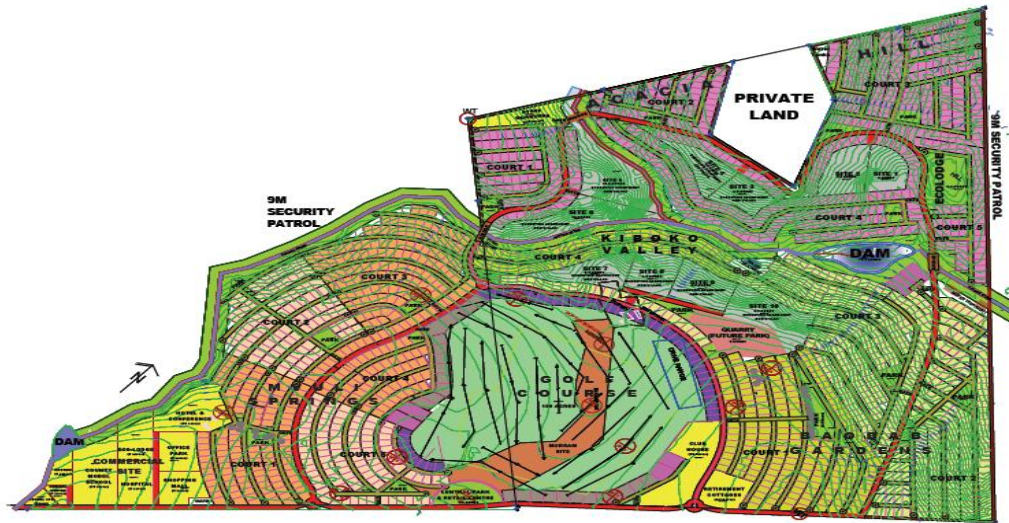


Environmental and Social Impacts Assessment Brief Report For the Proposed Makuyu Ridge Mixed Development



In Makuyu Sub-County, Muranga County

By

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DECLARATION

This Project brief was prepared for approval by NEMA so as to prepare and submit the TORs and a full EIA study report for the proposed for a mixed development project at Makuyu Muranga County, Kenya in accordance with Environmental Management and Coordination Act, 1999 and the Environmental Impact Assessment and Audit Regulations, 2003.

The undersigned, submit this project brief for the proposed project to be located in Makuyu, Muranga County, Kenya. All information contained in this brief is accurate and a truthful representation of facts relating to the project.

NAME.....

SIGNATURE.....

NEMA REGISTRATION No: 2815

DATE.....

On behalf of the Proponent:

Resorts and Cities Limited of P.O. Box 64553-00620, Nairobi, Kenya.

Signed by:

<i>Name</i>	<i>Signature</i>	<i>Date</i>

Disclaimer:

The information in this brief is strictly confidential to Resorts and Cities Limited (the proponent) and any use of the materials thereof should be strictly in accordance with the agreement between the proponent and Ecodym Africa; Dr. Joseph M. Maitima (the EIA Expert). It is, however, subject to conditions in the Environmental (Impact Assessment and Audit) Regulations, 2003 under the Kenya Gazette Supplement No. 56 of 13th June 2003.

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Introduction

This environmental impact assessment was carried out on behalf of Resort and Cities who have proposed to construct residential houses, hotels, schools, churches, an 18 hole golf course, sports facilities and the associated infrastructure on a 1000 acres piece of land located in Makuyu sub county of Maranga County. The proponent wishes to acquire a NEMA license to undertake the development activities described above and others as will be presented in this report. The acquisition of an Environmental Impact Assessment (EIA) license is a requisite under section 58 of the Environmental Management and Coordination Act (EMCA), 1999 which stipulates that a proponent must seek an Environmental Impact Assessment (EIA) license “notwithstanding any approval, permit or license granted under this Act or any other law in force in Kenya. This requirement applies to all projects listed in the Second Schedule to the Act. The purpose of Environmental Impact Assessment (EIA) is to identify potential positive and negative environmental impacts associated with the proposed development project and thus provide recommendations on how to take advantage of the positive impacts on one hand and how to mitigate the negative environmental impacts on the other hand. The proposed development will include retreat for holiday and retirement homes, leisure, golf and conferencing. This will include polo field, sporting field, beautiful landscaped gardens and water features. Others include university, hospital, school, a petrol station, a shopping mall, a police post and a community church.

The proposed project is expected to cost approximately Kshs. The study will be done within the study limitations and resources available. The EIA team will carry out the assessment using a combination of methods including site inspection and interviews with the neighbouring community, the project proponent and workers on the site. Existing literature on statutory and other requirements will also be reviewed. Reference was made from documents relating to the proposed project including land ownership documents, structural and architectural plans for the proposed building and bills of quantities for the proposed project. The main project components include but not limited to the following:

- a) Clearing and preparation of the project site;
- b) Construction of proposed buildings and other structures;

- c) Construction of local access roads, parking, walkways and drive ways;
- d) Installation and reticulation of utilities (water, drainage and electricity among others);
- e) Site landscaping and building finishing.

The Environmental Impact Assessment (EIA) will identify specific areas of concern that need to be considered in the implementation of the proposed project in all the three phases; construction, operation and decommissioning and propose mitigation measures for these impacts. An Environmental and Social Management and Monitoring Plan (ESMP) will be provided to guide the proponent in ensuring that environment is not degraded.

Justification for Environmental Impacts Assessment at full study level

In schedule II “urban development” that includes,

- (a) designation of new townships;
- (b) establishment of industrial estates;
- (c) establishment or expansion of recreational areas;
- (d) establishment or expansion of recreational townships in mountain areas, national
- (e) parks and game reserves;
- (f) shopping centres and complexes.

“Dams, rivers and water resources” including—

- (a) storage dams, barrages and Piers;
- (b) river diversions and water transfer between catchments;
- (c) flood control schemes;
- (d) drilling for the purpose of utilising ground water resources including geothermal
- (e) energy.

“Mining, including quarrying and open-cast extraction and Blasting” of—

- (a) precious metals;
- (b) pemstones;
- (c) metalliferous ores
- (d) coal;

- (e) phosphates;
- (f) limestone and dolomite;
- (g) stone and slate;
- (h) aggregates, sand and gravel;
- (i) clay;
- (j) exploration for the production of petroleum in any form.
- (k) extracting alluvial gold with use of mercury.

Hence the Makuyu project encompasses some of the above activities that make the proposed project be categorized as a high impact project and thus requiring full study assessment.

Project proponent

The project proponent is Resorts and Cities Limited of P.O. Box 64553-00620, Nairobi, Kenya.

Project development

The project seeks to develop a gated community that is fitted with various amenities such as polo field, sport field, landscaped gardens, water features, hospitals, university. Petrol station, shopping mall, police station, community church, residential houses, hotels, schools and 18 hole golf course.

Objectives of the project brief

The principal objective of this assessment will be to identify significant potential impacts of the project on environmental and social aspects, and to formulate recommendations to ensure that the proposed project takes into consideration appropriate measures to mitigate any adverse impacts to the environment and people's health through all of its phases (construction, implementation and decommissioning phases).

The specific objectives of this ESIA will be to:

1. To assess the environmental impacts associated with the proposed developments
2. Prepare a report detailing all impacts and the mitigation measures that the proponent should take to avoid or minimize the adverse effects and maximize the beneficial effects so as to preserve the environment for all
3. Conduct community participation surveys
4. Prepare an environmental Monitoring Plan

5. Prepare recommendations
6. Submit the report to the proponent
7. Submit the required number of copies of the report to NEMA for purposes of obtaining a NEMA license.

Scope of the Study

This impact study will be for the following developments: a mixed low density residential occupation with golf course, road network, water reticulation, solid and liquid waste management plans, cemetery, dams, and solar powered electric perimeter fence and as agreed upon with the project proponent. The current understanding is that developments earmarked for later implementation and whose architectural designs are not provided here will be subject to further environmental impacts assessment when the details of their designs will be provided. These include developments like, school, hotels, hospital, college, shopping malls, office park, petrol station, conference centre and others as provided for in the project master plan. Due to the magnitude of the project, the impact assessment has necessitated a full study according to the EMCA 1999.

