RIVER AREA ,MACHAKOS COUNTY.

(GPS CO-ORDINATES; LATITUDE; 1.42686368S,
LONGITUDE; 36.70925 E)

PROJECT PROPONENT:

**ERDEMANN PROPERTY LIMITED
P.O. BOX 42541-00100
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JUNE, 2018

Document Authentication

This project report on Environmental Impacts Assessment has been prepared by Katrina Management Consultants Limited; NEMA registered and licensed EIA/EA Firm of Experts.

This report has been done with reasonable skills, care and diligence in accordance with the Environmental Management and Coordination Act, Cap 387, and the Environmental (Impact Assessment and Audit) Regulations 2003.

We the undersigned, certify that the particulars given in this report are correct and righteous to the best of our knowledge.

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ACRONYMS

EIA	-	Environmental Impact Assessment
EHS	-	Environmental, Health and Safety
EMCA	-	Environmental Management & Coordination Act
EMP	-	Environmental Management Plan
NEMA	-	National Environmental Management Authority
ISO	-	International Standard Organization
SEA	-	Strategic Environmental Assessment
KFS	-	Kenya Forest Service
KWS	-	Kenya Wildlife Service
ODS	-	Ozone Depleting Substances
PAP	-	Project Affected Population
PPE	-	Personal Protective Equipment
WRMA	-	Water Resources Management Authority

NON-TECHNICAL SUMMARY

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

The Great Wall Garden housing development on **plot No L.R 12581/14 off Mombasa –Namanga Road interchange, Mavoko, Machakos County** will be done on a 7.5 acres piece of land adjoining the London Distillers Kenya (LDK).The development will constitute;

- 12 No. of Blocks
- 48 Units per Block
- Total No. of units - 576No.
- No. of parking spaces - 500
- Shop units - 20

The proposed housing development may have significant impacts on the environment which has to be mitigated, if adverse, and optimized, if beneficial.

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

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

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

- Provision of adequate sanitation to the construction workforce and strict enforcement of good behavior by the workforce.
- Transportation of building materials to site and construction debris from site has to be undertaken during off peak hours.
- No construction activities shall be undertaken at night
- Adequate dust screening and water sprinkling to control dust emissions
- Minimization of noise and vibrations by ensuring compliance with maximum permissible noise levels (day or night) in accordance with the Noise and excessive Vibration pollution control) Regulations 2009.
- and adhere to the provisions of Occupational Safety and Health Act, No. 15 of 2007 to ensure safety of the workforce.

Occupation/operation phase of the project presents lesser negative environmental impacts mainly restricted to the pressure on existing infrastructure (water, sewer, and road) and waste generation. The area depicts a mixture use development of industrial, commercial and residential project.

The proposed site has an existing borehole which accommodates the entire Great Wall Gardens estate, both phase one already existing and the upcoming proposed phase II. Also there is piped water from the Mavoko water and sewerage Company and from the EPZ.

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

The project will embrace Green building concept (also known as **green construction** or **sustainable building**) which refers to a structure that is environmentally responsible and resource-efficient throughout a building's life-cycle: from siting to design, construction, operation, maintenance, renovation, and demolition. This will require close cooperation of the design team, the architects, the engineers, and the client at all project stages. The Green Building practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. The common objective is that green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and environmental degradation

The summary therefore posits that a number of environmental mitigation measures be implemented to minimize environmental degradation and enhance environmental quality. The proponent, contractor and the Environmental

Consultant shall therefore ensure that adequate supervision is in place to implement the guidance in the Environmental Management Plan.

1. INTRODUCTION

1.1 Project Background and Rationale for an Environmental Impact Assessment

Founded in 2003 and based in Nairobi - Kenya, ERDEMANN PROPERTY LIMITED (“EPL”) is a limited Liability Company specializing in property development. EPL operates under the Investment Promotion Centre and was pioneered by a Chinese investor, Mr. Zeyun Yang together with a dedicated team of professionals who have been very instrumental in the company’s transformation over the years.

EPL provides decent, low-cost shelter to Kenyans by employing the latest technology to the art of building construction. EPL has built more than 2000 housing units from the year 2003 to-date and are still doing more including the proposed industrial park.

Erdemann property Limited is developing Great wall Gardens housing project phase II on plot L.R12581/14 off Mombasa-Namanga Road interchange, Mavoko, Machakos County. The development will include;

1. No. of Blocks 12No.
2. Units per Block - 48No.
3. Total No. of units - 576No.
4. No. of parking spaces - 500No
5. Shop units - 20No

The proponent is aware that an environmental impact assessment (EIA) is a statutory requirement under section 58(2) of the Environmental management and coordination act (EMCA), Cap. 387. The expert undertook the study with the objective of identifying both positive and negative impacts of the proposed project; provide counter measures for the negative impacts and optimize the positive ones and come up with an Environmental Management Plan (EMP) as per the terms of reference (TOR).

The EMP will be useful in managing the activities at the site so that potential and actual impacts to the environment are addressed. The report has also provided guidelines on how to mitigate the negative environmental impacts and is confident that they will be implemented by the proponent. The EMP will also be an excellent reference tool for compliance audits in future. This is in line with the statutory requirements and the guidelines issued by NEMA.

1.2 The study

The second schedule to the Environmental Management and Coordination act (EMCA), Cap 387 specifies categories of projects that must be subjected to environmental impact assessment (EIA) at the project planning stages to ensure that significant impacts on the environment are taken into consideration at the design, construction, operation and decommission stages of the project.

The objectives of this EIA study were therefore:

- (i) To identify and discuss the project's likely adverse impacts on the environment such as to include natural, social, cultural and economic aspects.
- (ii) Note the positive impacts and suggest on augmentation/optimization
- (iii) To consult with the likely affected public/institutions/offices as Project Affected Population to get their views on the proposal, create awareness and harmony,
- (iv) To propose options for mitigation measures and develop an Environmental Management Plan for the project phases (Planning, Construction, Operation and Decommissioning phases).
- (v) To generate an Environmental Impact Assessment Project Report for submission to the NEMA as required by law for informed decision making.

1.2.1 Terms of reference

The key instructions to the environmental expert were as follows:

- (i) Provide a description of the proposed projects activities with a focus on potential adverse impacts of all the activities
- (ii) Establish the environmental baseline conditions of the project area and identify areas that are likely to be impacted on by the project in accordance with laid down environmental legislation and guidelines.
- (iii) Carry out a systematic EIA following the gazetted regulations (The Environmental (Impact Assessment and Audit) Regulations, 2003 covering among others policy and legal framework.
- (iv) Produce a comprehensive EIA report that should contain among other issues, identification of key environmental aspects, recommendations on appropriate mitigation measures to minimize or prevent adverse impacts while optimizing the positive impacts.
- (v) Undertake consultation with the neighbours and/or Project Affected Population (PAP).
- (vi) Develop an Environmental Management Plan detailing the prescribed mitigating measure, person(s) responsible, timeframe/timeline, cost of mitigation and monitoring mechanisms.

The following environmental issues were identified for coverage as per the terms of reference above;

- a) Physical Environment
 - (i) Pressure on water, road and sewer infrastructure,
 - (ii) Soil contamination and land degradation

- (iii) Drainage patterns
 - (iv) Air quality
- b) Natural Environment
- (i) Vegetation
 - (ii) Topography
- c) Social, economic and cultural environment
- (i) Settlement patterns
 - (ii) Changes in land use
 - (iii) Public health, safety and general hazards
 - (iv) Aesthetic changes
 - (v) Construction materials and wastes
 - (vi) Income generation opportunities
 - (vii) Occupational Safety, Health and Welfare

1.3 Scope and content of project

The project assessment investigates and analyses the anticipated environmental impacts of the proposed development in line with the Environmental (Impact Assessment and Audit) regulations 2003.

Consequently, the report will provide the following:-

- Nature of project
- The location of the project including the physical area that may be affected by the project's activities.
- The activities that shall be undertaken during the project design, construction and operation phases.
- The materials to be used, products and by-product including waste to be generated by the project and the methods of disposal.
- The potential environmental impacts of the project and mitigation measures to be taken during and after the implementation of the project.
- Analysis of comments from the PAP.
- 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
- Ensure substantive conformity with the zoning specifications of the area
- Use of environmentally friendly alternatives e.g. use of ODS alternatives
- Any other information that the proponent may be requested to provide by NEMA

Methodology

To achieve all this, a systematic approach was followed by the consultants who include the general steps outlined below:-

- Environment screening
- Environmental scoping which provided the key environmental issues
- Desktop studies and interviews
- Physical inspection of the site and surrounding areas
- EIA Public participation via interviews and the use of questionnaires
- Discussions with the Proponent and project architect
- Reporting.

All these aspects will be considered accordingly. This report also seeks to ensure that all the potential environmental impacts are identified and that workable mitigation measures are adopted. The report also seeks to ensure compliance with the provision of the EMCA, Cap. 387 and Environmental (Impact Assessment and Audit) Regulations 2003 as well as other regulations.

1.4 Environmental Concerns

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

- The site topography, vegetation, soil type, and general scenery
- How are the site maps, structure distribution
- The construction material to be used
- The proposed method to dispose the effluents and solid wastes
- Area zoning specifications a critical planning framework to guide on project level EIA and the need to adhere to the same.
- Water supply system
- If some of the materials will be obtained from within and where exactly, quantity, site regeneration program
- Whether any de-vegetation will take place
- The power sources to be used
- Infrastructure available and pressure on the existing infrastructure such as water, sewer and traffic.

- Protection of ecologically sensitive areas such as dams and river riparian reserves neighboring the plot.

1.5 Need for the project

The main objective of EPL is to provide decent, low-cost shelter to Kenyans by employing the latest technology to the art of building construction.

2. LEGAL AND LEGISLATIVE FRAMEWORK

2.1 Policy framework

Environmental and Social Impact Assessment is a tool for environmental conservation and has been identified as a key component in new project implementation. According to section 58 of the principal Environmental Management and Coordination Act (EMCA, Cap387) No. 8, second schedule 9 (I), and Environmental (Impact Assessment and Audit) Regulation, 2003, both new and old projects must undergo Environmental Impact assessment and Audits. The report of the same must be submitted to the National Environment Management Authority (NEMA) for approval and issuance of the relevant certificates.

There is a growing concern in Kenya and at global level that many forms of development activities cause damage to the environment. Development activities have the potential to adversely affect the natural resources upon which the economy is dependent. Environmental Impact Assessment is a useful tool for protection of the environment from the negative effects of developmental activities. It is now accepted that development projects must be economically viable, socially acceptable and environmentally sound.

2.2 Environmental policy

This ESIA has been prepared to fully comply with environmental and social safeguard policies and procedures as outlined in the various regulations by Kenya's National Environment Management Authority.

2.3 Relevant Kenya Policies

2.3.1 National Environment Policy 2013

The National Environment Policy aims to provide a holistic framework to guide the management of the environment and natural resources in Kenya. The major objective of the policy is to provide a framework for an integrated approach to planning and sustainable management of Kenya's environment and its natural resources. The policy further ensures that the environment is integrated in all government policies in order to facilitate and realize sustainable development at all

levels. This would help promote green economy, enhance social inclusion, improve human welfare and create opportunities for employment and maintenance of a healthy ecosystem.

2.3.2 Physical Planning Policy

The current policy governs the development and approval of all building plans as provided for in the Physical Planning Act (Cap 286). The proposed project has been subjected to the provisions of this policy and legislation.

2.3.3 Public Health Policy

The prevailing public health policy calls upon the project proponent to ensure that ancillary buildings are adequately provided with utilities that make them fit for human habitation. The proposed development has been designed by professional engineers and architects and as such will have all amenities/utilities that are essential for safeguarding public health for all the residents and visitors who access the facilities.

2.3.4 The Sessional Paper No.4 on Energy

The major objective of the Policy is to ensure adequate, quality, cost effective and affordable supply of energy through indigenous resources while protecting the environment. It encourages wider adoption and use of renewable energy technologies to enhance their role in the country's energy supply matrix. The Energy Policy is aligned to long term development strategy -Vision 2030 and other policies.

2.3.5 The Kenya Vision 2030

The Kenya Vision 2030 is the national long-term development policy that aims to transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment.

2.3.6 The Kenya National Climate Change Response Strategy

The purpose of this strategy is to put in place robust measures needed to address most of the challenges posed by climate variability and change through thorough impact assessments and monitoring of various projects. According to Climate Change Projections, the country is likely to experience hotter drier sunny seasons, warmer wetter rainy seasons, rise in sea levels and an increase in extreme weather events.

In the construction sector, priority inclusion areas should include energy efficient innovations and technologies, and utilization of low-carbon appliances and tools;

the utilization of eco-friendly energy resources such as wind, solar, biogas, etc.; as well as possible utilization of biofuels.

2.3.7 The National Occupational Safety and Health Policy

This Policy significantly sustains continual development and implementation of the National Occupational Safety and Health systems and programs to reduce incidences of work related accidents and diseases. In addition, it seeks to offer equitable compensation to those who suffer physical injuries and contract occupational diseases.

The Policy addresses the current challenges, gaps and future development of safety and health systems and programs in the country. It promotes basic principles of assessing occupational risks or hazards; combating occupational risks or hazards at source; and developing a national preventative safety and health culture that includes information, consultation, research and training. The policy also promotes continuous improvement of occupational safety and health by integrating Kenyan national laws and regulations with Regional Protocols, ILO Conventions, ISO standards and the best practices in the world. It sets up mechanisms for resource mobilization for occupational safety and health programs and activities and provides guidance to all stakeholders in the development and implementation of national occupational safety and health systems and programs. In all phases of the project, the issues of occupational safety and health will emerge and the National Occupational Safety and Health Policy will be handy in addressing these issues.

2.5 Institutional Framework

Environmental Impact Assessment (EIA) is a critical examination of the effects of a project on the environment. The goal of an EIA is to ensure that decisions on proposed projects and activities are environmentally sustainable. It guides policy makers, planners, stakeholders and government agencies to make environmentally and economically sustainable decisions. It is therefore a legal requirement to carry out an EIA before commencement of the proposed project.

At present there are over twenty (20) institutions and departments which deal with environmental issues in Kenya. Some of the key institutions relevant to the proposed industrial development include the National Environmental Council

(NEC), National Environmental Management Authority (NEMA), the Kenya Forest Service, Water Resources Management Authority (WRMA), Directorate of Occupational Safety and Health Services (DOSHS) and others. There are also local and international NGOs involved in environmental issues in the country.

2.5.1 National Environment Management Authority (NEMA)

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

- Co-ordinate the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations into development policies, plan, programmes and projects with a view to ensuring the proper management and rational utilisation of environmental resources on a sustainable basis for the improvement of the quality of human life in Kenya.
- Take stock of the natural resources in Kenya and their utilisations in consultation, with the relevant lead agencies, land use guidelines.
- Examine land use patterns to determine their impact on the quality and quantity of the natural resources.
- Carry out surveys, which will assist in the proper management and conservation of the environment.
- Advise the government on legislative and other measures for the management of the environment or the implementation of relevant international conservation treaties and agreements in the field of environment as the case may be.
- Advise the government on regional and international environmental convention treaties and agreements to which Kenya should be a party

and follow up the implementation of such agreements where Kenya is a party.

- Undertake and co-ordinate research, investigation and surveys in the field of environment and collect and disseminate information about the findings of such research, investigation or survey.
- Mobilise and monitor the use of financial and human resources for environmental management.
- Identify projects and programmes or types of projects and programmes, plans and policies for which environmental audit or environmental monitoring must be conducted under EMCA.
- Initiate and evolve procedures and safeguards for the prevention of accidents, which may cause environmental degradation and evolve remedial measures where accidents occur.
- Monitor and assess activities, including activities being carried out by relevant lead agencies in order to ensure that the environment is not degraded by such activities, environmental management objectives are adhered to and adequate early warning on impending environmental emergencies is given.
- Undertake, in co-operation with relevant lead agencies programmes intended to enhance environmental education and public awareness about the need for sound environmental management as well as for enlisting public support and encouraging the effort made by other entities in that regard.
- Publish and disseminate manuals, codes or guidelines relating to environmental management and prevention or abatement of environmental degradation.
- Render advice and technical support, where possible to entities engaged in natural resources management and environmental protection so as to enable them to carry out their responsibilities satisfactorily.

- Prepare and issue an annual report on the state of the environment in Kenya and in this regard may direct any lead agency to prepare and submit to it a report on the state of the sector of the environment under the administration of that lead agency and,
- Perform such other functions as government may assign to the Authority or as are incidental or conducive to the exercise by the authority of any or all of the functions provided under EMCA.

However, NEMA mandate is designated to the following committees

2.5.2 National Environmental Complaints Committee (NECC)

The NECC'S mission is to facilitate access to environmental justice to the public by providing a forum for environmental conflict resolution and contributing to environmental policy. The Committee performs the following functions:

- Investigate complaints or allegations regarding the condition of the environment in Kenya and suspected cases of environmental degradation.
- The NECC also undertakes public interest litigation on behalf of the citizens in environmental matters.

2.5.3 County Environment Committee

The County Environment Committee shall-

- (a) Be responsible for the proper management of the environment within the county for which it is appointed;
- (b) Develop a county strategic environmental action plan every five years for consideration and adoption by the County Assembly. Every County Environment Committee, in preparing a county environment plan, shall undertake public participation and take into consideration every other county environment action plan already adopted with a view to achieving consistency among such plans. The respective County Executive Committee members of every county shall submit the county environment action plan to the Cabinet Secretary for incorporation into the national environment action plan.
- (c) Perform such additional functions as are prescribed by the EMCA (Amendment) Act 2015 or as will from to time, be assigned by the county Governor by notice in the Gazette.

2.5.4 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. The members of the Standards and Enforcement Review Committee are set out in the third schedule of the principal Environmental Management and Co-ordination Act.

The Principal Secretary under the Cabinet Secretary is the Chairperson of the Standards and Enforcement Review Committee. The Director General appoints a Director of the Authority to be a member of the Standards and Enforcement Review Committee who also provides secretarial services to the Committee. The Committee regulates its own procedure. The Standards and Enforcement Review Committee may co-opt any person to attend its meetings and a person so co-opted shall participate at the deliberations of the committee but shall have no vote. Finally, the Committee shall meet at least once every three months for the transactions of its business.

2.5.5 National Environmental Tribunal

The tribunal's principal function is to receive, hear and determine appeals arising from decisions of the National Environment Management Authority (NEMA) on issuance, denial or revocation of environmental impact assessment (EIA) licenses, among other decisions. If disputes with respect to the proposed mini-hydro project arise, the NET will function very much like a court of law.

2.5.6 National Environmental Council (NEC)

Part III section 4 of the principal Act outlines the establishment of the National Environment Council (NEC). NEC is responsible for policy formulation and directions for purposes of EMCA; sets national goals and objectives, determines policies and priorities for the protection of the environment, promotes co-operation among public departments, county governments, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes. It also performs such other functions as assigned under EMCA.

2.5.7 Directorate of Occupational Safety and Health Services (DOSHS)

This is one of departments within the current Ministry of East African Community, Labour and Social Protection, whose primary objective is to ensure safety, health and welfare of all workers in all workplaces. Unsafe and unhealthy work environment causes accidents, diseases, disasters and environmental pollution that occasion huge economic and social burdens to individuals and enterprises thereby stifling economic and social growth.

The Directorate enforces Occupational Safety and Health Act, 2007 (OSHA, 2007) with its subsidiary legislation which aims at prevention of accidents and diseases at work. It also administers the Work Injury Benefits Act, 2007 (WIBA, 2007) which provides for compensation of workers who have been injured or have suffered a disease out of and in the course of employment.

Functions

In fulfilment of its responsibility of identifying hazards at workplaces and assessment of risks with a view of preventing accidents, diseases and damage to property, the Directorate undertakes the following functions;

- Systematic inspection and auditing of workplaces to promote best practices and ensure compliance with safety and health standards as set out in OSHA, 2007 and its subsidiary legislations.
- Examination and testing of steam boilers, air and steam receivers, gas cylinders, refrigeration plants, passenger lifts, hoists, cranes, chains and other lifting equipment to ensure their safe use.
- Identification, evaluation and control of biological, chemical, physical, psychosocial, ergonomic and other factors in the work environment which may affect the safety and health of employed persons and the general environment.
- Medical surveillance, including medical examination to monitor and check on the health status of the workers and advise on intervention measures.
- Training and awareness creation on occupational safety and health in order to promote safety and health culture in the country.

- Ensuring compensation to employees for work related injuries and diseases contracted in the course of their employment in accordance with the provisions of WIBA, 2007.
- Investigation of occupational accidents, dangerous occurrences and cases of Occupational diseases with a view to preventing recurrence.

2.6 Legal Framework

2.6.1 Environmental Management and Coordination Act, Cap 387

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

Relevance to the proposed project

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

2.6.2 Environmental Impact Assessment and audit regulations 2003

These regulations stipulate how an EIA project report should be prepared and specifies all the requirements that must be complied with. It highlights the stages to be followed, information to be made available, role of every stakeholder and rules to be observed during the whole EIA project Report making process. It also requires that during the EIA process a proponent shall in consultation with the Authority seek views of persons who may be affected by the project or activity.

Relevance to the proposed project

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

2.6.3 Water Quality Regulations (2006)

The Water Quality Regulations (2006) are contained in the Kenya Gazette Supplement No. 68, Legal Notice No. 120. Water Quality Regulations apply to water used for domestic, industrial, agricultural, and recreational purposes; water used for fisheries and wildlife purposes, and water used for any other purposes. Different standards apply to different modes of usage. These regulations provide for the protection of lakes, rivers, streams, springs, wells and other water sources. It is an offence to contravene the provisions of these regulations with a fine not exceeding five hundred thousand shillings. In addition, of immediate relevance to the proposed project for the purpose of this Project Report is Part II Sections 4-5 as well as Part V Section 24.