The study is provisioned to comprise of:

1. Development of baseline surveys (full screening and scoping) on:
 - (a) Compliance with sectoral regulatory requirements or provisions
 - (b) Current vegetation and seasonal variations
 - (c) Current biodiversity and seasonal variations
 - (d) Soils
 - (e) Water resources
 - (f) Climate including air and local microclimate conditions
2. Effects of various project phases (construction, operations and decommissioning) of the development on the items listed above.
3. Conduct adequate public and stake holder participation
 - a. Stakeholder consultations on
 - I. The views on benefits and effects of the proposed development on their economic activities, socio cultural processes, and environment
 - II. Public views on the proposed development especially in relation to the environment identifying the issues the project proponent should take care of
4. Identification of project specific impacts and development of mitigation measures
5. Development of Environmental and Social Monitoring Plan (ESMP)

6. Preparation of a comprehensive report with details of all the above for NEMA evaluations.
7. Submission of the relevant number of copies to the proponent and NEMA.
8. Responding to any areas of concern to NEMA

Study area



Figure 1; Makuyu Study Area

The project site is located 72 km from Nairobi in Makuyu, near Kakuzi off the Nairobi-Thika-Sagana highway. The Resort is 8 km off the main road on the rolling ridges amid scenic coffee estates

Project activities

The principal objective of the assessment will be to identify significant potential impacts of the project on environmental and social aspects, and to formulate recommendations to ensure that the proposed project takes into consideration appropriate measures to mitigate any adverse impacts to the environment and people's health through all of its phases (construction, implementation and decommissioning phases).

The specific objectives of this ESIA will be to:

- Identify and assess all potential environmental and social impacts of the proposed project;
- Identify all potential significant adverse environmental and social impacts of the project and recommend measures for mitigation;

- Identify problems (non-conformity) and recommend measures to improve the environmental management system;
- Recommend cost effective measures to be used to mitigate against the anticipated negative impacts;
- Prepare an Environmental Impact Assessment Project Report compliant to the Environmental Management and Coordination Act, 1999 and the Environmental (Impact Assessment and Audit) Regulations, 2003, detailing findings and recommendations.
- Verify compliance with the environmental regulations and relevant standards;
- Generate baseline data that will be used to monitor and evaluate the mitigation measures implemented during the project cycle;

Alternatives to the project

This section examines alternatives to using the land as proposed for construction of holiday homes, golf course, hotel, school, hospital and considers the possible environmental and social impacts each of the alternatives would have. The impacts of each alternative are identified, discussed and compared with those of this development proposal. With such information, reviewers have basis for decision making.

No Project Alternative

No project alternative would mean that the site remains used as it is now, where the land has old abandoned coffee plantation. With coffee prizes being too low the previous owners of the two pieces of land had to abandon the land. In such a situation it is only wise to find an alternative land use. Use of the land as proposed in this project will create a variability of the common land use.

Alternative to site

Currently this is the site that the proponent has been able to acquire in the region and therefore there is no alternative site to implement the project. The location of the land is considered by the proponent to be appropriate for the proposed development. The proponent finds no reason to look for an alternative site. The residents of the area have shown an overwhelming support for the project and eagerly looking forward for the development.

Alternative design, layout and technology

All designs made for this project have been done professionally taking into account the topography, soil types and structure and with all environmental considerations to make sure that the developments do not negatively affect the surrounding environments and the people in the area. The architectural designs, structural engineering of the proposed buildings and roads are specially designed and the construction will use modern technologies that are in accordance to sustainable development and green economy.

The project lay out has been done in the most economical design utilizing the topography and the landscape. Areas with depressions will be used as water reservoirs and recreations for water sports. Areas on very steep slopes will be use for afforestation to preserve the beauty and sceneries of the area. The golf course will be maintained green with a permanent all year round green cover.

Alternative land use

The proposed land use is considered to be the most beneficial both economically and environmentally because currently the site is highly degraded through soil erosion. The proposed use of the land will maintain more greenness that is currently in the area. The previous land use was abandoned largely because of being uneconomical. There are no restrictions on how the land can be used in the area. However, since the land has been previously used as agricultural land, the proponent will have to have a change of user approved by the relevant authority.

The comparison of alternatives

Under the proposed development alternative, the project will create more varied and standard housing stock and would provide employment directly and indirectly to the public. It would provide jobs for the workers during construction. After completion more jobs will be generated during occupation. Under the No Action Alternative, there would be no development at all. There would be no benefits from the site and neither would there be the insignificant environmental impacts. Layout redesign may perhaps give an optimal design and should be explored for optimization of the benefits and environmental enhancement.

Provided the environmental impact mitigation measures are implemented as well as adoption of sound construction management practices, negative impacts will be avoided/ minimized. However, commitments related to development alternative

would ensure that potential impacts are minimized to levels of insignificance as envisaged in the ESMP.

Environmental Baseline of the area

Physical Environment

Climate

The climate of Muranga is very varied as the county extends from the cold highlands of Aberdares (Nyandarua Ranges) where tea is the main cash crop to the dry and hot lowlands bordering Machakos County. Rainfall ranges between 700-1000 mm per annum and daily temperatures range from 14 - 28^o C. The long rains fall in the months of March, April and May. The highest amount of rainfall is recorded in the month of April, and reliability of rainfall during this month is very high. The short rains are received during the months of October and November. It is generally wet and humid due to the influence of the Aberdares and Mt. Kenya. The population engaged mainly in subsistence agriculture, growing horticultural food crops and rearing of livestock. However one large scale farm, Kakuzi is located near the proposed study area.

Ecological Conditions of Muranga County

The county is divided into six agro ecological zones. The agro ecological zone one consists of the highest potential zones where forestry, tea and tourism industry form the most important economic activities. Agro-ecological zones two and three are the lowlands east of Aberdares and are generally suitable for both coffee and dairy farming. The flatter area of Makuyu division of Maragwa constituency is characterized by arid and semi-arid conditions. This forms the agro ecological zones 4, 5, and 6. In these zones coffee and pineapple plantations thrive by irrigation.

Land Use

The site is presently with unmanaged coffee plantation that appears to have been neglected a few years ago. There are a few buildings on the property including the residence of the caretaker, coffee estate and the offices. The area around the project site is surrounded by a number of small and medium size coffee farmers where the farmers practicing small scale farming also grow food crops mainly maize and also keep cattle.

Hydrology

Rainfall in the project area is due to the movement of the inter-tropical convergence zone of the southern and northern hemisphere air masses. This gives rise to two rainy seasons, the short rains (October-November) and the long rains (March-May). Relief largely dictates the amount of rain. The mean annual rainfall in the area is 1200mm

Since rainfall in the area is more than 875 mm annually and since relatively high precipitation is retained as groundwater recharge in the volcanic rocks, most of the rivers in the district flows throughout the year. This perennial flow is further regulated through the hydrological stabilisation generated by the forest vegetation in the elevated areas of the district. Seasonal rivers and streams are found only in the southeastern part of the district where the porous Basement system soils drain freely. The water struck levels is approximately 122m below ground level and the water rest level is around 18m below ground level.

Geology

The geology of the area consists of volcanic rocks of Pleistocene to Recent and Tertiary eras and Basement System rocks of Archean type. The volcanic rocks occupy the western part of the County bordering the Aberdare while the rock of the Basement System occupies the eastern part. The volcanic accumulations originated from the Rift Valley and Mount Kenya; the earliest of the, the phonolites, flowed from the west during the Miocene period. These were subsequently covered by deposits of ash and basalt.

Surface and Groundwater Quality

Biological Environment

Flora and Fauna

List of birds identified in the project area

Common	Scientific
Hadada Ibis	<i>Bostrychia hagedash brevirostris</i>
African Black Duck	<i>Anas sparsa leucostigma</i>
Long-crested Eagle	<i>Lophaetus occipitalis</i>
Red-eyed Dove	<i>Streptopelia semitorquata</i>
Grey-headed Kingfisher	<i>Halcyon leucocephala</i> <i>leucocephala</i>
Cinnamon-chested Bee-eater	<i>Merops oreobates</i>
White-headed Barbet	<i>Lybius leucocephalus</i>
African Pied Wagtail	<i>Motacilla aguimp vidua</i>
Common Bulbul	<i>Pycnonotus barbatus</i>
White-bellied Tit	<i>Parus albiventris</i>
Black Cuckoo-shrike	<i>Campephaga flava</i>
Pied Crow	<i>Corvus albus</i>
Variable Sunbird	<i>Nectarinia venusta</i>
Beautiful Sunbird	<i>Nectarinia pulchella</i>
White-browed Sparrow-Weaver	<i>Plocepasser mahali melanorhynchus</i>
Baglafaecht Weaver	<i>Ploceus baglafaecht</i>
Red-billed Quelea	<i>Quelea quelea aethiopica</i>
African Citril	<i>Serinus citrinelloides</i>
Marico Sunbird	<i>Nectarinia mariquensis</i>

Biodiversity

The proposed site is under agricultural use hence the site is dominated mainly by coffee plants that appears to have been neglected for some time. Areas surrounding the project site have food crops such as beans, maize, and assortment of horticultural crops and fruit trees like mangoes and avocados. The plants that will be cleared for the proposed development are the old neglected coffee trees that are no longer in production.