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

Relevance

All waste water shall be channeled to the main drain so as not to pollute the ground and surface water..

2.6.4 EMCA (Waste management) Regulation, 2006

The Waste Management Regulations (2006) are contained in the Kenya Gazette No. 69, Legal Notice No. 121. The Waste Management Regulations are meant to

streamline the handling, transportation and disposal of various types of waste. The aim of the Waste Management

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

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

Relevance

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

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

These Regulations require that no person or activity shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and

the environment. In determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered:

Time of the day;

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

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

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

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

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

Section 13 (1) states that except for the purposes in sub-Regulation (2) hereunder, no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of

the permissible levels as set out in the Second Schedule to these Regulations. These purposes include emergencies, those of domestic nature and/or public utility construction.

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

Relevance

The contractor shall be required to implement these measures, ensure that all machineries are in good working condition to reduce noise. Also construction activities shall be restricted between 0800Hrs-1700Hrs to ensure that the neighbours are not disturbed.

2.6.4 Environmental Management and Coordination (Air Quality) Regulations, 2008

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

Relevance

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

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

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

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

Responsibility for compliance

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

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

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

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

Relevance

In compliance to these regulations solar energy shall be adopted for water pumping, lighting common areas and cooling systems within the development.

2.6.6 Environmental Management and Coordination (Conservation of Biodiversity regulations), 2006

Kenya has a large diversity of ecological zones and habitats including lowland and mountain forests, wooded and open grasslands, semi-arid scrubland, dry woodlands, and inland aquatic, and coastal and marine ecosystems. In addition, a total of 467 lake and wetland habitats are estimated to cover 2.5% of the territory. In order to preserve the country's wildlife, about 8% of Kenya's land area is currently under protection.

The country has established numerous goals, as well as general and specific objectives that relate to these issues, among others: environmental policies and legislations; involvement of communities; documentation of national biological

resources; sustainable management and conservation of biodiversity; fair and equitable sharing of benefits; technical and scientific cooperation; biodiversity assessment; dissemination of information; institutional and community capacity building; and integration of biodiversity concerns into development planning.

Relevance to the project

The proposed project must comply with the various national provisions that aim at the protection and conservation of the country's biodiversity

2.6.7 County Governments Act, 2012

This Act vests responsibility upon the County Governments in planning of development projects within their areas of jurisdiction is it projects of importance to the local County Government or those of national importance.

Section 102 of the Act provides the principles of planning and development facilitation which include integration of national values in county planning, protect the right to self-fulfillment within the county communities and with responsibility to future generations, protection of rights of minorities and marginalized groups and communities, promotion of equity resource allocation, among others.

Section 103 of the Act outlines the prime objective of county planning which aligned to the bill of rights and the constitution of Kenya.

Section 114 and 115 indicate and give guidelines in planning of projects of national significance and instill the aspect of public participation in every aspect of the planning process through that: clear strategic environmental assessments; clear environmental impact assessment reports; expected development outcomes; and development options and their cost implications. Each county assembly is tasked with the role to develop laws and regulations giving effect to the requirement for effective citizen participation in development planning and performance management within the county.

Relevance to the project

The project proponent has initiated the process of County Government engagement in the initial project planning through application of essential development approvals from Nairobi County Government.

2.6.8 Land Planning Act cap 303

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

Relevance to the proposed project

The proponent has submitted architectural plans to Nairobi County for approval.

2.6.9 The Land Act, 2012

This is an Act of Parliament to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land based resources, and for connected purposes. The Land Act of 2012 subsection (1) states that ‘any land may be converted from one category to another in accordance with the provisions of this Act or any other written law.’ it continues to state in subsection (2) that Without prejudice to the generality of subsection (1)

- a) Public land may be converted to private land by alienation
- b) Subject to public needs or in the interest of defense, public safety, public order, public morality, public health, or land use planning, public land may be converted to community land
- c) private land may be converted to public land by
 - i. Compulsory acquisition;
 - ii. Reversion of leasehold interest to Government after the expiry of a lease; and
 - iii. Transfers; or
 - iv. Surrender.
- (d) Community land may be converted to either private or public land in accordance with the law relating to community land enacted pursuant to Article 63(5) of the Constitution.

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

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

- (a) allocation;
- (b) land adjudication process;
- (c) compulsory acquisition;
- (d) prescription;
- (e) settlement programs;
- (f) transmissions;
- (g) transfers;
- (h) long term leases exceeding twenty-one years created out of private land; or any other manner prescribed in an Act of Parliament.

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

2.6.10. The Land Registration Act, 2012

The Land Registration Act is place to revise, consolidate and rationalize the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes. This Act applies to Subject to section 4, this Act shall apply to:

- Registration of interests in all public land as declared by Article 62 of the Constitution;
- Registration of interests in all private land as declared by Article 64 of the Constitution; and
- Registration and recording of community interests in land.

Section 24 states that: (a) the registration of a person as the proprietor of land shall vest in that person the absolute ownership of that land together with all rights

and privileges belonging or appurtenant thereto; and (b) the registration of a person as the proprietor of a lease shall vest in that person the leasehold interest described in the lease, together with all implied and expressed rights and privileges belonging or appurtenant thereto and subject to all implied or expressed agreements, liabilities or incidents of the lease.

2.6.11 The Environment and Land Court Act, 2011

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

2.6.12 The National Land Commission Act, 2012 (No. 5 of 2012)

Section 5 of the Act outlines the Functions of the Commission, pursuant to Article 67(2) of the Constitution as follows 5(1):-

- to manage public land on behalf of the national and county governments;
- to recommend a national land policy to the national government;
- to advise the national government on a comprehensive programme for the registration of title in land throughout Kenya;
- to conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities;
- to initiate investigations, on its own initiative .or on a complaint, into present or historical land injustices, and recommend appropriate redress;
- to encourage the application of traditional dispute resolution mechanisms in land conflicts;
- to assess tax on land and premiums on immovable property in any area designated by law; and To monitor and have oversight responsibilities over land use planning throughout the country

Relevance to the project

The proponent is the owner of the proposed plot as per the provided certificate of title attached.

2.6.12 National Construction Authority Regulations, 2014

The NCA published the National Construction Authority Regulations 2014, the Code of Conduct and Ethics for the Construction Industry, and the NCA Strategic Plan (2015-2020) to effectively regulate the construction industry in Kenya. Contractors operating or willing to undertake construction operations in Kenya are required by law to register through the National Construction Authority (NCA), which is constituted under Act No. 41 of 2011 Laws of Kenya. The NCA is mandated to clear builders and contractors as a way of eliminating rogue contractors in Kenya and malpractices in the building and construction industry. The Authority has provided the regulatory framework for registration and renewal of contractors. It is tasked with the responsibility of inspecting construction and building projects around the country to ensure high quality of work and close projects posing health risks and collapse hazards.

Relevance to the project

The proponent should contract an NCA registered contractor and adhere to the regulations as it is stipulated.

2.6.13 Occupational Safety and Health Laws and Regulations

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

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

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

Duties of the proponent pertaining to safety and health

It is the duty a proponent to:-

- i) Provide and maintain of safe plants and systems at the factory during the operational phase.
- ii) Ensure absence/elimination of risks at the workplace.
- iii) Provide information to employees to ensure safety and health at the factory.
- iv) Maintain the factory in a safe and healthy state.
- v) Provide and maintain the factory in a safe and healthy state.

- vi) Carry out the workplace risk assessment and send a copy of the risk assessment to the Directorate of Occupational Safety and Health Services (DOSHS).
- vii) Stop any hazardous activities.
- viii) Obtain a certificate of registration of a workplace with the Directorate of Occupational Safety and Health Services.
- ix) Prepare safety & health policy and submit a copy to the Directorate of Occupational Safety and Health Services.
- x) Bring the content of the safety and health policy statement to the attention of employees.
- xi) Prevent environmental pollution
- xii) Send notice of accident occurrence, cases of occupational diseases and dangerous occurrence to DOSHS
- xiii) To have the architectural plans of the factory approved by the Directorate of Occupational Safety and Health Services before construction activities commence. In approving the plans Directorate of Occupational Safety and Health Services will among other requirements ensure that:
 - Prescribed dimensions with regards to distance of floor to ceiling of every workroom is upheld
 - Space defining machine layout for intended use by operators will be within statutory limits
 - Emergency exits are provided for and are designed to open in accordance to statutory requirements
 - Sanitary conveniences are provided for with adequacy as to number of intended employees and are designed to have separate approaches
 - First aid facilities like first aid room(s) are provided for,
 - There is provision for accommodation for clothes not worn during working hours
 - There is provision for adequate ventilation
 - There is provision for storage of fire fighting water storage tank with a capacity of at least 10,000 litres
- xiv) Ensure that no employee is discriminated against by virtue of:-

- Lodging a complaint about an unsafe condition at the workplace
 - Being an active member of a health safety committee.
- xv) Establish a health and safety committee whose composition should be in accordance to the Factories (Health and Safety Committees) Rules L.N. 31 of 2004, if he will employ 20 or more employees.
- xvi) Carry out workplace health and safety audit on an annual basis.

General Duties of Employees

Persons employed in the factory during the operational phase will be required:

- i) To ensure personal safety and health at the workplace
- ii) To co-operate with the employer with respect to the safety and health at the workplace
- iii) To use personal protective equipment and appliances adequately
- iv) To comply with any relevant safety and health rules under the Occupational safety and Health Act, 2007
- v) To report to the supervisor, hazardous situations
- vi) Not to interfere with or misuse of provisions that are for their safety and health
- vii) Not to create hazards by bad behavior, practical jokes etc.

Relevance

The contractor as the employer during the construction phase has a duty to provide for the safety, health and welfare of workers and all persons lawfully present at the workplace. The developer (Proponent) has a subsequent duty to provide for the safety, health and welfare of workers and all persons lawfully present at the workplace during the operational phase of the project.

Work Injury Benefits Act, No. 17 of 2007

This law was assented to by His Excellency the President on 22nd October 2007. Various sections in this law were nullified by the high court as they were found to be unconstitutional. This is an act of parliament designed to provide for compensation to employees for work-related injuries and diseases contracted in the course employment and for connected purposes. This is the law whose enactment led to the demise of the Workmen Compensation Act Cap 236.

Relevance to the proposed project

The contractor as the employer has a duty provide for compensation to employees for work related injuries and diseases contracted in the course of their employment at the construction site.

Rules and Regulations

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

i. Safety & Health Committee Rules, 2004 Legal Notice No. 31

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

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

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

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

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

Relevance to the proposed project

This Subsidiary legislation require the contractor to form a safety and health committee to oversee safety and health on site while construction activities on site are ongoing

ii. Fire Risk Reduction Rules, 2007 Legal Notice No. 59

The rules apply to workplaces where the Occupational safety and Health Act, 2007 applies.

An employer/occupier having flammable substances must have fire resistant facility. The occupier to store highly flammable substances in fixed storage tanks, closed vessels, cupboards except for vehicles transporting the same. Flammable materials have to be kept in separate labeled stores. In go-downs, the employer has to maintain a distance of at least 80 cm wall gangway between the walls and stack of goods.

Every employer is required to maintain good ventilation to allow exit of flammable fumes, maintain good housekeeping, maintain good electrical fittings, provide and maintain fire exits, form and train fire fighting teams, conduct fire drills yearly, designate an assembly point, provide and maintain first aid facilities, post fire safety notices, install fire detectors, provide and maintain fire fighting appliances, conduct an annual fire safety audit and formulate a fire safety policy.

Relevance to the proposed project

In the construction phase, the contractor will apply the rules to ensure fire safety at the site offices and site camp while the rules come in handy for use by the developer when the go-downs are up and running.

iii. Hazardous Substances Rules, 2007 Legal Notice No. 60

The rules require that where hazardous substances are handled, washing facilities be provided, protective clothing be kept separate from personal clothing, separate clean and dirty changing rooms be maintained, proper maintenance and testing of engineering controls be done after every 2 years and a report submitted to DOSHS, protection against radioactive, carcinogenic, mutagenic or teratogenic be provided, Material Safety Data Sheets (MSDS) be available in respect of chemicals handled, correct disposal of hazardous chemical substances be done, containers of hazardous substances be labeled, workers be trained on hazards associated to hazardous substances handled and air monitoring and measurements be done after every 12 months by an air quality monitor.

Relevance to the proposed project

Substances in form of cement, paints, solvents, fuels and lubricants for construction plants will be used on site by the contractor. The rules will help the contractor to ensure safety and health of workers with regards to the substances. At the operational phase the rules will be very useful as many types of goods including hazardous are likely to be stored in the go-downs.

iv. First Aid Rules, 1977 Legal Notice No. 160

These rules outline first-aid box content with respect to size of a workplace and under whose charge the first-aid box should be placed.

Relevance to the proposed project

During all phases of the project provision of first aid is a requirement and the rules will be useful in this regard in catering for injuries sustained on site and workplace.

v. Eye Protection Rules legal Notice No. 44 of 1978

The rules were developed for purposes of eye safety in workplaces. Processes where eye protection is required include blasting, cleaning, chipping, metal cutting, arc welding, abrasive wheel use (grinding)

Relevance to the proposed project

During the construction phase, work activities requiring eye protection will be a common feature. The rules will provide a good platform for ensuring eye safety of the workers involved in the stated activities

vi. Electric Power(Special) Rules, 1979 Legal Notice No. 340

The rules were developed to provide for electrical safety with regards to electrical power installations, use and handling. These rules apply to generation, transformation, conversion, switching, controlling, regulating, distribution and use of electricity.

vii. Building Operations and Works of Engineering Construction Rules, 1984 Legal Notice No. 40

These rules provide for the safety, health and welfare of workers in construction sites.

Relevance to the proposed project

The contractor will be expected to ensure safety, health and welfare of workers and all persons lawfully present at the construction site

viii. Medical Examination Rules, 2007 Legal Notice No. 24

The rules apply to workplaces of classified hazards. Every employer has to ensure medical examination of workers in the workplaces of classified hazards.

Relevance to the proposed project

During the construction phase there will be noise emission, exposure to dusts and fumes (cement, soil, welding fumes etc) and exposure to musculoskeletal hazards. Exposure to the said hazards will require statutory medical examination on the victims.

ix. Noise Prevention and Control Rules, 2005. Legal Notice No. 25

Kenya's Noise Prevention and Control Rules were passed under Legal Notice No. 25 dated 2005, as a subsidiary legislation of the now repealed Factories and Other Places of Work Act, Cap. 514. The rules state that '*No worker shall be exposed to noise level excess of the continuous equivalent of 90 dB(A) for more than 8 hours within any 24 hours duration*'.

Relevance to the proposed project

During the construction phase there is likely to be noise emission in excess of 90 dB(A) requiring the invoking of these rules to provide for the safety with regards to noise. The rules will guide the contractor in protecting the workers from effects of high noise levels.

2.6.14 The Standards Act Cap. 496

The Act is meant to promote the standardization of the specification of commodities, and to provide for the standardization of commodities and codes of practice; to establish a Kenya Bureau of Standards, to define its functions and provide for its management and control. Code of practice is interpreted in the Act as a set of rules relating to the methods to be applied or the procedure to be adopted in connection with the construction, installation, testing, sampling, operation or use of any article, apparatus, instrument, device or process.

Relevance to the project

The proponent to ensure that all the materials to be used have undergone testing and verification to ensure they are of good quality.

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

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

Relevance to the Project

As part of the project the proponent will rehabilitate the Jadongo access road. The access road will be used during material delivery and during occupation phase.

2.6.16 Water Act, 2002

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

discharge of a pollutant into any water resource; (d) Any purpose, to be carried out in or in relation to a water resource, which is prescribed by rules made under this Act to be a purpose for which a permit is required.

Relevance to the project

The proponent shall apply for water and sewer services from the provider NCWSCO

2.6.17 Physical Planning Act, 1999

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

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

The application shall be accompanied by such plans and particulars as are necessary to indicate the purposes of the development, and in particular shall show the proposed use and density, and the land which the applicant intends to surrender for— (a) Purposes of principal and secondary means of access to any subdivisions within the area included in the application and to adjoining land; (b) Public purposes consequent upon the proposed development. 36. If in connection

with a development application a local authority is of the opinion that proposals for industrial location, dumping sites, sewerage treatment, quarries or any other development activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an environmental impact assessment report.

Relevance to the proposed project

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

2.6.18 The Local Government Act (Cap. 265).

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

Relevance to the proposed project

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

2.6.19 The Penal Code (Cap. 63)

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

persons/institution in dwellings or business premises in the neighbourhood or those passing along public way commit an offence.

Relevance to the proposed project

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

2.6.20 The Traffic Act, 2012

The Traffic Act, 2012 gives provisions and guidelines that govern the Kenya roads transport sector. These guidelines are essential to private, public and commercial service vehicles in ensuring safety and sanity on the roads hence ensuring the environment; the human being a component is safeguarded. In section 41 The Act demands for installation and certification of speed governors for the commercial vehicles ferrying goods adjusted to the loading condition of such vehicles to a limit of 80 KPH, registration and competence of drivers.

Moreover, the owner of commercial vehicles or trailer shall ensure clear markings on their vehicles in English language on the right side of the vehicle showing ownership details, tare weight of vehicle and maximum authorized weight.

Section 26 and 27 of the same discourages engines that emit exhaust gases to the atmosphere without passing via a silencer or expansion chamber

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

Relevance to the Project

The proponent shall adhere to this regulation where applicable

2.6.21 Persons with Disability Act (PWD), 2003

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

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

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

Relevance to the project

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

2.6.22 Public Health Act (Cap. 242)

Part IX, section 115, of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires that County governments take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 as waste pipes, sewers, drainers or refuse pits in such state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health.

2.6.23 Building Code 2000

Section 194 requires that where sewer exists, the occupants of the nearby premises shall apply to the local Authority for permit to connect to the sewer line

and all the wastewater must be discharged in to sewers. The code also prohibits construction of structures or building on sewer lines.

3. DESCRIPTION OF THE PROJECT

3.1 Introduction

This section describes and highlights various aspects and design related to the proposed Great wall Gardens phase II housing development project. The aspects include the following: Client's brief, location, access and design and response to the environment.

3.2 Project location

The proposed industrial park is located on plot L.R12581/14 off Mombasa-Namanga Road interchange, Mavoko, Machakos County.

3.2.1 Other features related to the proposed project

(Architectural drawings detailing the project design are annexed to the study Report for further needed details).

3.2.2 Infrastructure

The premise will have a comprehensive infrastructure including adequate parking space, water storage facilities, borehole, piped water, electricity distribution, security considerations and waste water treatment plant amongst other facilities.

3.2.3 Water reticulation system

The proposed development has an already existing borehole and will connect piped water from the greatwall garden estate whose main source are the Mavoko water and sewerage company and the export processing Zone(EPZ)

3.2.4 Waste / Sewerage

The proposed project now will use a waste water treatment plant which is underway construction and in future will have a sewerage line .Solid waste management will consists of dustbins cubicles (waste receptors) located appropriately within the compound and building to the main entrance of the compound. Waste Segregation at source will also be practiced. The wastes will be protected from rain and scavenging animals. This waste will then be collected by a contracted waste transporter registered as such by NEMA as per the Environmental Management and Coordination (Waste Management) Regulations 2006 for disposal.

3.2.5 Storm water run-off

There will be rain water gutters in the roofs of all the building to facilitate storm water collection. All storm water drainage will be run into the open storm water drainage draining to Athi River near the site. There shall be soil water pipes (SVP) to be provided at the heads of all drainage systems. All drains passing beneath buildings and driveways will be encased in concrete surround.

3.2.6 Security

The proponent will arrange on the security of the development now and even during operation phase .As much as the area is rapidly developing and thus the security is improving, the proponent is advised to install CCTV cameras for ease monitoring of the property, build a boundary wall and to hire security guard to man the entry and exits of the property and general security of the area.

3.2.7 Parking area and driveway

There shall be well demarcated and spacious parking. The parking bays will be inclined to a degree that does not allow stagnation of water and thus linked to storm water drainage system.

3.2.8 Landscaping

A functional landscaping and tree planting scheme will be undertaken to give the required and desired open space. Required expertise shall be put in place to guide the aesthetic and beautification programme.

3.3 Description of the project's construction activities

3.3.1 Pre-construction investigations

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

3.3.2 Clearing of Vegetation

The proposed area is fenced with iron sheets and tapes are in place all round. The excavation is ongoing and the proponent has been advised to get clearances from NEMA before proceeding with the work.

3.3.3 Sourcing and transportation of building materials

The main building materials include steel bars which will be transported to the project site from their manufacturer, or storage sites using transport trucks. Greater

emphasis will be laid on procurement of building materials from within the local areas, 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.

Furthermore selection of contractor and transporter will be determined by their environmental credentials. For instance, company's environmental practices, compliance to Environmental Audit Requirements and compliance to Waste Management Regulations 2006 will form part of environmental credentials to be considered.

3.3.4 Storage of materials

Building materials will be stored on site. Bulky materials such as rough stones, ballast, sand and steel will be carefully piled on site. To avoid piling large quantities of materials on site, the proponent will order bulky materials such as sand, gravel and stones in bits. Materials such as cement, paints and glasses among others will be stored in temporary storage structures, which will be constructed within the project site for this purpose.

3.3.5 Excavation and foundation works

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

3.3.6 Masonry, concrete work and related activities

The construction of the industrial park will involve masonry work and related activities. General masonry and related activities will include stone shaping, concrete mixing, plastering, slab construction, construction of foundations, and extension of the wall and curing of fresh concrete surfaces. These activities are known to be labour intensive and will be supplemented by machinery such as concrete mixers.

3.3.7 Structural steel works

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

3.3.8 Roofing

Roofing activities will include erection of steel metals and laying down of roofing materials.