There is a rich diversity of arthropod fauna whose life was dependent on the plants that are at the proposed site but the landscape is a continuum of similar land cover and land use. There is no unique natural habitat that the proposed development will disturb or destroy.

The vegetation that will be removed to give way to the developments is the old coffee trees. However, the proponent intends to leave most of the coffee plants as ornamental trees especially within the proposed 18 hole golf course and in all the open spaces within the site.

However, it is worth noting that considering the scale of the proposed project and commonly found flora and fauna within the project area, no significant adverse effects are envisaged on the ecology of the area. Similarly, there are no known archaeological sites or unique habitats. Hence, no major impact in this area is anticipated.

Archaeology of Makuyu Area

A thorough literature search has been made to determine presence of any known pre-historical site in the area. This search has not revealed any site of archaeological or paleontological importance either within the project site or in Makuyu area in general.

If prehistorically important materials are unearthed during construction in the proposed project, relevant authorities in the National Museums of Kenya will be informed with a purpose to collect and preserve the materials in accordance to the procedures laid down by the National Museums of Kenya.

Socio-Economic Environment

Muranga is a predominantly agricultural County with nearly 70% of the population engaged in cultivation. However, the farming sub-sector is yet to achieve its full potential owing to constraints such as use of uncertified seeds, shortage and high costs of farm inputs, lack of appropriate storage facilities, poor farming skills and drought in the semi-arid parts of the County.

The County has witnessed a rise in livestock production with the main enterprises being dairy cattle, poultry and pig keeping, in that order. The local food processing industries and proximity to a ready market in Nairobi has increased the demand for livestock products. The County's Industrial sector is fairly robust owing to demand from and proximity to the capital city of Nairobi and it has flourishing milk processing and packaging industries, among others. Prospects for industrialization remain high in the dairy sector and manufacture of animal feeds. Though there are a good number of financial institutions operating in the county, the demand for financial services by the hardworking and enterprising population is enormous and expansion and further capacity building is needed.

Makuyu division where the project site is located is dominated by Kakuzi Corporation that produces coffee in large scale among other tree and fruit crops. Majority of people in the division depend of subsistence agriculture in small scale farming system. Many people provide labour to the large scale commercial farmers to subsidize their farm outputs.

Demography and Population profile

Population: 942,581 (Male 49%, Female 51%)

Population Density: 524 people per Km²

National Percentage: 2.44%

Age Category

Table 1: Age Range

Age Category	Range (%)
0 – 14	30
15 – 64	59
> 65	11
15 – 64	59

Health

HIV and AIDS pandemic poses a serious threat to the development of the county as the prevalence rate stands at 3.7per cent. Like in all other counties in the republic, the scourge is on the increase virtually in all the sub counties of the county.

Adverse social issues due to the implementation of the project such as the risk of the spread and contamination of HIV-AIDS and other sexually transmitted diseases and unwanted pregnancies were identified. However, the sensitization of workers for the use of appropriate preventive measures such as abstinence and the use of condoms by workers is recommended as appropriate management tools to be implemented by the Contractor.

One of the proposed facilities to be developed by the proponent is to put up a hospital within the site. This hospital will provide service to the local residents to supplement the already existing government and other private health care facilities in the region. .

Soils

The predominant soils in Makuyu are the deep and well-drained red/brown soils. These soils are loose and combined with the hilly terrain are easily eroded and sometimes are responsible for the landslides which are common in the district.

The proposed development of roads, houses and other infrastructure will take cognizance

Infrastructure

The project site is served by a dust all weather murram 8 kilometer road from the junction of Thika – Sagana - Embu tarmac road. This road will be improved to a high quality murram that will be motor able by all types of vehicle all year round.

The area is served by piped water and has some individually owned bore holes. The proponent has granted the residents request for an additional borehole dedicated to the public and will be located outside the project area in a site to be proposed by the residents.

Structures in the site area

The site was formerly comprising of two large scale coffee farms whose acreage total to about 1000 acres. The permanent immovable structures on site are old buildings that were used as farm houses and an old coffee factory that used to process coffee from the farm. The firm is supplied with piped water that was used for irrigating the coffee and providing for all other water needs in the farm. Some of the buildings are now being used by the proponent as site office, store and residential for some of the site workers.

Anticipated Environmental Issues

The proposed development plan will include retreat for holiday and retirement homes, leisure, golf and conferencing. This will include polo field, sporting field, beautiful landscaped gardens and water features. Given its location and scale of operation, the project has the potential to impact the environment and socio-economic landscape of the region within which it is located in both positive and negative ways. The potential impacts identified are presented below:

Physical Environment

1. Water quality aspects for both surface water sources like piped water, storm water, and other related aspects
2. Soil conditions, soil contamination and landscape alterations/degradation (based on aesthetic aspects) associated with the proposed project.
3. Drainage patterns especially in relation to wastewater effluents
4. Air quality aspects especially atmospheric emissions and related discharges from machinery like diesel run equipment etc.
5. Noise and Vibrations where applicable Natural

Environment

1. Natural flora and fauna from the proposed development and the adjacent ecosystems where applicable. (i.e., effects to natural plants and animals where applicable).
2. Effects on water flow patterns especially during the rainy seasons and quality aspects, user interference and contamination.
3. Topography: effects on soil and landscape.

Social welfare, Economic and Cultural Environment

1. Determination of implications to the human society distribution, demographic details, settlement patterns, changes to the cultural lifestyle and indigenous knowledge of the local society/public where applicable.
2. Notable changes in land use systems and the general land utilization types where applicable.
3. Implications on the employees, visitors and public health, safety and related hazards/risks such as HIV/AIDS, consumption of contaminated intravenous infusions products due to disease outbreaks, sanitary facilities, etc.

4. Aesthetic, landscape alterations and changes to infrastructural facilities, among others.
5. Effects associated with the construction and operation activities and related handling and disposal of wastes generated during the operations.
6. Effects associated with income generation opportunities created by the project due to the upcoming operations.
7. Introduction of nuisances, such as pests and related multiplication breeding sites.

Estimated quantities of generated components

Design and construction phase

The components and wastes generated at the design phase are very negligible. During construction, it is also difficult to estimate the amount of component waste that can be generated as it will entirely depend on project management and the proponent. The services of a quantity surveyor have been acquired, to ensure that only what is needed will be purchased. Purchasing of excess materials will obviously foresee more wastes and leftovers. On the other hand, poor management and planning will also cause wastage even if the material purchased is adequate for the construction work. The proponent has planned for materials to be re-used to minimize waste.

Environmental and Legislative Framework

Overview

There are a number of legislations and regulatory frameworks that the proposed development will have to consider in order for the development to be in full compliance with their guidelines and requirements. This study has outlined them here below and given suggestions of how the development can comply or the steps proponent has taken in compliance.

The Environmental Management and Co-ordination Act, 1999

The Act entitles every person in Kenya to a clean and healthy environment and aims to safeguard and enhance the environment. Though there are other sectoral laws on environmental conservation, this is the supreme legislation. It provides guidelines on issues of environment, stipulates offences and penalties and establishes NEMA. The Act also lists the type of projects, which must be subjected to the EIA process and establishes NEMA as the statutory body responsible for the implementation of the act.

In compliance to the requirements of the act, the proponent was appointed an expert to conduct the EIA study project report in order to seek approval before implementation of the proposed project.

The Environment (Impact Assessment and Audit) Regulations, 2003

The regulations are entrenched under section 147 of the EMCA. The regulations provide the framework for carrying out EIAs and EAs in Kenya.

This EIA project report is conducted in conformity with these regulations and EMCA, 1999.

Discretionary approvals required

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

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 to the authority in the prescribed form, giving the prescribed information and which shall be accompanied by the prescribed fee.

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

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

These regulations define the responsibilities of waste generators and define the duties and requirements for transportation and disposal of waste. It provides for mitigation of pollution and provides for hazardous and toxic wastes. The regulations require a waste generator to dispose waste only to a designated waste receptacle.

The proponent shall adhere to the regulations and proposes to contract a NEMA registered waste transporter.