3.3.9 Electrical work

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

3.3.10 Plumbing

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

3.4 Description of the project's operational activities

3.4.1 Occupation

During operation phase there will be more production of solid waste which has to be disposed off in an environmentally sound manner as discussed below.

3.4.2 Solid waste and waste water management

The proponent will provide facilities for handling solid waste generated within the facility. Segregation at source will also be practiced. These will include dustbin cubicles for temporarily holding waste within the premises before final collection and disposal by appropriate contracted firm licensed by NEMA as per the Waste Management Regulations, 2006. Segregation at source will be emphasized.

3.4.3 General repairs and maintenance

The go-down 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 leaking water pipes, painting, maintenance of flower gardens and replacement of worn out materials among others.

3.5 Description of the project's decommissioning activities

When a time come for the decommissioning of the building for any other reason, and then a decommissioning plan as outlined in this report will be adhered to guide the phase.

3.5.1 Building End of Life Situation

In a situation where the building have completed their useful life the decommissioning process will involve demolition of the existing buildings, dismantling of plant equipment and fixtures (electrical installations, furniture partitions, pipe-work and sinks among others), clearing of the site, and reclaiming

or restoring the affected land into a natural condition. The demolition process will entail removal of roofing using crowbars and hammers, steel removal and reinforced slabs using sledge hammers and/ or jack hammers which utilize compressed air and lowering of materials from high to low levels.

The exercise will therefore entail working at high level and all the necessary health and safety measures will need to be implemented including provision of personal protective equipment such as harnesses, helmets, gloves, respirators, safety shoes, coveralls, goggles and ear protectors.

In addition, all debris generated from the demolition process will need to be cleared from the site and dumped at the approved disposal facility. However some of the debris may be used as base material in new construction works.

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, landscaping and re-vegetation using indigenous/suitable plant species (if no alternative use will be proposed). If alternative use is proposed the proposal shall adhere to laid down rules and guidelines governing development of that nature then.

3.5.2 Change of Use Situation

A change of use may arise before the buildings complete their useful life. In this case the proponent may decide to alter and/ or recondition the existing buildings. Change of use may also involve the transfer of equipment and materials from the site for appropriate disposal or reuse. Disposal of the equipment will either involve selling those that will not have completed their useful life to engineering workshops undertaking similar operations or selling those which will have become “dead” to scrap dealers.

In order to affect the change of use, the project proponent will be required to seek a written consent from the council and the Ministry of Lands in which case a public notice in relation to the change of use will be published in the local newspapers to inform all the interested parties.

The proponent will need to follow the safety guidelines issued in the Kenya Gazette supplement No.13, Legal Notice No. 40, parts IX and X during the demolition process.

4. PUBLIC PARTICIPATION

4.1 Introduction

In conducting the EIA, the EIA expert is required to seek views of the most likely affected immediate public/neighbor/institution. The views are of paramount importance in ensuring optimal operations and therefore sound environmental performance.

The neighbouring facilities were consulted with respect to mitigation measures affecting their property and jointly develop a program to implement the required measures that are relevant and consistent with statement of residents.

The surrounding neighbours include;

- Great wall Gardens Estate
- Mavuno Church
- London Distillers Kenya
- Safaricom Foundation
- Hill crest Estate
- Sunset Boulevard Estate
- And other private owners

Interviews were carried out in the neighborhood by the use of questionnaires (attached), to find out all the views from the neighbors' towards the proposed housing project. The site falls under mixed use development residential, commercial and industrial use. Other associated developments include access roads, electricity supply, water, sewer, Waste water treatment plant and other infrastructures.

The main purpose for such interviews was to identify the positive and negative impacts and subsequently promote and mitigate them respectively. It also helps in identifying any other miscellaneous issues which may bring conflicts in case project implementation proceeds as planned. The following are main concerns raised by the neighbors.

Name of the affected persons	Reactions to the project	Reasons
London Distillers Kenya Limited(Mohan Galot)	Object the development	<ul style="list-style-type: none">• The said area is an industrial area and therefore it would be wrong to construct residential dwellings• There is already

		existing friction between the London distillers Kenya and the Erdmann property Limited with regard to the initial Great Wall Gardens Phase 1 which is adjacent to LDK
Emma Mureithi (Private resident)	Objecting the development	<ul style="list-style-type: none"> • Loss of privacy to the adjacent properties • The proponent of the development to put in place an appropriate and sustainable source of garbage management • Construct an appropriate sewerage system • Adhere to the building ethics e.g use of dust • The development will lead to increase in crime
Savilia Watema (private resident)	Not interested in the proposed project development	-

Note; for the issues above find the attached questionnaires for further affirmation

4.1.1 Other issues

There were other concerns raised verbally e.g. the unsettled sewerage project issue between the neighbours (safaricom foundation, Sunset Boulevard Estate) and the proponent (EPL),the degradation of Athi River ,replacement agricultural practice in the area and many others discussed below

4.1.1.1 Noise and dust

There was concern over the possibility high noise and dust levels in the project site as a result of construction works. The sources of noise pollution will include transport vehicles, construction machinery and metal grinding and cutting equipment. Concern was raised over possibility of generation of large amount of dust within the project site and surrounding areas as a result of transportation of building materials. It was suggested by some neighbors that the construction

material should be transported to the site during weekdays and not on weekends and there should be sprinkling of water on loose ground to control dust.

4.1.1.2 Waste Management

Some neighbours were concerned on the wastes to be produced in the development during operational phase but after understanding that it is a storage facility they urged the proponent to manage any kind of waste both solid and liquid be managed and disposed of in an Environmental friendly manner as stipulated by EMCA, cap 387.

4.1.1.3 Aesthetics and solid waste generation

It was seen that there will be effect on the aesthetics of the area. Any disturbance of vegetation during construction works should be replaced through a functional landscaping and tree planting scheme. However it was suggested that the proponent should ensure high hygiene standards within the premise and surrounding areas during construction possibly by landscaping. Generation and sound handling of solid wastes during construction and operation was also a concern. Decent behavior of the construction workforce has also been emphasized by the neighbors.

4.1.1.4 Pressure on the infrastructure (water, sewer and roads)

Major concern was pressure on the existing infrastructure (water, need for sewer facility and roads). The proponent will ensure that proposed water and sewerage reticulation system is evaluated and approved by the county service providers. Functional traffic management plan shall also be put in place by the proponent to control traffic into and out of the proposed Development. Adequate parking spaces have been proposed.

4.1.1.5 Health and safety concern

There was a concern on the health and safety of the workers in the development and the surrounding environs. The proponent is requested to employ a health and safety supervisor/officer to oversee the general safety of the people within and immediate neighbours.

4.1.1.6 Creation of employment

Others also felt that the project being an industry it will offers opportunity for employment because of its nature and by considering its size it will create both directly and indirectly to the employment of a large number of people such as masons, plumbers, and food vendor's etc.

5. BASELINE INFORMATION OF THE STUDY AREA

5.1 Introduction/Data information gathering procedure

Project information was gathered through discussions with the project proponent. Site visits were also undertaken for investigation of the site status and environmental status in the immediate neighborhood (see the attached pictures). In addition, a review of the proposed project operations and activities and the intended raw materials inputs was carried out at the preliminary stages of this assessment. Project records on approvals and permits from the relevant Government Departments were reviewed as well.

Other physical observation taken into consideration were the geological status, drainage systems, water supply and waste disposal in the area, land-use patterns as well the typical socio economic activities around the proposed site.

A field database addressing various aspects of the proposed project and the environment had been pre-prepared for use in the data/information gathering. The datasheet was adopted from the international Environmental protocol, tailored to address issues listed in the Environmental (Impact Assessment and Audit) Regulations 2003.

5.2 Description of the area

5.2.1 The site Location

The proposed site is located off Mombasa – Namanga road interchange, Mavoko; Machakos County on plot L.R 12581/14. **(GPS CO-ORDINATES; LATITUDE; 1.42686368 S, LONGITUDE; 36.97820808 E)**

The site is situated in an already mixed development zone of residential, commercial and industrial. Other associated developments include electricity supply, water, sewer, waste water treatment plant (under development) and other infrastructure.

5.2.2 Land use

The proposed area is not clear whether it is a mixed use zone or an industrial zone but from the observation point of view of the experts the area has mixed developments of residential, industries and commercials.

5.2.3 Topography

The area is generally sloping towards Mombasa road; it is a semi-arid area with presence of scarce shrubs kind of vegetation. The ecological features near the area include the Athi River which is about one kilometer from the project site. Due to the rapid growth of constructions and human settlement in the area, the wild life

have been pushed to other undeveloped areas of Machakos County thus no wildlife/wildlife corridor or presence of wild animals which makes the area less ecological sensitive.

5.2.4 Geology and Soils

The location soil type is dark gray clay soil

5.2.5 Water source

The proposed area falls under the category of surface water as the main source of water. The Great wall Gardens Estate has an existing borehole and piped water from Mavoko Water and Sewerage Company and from Export processing Zone (EPZ)

5.2.6 Electricity Source

The project site is connected to electricity supplied by Kenya Power Company (KPC).

5.3 Sewerage and other services

There is a provision of waste water treatment plant and plans for sewer connections. The Great wall Gardens sewerage line will connect to the EPZ main line

There are also waste disposal services provided by the Machakos County and private companies licensed by NEMA as per the Waste Management Regulations 2006. Provision for waste segregation at source and dustbin cubicles protected from rain and scavenging animals together with appropriate waste transport and disposal infrastructure have been incorporated in the design of the project.

6. POTENTIAL ENVIRONMENTAL IMPACTS

6.1 Introduction

This chapter outlines the potential negative and positive impacts that will be associated with the 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 occupants. In addition, closure and decommissioning phase impacts of the project are also highlighted.

The impacts of the project during each of 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.

6.2 Negative environmental impacts of construction activities

6.2.1 Increased soil erosion

Clearance of land and excavation works will lead to increase soil erosion at the project site and release of sediments into the drainage systems. Uncontrolled soil erosion can have adverse effects on the local storm water drains, road network and sewer line blockages.

6.2.2 Solid waste generation

Large quantities of solid waste will be generated at the site during construction of the buildings and related infrastructure. Such waste will consist of metal cuttings, rejected materials, surplus materials, surplus spoil, 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.

6.2.3 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 excavation and leveling 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/neighboring facilities, which will be accentuated during dry weather conditions.

6.2.4 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.

6.2.5 Water use

The construction activities will require large quantities of water. Water will mainly be used for concrete mixing, sanitary and washing purposes. Excessive water use may negatively impact on the supply to neighboring facilities.

6.2.6 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 Kenya Power & Lighting Company (KPLC) Ltd. Electricity in Kenya is generated mainly through natural resources, namely, water and geothermal resources. In this regard, there will be need to use electricity sparingly since high consumption of electricity negatively impacts on these natural resources and their sustainability.

6.2.7 Extraction and use of building materials

Building materials such as hard core, ballast, cement, rough stone and sand required for construction of the project will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as rivers and land. Since substantial quantities of these materials will be required for construction of the 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 vegetation, poor visual quality and opening of depressions on the surface leading to several human and animal health impacts.