Environmental Management and Co-ordination (Noise and Excessive Vibrations Pollution) (Control) Regulations, 2009.

The recently gazetted noise and excessive vibrations regulations require that noise and excessive vibrations should be minimized to the largest extent possible and that this should not exceed particular decibels. To minimize the impacts of noise and vibrations from the proposed activities, the activities will be limited to working hours between, 8.00 am and 5.00 pm. All possible care will be undertaken to ensure that the machinery are properly greased and oiled to reduce friction and possible noise emission.

The proponent shall strictly adhere to the provisions and requirements of these regulations

The Environmental Management and Co-ordination (Water Quality) Regulations, 2006

Then law is based upon the principle that everybody is entitled to a healthy and clean environment.

Section 42, pertinent to the implementation of this project

National Environmental Action Plan (NEAP)

According to NEAP, 1994 the Government recognized the negative impact on ecosystems emanating from development programmes that disregarded environmental sustainability. Established in 1990, the plan's effort was to integrate environmental considerations into the country's economic and social development. Under the NEAP process EIA was introduced.

The world commission on environment and development—the Brundtland Commission of (1987)

The Brundtland Commission addresses the environmental aspects of development. It has emphasized on sustainable development that produces no lasting damage to the biosphere and to particular ecosystems. In addition to environmental sustainability is the economic and social sustainability. Economic sustainable development is development for which progress towards environmental and social sustainability occurs within available financial resource.

The proponent is committed to adhere to the proposed EMP to ensure environmental enhancement and this would first be monitored through the initial environmental audit.

National Policy on Water Resources Management and Development

It enhances a systematic development of water facilities in all sectors for the promotion of the country's socio-economic progress, and also recognizes the by-products of these processes as wastewater. It calls for development of appropriate sanitation systems to protect people's health and water resources from pollution.

The proponent has conducted a detailed analysis of the hydrology and water resources in the area and has provided designs for septic tanks to be used by individual plot owners.

Factories and Other Places of Work Act – (Cap. 514)

The Act aims at making provision for the health, safety and welfare of persons employed in factories and other places of work. Section 13 states that every factory shall be kept in a clean state and free from effluvia, arising from any drain, sanitary convenience or nuisance. Effective and suitable provisions is also proposed for securing, maintaining by circulation of fresh air in each workroom, the adequate ventilation of the room. Section 36 provides for precautions with respect to explosive inflammable dust or gas. The Section is specific that where in any building, if dust that could escape to work man's room and explode by ignition, steps must be taken to prevent such an explosion. Section 41 compels that in every factory; there shall be maintained fire extinguishers, which shall be adequate and suitable in case of fire out breaks. Similarly, it mandates every factory to provide adequate means of escape in case of fire outbreak for the employees. The Act further requires that if a factory worker is employed in any process involving exposure to wet or to any injurious or offensive substance, suitable protective clothing must be provided by the employer.

The proponent will appoint a reputable contractor who will be responsible for enforcing the requirements during construction and subsequent repairs and maintenance after project completion.

The Physical Planning Act (Cap. 286)

This is the principle Act governing land use planning in Kenya. The Physical Planning Act (Cap. 286), which commenced on 29 October 1998, aimed at developing a sound spatial framework for co-existence, through plan proposals that enhance and promote integrated spatial/ physical development of socio-economic activities. Because building/construction of residential houses constitutes making of material change to land, the activity constitutes “development”, hence need to be controlled by local authorities. From the foregoing, the Physical Planning Act (Cap. 286) has made specific provisions in respect to the mandate of local authorities in the need for physical planning. The project proponent is required to acquire a Certificate of Compliance or approval letter from the relevant institutions as set out in the Act. The sole objective of the Act is to harmonize development.

- Section 24(1): the Director may prepare with reference to any Government land, trust land or private land within the area of authority of a city, municipal, town or urban council or with reference to any trading or marketing centre, a local physical development plan.
- Section 24(3): the Director may prepare a local physical development plan for the general purpose of guiding and co-coordinating development of infrastructure facilities and services for an area referred to in subsection (1), and for the specific control of the use and development of land or for the provision of any land in such area for public purpose.
- Section 25(b): a local physical development plan shall consist of such maps and description as may be necessary to indicate the manner in which the land in the area may be used According to Section 33 of the Physical Planning (Building and Development Control) Regulations, the Director of Physical Planning shall refuse to recommend any new building or proposed development, or alteration or addition to any existing building if:
 - i. The proposal is not in conformity with approved development plan
Such plans discloses a contravention of the physical planning (Building and Development) rules
 - ii. The plans are not correctly drawn or omit to show information required on such being required, a separate application accompanied by sets of plans has not been lodged in respect of buildings on separate plots or subplots
 - iii. The land or the proposed building or structure is not used for any purpose which might be calculated to depreciate the value of neighbouring property or interfere with convenience or comfort of neighbouring occupants
 - iv. The proposed building or land use is unsuitable, injurious to amenities or detrimental in respect of appearance or dignity or fails to comply with physical planning requirements in regard to sitting, design, height, elevation, size, shape, structure or appearance
 - v. Roads of access, parking bays, vehicular and pedestrian circulation spaces or other services to the plot or premises are inadequate
 - vi. The building is not sited in a satisfactory position
 - vii. The system of drainage, including soil, waste and surface water of the plot, or subplot upon which the building is to or stand, is not satisfactory

- viii.* Provision has not been made for adequate natural light and ventilation, or any other physical planning issue Section 36 of the Act (Cap. 286) further compels that if in connection with a development application, a local authority is of the opinion that proposals for industrial location, or any other development activities (such as building developments) will have injurious impact on environment, the applicant will be required to submit together with application an environmental impact assessment report. The above provision compares well to Section 29 (a), which confers upon local authorities the powers to prohibit or control the use and development of land and buildings in the interests of proper and orderly development of its area.

The drawings (plans) of the proposed project have been submitted to the Municipal Council of and approved.

Local Government Act (Cap. 265)

This Act specifically sets out the procedures in administration of local authorities. Because of this, it clearly articulates the constitution as well as the conduct of all local authorities in Kenya. The Act empowers local authorities to control or prohibit all places of work that by reason of smoke, fumes, or chemical gases, dust smell, noise or vibration or other cause may be a source of danger, discomfort, or annoyance to the neighbourhood, and to prescribe the conditions subject to which businesses, factories and workshops shall be carried on. Section 160 (a) underscores that every municipal council has the power to establish and maintain sanitary services for the removal and disinfection, or otherwise dealing with all kinds of refuse and effluent, such as spent oil, and where any such services is established, to compel the use of such services by persons to whom the service is available.

In compliance, EIA study report has proposed potential mitigation measures in the EMP and monitoring plan; and the environmental management Framework in the report.

Land Control Act (Cap 302)

Section 6(1) – Each of the following transactions;

- (a) the sale, transfer, lease, mortgage, exchange, partition, or other disposal of or dealing with any agricultural land which is situated within a land control area;
- (b) the division of any such agricultural land into two or more parcels to be held under separate titles, other than the division of an area of less than twenty acres into plots in an area to which the Development and Use of Land (Planning) Regulations, 1961 for the time being apply;
- (c) the issue, sale, transfer, mortgage or any other disposal of or dealing with any share in a private company or co-operative society which for the time being owns agricultural land situated within a land control area; is void for all purposes unless the land control board for the land control area or division in which the land is situated has given its consent in respect of that transaction in accordance with this Act.

The proponent has already acquired all approvals for transfer of ownership to the buyers of the plots in the proposed development

Building Code 2000

In recognition of the role of local authorities as lead planning agencies, the adoptive by-law compels any potential developer to submit development application to relevant local authority for approval. The local authorities are empowered to disapprove any plan submitted if it is not correctly drawn or do not provide sufficient information that complies with the by-law. Any developer, who intends to erect a building such as a residential block, must give the concerned local authority a notice of inspection, before the erection of the structure. After erecting the building, a notice of completion shall be issued to the local authority to facilitate final inspection/approval. No person shall therefore occupy a building whose certificate of completion has not been issued by the local authority. As a precaution against fire breakout, the by-law states that the walls of any premise shall be non-combustible throughout, similarly, in every building, other than a small house, which comprises more than one storey, shall have fire resistance. The by-law, in Section 214 indicates that in any public building where floor is more than 20 feet above the ground level, the council may recommend the provision of firefighting equipment that may include one or more of the following: hydrants, hose reels and fire appliances, external conations, portable fire appliances, water storage tanks, dry risers, sprinkler, drencher and water spray spring protector system.

All approvals will be sought before commencement of the work and regular monitoring will follow to ensure compliance with set standards and conditions.

Public Health Act- (Cap. 242)

Environmental degradation may pose a health hazard to the general public. This is among the factor considered by the Public Health Act to constitute “nuisance”. For the interpretation of the Act, Section 15 (IX) indicates that any noxious matter or wastewater discharged from any premise, such as a building constitutes nuisance. Any premise not kept in a clean and free from offensive smell such as gases which are injurious to health such as those from commercial establishments shall therefore generate nuisance. The act therefore stresses that no person shall cause a nuisance to exist on any land or premise occupied by him. Because of the above, the Act acknowledge that it shall be the duty of all local authorities to take all lawful measures for maintaining its district at all times in a clean and sanitary condition for remedy of any nuisance or condition liable to be injurious to health. To safeguard against this, Part X of the Public Health Act states that where in the opinion of the Medical Officer of Health that food stuffs within a warehouse, or a building are insufficiently protected, the owner shall be compelled to observe the require regulations, else he shall be guilty of an offense.

For instance, the effluent will be discharged into septic tanks in every house and when full exhaustion will be by approved exhausters who will empty into designated sewers. The solid waste shall be handled by a professional garbage collector on regular basis and disposed appropriately as per the waste regulations. Sanitary facilities shall be in conformity with MOH standards and installation of standard fittings.

The Water Act, 2002

Part II, section 18, of the Water Act, 2002 provides for national monitoring and information systems on water resources. Section 73 of the Act allows a person with license (licensee) to

supply water to make regulations for purposes of protecting against degradation of water sources. Section 75 and sub-section 1 allows the licensee to construct and maintain drains and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction.

The proponent shall draw water from surface runoff from the escarpment and Mt. that will collect in well designed dams and reservoirs to a supply network and the individual developers will each construct a septic tank for sewerage. The proponent is also to drill boreholes in the proposed site to increase availability of water to the residents.

The Penal Code (Cap. 63)

The chapter on “Offences against Health and Conveniences” contained in the Penal Code enacted in 1930 strictly prohibits the release of foul air into the environment, which affects the health of other persons. Any person who voluntarily violates the atmosphere at any place, to make it noxious to health of persons in general dwelling or carrying out business in the neighbourhood or passing along public ways is guilty of misdemeanour, i.e. imprisonment not exceeding two years with no option of fine. Under this code, any person who for the purpose of trade or otherwise makes loud noise or offensive awful smell in such places and circumstances as to annoy any considerable number of persons in the exercise of their rights, commit any offence, and is liable to be punished for a common nuisance, i.e. imprisonment not exceeding one year with no option of fine.

The World Commission on Environment and Development

The commission commonly referred to as “the Brundtland Commission” focused on the environmental aspects of development, in particular, the emphasis on sustainable development that produces no lasting damage to biosphere, and to particular ecosystems. In addition, environmental sustainability is the economic and social sustainability. Economic sustainable development is development for which progress towards environmental and social sustainability occurs within available financial resources. While social sustainable development maintains the cohesion of a society and its ability to help its members work together to achieve common goals, while at the same time meeting individual needs for health and well-being, adequate nutrition, and shelter, cultural expression and political involvement.

The Rio Declaration on Environment and Development

Agenda 21 – a programme of action for sustainable development worldwide, the Rio Declaration on Environment and Development was adopted by more than 178 governments at the United Nations Conference on Environment and Development, known as the Earth Summit, held in Rio de Janeiro, Brazil from 3rd to 14th June 1992.

Principle No. 10 of the declaration underscored that environmental issues are best handled with participation of all concerned citizens at all the relevant levels. Effective access to judicial and administrative proceedings, including redress and remedy shall be provided. The foregoing discussion is relevant to the proposed development because EMCA demands that the public must be involved before any development project that is likely to have adverse impacts to the environment is initiated by a proponent. The Act has further established Public Complaints

Committee (PCC) where the issues raised by the public in regard to any proposed development can be addressed.

Sessional Paper No. 6 of 1999 on Environment and Development

Every person in Kenya is entitled to a clean and healthy environment and has a duty to safeguard and enhance the environment (Kenya, 1999). As envisioned in Sessional Paper No. 6 of 1999 on Environment and Development, Kenya should strive to move along the path of sustainable development to meet the needs of the current generation without compromising the ability of the resource base to meet those of future generations. The overall goal is hence to integrate environmental concerns into the national planning and management processes and provide guidelines for environmentally sustainable development (Kenya, 1999). The policy paper emphasized environmental impact assessments must be undertaken by the developers as an integral part of a project preparation. It also proposed for periodic environmental auditing to investigate if developer is fully mitigating the impacts identified in the assessment report.

The National Environmental Action Plan (NEAP)

The NEAP for Kenya was prepared in 1994. It was a deliberate policy to integrate environmental considerations into the country's social and economic development process. The integration was achieved through multi-sectoral approach to develop a comprehensive framework to ensure that environmental management and conservation of natural resources is an integral part of societal decision-making process.

National Shelter Strategy to the Year 2000

This strategy followed the International Year of Shelter for the Homeless in 1987 and was formulated to advocate a change in policy in order to allow other actors to come in and assist the Government in providing housing. The Government was to simply facilitate other actors such as for the proposed housing developers to invest in shelter.

This is the role the proponent wishes to contribute to by investing and providing shelter to people.

The National Poverty Eradication Plan (NPEP)

The NPEP has the objective of reducing the incidence of poverty in both rural and urban areas by 50% by the year 2015; as well as strengthening the capabilities of the poor and vulnerable groups to earn income. It also aims to narrow gender and geographical disparities and create a healthy, better-educated and more productive population. This plan has been prepared in line with the goals and commitments of the World Summit for Social Development (WSSD) of 1995. The plan focuses on the four WSSD themes of the poverty eradication; reduction of unemployment; social integration of the disadvantaged people and the creation of an enabling economic, political, and cultural environment. This plan is to be implemented by the Poverty Eradication Commission formed in collaboration with Government ministries, community based organizations, and private sector such as the proposed development will create employment opportunities for Kenyans, hence contributing to poverty eradication.

The Poverty Reduction Strategy Paper (PRSP)

The PRSP has the twin objectives of poverty reduction and economic growth. The paper articulates Kenya's commitment and approach to fighting poverty; with the basic rationale that the war against poverty cannot be won without the participation of the poor themselves. The

proposed project during and after implementation, will offer jobs to many Kenyans as a way of contributing to this noble objective of reducing poverty in the nation.

Institutional Framework

The environmental impact assessment for the proposed development is bound to be influenced by the operational interests of several lead agencies. These include, but not limited to the following key institutions:

County of Muranga

The County of Muranga is the principle lead agencies on all matters pertaining to planning within the proposed site. The County Governments’ Act (Cap 265) clearly defines the functions of this key institution. Section 166 empowers them to be responsible for local planning and development control in the region. The Physical Planning Act (Cap 286) also confers upon local authorities the powers to control development in their areas of legal jurisdiction. Accordingly, Section 29 (a) has granted all local authorities in Kenya, the Municipal Council of and County Council of (..... is in County) being no exceptions, the power to prohibit or control the use and development.

Conclusion

The institutions guided by relevant policies and legislations must regulate urban development and planning projects. The above expression is envisioned as a basic principle component of coordinated and harmonious development in urban areas, and is one of the core pillars for attaining sustainable development. These provisions will therefore guide the proposed

Adverse Environmental and Social Impacts to be addressed into detail in the study report

The following are some of the potential economic and social benefits (positive impacts) likely to arise as a result of the development by Makuyu Ridge, Resorts and Cities Limited:

Table 3: Positive Impacts of the Proposed Development

Provision of high class and affordable housing to the residents	The proposed project will provide affordable housing to the residents with emphasis on their safety and well being
Improved Security	Security will be ensured around the proposed development through distribution of suitable security lights and presence of 24 hour security guards. This will lead to improvement in the general security in the surrounding area.