6.2.8 Exhaust emissions

The trucks used to transport various building materials from their sources to the project site will contribute to increases in emissions of CO₂, 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 Machakos, 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.

6.2.9 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.

6.3 Positive environmental impacts of construction activities

6.3.1 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 Kenya.

6.3.2 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 in Machakos and the surrounding areas. This provides ready market for building material suppliers such as quarrying companies, hardware shops and individuals with such materials.

6.3.3 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.

6.4 Negative environmental impacts of operational activities

6.4.1 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, chemicals 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.

6.4.2 Water use

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

6.4.3 Energy consumption

During operation, the industrial park will use a lot of electrical energy mainly for light industrial production such as lighting, running of machines 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.

6.4.4 Increased demand for sanitation

The project involves the construction of 53 go downs and other associated amenities plus the existing Great Wall Garden Estate. The number of occupants is high in this regard this will lead to increased demand for sanitation and sewerage disposal.

6.4.5 Increased storm water flow

The building roofs and pavements will lead to increased volume and velocity of storm water or run-off flowing across the area covered by the building. This will lead to increased amounts of storm water entering the drainage systems, resulting in overflow and damage to such systems in addition to increased erosion or water logging in the neighboring areas.

6.5 Positive environmental impacts of operational activities

6.5.1 Employment opportunities

The proposed development being an industry will provide employment to many Kenyans, some permanent terms and some temporary terms.

6.5.2 Revenue to national and local governments

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

6.6 Negative environmental impacts of decommissioning activities

6.6.1 Solid waste

Demolition of the project buildings and related infrastructure will result in large quantities of solid waste. The waste will consist of demolition debris 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.

6.6.2 Dust

Large quantities of dust will be generated during demolition works. This will affect demolition staff as well as the neighboring residents.

6.6.3 Noise and vibration

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

6.7 Positive environmental impacts of decommissioning activities

6.7.1 Rehabilitation/Restoration

Upon decommissioning the project, rehabilitation of the project site will be carried out to restore the site to its original status and/or a change of land-use adopted that will be consistent with the planning framework. Rehabilitation will include replacement of topsoil, landscaping and revegetation that will lead to improved visual quality of the area.

6.7.2 Employment Opportunities

Several employment opportunities will be created for demolition staff.

7. ANALYSIS OF PROJECT ALTERNATIVES

This section analyses the project alternatives in terms of site, technology scale and waste management options.

7.1 No project alternative

The No Project option in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will however, involve several losses both to the landowner and the community as a whole. The landowner will continue to pay land rates on the plot while the property is underutilized. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The economic status of the Kenyans and the local people would remain unchanged.
- The local skills would remain under utilized.
- Reduced commercial activities.
- Reduced interaction both at local, national and international levels.
- No employment opportunities will be created for numerous numbers of Kenyans.
- Increased urban poverty and crime in Kenya.

From the analysis above, it becomes apparent that the No Project alternative is no alternative to the local people, Kenyans, and the government of Kenya as compared to the development of the project

7.2 Analysis of alternative construction materials and technology

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

Heavy use of timber during construction is discouraged because of destruction of forests. The exotic species would be preferred to indigenous species in the construction where need will arise.

Eco-friendly materials and technology will be employed to ensure that the project blends with the surrounding area. Furthermore air conditioning equipment employed will be those of zero ozone depleting potential.

7.3 Solid waste management alternatives

A lot of solid wastes will be generated from the proposed project. An integrated solid waste management system is recommendable. First, the proponent will give priority to reduction at source of the materials. This option will demand a solid waste management awareness programme for proponent and adherence to provisions of Environmental Management and Coordination (Waste Management) Regulations 2006.

Secondly, waste Refusal, Reduction, Return, Refill, Recycling, Reuse (6-R Oriented Resort) and composting of the waste will be the second alternative in priority. This will call for a source separation/segregation programme to be put in place. The waste will be collected by a private waste management company licensed by NEMA for sanitary land filling or ultimate appropriate disposal.

The third priority in the hierarchy of options is combustion of the waste that is not recyclable and this is NOT acceptable.

This section analyses the project alternatives in terms of site, technology scale and waste management options.

7.4 Activity Alternatives

Consideration was made to other project alternatives but site suitability factors, compatibility and conformity with overarching planning framework favored the proposed development.

The rating of the site suitability factors was also guided by provisions in the physical Planning Act (Cap 286) and policy guidelines in the physical planning handbook (2008) as well as the 70 points score indicates that the site is generally suitable for the proposed development with minimal adverse impacts to the social, economic and cultural fabric of the neighbourhood and does not present any irreversible adverse environmental impacts.

7.5 Scheduling/sequencing Alternatives

Consideration will be given such that activities that produce noise will be scheduled during the day to minimize impacts, etc.

8. IMPACTS MITIGATION AND MONITORING

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 management programme (EMP) in Chapter 9.

8.2 Mitigation of construction phase impacts

8.2.1 Minimization of Environmental disturbance

The proponent will ensure proper demarcation of the project area to be affected by the construction works. This will be aimed at ensuring that any disturbance to flora and fauna is restricted to the actual project area and avoid spill over effects on the neighbouring areas. In the same vein, there will be strict control of construction vehicles to ensure that they operate only within the area to be disturbed by access routes and other works.

In addition, the proponent will re-vegetate some of the disturbed areas through implementation of a well-designed landscaping and tree planting programme.

The contractor shall only clear the vegetation that needs to be cleared in accordance with the structure plan. These protection measures apply to both the construction areas as well as to any associated activities such as sites for stockpiles, disposal of clean fill and construction of diversion roads.

The contractor shall deploy, the following measures to protect flora and fauna within the city;

Fell trees into the construction zone, not into undisturbed vegetation;

- Do not burn off cleared vegetation – where feasible, chip or mulch and reuse for the rehabilitation of affected areas;
- Mark the areas to be cleared;
- Do not disturb areas outside the approved construction zone;
- Mark access tracks and keep traffic to these areas;
- Confine vehicle movements to the old or new alignment where feasible
- Only disturb areas that must be disturbed;
- Place site depots, equipment compounds and stock pile areas on previously cleared areas away from trees, bushes and native grasses.
- If cleared areas are not available for stockpiles on the site, consider using cleared areas on adjoining land;

- Avoid work within the drip-line of trees to prevent damage to the tree roots and compacting the soil;
- Store fill, materials and equipment away from trees to avoid compacting the soil and preventing air and water reaching the tree roots;
- Limit the removal of topsoil and cleared vegetation from the site to reduce the risk of spreading weeds and diseases;
- Construction site may be a habitat for native animals. Constructor must be aware of the animals that live near your site and keep alert for native faunal movements;
- Retain or relocate tree hollows, where appropriate leave dead trees where possible as habitat for fauna;
- Report any animal kills or injuries to the site manager; and
- Check the site for the animals trapped in site works.

Management of borrow pits and quarries-The contractor undertakes to source materials only from licensed quarries as provided for under EMCA ,Cap 387 and the second schedule to the act. Where the contractor has entered into an agreement with the land owner for this purpose, he should undertake an EIA study and seek the necessary approval from NEMA.

The contractor, where applicable develop, implement and keep relevant records of quarry/borrow pit lease agreements, rehabilitation/restoration management plans. The contractor shall also undertake measures to prevent persons, or stocks other than dogs or poultry, from inadvertently entering the pit as provided for in the mining act (revised in 1987). The contractor shall ensure that borrow pits and quarries are properly secured (fenced with access limited to authorized persons only).

8.2.2 Minimization of run-off, soil erosion and Nuisance

The proponent will put in place some measures aimed at minimizing soil erosion and associated sediment release from the project site during construction. 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.

The proponent shall also ensure that transportation of building materials and construction debris is undertaken during weekdays, off peak hours. Construction works shall be restricted to daytime and No construction activity shall be undertaken at night.

The contractor shall apply appropriate measures to control runoff, erosion and sediment including but not limited to the following:

- Divert natural runoff around construction areas prior to any site disturbance;
- Install protective measures on site prior to construction, for example, storm water basins or sediment traps;

- Temporary diversion pipe outlets beyond the fill toe line to avoid erosion of embankments; install "cutoff drains " where long cut/fill batter slopes occur to control water runoff speed
- Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, hay bales or bunds;
- Restrict vehicular movements over cleared areas;
- Limit equipment and vehicular movements to within the approved construction zone;
- Construct temporary access tracks to cross concentrated water flow lines at right angles;
- Plan construction access to make use, if possible, of the final road alignment;
- Use vehicle- cleaning devices, for example, ramps or wash down areas;
- Remove debris from drainage part and sediment control structures;
- Observe the performance of drainage structures and erosion controls during drains and modified as required.

8.2.3 Minimization of construction waste

It is recommended that construction waste be recycled or reused to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses. In this regard, the proponent 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, and institutions.

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 of nature i.e. sunshine, rain etc
- iii. Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste

- iv. Use of construction materials containing recycled content when possible and in accordance with accepted standards.
- v. Locate site storage depots away from watercourses and danger areas, areas prone to flooding, Avoid spillage during refueling and servicing of plants and equipment

It is further suggested that the excavated top soil be used to backfill/infill an identified abandoned quarry sites within Nairobi or nearby towns to assist in its rehabilitation and after-use plans.

8.2.4 Reduction of dust generation and emission

Dust generation is the main air quality issue on construction sites. Dust is a nuisance in the environment that can be a health hazard and a risk to traffic safety. Dust emission during construction will be minimized through strict enforcement of on site 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 or sprinkle water to control dust and install appropriate dust screens; and traffic routes on site be sprinkled with water regularly to reduce amount of dust generated by the construction trucks especially during dry seasons. Furthermore the contractor is required to Limit the extent of disturbed areas and restore disturbed areas as soon as practicable to limit construction activities (including blasting on windy days); Water construction materials prior to loading and transport; use equipment and vehicles fitted with appropriate emission controls; and Service all equipment and vehicles regularly to minimize emissions; spray with water and/or cover pavement materials and aggregates before transporting; and dispose of any harmful solid and liquid waste at an approved and licensed disposal facility.

8.2.5 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, residential areas and hospitals. In addition, construction machinery shall be kept in good condition to reduce noise generation. It is further recommended that:

- All generators and heavy duty equipment be insulated or placed in enclosures to minimize ambient noise levels;
- Use the quietest available equipment or modify equipment to reduce noise;
- Use the correct equipment within the defined operating hours and locations;
- Install temporary noise control barriers where appropriate;
- Notify affected people if noisy activities will be undertaken, eg pile driving, blasting;
- Plan deliveries to and from site to minimize impacts;
- Secure areas prior to blasting and inspect the area immediately afterwards to visually monitor for any incidence;
- Select all equipments having regard to its published sound power level;

- Investigate an alternative technique if an activity is inherently noisy (e.g. a driven piling) plant and equipment should be located having regard to its proximity to sensitive receptors (e.g. school, hospitals and residential property);
- Anti-social behavior involving loud talking, shouting or whistling, radios, sirens or hooters and motor revving should be avoided.