Generation of Direct & Indirect Employment and Income	Besides the direct employment by the proposed development, other forms of employment are likely to result from the spillover effects, through indirect services during the construction and operation phases. The employment opportunities will generate income and improve the living standards of the local population and its environs.
Contribution to Government Revenue	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. The proponent is also expected to pay a fee to NEMA for the EIA license of 0.1% of the total cost of the Project.
Economic investment	The proponent will receive returns on his investments hence increases in wealth

Predicted negative impacts and potential mitigating measures

The proposed development plan will include retreat for holiday and retirement homes, leisure, golf and conferencing. This will include polo field, sporting field, beautiful landscaped gardens and water features. Given its location and scale of operation, the project has the potential to impact the environment and socio-economic landscape of the region within which it is located in both positive and negative ways. The potential impacts identified are presented below:

Soil and Geology

During construction phase, the activities involved in the site preparation and construction phase of the development may have a major negative and moderate impact on soil and geology of the project site. This is due to the removal of vegetation from the area which will leave considerable areas of soil exposed to the elements, which may result in soil erosion. Heavy machinery will be traversing the site due to the construction activities this may lead to soil compaction and erosion of the soil. Uncontrolled soil erosion can have adverse effects on the local water bodies.

Hazardous substances such as diesel used for the operation of machinery and stand-by generators, may be stored on the property. This may have a significant negative long-term impact on soil quality in the area.

During Operational phase the building roofs and pavements will lead to increased volume and velocity of storm water or runoff flowing across the area covered by the buildings. 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.

Mitigation measures

- Excavation should be done under controlled conditions which will include minimizing vegetation removal, avoiding creating large open expanses of bare soil, creating wind breaks, installation of silt traps near the rivers, using of single or few designated tracks to bring vehicles into the area and watering using water
- Open stockpiles of construction materials (e.g. aggregates, sand and fill material) on sites should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.
- Landscaping should be done on the land during the operation phase and de-commissioning phase to ensure that the same is returned to its original state. The contractor should also provide adequate soil conservation structures to ensure that areas prone to soil erosion are protected from runoff.

Water resources; supply and use

Potential impacts on the water environment could result from: reduced percolation to ground due to increase in non-permeable surfaces; contamination of water sources from waste water and chemicals, fuel and oil spills or leaks from various areas. If the sites for dumping solid wastes are not well taken care of, they may cause contamination to ground water source

To minimize air pollution, the following measures are to be adhered to:

Potential Mitigation Measures

- Avoid excessive use of the water. Water supply and use should follow approvals by the service provider and as per the extraction permits.
- Roof catchments should be provided with gutters to facilitate collection of the run-off. This water should be stored for general use i.e. cleaning, fire fighting, watering the golf course etc. In fact, the water can be consumed after suitable treatments and approvals by relevant authorities.
- Sufficient water Storage tanks should be provided. Since houses will be constructed by their individual owners, they should be encouraged to put up water storage tanks per housing unit.
- Provide notices and information signs to the involved stakeholders on means and needs to conserve water resource i.e. 'KEEP/LEAVE THE TAP CLOSED', 'WATER IS LIFE. SAVE IT' etc. this will awaken the civic

consciousness of the community with regard to usage and management of the water resources.

- Install water conserving taps that turn-off automatically when water is not in use.
- Encourage water reuse/recycling mostly during construction and occupation phases.

Waste water

Sewage is the used water or liquid waste of a community, which includes human and household wastes together with street-washings, industrial wastes such as ground and storm-water as may be mixed with it.

Effluent/sewage resulting from sanitary facilities and wastewater from washrooms is of significant importance to the environment. It must never come into contact with the surrounding i.e. water, soil, air etc. It must always drain effectively into the system as designed by the engineers. Sound sanitation should be ensured to influence prevention of the sporadic outbreak of diseases dangerous for the general health of the community (within the projected area), workers and the general public. Either controlling or eliminating such environmental factors that contribute in some form or the other to the transmission of the diseases can achieve this.

Potential Mitigation Measures

Households will use septic tanks that will be exhausted when filled and disposed to municipal designated disposal areas as per municipal regulations.

Waste water from kitchens will be used in gardens within the homes for vegetable growing. Drain water. Drain water from roads will feed into a dam for water that will be used to irrigate a 10 acre farm within the estate organic farming techniques to grow vegetable and fruits for the residents

Surface water drainage

The proposed development plan will include retreat for holiday and retirement homes, leisure, golf and conferencing. This will include polo field, sporting field, beautiful landscaped gardens and water features. Given its location and scale of operation, the project has the potential to impact the environment and socio-economic landscape of the region within which it is located in both positive and negative ways. The potential impacts identified are presented below:

DRAINAGE

The proposed development will result in the removal of vegetation, construction of roadways and buildings. This will result in a reduction of the infiltration capacity of the underlying soil/rocks in certain areas and consequently increased surface runoff.

Mitigation

- Terracing and leveling the project site to reduce run-off velocity and increase infiltration of rainwater into the soil.
- Drainage channels shall be installed in all areas that generate or receive surface water. The channels will be covered with gratings or other suitably approved materials to prevent occurrence of accidents and dirt entry that may compromise flow of run-off.
- Ensure that the drainage plan proposed is implemented as stipulated on the plan.
- Paving of the sidewalks, parking and other open areas shall be done using pervious materials i.e. concrete blocks to encourage water percolation thus reducing run-off volume.
- Additional drainage may be put in place to convey the flood discharge
- Ensure that all drains and culverts collecting water within the site are regularly cleaned and maintained.

Noise and vibration

Noise is unwanted sound that can affect job performance, safety, and health. Psychological effects of noise include annoyance and disruption of concentration. Physical effects include loss of hearing, pain, nausea, and interference with communications when the exposure is severe. Construction activities will be generating noise and hence affecting the immediate environment; i.e. other operations in the nearby. Such noise will emanate from the construction machinery and equipment i.e. concrete mixers, excavators, workers, trucks and other vehicles accessing the site. It will also affect small animals and bird life.

During occupation noise will come from vehicles, and other operations within the site. Production machines generate/ produce a lot of noise. Hearing protection is thus essential when noise exposures cannot be controlled at their source.

Potential Mitigation Measures

- When occupation of the estate commences, construction works should be carried out only during the specified time i.e. from 0800 hrs to 1700 hrs; when most of the neighbours will be at work
- Machineries should be maintained regularly to reduce noise resulting from friction.
- There should be no unnecessary honking of the involved machinery and vehicles.
- Provision of bill boards at the construction site gates notifying of the construction activity and timings.
- Workers should be provided with relevant personal protective equipment/materials such as earmuffs and earplugs when operating noisy machinery and when in noisy environment.
These provide a physical barrier that reduces inner ear noise levels and prevent hearing loss from occurring.

Air Quality

The construction activities on the site will result into increased dust and gas emissions. Construction machinery and trucks (including small vehicles) generate hazardous exhaust fumes such as Carbon Oxides (CO_x), Sulphur Oxides (SO_x) and Nitrogen Oxides (NO_x). Dust particles caused by vibrations of machines and vehicle movement suspends in the air mostly during dry spells. Diesel engines emit black carbon, which absorbs sunlight and warms the atmosphere and micro-particles. Unseen and odourless, microscopic particles of air pollution is very harmful. Exhaust from diesel engines and dust swirl into an insidious cocktail of tiny particles that can spend weeks airborne. The most harmful are the smallest, less than 2.5 microns in diameter; when inhaled, the lungs or pass directly into the bloodstream and damage arteries.

Potential Mitigation Measures

- Provide Personal Protective Equipment (PPE) such as nose masks to the workers on site.
- Regular and prompt maintenance of construction machinery and equipment. This will minimize generation of noxious gases and other suspended particulate matter.
- Control over areas generating dust particles. Such areas should be regularly cleaned or sprinkled with water to reduce dust. The areas can be enclosed to mitigate effects of wind on them.

- Workers should be trained to understand the hazards that may be generated in such work environments.
- Workers should be encouraged to go for regular health check-ups to ascertain their health standards.
- Enclose the site with dust-proof net during the construction.

Oil Leaks and Spills

It is important to note that oil/grease spills are prevalent in construction sites and in most areas that make use of petroleum products. Such products contain detrimental elements to the environment. They contain such heavy metals as mercury, lead, and sulphur among others. Though this may not be common at the site, it is wise to control and observe the little that could occur especially during maintenance of the involved machinery.

Potential Mitigation Measures

- All machinery must be keenly observed not to leak oils on the ground. This can be affected through regular maintenance of the machinery.
- Maintenance must be carried out in a designated area (protected service bays) and where oils are completely restrained from reaching the ground. Such areas should be covered to avoid storm water from carrying away oils into the soil or water systems. Waste water/ wash water from these areas should be properly disposed.
- All oil products and materials should be stored in site stores or in the contractor's yard. They should be handled appropriately to avoid spills and leaks.
- Car wash areas and other places handling oil activities within the site must be well managed and the drains from these areas controlled. Oil interceptors must be installed along the drainage channels leading from such areas.