The contractor will undertake to comply with all the relevant legislation (existing and emerging) and regulations governing the generation of excessive noise and vibration. This includes:

- Using engineering controls by segregating or enclosing machinery which emits noise levels exceeding 90 dB(A) and providing suitable hearing protection for affected workers as prescribed under factories and other places of work (noise prevention and control) Rules, 2005-Rule 10 and 12.

- Conducting (occupational) noise measurements at least once every 12 months to determine prevailing noise conditions as provided under factories and other places of work (noise prevention and control) Rules 2005-Rule 6

- Limiting construction activities within the normal working hours as provided for under factories and other places of work (noise and excessive vibration pollution) (control) Rules 2009-Rule 13. The same rule prescribes for evenly distribution of equipment used and avoiding concentrated usage of equipment at the same time.

- Acquiring requisite license to generate excessive noise and vibration as provided for under legal notice No.90 of 2009.

The contractor shall apply the appropriate measures to prevent or mitigate construction noise and vibration including but limited to;

8.2.6 Minimization of water use and Water Quality Protection

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

The contractor shall apply the following measures to manage water quality Leaving the site:

- Divert runoff from undisturbed areas around the construction site;
- Limit the area of disturbed land—progressively clears the site in accordance with construction needs and rehabilitate as soon as possible;
- Protect drainage lines with sediment basins, silt fences and hay bales;
- Dewater sites by pumping water to a sediment basin prior to release off site- do not pump directly;
- Monitor the water quality in the runoff from the site or areas affected by dredge plumes, and improve work practices as necessary;
- Stockpile materials away from drainage lines;
- Maintain equipment to prevent fuel and oil leaks; prevent all solid and liquid waste entering waterways by collecting solid waste;

- Oils, chemicals, bitumen spray waste and waste waters from brick, concrete and asphalt cutting where possible and transport to a licensed waste disposal site or recycling depot;
- Minimize surplus waste water from brick and pavement cutting;
- Store all chemicals, fuels and other hazardous materials within bundled and covered areas.

8.2.7 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.

8.2.8 Efficient sourcing and use of raw materials

The proponent will source building materials such as sand, ballast and hard core from registered quarry and sand mining firms, whose projects have undergone satisfactory environmental impact assessment/audit and received relevant licences from NEMA. 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

8.2.9 Minimization of exhaust emissions

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

8.2.10 Reduction of risks of accidents and injuries to workers

The proponent is committed to adherence to the occupational health and safety rules and regulations stipulated in Occupational Safety and Health Act, No. 15 of 2007. In this regard, the proponent is committed to provision of appropriate personal protective equipment, as well as ensuring a safe and healthy environment for construction workers.

The contractor will prepare and provide a current Emergency Contracts set of Procedures for each work site. The procedures will be followed in any site emergency. They will contain emergency phone numbers and the method of notifying requisite services for action by the contractor. Copies of the procedures will be issued to the Local Authorities, Fire Brigade, Ambulance Service and Statutory Authorities.

The contractor shall also do the following:

- Register all workplaces with Department of occupational Safety and Health Services as provided for under Osh Act 2007 Part v section 43-46;
- Maintain a general register for entering particulars of every accident and cases of occupational diseases occurring at the workplace as prescribed under OSH Act 2007 established Safety Health and Environment committee as prescribed under the Factories and Other Places of Work (Health and Safety committees) Rules 2004, Rule 4;
- Provide and maintain so as to be readily accessible, a First Aid box or cupboard of the prescribed standard in all the workplaces as stipulated under OSH Act 2007 part x part 95 First Aid Rules 1977, Rule 2;
- Issue a permit to work for any employee likely to be exposed to hazardous work as provided for under OSH Act 2007;
- Set out the work to be done, the hazards involved and precautions to be taken before the work commences in the aforesaid permit to work;
- Provide and maintain for use by employees in the workplace where employees are exposed to wet or any injurious activities, adequate, effective and suitable clothing and appliances as stipulated under OSH Act 2007.

8.2.11 Weed, Pest and Disease Control

The contractor shall undertake to use pest control products including herbicides with reference to the chapter 346; pest control products. This act covers the use, application, importation and trade in the pest products. The contractor shall apply appropriate measures to limit the spread of weeds, animal pests and diseases, including but not limited to the following;

- Control weeds on the site during construction;
- Be careful not to spread weed seeds around the construction site;

- Use only approved chemical sprays with dye to identify sprayed areas;
- Dispose of weeds to a licensed waste disposal site;
- Minimize the opportunity for weeds to multiply by minimizing disturbance;
- Limit topsoil movement along the road reserve;
- Store topsoil away from drainage lines;
- Clean the build-up of mud and waste from plants and equipment prior to relocation;
- Ensure vehicles used for cutting spoil and weeds are cleaned of all soil and plant debris prior to carting clean, materials (e.g. gravel), to reduce the risk of spreading weeds;
- Provide sealed bins for site waste to discourage animal pests;
- Avoid placing stockpile sites next to seeding weeds. Monitor stockpile/dump sites for weed growth and implement necessary controls to remove weed growth before flowering and seeding;
- Weed infested materials (e.g. drain spoil containing pasture grasses) should not be stockpiled on, or next to land which has native vegetation;
- Manage the weeds surrounding gravel and lime pits, to reduce the risk of introducing weeds to new sites;
- Shall consider and implement alternatives to herbicides where appropriate;
- Ensure that only trained staff only uses herbicides;
- Shall avoid herbicide runoff into watercourses, wetlands or drinking water catchment areas;
- Ensure care is taken to avoid drift onto non-target plants and waterways especially in areas of high conservation or adjacent land;
- Shall maintain records of herbicide application.

8.2.12 Protection of sites of cultural and natural heritage significance

All the sites of heritage already identified (or so demarcated later) including areas of geological significance must be protected. Heritage items include cultural sites, building, geological features, trees and natural areas. Sites of known significance within the construction zone will be flagged as “no-go” areas prior to construction to ensure their protection. Measures that maybe applied by the contractor to protect sites of heritage significance include but are not limited to the following;

- Restrict all construction activities and related activities including stock piling, servicing, drainage works etc to approved areas and not to enter “no-go” areas;
 - Maintain flagging or fencing marking “no-go” areas during construction;
 - Work in accordance with the contract documents;
 - Take special care and use appropriate equipment when working next to a heritage site;
- If, during construction an Aboriginal heritage or burial site is discovered, stop work immediately and notify the site manager. It is an offense to recommence working the vicinity of the site until approval to continue is given by the project manager.

8.3 Mitigation of operation phase impacts

8.3.1 Ensuring efficient solid waste management

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

8.3.2 Ensure efficient water use

The proponent will install water-conserving automatic/push taps and toilets. Moreover, any water leaks through damaged pipes and faulty taps will be fixed promptly by qualified staff. Furthermore, rainwater encouraged.

8.3.3 Ensure efficient energy consumption

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

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 described in Section 8.2.3.

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 8.2.4.

8.4.3 Minimization of noise and vibration

Significant impacts on the acoustic environment will be mitigated as described in Section 8.2.5.

9. ENVIRONMENTAL MANAGEMENT/MONITORING PLAN

9.1 Introduction

This Environmental Management Plan (EMP) has been developed to assist in prioritizing the key findings of the EIA, suggesting necessary mitigation actions and allocating responsibilities. From the EMP, a schedule for the project implementation could also be drawn that takes into consideration all issues that could develop into serious risks to environment, health and safety when the operations starts.

The environmental management plan is based on the ISO 14001 principles, a semi circular process of activities comprising of the following key aspects:

9.1 Environmental Policy

- (i) Nature and scale of operations
- (ii) Continuous improvement strategies
- (iii) Pollution prevention strategies
- (iv) Legal compliance
- (v) Objectives and targets
- (vi) Documentation and maintenance
- (vii) Employee involvement
- (viii) Availability to the public

9.2 Planning

- (i) Identification of potential impacts and their sources
- (ii) Identification of legal and other requirements
- (iii) Setting objectives and targets
- (iv) Developing an environmental management programme

9.3 Implementation and Operations

- (i) Allocate responsibilities
- (ii) Undertake training and capacity building
- (iii) Ensure communication at all levels
- (iv) Establish a documentation systems
- (v) Establish an emergency preparedness procedure.

9.4 Corrective actions

- (i) Scheduled monitoring and measurements
- (ii) Identification areas of non conformance
- (iii) Carry out prevention and corrective actions
- (iv) Establish a documentation and recording procedures

- (v) Environmental audits.

Finally, management reviews and continuous improvement determines which of the above issues require to be re-visited and at what schedules.

On the basis of the policy guidelines and development of the EMP, among other actions recommended to be undertaken by the management in the implementation of the latter are:

- (i) Identification of additional issues that are not covered in the EMP
- (ii) Establish a legal register
- (iii) Develop a training plan and schedule
- (iv) Develop an in house environmental audit protocol and schedule
- (v) Establish a suitable and comprehensive database
- (vi) Put in place an emergency preparedness procedure
- (vii) Establish the EMP implementation schedule
- (viii) Establish an incident log book to manage environmental incidents
- (ix) Establish an environmental management committee to oversee and assist in the implementation of the EMP

The mitigation measures recommended and the targeted achievement have been tabulated below along side institutional responsibilities and indicators to assess success. A time frame has also been proposed. However, related costs could not be worked out per activities at appropriate times.