Solid Waste

Construction activities results into increased solid wastes within the sites. Such waste materials include excavated soil, stones, construction debris, wood, broken glasses, containers, rods of metal, pieces of iron sheets, vegetation litter on the site, kitchen materials and other house refuse especially during the occupation of the project etc.

On completion, the site will be generating waste products from various operations and activities house refuse. Removal and disposal of house refuse comes under

public cleaning and is very important and costly item on the local authorities' budgets. If it is not removed promptly away from the generation points (house compounds), it accumulates in large heaps harboring rats, flies and vermin which disseminate germs of disease. A good deal depends upon the mutual cooperation between the local authorities and the public. Proper maintenance and use of dustbins is the key to the satisfactory solution of the problem of sanitary storage and collection of refuse without causing nuisance.

The problem of dealing with house refuse resolves itself into four parts: storage, collection, transportation and disposal. Therefore bins come in handy during storage and collection; both in the house and on foot paths of the streets for the throwing of whatever rubbish such as paper wrappings, cigarette ends etc., into them instead of scattering them all over. Transportation of the collected waste need be simplified and finally, the use of sound method of waste disposal. The proponent shall include dustbin cubicles to facilitate solid waste management.

Potential Mitigation Measures

- The contractor or proponent should work hand in hand with NEMA, private refuse handlers, environmental experts and the County of Muranga to facilitate sound waste handling, and disposal from the site. All wastes must be taken to the approved dumpsites. The wastes should be properly segregated and separated to encourage recycling of some useful waste materials; i.e. some excavated stone materials can be used as backfills. (Use of an integrated solid waste management system; through a hierarchy of options: source reduction, recycling, composting and reuse, and sanitary land filling).
- On completion, the project management should adapt effective waste management system to handle solid waste materials that will be generated from various operations. (Use of an integrated solid waste management system; through a hierarchy of options: source reduction, recycling, composting and reuse, and sanitary land filling).
- There should be several bins. The bins should have a close fitting cover. The receptacle(s) must be kept in a good condition, and sanitarily cleaned by frequent washing and disinfecting. The first action should be reduction of waste at source and all residents and shop owners must be encouraged and sensitized on reduction or waste. Biodegradable wastes should be composted for use in the gardens. There should be several bins clearly labeled and

possibly colour coded to handle various categories of waste. Plastics and polythene materials should be sold or given away to the approved plastic recyclers while paper waste should be sold to waste paper recyclers. Glass waste should be sold to glass manufacturers for recycling. Tins and scrap metal/waste metals should be sold to approved scrap metal dealers or steel rolling mills for recycling. Wastes from wood and related products should be reused or sold out for reuse elsewhere or as firewood. Any unrecyclable waste should be disposed in approved dump sites and as per the Waste management Regulations.

- In addition to the bins to be used by each individual plot owner or resident, the proponent should provide a number of dustbins strategically located on the footpaths of the driveways for the pedestrians to throw whatever rubbish instead of scattering them on the road surface or compound. This is to be done along the golf course as well.
- The collection should be made at least once in 24 hours, and it should be done in such a way as to minimize nuisance of smell vans or any employed (suitable) collection method. All the refuse collected from maisonette to maisonette must be carried away from the storage site to a safe place where it can be suitably disposed. Lastly, suitable and most effective method of disposal should be applied.
- Train or educate the involved stakeholders on the importance and means of waste (garbage) management and handling especially during operation.
- The contractor or proponent should work hand in hand with private refuse handlers, NEMA and the Muranga County Environment department to facilitate sound waste management as per the prevailing regulatory provisions.

Ecological Impacts: Flora and Fauna

Vegetation has a great effect on the general and localized environment and normally can modify microclimate. Usually, the flora creates a good environment for habitats thus the two may go together more often than not. In consequence, de-vegetation may result to negative effects on the fauna. Singly, the proposed project may appear of no significant impact but the cumulative effect in concert with other current and future projects are capable of significant and serious effects including but not limited to soil erosion, decrease in air purifiers (carbon sinks) and thus

contribution to global warming etc. As earlier indicated, there is no vegetation on site except some grass and weeds. However, there may be some temporary and permanent disturbances to insects that inhabit the grass/weeds.

Mitigation

- Avoid unnecessary clearing of vegetation by conserving vegetation not in the sections being built up
- Landscape and plant vegetation in all open areas after the completion of the project and manage the introduced vegetation on completion of the development to restore or improve the site.
- The arboretum planned in the developed sites should use appropriate tree species that protect the soil and conserve water.

Construction materials

They include stones, sand, cement, ballast, reinforcing steel rods etc. They should be of the appropriate quality.

Potential Mitigation Measures

- Should be sourced from licensed dealers and suppliers.
- Quality should be thoroughly controlled through regular tests.
- Procurement of the materials should follow specifications by the structural and architectural Engineers

Visual Intrusion

Visual impacts occur during earthworks for the foundation of projects. The proposed project will alter the landscape as there are no similar developments in the area. However, the visual impact will not be significant and will have very little effects to neighbouring activities and the general public.

Potential Mitigation Measures

- On completing the earthworks, the worked area should be restored through backfilling, leveling and planting of vegetation. All existing trees not in areas under construction should be spared.
- The scheme should be blended in a way to merge with existing environment. It should in fact upgrade the quality of the surroundings. Landscaping and planting of vegetation especially trees shall go a long way in mitigating the visual intrusion.

Public safety, traffic, Occupational Health and Safety (OHS)

During the construction period there should be opportunities to increase awareness of health and safety issues and implement appropriate standards of performance. Occupational and environmental health in and around the contractor's camps and facilities should be subject to such scrutiny. It should be a requirement that the contractors supervising foremen will have basic First Aid training which should be available from hospitals and medical NGOs. There should also be plans for coping with emergencies. A fully stocked First Aid kit (and set of emergency numbers) will be available at each worksite and workshop.

Appropriate safety protection equipment should be worn at all workshops, yards and construction sites to conform with national regulations and/or as specified by the Supervising Engineer's Representative. Protective equipment includes hard boots and hats, protection for eyes and ear muffers (when using pneumatic drills, grinders, etc.). Likewise fire prevention measures should be in place, including the deployment of adequate functional extinguishers and simple dry sand buckets. The project monitoring program should include inspection of safety equipment use.

Basic hygiene standards should be required at all residential and other contractor facilities, with proper approved waste disposal arrangements. HIV Aids awareness development and disease spread mitigation should be fostered by the contractor among his staff. Contact with appropriate specialist to conduct basic training and awareness among workers should be facilitated.

During construction, there will be increased dust, air and noise pollution. These are considered as negative impacts as they significantly lower the quality of environment. The residents and workforce involved would be more subjected to these environmental hazards. Food for the construction workers is provided by mobile individuals most of whom operate without licenses. This can compromise health of the workers especially if such foodstuffs are prepared unhygienically. Road entry and exit may also be a risk if not properly designed and controlled and more so the heavy trucks during construction. Traffic congestion is also a problem during occupation because the proposed project will add some cars.

Mitigation measures

- Provide properly fitting Personal Protective Equipment (PPE) depending on tasks being performed to avoid injuries and illness including working boots, overalls, helmets, goggles, earmuffs, masks, gloves etc

- Factories Act abstract should be posted at a strategic point on site. **Factories and other places of Work Act** should be strictly adhered to, the **Building Code** and other relevant regulations. Only specialized, machine operators should operate machinery and specialized equipment and all moving parts should be provided with appropriate guards. A first aid kit should be provided within the site. This should be fully equipped at all times and should be managed by qualified persons.
- Proper designs to allow for deceleration and acceleration to the site. Clearly indicate direction of traffic throughout the project cycle. Internal driveways should also be erected with bumps to control speed and thus reduce potential accidents. There should be careful design and layout of the site entrance, providing adequate visibility
- Adapt effective emergence response plans especially during construction phase.
- Safety awareness may be gained through regular safety meetings, safety training or personal interest in safety and health. This awareness will increase ability to respond if, some day in future, one is a bystander in an emergency.
- The contractor should have workmen's compensation cover. It should comply with Workmen's Compensation Act, as well as other Ordinances, Regulations and Union Agreements.
- Sanitary facilities should be provided (for each sex where conditions warrant). Standard cleanliness of the facilities should be maintained.
- Local individuals preparing food for the workers at the site should be controlled to ensure that food is hygienically prepared.
- Workers during construction phase should always be sensitized on social issues such as drugs, alcohol, diseases etc. There should be training programs to facilitate this.
- Proper waste management of domestic waste to prevent vector-borne diseases.