Environmental monitoring/Management plan for the construction and operational phases

PHASE	IMPACT	MITIGATION MEASURES	TIME FRAME	RESPONSIBLE PERSONS	BUDGET (KSH)
CONSTRUCTION PHASE	1. Soil erosion and siltation	<ul style="list-style-type: none"> ▪ Site excavation works to be planned such that a section is completed and rehabilitated while another section begins. ▪ Apply soil erosion control measures such as leveling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil. 	Continuous	Contractor	100000
	2. Noise Pollution	<ul style="list-style-type: none"> ▪ The construction works will entirely be planned to be during day time. No construction shall be undertaken at night. ▪ Ensure that all generators and heavy-duty equipment are insulated or placed in enclosures to minimize ambient noise levels. ▪ Workers operating noisy machinery should be provided with ear muffs or plugs. ▪ Noise hazard signs should be put displayed where necessary. ▪ Iron sheets or other suitable means should be used to reduce noise exposure to neighbours or passersby. ▪ Noisy machinery should be modified or replaced with better machinery, well lubricated and serviced. ▪ Construction should take shortest time possible. ▪ Subject exposed workers to statutory medical examination 	Continuous	Contractor/Proponent	100000
	3. Disturbance of soil and destruction of soil structure by excavation	<ul style="list-style-type: none"> ▪ Excavation material will be loaded into trucks and be transported to designate disposal sites and/or used to backfill/infill abandoned quarry pits to assist in their rehabilitation and after-use plans. ▪ Design and implement an appropriate landscaping program to help in re-vegetation of part of the project area after construction ▪ Reuse of the topsoil in landscaping. 	During construction and decommissioning	Contractor/Proponent	100000

CONSTRUCTION PHASE	4. Collapse of loose soil and other materials on workers; Fall of persons	<ul style="list-style-type: none"> ▪ All excavations, shafts, pits or openings more than two metres deep should be covered or barred by suitable means when access is not needed. ▪ No materials should be stored near such excavations. ▪ All excavation wall over 1.2 metres deep should be reinforced with timber to prevent collapse to persons working inside. • Supervision of such works should include collaboration with safety supervisors. 	During Excavations	Contractor	200,000
	5. Building materials waste scattering and associated pollution and blockage of drainage channels leading to flooding.	<ul style="list-style-type: none"> • Ensure that construction materials left over at the end of construction are used in other projects rather than being disposed off. • Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements • Minimize waste through accurate estimation of the sizes and quantities of materials required, order materials in the sizes and quantities they will be needed, rather than cutting them to size, or having large quantities of residual materials. • Ensure that drainage channels are reinforced to prevent damage by construction equipment. 	Continuous	Contractor	150,000
	6. Waste generation and scattering by workers	<ul style="list-style-type: none"> • Provide waste collection bins, segregate at source and ensure NEMA licensed transporters collects the wastes for appropriate disposal. • Make provisions for sanitary facilities/accommodation for workers during construction. • Construction debris to be disposed off at sites approved by the city engineer and in accordance with the waste Management 			10000

		Regulations 2006.			
	7. Damage to utility cables	<ul style="list-style-type: none"> Contractor should consult council, KPLC, KPC, Telkom Kenya Limited and any other company affected on the presence of utility cables and sewer lines. 	Once	Proponent	None
	8. Blockage of access roads	<ul style="list-style-type: none"> Alternative access for vehicles and pedestrians passing by the site can be arranged with the Council so that vehicles may be diverted to other roads when major works are ongoing. Transportation of construction materials and construction debris to and from site should be done during weekdays, off peak hours. 	During tree cutting and heavy equipment installations	Proponent/ KURA, Nairobi City County	10000
CONSTRUCTION PHASE	9. Air /Dust pollution	<ul style="list-style-type: none"> Set maximum on-site speeds at 10 kilometres per hour or less. Ensure strict enforcement of on-site speed limit regulations Avoid excavation works in extremely dry weather. Sprinkle water on graded access routes each day to reduce dust generation by construction vehicles. Provide appropriate dust screens to reduce dust exposure. Provide dust masks to workers in extreme dust producing operations. Use only critical number of workers to reduce exposure. Maximize the use of manual labour and hand tools. Avoid spillage of loose soil to the road where it will be disturbed and blown by traffic. Subject exposed workers to statutory medical examination 	Construction	Contractor	10000

10. Oil spills	<ul style="list-style-type: none"> ▪ Ensure that all transport and construction equipment are in good serviceable condition and no service is carried out on site. ▪ Ensure that no fuels or oils are stored on site but procure them when needed. 	Continuous	Contractor	None
11. Storm-water drainage	<ul style="list-style-type: none"> ▪ Open drains adjacent to site will be used ▪ Construction of water storage tanks to collect storm water for construction purposes and gardening. 	Once	Contractor	
12. Security	<ul style="list-style-type: none"> ▪ Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises. 	Continuous	Contractor/PropONENT	None
13. Occupational diseases due to excessive dust, noise, contact and poor sanitation	<ul style="list-style-type: none"> ▪ Provide suitable PPE to all exposed workers. ▪ Reserve each PPE for one worker to avoid sharing. ▪ Provide adequate sanitary conveniences and in a clean state. ▪ Provide wholesome drinking and bathing water and facilities for workers. ▪ Minimize soil disturbance and sprinkle water regularly to reduce dust generation. ▪ Subject workers exposed to classified hazards to statutory medical examinations at prescribed intervals 			100,000

CONSTRUCTION PHASE	14. Occupational accidents from fall from heights, falling objects failure of lifting equipment and tools.	<ul style="list-style-type: none"> ▪ Ensure that all workers obtain an insurance cover. ▪ Appoint qualified safety supervisors. ▪ Involve the Directorate of Occupational Health and Safety Services in inspections/audits. ▪ Ensure that all lifting equipment have undergone statutory inspections and are well maintained. ▪ Provide side netting and sheets to protect workers, pedestrians and motorists from falling objects. 	Immediate-6 months after commencement	Contractor	200,000
	15. Accidents from moving parts of machines or inexperienced workers.	<ul style="list-style-type: none"> ▪ Provide and enforce the wearing of personal protective equipment such as helmets, hand gloves, reflector jackets and overalls where needed. ▪ Provide first aid facilities under trained first aid attendants and contract ambulance and hospital services. ▪ Ensure that all form work and scaffolds are made using materials and workmanship of the highest quality and under the supervision of safety supervisors. 			
	16. Motor Vehicle accidents due to proximity to the road	<ul style="list-style-type: none"> ▪ Employ only experienced workers and only in critical numbers to avoid unnecessary overcrowding. ▪ Road signs should be displayed to warn motorists of heavy vehicles and equipment turning. 			
	17. Accidents due to use of electrical energy	<ul style="list-style-type: none"> ▪ All moving parts of equipment should be guarded. ▪ All electrical equipment should be handled and fitted by qualified persons and serviced regularly. ▪ Use of live electrical equipment should be closely supervised. 			

	18. Scattering of wastes, clogging of storm drains and accidents during site clearance.	<ul style="list-style-type: none"> ▪ All wastes should be collected for safe disposal or reuse elsewhere ▪ Provide dust masks to workers. ▪ Clear all storm drainages 	Continuous	Contractor	
OCCUPATION PHASE	19. Solid and liquid waste generation.	<ul style="list-style-type: none"> ▪ The building designs provide for sanitary facilities which will be connected to package waste water system. ▪ Use tamper proof and good quality fittings. ▪ Use qualified and experienced workers in consultation with service providers to connect to sewer lines. ▪ Employ or contract regular cleaning services on corridors and passages. ▪ Provide waste collection bins and encourage segregation of wastes between recyclable and organic wastes. ▪ Contract a NEMA licensed waste handler and transporter. 	Continuous	Proponent	
	20. Access to upper floors.	<ul style="list-style-type: none"> ▪ Adequate staircases provided to upper floors. The staircase as per the building plans is wide enough to accommodate movement of persons and household goods to upper floor. ▪ The building plans to accommodate a ramp for use by disabled persons where applicable. ▪ The height of workrooms as per the building plans to be adequate ▪ Guard rails to be provided to staircases 		Proponent	
	21. Use of water and electricity	<ul style="list-style-type: none"> ▪ Use qualified technicians in all fittings for water and electricity. ▪ Install water and energy saving fixtures ▪ Encourage responsible use. ▪ Conduct regular inspections of fittings. 		Proponent	

	22. Fire safety	<ul style="list-style-type: none"> ▪ Provide adequate means of fighting fire in all units including portable extinguishers. ▪ Designate emergency exits. ▪ Incorporate emergency response fixtures (e.g. fire sensors) in the project design. ▪ Develop emergency response plan and train occupants on the same 		Proponent	
	23 Traffic congestion	<ul style="list-style-type: none"> ▪ Adhere to the Traffic management plan- provision of adequate driveways and parking spaces/bays; erection of traffic signage limiting traffic speed, security checks and prohibiting hooting. 	Continuous	Proponent	Incorporated into the project design

9.5 Decommissioning Phase

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

Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Demolition waste management			
1. All buildings, machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible	Contractor, Proponent	One-off	–
2. All foundations must be removed and recycled, reused or disposed of at a licensed disposal site			
3. Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should taken to a licensed waste disposal site	Contractor, Proponent	One-off	–
4. Donate reusable demolition waste to charitable organizations, individuals and institutions	Contractor, Proponent	One-off	–
2. Rehabilitation of project site			
<ul style="list-style-type: none"> Implement an appropriate revegetation programme to restore the site to its original or improved status 	Contractor, Proponent	One-off	–
<ul style="list-style-type: none"> Consider use of indigenous plant species in revegetation 	Contractor, Proponent	One-off	–
<ul style="list-style-type: none"> Trees should be planted at suitable locations so as to interrupt slight lines (screen planting), between the adjacent residential area and the development. 	Contractor, Proponent	Once-off	–

Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
3. Change of Use Situation			
A change of use may arise before the buildings complete their useful life. In this case the proponent may decide to alter and/ or recondition the existing buildings. Change of use may also involve the transfer of equipment and materials from the site for appropriate disposal or reuse.	Contractor, Proponent	Once-off	-

11.0 AUXILLIARY INFORMATION

11.1 Monitoring Guidelines

Continuous observations and assessment is essential so that if foreseen safety dangers are noticed, alternatives must be sort for. Risk assessment of fire outbreaks, and others should not be ignored in the construction plan. Waste management plan should be strictly followed. Mitigation measures of storm water management are essential. Safety standards should constantly be maintained, in brief, monitoring guidelines could be based on the following parameters:

- Efficient use and Pressure on existing infrastructure such as water, sewer and traffic
- Health and safety measures using such standards as ISO 14000 and EMS and the laid down regulatory framework
- Waste management practices
- Examine the changing land use patterns including those for residential, ecological and economic purposes
- Accidents and risk assessment arising from the use of water, roads, electricity and or any other amenity

11.2 Reporting

Constant reporting by the site contractor to the architect and Environmental consultant is necessary to ensure the project is executed as per the architectural drawings and Environmental Management Plan respectively. The safety officer should always remain on site to report any safety concerns for urgent mitigation. He should also at all times enforce safety requirements as per the relevant legislation.

11.3 Conclusion and Recommendations

During the preparation of this report for the development of Great wall Garden estate phase 2, it is observed and established that most of the negative impacts on the environment are rated low and short term with no significant effect. The negative environmental impacts that will result from establishment of the project which include increased population without commensurate services and facilities; increased pressure on infrastructure; air pollution; and generation wastes among others which however can be mitigated.

The positive impacts are highly rated and will benefit all stakeholders. The project proponents have proposed to adhere to prudent implementation of the environmental

management plan. 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

This project should be licensed subject to undertaking environmental audits in the first year of operation to confirm the adequacy and efficacy of the EMP and to prescribe appropriate measures for any emerging issues not foreseen during this study. The proponent is further required to comply with all other lead agencies requirements governing development of this nature such as:

- Project design to blend with the surrounding and to conform to the area zoning specifications.
- Obtaining development permission from the Nairobi County
- Approval of water and sewerage reticulation system by the county service providers.
- Adherence to the provisions of Occupational Safety and Health Act, 2007 as appertains to the safety of the construction workforce.

This will be in compliance with the Environmental Management and coordination Act Cap 387 and the Environmental (Impact assessment and Audit) Regulations 2003.

REFERENCES

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Pictures



London Distillers Kenya



The proposed site



Private homes neighbouring the site



Access road to the site

Annex 1: Copy of title

Annex 2: Certificate of incorporation

Annex 3: KRA pin Certificate

Annex 4: Project description, Architectural drawings

Annex 5; Public consultation questionnaires