- Public awareness campaigns on the prevention and management of prevalent diseases such as malaria, STDs and HIV AIDS.
- Ensure (consistently) good water quality through regular water analysis to ascertain compliance to public health standards.

Accident prevention and Emergency Response Plan (ERP)

Emergencies and disasters are a reality of everyday life. Stakeholders must therefore be sensitized and prepared on how to react during both the construction and occupational phases. Absence of such plans may be risky since there would be no guidelines to handle or control emergencies if they occur. The proponent and the contractor shall take all necessary steps to prevent accidents in the entire project cycle. All construction safety procedures shall be followed as discussed elsewhere in this report while measures to prevent and manage fires shall be taken as discussed elsewhere in this report. For further management of any foreseeable accidents, the proponent shall develop an ERP which shall be documented and all the residents shall be provided with the requisite training and annual drills conducted.

The ERP shall typically contain all information on all likely types of emergencies likely to be encountered mainly accidents and fires. The ERP shall include actions to be taken in case of emergencies and shall display emergency contacts (ambulance, doctors, police and fire engines) telephone list; simple instructions on do and don'ts in various emergencies such as fires, LPG incidents, armed robbery etc. On traffic safety, the road shall be constructed to adoptive standards and the entry and exit points provided with clear views. Bumps shall be erected to control speed along the driveway and the parking. The ERP shall also provide for basic First Aid training to some of the potential residents. The ERP shall also promote good neighbourliness which shall go a long way in emergency response. Such plans must be properly documented and made available to all. For instance, a fire assembly point must be identified and clearly

Security

Security is a prerequisite for any development. During construction, security is very important in any site. This ensures that materials are in order. It also controls movement within the site especially for the intruders who might be injured by the materials and other hazardous features available within the site. The area is well covered with communication facilities, which facilitate security to large extents.

After the project is over, security guards and facilities should be provided. The issue has been catered for in the project design.

Potential Mitigation Measures

- The project should be enclosed using suitable walls and an electric fence on top of wall to beef-up security and to control movement within the site.
- Security guards must always guard the gate to the facility to keep away the intruders and to control movement within the site.
- Lighting as well as security alarms should be installed in strategic positions all over the site after the completion of the project.
- Contractor should provide adequate security during the construction period when there are no works on the site.
- The guards stationed at the gates should document movements in and out of the site/ property.

Fire preparedness

Fire outbreaks are common in Kenya and they usually subject detrimental effects to the environment. Fire causes both economic and social drawbacks. There are operations that are prone to such outbreaks at construction sites. It is therefore always important to consider the issue of fire.

Potential Mitigation Measures

Recommended Firefighting equipment: Potential causes of fire are many and varied electrical faults, smoking, gas leaks, carelessness etc.

Fire incidences result to economic and social drawbacks. It is therefore always important to consider the issue of fire by bringing in the element of preparedness. In this regard, the design should provide and recommend implementation of fundamental fire fighting measures and control facilities.

- The home owners should install an automatic fire alarm system in housing units and provide 2No. 9kgs water or powder fire extinguisher for every house. Provide 2No. powder or carbon dioxide extinguishers for the ground floor where there is parking
- Provide appropriate Fire Hydrant Ring main with suitable outlet points.
- Install manual electric break-glass fire alarm system with secondary power
- All installation to follow Fire Masters requirements approval.
- Ensure that all firefighting equipment are strategically positioned, regularly maintained and serviced.

- Encourage tenants to store LPG cylinders outside their houses
- Provide fire hazard signs such as ‘No Smoking’ signs, Direction to exit in case of any fire incidence and emergence contact numbers should be provided as well.

Conflict with the community

Projects of such magnitude usually attract public uproar (especially from the neighbouring residents and community) if they are not made to own the project. Conflicts usually arise mostly from the foreseen negative impacts but mainly due to carelessness in executing the works.

Potential Impacts

- Increased social crime risks
- Due to the influx of construction workers on site, there are chances of introduction of individuals with potentially anti-social behaviors such as thieves/thugs, drug users and traffickers and may pose a risk to the community both during the implementation and occupational phases.

Mitigation

- Adopt strict hiring guidelines to lock out the bad elements and limit movement outside the site.
- The contractor has a responsibility of sensitizing the workers on social issues such as HIV/AIDS, drugs and other social issues through regular training and social gatherings and strict monitoring. Workers should not be housed on site.
- Consultation with neighbours on the mitigation measures prescribed for the negative impacts as a way of conflict resolution and neighbourhood association.

Construction safety

Construction work can be particularly hazardous. Personal protective equipment, fire safety, electrical safety, and other precautions are essential for safe construction work. Follow these guidelines when visiting or working at construction sites:

- Do not walk, stand, or work under suspended loads. If you raise a load, be sure to crib, block, or otherwise secure the load as soon as possible.
- Avoid placing unusual strain on equipment or materials.

- Be prepared for unexpected hazards. BE ALERT!
- Proper personal protective equipment, (i.e. safety shoes, hardhat, goggles, Respiratory Equipment and Gloves) must be used at all times on the site or as conditions warrant. Jewellery should be avoided.
- Prior to the start of construction, all areas should be inspected for the presence of potentially hazardous energy in the area should be located and precautions taken.
- Workers should be trained on the proper use of tools and protective equipment.
- Great care must be given to excavations and the safety of the machinery, tools and other equipment such as scaffolding, ramp or ladder must be guaranteed. Accident prevention should be the overriding safety precaution. A qualified person should always be on site to oversee the working.
- Any area that poses a physical threat to workers and/or pedestrians requires barriers or guards. Contractors and project managers should use barriers and guards as necessary to protect employees, and visitors from physical hazards. Areas that typically require permanent or temporary protection include the following:
 - Stairways, Open Manholes, Elevated Platforms, Areas with moving machinery, Excavation sites,
 - Construction sites, Temporary wall or floor openings, Doors opening into construction.

Community Facilities and Social Infrastructure Services

The increased population accommodated in the proposed housing development has been provided with adequately community facilities and services. However, there may be some that will not be available due to the diverse nature needs to mankind. These include recreation facilities (such as specialized sports facilities), schools for special education or foreign curriculum and as well as specialized health facilities, religious facilities such as mosques, and sewer). Elsewhere the inadequacy of these facilities has led to unplanned and spontaneous change of use of other properties to accommodate these deserving community facilities and services.

Mitigation

The county government and other government agencies together with all stakeholders (including developers) should discuss for a solution and come up with a comprehensive development plan.

Potential proliferation of business centres and kiosks

Due to the business opportunities presented by such developments, there is a likelihood of erection of kiosks along road reserves and other commercial centers beyond areas designated as commercial zones.

Mitigation

The county government and other government agencies together with all stakeholders (including developers) should discuss for a solution and come up with a comprehensive development plan to avoid flouting of Building development regulations and zoning guidelines with impunity. The council and the developers especially the home owners should strictly enforce the planning policy.

Project Completion

After laying down the entire infrastructure, the contractor will leave the site after officially handing over the completed project to the proponent. Before leaving the site, the proponent should ensure that the contractor done the following:

- I. Comprehensive landscaping of open areas should be done.
- II. All waste materials must be cleared and removed from the site. However, these should be disposed appropriately and to the approved dump sites in accordance to the laid down regulations.
- III. The structures should be cleared, cleaned and rubbed of any dust particles before occupation.

Project Costs

The total installation cost of the Project is approximately \$2,550,000. This includes the cost of the equipment acquisition, installation, electromechanical works, soft costs like engineering and project management¹.

Project Cost Breakdown

The table shown below summarizes the estimated costs of the project uses of funds².

PROJECT CAPITAL COSTS	
Project Size	1000 acres; Developed with Golf Course, Retirement Homes,
PLANT EQUIPMENT	
Item	Cost
Equipment and Machinery	\$750,000

Gasification Equipment	\$1,000,000
Biomass Handling Equipment	\$200,000
Biomass Transport Equipment	\$200,000
Transmission Line	\$150,000
Civil works	\$250,000
SOFT COSTS	
Engineering & Project Management	\$100,000
Total	\$2,550,000

Calculations of NEMA fees

$$\$2,550,000 * 88 = \text{Ksh. } 224,400,000$$

$$224,400,000 * .1\% = \underline{224,400}$$

Amount Due to NEMA = Ksh. 224,400